THE PATH TO CITY RESILIENCE

Edited By: Dr. Zeinab Feisal and Dr. Nihal Amer

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CITY RESILIENCE 2020

THE PATH TO CITY RESILIENCE

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INTRODUCTION

All cities are vulnerable to severe impacts from a range of shocks and stresses that can be both natural and human made. Resilience challenges could be a result of rapid urbanization, climate change, political or economical instability. Resilience is the ability of urban systems to maintain continuity through all pressures and strains while positively adapting and transforming towards sustainability. A resilient city assesses, plans and acts to prepare to absorb, respond to and recover from all hazards, either sudden or slow-onset, expected or unexpected while maintaining its essential functions, structures and identity and adapting to continual changes. Consequently, resilient cities have the ability to protect and enhance people's lives, secure development gains, foster an investible environment, and drive positive change. Unplanned cities are more vulnerable to shock as they often have pre-existing stresses. In cities that are not prepared or unable to recover, shocks can intensify existing stresses and create a flow of negative impact that compromise city functionality and put people at risk. The fundamental aspect is how cities should protect their cultural and natural heritage to adapt to climate change without losing their identity.

CONFERENCE PURPOSE

This conference will be a chance to find new solutions and innovations in the resilient urban systems. These creative inventions can be a motive to dynamic, desirable and healthy communities. "The Path to City Resilience" conference is a fertile ground for architects, engineers, city planners, social and political scientists who able to consider new concepts and adapt them according to technological innovations and human desires.

CONFERENCE THEMES

1. Urban Resilience:

Urban resilience is the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability. Cities and city inhabitants are facing additional challenges as a result of rapid urbanization, a changing climate and political instability. A resilient city assesses, plans, and acts to prepare for and respond to all hazards; sudden and slow-onset, expected and unexpected. As risks and urban population are increasing, urban resilience has gained greater importance in international development discourse and has emerged as one of the core principles of sustainable urban development in the global development frameworks and targets, including sustainable development goals, new urban agenda and agreements on climate change. It is essential to consider the following aspects:

- Pathways towards implementing resilience.
- Innovation in the realm of urban resilience. New challenges require new solutions. How innovations in the resilient urban systems can be a motive to dynamic, desirable and healthy communities.
- Building cohesive, healthy and resilient community.

2. Resilience Planning

Resilience planning is a holistic approach that takes into consideration future economic, social and environmental developments including climate change. Planning for resilience empowers diverse stakeholders to evaluate plans, set strategic policies, and implement projects that will enable communities to adapt and succeed when faced with challenges. Resiliency planning can include the following:

- Updating land use codes, zoning, development standards, incentive programs, and other plans or policies to better prepare for shocks and stresses
- Developing measures that allow for action in the face of uncertainty or unexpected events.

3. Resilience and Heritage

Historic cities, monuments, archaeological sites, museums and cultural landscapes are increasingly affected by threats both natural and manmade. The progressive loss of these places as a result of floods, mudslides, fire, earthquakes, civil unrest has become a major concern.

- Heritage contributes to social cohesion, sustainable development and psychological well being. Protecting heritage promotes resilience. There is a considerable wealth of experience exists in protecting heritage from disasters and in harnessing the potential of a well-maintained historic environment to strengthen the resilience of communities.
- The initiative and commitment of national and local governments, businesses and communities around the world is increasingly apparent. Their efforts need to be further encouraged. UN Agencies, NGO's and a wide range of universities and technical institutions have been organizing additional support and guidance. Nevertheless, efforts to protect heritage from disaster risk remain fragmented and efforts to draw on heritage as an instrument for building resilience remain inconsistent.
- It is essential for cities to protect their cultural and natural heritage to adapt to climate change without losing their identity.

4. Environmental Resilience

Climate change is aggravating the intensity and frequency of natural disasters worldwide. It is crucial to consider the following aspects:

- How cities should be ready to cope with environmental risks.
- Examining the ability of natural systems to recover from disturbances and to tolerate or adapt to changing climate.
- Improving our understanding of the risks facing both natural and managed systems as a result of global change factors, such as climate change, land-use change and nutrient pollution.

5. Landscape Resilience

Landscape resilience is the ability of a landscape to sustain desired ecological functions, healthy natural biodiversity, and critical landscape processes over time, under changing conditions, and despite multiple stressors and uncertainties. Landscape resilience identifies the factors that create options and alternative for species and processes within places places. The attributes of resilience

differ depending on whether the focus is on species and ecosystems or on enduring physical landscape. It is essential to explore the following:

- The factors that allow a landscape and a geophysical setting to sustain ecological function and maintain a diverse array of species places as the climate changes. Those places with inherent properties that built resilience will be natural strongholds for species and nature into the future.
- The seven main principles of landscape resilience are setting, process, connectivity, diversity and complexity, redundancy, scale and people.

6. Infrastructure Resilience

Infrastructure systems are important when considering infrastructure resilience. Resilience is not just related to individual infrastructure elements, but it shows how these work together as energy, transport, water and sanitation, ITC networks – and affect each other.

- Climate Change:

- Understanding climate change implications for infrastructure resilience.
- Best practices in infrastructure resilience and enhancing capacity.
- Critical consideration of the role of planning in resilience.

- Emergency Planning:

- Understanding acute events and their implications for infrastructure resilience.
- Understanding emergency planning's role in infrastructure resilience.
- Best practices in emergency planning.

- Hard Infrastructure:

- Understanding the fundamentals of infrastructure resilience.
- Best practices in infrastructure resilience and enhancing capacity.
- Critical consideration of the role of planning in resilience.
- Natural areas and cities.

- Soft Infrastructure:

- Understanding the fundamentals of infrastructure resilience.

7. Resilience in Systems

System resilience is an ability of the system to withstand a major disruption within acceptable degradation parameters and to recover within an acceptable time. It is vital to consider the following aspects:

- Innovative methodologies and smart technologies.
- Techniques and solutions to resilience challenges.

8. Innovative Smart Technologies and Resilience

Innovative applications of smart technologies make cities stronger fostering the following aspects:

- Improving resources allocation.
- Strengthening communication and social cohesion.
- Generally making life easier for everyone living in the city.

9. Resilience in Education System

Resilience matters in education because learning and education can be the vehicle to overcome shocks and stresses. Education resilience involves the following aspects:

- Identifying risks and assets.
- Protecting the assets in schools, universities and communities.
- Aligning education system commitment to a resilience approach.

10. National Policy Frameworks on Resilience

Collaboration with other levels of government is one of the key drivers to ensure a coherent and integrated approach to resilience. Many national governments have plans for reinforcing their countries' resilience establishing national policy frameworks on resilience.

- The role of cities or subnational governments for building national resilience in the national policy frameworks on resilience is crucial.
- This clarifies the importance of local actions for resilience by emphasizing that local authorities are primarily responsible for building resilience.
- Some frameworks on resilience include very specific roles and missions for cities.

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English Scientific Papers

The Econometric Impacts of LEED Certified Building

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Abstract:

Human bad behavior and their un-consciousness of the environmental impacts during burning the fossil fuel which can support the global warming to be on spot, especially after the Amazon forest and Lebanon crisis, that can help in increase the deforestation and the unbalanced of Co_2 emissions for nowadays. The eight principles of green architecture have been characterized in Sustainable Rating System Tools to be categorized in Energy and Atmosphere category, Water Efficiency category, etc. Indoor Environmental Quality is one of the main LEED`s category, helps to improve the indoor spaces efficiency of their light intensity, acoustic performance, and air quality. During design stages, architect play an important role in skin façade design to be more romantic and magnified for achieving the LEED credit requirements, the paper is examining two consequently credits "Quality View" and "Daylight" in LEED V4 BD+C. Rhinoceros software with the cooperation of LadyBug and HoneyBee plug-in both are used to calculate the total energy consumption using Energy Plus engine and measure the direct line of sight to the outdoors through indoor spaces and the situation of daylight in various conditions which including; $ASE_{1000,250}$ and $sDA_{300/50\%}$ metrics for each case study of the four rooms. The results show that for achieving the "Quality View" credit the windows area and energy consumption for heating and cooling are approximately tripled, that is not all, the natural light is exceeded the permissible level of light intensity that can cause glare and uncomfortable for building users during operation time.

Keywords: Daylight Autonomy, Quality View, Indoor Environmental Quality, light intensity, Energy Consumption

1. Introduction

Energy crisis is considered one of the main issues that facing the world now days (Booth et al, 2015). A direct correlation is set between energy efficiency and occupant satisfaction to establish a good thermal comfort and better vision for outdoor spaces (Lagois et al, 2014). A physiological effect can affect the building human occupants, due to the quantity and quality of daylight that can enter the indoor spaces (USGBC,2014) , that it is not all, but the more exposing to sufficient daylight the more healing time in hospitals, nevertheless, improve students' performance and attitude in school day, increase productivity in the workplace for offices, and fight depression and lethargy (Li and Tsang, 2008).

The Energy and Atmosphere (EA) category approaches energy from a comprehensive perspective, addressing energy use reduction, energy-efficient design strategies, and renewable energy sources. At 1/7/2019 Prof. Mohamed Shaker, the president of Electricity and Renewable Energy in Egypt, have introduced the new tariff for the list of charging for the electric consumption in Kilowatts (Department of Electricity and Renewable Energy, 2019), the high more energy consumption is the transfer from one category to another, no dedicated fees for each Kilowatts.

Nowadays, Parametric tools are gaining the momentum of digital modelling in a series of design variants whose relationships to each other are defined through mathematical operations and different parameters. The new generation in varies fields of engineering is grown up in this new dimensional approach in designing for various elements. These relationships form a parametric space that can generate numerous of related but distinct forms (Schumacher, 2009). Design parametrically is not essentially for complex building only, but to achieve the optimization for existing designed building, in which these enhancements including the maximize the daylight, quality view for outdoor spaces, reducing the energy consumption, and etc.

2. Methodology

The methodology which implemented in this study is divided into three successive stages. First stage, is directly measuring the percentage of "Quality View" for building occupants through a direct line of sight to the outdoor building for more exposing to the green and blue color, while second and third stages are analysing of daylighting performance equivalent to the area of the working plane for achieving the adequate light intensity in Lux. The three sequential stages used Ladybug and HoneyBee plug-in for Rhinoceros software to measure each stage separately using a calibrated two software which are: RADIANCE and DAYSIM as its basic daylight simulation engines. These engines can employ a reverse ray-tracing algorithm based on the physical behaviour of light in a volumetric, three-dimensional model which should most accurately represent reality.

The written scripts are cleared below in figure 1 and 2. While figure 1 shows the six sequential steps for the parametric definition to reach the exactly output results from the simulation, step (1) is establishing the parametric office room, which including the wall thickness and type, Window Wall Ratio (WWR), opening orientation, while step (2) is defining the grid size in centimeters, step (3) is calculating the radial view study at the working plane level, step (4) is measuring the exactly value at each point of the grid, step (5) is mathematical calculations in accordance between the output results and working plane grid, and finally step (6) is coloring the grid mesh for each value with the simulated results.

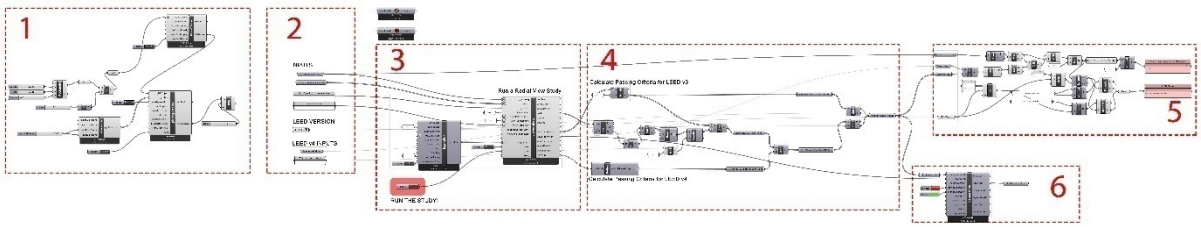


Fig. 1: The comprehensive Parametric Definition in Grasshopper for "Quality View" Credit Calculation.

The second script is defining the repetitive method for achieving the $ASE_{1000,250}$ and $sDA_{300/50\%}$ metric measurements. Step (1) is defining the space boundaries, working plane, and the grid size, while step (2) is importing the Energy Plus Weather file (EPW) to calculate the sun vectors to deduce the sunlight ray's intensity that received by the working plane, step (3) the output results are compared with the value of the conditional statement, whether matching or not, added or neglected, and finally step (4) is a mathematical calculation to deduce the final result of each metric separately. Both metrics $ASE_{1000,250}$ and $sDA_{300/50\%}$ have the same script except the conditional statement and percentage of achieved area with the adequate light intensity.

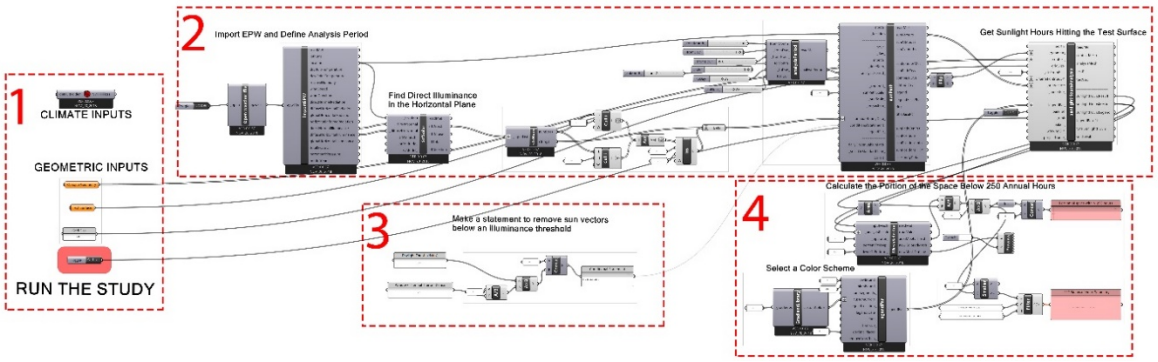


Fig. 2: The Comprehensive Parametric Definition in Grasshopper for "Daylight" Credit Calculations.

2.1 Energy Building Simulation

The third script as shown in the below figure (3), is defining the comprehensive parametric definition in Grasshopper for calculating the total energy consumption for cooling and heating loads. First step is defining the space boundary, Windows Wall Ratio, and type of glazing. Step (2), is determining the type of HVAC system, Variable Air Volume (VAV) is chosen to heat and cool the space, this system is unlike Constant Air volume (CAV) which supply a constant air flow with a variable temperature, VAV supporting a variable air flow with constant air temperature. VAV is considered more precise temperature control than CAV, and, have the ability in lower energy consumption. Step (3), is switching on and off the Energy plus engine controller to adjust the output results which is including the heating and cooling loads of each space under different conditions. This script is supported by calibrated engine of "Energy Plus" and "Weather Data File". The output simulated results are nearly equal in real life of electric meter, as taking in consideration the weather conditions of solar intensity, wind speed, humidification, etc.

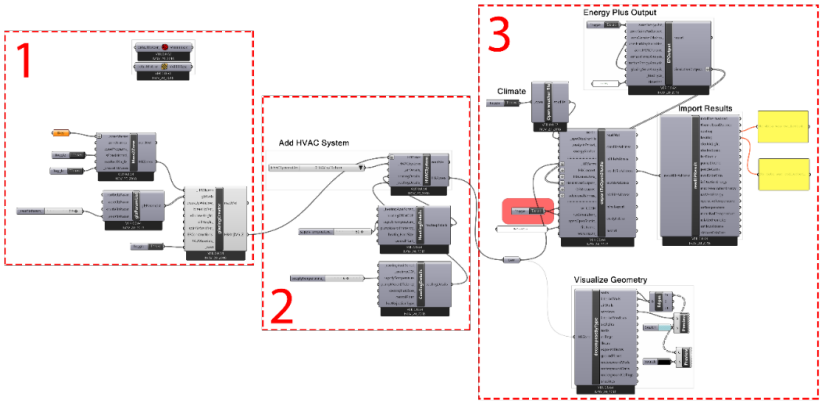


Fig. 3: The Comprehensive Parametric Definition in Grasshopper for calculating the Total Energy Consumption of Cooling and Heating Loads.

3. Research Problem

LEED rating system is considered one of the main successively green tools. This tool is introducing the eight green principles in sequential categories. Although the tool has a good reputation but it has some lacking in credit implementations which can affect the energy consumption during occupations.

3.1 LEED Critique

It is important to raise the importance of LEED certificate for transferring the conventional building into green and sustainable one. However, does this certificate is achieving and covering all the green aspects and goals?

A comprehensive study was conducted by Newsham at 2009 to assess the post-occupancy evaluation of LEED and non-LEED certified buildings. The results showed that 28 to 35 percent of LEED certified buildings were using more energy per floor area than non-certified buildings (Newsham, 2009). That is not all, but Newsham didn't find statistically significant relationship between LEED certification levels and energy performance. For example, a LEED gold building is not better in energy saving than silver one, nor LEED platinum building is the best in energy performance than the other levels. While Auer et al highlight a major flaw in LEED certification; no correlation between the simulated 3D modelled during the designed stage for the predicted energy consumption versus the post-occupancy stage with the real use of energy consumption after building construction (Auer et al, 2012).

Nowadays, it is an easy exercise to achieve the LEED checklist, and it became like a repetitive method to acquire points. Architects used to target the easiest and cheapest points as: bicycle racks, car pool lots, etc (Peterson et al, 2014). Another point of view, LEED checklist encourages designers to greenwash their projects through implementing green roofs, vertical gardens, solar panels, wind turbines, etc (Auer et al, 2012) (Kauffman and Jordan, 2006) (Cucuzzella and Carmela, 2015). Due to the inaccuracy of LEED checklist, engineers including architects used the short-term solutions which doesn't represent a deep commitment to sustainability instead of using the long term carrying the critical aspects of sustainable issues and battle the global warming.

3.2 Daylight Autonomy

Köppen has classified the climate zones into 14 prototypes, Egypt are laying in hot desert arid climate (Peel et al, 2007). This climate is characterized by high direct solar radiation and clear sky which needs special façade treatments to overcome the undesirable heat gain while the sun rises.

Architect is the maestro of the building engineers' plateau; who is responsible for building design facades` and plan prototype of any certain building. Architect is also cooperating in providing the adequate light intensity for building occupants at their working planes, as shown in figure (4) of a classroom of daylight measurements ,and one more thing, the direct line of sight for building occupants to the outdoor spaces who can receive more green and blue colors from plantation and sky pureness, as shown in the below example in figure (5) of a classroom. These two points are covered in detailed through Leadership in Environmental and Energy Design (LEED) rating system for Building Design and Construction (BD+C) Version 4, especially the Indoor Environmental Quality (IEQ) category.

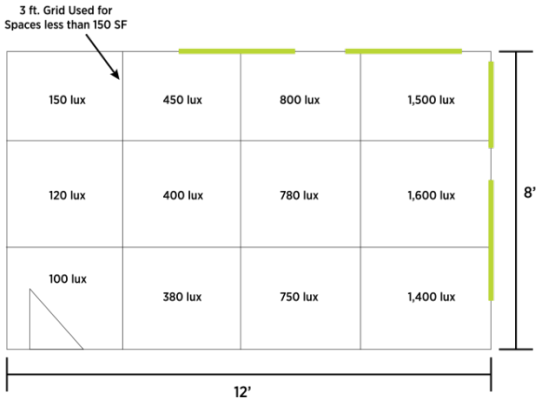


Fig. 4: Daylight Measurements Recorded during Certain Period

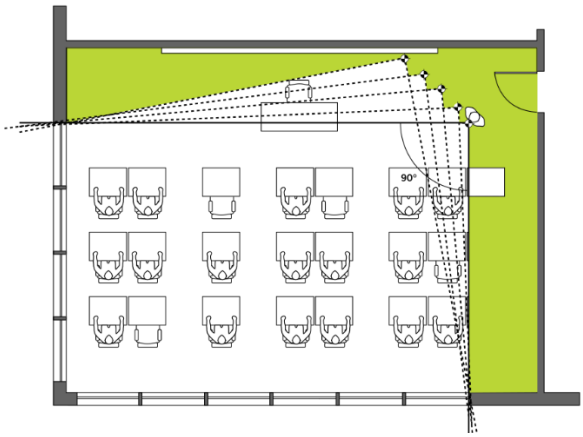


Fig. 5: Lines of sight in classroom
Green highlighted space is the non-complaint view area

Spatial Daylight Autonomy ($sDA_{300/50\%}$) and Annual Sun Exposure ($ASE_{1000,250}$) are two important metrics under the umbrella of "Daylight" credit of LEED rating system, this credit is used to evaluate the natural daylight performance for indoor spaces. $sDA_{300/50\%}$ metric describes the daylight intensity received by working plane with light level not less than 300 Lux for 50 % of the annual occupied hours for 55% of the floor area of the occupied spaces and more. while $ASE_{1000,250}$ metricis used to describe how much the working plane received extra natural daylight than normal intensity which is more than 1000 lux for at least 250 hours of the occupied hours per year and not exceed than 10 % of the floor area of the occupied spaces (IESNAI, 2012) (USGBC, 2014).

The objective of this study is to deduce Spatial Daylight Autonomy ($sDA_{300/50\%}$) and Annual Sun Exposure ($ASE_{1000,250}$) metrics, which forms together a clear picture of daylight performance, subsequently, increasing the windows glazing ratio accompanied by increasing the space proportional to achieve the LEED credit " Quality views" requirements and their impacts in energy building consumption in each case study separately.

4. Daylight Simulation Tools

Implementing LEED credit for registered building is a must, each engineer at his/her field try to achieve the LEED certificate. So, LEED encourages engineer for using simulation tools to predict the natural daylight intensity in alternative periods along the year during the occupation hours (Gasiu and Reinhart, 2008). In 2007, David Rutten at Robert McNeel & Associates have developed a software “Rhinoceros”, this software is able to model in 3 dimensions, receive various plug-ins to add different features to the program. Grasshopper is one of the main plug-ins in Rhinoceros and can be briefly described as a graphical algorithm editor that allows designers with no formal scripting experience to quickly generate parametric forms from the simple to the awe inspiring (Architecture, Engineering and Construction, 2019).

5. Case Study

In this research, a small meeting room as shown in figure (6), at office building is used to measure and examine the physiological effect on building occupants using LEED criteria. The room`s height and depth are constant along the research; 3 and 6 meters, respectively. While the space width is increasing gradually with proportion to be; equal, one & half, twice, and twice & half the space depth. The working plane is determined at height 76 cm from Finish Floor Level as LEED V4 BD+C recommended. The windows opening is oriented towards the East direction for the four case studies. The windows area is increasing respectively to the increase of the façade width to be constant of Window Wall Ratio to be 90%, the missing 10%

is due to the slab and beams thickness which can act like an obstacle for the indoor space. Only one type of glass windows is used in the four case studies. This glass has high-performance specs of solar energy transmittance of 0.9%, that can overcome any heat gained through windows opening glass.

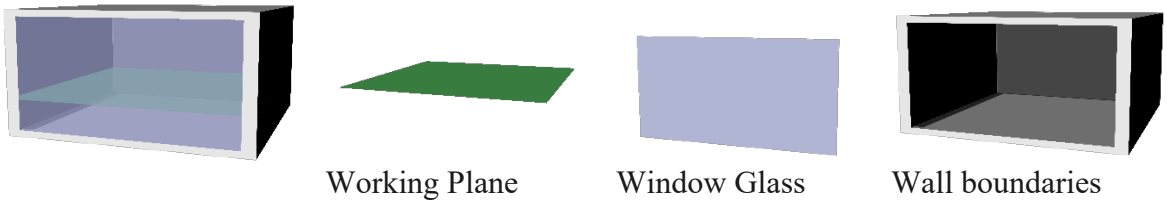


Fig. 6: 3D shot for the Office Room Prototype.

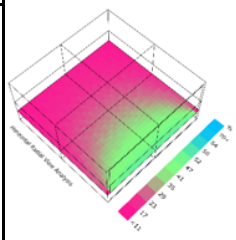
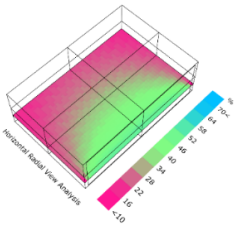
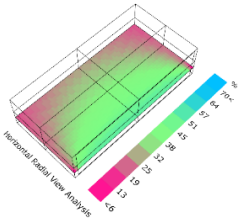
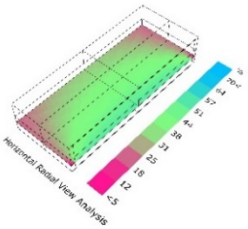
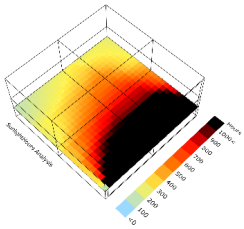
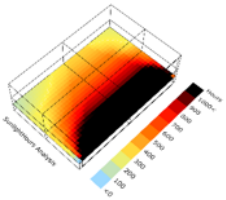
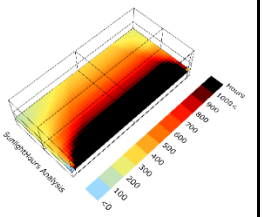
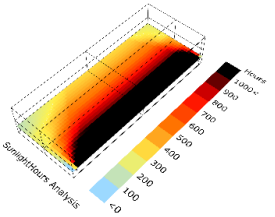
The surfaces reflectivity of the four cases are remain constant along the simulations either for indoor and the surrounding outdoor surfaces from landscape and buildings.

6. Output Result

The output simulations are averagely calculated for one year and briefly figured out in consequently two figures for each case as cleared in table (1). The displayed output results show the inappropriate correlation is set between "Quality View" and "Daylight" credits. In order to fulfil the minimum percentage of credit requirement for "Quality View", the windows area is extended from16.2 m^2 to 40.5 m^2 to achieve a direct line of sight to the outdoor views from greenery soft-scape and the blue sky. The credit results are 30.4%, 45.2%, 60.8%, and 75.3% respectively. The largest windows opening is the only one achieved the credit minimum percentage of 75% of the floor area and acquired one point. Otherwise the increases in windows area can cause increasing in energy consumption for cooling and heating loads, and waste the non-renewable resources of energy production.

Spatial Daylight Autonomy ($sDA_{300/50\%}$) metric is basically measuring the building occupant's satisfaction from receiving the adequate light intensity at working plane for 50% of the occupation hours, also measuring the dissatisfaction of building occupants from receiving more Lux than 300. The results of the four case studies are exceeded the minimum percentage of the $sDA_{300/50\%}$ metric, that covering more than 55% of the floor area, and they calculated 100%. Additionally, the credit is partially achieved the points. While the issue can be comprised at $ASE_{1000,250}$ metric, and it tends to lose the credit points because the results of the four case studies are far away from the LEED`s minimum achieving percentage, and the results are laying between 83% to 91%, in which the output value is exceeding the credit minimum percentage of 10% of the floor area. While the working plane is receiving undesirable light intensity of 1000 Lux for more than 250 hours along the year, this phenomenon needs comprehensive solutions to overcome these light rays, otherwise the first case study needs a traditional overhang and indoor louvers to overcome the glare.

Table 1: The Output Simulations for the Four Case Studies.

Point of interest	Room 1	Room 2	Room 3	Room 4
Quality View simulations				
Direct line of sight to the outdoors	30.4 %	45.2 %	60.8 %	75.3%
Meets the threshold	Not achieved	Not achieved	Not achieved	Achieved
Daylight simulation				
$ASE_{1000,250}$	83 %	88 %	90 %	91 %
$sDA_{300/50\%}$	100 %	100 %	100 %	100 %
Windows area	16.2 m^2	24.3 m^2	32.4 m^2	40.5 m^2

6.1 Energy Consumption of Cooling and Heating Loads:

The output simulation results seem rational and objective, the more increase in floor area the more energy consumption with the same Window Wall Ratio of 90%. Two different values of measurement were taking place during simulation for each space separately, in which each space is measuring the total energy consumption for cooling and heating loads in Kilo Watt Hour per Month. The total annual energy consumption values, are calculated averagely per month to deduce the impact of increasing the Window Wall Ratio versus area floor plan.

In cooling loads chart figure (7), by comparing room (2) vs. room (1), room (3) vs. room (2), and room (4) vs. (3), it is deduced a constant ratio`s values of 1.45%, 1.3%, and 1.2%, respectively. These ratios are showing the correlation between the total energy consumption with the floor area, when the windows area is increasing from one room to another at constant ratio 90%. But when the two rooms of (4) and (1) is compared, the ratio`s value is 2.3% increasing in energy consumption, but when room (3) and (1) is compared, the ratio`s value is 1.9%, and last between room (4) and (2) is 1.6%.

Energy Unit Intensity (EUI) is used to calculate the total energy consumption divided by total gross floor area in KWH/Month/M^2, while these values are nearly equal for the four case studies, and calculated averagely per month as: 3.02, 3.16, 4.82, 7.24, 8.37, 9.04, 9.74, 9.49, 8.64, 8.27, 6.56, and 4.19 KW/Month/M^2. These results started with the minimum and least value of 3.02 KWH/Month/M^2 of January month until reaches it is peak at July of 9.74 KWH/Month/M^2, the value is tripled in energy consumption at their maximum value.

consequently, the energy cost fees are transferred to another category not triple the cost fees value, but it is more than five times the least cost fees value, according to the new tariff in Egypt.

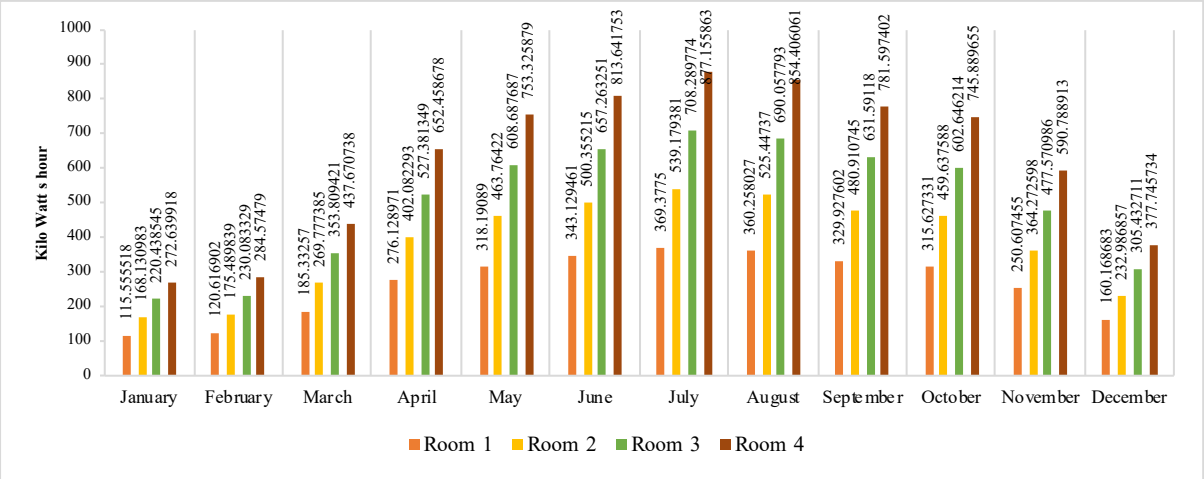


Fig. 7: Cooling Loads for the Four rooms in Kilo Watts hour per Month.

When the values of KWH are transferred to numerical quantitative, these analytical values can be easily compared and deduced the exactly fees cost for each month separately, and it is cleared in the below table (2). All the values are looking rational, the least value in charge for Room (1) in month January is 58 L.E, while the peak value in charge for Room (4) in month July is 1227 L.E. The colored table as shown below, is clarifying the values of fees cost for each room per month separately and it looks like a bubbled and circler path in sequentially cost fees, start with the orange color which is dominated at the center of the table, then the green values, after that the blue category and at last the reddish color for category (3).

Table 2. The Total Energy Cost Fees Per Month for each Room

Mon	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
R1	58	60	93	226	261	282	370	360	295	260	205	80
R2	84	88	222	400	463	500	540	525	481	460	364	190
R3	187	189	353	527	608	920	990	966	631	602	477	250
R4	224	234	437	650	1055	1138	1227	1195	1093	1043	590	377

Legend		
	Category (3): 0 to 200 KW, 0.50 LE	Category (4): 201 to 350 KW, 0.82 LE
	Category (5): 351 to 650 KW, 1.00 LE	Category (6): 651 to 1000 KW, 1.40 LE

In Heating loads chart figure (8), by comparing room (2) vs. room (1), room (3) vs. room (2), and room (4) vs. (3), it is deduced a constant ratio of 1.46%, 1.32%, and 1.24%, respectively. These ratios are showing the correlation between the total energy consumption with the floor area, when the windows area is increasing from one room to another at constant ratio 90%. But when the two rooms of (4) and (1) is compared, the ratio`s value is 2.3% increasing in energy consumption, but when room (3) and (1) is compared, the ratio`s value is 1.9%, and last between room (4) and (2) is 1.6%, while these ratios are the same like the cooling loads.

Energy Unit Intensity (EUI) is used to calculate the total energy consumption divided by total gross floor area in KWH/Month/M^2, while these values are nearly equal for the four case studies, and calculated averagely per month as: 17.17, 10.53, 7.98, 3.31, 1.58, 0.78, 1.02, 1.57, 2.15, 4.79, 8.37, and 15.89 KWH /Month/M^2. These results started with the peak value of 17.17 KWH/Month/M^2 of January month until reaches it is least value at June month of 0.78

KWH /Month/M^2, both the value is 22 times in energy consumptions for cooling loads, when it is compared. consequently, the energy cost fees are transferred to the highest category according to the new tariff in Egypt.

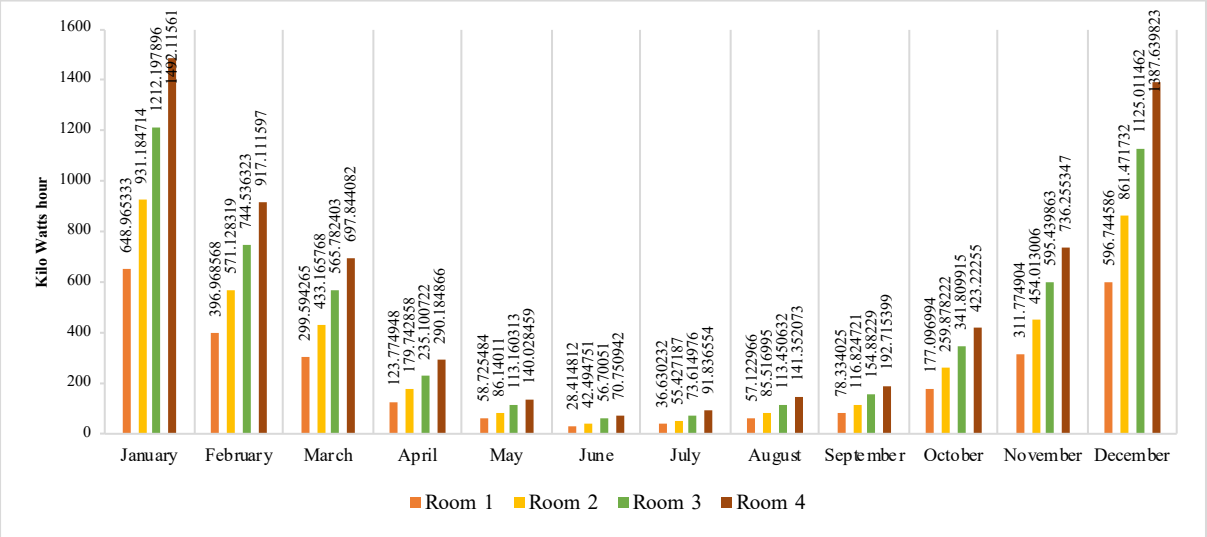


Fig. 8 Heating loads for the Four Rooms in Kilo Watts Hour per Month.

The below colored table (3) as shown below, is clarifying the values of fees cost for each room per month separately, when the values of KWH are transferred to numerical quantitative, these analytical values can be easily compared and deduced the exactly fees cost for each month. All the values are looking rational, the least value in charge for Room (1) in month June; is 14 L.E, while the peak value in charge for Room (4) in month July; is 2163 L.E.

Due to the increase in Wall Window Ratio towards the east direction, the space is gaining more heat flux through windows opening. This passive technique helps to reduce the use of the heater in winter season. while the absorbed waves are transferred from short waves to long waves and this phenomenon is called the greenhouse gas effect which can help to preserve the heat gained.

Table 3. The Total Energy Cost Fees Per Month for each Room

Mon	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
R1	648	396	246	62	29	14	18	28	39	88.5	255	596
R2	1303	571	433	90	34	21	28	42	58	213	454	1205
R3	1757	1042	565	193	57	28	36	56	77	280	595	1631
R4	2163	1284	975	237	70	35	45	70	92	423	1030	2011

Legend		
	Category (3): 0 to 200 KW, 0.50 LE	Category (4): 201 to 350 KW, 0.82 LE
	Category (5): 351 to 650 KW, 1.00 LE	Category (6): 651 to 1000 KW, 1.40 LE
	Category (7): more than1000 KW, 1.45 LE	

By comparing the two graphs of the cooling and heating loads, both the graphs are inversely proportional with each other, once the cooling loads increase the heating loads decrease which is rational and objective output results simulation. In figure (9), the output results of each month are calculated per floor area in cooling and heating loads and averagely summed up, it is deduced that total energy consumption of January and December months are nearly equal 20 KWH/Month/M^2, while months April to September are nearly halved the energy consumption than January and December of 10 KWH/Month/M^2, at last February, March, October and November these months are in ranges between 13 to 15 KWH/Month/M^2.

Most of energy are consumed in heating the spaces than cooling energy as deduced in winter season for months January and December. But due to the high efficiency of the cooling units VAV, the energy used for cooling is not high if it compared with split unit and other type of cooling system, which is saving in energy.

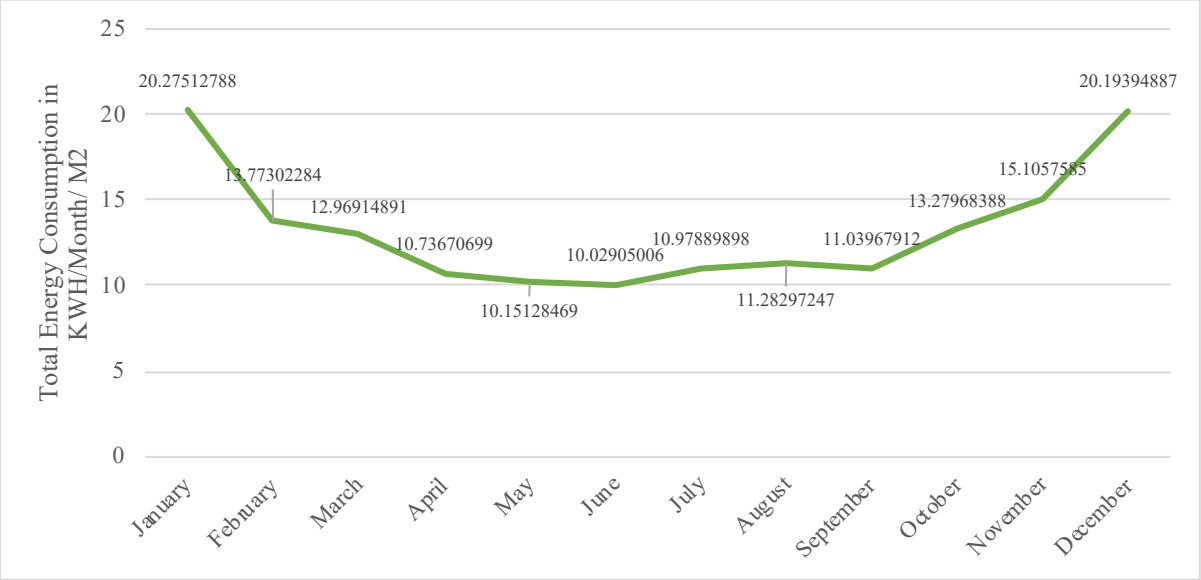


Fig. 9 Output Results of each Month in Cooling and Heating Loads in Kilo Watts Hour per Month per Meter Squared.

7. Conclusion

This research is addressing the impact of increasing the windows and total gross floor area to achieve the LEED credit requirements in two sequential credits. The results show, to achieve the "Quality View" credit, it is must increase the width`s room to be twice & half, consequently the windows area is increased with the same ratio of 90% WWR, in another point view, the windows area is increased from 16.2 to 40.5-meter square.

The total energy consumption of room (4) is 2.3 more than room (1) along the year. But the energy consumption per meter square is different in values in KWH/Month for each month as detailed below in table (2) starting with cooling loads and after that the heating loads. The table (4) below shows the cooling loads are in ranges between 3 to 10 KWH/ Month, while the heating loads are laying between 0.78 to 18 KWH/ Month and this shows that the space needs more heating in winter season than cooling in summer season, the energy is most properly consumed in warming up the space temperature. Otherwise, VAV technology is used for cooling the space which is reducing the energy consumption than split units and other method of cooling systems.

Table 4. The Total Energy Consumption for each Month Per Meter Square

Months & Case studies		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Cooling Loads	Room (1)	3.2	3.3	5.1	7.6	8.8	9.5	10	10	9.1	8.7	6.9	4.4
	Room (2)	3.1	3.2	4.	7.4	8.5	9.2	9.9	9.7	8.9	8.5	6.7	4.3
	Room (3)	3.0	3.1	4.9	7.3	8.4	9.1	9.8	9.5	8.7	8.3	6.6	4.2

	Room (4)	3.0	3.1	4.8	7.2	8.3	9.0	9.7	9.4	8.6	8.2	6.5	4.1
Heating loads	Room (1)	18	11	8	3.4	1.6	0.78	1	1.5	2.1	4.9	8.6	16.5
	Room (2)	17.2	10.5	8	3.3	1.5	0.78	1	1.5	2.1	4.8	8.4	15.9
	Room (3)	16.8	10	7.8	3.2	1.57	0.78	1	1.5	2.1	4.7	8.2	15.6
	Room (4)	16.5	10.1	7.7	3.2	1.5	0.78	1	1.5	2.1	4.7	8.1	15.4

The futuristic studies must cover the heating passive strategies than using heater and wasting the non-renewable resources of energy production. Also, United Stated Green Building Council must recognize this consequently credits of “Quality View” & “Daylight” and their impacts on energy consumption during the building operation.

In Egypt, different authorities from governmental ministries, academic & research fields, professionals, etc. starts to re-consider the applicability of these unfamiliar LEED credits` and trying to find an alternative path to achieve the credits` purposes. Although the LEED is targeting to decrease and reduce the using of the non-renewable resources in generating the electricity in building, but in reality, it consumes more and more, which can lead to increase the global warming and this phenomenon is due to the unwise of using the LEED credits’ achievement methodology accompanied by American technologies and innovations with can comply with Europe weather condition.

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"The Influence of Building Envelope Color and Texture on Energy-Efficiency in Hot-Desert Climate:

"A Study for Housing in Cairo, Egypt"

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Abstract:

Climate change has an immense impact on cities that needed to be resilient in response to the global warming effect. Buildings play a key role in the concept of resilience policies and at the same time, responsible for handling human thermal comfort. Considering that the outer surface texture is part of the outer envelope, this factor is in need of a study in advance. It has a crucial function in controlling the indoor energy loads and mitigating the urban heat island effect.

This paper aims to study the influence of different parameters of outer surface texture on improving the indoor thermal environment in hot-desert climate housing. As, the impact of surface roughness, color solar absorptance, and plastering groove-cut shading design on the thermal response of heating and cooling loads examined. This paper questions are meant to examine exactly how far proper choices of surface texture can enhance the indoor thermal environment. The analysis based on simulating a tested case of a residential unit using energy simulation software "Design Builder" to calculate values of the yearly heating and cooling energy loads to find the optimal alternative for each parameter.

Results demonstrated that the outer surface texture profile is not a minor factor and it can play a main part in maintaining the energy consumption of housing in hot-desert climate. Changing its parameters can reduce buildings' energy consumption ranging from 13.9% to 22.9% for the north to south orientations. The study proved the role of low solar absorptance value of surface colors support the energy-efficiency of buildings. In addition, the importance of shading presence even in the north orientation intensified the thermal performance of the outer envelope even by grooving-cut the plastering layer.

Keywords: energy-efficiency, surface texture, roughness, color, solar absorptance

1. Introduction

Large cities face defined challenges in their built environment because of climate change effects and rapid development in the last decades. This transformation affects the thermal environment quality inside buildings by increasing energy demands. For instant, the building sector in Egypt consumes around 70% of the total energy profile of Egypt (Agency, 2015). Energy-efficient building design can play a major role in maintaining the indoor thermal environment. (Akbari, Bretz, Kurn, & Hanford, 1997). The outer surface properties have a consequence on the building's thermal performance, besides influencing the outdoor thermal conditions through increasing the albedo of urban spaces (Mansouri, Belarbi, & Bourbia, 2017).

Building envelope surface temperature is influences by two main factors: Firstly, external factors as outdoor urban environment components, and the building orientation. Secondly, the façade's surface properties factor as density, specific heat capacity, emissivity, color, albedo, absorptivity, transmittance, and roughness (Azarnejad, Wien, View, & Azarnejad, 2017). In addition to the wall design and material, the external surface texture can affect the thermal performance of the building

envelope. The surface texture parameters are roughness, glossiness, and a sense of depth (Yonehara et al., 2004).

Nomenclature	
BC	Base Case
Bwh	Hot Desert Climate
Kwh/annum	Kilowatt per hour per year
WWR	Window to Wall Ratio

The surface profile is an expression to device the characterization of roughness surfaces (Kovalev, Yazhao, Hui, & Meng, 2019) which influences the solar absorptance and emissivity. Solar absorption is how the material absorbs the incident solar radiation. It is affected by the incidence surface angle degree and conditions of exposure and radiation intensity (Alonso et al., 2017). Many studies proved that there is a direct correlation between surface emissivity and roughness (Albatici, Passerini, Tonelli, & Gialanella, 2013; Ibos et al., 2006; Lide & Frederikse, 1993). As roughness increases the shaded percentage of the surface, it is also able to reduce the glare (Wu & Xie, 2011). But on the other hand, a study in 1996 found that the solar energy absorbed by surface rising by increasing its roughness due to increasing ray's reflectivity on the surface (Seker & Tavil, 1996). A study on residential buildings in Hong Kong submits that roughness of exterior wall finish has a minor effect on losing and gaining heat (Sang, Pan, & Kumaraswamy, 2014).

The temperature of the surface is mainly affected by cool materials with high solar reflectance and infrared emittance values (Akbari et al., 1997). But as cool and light materials have high solar reflectance, it can be suitable for warm and hot climate. For a cold climate, a new cool colored coating had been developed with a more selective absorption band in the infrared spectrum (Synnefa, Dandou, Santamouris, & Tombrou, 2006). This developed coating can reduce the building albedo by 0.45 and decrease air temperature by 1.6°C. Albedo is a measure of how many solar rays that hits a surface is reflected without being absorbed (The Merriam-Webster.com Dictionary, n.d.). An experiment found that the white painted surface decreases the inner temperature by 6 ^{o}C in summer, and 4 ^{o}C during winter than a black-painted room (Bansal, Garg, & Kothari, 1992).

Shading for buildings provides protection from excess heat gain caused by direct solar radiation (Nikpour, Kandar, Ghasemi, Ghomeshi, & Safizadeh, 2012). One of the shading strategies is providing a self-shading from the building form or even through the design of the outer surface from inclination or grooving-cut. Energy-savings are backing not only for lowering electric lighting but mainly for cooling and heating loads (Kandar, Nimlyat, Abdullahi, & Dodo, 2019).

In developing countries, 70% of the actual construction housing costs go back to the construction phase. It is clear the importance of providing low-cost materials for decreasing building energy costs (Wassenhoven, 1982). Low-technology techniques with low-cost or no additive cost value would be preferable especially for social and economic housing projects.

This paper specifically focuses on the analysis of simulation results of the thermal efficiency of external surface-profile of the building envelope. The main three factors included are the surface roughness, color solar absorptance, and the effect of groove-cut design in the final plastering layer of the external walls as a surface self-shading. This investigation is carried out to stand on the thermal behavior of the effective surface texture and the role of minor low-cost elements in reducing the energy consumption of housing in Egypt.

2. Methodology

The evaluation of the outer envelope surface texture performance is carried out through a simulation process, where the results are analyzed through the annual energy consumption for heating and cooling loads. A hypothetical test room simulated by DesignBuilder 2.2.5 software which simulated internally using EnergyPlus. The tested room located in Cairo, representing the hot-desert climate which is considered to be hot desert climate (Bwh) according to the Köppen-Geiger climate classification (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006). According to the Egyptian climatic zones, Cairo lies in the "Cairo and Delta" zone that is characterized by a hot humid summer and mild humid winter. (HBRC, 2006). The tested room dimensions are (3m*3m*3m H) as this is the average dimension of residential spaces in Egypt. Only one wall with a fixed Window to Wall Ratio (WWR) 10% tested to find the exact thermal performance of wall alternatives in each orientation (north, east, west, south). Table 1 shows the simulation specifications of the tested room and outer surface alternatives.

Table 1: Test room simulation specifications

BUILDING		**HVAC**	Fan coil unit	Electricity from grid
Area:	3m * 3m = 9 m^2	**Setpoint:**	23 °C for Cooling	21 °C for Heating
People density:	0.02 people/m2	**LIGHTING**	**Illuminance:**	100 lux
Activity:	Living, Residential		**Energy:**	5w/m^2
CONSTRUCTION	0.3 m thickness: Outer plaster 0.05m + Red Brick 0.2m +Inner plaster 0.05m			
OPENING	**WWR:**	10%	**Window Type:**	Double Glazing
CLIMATE			Summer:	Winter
City:	Cairo	**Characteristic:**	Hot-Humid	Mild Humid
	Hot desert	**Temp. range:**	22 °C- 35 °C	9 °C-21 °C
SURFACE TEXTURE PARAMETERS				
Groove-cut shading %:	Wall shading % [no shading – 20% - 40% - 60%]			
Roughness:	[smooth – rough – very rough]			
Colors solar absorbance:	[light – Medium – high]			

The research studied three different parameters that identify the outer surface texture characterization. These selected parameters are wall grooving-cut shading percentages, wall finishing colors and wall finishing roughness. The simulation alternatives are:

(i) The grooving-cut design and shading percentages from (0% - 20% - 40% - 60%) of the total wall area. Fig. **1** shows the assorted designs of the outer surface.
(ii) The wall finishing color that altering from (low 0.25 – medium 0.5 – high 0.75) solar absorptance values.
(iii) The wall finishing roughness that altering from (smooth – rough – very rough) surfaces texture.

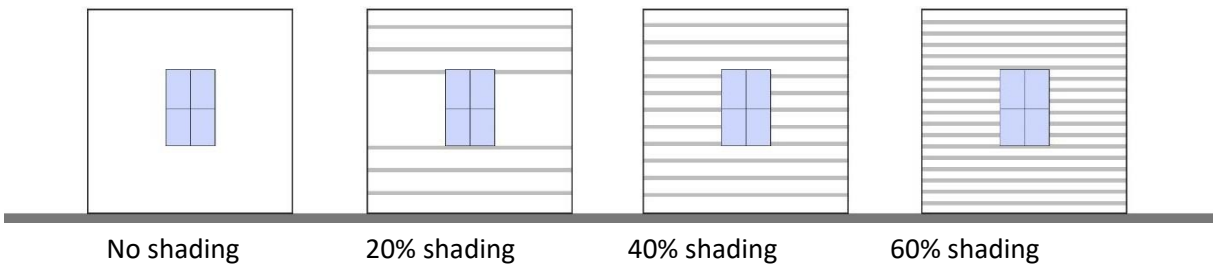


Fig. 1: Different percentage of tested wall self-shading

The determined values of solar absorptances represent a specific range of colors, as the low solar absorptance value are several types of white paint, like acrylic paint, half-glossy white, and silver color. The medium value is the group of light to medium green, medium yellow and orange paint colors. Whereas the high value represents brown, reddish and light-grey olive colors (HBRC, 2006).

The simulation method studied the thermal performance of each parameter separately to have a deep analysis of its thermal behavior for different orientations. This analysis followed by investigating the optimum outer surface design for each orientation between the three tested parameters. The discussion passed through three analytical phases:

(i) The thermal performance of each parameter separately;
(ii) The performance of each solar absorptance color for different orientations;
(iii) The streamline phase to stand on the optimum specification for each orientation.

3. Results and Discussion

Results of different surface design parameters addressed in comparison with a base case. The determined base case is a white smooth outer surface without groove-cut design as it is the dominant practice for most buildings in Egypt. The annual energy consumption is the comparing unit, which shows the sum of heating and cooling consumed. Fig. 2 illustrates the detailed energy consumption of the base case. The graph shows that the west orientation is the most consuming orientation for heating and cooling energy with the highest cooling loads, while the other three orientations have approximate annual energy consumption. The south consumes less in heating loads.

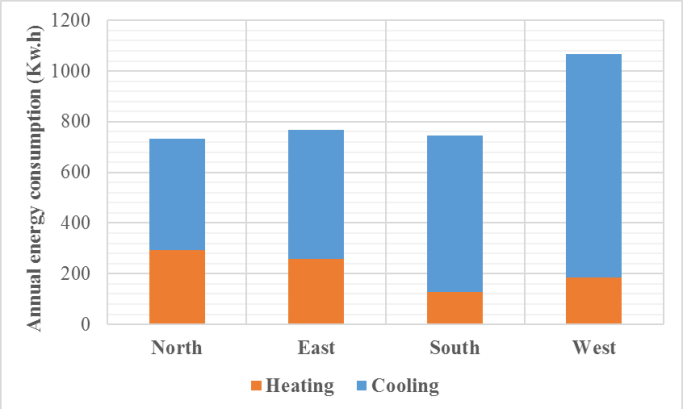


Fig. SEQ Fig. * ARABIC 2: Energy consumption of the base case [white smooth with no groove-cut surface] in different orientations

3.1. *Surface Parameters Analysis*

3.1.1. Shading Analysis

At the hot humid climate as Cairo, increasing the outer surface shading percentage supplied better results. Just by applying simple grooving-cut to the plaster layer of the finishing material, a decreasing in energy consumption is achieved. The saving percentage can reach 31.4% at south orientation with 60% of wall shaded. The least efficient orientation was the north due to lack of direct solar gain, as the saving percentage decreased to 13.8% in comparison to the no shading base case. It is clear that even the north orientation is in need of shading percentage in order to decrease the total heating and cooling energy consumption.

Although the 60% shading showed as the best alternative, the difference between its performance and the case that has 20% was not so big, especially in north, east, and south orientations. The saving difference was 1.3%, 2.2%, and 2.6% for the north, east, and south respectively as seen in Fig. 3. At those orientations just applying 20% shading to the wall was sufficient to achieve a remarkable reduction in energy loads. Except for the west, the difference in saving reached 4.3% for 60% wall shading in comparison with 20%.

3.1.2. Roughness Analysis

The surface roughness has two factors that control its performance, its self-shading and solar absorption. The roughness played a significant role in reducing the total energy consumption in Cairo for a certain limit, and afterward, the effect was inverted. As by increasing the surface roughness to rough texture, the total energy consumption decreased due to shading nature dominance over the increase in solar absorptance. As it is noticed that the heating loads increased in the very rough surfaces rather than the rough. This enlargement observed to affect the total energy consumption at north and east orientations, where the solar gain was absent, or for a minor time.

Fig. 4 shows that a similar reduction percentage is achieved by a rough surface through the four orientations by values 9%, 8%, 7.7%, and 8.1% for the north, east, south, and west, respectively.

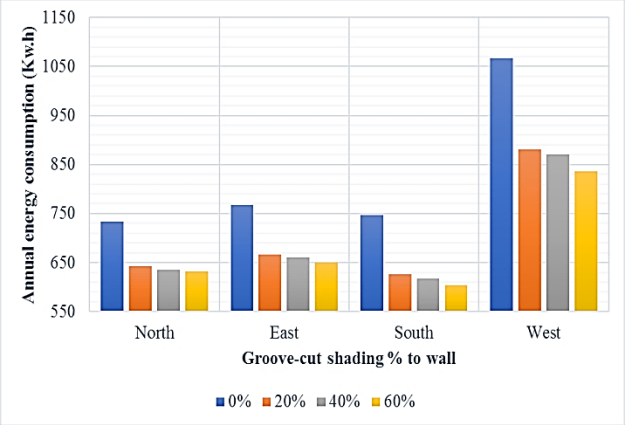


Fig. 3: Annual Heating and cooling energy consumptions for different groove-cut shading % to the wall in different orientations

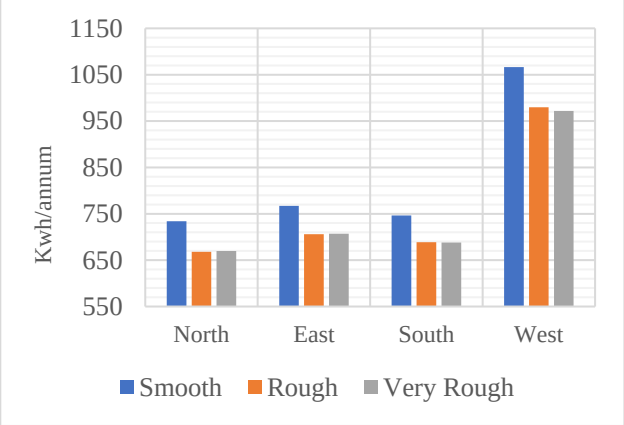


Fig. 4: Annual Heating and cooling energy consumptions for different surface roughness in different orientations

3.1.3. Coloring Analysis

Low solar absorptance surfaces as white color achieved the lowest energy consumption for smooth no shading outer envelope surface. On south and west – most orientations face direct solar gains- the deterioration in energy efficiency maximized as the surface color darkens by values -30% and -35% respectively. While on north and east the deterioration was less sever by -8.7% and -14.6% for the high absorbance to the base case. Fig. **5** illustrates the detailed results.

For north orientation, the medium color as light green achieved a bit reduction by 0.5% compared to low solar absorptance colors. It was due to the absence of direct solar gains and the surface needs for heating loads as the reduction in heating loads was more than the increase in cooling loads as shown in Fig. 6.

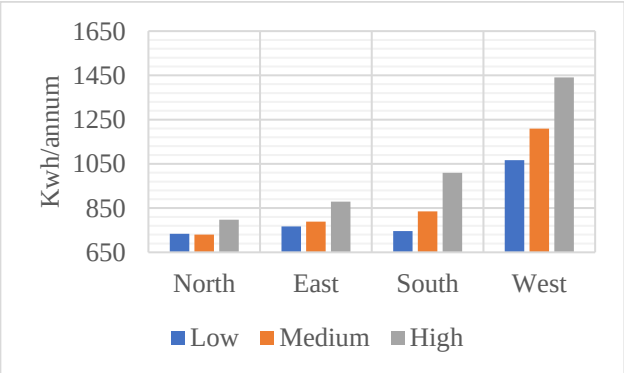


Fig. 5: Annual Heating and cooling energy consumptions for different surface colors in different orientations

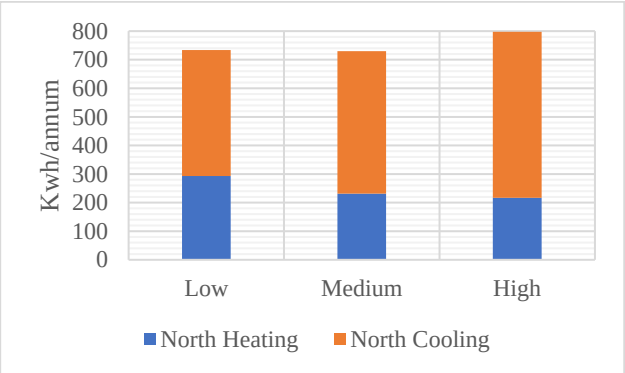


Fig. 6: Annual Heating and cooling energy consumptions for different surface colors on North

3.2. *Optimum Design for different Solar Absorptance Colors Analysis*

Referring to the results of total energy consumption for each orientation, the energy-saving percentage for all parameters' alternatives varied in different ranges. This phase of analysis is concerned about exploring the alternatives that had the ability to achieve energy-saving in relation to the base case. As some alternatives did not achieve a proper reduction in energy consumption compared to the base case, but in relation to their category of solar absorptance, they achieved a remarkable energy efficiency. This concept played a role in selecting the optimum surface roughness and shading percentage for each solar absorptance color group.

For the low solar absorptance colors, the energy-saving performance varied in different roughness and orientations. Fig. **7** shows the energy percentage savings for low solar absorptance color alternatives and their performance in the four tested orientations. The very rough surface had the minimum energy-saving for the low solar absorptance colors in the north, east, south orientations, while at west it achieved the maximum energy-saving for all shading percentages. For the no shading surfaces, the difference was narrow in energy-savings among different orientations. On the other hand, the performance of saving of low colors with shading percentage from 20-60% had increased in the west orientation, and in the north, west, and south the savings had the same values.

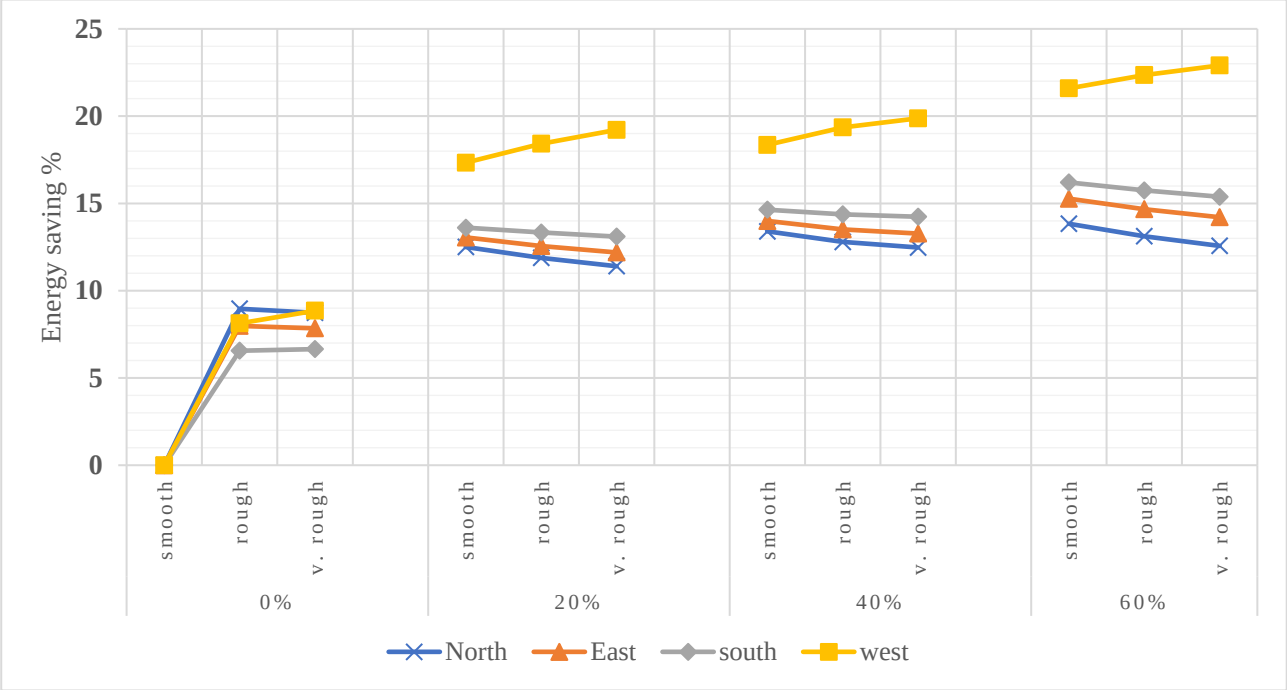


Fig. 7: Energy-saving percentage for different alternatives for low solar absorptance color

3.2.1. Low solar absorptance colors

South and West orientations: the 60% shading achieves the maximum energy-saving 15% ~ 16%, followed by 20 ~ 40% shading.

East and North orientations: 20%– 40%- 60% had the same performance, as all of them achieve energy-saving range from 11.4 % to 13.8%.

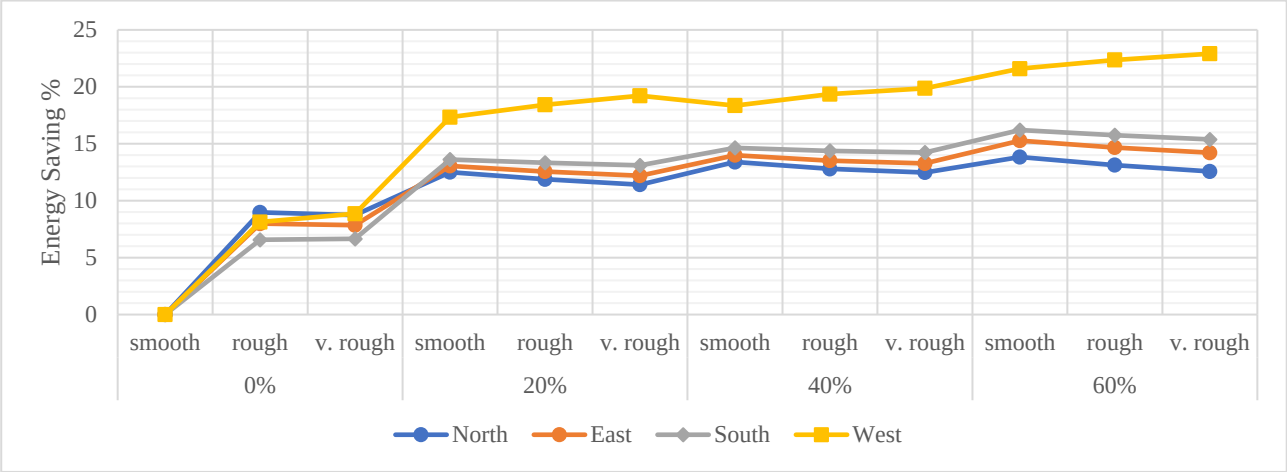


Fig. 8: Energy-saving percentage of different alternative for low solar absorptance colors

3.2.2. Medium solar absorptance colors

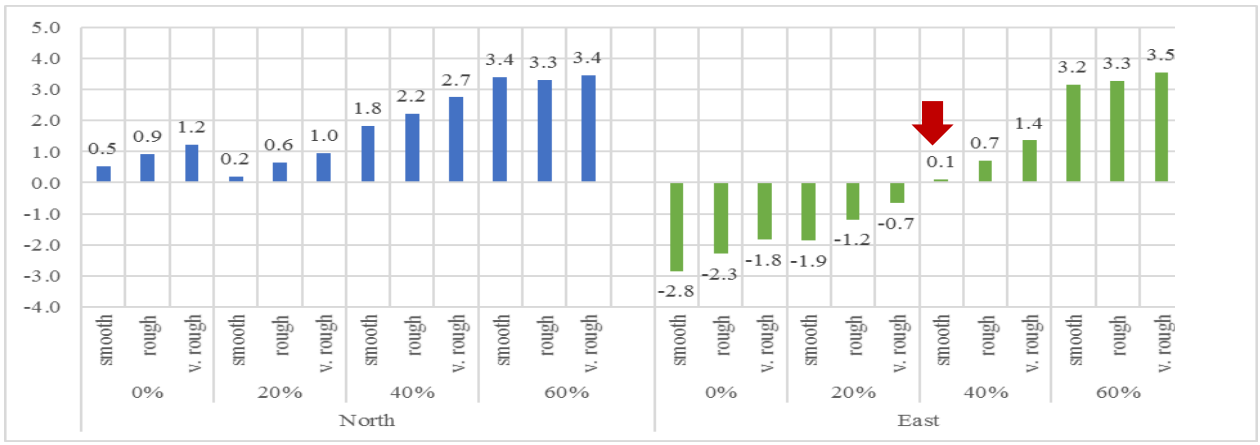
Fig. **11** shows the performance of different alternatives' energy-saving percentages for the medium solar absorptance colors.

North orientation: All shading alternatives achieved energy-savings with a range from 0.2% to 3.4% for 0.2 shadings smooth surface to 0.6 shading surface respectively comparing to the base case. It is noticeable that by achieving 60% shading, all types of texture roughness had the same performance.

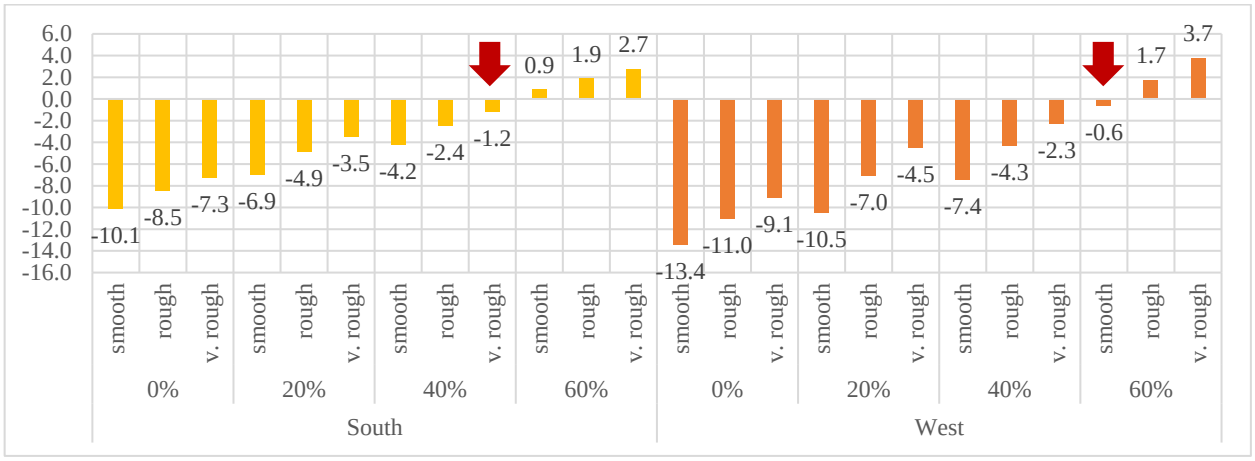
East orientation: The absence of effective shading deteriorated the surface thermal performance as no shading deteriorated the efficiency by -0.7% to -1.9% from very rough to smooth surface. On the other hand, the high shading percentage as 60% and 40% alternatives enhanced the energy-savings with a range from 0.1% to 3.5%.

South orientation: The 60% shading alternatives were the only case that achieved energy-savings with a range from 0.9% to 2.7% from smooth to very rough surface, respectively. However, all other alternatives decreased to the total energy-saving values with a range from -0.1% to -1.2%. The turning point determined after increasing the shading percentage from 40% to 60%.

West orientation: The rough and very rough finishing with 60% shading alternatives were the only cases that achieved energy-savings with a range from 1.7% to 3.7%. All other alternatives caused an incrementation of the total energy consumption values with a range from -0.6% to -13.4%. The higher energy consumed case among the tested alternatives was the "0% shading with smooth surface", as this case deteriorated the energy consumption.



(a)



(b)

Fig. 9: Energy-saving percentage of different alternative for medium solar absorptance colors

3.2.3. High solar absorptance colors

The high solar absorptance colors could not compete with the base case as it included a low solar absorptance color. Neither the shading percentage nor roughness could enhance its solar performance as shown in Fig. **10**. All alternatives achieved an increment to the total energy consumption values with a range from -6.6% to -41.2% to the base case (Fig. **10**). As shading still improved the performance with very rough surfaces, so it is recommended if architects need to select dark colors for a surface to choose a very rough textured with supplying high shading percentage to the surface.

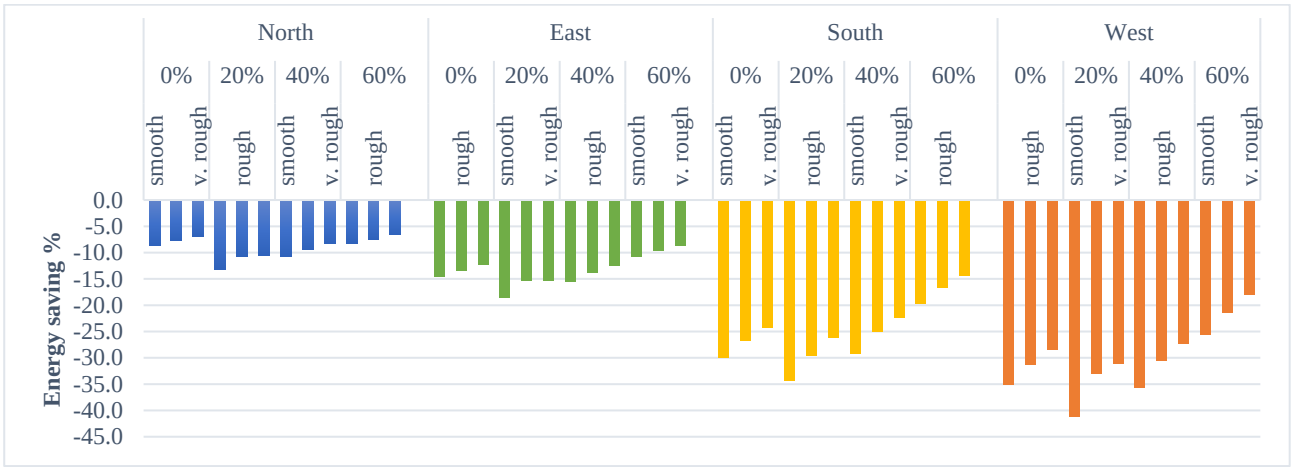


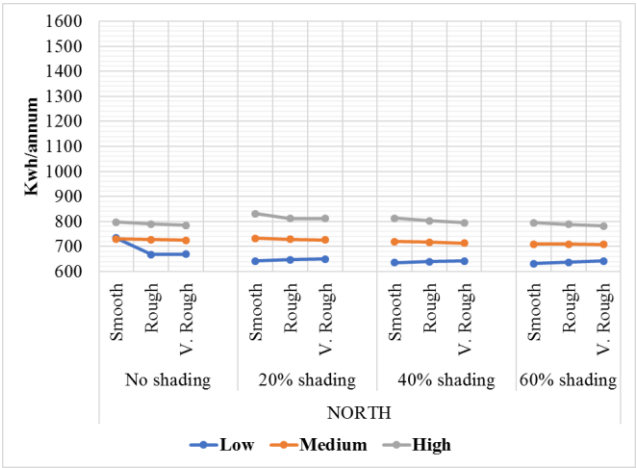
Fig. 10: Energy-saving percentage of different alternative for high solar absorptance colors

3.3. Optimization Analysis

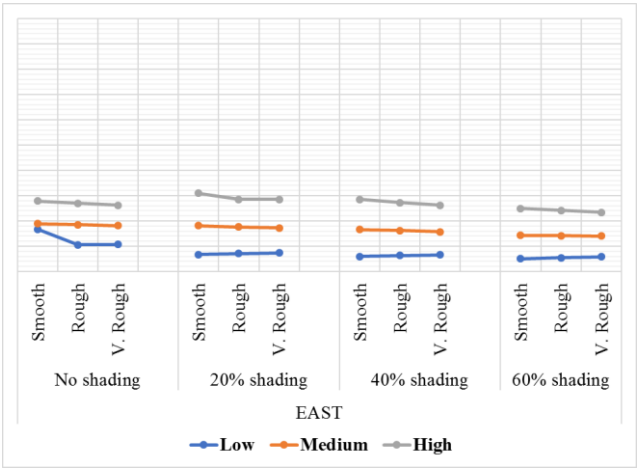
A study for the three parameters conducted to investigate the optimal thermal performance of fully optimized outer envelope surface texture of residential buildings in Egypt. To achieve this aim, an optimization simulation applied for the three parameters' alternatives for each orientation. The results showed that the best value for the multiple parameter study with a reference of the role of self-shading in energy loads reduction, besides the significant role of color solar absorptance in controlling the surface thermal performance. The parameters of the optimal surface for all orientations included the low solar absorptance color with high shading percentage even at the north orientation as mentioned in Table 3.

As at north facades, surfaces with 60%, and 40% shading percentage with low solar absorptance color smooth texture achieved 13.9%, and 13.4% reduction in energy consumption correspondingly rather than the base case (Fig. **11**-a). In the case of east orientation, the energy-efficiency was increased to an average of 14.2% to 15.3% of low solar absorptance color with 60% shading for very rough to smooth surface texture (Fig. **11**-b). Moreover, south and west orientations achieved the greatest energy loads reduction to reach 19.1%, and 22.9% respectively for smooth low solar absorptance with 60% shading (Fig. **11** c, and d).

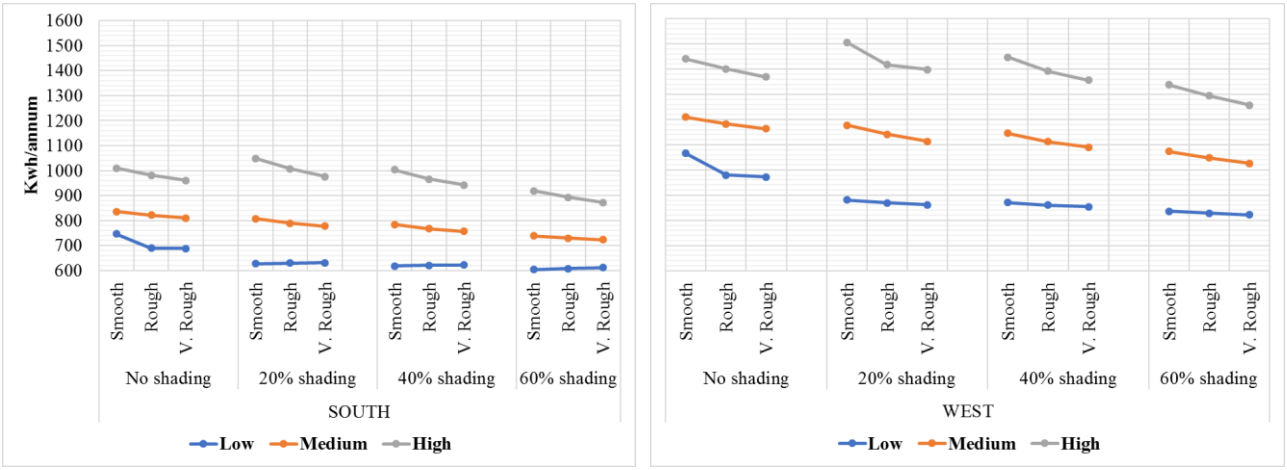
In general, a smooth-textured surface achieved an impressive thermal performance for shaded white elevations, especially for north and east. Whereas, the absence of shading with black color, smooth texture deteriorated the thermal efficiency for -35% at south and west. And it cannot count on the self-shading of surface roughness, as its performance was -28%. It is noticed the odd performance of the smooth no shading low solar absorptance surfaces especially at the north and east orientations. It was, as a result, of increasing the heating loads in comparison with the decrease in cooling loads at those orientations as illustrated in Fig. **2**. As the ratio between heating to cooling loads at the north, and east are 1:1.5, and 1:2, while at the south, and west are 1:4.8.



(a)



(b)



(c) (d)

Fig. 11: Energy consumption of different cases for four main orientations

4. Conclusions

The study proved the significant part of the outer surface texture profile in enhancing the energy performance of housing in the hot-desert climate, as a proper design can reduce the energy consumption by 22.9% at residential buildings in Cairo. For example, the wall self-shading, roughness, and coloring could reach efficiency in energy consumption even in the north orientation reached 13.9%, while the most orientation profited was the west where saving reached 22.9%. As the surface roughness increased, the efficiency enlarged at orientations directed to the direct solar gains. Whereas at north the smooth textures had the priority for energy reduction (Table 3).

As a rule, using low solar absorptance colors in hot climatic zones had the superiority rather than other color spectra for the impulse cooling needs in comparison with heating. Infrequently, at the north a priority of medium solar absorptance color noticed for the need for heating to the absence of direct solar gain with a no-shading smooth surface. The achieved saving percentage was minor by 0.5% to the base case. Considering that, the architectural design needs a variety in designing with any color, achieving the energy-efficient specification for each color range which are:

- **Low solar absorptance colors:** 60% shading smooth texture for the north, east, and south, and for west use a very rough texture.
- **Medium solar absorptance colors:** 60% shading with any texture for north and east and use a very rough texture for south and west.
- **High solar absorptance colors:** the 60% shading with a very rough texture was the best design used among all orientations.

For the medium solar absorptance colors, only some alternatives achieved energy-saving rates. Table 2 shows that the high values of energy-saving achieved by increasing the surface roughness or the shading percentage. All the highest energy-saving percentages achieved in the 60% shading, especially in east and north orientations. The medium solar absorptance colors did not achieve any energy-savings compared to the base case in south or west orientations, unless by using 60% shading with a rough and very rough surface, and the 60% shading with the smooth surface only in the south orientation.

Table 2: Surface alternatives that achieved energy-saving by medium solar absorptance colors

	0%			20%			40%			60%		
	smooth	rough	v. rough	smooth	rough	v. rough	smooth	rough	v. rough	smooth	rough	v. rough
S										0.9	1.9	2.7
W											1.7	3.7
E							0.1	0.7	1.4	3.2	3.3	3.5
N	0.5	0.9	1.2	0.2	0.6	1.0	1.8	2.2	2.7	3.4	3.3	3.4

High energy-saving % Medium energy-saving % Low energy-saving %

In summary, achieving energy-efficient housing is an incredibly important topic with respect to considering the economic factor. Therefore, the importance of investigating and developing even minor factors is necessary to empathize with their roles. Therefore, the outer surface texture profile is not a minor factor and it can play a main part in maintaining the energy consumption of housing.

Future studies for several aspects need to be investigated to widen the scope and provide a deep understanding of the correlation between surface texture and other design aspects as the window to wall ratio and wall materials. Also, investigating the application of the results on natural ventilated buildings to provide well indoor thermal conditions with no additive cost specially for .

Table 3: Percent energy-saving compared to the base case with the best and worst scenarios.

Groove-cut shading	Roughness	Color solar absorb.	Cooling and heating energy loads			
			NORTH	EAST	SOUTH	WEST
0%	Smooth	Low				
		Medium	0.6%	-2.9%	-12.0%	-13.4%
		High	-8.7%	-14.6%	-35.3%	-35.2%
	Rough	Low	9.0%	8.0%	7.7%	8.1%
		Medium	0.9%	-2.3%	-10.1%	-11.0%
		High	-7.6%	-13.4%	-31.6%	-31.4%
	V. Rough	Low	8.8%	7.8%	7.8%	8.8%
		Medium	1.2%	-1.9%	-8.6%	-9.1%
		High	-6.8%	-12.4%	-28.7%	-28.4%
20%	Smooth	Low	12.5%	13.0%	16.0%	17.3%
		Medium	0.2%	-1.9%	-8.2%	-10.5%
		High	-13.2%	-18.6%	-40.5%	-41.3%
	Rough	Low	11.9%	12.5%	15.7%	18.4%
		Medium	0.7%	-1.2%	-5.8%	-7.1%
		High	-10.7%	-15.4%	-35.0%	-33.0%
	V. Rough	Low	11.4%	12.2%	15.4%	19.2%
		Medium	1.0%	-0.7%	-4.1%	-4.5%
		High	-10.6%	-15.3%	-30.9%	-31.2%
40%	Smooth	Low	13.4%	14.0%	17.2%	18.3%
		Medium	1.9%	0.1%	-5.1%	-7.4%
		High	-10.7%	-15.4%	-34.5%	-35.8%
	Rough	Low	12.8%	13.5%	16.9%	19.3%
		Medium	2.3%	0.7%	-2.9%	-4.3%
		High	-9.3%	-13.8%	-29.5%	-30.5%
	V. Rough	Low	12.5%	13.3%	16.7%	19.8%
		Medium	2.8%	1.3%	-1.5%	-2.3%
		High	-8.2%	-12.4%	-26.4%	-27.2%
60%	Smooth	Low	13.9%	15.3%	19.1%	21.6%
		Medium	3.4%	3.2%	0.9%	-0.7%
		High	-8.2%	-10.7%	-23.2%	-25.5%
	Rough	Low	13.1%	14.7%	18.5%	22.3%
		Medium	3.3%	3.3%	2.1%	1.7%
		High	-7.4%	-9.7%	-19.8%	-21.5%
	V. Rough	Low	12.6%	14.2%	18.1%	22.9%
		Medium	3.5%	3.5%	3.1%	3.7%
		High	-6.6%	-8.6%	-16.9%	-18.0%

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The impact of architectural responsiveness to achieve environmental resilience

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Abstract:

The building systems will get active in the responsive system process by dominating their consumption of energy to optimize sophisticated criteria beyond ensuring local end-user comfort satisfaction. It's necessary to enable integration between buildings and the surrounding environment. Buildings have become integrated concepts in which advanced systems work together to reach optimal performance in energy, comfort, and health. Mainly the convergence between different engineering fields and the overlapping field of building technologies and services, namely the responsive building components, has a great future potential to realize the next step in energy saving. Energy consumption in the built environment represents approximately 40% of end-use energy consumption in the European Union. For office buildings with HVAC systems, the energy consumption of these systems corresponds up to a quarter of the total energy consumption registered in the building. Thus, several building concepts are developed to evaluate their impact on HVAC energy consumption and the capacity of installations.

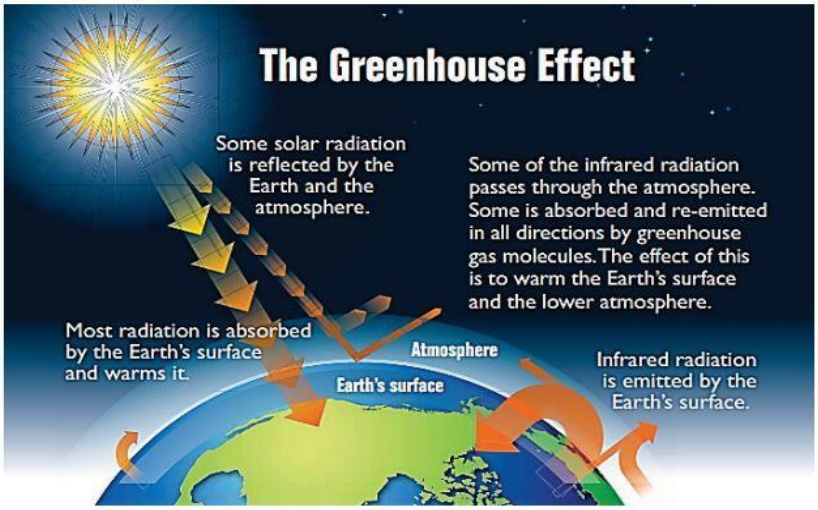
Additionally, external factors that influence building performance such as inter-building effects, and climate change are analyzed. The outputs resulting from a dynamic thermal behavior analysis - performed in the building simulation tools- of the building concepts are translated into performance indicators of energy, sustainability, and costs that allow users to make a conscious decision based on the factors that are most relevant to them.(Geográfica, Energia, Giuseppe, & Marques, 2016). Cities emit 80% of the greenhouse gas (GHG) industry, transportation, mobility, and building construction it produces three-quarters of the world's (GHG) emissions. They're home to well over half the world population. The research, therefore, spotlights on new methods that make our buildings interact with the external environment using modern technology, smart materials, and simulation programs thus achieving the architectural response to the surrounding variables to reduce Co2 emissions and pollution.

Keywords: Responsive systems, building performance, Built Environment, smart materials, thermal performance.

1. Introduction

It is easy today to say that the environment with the building intends to ensure the comfort of users by controlling energy consumption to improve environmental standards and quality of life (QOL), but contemporary buildings are now largely ignoring those criteria for achieving sustainability within them, which has caused a gap between human and its surrounding environment, which is to reduce the burden on the environment and achieve environmental balance. Due to the huge size and external surface area exposed to harsh outdoor conditions (solar radiation, temperature, and humidity), tower buildings usually consume massive amounts of energy mainly for cooling, heating, lighting and water, which makes them among the highest environmental footprint contributors and the largest Co2 and greenhouse gases emitters. Many problems emerge from improper design decisions made at the

early phases of architectural design such as the choice of form configuration and orientation or the depth of floor-plate (Sayigh, 2016).The impacts of climate change are already being felt, as shown in figure (1). In this context, it is too easy to see adaptation for protecting core assets or functions from the risks of climate change. Adaptation to Climate Change argues that without care, adaptive actions can deny the deeper political and cultural roots that call for significant change in social and political relations if human vulnerability to climate change associated risk is to be reduced (Pelling, 2010). The idea of the resilience become fashionable in the past decade. As a consequence, resilience concept has become embedded in public policy discourse in countries across the world in a range of contexts planning, education, and emergency management (Keller & Shipp, 2018). Although resilience is a concept applied across all scales from global to individual and even neurological, we focus on community resilience. (Chandler, 2014).



Source: "Climate Change Indicators in the United States, 2014," U.S. Environmental Protection Agency, 3rd Ed., 2014 https://www3.epa.gov/climatechange/pdfs/climateindicators-full-2014.pdf, accessed May 2016.

Figure (1): Climate change indicators in US, Environmental Protection Agency. **Source:** climateindicators-2014

2. Research Problem:

A lot of buildings are supposed to be designed to adapt to the process of changing the surrounding environment. It uses excessive energy systems. Thus great quantities of energy are being consumed and the rates of energy consumption are increasing rapidly which causes mainly environmental pollution causing increased CO2 footprint then leading to global warming or climate-changing phenomena. Eco-system becomes imbalance and an increase in environmental pollution and overall global international temperature. So, we need to review into the design, building constructions, materials and cities to interact with the environment by using new methods, it's important that our future cities must be more livable, smart, and responsive; that's mean the intelligence is how to adapt with the environment changes. *"Traditionally, urban plans and detail plans have been developed with rigid and definitive design systems. To deal with the complexity and change that characterize contemporary urban societies a more flexible approach to design is required"*(Beirão & Duarte, 2005). Accordingly, the problem is stated as follows; the traditional tools of dealing with complexity which controlling the environmental aspects. As a result, it is essential to consider new technologies and methods in the design process and urban modeling by using smart applications, responsive

systems, computer vision, and simulation. Asia and Africa will see the largest increases in urban population, which are expected to reach 64% and 56% urban population, respectively, by 2050. If the developing world continues to urbanize as expected, replacing sprawling urban areas with extremely intensive ones, they will face a plethora of problems. Poor designs of buildings nowadays can have underlying imperfection as they do not contribute to the energy saving and reduce energy consumption inside them. Sustainable urban design brings a new horizon into focus driven by economic, energetic, technological and cultural changes (Jovanovic, Sun, Cekic, & Koprivica, 2019). Denser urban areas are generally considered to be more sustainable, requiring less land, infrastructure, and being resource-efficient; and it is highly probable that future cites in currently developing countries will be at least as dense as those in the developed world. Climate change will affect the performance of buildings, urban areas, and the comfort and health of a city's occupants (Change & Impacts challenges, 2012).

3. Research Questions:

The research clarify on a lot of questions which in turn can optimize the efficiency of buildings without causing more damage to the environment, like:

- How can the high performance of buildings be achieved through the use of responsive systems and modern technology to improve energy efficiency and reach to thermal comfort? And How to adapt with many environmental changes variables?

- How can the distribution of energy in buildings be controlled by Aerial analysis (Thermal survey) which turns the technology into a powerful, efficient tool?

- To what extent can new programs and simulation tools help to achieve environmental resilience and the viability of life in the environment?

4. Research Objectives:

- Study the influence of Responsive systems and potentials of computer applications on architecture to discuss its role and function as a resilient approach.

- Study the future of highly efficient construction to transfer cities from what they are to become resilient, responsive and more livable cities that can adapt to all variables.

- Reduce energy consumption in buildings to increase their efficiency and reduce environmental damage, and try to treat urban spaces for efficiency and thermal comfort within buildings.

- Awareness of the importance of environmental studies and analysis through various simulation programs and modern technology.

- Create and develop a design system that can facilitate dealing with several environmental parameters during the urban design process.

- Participate of all engineering and community disciplines to solve the energy efficiency crisis in buildings and link all areas together.

5. Tools:

The research aspires to reduce energy consumption and achieve the efficiency of buildings by applying the methodology and using the following tools in building analysis and measurement to see the extent to which they can be applied

- Simulation programs) Ladybug / Diva for Rhino/Dynamo/ envy mate/ Insight 360)

- Aerial Analysis (Thermal Survey), Aerial Intelligence for Retrofit Building Energy Modeling (Air-BEM).

- Achieving sustainability in many levels of mobility and thermal comfort in spaces.

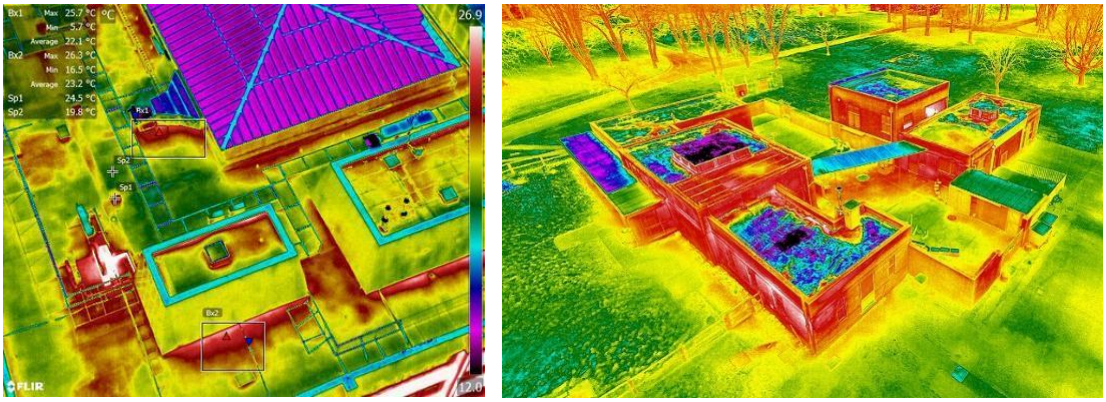


Figure (2): Thermal Imaging Services. **Source:** https://www.svvdroneservices.com/thermal-imaging

6. Research Methodology:

The research tries to prove that responsiveness in architecture can decrease the consumption of energy in buildings. Added to this, it will result in clarifying the most efficient type of responsive architecture in reducing energy consumption. Presentation of global models in some countries that have applied new technologies and systems to generate the external envelope to provide the consumption of energy in buildings. The consequences of the research will be achieved via the following research methodology:

6.1. Theoretical Part:

- In reviewing responsive architecture history, types, technology and problems facing it.

6.2. Analytical Part:

- Analysis of international case study, by determine a Common Factors **such as (**Climatic Conditions / Type of Responsiveness.

- Analysis of different climatic conditions in Egypt and study the Applicability in Egypt.

6.3. Practical Part:

- The comparative qualitative research methodology will be used in this part; analytical study for buildings that used responsive architecture and the result after the qualitative methodology of measure the same principles in Egypt to see if they can be applied or not. The result of comparative

research methodology is investigating the responsive architecture used and the effect of it on the surrounding environment.

7. Definition of Responsive Architecture: Nicholas Negroponte, who introduced the responsive architecture, conceived of it through the late 1960s when design issues got explored through the application of cybernetics to architecture (Zuk & Clark, 1970). Tristan Sterk defined Responsive architecture as a class of architecture or building intending to physically reconfigure themselves to respond to the changing needs with changeable mobility, geometry or location. Responsive architecture can adapt to the variable weather conditions variable while taking the light, heat, and cold into consideration, to provide the best lighting and heating conditions inside the building windows can respond to light, opening, and closing (Sterk, 2005). Responsive architecture is a category of architecture or buildings able to change its form based on an environmental condition that surrounds it continually. They can adapt to the surrounding environment by whether changing its geometric patterns or by changing the properties of the facade's material. They can reform its shape for aesthetical purposes and forming an iconic building, or for interacting with the users and grabbing their attention (Meagher, 2015). So, it can be said that the architectural response can be achieved in static ways not just a dynamic ways.

8. History of Responsive Architecture: Responsive architecture became a common term in the late 1960s and from early to the middle of 1970s as a result of shortfalls within modern buildings. These shortfalls made architect think of design methodologies (Sterk, 2005). Vernacular Architecture is the most relative architecture that used the surrounding materials to form comfortable shelters. In region where large wood resources exist, like those in Sweden. They used wooden houses as they can be heated rapidly adapting to the surrounding environmental conditions. In other regions especially in Southern Europe, they used stones materials instead. They are used by the cultures that regularly depart such as the Bedouins in the African deserts (Modin, 2014). So, the conventional materials have a great role to achieve adaptation and integration with the surrounding environment**.**

9. Types of Responsive Architecture: It's includes an elementary concentrate on either changing patterns in usage (the building's inhabitant's activities) or changes in the (external and internal) environment, the figure (3) Showing the classification of responsive architecture types:

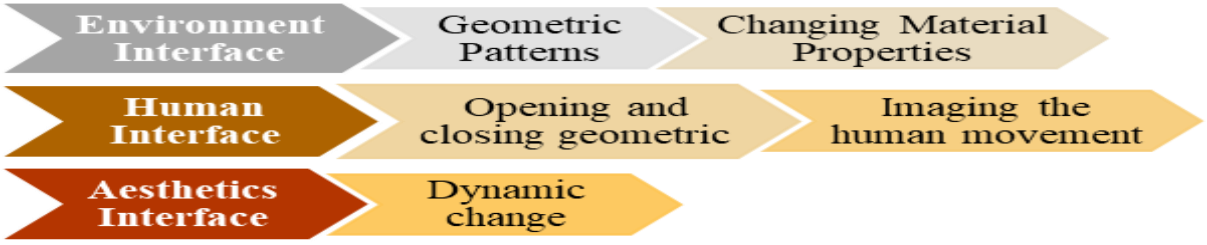


Fig. (3): Classification of responsive architecture. **Source:** by author, 2018

9.1. Changing geometric patterns: This type of responsiveness to environment interface depends mainly on changing the fragments and kinds on the facade. The redaction of the sun that enters the buildings is a result of dividing the building into a changeable location pattern.

9.1.1. **Southern Denmark University Building, Kolding 2014:** Designed by Henning Larsen Architects. Fitted with sensors which measure the levels of light and heat levels regulate the shutters

via a small motor, the solar shading systems as shown in figure (4) which adapts to the surrounding climatic conditions and changes its pattern to improve the indoor climate quality. It simulates the concrete of thermal characteristics and the redaction of the energy consumption for heating and cooling(Knol, Kneepkens, & Zvironaite, 2014).

Fig. (4): Façade of Denmark Uni. with a unique design and cladding, **Source:** arcdog.com

This type depends mainly on changing their patterns on façade, which based on the different conditions of the indoor and outdoor climate and movement of façade tiles, to improve the performance of building.

9.1.2. **Kiefer Technic Show Room - Dynamic facade, Austria 2010:** Designed by Architect Ernst Giselbrecht, Austria. This office building moved depending on different weather condition as shown in figure (5). It is an amazing example of interactive architecture consisting of a 112-tile external framework that switches and collapses into rows on orders.

Fig. (5): The Kiefer Technic Showroom façade that moves according to weather condition, **Source:** designindaba.com

This building façade can move to allow the sun enter to the space and control of the quantity of the sunlight and when the pattern of façade open, this façade transforms to barriers to reflect bad rays of the sun by adjustable shading.

Conclusion: This type depends mainly on changing their patterns on façade, which based on the different conditions of the indoor and outdoor climate.

9.2. Changing the material's properties: This type of responsiveness to environment interface depends mainly on changing the properties of the material. Material due to a certain condition like exposed to high solar radiation changes its properties to minimize the percentage of solar radiation entering the building.

9.2.1. Media-TIC Building, Spain, Barcelona 2013: The Media-TIC is an office building Designed by EnricRuiz, cloud 9 and Zone France the consortium and was completed in 2013, located in Barcelona, Spain. The feature of Media-TIC building is based on the idea of making a balance among

the new digital uses of energy, (Kolarevic & Parlac, 2015).It's a cube from of 44m*44m with 37.8m height, as shown in figure (6).

Fig. (6): The main façade has a quilted appearance, owing to a sophisticated pneumatic system which lets in light or creates shade, according to the position of the sun. **Source:**(Kolarevic & Parlac, 2015)

Using ETFE panel in this building according to the sensors affected by light intensity to reduce the entering light acting like shades for building, and the implanted sensors inside the building which can regulate the energy consumption according to the number of users in each space. 95% CO2 reduced in the building due to decreasing consumption by HVAC, PV roof and ETFE skin (Kolarevic & Parlac, 2015). This type depends on minimize the radiation of the sun that enter the building and controlling in the amount of lighting that's entering in different spaces and prevent a lot of harmful rays that's affected on energy consumption on the building.

9.2.2. Heomeo-Static Facade system, New York- 2013: Decker Yeadon designed this building to adapt to changing environments, like the light of the sun and temperature differences. This system is a double skin responsive façade that responds automatically to the external environment (conversation magazine website, 2015). The system composed of curvilinear surfaces made of dialectic elastomers (DE), it's a type of electroactive polymer (EAP). The two sides of the dielectric material are encapsulated with silver electrodes, as shown in fig. (7)(Eco-building Pulse website,2015).

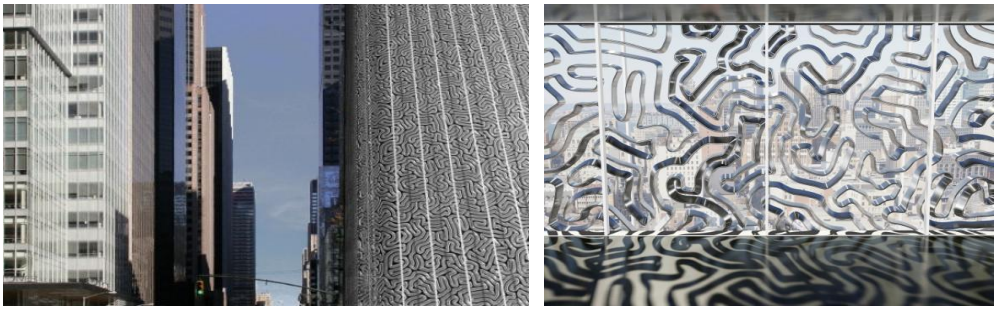


Fig. (7): The dialectic elastomers (DE)**, Source:** Researchers at Tufts University School of Engineering developed magnetic elastomeric

The façade used the silver layer; reflects light, and distributes electric charge all over the material, which causes deformation. This enables the façade to adjust the temperature inside the building.

Conclusion: to minimize the radiation of the sun that enter the building and controlling in the amount of lighting that's entering in different spaces and prevent a lot of harmful rays that's affected on energy consumption on the building. This responsive technique makes energy savings a large amount of consumption.

9.3. Responsive building concepts: Via working in an organized way to vary the concepts is solution which balances the best internal conditions and the performance of environment. It purposes to optimize energy while including the integrity of human factors and architectural consideration. , as shown in figure (8)(Willems, Jablonska, Ruig, & Krikke, 2011)**.**

To reach optimal environmental performance a perfect combination of responsive building items and complementarily of these elements with the building services systems and renewable energy systems should be achieved. Responsive concepts have many notable advantages:

- Improvement in environmental and operating cost performance.
- Better use of technologies for building users.
- The development of new technologies and elements that serve the other buildings.

The efficiency of the performance of the buildings is affected by a number of factors, including reduced depending on artificial ventilation and lighting and air conditioning systems to reduce energy consumption and electricity generation(Willems et al., 2011)

Fig. (8): Diagram showing Responsive building Concept and the elements that effect of the concept of it.
Source: by author, referring to (Willems et al., 2011)

9.4. Energy performance: Energy performance of buildings should calculate some categorize such as thermal properties of the building, air-condition (AC), ventilation, lighting, and supplies. Proposals to upgrade a popular procedure for an energy performance certificate and CO2 emissions are given here, as shown the fig. (9) example of analyses of energy performance in commercial

buildings in Egypt (Khalil & Khalil, 2015)

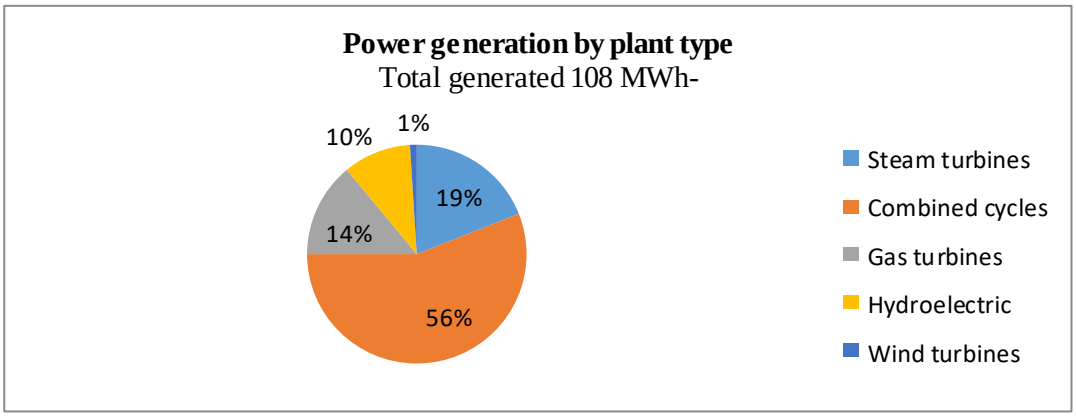
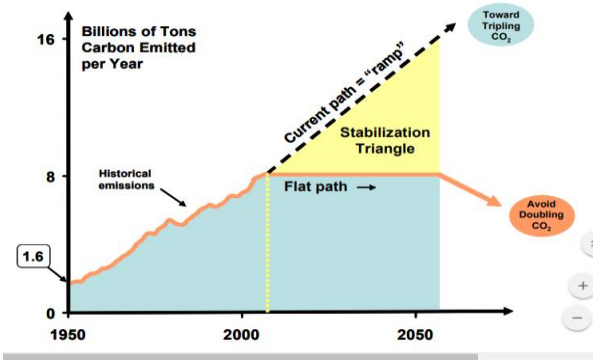


Fig. (9): Existing power generation in Egypt. **Source:** Khalil, E.E, Energy performance of commercial buildings, (2015)

9.4.1. **Problem of Co2 emission and the way to decrease these phenomena:**

Our daily life depends on food and water for survival and energy is needed for a lot of purposes, from local cooking through to main industrial operations. We need to use natural resources to decrease energy consumption to decrease CO2 emissions, so in this fig. (10) from the scientific Socolow* it shows the relation between CO2 emission and compare it by timing and future expectation, after that he analysis this relation to solving the problem of carbon emitted per year (Roberta Hotinski, 2015).



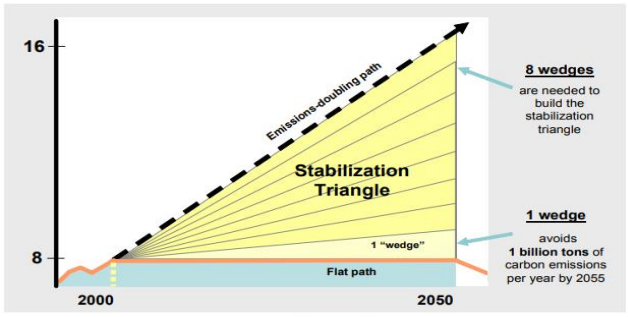


Figure 4. The eight "wedges" of the stabilization triangle.

Fig. (10): Relationship between CO2 emission and timing. **Source:** Roberta Hotinski, 2015.

Fig. (11): The eight "wedges" of the stabilization triangle.

Source: Roberta Hotinski, 2015

Based on Socolow time plan or Wedges it's on a fig. (11). It is a strategy to reduce and then dispose of these emissions over the past 50 years and there are several factors for achieving the time plan by: (Energy rationalization) improving consumption efficiency by reducing consumption in both administrative and residential buildings by 25% to 50% use of clean and renewable energies such as (solar, wind, Geothermal, .. etc.), which will be explained by the use of modern construction technologies. To help to achieve that theory by paying attention to the rationalization of consumption through different architectural response methods (Roberta Hotinski, 2015).

*Socolow: Robert H. Socolow is an American theoretical physicist and professor emeritus of Mechanical and Aerospace Engineering, owner of wedges theory to reduce the footprint of CO2.

9.5. Climate Responsive Design and Environment:

The role that the architects have to perform in the buildings' environmental design depends on the building's environmental influences and the influence of their interior environments' quality. To extend people's experience of building, the architectures respond to climate. Rather than counting on active energy systems, which unfortunately use non- renewable resources. Passive climate control systems can be used. The use of climate-responsive design is a subset of wider issues of environmental design; therefore the philosophy of climate design has as its foundation the holistic orientation of environmental design (Hyde, 2013). When and where needed Comfort is provided; buildings can act responsively to the climate internally and externally and to the interrupting intervention (Looman, 2017). To make the building quieter, it should be designed within the climatic envelop because it doesn't need noisy mechanical systems, as shown in fig. (12). The building, with the help of day-lighting instead of electric lighting, will be more comfortable; it will be healthier because of using fresh instead of recycled air (2019 SERA Architects, Inc.)

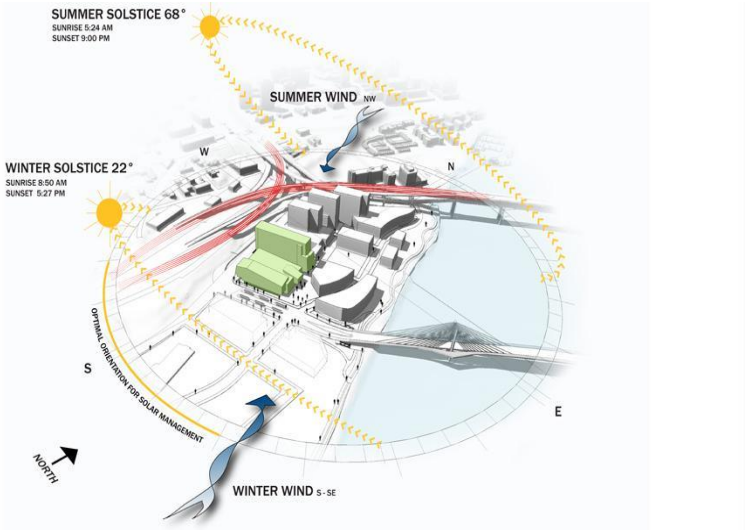


Fig. (12): Designing within the climatic envelope, **Source:** www.seradesign.com/climate-responsive-design/,2016

The climate is the motive in the climate- responsive design. The mass and space of building can act as an intervener between the internal and the external environment; this facilitates the energy replacement between both of them and filtrating the environment (Looman, 2017).

As shown in fig. (13), climate responsive design includes the combination the following three principles: the environment, as an energy source; the building, as a passive system; and comfort which has been provided directly.

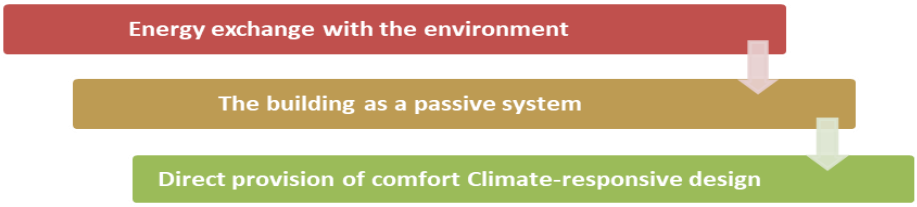


Figure (13): Three basic principles of Climate-responsive Design, **Source:** seradesign.com ,2016

9.5.1. Responsive kinetic envelope:

High-performance envelopes resulted in sophisticated assemblies that combine real-time environmental response, advanced materials, dynamic automation with embedded microprocessors, wireless sensors and actuators, and design-for-manufacture techniques. Expressions like: "smart", "intelligent", "vigorous" and "responsive" are utilized in different ways in the architecture field because they have a specific meaning related to building performance and design. So, the 4 concepts of kinetic building envelopes will be explained (Dalton, 2014).

Fig. (14): concepts of kinetic building envelopes. **Source:** by author, referring to Kathy Velikov، 2012

9.5.2. **Responsive building skin to renewable energy:** Renewable energy, as a kind of solar and wind energy, affects to responsive building skin to produce electricity to reduce the carbon dioxide footprint of the building, to reach the net-zero energy building concepts.

- Responsive to solar energy: Either responsive to solar energy to change direction or automate some of the building features like the solar track louvers or to response to the solar energy as shown in figure (15), to produce electrical energy.

Fig. (15): Climate adaptive building shells, Surry Hills Library Automatic sun-tracking louvers. **Source:** assets.inhabitat.com &flickr , 2017

- Responsive to wind energy: Generation of electricity from wind in the building skin to make the wind energy, like vertical and horizontal wind turbines. In Chicago parking garage the wind turbine can be put to generate electrical energy Vertical shows at the fig. (16) With no moving parts called EWICON (Electrostatic Wind Energy Converter).

Fig. (16): Chicago parking garage harvests energy from wind, Vertical turbine. **Source:** inhabitat, 2016

In a process called Electro-Spraying, a steel frame that has horizontal rows of isolated tubes which release favorably charged water spray in the air is an example in the Delft University of technology. This Type on the fig. (17) of wind turbines will decrease the problems caused by the vertical and traditional wind turbines as noise and vibrations that will disturb the comfort of the building occupants (glassdoor. 2016).

Fig. (17): Wind turbine of Delft University of technology, Horizontal turbine**. Source:** glassdoor.2016

1. **The impact on the indoor environment quality:**

Indoor environment quality, IEQ, is considered as an indicator of the level of comfort which is not confined to the thermal conditions, it includes elements such as thermal comfort, acoustic comfort, indoor air quality, Natural ventilation, lighting and visual comfort. Knowledge of IEQ is useful for rehabilitation of buildings, for example, it can indicate areas which require improvement measures of the parameters which affects indoor environment. We must consider that indicators of comfort are only valid for the stationary regime. An energy evaluation of building is required for a good interpretation of indoor environment quality depending on energy consumption and possibly to finding increase in energy consumption in order to include IEQ in a higher class(Mihai & Iordache, 2016). As shown in figure (18), it illustrates the main parameters that the (IEQ) depending on it such as, ventilation, daylight and temperature (Frontczak et al., 2012).

Figure (18): The main parameters that the (IEQ) depending on it. **Source:**(Frontczak et al., 2012)

In many cases, a building that is used to the desires of users can shape their experience. Following on from the definition of dynamic response to the user's desires, the interactive architecture can create an improved spatial experience. While a building is responding to the actions of users, they are faced with a new phase of awareness. To fulfill it, the environment must work on a simple and basic level of communication. Evolving effective responsive systems and an immense emphasizing on making seamless interactive spatial user interfaces. The following examples explain how climatic factors influence design decisions to achieve high building efficiency and thermal comfort for their users.

4.1- Effect of the buildings on indoor environment Quality and performance of buildings:

- Solar Gain
- Energy Consumption
- Carbon Emission
- Natural Light / ventilation

4.2- Evaluation criteria: Type of Buildings / Renewable Energy (Solar Energy – Wind Energy) / Smart Materials (Energy Exchanging- Property changing- Lighting material / Maintenance requirement / Environmental Effects of Energy / Energy Conservation (Energy saved by HAVC system - Energy saved by skin- Reduce CO2 emission- Energy saved by lighting).

6.4 - International Examples of Case Studies:

No.	Name of Project	Year	City	Country	Climate type
1	Al Bahr tower	2012	Abu Dhabi	U.A.E	**Arid and dry**
2	South Australian Health and Medical Research Institute	2013	Adelaide	Australia	**Mild climate**
3	Humber River Hospital	2015	Toronto	Canada	**Cold climate**

Table (1): examples of case studies

6.4.1. Al Bahr Towers, Abu Dhabi, United Arab Emirates, 2012: Al-Bahr Towers, which are high-performance design inspired by its context, shown in fig. (17) are buildings that implement a unique responsive solution in their façade, the unit that can reduce the energy consumption and their carbon emission (Karanouh A., 2013)

Figures (17): Al Bahr Towers and their façade, **Source:** ahr-global.com, (2013)

- **Climatic Condition:** Abu Dhabi city is located in arid climatic conditions, as shown in figure (18 & 19). So, the challenge for designers to search about architecture methods to solve the problem of the climate on buildings and reduce the negative effect of these climates (World Weather Online, 2019).

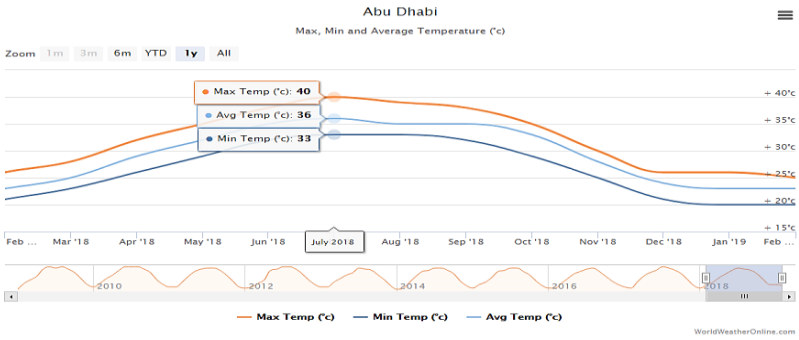


Fig. (18): The average temperature in Summer year 2018, **Source:**(World Weather Online,2019).

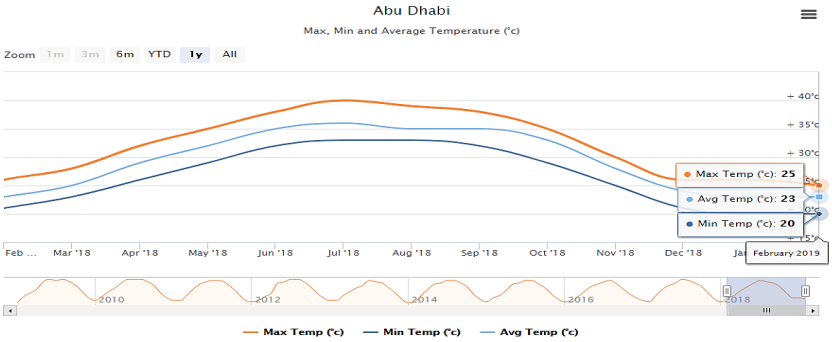


Fig. (19): The average temperature in Winter year 2018, **Source:**(World Weather Online,2019).

- **Type of Responsiveness in Architecture:** Al Bahr Towers use "Mashrabiya" responsive units in their facades which change their geometric patterns and unfold to response to the sun's path and surrounding environment in order to decrease the solar exposure and the solar gain. Units which can response are designed in the form triangle or origami umbrellas, as shown in fig. (20)

Fig. (20): Responsive Unit and their inspiration, **Source:** Karanouh A. &Keber.E.,(2015)

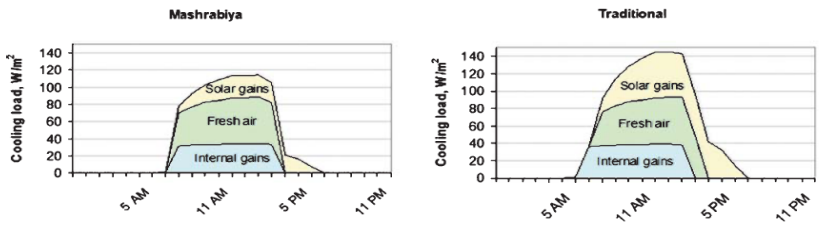


Fig. (21): comparison between the cooling loads in responsive façade and in traditional façade**. Source:** Karanouh A. &Keber.E.,(2015)

1.5.1.7- Tables of building analysis:

Type of Responsiveness		Degree	Reason for degree
Lighting control	Day lighting		A motif like mashrabiya pattern, allow enough amount of light
	Responsive Artificial lighting		Reflective glass curtain walls and mashrabiya responsive units
	Dynamic shades		Automated and kinetic responsive units to avoid solar gain
Renewable Energy	Solar Energy		Solar collectors and cells PVCs to collect solar gain on roof
	Wind Energy		didn't use the energy of wind because of a dry climate
Smart material	Energy Exchanging		PVCs and cooling from water evaporate /exchange from sun
	Property changing		Didn't use materials that can change its properities
	Lighting material		Responsive triangular units with reflective glass
Maintenance requirement			Needs high maintenance due to dynamic systems and solar panels
Environmental Effects of Energy			Air circulations, photovoltaic cells and dynamic units
Energy conservation	Energy saved by HVAC		Only used glass curtain wall and reflective glass
	Energy saved by skin		PVcs on the envelope and responsive units for solar gain
	Reduce CO2 emission		Actuator consumer lower energy than normal bulb and daylight
	Energy saved by day lighting		By using glass curtain wall and dynamic units

Table (3.3): Table of Al- Bahr towers analysis, **Source:** by author, 2019

High		Moderate		Low	

Type of Responsiveness		Degree	Reason for degree
Lighting control	Day lighting		Smart materil in massive glass facades
	Responsive Artificial lighting		BMS to reduce the glare effect
	Dynamic shades		The building didn't use these techniques
Renewable Energy	Solar Energy		From nano layers of electro-chromatic coating
	Wind Energy		The building didn't use these techniques
Smart material	Energy Exchanging		From Nano glass material
	Property changing		Nano glass Dynamic glass
	Lighting material		Smart material glass with nano layers
Maintenance requirement			it doesn't require a maintenance a lot, its for dynamic glass only
Environmental Effects of Energy			Recycled materials decrease of water usage, smart glass and roofs
Energy conservation	Energy saved by HVAC		Dynamic glass as a response to solar control
	Energy saved by skin		Dynamic glass and revlective roofing materials
	Reduce CO2 emission		Sensors trackingthe sun to reduce AC system, dynamic glass
	Energy saved by day lighting		Smart galss treated with nano layers.

Table (3.5): Table of Humber river regional hospital analysis, **Source:** by Author, 2019

High		Moderate		Low	

Table 2. Al- Bahr Tower building Analysis Source: by author

- Units inspired by the Mashrabya reduce solar exposure and solar gain on the façade.

- The reflective glass reduces the artificial lighting and reflects the harmful solar rays.

- Determining the angle of the sun plays an important role in determining the opening and closing times of the units.

7.4.2. South Australian Health and Medical Research Institute, Adelaide, Australia, 2013:

Climatic Condition: Adelaide city is located in a cold climatic conditions, as shown in figure (20&21). So, the challenge for designers to search about architecture methods to solve the problem of the climate on buildings (World Weather Online, 2019).

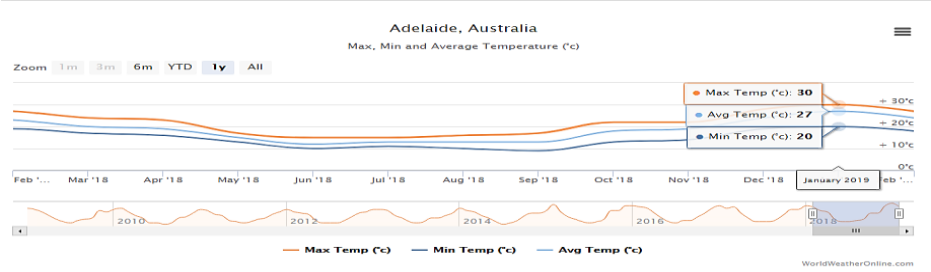


Figure (20): The average temperature in Summer year 2019 ,**Source:** By author using(World Weather Online, 2019).

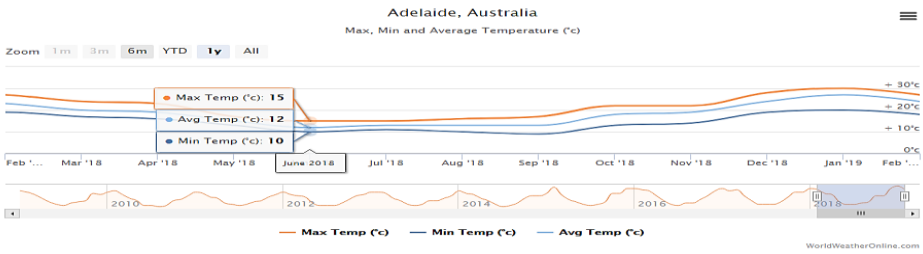


Figure (21): The average temperature in Winter year 2018, **Source:** By author using(World Weather Online, 2019).

The primary studies – which have investigated the different panel patterns and concepts of shading – got developed through the use of "Rhino Paneling Tools" on the surfaces that are flat and larger, as shown in fig. (22). Working isolated on a simpler surface has permitted for a quick iteration. Part of the higher-performing irritations was completely analyzed through our exterior sustainability consultant whose final data resorted into the model of "Grasshopper" for the future. The use of Grasshopper let the team test the schemes through various patches and shapes of the form, and also to concentrate on the resolution and fine-tuning of the problems, as shown in fig. (23) (Shane Burger, 2014).

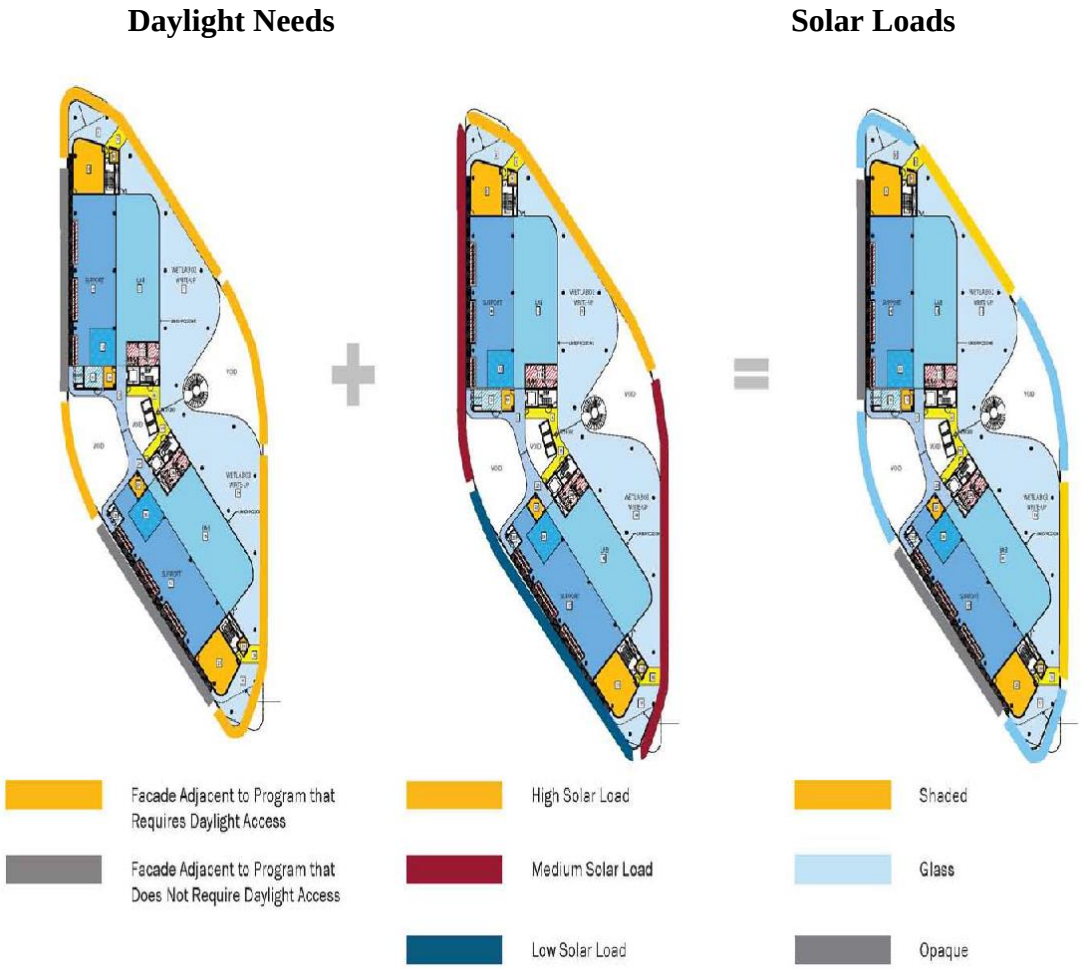


Fig. (22): Analysis of program lighting demands and limitations, crossed with surfaces that received a high solar overhead, and produced inceptive diagram noting areas with required solar relief. **Source:** (Shane Burger, 2014)

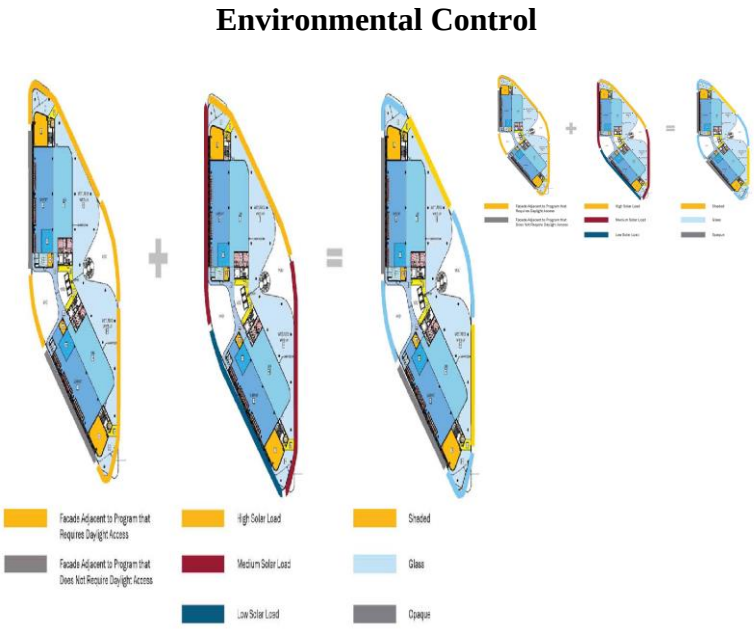


Fig. (23): The result after Analyze of a high solar overhead and produced inceptive diagram noting areas with required solar relief. **Source:** (Shane Burger, 2014)

Type of Responsiveness		Degree	Reason for degree
Lighting control	Day lighting		Facades allow natural lighting and prevent glare and heat
	Responsive Artificial lighting		By using Rhino Paneling Tools on the surfaces that are flat and larger
	Dynamic shades		The surface got segmented to a group of greater panels in order to be manufactured off-site
Renewable Energy	Solar Energy		Depending on day light and used solar energy by material on facades
	Wind Energy		didn't use the energy from wind because of climate
Smart material	Energy Exchanging		From using materials of treated glass on facades
	Property changing		Didn't use materials that can change its properities
	Lighting material		Treated glass, panel materials such as shade, perforated & metal panel
Maintenance requirement			Needs amoderate maintenance due to dynamic panels systems
Environmental Effects of Energy			building permitting the solar radiation and relying on (NL)
Energy conservation	Energy saved by HVAC		Only used treated glass and reflective glass
	Energy saved by skin		Building skin and permits transform the spaces through days.
	Reduce CO2 emission		Reduce the solar radiation and artifitial lighting and Ac systems.
	Energy saved by day lighting		Treated glass and dynamic workplace environment inside.

Table (3.4): Table of of South Australian Health and Medical Research Institute analysis, **Source:** by author, 2019

High		Moderate		Low	

Table 3. South Australian Health and Medical Research Institute, Adelaide Analysis Source: by author

The building's facades are designed to allow natural lighting and prevent glare and heat from entering. The facades are divided so that one part allows natural light to pass and another does not allow. The building is based on passive building thanks to the use of the tech. like "Rhino".

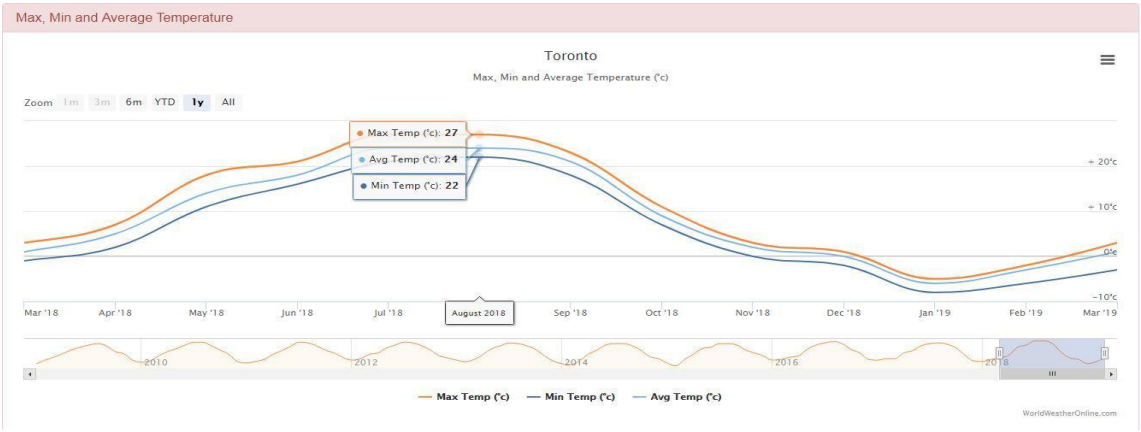
7.4.3. Humber River Regional Hospital, Toronto, Canada, 2015:

Humber River Regional Hospital is located in Toronto, Canada. Designed by HDR architects and Constructed in 2015. It is one of the largest care facilities the building was designed to get a silver gold but it got gold LEED certification through sustainable design (newswire.ca, 2017)

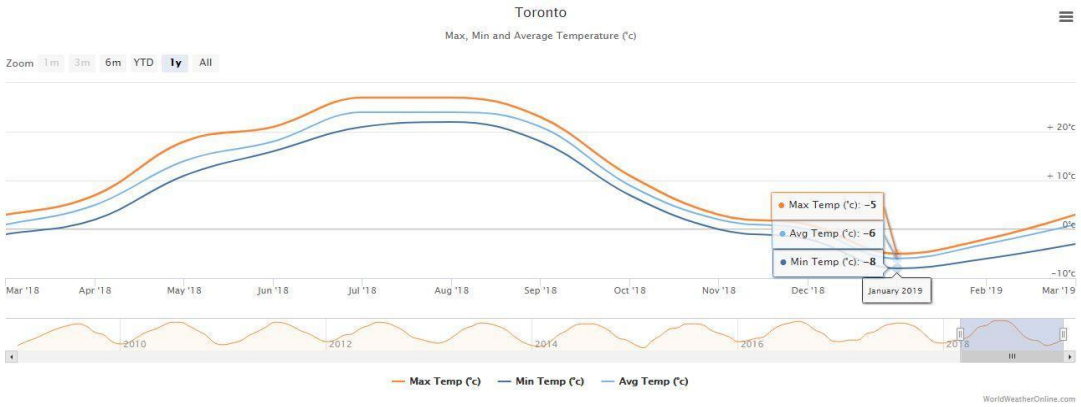
Fig. (27): Shots of Humber River Hospital in Toronto. **Source:**(newswire.ca, CNW Group/Humber River Hospital, 2017)

- **Climatic Condition:**

As Toronto is located on the lake of Ontario, it is known with its humid and sunny summers and relatively warm winter as it is warmer than other cities in Canada.



Figures (28): The average temperature in Summer year 2018, **Source :**(World Weather Online,2019).



Figures (29): The average temperature in Winter year 2018, **Source:**(World Weather Online,2019).

Type of Responsiveness		Degree	Reason for degree
Lighting control	Day lighting		Smart materil in massive glass facades
	Responsive Artificial lighting		BMS to reduce the glare effect
	Dynamic shades		The building didn't use these techniques
Renewable Energy	Solar Energy		From nano layers of electro-chromatic coating
	Wind Energy		The building didn't use these techniques
Smart material	Energy Exchanging		From Nano glass material
	Property changing		Nano glass Dynamic glass
	Lighting material		Smart material glass with nano layers
Maintenance requirement			it doesn't require a maintenance a lot, its for dynamic glass only
Environmental Effects of Energy			Recycled materials decrease of water usage, smart glass and roofs
Energy conservation	Energy saved by HVAC		Dynamic glass as a response to solar control
	Energy saved by skin		Dynamic glass and revlective roofing materials
	Reduce CO2 emission		Sensors trackingthe sun to reduce AC system, dynamic glass
	Energy saved by day lighting		Smart galss treated with nano layers.

Table (3.5): Table of Humber river regional hospital analysis, **Source:** by Author, 2019

High		Moderate		Low	

Type of Responsiveness		Degree	Reason for degree
Lighting control	Day lighting		Smart materil in massive glass facades
	Responsive Artificial lighting		BMS to reduce the glare effect
	Dynamic shades		The building didn't use these techniques
Renewable Energy	Solar Energy		From nano layers of electro-chromatic coating
	Wind Energy		The building didn't use these techniques
Smart material	Energy Exchanging		From Nano glass material
	Property changing		Nano glass Dynamic glass
	Lighting material		Smart material glass with nano layers
Maintenance requirement			it doesn't require a maintenance a lot, its for dynamic glass only
Environmental Effects of Energy			Recycled materials decrease of water usage, smart glass and roofs
Energy conservation	Energy saved by HVAC		Dynamic glass as a response to solar control
	Energy saved by skin		Dynamic glass and revlective roofing materials
	Reduce CO2 emission		Sensors trackingthe sun to reduce AC system, dynamic glass
	Energy saved by day lighting		Smart galss treated with nano layers.

Table (3.5): Table of Humber river regional hospital analysis, **Source:** by Author, 2019

High		Moderate		Low	

Table 4. Humber River Regional Hospital, Toronto Analysis Source: by author

- The building respects the surrounding environment to improve the performance and efficiency of energy consumption in the building by using smart materials in their facades, which work to reduce the glare and controlled by sensors tracking the paths of the sun, in addition to the use of treated glass with nano-layers.
- The use of dynamic glass, which contributed to reducing energy consumption in refrigeration by 7%, reducing industrial lighting by 7% and industrial ventilation by 6%, to be about 20% of the energy saved.
- Using reflective materials on the roofs of buildings and plant other parts to reduce the heat island effect.

8. Results of the analytical study:

From the analytical study of previous examples it can be concluded that climatic factors have a significant impact on techniques that can be used in buildings to achieve better performance of building efficiency, which can be classified as described in the following table (4):

Climatic condition	Reason for Using	Responsive and Environmental systems
Hot and Dry Weather	Highest average of sun hours and temperature	Dynamic Shades Photovoltaic solar cells
Mild Weather	Mild to get a natural lighting and ventilation	Ventilated double skin facades Change properties materials
Cold Weather	Lack of day lighting and natural ventilation	Smart materials that allow solar radiation to enter and reflective glass Glass treated with nano

Table 4. Classification of technologies that can be used by climate for the construction area, **Source:** by author

Type of Responsiveness		Type of responsiveness		
		Kinetic Skin	Kinetic with SM	Smart Glass
		Al Bahr tower, U.A.E	SAHMRI, Institute, Australia	Humber River Hospital, Canada
Lighting control	Day lighting			
	Responsive (AL)			
	Dynamic shades			
Renewable Energy	Solar Energy			
	Wind Energy			
Smart material	Energy Exchanging			
	Property changing			
	Lighting material			
Maintenance requirement				
Environmental Effects				
Energy Conservation	Energy saved by HVAC			
	Energy saved by skin			
	Reduce Co2			
	Energy saved by lighting			

Table (5): Comparative analysis between international case studies. **Source:** by Author, 2019

High | Moderate | Low

The study was made clear on several projects with different climatic elements, according to the criteria previously, and through the table of analysis and comparison that has been drawn, can be explained in the following:

- The buildings included in the study are characterized by the high efficiency of energy consumption using many different methods, which varied depending on the factors that affected them, including the ambient environmental conditions, the design objectives, and aesthetic values sought by the designer.

9. The Possibility of application in Egypt in different climatic variables:

Through the analytical study of previous examples, which were carried out in areas with different climatic conditions, it was found that climate studies and weather factors have a great impact on the selection and use of modern technologies in line with those climatic conditions, so it have done in the last part of the research a climatic study for different regions environmental and climatic conditions in Egypt like (Upper Egypt: Aswan- Mediterranean and Delta: Alexandria- Lower Egypt: Cairo- Red Sea: Hurghada) to discuss and know the possibility of applying such techniques mentioned on buildings in Egypt based on the criteria mentioned in the research, by using climatic data by World Weather & Weather Spark online programs.

Diagrams on Appendices that showing the climatic analysis:

1- Aswan (Upper Egypt): It is clear from diagrams that the highest temperatures are in upper Egypt such as Aswan, which is characterized by high solar brightness throughout the day, which can be used using the techniques of mobile interfaces to control the intensity of light and solar radiation entering the vacuum, as in the sea towers that used such Technology in such hot weather. Solar cells can also be used through which electrical power is generated as the highest number of hours of solar brightness in Aswan is about 14 hours and the lowest number of hours in winter is 10 hours at an average 8.5KWh in summer and 4.8 KWh in Winter, This is explained by Appendix (1), about the study of climate elements in Aswan (news.energysage, 2019).

2- Hurghada (Red Sea): It is characterized by the highest wind speed as the lowest wind speed is about 18Kph, and the highest wind speed of 24.5 Kph. Solar energy can also be used as it reaches to 4KWh in January it increases to the beginning of June, where it reaches its max. Rates of 8.3 KWh. Generally, wind speeds are as follows:

-8 kph (2 m/s) minimum is required to start rotating most small wind turbines.

-12.6 kph (3.5 m/s) is the typical cut-in speed, when a small turbine generating power.

-20- 28 kph (5-7 m/s) products a moderate amount of generated power.

-36–54 kph (10–15 m/s) produces maximum generation of power.

The wind power at a site can be obtained by a measurement device mounted on a pole at the height of the future wind generator (level.org.nz, 2019). In addition, humidity is lower where the highest rate is 28% in August and decreases in the rest of the months to reach 16% and be almost non-existent in the rest of the year, which helps in the use of solar cells and turbines without affecting them by

damage or other humidity, so Hurghada is one of the most suitable areas. Which can be used in the techniques of treated glass to interact with the natural lighting, it is also the most suitable in the use of wind energy in buildings.

3- Alexandria (Mediterranean and Delta):

In Alexandria, the summers are long, warm, muggy, arid, and clear and the winters are cool, dry, windy, and mostly clear. The mild weather in Alexandria helps to enable many responding systems, especially for natural ventilation, because Alexandria has a mild weather and a balanced wind rate most of the year due to its presence on the Mediterranean Sea. Like using Ventilated Double Skin Facades to get a natural ventilation in summer and insulating buffer in winter and the average of sun hours is also good to use the roofs of buildings solar panels and reflective materials to take advantage of the power generation through which it is not preferred to be used in the facades in Alexandria or directly to the sea due to high humidity. We can use also the lighting materials that can change their properties to adapt to the surrounding environment in summer and winter to achieve natural lighting and decrease the need for using AL.

4- Cairo (Lower Egypt):

In Cairo, the summers are long, hot, humid, arid, and clear and the winters are cool, dry, and mostly clear. The climate is moderate in Cairo, but the temperature has recently become high as a result of the climate change that prevails in the whole world, which can be utilized by the work of solar panels and achieve architectural response by choosing smart materials that help in this such as facades Mobile and glass treated with nanotechnologies, in addition to the use of gradient in the openings and moving them according to the space at different time. This is illustrated by the following charts.

5- The average of climatic analysis and intersection between climate conditions:

The charts show the overlap between the climatic elements to determine what affects a larger percentage of the other, as shown in (Appendix 3). The result of these charts will also be explained in the table (6) of how they are applied and how appropriate each place is for the appropriate technology according to its climatic conditions.

The average of climatic analysis and intersection between climatic conditions:

Location	Climate Condition											Reason for Using	Responsive and Environmental systems
	Temperature (C)			Wind Speed (Kmph)		Humidity (%)		Ultraviolet rays (UV)		Sun days (Hr)			
	H	L	AV	Max	AV	Max	L	Max	L	Max	L		
Upper Egypt (Aswan)	42 23	31 15	39 20	20.3 19.9	17.2 19.9	35%	10%	+10	+5	387.5	210	Highest average of Sun hours daily	Dynamic shades Photovoltaic Cells
Mediterranean and delta (Alexandria)	30 18	25 14	27 16	26.8 15.4	21.1 15.4	65%	45%	+6.5	+2.5	382	149.5	The mild weather to get a natural ventilation & natural lighting	Ventilated Double Skin Facades & Change properties materials.
North (Lower) (Cairo)	40 19	25 13	36 17	31.5 17.8	16.6 12.1	48%	45%	+7.8	+2.7	386	184.5	The climate is moderate in Cairo, but the temperature has recently become high	Solar panels, smart materials that help in this such as facades Mobile and glass treated with Nano.
Red sea area (Hurghada)	34 21	28 17	33 19	26.7 23.5	26.7 17.6	46%	38%	+8	+5	387.5	202.5	Highest average of wind speed & Sun hours	Wind turbine & solar cells for energy generation and dynamic shades

Table (6): Comparison of the average weather in Aswan ,Hurghada, Alexandria and Cairo. Source: by author

10- Conclusions:

The world is facing a significant challenge represented in the lack of conventional energy and environmental pollution related to the ever increase in energy consumption. Climatic change and global warming is another challenge which is linked to the CO2 emission from fossil fuels. The buildings contribute to these problems as they are considered the main consumers of energy and which contribute to increase the environmental pollution. Designing buildings to achieve thermal comfort is associated with studying the mechanisms of heat transfer between the building and the outdoor environment. Also, defining the means of heat gain and heat loss is essential in achieving the thermal balance. The main findings of this study are:

The following points are the concluded:

- The responsive façade reduce the energy consumption and the carbon dioxide emissions, depending on the climatic condition of the building.
- The responsive systems reduce the absorption of the solar gain.
- The allowance of entering the natural light inside the building depends on the material of responsive units.
- The component and material of the responsive units have to be selected carefully to avoiding the cost and problems of maintenance.

11- Recommendations:

The following are recommendations for the architects and government in order to improve the application of responsive architecture in Egypt:

In Design Stage:

- The façade where the responsive architecture will be applied on.
- The exact hour and the corresponding rotation angle or movement distance of each unit.
- The orientation of responsive facade, whether it is vertical or horizontal.

In the Implementation Stage:

- The components of the system which can be easily replaced if there is any failure occurred.
- The mechanism of movement which should not be a complicated movement in order to avoid the system’s failure.

12- Future Studies:

- Study ways of integrating the building, and maximizing energy efficiency and improving the building's thermal performance.
- Knowledge into a design strategy that assist designer into the design process in making performance based into integrated application in climate-responsive building elements .
- The role of responsive systems as a means of solving the energy consumption problem in buildings.

13- Reference:

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Eco- Villages Planning

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Abstract:
Eco-village design is a new field of knowledge still under development. It will be the physical manifestation of an increasing role in future urban development world –wide. In order to ensure ecological sustainability, cities around the world have to decrease their environmental footprint. The elements of eco -villages include sustainable design, definition and principles, the necessity of ecological design, green building, and ecological architecture, the second element is infrastructure, recycling- water, sewage waste .the third element is permaculture, finally is resource and energy consumption.
Ecology is one of the important issues in creating sustainable residential areas like eco-cities and eco-villages. Today, the development of cities and villages has created many environment damages, and presenting some solutions to minimize these damages is useful. We should find a new model of the residential area to fulfill with the new community requirements and create sustainable development in urban and village residential areas. The present study introduces and evaluates eco-village and how eco-villages have considered the concept of sustainability. Also, this study Evaluates how sustainability goals based on the main solutions of sustainable architecture can focus on three important criteria of ecology, society and culture. The study method is based on document and analytic descriptive study. Finally, some solutions are introduced to create eco-villages based on the criteria in sustainable architecture.
Keywords: Eco-village, Ecology, Sustainable architecture, Sustainable development

1. Introduction

Possibilities for the future of human settlements basically point to two competing alternatives. The first is that the statuesque is continued indefinitely with continued dependence on non-renewable natural resources. The second is a concerted change in creating more efficient land use and consumer patterns so as to render the available resources more sustainable. The limit to growth case has been well- developed over the years and it is realized that large scale global changes are necessary to counteract the process of diminishing natural resources (Birke land 2002, 34).

There are a number of implications for sustainable settlements design (Ibid, 5). it is emphasized that not only are physical changes required, but to accomplish this social systems should be developed in which a satisfactory quality of life can be achieved at much lower levels of resource consumption than at present life styles would have to be simpler a high level of economic self-sufficiency should be sought (at national as well as at local levels) and more cooperative ways of working and sharing of resources should be explored. Eco- villages are based on an approach where the available technology is used to assist in environmentally friendly practices. Eco-villages by striving for lifestyles which can be continued indefinitely are living models of sustainability and illustrate how action can be taken immediately. They represent an effective and practical way in which to combat the degradation of the social and ecological environment.

1-1- Define Eco villages

- Eco villages are green communities on the cutting edge of sustainable human development. But what exactly is an Eco village? Defining the term is challenging because, like “sustainability”, ”Eco village” is used in many contexts with different meanings.

Robert Gilman offered an early and enduring definition in 1991 when he wrote

- “an Eco village is a human-scale, full-featured settlement in which human activities are harmlessly integrated into the natural world in a way that is supportive of healthy human development, with multiple centers of initiative, and can be successfully continued into the indefinite future.”

-An Eco village is a traditional or intentional community with the goal of becoming more socially, culturally, economically, and ecologically sustainable.

- An Eco village strives to produce the least possible negative impact on the natural environment through intentional physical design and resident behavior choices. It is consciously designed through locally owned, participatory processes to regenerate and restore its social and natural environments. Most range from a population of 50 to 250 individuals, although some are smaller, and traditional Eco villages are often much larger. Larger Eco villages often exist as networks of smaller sub-communities. Some Eco villages have grown through like-minded individuals, families, or other small groups—who are not members, at least at the outset—settling on the Eco village’s periphery and participating de facto in the community.

1-2- Back ground and problem statement

According to United Nations estimates, as quoted by Swilling (2004:3), by 2007 half of the world’s total population of over 6 billion people will be living in cities. Furthermore by 2050 the world’s resources will have to support more than 9 billion people, of which 75% will be living in cities. Urbanization is not a foreign concept to the development agenda of the world, but the move to cities creates opportunities to commit to a sustainability agenda given that more and more is at stake when the natural environment is not properly cared for. Swilling (2004:3) highlights four challenges that must be met to ensure sustainable societies:

-Substances produced by nature are to be removed for consumption at a slower rate than at which they are regenerated by the earth’s natural systems.

-Substances (mainly wastes) produced by society are to be deposited in natural systems at a slower rate than at nature’s capacity to absorb them.

-Ecosystems are not to be degraded or destroyed.

The fundamental human needs of every individual are to be met, including the need to be healthy, secure and expressive. It seems that we have approached, the limit of human activities the earth can sustain. To ensure the continuance of a ‘tolerable planet’, a new way of dwelling has to be explored. Trainer (2002: 67) argues that such a radically different conception of development and an associated practice are now emerging in rich and poor countries, in response to the failure of conventional development theory and practice. This ‘appropriate development’ focus is most evident in the global eco-village movement. Around the world. There are now many smaller settlements exploring ways of living cooperatively and with less impact on earth, via simpler lifestyles, more cooperative and participatory systems and small- scale, highly self-sufficient local economies.

The emergence and growing popularity of eco-villages1 is a reaction to the consumerist culture of the world. They are concerned with diversity, cultural pluralism, local governance and empowerment. Eco-villages or similar sustainable settlements place special emphasis on contextually and local action. This study is concerned with the efficiency of such initiatives in dealing on a local level with problems facing humanity as a whole. The potential of the eco-village concept to serve as alternative urban model will be examined together with the influence that these developments might have.

1-3 Method

The study is descriptive in nature and is based primarily on an overview of relevant literature. This is complemented by information-gained through discussions and interview FINDHORN FOUNDATION eco village is discussed as a case study.

1-4 Goal

The aim of this study is to investigate the extent to which eco-village are a sustainable, environmentally-friendly and socially acceptable housing and living alternative. I will explore the question of eco village perhaps being a luxury for fortunate few or a necessary way forward for Egypt society to deal with the issues of the past and move to a more inclusive, environmentally and economically sustainable society .the adjective of this study is further to examine the occurrence of eco villages as an efficient response to the environmental and social problems of modern urban living and to analyses the way in which eco village function. By examining the details of eco villages the goal is to determine the possible influence of eco villages and the lessons that can be learned from them.

2-Eco-village theory

2-1 Sustainability and Eco villages

The term sustainability fundamentally implies a limit to environmental impacts and the consumption of natural resources (Beatly & Manning 1997: 27). Eco-villages, by striving for lifestyles which can be continued indefinitely, are living models of sustainability, and illustrate how action can be taken immediately. They represent an effective and practical way in which to combat the degradation of the social and ecological environment.

2-2 The Eco- Settlements

2-2-1 Traditional Settlements in history

The development of urban settlements from pre-history unit today is an expression of the organization of human activities. Habitable spaces are designed and adapted accordingly. A historical overview of settlement patterns reveals certain tendencies in the way that the environment is modified for human habitation and use. Initial settlements simply afforded people a more effective way of survival as far as primary needs were concerned .as human control over the environment increased and their activities expanded, settlements developed into more complex organizations .settlements gradually expanded as their surrounding natural environment allowed and as technology development such settlements had the potential

2-2-2 The Emergence of Eco villages

3- Defining Eco- village

3-1 Definition

- Eco- villages are described by global eco- village movement (2005) as urban and rural communities of people, who strive to integrate a supportive social environment with a low impact way of life. To achieve this, they integrate various aspects of ecological building, green production, alternative energy and community building practices.

-Eco- villages are created as a response to the environmental and social problems of our times it is an attempt to live sustainably in the face of the limits to growth that the plant is experiencing and renew the quality of lives with a reconnection to nature. (Kennedy2004) suggests that motivation for eco- villages is the need to reverse the gradual disintegration of supportive social and cultural structures and the upsurge of destructive environmental practices on our planet. The field of reference for eco- villages corresponds largely to that of sustainability itself.

Eco –villages are built upon a combination of social and cultural, ecological and economical dimensions. The ecological dimension is addressed by allowing the inhabitants of a village a personal connection to nature and by emphasizing respect towards it. The nature of human activities is modified to an extent that sufficiently limits damage to the physical context, but still allows inhabitants to benefit. Ecological activities, as mentioned by the global Eco village network (2005).include the growing of food, organic production, the creation of building using environmentally- friendly materials and techniques, the use of renewable energy systems where possible, the protection of nature and wilderness areas as well as an assessment of all products used in the eco village from a social, spiritual and ecological view. re to be supported in a network of like-minded people. The social aspect is equally important .eco villages are primary communities in which inhabitants.

3-2 Charcteristics of Eco villages

With the increasing evidence of human-initiated climate change, people throughout the world are coming together to try to reduce their carbon-footprint. Groups are trying to move away from the dependence of fossil fuels and consumerist practices. There is a focus on producing and consuming locally, forging meaningful relationships and living as sustainably as possible. Many initiatives are encouraged such as: reducing energy use, creating sustainable local businesses, localizing farming and creating environmentally minded communities. There are many different dimensions of Eco villages that need to examine. For instance, building a positive community is integral to the workings of an Eco village. As these groups are quite small, members need to feel empowered, included and comfortable speaking and sharing ideas. As well, cultural and spiritual practices are encouraged - such as an understanding of the interconnectedness of the earth. Ecologically, Eco villages allow people to be connected to the earth. Members respect their environment as it provides them with the majority of their sustenance. Villages grow the majority of their food organically, use local materials for their buildings, protect biodiversity and growing seasons and protect local water, soil and air. The majority of the practices undertaken by Eco villages aim to take care of the land. Eco villages demonstrate a unique economic dimension, as money is kept within the community and is circulated between members.

fig.(1) the eco villages greatest milstone

4- ELEMENTS OF ECO- VILLAGES

4-1 Sustainable design

Sustainable design, green building, ecological design and organic architecture involve more or less similar concepts of ecologically appropriate design and building practices .such design approaches attempt to address the negative impact on nature by using suitable materials in environmentally – friendly construction practices.

4-2 INFRASTRUCTURE AND LAY OUT PRINCIPLES

Infrastructure is the fundamental facilities and systems serving a country, city, or other area, including the services and facilities necessary for its economy to function. Infrastructure is composed of public and private physical improvements such as roads, railways, bridges, tunnels, water supply, sewers, electrical grids, and telecommunications (including Internet connectivity and broadband speeds). In general, it has also been defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions.

4-3 RECYCLING- WATER, SEWAGE, AND WASTE

4-3-1 WATER AND SEWAGE SYSTEM

The average person produces about 500 liters of urine and 50 liters of faeces per year, which together is termed as blackwater.when having access to tap water, person produces an extra 20000to 100000 liters of grey water (wastewater) per year (otterpohi 2000:1).In current sanitation systems black water and greywater are collected simultaneously which leads to costly treatment and little opportunity for the reuse of water and pathogens and micro pollutants are spread out in a high volume of water. Ecological wastewater treatment its aims the efficient use &reuse of water, long-term soil fertility and protection of natural waters.as water and fertile land are vital to future generations, sanitation can play an important role in the quest for sustainable development.

4-3-2 WASTE RECYCLING

In today’s society, waste is generated at an increasing rate as the desire to continually obtain new products motivates consumer behavior. Products are regarded as waste long before their actual life span is reached. In modern lifestyles, recycling is often not regarded as an option, simply because of an overwhelming reliance on seemingly limitless resources. The waste created a large environmental coast. Apart from the finite resources that are depleted in the creation of consumer products and lifestyles. The environment id polluted by materials that not recycled or decomposed and by the disposal of unwanted residue into the physical environment. Current refuse removal practices rely heavily on the dumping of refuse in landfill sites. This not only requires large investment in land and treatment, but alo signifies lost recycling opportunities. Mixed collection in compacting vehicles causes a maximum amount of household waste to be diverted to landfills.

4-3-3 RESOURCE AND ENERGY CONSUMPTION

It is generally assumed that the atmosphere is a free resource. However the greenhouse effect and global warming have proved that is not the case. Furthermore, energy resources and dwindling and the carbon economy faces increasing shortages in future with server economic implications. Andrson (1993:6) argues that there are two possible ways out of the existing carbon crisis, both involving a switch from fossil fuels to other sources of energy.one option is to move from the carbon economy to the nuclear economy, based on plutonium and uranium. The other way is to

make great use of renewable energy sources, based on solar, wind and wave power and also including greater energy efficiency and economic rules to limit the use.

4-3-4 PERMACULTURE PROJECT

Many ecologically oriented eco villages have started from the perspective of developing low impact lifestyles. They want to reduce the" ecological footprint" by as much as 80% permaculture design has been their primary method of choice .it was initiated 30 years ago it is based in the values of " care of the earth and of people"

5- Example of case study in another country

Hagaby(Hallen) in (Sweden)

Amind more than thirty eco-villages in Sweden, Hagaby (Hallen) and Understenshojden were selected for this study since both eco-village is situated within large urban settings fig ( ) the location of the cases. Besides that, the two cases were chosen because they provided an adequate sample size (total 66 households) for the study, and also they were easily accessible from Uppsala, the location of the Master programmer within which this thesis is performed. Hallen eco-village within Hagaby,Uppsala.It is 4.5km from the center of Uppsala. Uppsala is the largest city in Sweden, with the population of 210216 person in 2015.the village is not isolated from the city. The major service function such as bank, shops, transport, schools and health care is provided by local centers.Hagaby consists of 78 rebuilt apartments by the municipal residential company,Uppsalahem,and newly built 11 duplexes(22 houses) by JM Byggnads AB. The latter is the first ecologically adapted housing in Uppsala,Hallen. Hallen adopted more advanced technologies and construction area, but it was co-planned and co-designed with the 78 apartments, so both areas are functionally area increased the resource pool of Hagaby (Norbeck, 1999).

The second case is Understenshojden which is known as the first eco-village built in Stockholm. It was established in 1995 and located in Bjorkhagen subway station. The Bjorkhagen centrum is next to the subway station, so the public library, a supermarket, restaurants and other shops are accessible easily from the village too.

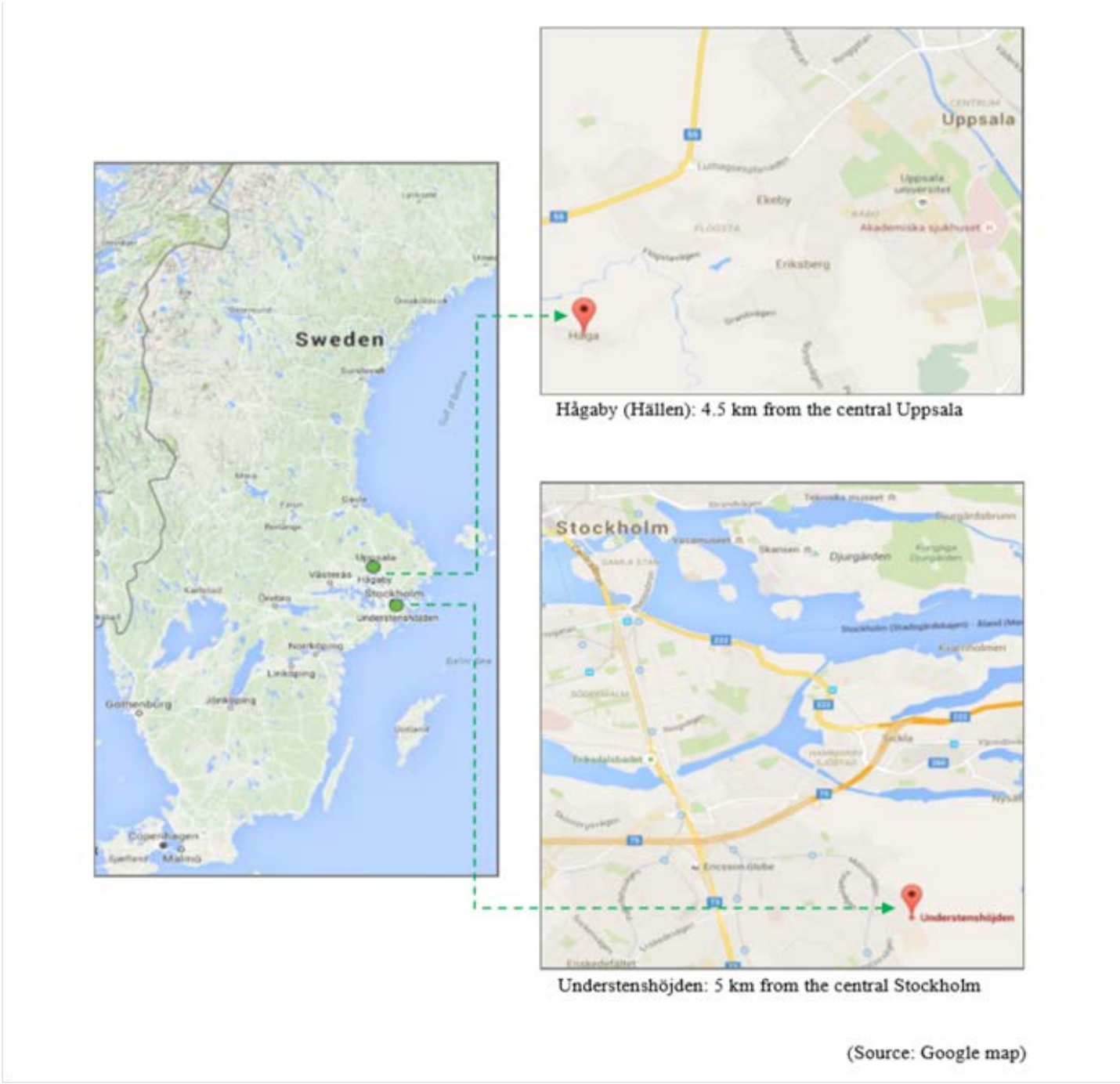


Fig (2) The location of the cases

5-1The edges of Understenshojden meet other apartment buildings a day care Centre, and the Nacka nature reserve.Basic information about the villages and the elements for environmentally friendly living are given in table. The ground plan and images of each village are presented in fig (2), respectively.

Table (5-2) Summary of the chosen eco-villages

Eco-village	Hallen within Hagaby	Understenshojden
Established	1999	1995
Households	22(Hagaby: 99households)	44
Location	Uppsala	Stockholm
Developer	Builder:JM Byggnads(Hallen)(78houses:Uppsalahem AB)	HSB SMAA(smahus for sjalvbyggeri
Elements for environmentally friendly living	Environment-friendly materials Local sewage treatment facility Solar collection Urine separation toilet(most of the flushing toilets) Automatic composting facility Sharing tools Cultivation plots	Natural materials On-site sewage treatment facility Solar pannelson the roof Urine separation toilet(most of the flushing toilets) Compost areas Second-hand exchange room
Features	Attached to an existing village	First eco-village in Stockholm

Source: Understenshojden-overview (Norbeck, 1999)4.3 Hagaby p.54-78)2007 (Lin, Table5.2.sustainability example on exhibition in Hagaby, 2002

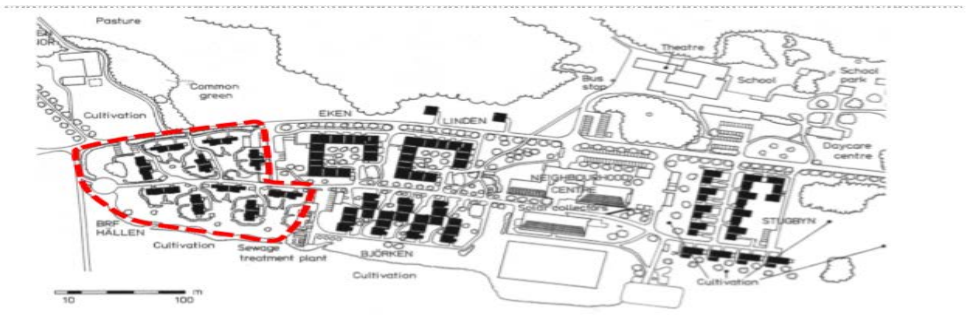
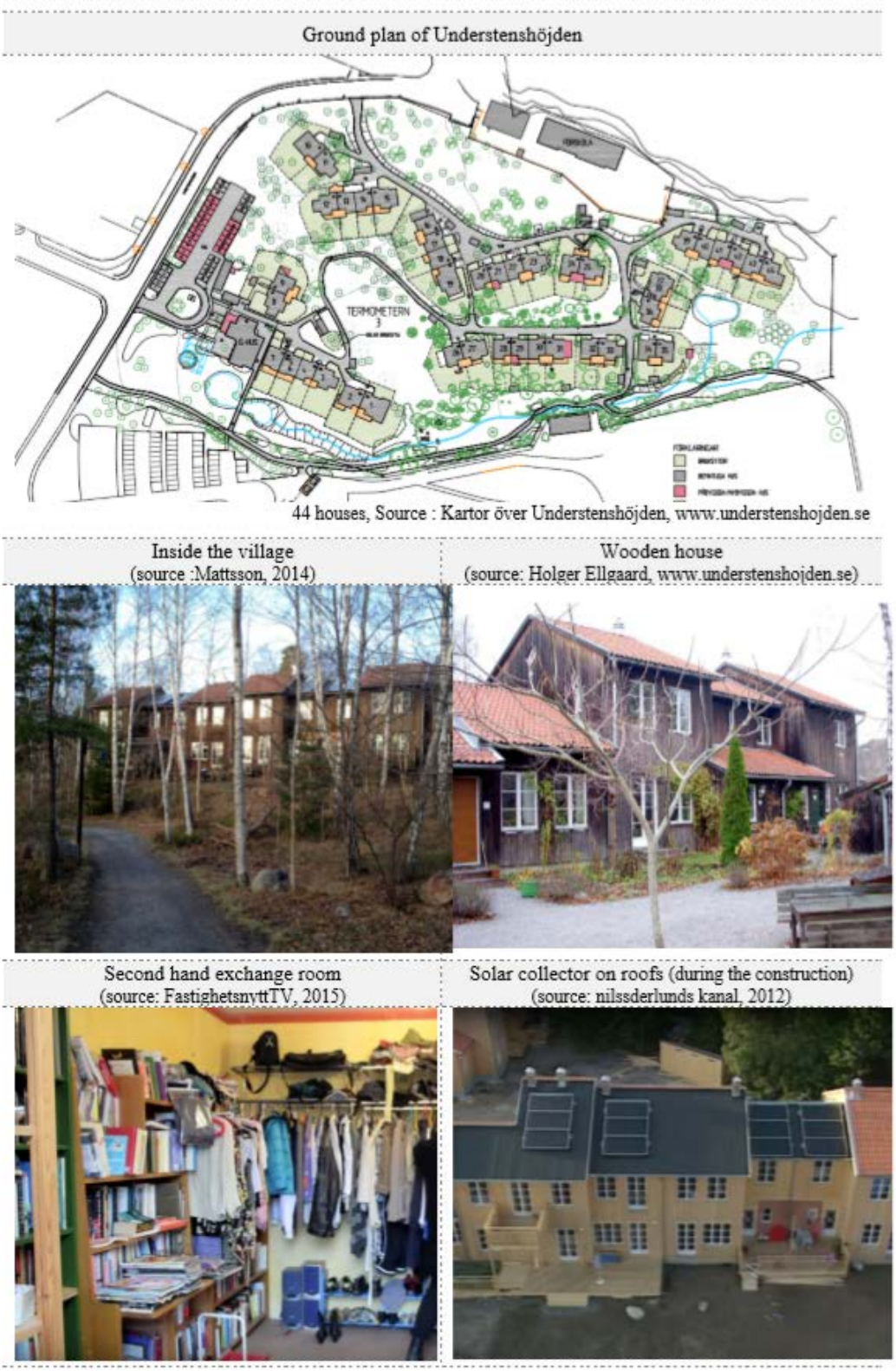


Fig (3) show the (Inside red line:Hallen) Source: plan of the Hagaby area (berg, 2002a)

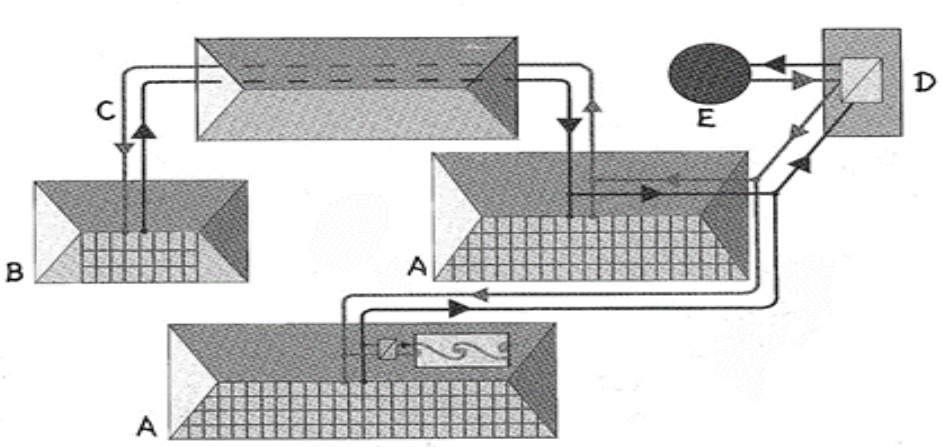
Fig(4) Ground plan and images of Understenshojden



Fig(5) ground plan of understenshojden ,Solar collector &wooden house

5-2 Energy techniques and energy efficiency

The heat energy consumption in Uppsalahem's rental buil- dings in Hågaby is on the average somewhat lower than the ordinary Swedish home (which is around 200 kWh per square metre). The heating and hot water need is thus about 180 kWh per square metre and year for the rebuilt apartments (Table 6.1). This is not extremely good, but the heat consumption was lowered by 30% for all buildings when they were rebuilt (at which time the buildings had very high energy demands). The newly built BRF Hällen has been estimated to use around 110 kWh per square metre and year, and this was confirmed as hot water and heating have been properly regulated and the houses have been able to dry out completely. The low heat energy need for BRF Hällen is probably primarily due to well insulated houses, to low-energy windows (see Figure 6.1) and to hot-water saving measures in laundries, bathrooms and kitchens.



Figure(6) solar collector system in Hågaby. A. Conventional solar collectors. B. Mareco reflector equipped solar collector's C. Hot water pipe system. D. System regulation central. E.70 m3 corrosion free hot water accumulation tank.

5-3 Resourceful water supply and use

Water is mainly supplied to Hågaby from the great Uppsala ridge, which supports more than 2/3 of the population of Uppsala with naturally infiltrated water. There is however also a local ground water supply in Hågaby, which through hand pumping, if needed, can provide all its inhabitants with drinking water.

Pure drinking water is conserved in Hågaby, through a number of different measures. The taps of kitchens and bathrooms are provided with flow limiters, which theore- tically gives a 30% reduction in flows. The four laundry rooms are equipped with washing machines with extremely good water-saving technology and all toilets in Hågaby are equipped with some kind of water saving technology. Most toilets (in the central buildings and in 64 apartments) have two flushing modes, one small (2 litres) and one bigger (but still comparatively small) flushing volume (4 litres). In 14 apartments, urine sorting toilets of a simpler kind, are being tried, which save some water due to lower flush amounts. And in 22 newly built apartments, an advanced water saving system is used in urine sorting toilets with only a few decilitres flushed in the urination bowl. The other main bowl is flushed with 4 litres.Pure district supplied drinking water is also conserved in 43 households by using local ground water for irrigation of agricultural plots near the housing groups. In the first year of establishment, a great amount of fresh water was also used for initial irrigation of lawns, bushes

and tree- plantings. In the future, the effect of local use of storm water systems together with the local ground water pump, will result in considerably less irrigation in Hällen in par- ticular than in ordinary residential areas in Sweden.

to substitute some of the distant mobility for local mobility. But what types of travel can we decrease? Surprisingly enough, it is not work-travel that dominates (about 25% of all travel) or even service travel (around 20%). More than half of all travel is related to leisure purposes!

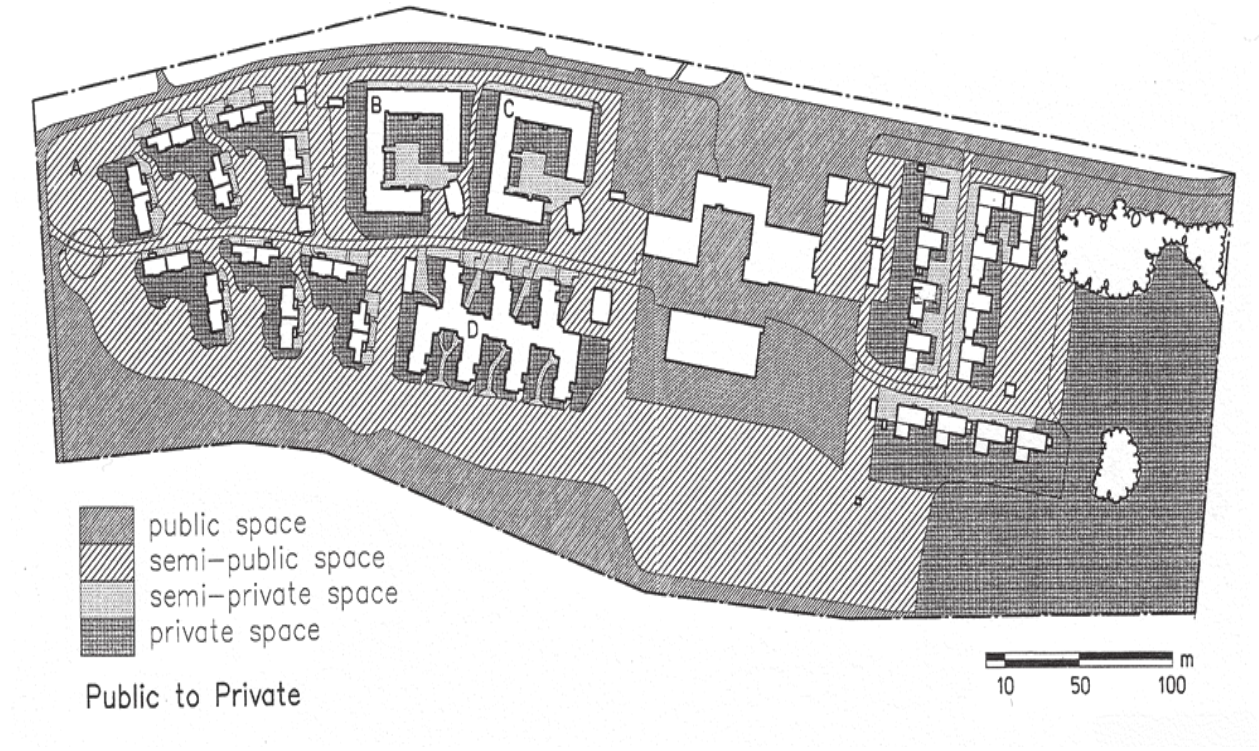
In Hågaby several factors affect the overall need for transportation. A location only 4 km from the city centre, near three local suburban centres and close to a varied and exciting landscape contributes to fewer and shorter trips by car. The transportation infrastructure consists of a main bus and car road and a great number of comfortable bicycle or walking paths. Except for walking or bicycling, residents use the municipal buses, private cars or shared cars. Bicycling is particularly convenient in Hågaby, which also contributes to a relatively low transportation volume from and to Hågaby. There are still no direct figures on the “travel-profile” of Hågaby residents, but this will hopefully be done during the year 2002. There is a high frequency of bus-travellers (more than 90% of all residents use the bus, but only for roughly 20% of the transport needs) and many bicycles (more than 300). Service trips are short and more than 40% of all households have someone working full or part-time in Hågaby. The residents also use the near landscape for leisure. All this suggests that the average travel length is in the range of 10-30% lower than the Swedish average (Table 6.3).

5-4 balance between private and public space

In the planning of Hågaby, a balance between individual and social spaces was sought. The rationale of this was the hypothesis that a person is a social and an individual being who is always moving between the two (see chapter 4.3.5). Another way to put this is to say that to be social you have to have your own territory. Both the new and the renewed areas of Hågaby thus exhibit a number of private spaces with semi-public spaces or public thoroughfares between them. For the rebuilt buildings, private outdoor spaces could be achieved to some extent by adding two gardens or private plots outside the two entrances. If possible, all apartments got at least some space towards the west and the evening sun. In Hällen, all the houses’ gardens face south or west whereas the entrances face the north or the east. Because they are duplexes, all families possess private outdoor spaces in three directions.

Between the buildings, semi-public common greens extend the private gardens and function as meeting-places, common playgrounds and celebration areas. Outside the housing groups in all of Hågaby, there are larger common greens for sports, recreation or larger celebrations. Other private spaces can be found in apartments and in special garden plots close to each house cluster. The most im- portant public outdoor space is the walking road running through all of Hågaby.

Figure 6.8 Public, semi-public, semi-private and private spaces in Hågaby. Map showing distribution of space by Dorota Wlodarczyk, Technical University of Gdansk who made the original analysis. All households in Hällen (A), Eken (B), Linden (C), Björken (D) and Stugbyn (E) have access to private and semi-private space.



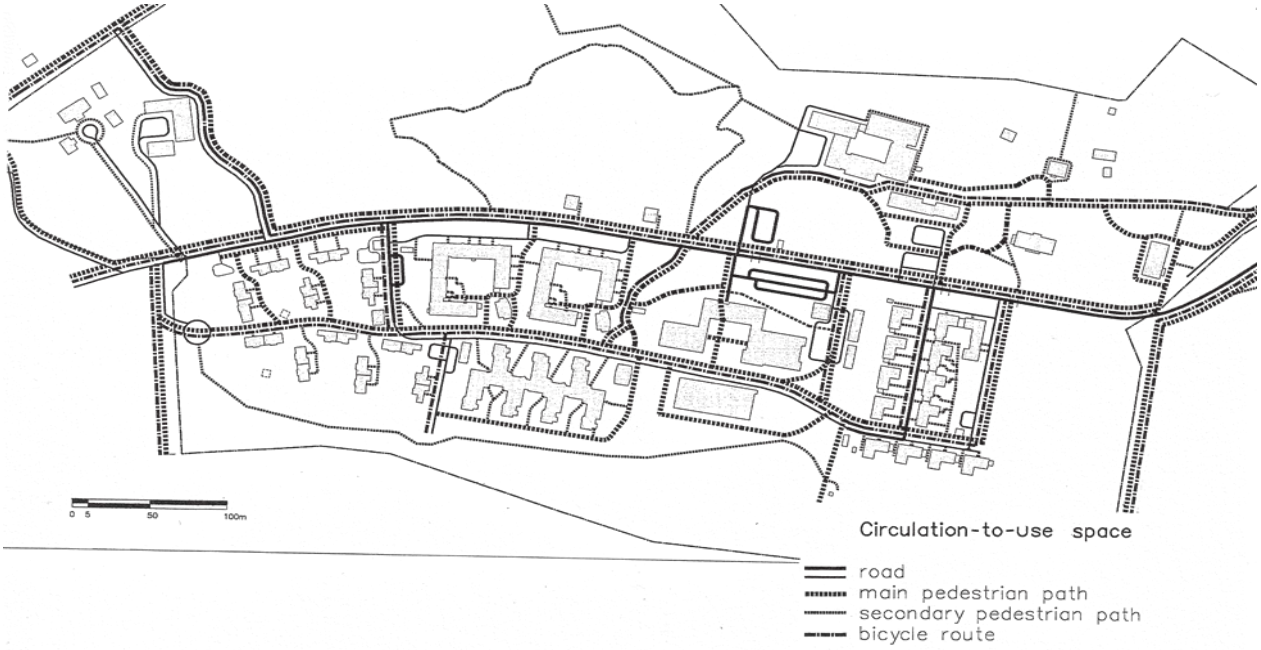
Figure(7) Public, semi-public, semi-private and private spaces in Hågaby. Map showing distribution of space by Dorota Wlodarczyk, Technical University of Gdansk who made the original analysis. All households in Hällen (A), Eken (B), Linden (C), Björken (D) and Stugbyn (E) have access to private and semi-private space.

There are also a number of common premises where the residents and the local working people can gather for meetings, handicrafts, sports, seminars, festivities and reflection. The Neighbourhood Center is a small glassed in information and communication room at the very Centre of Hågaby. It has just recently been planned and will, when it is finished, display the actors and specialties of Hågaby. The room also has a collection of books and brochures about Hågaby and its surroundings, as well as an information computer, with homepages to associations, information from the neighbourhood council and other valuable knowledge. Håga hall is the biggest common indoor space and can assemble up to 250 people. The residents' room is smaller with room for 40 people and can be rented by the residents for meetings, parties, cinema and seminars. Hällen has a smaller assembly room for up to 25 people as well as a studio in one of the old barns in the area. The studio is used for carpentry, table tennis and as an exhibition hall during the summer time, whereas it is used as a garage and a storage room during the winter. The common and the private spaces also include roads and paths.

5-5 Hierarchy of roads and paths

A main road for buses and cars runs through Hågaby north of most of the buildings. An additional Woonerf street (see chapter 4) runs parallel to the main road, but between the houses. This is the main neighbourhood street where all modes of travel exist, but where pedestrians and cyclists have the main access to the common space (see Figure 4.4). The main road and the village street are supplemented by a network of cycling and walking paths through the entire small community. Those small lanes are important for local mobility in Hågaby – they make movement

easy for all residents, including people in wheelchairs. There are also small private paths and sidewalks associated with the private spaces of residents (see Figures 6.8 and 6.9).



Figure(8) Circulation-to-use space in Hågaby. Map by Dorota Wlodarczyk, Technical University of Gdansk who made the original analysis. The network of paths and roads are also complemented by a fine-meshed network of smaller informal walking paths

5-6 social generators: children, shops, school and communication's fora

Some organizational functions will, in particular, gene- rate new contacts between children, between children and grown-ups, between youngsters and the elderly and between the adults themselves in the local community. Children will, by themselves, give rise to acquaintances between various parents thus exposing family structure to other families. In Hågaby, of 350 people, 120 are children up to the age of 15. There are between 20 and 50 small groups of children playing, talking or socializing.

Most of these friend-groups are formed by children who live close to each other (within 100 m). Several are also formed however at comparatively long distances in the neighborhood, which is particularly true for the older girls (>500 m). The shop, Tant Gröns Skafferi, is a major force for getting to know neighbors all over the community. The shop is in the middle of Hågaby and most people in Hågaby use it – at least a few times every month. The school (which is a Waldorf or Steiner school with nine grades so far) is another important local arena or forum where parents and children from different parts of Hågaby meet and learn to recognize each other. The school is also a contact surface to other parts of Uppsala and to many of the children's grand-parents The residential host for Uppsalahem's tenants was supported by more than 80% of the residents and the neighborhoods council is important for more than 90% of all the residents.

The residential host generated many new contacts between many of the tenants, Hällen's residents and the small enterprise owners. The same function cha- racterises the neighborhood council, which is supported by more than 70% of all residents.

6- CONCLUSION

This study explored the influences of two Swedish of two Swedish eco-villages into the broader society to understand whether the eco-villages into the broader society to understand whether the eco-villages can serve as catalysts accelerating urban sustainability. The influences were investigated through the two spheres: individual basis-influences and eco-village project basis-influence.

The findings suggest both potentials and challenges of the eco-villages as catalysts of urban sustainability. The potentials found in the first sphere are the residents reinforced environmental behaviours in various places, the resident's open-minded attitude to take further action to improve their village, and their capacity to inspire others and a broader society. A potential found in the second sphere is the indirect impact on the municipality and housing company in terms of knowledge building and inspiration.

The challenge found in the eco-village projects is the lack of engagement with the municipality who has responsibility or power to change urban development plans.it may be difficult to create a good circumstance for niche to regime translation without municipality's interest in these grassroots projects .Moreover, municipalities, indifferent attitude may weaken eco-villagers, capacity to make their own way of ecological living.

In connection with above result, this study draws some future research topics. Investigating what other conditions (apart from municipality's engagement) can facilitate niche to mainstream translation of eco-villages,practices,may increase the understanding of successful grassroots projects. Additionally, several problems of ageing eco-villages were noticed during the research, e.g. out – dated or inefficient facilities, replacement of residents (initiators of eco-villages to new-comers).it can be extended to drawing a new blueprint of eco-villages in relation to Nor beck, s statement, as society starts to catch up with the eco-villages, future villages can and have progressed to the next level,. Breaking new ground, (Nor beck, 1999).

Most villages are deserted and others are encountered with identity crisis. These problems direct the rural and urban planners to new solutions to eliminate residential area crisis. The position of rural life is the requirement of formation of sustainable villages.

Variety of rural roles, creating self-reliant community with sustainable living is the necessary

Factor for formation of high quality habitats Based on the introduced criteria in eco-villages, energy sustainability is of great importance and as shown in the history of creating eco-villages regarding creation of a sustainable ecological life by people shows that creating this small activities can create eco-villages.

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A Blue Green Approach For The Resilience Of Mediterranean Cities

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Abstract:
There is a growing recognition that urban areas will be profoundly affected by climate change whether in coastal areas, inland, or in high-altitude locations. The need for climate resilience strategies is growing. Different adaptation plans are being considered. One of the most important measures is increasing green spaces and natural elements in the city for their impact whether cooling, flood management or water management. This paper will discuss Mediterranean cities resilience strategies through planning a Blue Green infrastructure to aid in the adaptation to climate change.

Mediterranean coastal cities are high risk areas. These cities will face many side effects whether drowning from the sea level rise, droughts in desert areas, urban heat island effect in compacted dense areas or flooding. It is becoming clear that climate change will profoundly affect these cities in more ways than one. As urban areas today accommodate half of the global population, and will host two thirds of all humans by 2050, there is a need to focus on the adaptation of cities and urban communities to climate change. Investments made in the coming decades will be of utmost importance not only with regard to mitigating further climate damage, but also in terms of how well cities are equipped to respond to impacts within predicted climate scenarios. The aim of this paper is to analyze two Climate resilient Mediterranean cities Valencia in Spain and Thessaloniki in Greece to form a resilience plan for Alexandria.

This paper will be divided into two main parts. The first is an inductive methodology through which examples of Mediterranean coastal cities are analysed to form a list of criteria and resilience strategies. The second part will be forming a strategies and a list of recommendations on the case study Alexandria to propose a blue green infrastructure approach to the climate change crisis.

Keywords: climate change, Mediterranean cities, resilience, blue green infrastructure.

1. Introduction

Improper human activity such as: burning fossil fuels, chopping down forests and many other abusive actions have led to global warming and climate change. Many disasters and natural hazards started to occur such as oceans evaporation, ice melting, sea level rise, higher storms and stronger blizzards. Without taking the proper precautions against these changes cities which are the most important aspect of the urban structure and the where the population is concentrated will be destroyed.

There are different approaches to climate resilience one of the most popular ones is planning a blue green infrastructure to increase the amount of green spaces and vegetation and use their beneficial effects on the environment for adaptation and mitigation of climate change.

The aim of this paper is to propose an adaptation plan to climate change by planning a blue green infrastructure. Also, it has multiple objectives such as to spread awareness about the dangers of climate change, to learn the different methods of adaptation and mitigation to climate change, to encourage planners to consider adaptation measures in their design and finally to turn Egypt into a climate resilient country.

This paper will employ a mixed method approach that utilizes literature review and analyzed similar examples in the formulation of its proposed framework. An inductive, deductive method is

used in reviewing the literature to learn recent developments and approaches on the topic. A comparative analytical approach is taken to analyze two examples of similar conditions to that of the case study Alexandria and compare between their climate change solutions. Finally, a conclusion and a list of strategies and recommendations will be formulated.

2. Climate change in the Mediterranean region

Fig. 1. Mediterranean region map Source: Modified by researcher

Figure 1 indicates the location of the Mediterranean region. Table 1 illustrates the overall pattern and climatic characteristics of the Mediterranean region in the summer and winter.

Table 1: Climate in the Mediterranean region table Source: by researcher

Period	Overall pattern	Climatic characteristics
Mediterranean winter	From very cold mountains to mild areas along the coastlines of the south of the peninsulas, the eastern basin and north Africa	The total winter precipitation amounts range from 50 to 100 mm in north Africa to over 500 mm along the western coasts of the peninsulas enhanced due to orographic forcing land sea interactions
Mediterranean summer	Summer temperatures show a gradient from cool north to a warm south and exceed 30 degrees Celsius in the southeast.	Large areas receive no rain during summer, while in mountain areas precipitation totals can reach 400 mm

Climate change impact varied from temperature rise, to decrease in annual precipitation, increasing risk of desertification and many others. Table 2 illustrates the changes that occurred in different climatic parameters. Table 3 illustrates the extreme conditions and natural disasters that occurred due to climate change

Table2: Climatic parameter Source: By researcher

Climatic parameter	Observed change
Temperature	A decreasing trend of cold extremes is recorded. In summer an increase is found especially over the sea.
Precipitation	Decreasing precipitation throughout the region.
Sea level	The global mean of sea level rise was around 3mm per year over the last two decades. It is predicted to reach 0.1-0.9 by 2100 with possibly higher impacts in the southern Mediterranean areas.
Cyclones and wind storms	General decrease in the density of cyclones associated with extreme winds.
Overall	The Mediterranean climate would become progressively warmer, drier and less windy.

Table 3: extreme conditions and natural disasters Source: By researcher

Extreme temperatures	General increase in the number of very hot days and nights as well as longer warm spells and heat waves.
Extreme precipitation	Increase in heavy daily precipitation in winter
Cyclones and wind storms	No significant change in the intensity of the most extreme wind storms

Climate change side effects and natural disasters have impacted three very important factors in the existence of humanity which are living, working and moving. Table 4 illustrates the impact of each climatic parameter on these factors.

Table 4: Climate impact on living, working and moving Source: By researcher

	Living	**Working**	**Moving**
Heat	- Decrease comfort - Health risks - Increased energy for cooling - Decreased energy for heating	- Reduce productivity - Increased energy for cooling - Decreased energy for heating	- Discomfort - Rail buckling - Increased energy for cooling - Decreased energy for heating
Floods	- Health risks - Damage to houses - Power and water failure	- Reduce accessibility - Economic asset damage - Power and water failure	- Blocked roads and rails
Water Scarcity	- Discomfort Health and safety risks	- Reduced productivity - Power and water failures	- Shipping constraints
Wild Fires	- Damage to houses - Health and safety risks	- Damage to economic assets	- Transport route blockage
Storms	- Health risks - Damage to houses - Power and water failures	- Economic assets damage - Reduced accessibility - Power and water failure	- Blocked roads and rails

From this table it is apparent that climate change factors such as heat, floods, water scarcity, wild fires and storms are critical issues that should be handled urgently as they impact all aspects of people's lives and compromise their right to live, work and even move. A need for resiliency plans has emerged to fight climate change and protect the cities.

3. Resilience

The concept of resiliency originates from the field of ecology. It is defined as the capacity of a system to rebound after a natural or manmade disturbance. This means an ability to accommodate change and rebound to a state that is similar to the original state but not necessarily identical. (Rockefeller foundation, 2013)

Climate resilience has three different approaches coping, mitigation and adaptation. Coping can be considered a passive approach that prepares for possible disasters and considers current risks. It focuses on individual disasters rather than addressing the complex issue of climate change. Its solutions are considered very limiting. Adaptation does not mean that the negative impact of climate change will be avoided, only that it will be less severe. A city with more adaptive capacity is a more resilient city, able to withstand, manage and reduce climate change vulnerabilities. While, mitigation help reduce the magnitude of climate change by helping reduce human generated greenhouse gas emissions. Figure 2 illustrates the three approaches to climate resilience (UN-Habitat, 2014).

Fig. 2. Climate resilience approaches Source: By researcher

Figure 3 illustrates the relation between sustainability, resilience, climate adaptation / mitigation and disaster risk reduction. Sustainability is always the main goal for cities and resilience is considered the new key to sustainability. One of the major threats facing cities is climate change therefore creating a plan for its adaptation or mitigation is critical.

Fig. 3. Relation between sustainability, resilience, climate adaptation/ mitigation and disaster risk reduction Source: By researcher

4. Blue Green infrastructure

Blue Green infrastructure is a strategic and spatial approach to landscape and urban planning. This infrastructure is a combination of principles from landscape planning and landscape ecology used to fulfill multiple sustainable planning objectives by working with other networks and systems in the urban environment (Green infrastructure, 2019).

Its design principles include connectivity as open spaces should form a network in which different systems could be applied such as water management and waste management. Also, it should be multiscale to include green elements everywhere. It should be multifunctional to provide services that include social, ecological and environmental benefits. Finally, the elements of the infrastructure should be integrated with the surroundings and accessible (Kabisch N., 2017) .

This infrastructure is a network of patches and corridors of land that are planned for biodiversity conservation, nature protection, water management, land protection, recreational use, reduction and production of energy and for climate change mitigation and adaptation. The benefits of blue green infrastructure include better management of storm water runoff, flood prevention, reduced temperatures and urban heat island (UHI) effects, and defense against sea level rise (Kabisch N., 2017).

Examples of blue green infrastructure and technological practices include green roofs, green walls, pocket parks, green alleys and streets, urban forestry, green open spaces such as parks and wetlands and its application in scale from individual buildings, blocks, streets and neighborhoods to entire cities and metro regions (Kabisch N., 2017). Table 5 illustrates these practices at different scales to create the blue green infrastructure.

Table 5: Blue green infrastructure different scales Source: By researcher

Scale	Design elements
Building	Green roofs Green walls
Block	Green courtyards Clustered housing around greenery Backyards
Street	Green streets Sidewalk gardens Urban trees and Vegetated swales Edible landscaping
Neighborhood	Urban forests Ecology parks Community gardens Neighborhood parks Pocket parks
Community	Urban ecological networks City tree canopy Community forest Greening corridors
Region	River systems and floodplains Regional greenspaces Greening major transport corridors

5. Evaluation criteria

Table 6 illustrates the evaluation criteria to be used in the paper. This criteria was developed based on the principles of planning green infrastructure as it is the chosen approach for climate resilience, the different scales used and the climate changes and natural disasters the green infrastructure has helped fight and adapt to.

Table 6: Evaluation criteria Source: By researcher

Design criteria	Points
Principles	
Connectivity	
Multiscale	
Multi functionality	
Integration	
Accessibility	
Green Elements in different scales	
Building scale	
Green roof	
Green wall	
Block scale	
Green courtyards	
Clustered housing around greenery	
Backyards	
Street scale	
Green streets	
Sidewalk gardens	
Urban trees and vegetated swales	
Edible landscaping	
Neighbourhood scale	
Neighbourhood parks	
Pocket parks	
Ecology parks	
City scale	
Urban parks and forests	
Linear green spaces (Green corridors)	
City farms and urban agriculture	
Urban water ways and water bodies	
Climate change adaptation	
Regulating temperature	
Flood mitigation	
Sea level rise defense	
Reduce carbon dioxide in air	
Rainwater management	

Two Mediterranean cities Valencia, Spain and Thessaloniki, Greece are analyzed to further understand the planning of the green infrastructure and its impact on climate change. The analysis will include their location, climatic condition and the details of the resilience plan.

6. Analytical examples of Mediterranean cities: Valencia

6.1. *Valencia Location*

Valencia is a city in Spain which is located in Europe. It lies on the coast of the Mediterranean.

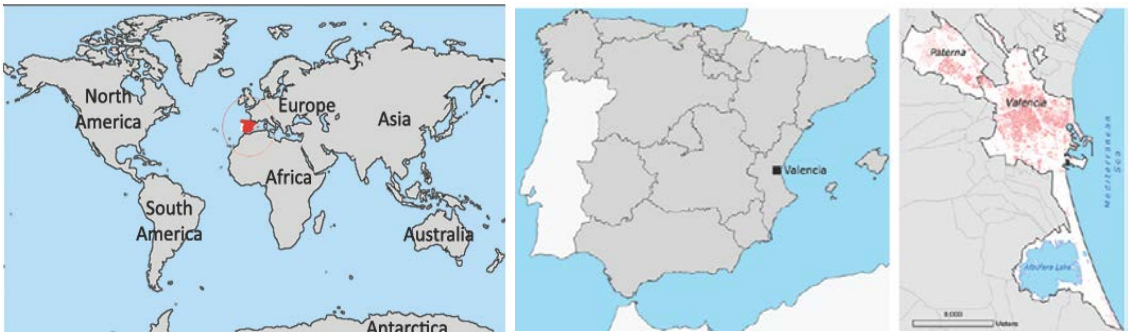

Fig. 4: Valencia's location Source: GeoProcessing 2012 conference paper

6.2. *Climate*

It experiences a Mediterranean climate which is known for warm summers and mild winters. During summer the sea wind causes cooling. Winter is cooler, however as soon as the sun starts to shine it warms up (Climate in Valencia, 2019) .

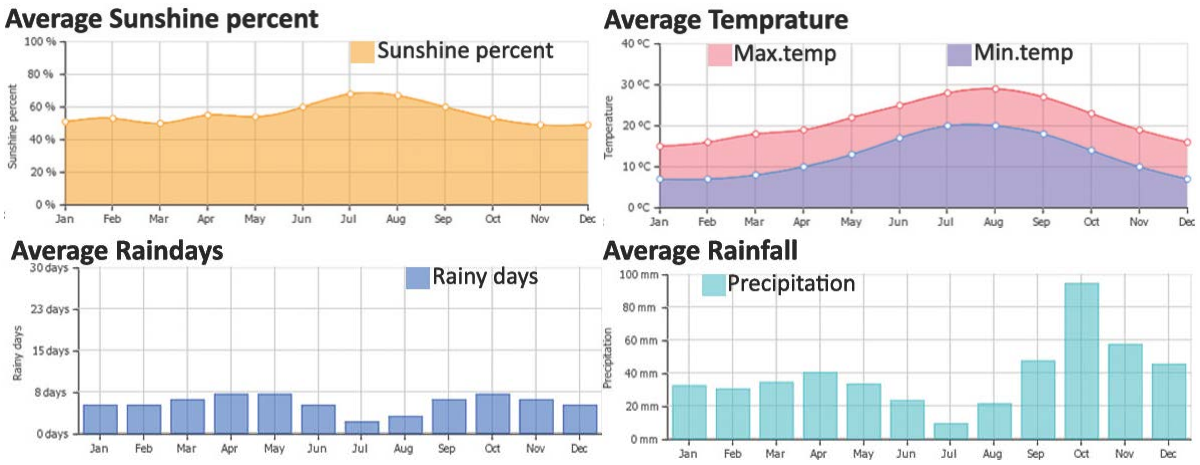

Fig. 5: Valencia's climate Source: https://weather-and-climate.com

6.3. *Problem*

Climate change is impacting urban areas in many ways from exacerbating the urban heat island effect to elevating flood risk. Similar to many European cities, Valencia started planning an adaptation plan. This plan focused on solving the major problems affect Valencia according to its location which were flooding from the river, coastal damage due to sea level rise and urban heat island effect in compacted built areas. Valencia's vision was to create a green infrastructure plan (L., 2013).

6.4. *Resilience Plan*

The plan is set out to improve and increase the open and green spaces in the city and, in parallel, conserve the existing spaces. The green infrastructure focuses on the main river corridors. Water is the main organizing factor. This strategy reinforces policies on conservation, re-use and management of water resources. It identifies the major water landscapes and integrates them into Green Infrastructure (Lets make green infrastructure the new normal, 2016). Figure 6 illustrates the main points in the plan and their use.

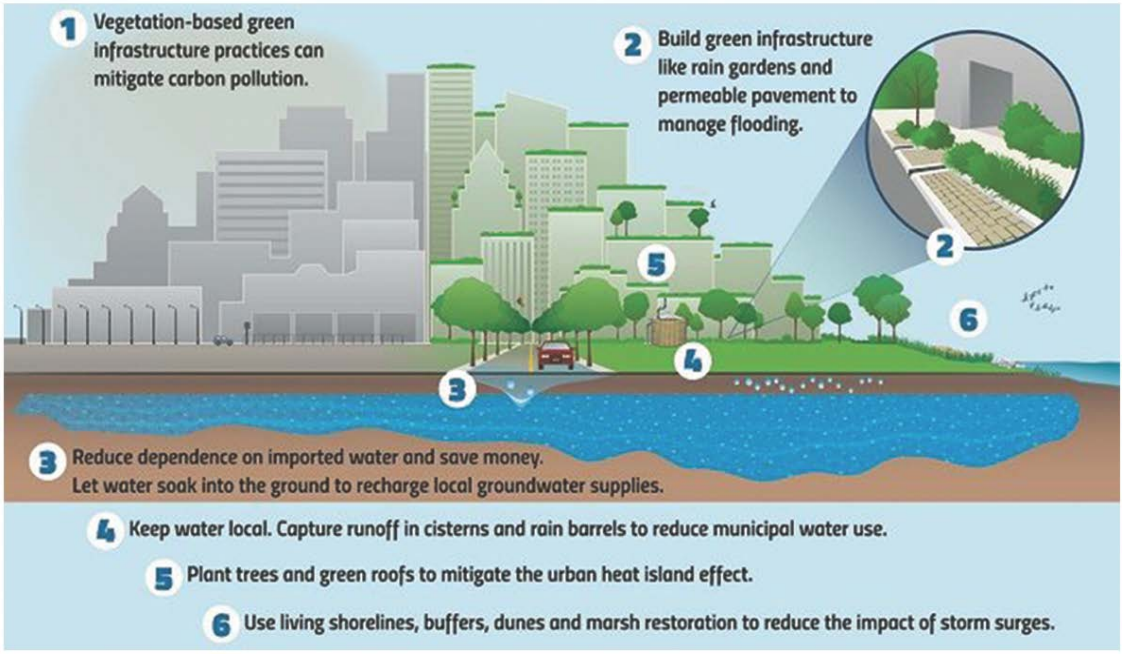

Fig. 6: Valencia's resilience plan Source: https://greeninfrastructureontario.org

The plan consisted of

- Low urban heat island effect: Studies show that green roofs reduce energy needed for cooling the floor below the roof by more than 50%
- Water management: By capturing rain water where it falls this could boast water supplies by up to 200 billion gallons per year
- Coastal resiliency: Wave heat could be reduced by 50% within the first 16 feet and 95% after 100 feet of marsh.
- Manage flood risk: Studies show reduction in runoff after the development of parks, gardens and other green spaces.
- Cooling trees: One young tree can produce cooling effect equivalent to ten room air conditioner working 20 hrs/day

The concept was designing an interconnected network of land composed of the following areas: sites of most relevant environmental, cultural, agricultural, and landscape values; the critical areas whose transformation involves environmental risks or costs to the community; and the network of ecological corridors and functional connections for linking all the mentioned areas (Stratigea A., 2017). Figure 7 illustrates the design concept while figure 8 illustrates the different scales of natural elements.

Fig. 7: Valencia's concept Source: Architectural research in Finland, Vol.1, no.1 (2017)

Fig. 8: Different scales Source: Green infrastructure planning at multiple levels of scale: Experiences from the Autonomous Region of Valencia, Spain paper

On a municipal scale the green infrastructure creates green corridors around town centers, prevents urban sprawl and helps preserve urban density (Stratigea A., 2017). Figure 9 is a map of Valencia in municipal scale to display the different green areas and water elements it includes while table 7 displays the area of each individually.

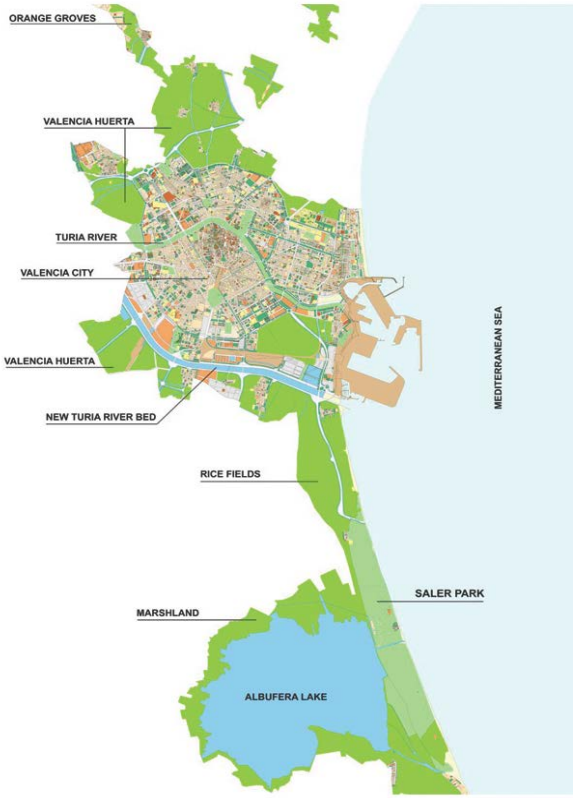

Fig. 9: Valencia's municipal scale Source: Journal of urban planning and development September 2011 issue

Table 7: Area of each land type Source Journal of urban planning and development September 2011 issue

Land type	Surface (hectares)
Urban land	3,632
Developable land	815
Nondevelopable land	
Parque del Saler	713
Albufera lake and marshland	2,843
Rice fields	1,400
Coastline area	71
Turia riverbed	226
Huerta market garden	3,382
Unirrigated land	112
Amenities and infrastructures	269
Total	13,465

At the urban and project scale, it creates a Green Infrastructure that connects urban public spaces, including squares, parks and streets, with surrounding landscapes. It demonstrates how the interaction of different spaces has an impact on the formal expression and design of cities as well as how they are lived in and sensed (Stratigea A., 2017).

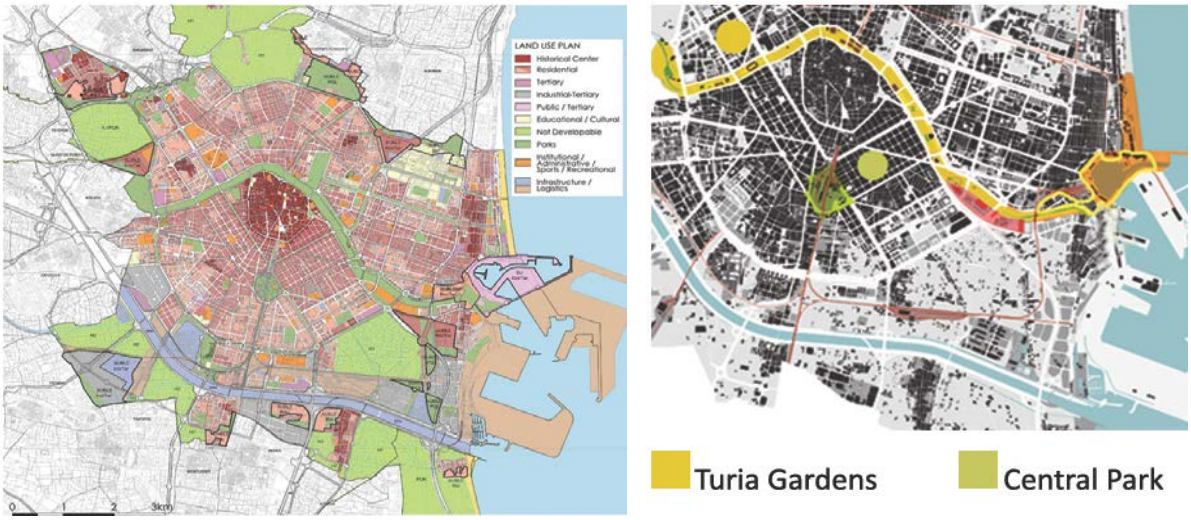

Fig. 10: Valencia's green areas in urban scale Source: A project for Valencia paper by Domantas Stukas

In 1957, Valencia experienced a devastating flood. Nearly three quarters of the city was inundated by floodwater from Turia river. This led to the plan of diverting the river around its western outskirts to the Mediterranean Sea as a flood management plan creating a long green spine for Valencia (Stratigea A., 2017). Figure 11 is the master plan of turai river, it shows the link between the river and the sea. The river was a major asset in the resilience plan.

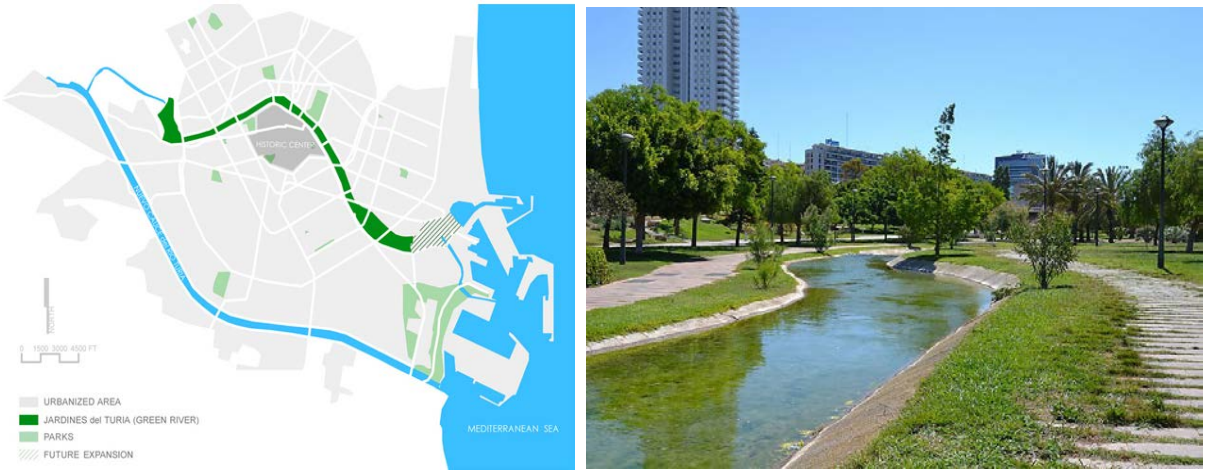

Fig. 11: Turai river master plan Source: https://scenariojournal.com

According to the new infrastructure plan, parks are developed to increase the percentage of green areas and thus increase their beneficial effects which are cooling and water management. Figure 12 is the master plan of the largest park in Valencia which is central park. Many plans and developments were made in the park and it was used as a main element in the resilience plan.

Fig. 12: Central park master plan Source: https://worldlandscapearchitect.com

Adding vegetation to the streets was a strategy that offered a great solution to increasing the amount of green spaces in the compacted city, such as:

- Green Buffer to obstruct noise and provide privacy
- Canopy trees for shading and acting as a cooling agent
- Bio swales and planters for collecting rain water and its reuse
- Creating pocket gardens to act as a breathing outlet in crowded urban areas

6.5. *Valencia's plan conclusion*

The resilience plan mostly depended on increasing green spaces in the form of blue green infrastructure plan to solve the many problems created by climate change from floods and sea level rise to heat island effect. It was done on different scales whether parks, gardens or as simple as adding trees to the streets.

7. Analytical examples of Mediterranean cities: Thessaloniki

7.1. *Location*

Thessaloniki is a city in Greece which is located in Europe. It lies on the coast of the Mediterranean.

Fig. 13: Thessaloniki's location Source: GeoProcessing 2012 conference paper

7.2. *Climate:*

Its climate is directly affected by the sea it is situated on. The city lies in a transitional climatic zone, so its climate displays characteristics of several climates. It has a humid subtropical climate that borders on a Mediterranean climate, as well as a semi-arid climate, observed on the periphery of the region (Rate this climate Thessaloniki, Greece, 2019).

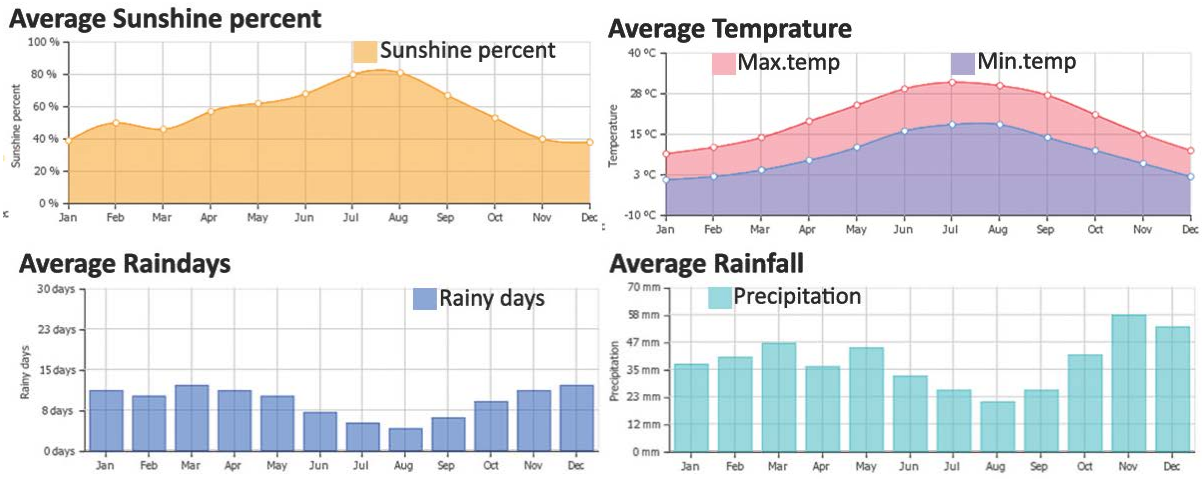

Fig. 14: Thessaloniki's climate Source: https://weather-and-climate.com

7.3. *Problem*

Thessaloniki is also exposed to some major natural hazards and shocks due to the climate change phenomena such as earthquakes, urban floods and forest fires, as well as extreme changes in temperature that interrupt city services and business continuity, like snow, subzero temperatures, floods and heat waves (News/ Can nature help reduce the impacts of climate change?, 2019).

7.4. *Resilience plan*

To address environmental impacts on the city more open spaces will be developed and a green infrastructure will be implemented. Which includes permeable surfaces, rain gardens, green walls to manage storm water and mitigate the heat island effect. Also, low cost solutions such as urban agriculture in inner courtyards and on private balconies and rooftops. Nature based-solutions will help harness the power of nature to turn environmental, social and economic challenges into opportunities. The plan mostly consisted of measures on the urban and building scales (Filoso, 2013). As shown in figure 15.

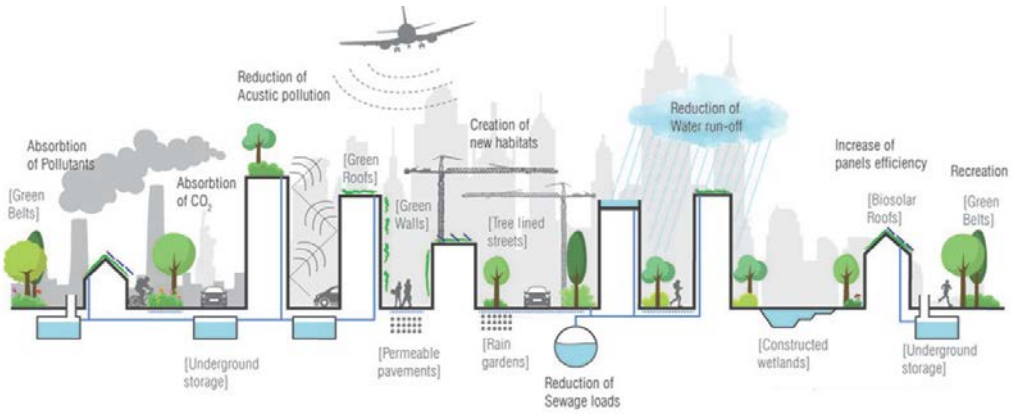

Fig. 15: Thessaloniki Resilience plan part 1 Source: Green infrastructure toolkit

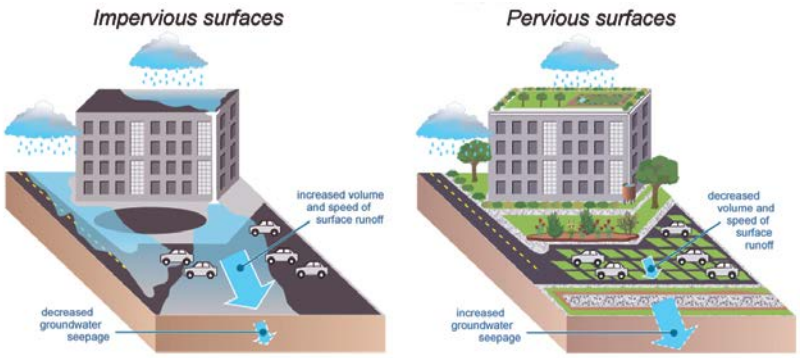

Fig. 16: Thessaloniki Resilience plan part 2 Source: Green infrastructure toolkit

Impervious hard surfaces such as roofs, roads, large areas of pavement and asphalt parking lots increase the volume and speed of storm water runoff. This swift surge of water erodes streambeds, reduces groundwater infiltration and delivers many pollutants and sediment to downstream waters. While previous soft surfaces green roofs, rain gardens, grass paver parking lots and infiltration trenches decrease volume and speed of storm water runoff. The slowed water seeps into the ground recharges the water table and filters out many pollutants and sediment before they arrive in downstream waters (Filoso, 2013).

The concept is to create small patches of green spaces such as pocket parks and connect them with a large open space an existing park or garden through green corridors which are the streets whether pedestrian or shared street. The city did not increase the number of regional parks only added vegetation and greenery to existing landscape (Filoso, 2013).

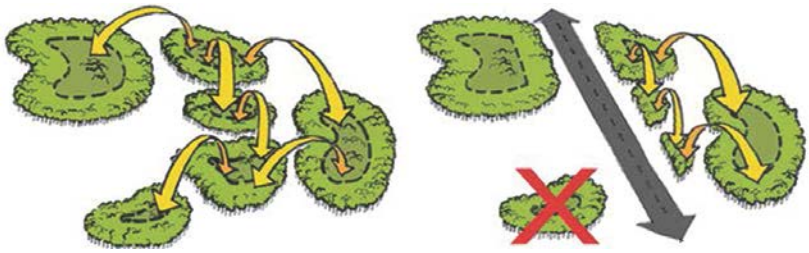

Fig. 17: Thessaloniki's resilience concept Source: Green infrastructure toolkit

One of the measures was creating new natural landscape through a sidewalk bio swale network to collect storm water within the built environment. This will contribute to the reduction of heat risks and carbon emissions in the city. The creation of green routes linking places will enhance the spatial quality of the city while increasing the local sense of identity and increasing the attractiveness of cultural heritage sites (Kabisch N., 2017).

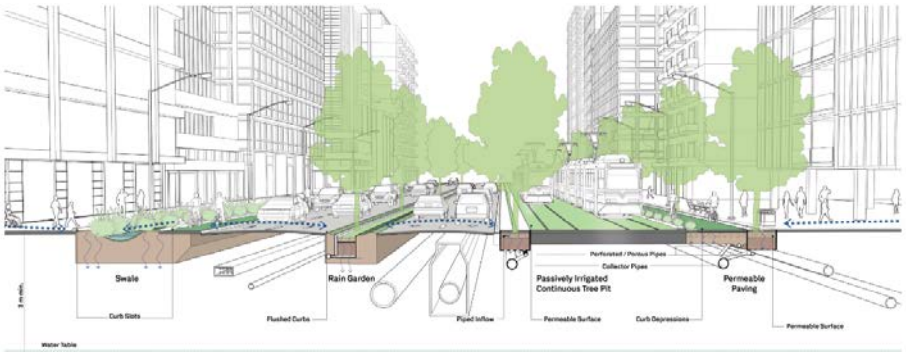

Fig. 18: Bio swales Source: https://www.natureworkseverywhere.org

Also, creating pocket gardens to act as breathing pockets and areas for socializing in compacted urban areas. These gardens are created in empty spaces found in the city such as alley, spaces between apartment buildings and vacant corners (Kabisch N., 2017).

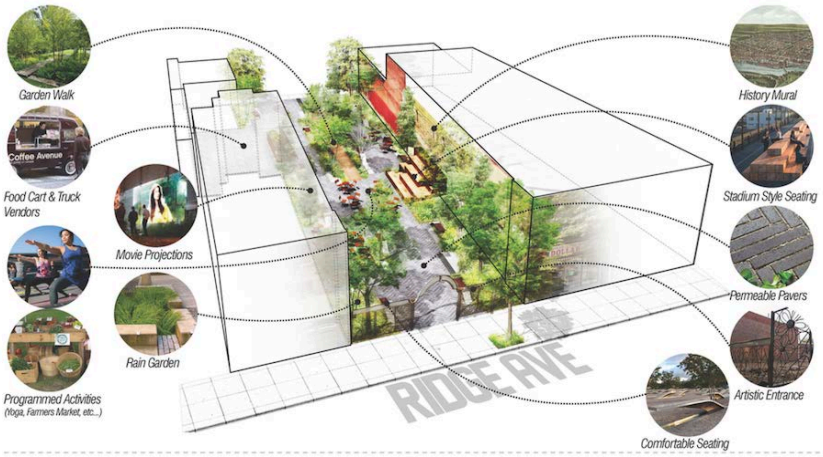

Fig.19: Pocket garden Source: https://www.phillyvoice.com

Coastal wetlands against sea level rise. They have many benefits such as improving water quality by filtering nutrients and sediments, protecting against erosion during periods of high water and providing habitat for many species of fish, birds and wildlife. Also, they offer recreational opportunities such as bird watching and hiking (Abhas K. Jha, 2013).

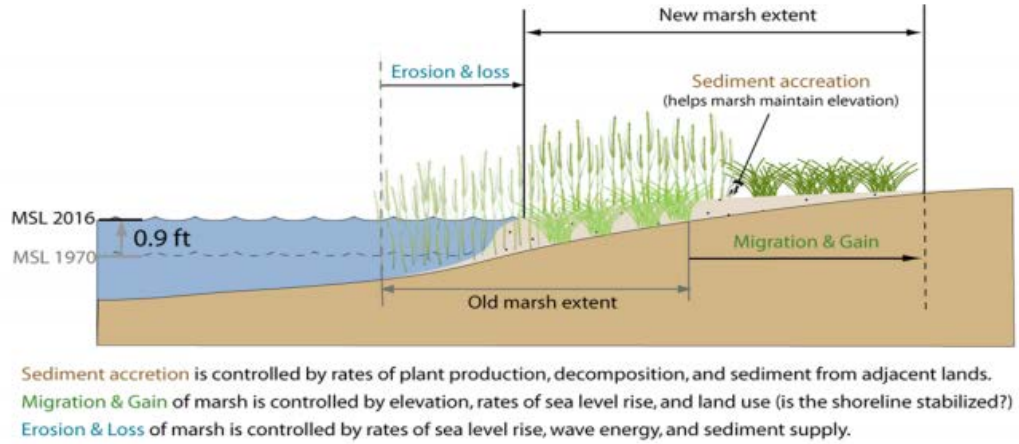

Fig. 20: Coastal wetlands Source: W&M ScholarWorks journal report Summer 2016

Canopy trees are used to add vegetation to different areas. Shade trees can be planted around buildings, providing shade to keep buildings and surrounding areas such as carparks and pavements cooler as well as increasing the scenic amenity. Trees help in climate adaptation as it purifies the air from carbon dioxide which causes climate change, help in shading and thus cooling, intercepts rain water and helps in its harvesting. All these factors make vegetation especially trees a very important element in the resilience plan (Abhas K. Jha, 2013).

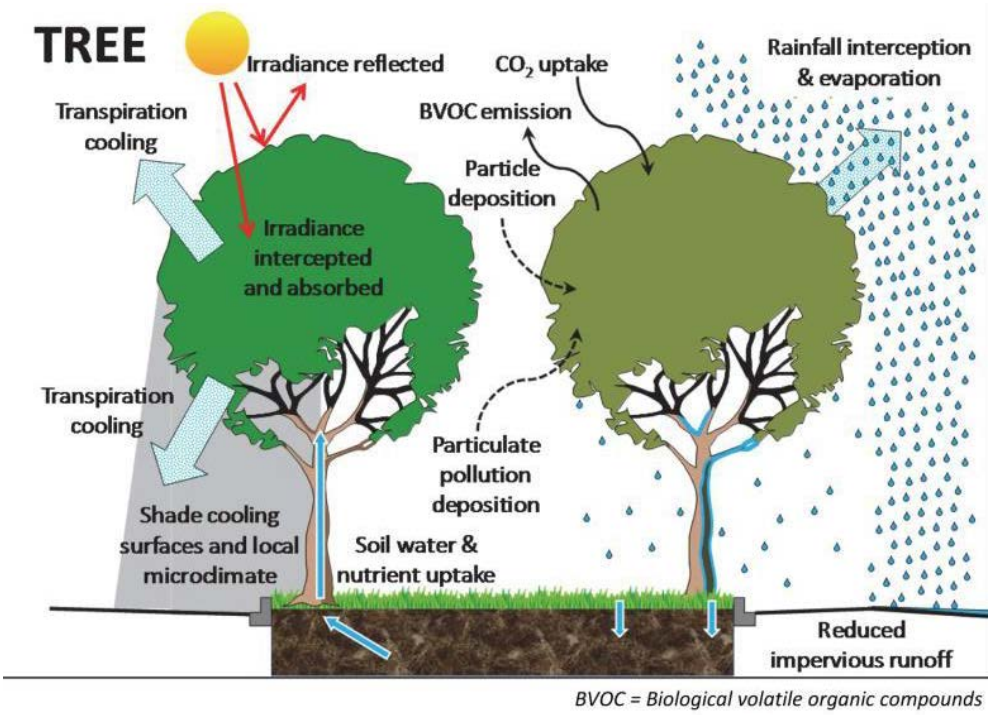

Fig. 21: Canopy trees Source: Understanding the value of Southampton's urban trees paper by Emma Mutch

All these measures were made on the urban scale to highlight the importance of vegetation and the flexibility with which it could be included. However, some of the measures were also on the building scale such as installing green roofs and green walls on buildings. These will be designed to retain rainwater and reduce rainwater runoff. The vegetation in these systems will help to filter heavy metals out of rainwater (Boemi, 2016).

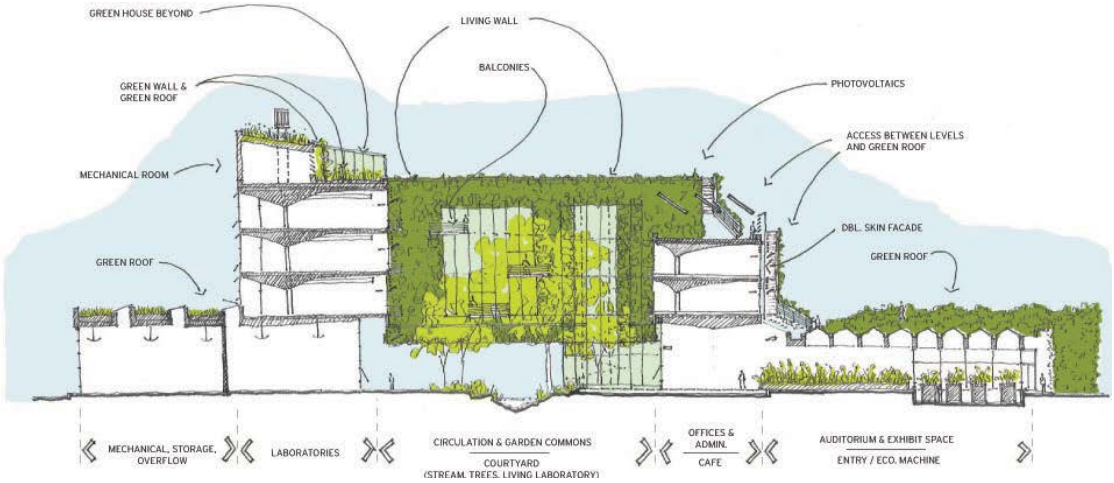

Fig. 22: Building scale vegetation Source: https://ugaecolivinglab.wordpress.com

7.5. *Thessaloniki's plan conclusion:*

The resilience plan mostly focused on increasing greenery in the urban and building scale rather than considering changes in the municipal scale. This plan's blue green infrastructure concentrated on the development of existing green elements and the addition of vegetation in the streets, on top of buildings, at the coasts and as pocket parks to help with its climate resilience plan.

8. Evaluation criteria

By comparing between the previously analyzed examples using the formulated criteria, the best adaptation plan for the case study could be determined. Table 7 illustrates the comparison between Valencia and Thessaloniki.

Key:

• Included	o Semi included	Unincluded

Table 7: Comparison Source: by researcher

Design criteria	Valencia	Thessaloniki
Principles		
Connectivity	o	•
Multiscale	o	o
Multi functionality	o	•
Integration	o	•
Accessibility	o	•
Green Elements in different scales		
Building scale		
Green roof		•
Green wall		•
Block scale		
Green courtyards		
Clustered housing around greenery	o	•
Backyards		
Street scale		
Green streets	o	•
Sidewalk gardens	o	•
Urban trees and vegetated swales	o	•
Edible landscaping		
Neighbourhood scale		
Neighbourhood parks	o	
Pocket parks	o	o
Ecology parks		
City scale		
Urban parks and forests	o	
Linear green spaces (Green corridors)	o	
City farms and urban agriculture		
Urban water ways and water bodies	o	
Climate change adaptation		
Regulating temperature	o	o
Flood mitigation	o	
Sea level rise defense	o	o
Reduce carbon dioxide in air	o	o
Rainwater management	o	o

From the previous comparison it could be observed that both examples were successful in applying the principles of a blue green infrastructure. However, Valencia planned it on different scales without considering the building scale while Thessaloniki focused only on the building and street scale without making changes in larger scales. The different approaches led to different results which led to the overall conclusion that Valencia was more successful in covering the points of the criteria and thus its approach should be considered in proposing the strategies for the adaptation of Alexandria but with some improvements to obtain additional benefits.

9. Case study: Mediterranean city Alexandria

From the previous comparison it could be observed that both examples were successful in applying the principles of a blue green infrastructure. However, Valencia planned it on different scales without considering the building scale while Thessaloniki focused only on the building and street scale without making changes in larger scales. The different approaches led to different results which led to the overall conclusion that Valencia was more successful in covering the points of the criteria and thus its approach should be considered in proposing the strategies for the adaptation of Alexandria but with some improvements to obtain additional benefits.

9.1. *Location*

Alexandria is a city in Egypt. It is located on the coast of the Mediterranean which makes it a Mediterranean coastal city.

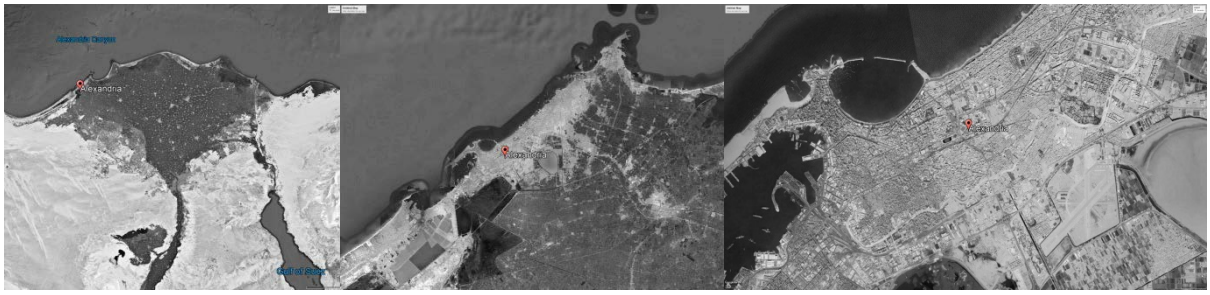

Fig. 23: Alexandria map Source: Google maps

9.2. *Climate*

Alexandria has a hot desert climate approaching a hot semi-arid climate. The city's climate is influenced by the Mediterranean Sea, moderating its temperatures, causing variable rainy winters and moderately hot summers that, at times, can be very humid (Alexandria, 2019).

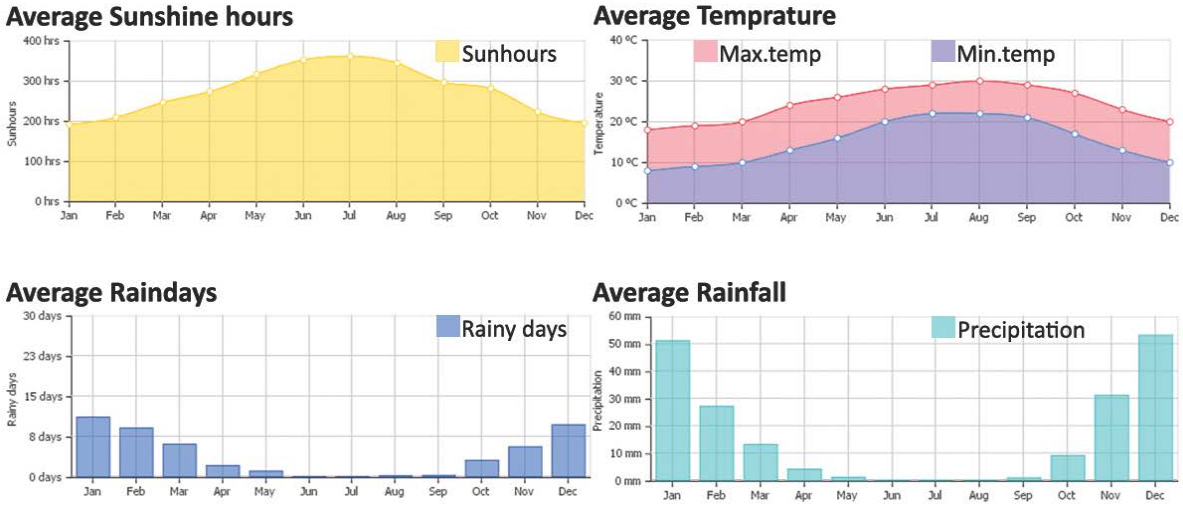

Fig. 24: Alexandria climate Source: https://weather-and-climate.com

9.3. *Blue Green infrastructure elements analysis*

There are various blue green elements in Alexandria

Key:

1. El Montazah Gardens
2. Alexandria sporting club
3. Smouha Club
4. El Nozha gardens and zoo
5. El Shalalat gardens
6. Alexandria stadium
7. Lake Mariout
8. Mediterranean sea
9. El Mahmoudia canal

Fig. 25: Alexandria map Source: modified by researcher

Green elements:

- Open spaces such as Alexandria zoo, El Montazah gardens, El Nozha garden and Antoniades gardens but they are neglected and in need of maintenance

Antoniadis Gardens

El Montazah Gardens

Shalalat Garden

Nozha Gardens

- Public squares contain landscape but they also need maintenance and repair. The landscape of some squares was neglected greatly that it vanished and only sand remains. Some of Alexandria's squares are Mansheya square, Ahmed Orabi square, Saad Zaghloul square, Shalalat square, Victor Ennannuel square and Saint Catherine square.

Victor Emmanuel square

Saad Zaghloul square

- Social clubs have landscape and playgrounds within them such as Smouha club and Alexandria sporting club

Smooha club

Alexandria sporting club

- Some college campuses contain landscape such as Pharos university and AAST Abu Qir campus

AAST Abu Qir campus

Pharos university campus

- Canopy trees and planters in a few streets.
- The concept of the pocket parks is not established in the city.
- There are little to no green walls or green roofs but there are garden terraces in some apartments made by their inhabitants.
- Yards of single family houses in a few neighborhoods such as kafr abdo increase the amount of green spaces in the city.

Blue elements:

- Lake Mariout covers 50 km^2 , it used to cover 200 km^2
- El Mahoudia canal is 45 mile long, it connects the Nile with the Mediterranean sea. It passes through all of Alexandria. Redevelopment in it is ongoing in 2019.
- Mediterranean sea coast
- There are some water elements and fountains added to plazas and open spaces.

Sea coast

Lake Mariout

El Mahmoudia canal

Fountain

10. Conclusion

Key:

• Included	o Semi included	Unincluded

Table 8: Alexandria by researcher

Design criteria	Points
Principles	
Connectivity	
Multiscale	
Multi functionality	
Integration	
Accessibility	
Green Elements in different scales	
Building scale	
Green roof	
Green wall	
Block scale	
Green courtyards	o
Clustered housing around greenery	
Backyards	o
Street scale	
Green streets	o
Sidewalk gardens	o
Urban trees and vegetated swales	o
Edible landscaping	
Neighbourhood scale	
Neighbourhood parks	
Pocket parks	
Ecology parks	
City scale	
Urban parks and forests	o
Linear green spaces (Green corridors)	
City farms and urban agriculture	
Urban water ways and water bodies	o
Climate change adaptation	
Regulating temperature	o
Flood mitigation	
Sea level rise defense	
Reduce carbon dioxide in air	o
Rainwater management	

From the analysis of the case study using the criteria it is obvious that Alexandria lacks many essential elements to have a blue green infrastructure. Although it has assets but they are not properly used or maintained. Efforts must be made to insure Alexandria's resiliency to be able to overcome and withstand climate change and natural disasters

11. Recommendations

A blue green infrastructure network should be planned by utilizing the existing elements and connecting between them. Also, adding new elements could be as simple as trees in streets and green roofs/ green walls on buildings or as complicated as making changes to the urban fabric and creating new green spaces. Figure 26 indicates the blue green network with its specific elements on Alexandria's map showing the possibility of the application of the elements according to the needs of each zone in Alexandria.

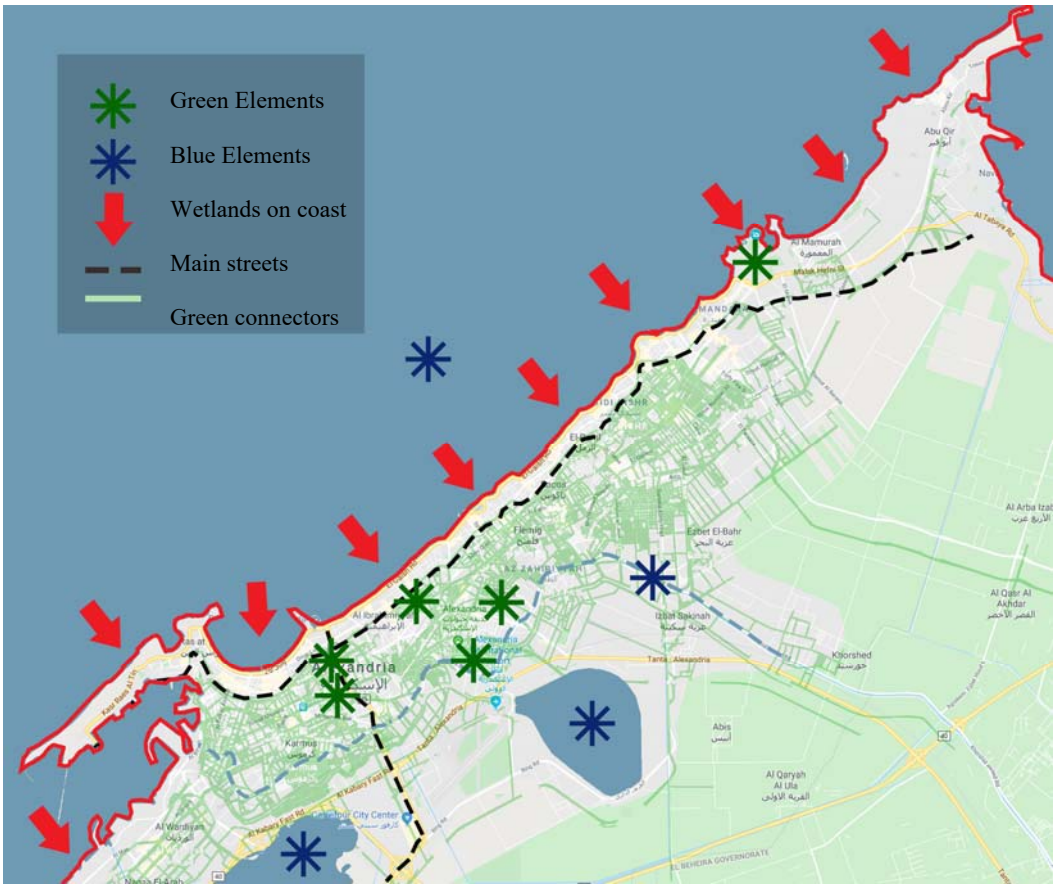

Fig. 26: Alexandria's recommendations map Source: modified by researcher

- Increase awareness about the climate change problem, the importance of an adaptation plan and the role of the blue green infrastructure.
- The use of wetlands to protect the coast from floods which is a result of climate change

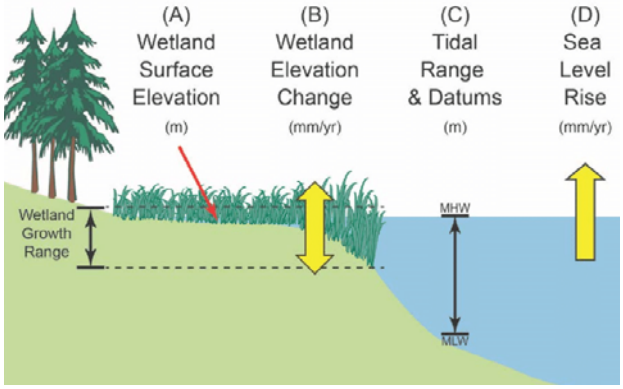

Fig. 27: Wetlands for coastal areas Source: modified by researcher

- Increase the amount of open spaces and parks by including them in the city's development plans

- Maintenance and repair of existing blue green infrastructure elements such as Antoniadis gardens, El shalalat, El Montazah, ElMahmoudia canal and lake Mariout. Figure 23 shows an example of the maintenance and repair that could be done to neglected open spaces by using Antoniadis Garden as an example

Fig. 28: Antoniadis Garden before and after repair Source: By researcher

- Creating pocket parks in alleys within crowded areas and parklets to increase the amount of green infrastructure elements without disrupting the urban fabric

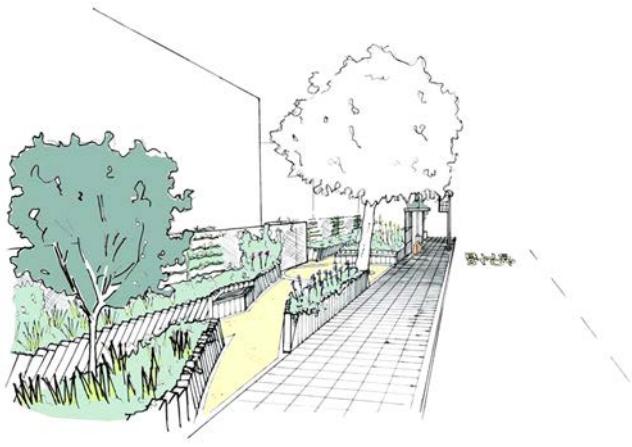

Fig. 28: Pocket parks between buildings Source: https://www.cladglobal.com

Fig. 29: Parklet Source: https://nacto.org

- Creating a network of green spaces by connecting existing open spaces with green corridors of trees which provide shade and cool the streets.

- The use of bio swales and permeable pavements in street design to absorb runoff

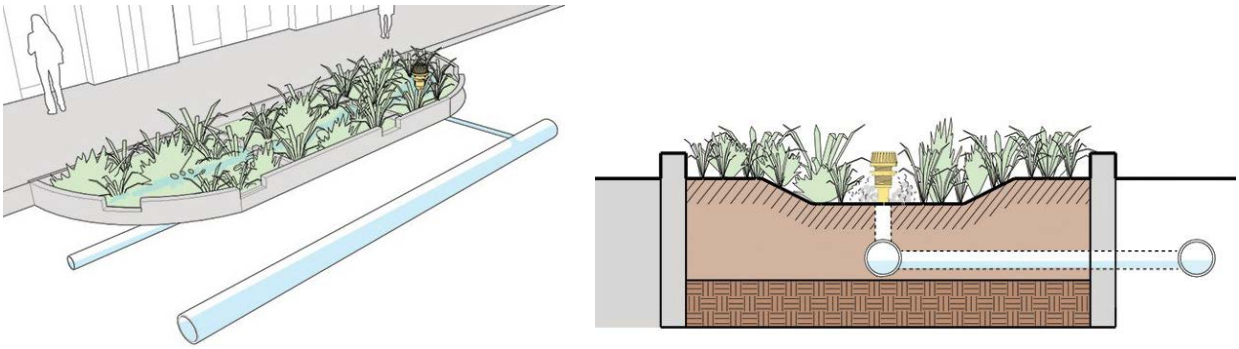

Fig. 29: Bioswales Source: https://nacto.org

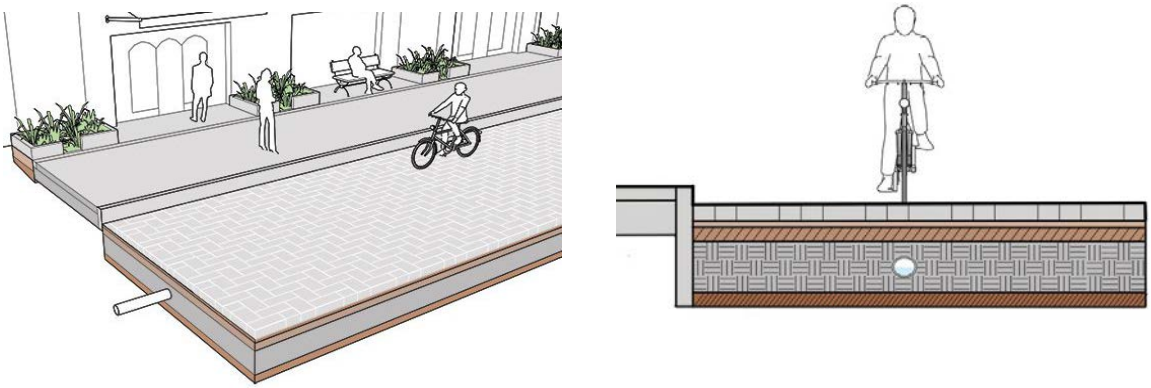

Fig. 30: Permeable pavement Source: https://nacto.org

- The use of green roofs and green walls on existing buildings to increase the amount of greenery in areas where new parks or gardens cannot be developed to save rainwater and aid in cooling

Fig. 31: Addition of green elements on buildings Source: https://www.dreamstime.com

- The utilization of private green spaces to the benefit of the public and include them within the infrastructure network and systems.

By applying these recommendations a blue green infrastructure will be created that follows the main design principles. Connectivity is achieved by connecting the open spaces with green corridors. It is multiscale by adding elements of the green infrastructure to the building, streets, block and city. Also, it is multifunctional as it helps with flood management, rainwater

management, regulating temperature and decreasing carbon dioxide in the air. Finally, the infrastructure is accessible as a major part of it depends on public green spaces and canopy trees in the streets.

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"Impact of Integrating Intelligent Photovoltaic Skin Facade on Daylighting Performance in Lecture Halls"

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Abstract:
Proper lighting is a crucial factor in the overall success of a lecture hall of all educational facilities. It is important to state that daylighting harvesting in indoor spaces has a specific effect on the global energy performance of a building in terms of heating and cooling loads. Meanwhile, Sun –Tracking systems or as it called daylighting tracking systems are technique to both reduce excess daylight at the building perimeter and increase daylight availability in deeper zones of building indoors. This paper investigates the effect of integrating IPSF (Intelligent Photovoltaic Skin Façade) as tracking system as well as intelligent tracking facade on daylighting performance in lecture hall. The main goal of this research is to achieve efficient design of intelligent PV modules and to identify it's parameters to improve the efficient of daylighting performance in lecture hall. The research conducted to a typical lecture hall space in Cairo, Egypt. The simulation focuses on the evaluation of the visual performance conditions in terms of illuminance and luminance distributions in lecture hall by using the climate data of Cairo city , Egypt, where the climate is desert clear sky. The simulation process of a mockup model generated by Rhino and Grasshopper plug-in and by using Diva-for-Rhino a plug-in used to interface Radiance and Daysim was used for calculating the annual Daylight Availability of the space. Results showed that performance of IPSF are related to its position, depth and rotation angle. Also, it showed that the daylighting performance could be significantly enhanced; the daylit area can reach more than 79% of the space in the case of PV skin façade.

Keywords: Building-integrated photovoltaics, Intelligent skin, Daylighting performance, Shading devices, .Sun-tracking systems

1. Introduction

Daylighting can be highly beneficial, bringing potential environmental, economic, and health benefits, in addition to an array of interpretive, aesthetic, and programmatic possibilities. These qualities make daylighting a crucial dimension in the development of sustainable strategies for interior environments (Lawrence, 2013). Daylighting, however, can cause visual discomfort like glare and unwanted reflections, and affect the thermal balance of rooms through overheating. In desert locations that are endowed with abundance of clear skies the uncontrolled daylighting could result in the incidence of uncomfortable glare and overheating of spaces due the admittance of direct solar radiation. On the other hand, envelope solutions of contemporary educational spaces in Egypt such as lecture halls follow the international style with large glass curtain walls, disregarding the climate and shading treatments, which results in high levels of direct sunlight transmittance and occurring glare phenomena and high solar thermal gains or significant thermal loss at night or in cold climate (Peng J, 2013) Daylighting systems divided into two systems: sun tracking systems and adjustment systems. Sun tracking system is based on a solar collector,

designed to collect the sun's rays and convert it into different shape of energy either electrical power or thermal energy. Photovoltaic cell is one of sun tracking system. The Adjustment systems, also called daylighting control or automatic daylight system depends on how to control the shading device according to the sun position by using a ceiling, wall as solar shading, protection from glare, redirection of daylight. This system could be fixed, dynamic and automated. All of these systems have been assessed for their capability to increase daylight penetration into the deep spaces. Building Integrated Photovoltaic (BIPV) is an application where solar PV modules are integrated into the building structures. Recent researches showed the installation by using the PV modules as part of the building materials other than to be installed on top of existing structures. Also, could be used as building elements (facades, roofs, walls, glass), and as non-building elements (sunscreen, sunshade) as shown in figure (1).

Figure SEQ Figure * ARABIC 1 Intelligent façade of automated wood louvers with building integrated photovoltaics create a continuous façade for TU Darmstadt's 2007 Solar Decathlon House**.**

Many recent research results have demonstrated that integrated PV modules can also attain efficiencies similar to the traditional modules. Also, researches showed that there is a wide usage of thin-film PV modules according to it's structure's lightweight that allows it to consider their integration into the building envelope (Nagy, et al., 2016). (Tashakori, 2014) focused on protecting the interiors from sun heat through automated shading device as a second layer capturing solar energy to supply the energy required for the automation through the concept of sun-tracking building envelope. Another research by (Nagy, et al., 2016) focused on the concept of Adaptive Solar Façade (ASF) as a highly integrated dynamic façade. Also, (ASF) improves the concept of dynamic facades; multifunctional module can provide shading, electricity generation and daylight distribution. The (ASF) consisted of the second generation of flexible thin film modules of PV-embedded textile as a shading system consisting of movable stripes that can perform two-axis solar tracking. Each module of the ASF 400 X 400 mm panels can exist in a fully open (90°), fully closed (0°) and slanted (45°) on horizontal axis. It was found that the use of ASF had a significant effect on total energy savings of 25% compared to the base case without shading device. The study carried by (Jeong, et al., 2017) examined the Smart Photovoltaic System Blind (SPSB) façade used as tracking and monitoring system. The integration between tracking (PV) and monitoring (blind) helps to evaluate the optimal tilted and azimuth angle that maximizes the electricity generation and affects the environmental conditions such as temperature and humidity. The third prototype gives the best result in electricity generation with almost 25% in energy savings and reduce the indoor cooling demand as it the main function of the blind. It became apparent that most of the related previous research has shown that there is a problem with energy and its increasing consumption without taking into account the daylighting performance of these systems. Integrating PV (photovoltaics) as shading systems opens new opportunities for improving building energy performance and occupant comfort by controlling glare, natural

lighting, and solar gain (Johannes Hofer, 2015). Many studies addressed the integration between PV modules as shading device and electricity generation without study its impact on daylighting performance and visual comfort.

2. Research Aim

The main goal of this research is to evaluate the visual performance conditions in terms of illuminance and luminance distributions in a lecture hall to improve the efficiency of daylighting performance in term of quality and quantity to achieve applicable sustainability guidelines and strategies for management of educational buildings.

3. Methodology

This paper studies the impact of a PV intelligent sun-tracking skin facade as an example of a combined passive and active solar façade system on daylighting performance in lecture hall in Egypt. In this part, five case studies are subjectively assumed that representing the integration between the intelligence in tracker systems. .The field study was conducted on four stages. The first stage collected information about case studies using PV skin façade and it's effect on daylighting performance. The second stage modeled the mock up model and developed its parameters and geometries. The third stage simulated daylighting performance of the proposed façade and with and without PV skin. To better examine the performance of the PV facade as sun-tracking systems, a digital mock-up of the simulated façade system module is visualized. The fourth stage evaluating and analyzing the simulation process's results to reach the most effective smart system for educational buildings.

3.1. Simulation Process

Simulation was conducted to a lecture hall in Egypt using the climatic data of Cairo , Egypt (30°6′N, 31°24′E, alt. 75 m). The simulation process evaluated the space in south orientation under clear sky conditions in hot arid climate of Cairo. The study carried out into two phases, the first phase simulate the impact of intelligent PV skin externally attached in front of its window to south façade and it's performance on year round using Daylight Availability Metric as shown in table 1. The second phase checks the glare probabilities of the first phase inside the lecture hall for more visual comfort. The south oriented lecture hall was selected for this study with no external obstruction. A typical lecture hall layout is daylight-illuminated from one side totally glazed facade, located on the ground floor with spatial dimensions 15 m in length, 13 m in width and 5.30 m in height as illustrated in figure (2 and 3). Ground reflectance of 20% was assumed. A digital model of the lecture hall space is constructed using Rhino. Also, this research studied the sun path of each phase and the daily rotation of the earth around its axis were investigated. (Sabry, et al., 2012) showed that the solar radiation of any fixed point will be fully shaded if the sun is higher than the path, and will be exposed if it was lower. Twelve solar paths were considered, each corresponds to the 21st day of each month of the year.

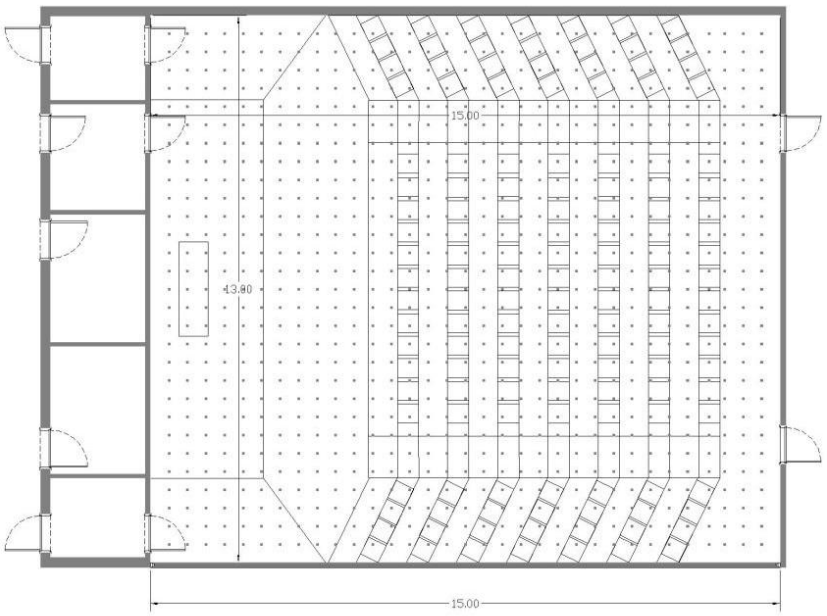


Figure SEQ Figure * ARABIC 2 Architectural design of the "Base Case" lecture hall plan.

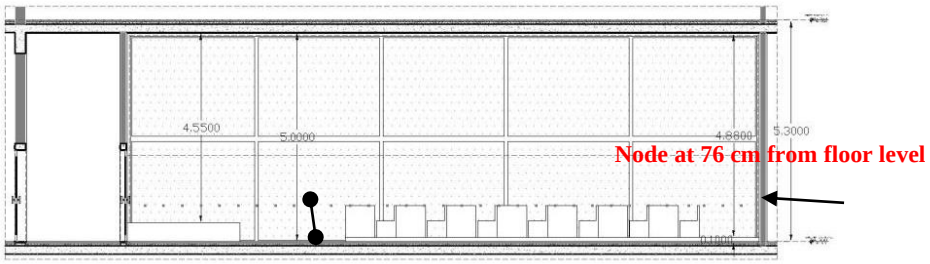


Figure SEQ Figure * ARABIC 3 Architectural design data of the "Base Case" lecture hall section.

3.2. Intelligent PV skin parameters

The outer PV skin is envisioned as a repetition of 4 cm thick anodized aluminum alloy framed the polycrystalline silicon PV module. The module of the façade consists of an intelligent PV skin. Each module is 140 x 110 cm. There are 32 modules as shown in figure (4), Each module tracks the sun movement during the daytime with a specific tilt and azimuth angle for each season varies from 25°, 30°, 40°,45° ,50° as shown in figure (5).

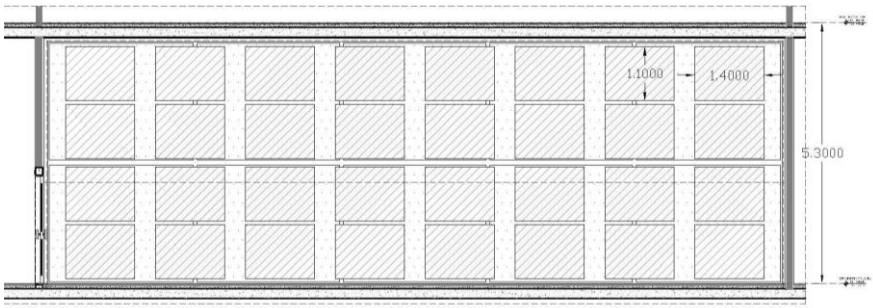


Figure SEQ Figure * ARABIC 4 Architectural facade of IPSF with dimensions.

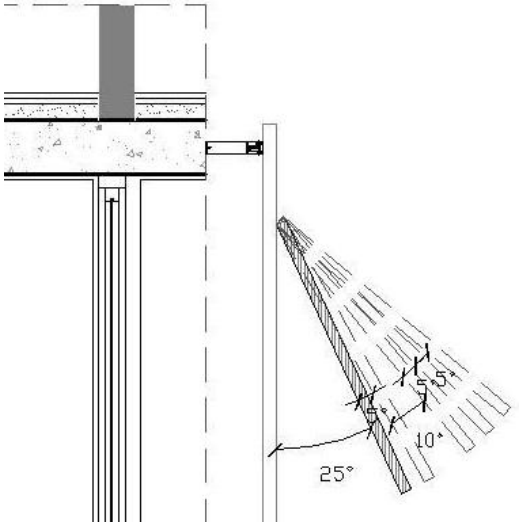


Figure SEQ Figure * ARABIC 5 Architectural section shows different rotation angles of IPSF.

The proposed intelligent system is using main element which is "PV module" with 0.3% reflectivity which means that only 0.3 % of incident light is reflected from the solar module's surface, while 99.7 % of incident light is absorbed by the module and is available for conversion into electrical energy. For this reason the system was chosen to track the sun all over the day for electricity generation and to protect the indoor from the sun light and the glare probability.

Table 1 Dimensions and materials of the tested "Base Case" lecture hall space.

Reading room Dimensions and Materials		
Floor level	Zero level	
Space dimensions (m)	13.00 * 15.00 * 5.30	
No. of Occupants	165 persons	
Floor	Material Reflectance	Wood 20%
Walls	Material Reflectance	Medium Colored Internal-walls (Off White) 50%
Ceiling	Material Reflectance	White painting 80%
Window Dimensions and Material		
Width (m)	15.00	
Lintel (m)	5.00	
Material	3.2 mm – tempered glass	
PV skin parameters		
Orientation	South-east	
Dimensions	Width	140 cm
	Height	110 cm
	Depth	4 cm
Rotation angle	Summer	Winter
	25°-30 °	40°-45°-50°
PV skin Reflectance	0.3 %	

3.3. Phase One: Daylight Availability

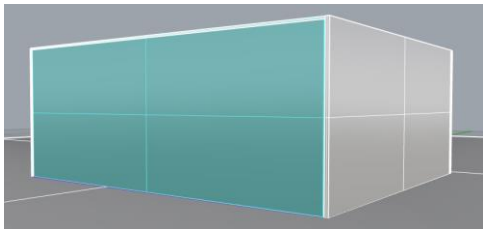
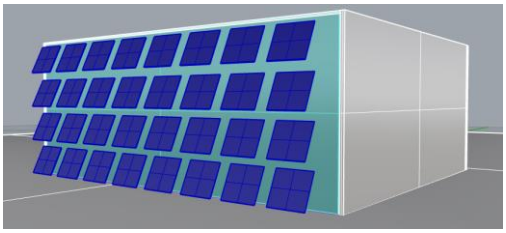
Parametric models were created using Grasshopper a plug-in for Rhinoceros modeling software. Simulations were conducted using Diva-for-Rhino (V.3.0.0.6) a plug-in for both Rhino and Grasshopper. Diva is used to interface Radiance and Daysim for annual simulation and illuminance computation. Annual daylighting simulations uses weather files to retrieve hourly solar radiation data for a specific location. Simulation was conducted using the IWEC weather file of Cairo. In this phase, a year round performance was calculated using Dynamic Daylight Performance Metrics (DDPMs) for five case studies. "Daylight Availability" was used in this paper to address the year round performance for each case. The year around represents the occupied hours during the day from 8 A.M to 6 P.M. Daylighting was simulated on a reference work plane. The reference plane was 76 cm high from the ground. Nodes on plane was taken that the spacing between them was 50 cm, as shown in figure (2 & 3). Recommended illuminance for the plane was 300-400 lux (LEEDv4 for schools). Daylight Availability was used to present three evaluation criteria:"Daylit" areas, which is the percentage of annual work hours during which all or part of a building's lighting needs can be met through daylighting alone Daylight Availability determines the illuminance level of occupied work plane that using amount of nodes. Daylight Availability has three criteria of measurements (Reinhart, 2011):

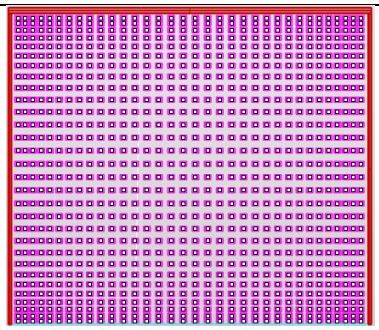
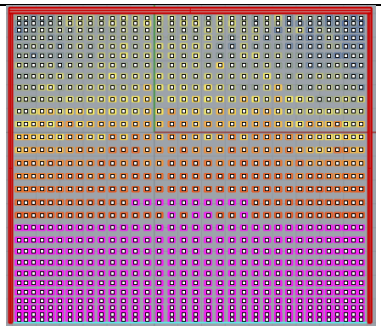
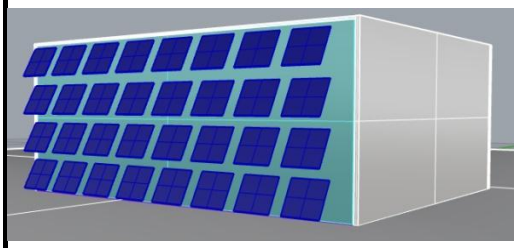
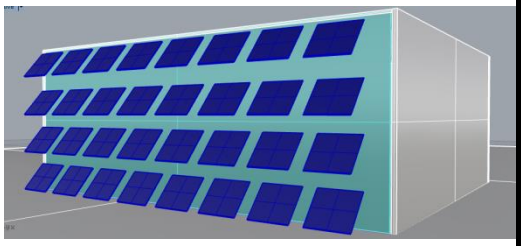
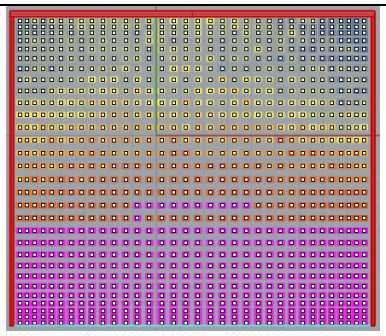
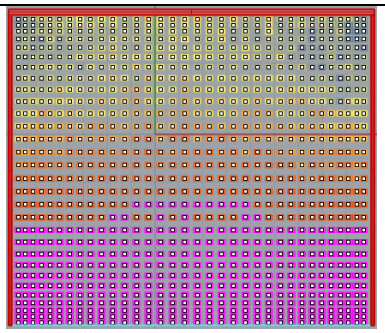
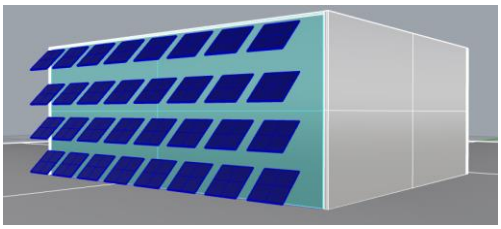
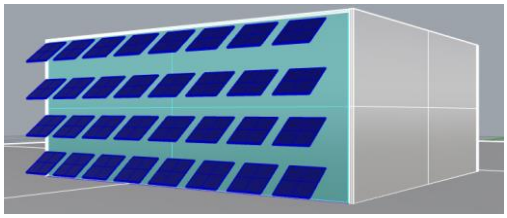
- "Overlit area" will be determined; dots having 10-times more than the determined lux (300-400 lux) in during at least 5% of the occupation time.
- "Partially lit" nodes having 0%–49% of the determined work time lux or more.
- "Daylit" are dots having between 50% and 100% are suitable and enough.

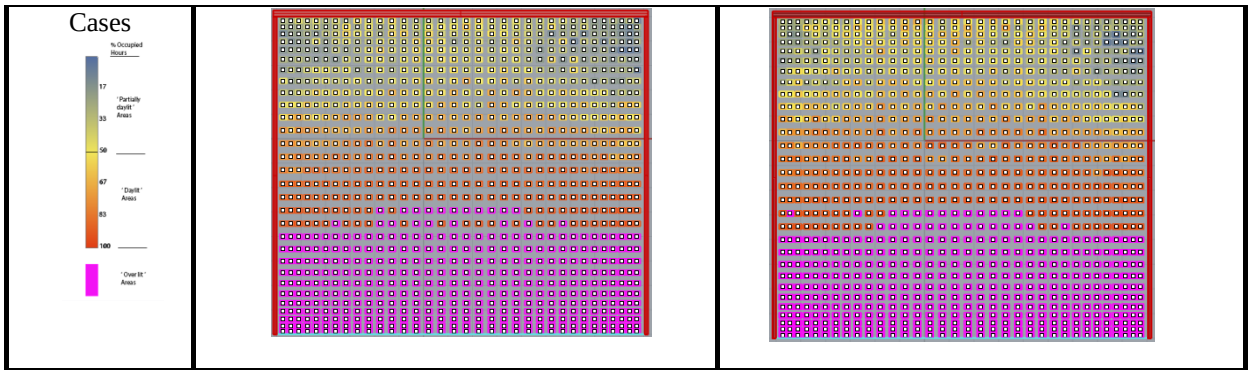
3.4. Results of phase one

At the base case the "overlit" was 100% of the space. While at case A,B,C,D and E the "overlit" area decreased. At case A the "daylit" area was too small only 25% and 39% of the space became "partiallylit" instead while, At case B the "daylit" area was 31% and the "partiallylit" area was 33%. Case C the "daylit" area was 35% and the "partiallylit" area was 29%. At case D the rotation angle was the most effective to balance between the three levels of illuminance that the "daylit" area was 36% and 27% was "partiallylit". At case E the "daylit" area was 40% and it was the highest of all cases and 23% was "partiallylit". These results are shown in table 2 and figure (6).

Table 2 Daylight availability analysis results on horizontal surface.

Cases	Base case (No PV Skin)			Case A (Rotation angle 25°)		
Daylighting Availability use by area percentage	**Overlit %**	**Daylit%**	**Partiallylit%**	**Overlit %**	**Daylit%**	**Partiallylit%**
	100%	-	-	**23%**	**66%**	**11%**
PV Skin Design						

Cases		
Cases	**Case B (Rotation angle 30°)**	**Case C (Rotation angle 40°)**
Daylighting Availability use by area percentage	**Overlit %** **23%** / **Daylit%** **67%** / **Partiallylit%** **10%**	**Overlit %** **21%** / **Daylit%** **71%** / **Partiallylit%** **8%**
PV Skin Design		
Cases		
Cases	Case D (Rotation angle 45°)	Case E (Rotation angle 50°)
Daylighting Availability use by area percentage	**Overlit %** **18%** / **Daylit%** **75%** / **Partiallylit%** **7%**	**Overlit %** **16%** / **Daylit%** **79%** / **Partiallylit%** **5%**
PV Skin Design		



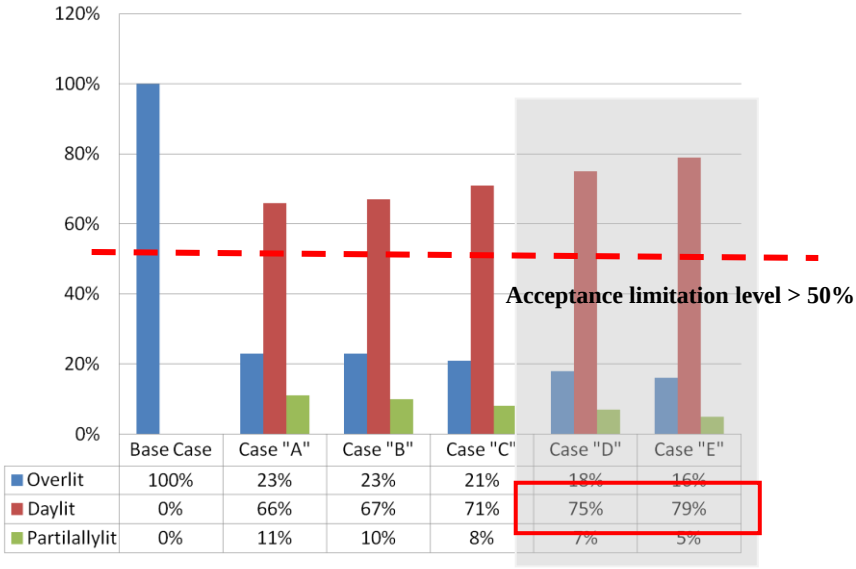


Figure SEQ Figure * ARABIC 6 Daylight availability distribution analysis for referance plane relative to space area percentage for PV skin tested in south façade.

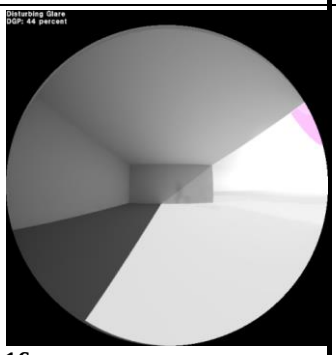
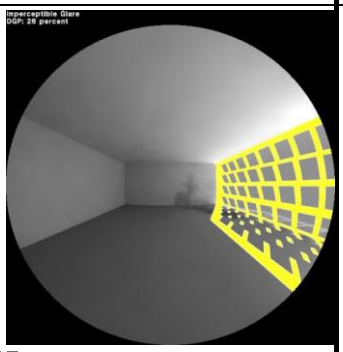
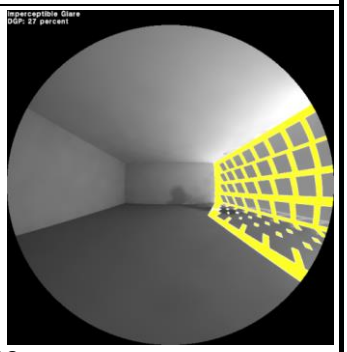
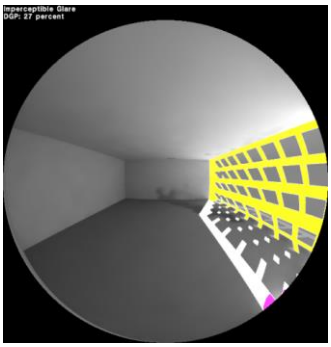
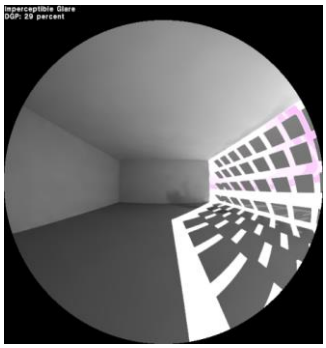
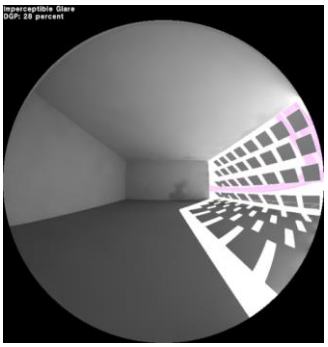
3.5. Phase Two: Daylight Glare Probabilities Analysis

In the second phase, the visual comfort and occurrence of glare phenomena was examined for the five cases. Daylight Glare Probability (DGP) was calculated for specific time as a sample in winter at 12 noon in 21th of March, June, September and December for these cases as it a south oriented facade. In this method, glare was divided into four categories: intolerable glare (DGP ≥ 45%), disturbing glare (45% > DGP ≥ 40%), perceptible glare (40% > DGP ≥ 35%), and imperceptible glare (DGP < 35%). Glare analysis was carried out by locating the fish-eye camera in one position. These were selected according to the expected furnishing of the lecture hall space and the place where glare phenomena was more likely to occur. The position was located at the end of the space beside the window. Glare analysis was performed on the five cases and a comparative study between the base case and these cases was carried out.

3.5.1. Results of Phase Two

In cases A,B C,D and E “imperceptible glare” has occurred from 24% to 29% according to the rotation angle of the PV skin that provided smooth daylighting distribution. While the same result for the base case which is “imperceptible glare”. This is illustrated in table 3.

Table 3 Daylight Glare Probability Distribution Analysis for Each Case in South Orientation.

1. Cases	2. Base case	3. Case A	4. Case B
5. Winter, 12:00 pm			
6. (DGP) 7. Glare Category	**8. 100%** **11.** Disturbing glare	**9. 24%** **12.** Imperceptible glare	**10. 26%** 13. Imperceptible glare
14. 15.	 **16.**	 **17.**	 18. 19.
20. Cases	**21. Case C**	**22. Case D**	**23. Case E**
24. Winter, 12:00 pm			
25. (DGP) Glare Category	**26. 27%** 29. Imperceptible glare	**27. 29%** 30. Imperceptible glare	**28. 28%** 31. Imperceptible glare
	 33.	 34.	 35.

3.5.2. Phase Three: Annual Daylight Glare Probabilities Analysis

This analysis was made to check the results of the fish eye point in time daylight glare analysis if it is the same at the whole year or at special occasions. Results in table 3 showed that for work plane the base case experienced imperceptible glare all over the year. For the other cases the lower rotation angle of the IPSF decreased the glare phenomena for all over the year except for some days which can be tolerated in that time.

4. Summary and Conclusion

The paper examined the impact of integrating PV modules as intelligent skin facade on the year round daylight performance inside a lecture hall, and the resultant glare phenomena probability. Five different designs of the tracking PV skin facade were simulated over one work plane, and compared with the base case without the skin. In addition, glare analysis was conducted for point at time for the cases to assure that no overexposure has occurred. Then an annual daylight glare analysis also conducted to assure that the point time glare analysis results is general for all over the year. Changing the rotation angle of the tracker designs started to decrease the “overlit” area in the space. IPSF with different rotation angle differ from 25°,30°,40°,45° and 50° , the rotation angle of 25°(case "A") produced small "daylit" area 66% of the space, while the

"partially daylit" area occupied only 11% of the space. In this case, although the "over lit" area 23% of the area, it produced an imperceptible glare, when checked using DGP. Another PV skin with rotation angle of 30° (case "B") with the “daylit” area was the 67% and the “partiallylit” area was 10% of the space. And a third case with rotation angle of 40° (case "C") produced “daylit” area 71% and 8% “partiallylit” area. The fourth case with rotation angle of 45°(case "D") was the more effective that the “daylit” area was 75% and the “partiallylit” area was 7% that cause some glare but it still imperceptible. The last case was the most effective over the previous cases with rotation angle of 50° (case "E") and “daylit” area of 79% and “partiallylit” area was “5%, but with imperceptible glare. The annual daylight glare analysis showed that the glare phenomena also existed in few days of the year for the five cases, also for the base case according to the glare phenomena that showed all over the year. However, Case "D" with rotation angle of 45° and "E" with rotation angle of 50° performed best results for daylighting availability on the work plane. On the other hand, case "A" with rotation angle of 25° performance was not the best that it produced the lowest percentage of “overlit” area as shown in figure (7 & 8). It became possible to say that changing the rotation axis and orientation of the facade can yield very promising results if planned and tested carefully.

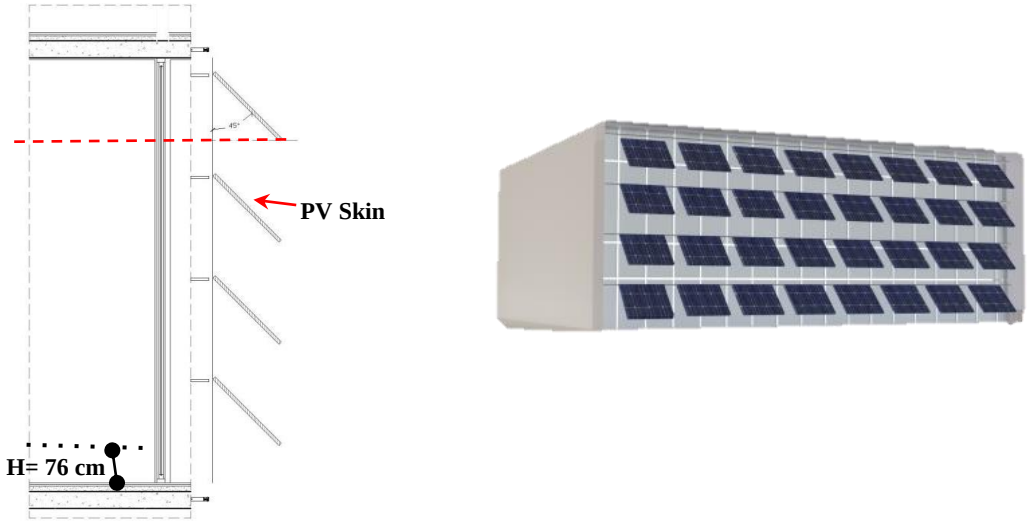


Figure SEQ Figure * ARABIC 7: Section and designed elevation of IPSF of case "D".

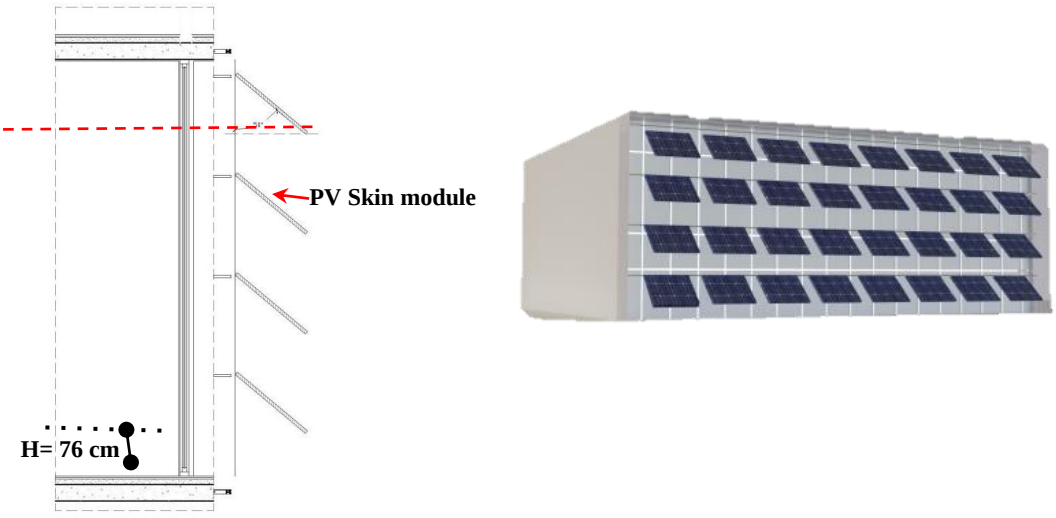


Figure SEQ Figure * ARABIC 8: Section and designed elevation of IPSF of case "E".

5. Recommendations and Further Researches

This research is a proof that architects' think environmentally that any product can be adapted to environment changes and can be integrated architecturally as one element with their aesthetic and performative concerns. Also, it hopefully provides grounds for future researches to integrate performance enhancing technologies and offers opportunity for further question and future study on:

- Upgrading the techniques of PV integrated system to intelligent façade design with different shapes and forms of PV cells.
- The effect of new materials such as smart materials to be integrated with PV systems to add flexibility and adaptability to architecture design of building façade envelope as Organic PV.
- More researches to study the effect of sun-tracking techniques, either to be adaptive, dynamic and intelligent with its properties neither to be automated.
- Studying the combined effect of integrated PV modules into building facades on daylighting performance in different climate changes and different axis of rotation.

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Human Thermal Comfort, a Framework for Public parks assessment

Using Parametric based simulation engine (PBSE)

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Abstract:
Public parks are one of the key parameters for a livable city. Its usability and functionality depends on many factors, one of them is the thermal comfort. Through design phase and Digital assessment, running a simulation for design optimization on outdoor thermal comfort is complex where the simulation parameters are forecasted variables. Hence, using indices make the process easier. The aim of this research is to define an appropriated index through literature and apply it on an existing case study using parametric based simulation engine, in order to identify weather the case is comfortable or not. The selected case study for the research is Al Minya Al Gdida residential public parks, as the width to height ratio between the parks and building height is low. Hence, the research will assess the case study using PET thermal comfort index, in order to achieve design recommendations for the parks towards thermal comfort optimization.

Keywords: Outdoor thermal comfort – PET – Thermal comfort Simulation - Parametric

1. Introduction

One of the important things that the parks should provide is the healthy and comfortable environment for its users, as one of the most important ergonomic factors is the thermal comfort, according to (ANSI/ASHRAE Standard 55, 2004) “thermal comfort is the state of mind that expresses satisfaction with the surrounding environment”, also according to (Staiger, 2012) it could be defined as the temperature at which the human feels neither warmer nor cooler, that’s why thermal comfort play and important role in the good design and functionality of the urban public parks and make it an attraction to stay for its users (Nasir, R.A., et.al., 2012). Actually in order to achieve effective human thermal comfort in public parks and outdoor areas heat balance of the human body must be achieved which means that the heat gains by the human body equals to the heat loss by it, hence if the outdoor enviornment did not allow for that thermal comfort could not be achieved (Gómeza at. el., 2013). In summer hot climate conditions all the paramters of the heat balacne should be equal or subjected to equivalent forces for the example the humdity subjected to the wind or the radiation to be subjected to shading effects. etc, or in other means decreseaing the unfavrouble paramters of heat gain and increseaing the favourable one in heat losses achieved (Gómeza at. el., 2013). Through this research an evaluation will be made to identify an outdoor thermal comfort index, and how it could be applied as a simulation using a parametric based modeling tool.

Nomenclature	
SET	Standard Effective Temperature
PMV	Predicted Mean Vote
PET	Physiological Equivalent Temoerature
UTCI	Universal Thermal Climate Index

2. Outdoor Thermal Comfort Assessment Indices

According to (Aljawabra, 2014), outdoor thermal comfort that have been done compared to the the indoor are too few, as it have the same importance as the indoor ones, that's back to the difficulty in assessing the outdoor thermal conditions and the subjection to a lot of complex indices as SET, PMV, UTCI, and PET which used for indoor as well but in outdoor the factores that affect those indices is the problem as it showe a lot of variablity such as the wind speed, solar radiation, temprature and humidity as well. During the last decade, the focus on the outdoor thermal assessment start in increase due to the climate change and the increase heat strees of the cities, but it also still too few (Nikolopoulou et al., 2003). The climatic date that became avilable for every one and the technology permit the researcher and designers in all fields to stimulate the main four climatic paramters, which are the ambient air temperature, radiation temperature, air humidity and air stream temperature and velocity as well (Mayer & Hoppe, 1987) for thermal comfort, which promotes studies to establish thermal indices for indoor measurments as SET (Standard Effective Temperature) and PMV (Predicted Mean Vote) by considering the level of insulation (Clo) and the human activity (Met) (Aljawabra, 2014). The previous indices were made for the indoor measurments which make it not accurate for the outdoor environment, their equivelent are the PET (Physiological Equivalent Temperature) and UTCI (Universal Thermal Climate Index) that were developed specfically for the outdoor environment in order to obtain better estimate, (see table 1) for comprison between PMV and PET (Mayer & Hoppe, 1987).

PMV	PET (Celsius)	Thermal Perception	Grade of physiological stress
-3.5	4	Very Cold	Extreme cold stress
-2.5	8	Cold	Strong cold stress
-1.5	13	Cool	Moderate cold stress
-0.5	18	Slightly Cool	Slight cold stress
0.5	23	Comfortable	No thermal stress
1.5	29	Slightly Warm	Slight heat stress
2.5	35	Warm	Moderate heat stress
3.5	41	Hot	Strong heat stress
>3.5	>41	Very Hot	Extreme heat stress

Table 1 Relation table between thermal stress and its equivalent PET and PMV value**s** (Matzarakis &Mayer, 1997) p.36

According to the thermal and bioclimatic comfort studies can fall within two categories which are; the analytical or rational approach which is based on the human energy balance model, and the empirical approach which is based on the calculations of different meteorological climatic variables, but it does not take into account the thermal physiology, activity, clothes insulation or personal data as a factor. The previous mentioned indices PMV, SET, and PET fall under the category of rational studies that's why it is better in simulating the outdoor comfort according to the accuracy dimension (Höppe, 1993). Recent studies had been shower that the most two indices used in the previous 10 years are the UTCI and PET because of their ease in use and accuracy in results for comcputational thermal comfort simulations (Jendritzky et. al., 2012).

2.1. *Predicted Mean Vote (PMV).*

Predicated Mean Vote was firstly developed in order to evaluate the thermal degree of dis-comfort in indoor climates through levels that describes various states of human body activity and clothing insulation level (Fanger, 1972), and creating a relation between the levels and comfort degrees as shown in table 1.

The index of the PMV was based on calculation as follow; internal heat production of human body (metabolism) = 80W, and heat transfer of the clothing that it wears = 0.9 Clo (Matzarakis & Mayer, 1997), which is a low activity and normal indoor clothing, which is not an outdoor phenomena that all the users of the urban parks will be like that, as there a people who will sit, run, play and others wake, with various types of clothing levels which make it not appropriately suitable for calculating and assessing outdoor thermal comfort. A model had been developed called Klima – Michel Model (KMM) based on the PMV index in order to make it suitable for the outdoor environment by adding to the PMV outdoor radiation factor which result in a very complex model (see fig. 1), were I = direct solar radiation, H = diffuse solar radiation, (I+H) refl = reflected short wave radiation, Eu = atmospheric counter radiation, EA = long wave emissions of the surroundings, and W = radiation from the man's surface (Jendritzky & Nübler, 1981).

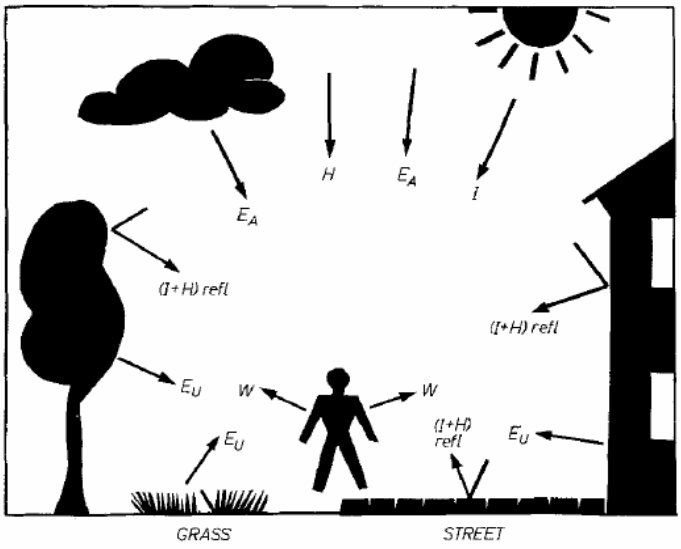

Fig. 1 KMM Model for outdoor thermal comfort illustration, (Jendritzky & Nübler, 1981). P.320

According to (Honjo, 2010), in 1997 Matzarakis and Mayer, used this model order to make a thermal outdoor environmental comfort assessment for Greece outdoor climates. They used the meteorological data offered by the climate monitoring stations as an input for the KMM equation, the objective was to define the areas that had PMV value greater than 3.0 resulting a map that shows broad areas with thermal ranges. The Same model was used for the calculation of thermal comfort in public parks and the results showed that the PMV for a walking person is 2.6, after adding the upwind direction as a factor he found the same person PMV will be 3.2 and 2.8 in the downwind direction, despite of the PMV factor in not within the range, but it concluded that the presence of the park and the direction of the wind can play an important role in decreasing and increasing the PMV factor (Vu et al,1998).

Afterwards, in 2004, a study made on the relationship between the thermal comfort and behavioral patterns in urban park located on Goteborg, Sweden, through making interviews and behavior

observations on the park users, with the calculation of the PMV, then the research in order to make the behavior influence the PMV, and ASV (Actual perception vote) were used in a comparison with the PMV, which result in a 41% of differences between the two results (see fig.2) (Thorsson et al., 2004).

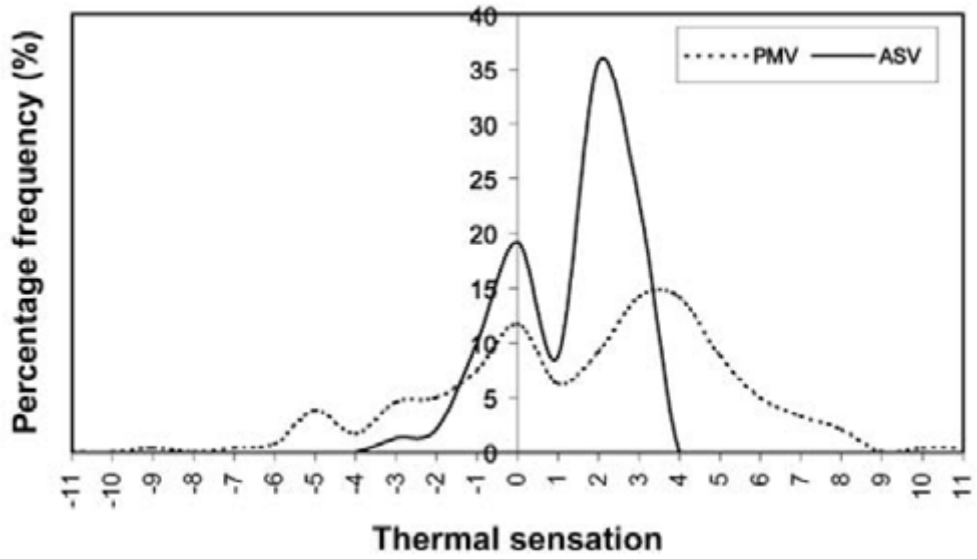

fig. 2 Percentage frequency distribution for thermal perception assessed by the predicted mean vote (PMV) indexand the thermal perception of the interviewees (ASV) (Thorsson et al., 2004).

2.2. *Psychological Equivalent Temperature (PET)*

Psychological Equivalent Temperature (PET) is one of the rational approaches in outdoor thermal comfort assessment, it's an index that consider all the basic thermal processes and based on the heat balance model (Höppe, 1993), PET index simulate the outdoor thermal comfort as if the measures were taken in a closed indoor environment with human metabolism 80 W of low activity, clothing of 0.9 clo, and the heat balance of the human body exists (Mayer & Höppe, 1987).

"As an example, a person in a hot and sunny outdoor location with a PET value of 43 ◦C would experience the same sensation of heat as if they were inside a room in which the temperature was 43 ◦C. If the person were to move from the sunlit area to the shade, this would lead to a reduction of the PET of around 14K to 29 ◦C." (Gómeza et. Al., 2013) P.30.

The previous calculations are based on indoor variables, with air velocity equals 0.1 meter per second, relative humidity equals 50% at air temperature 20 Celsius, and the temperature resulted from the sun radiation equals to the air temperature. (Honjo, 2010). Despite of the PET index was created on indoor bases, but it proofed its creditability and application on a variety of outdoor conditions, in addition it and the UTCI indices became recommended in the German guidelines for urban and regional planning, but the UTCI is to be used only for measurements above 10 meters. Hence on case of public parks it is preferred the use of PET index (VDI, 1998). in order to predicate the thermal changes in urban and regional climates by using RayMan software to be calculated easily which enables the easily estimation of the radiation temperature which is scientifically called Mean Radiant Temperature (MRT) based on the overall radiation as one of the most difficult climatic parameter and play an important role in the outdoor thermal comfort, which means that the

urban designers, planners and architects can simulate the outdoor thermal comfort without going through in a difficult processes (Gómeza et. Al., 2013). All of that establish a lot a practices using PET not just for outdoor thermal comfort but also for, urban bioclimatic studies, analyzing bioclimatic events such as heat waves and sea breeze, and to draw bioclimatic maps of different geographic zones (Matzarakis et. Al., 2009). As an example; (Ali, Toudert, and Mayer, 2006) analyzed the contribution of street design in the development of a pedestrian friendly microclimate, (Johansson, 2006) studied the influence of urban morphology on the outdoor thermal comfort, (Lin, 2009) used the PET to examine the thermal comfort in public square in hot and wet Taiwan climate. All of that shows how is the validity and creditability for PET index in the assessment of outdoor thermal comfort instead of using PMV, as it shows more accuracy in results. The comparison of PMV with PET (see fig. 3).

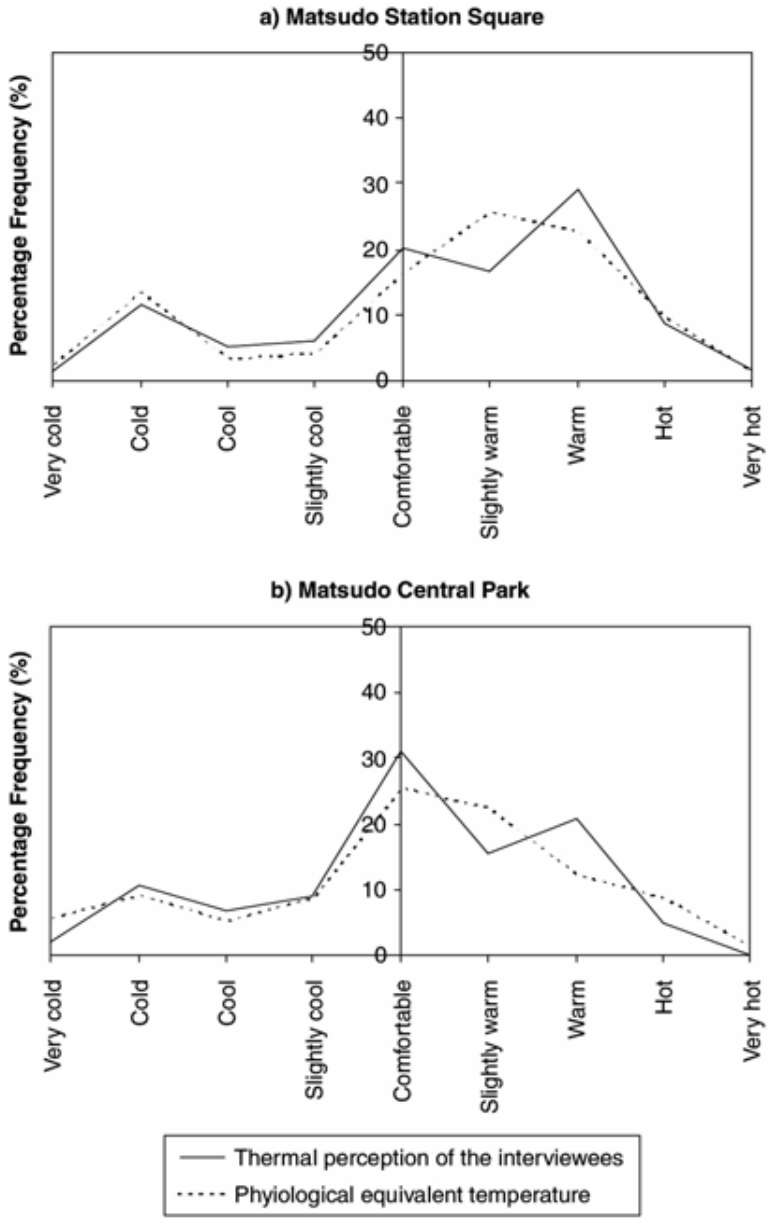

fig 3 comparison between the PMV and PET (according to Thorsson et al., 2007).

3. Case Study Al Minya Al Gdida Residential Public Parks

The research case study location is "Al Minya Al Gdida", and it aims to evaluate the thermal comfort of the urban space between the residential buildings that made public parks (see fig.4). One of areas will be evaluated to gets a design recommendation for thermal comfort by applying a parametric based simulation tool. From the observation that had been done on the width to height ratio (see fig.5), it can be concluded that the main factor that effects the thermal comfort is the MRT that results from the sun radiation as the width is too high and the height of the buildings is low in respect to the urban space with permits the sun to gets through the space during the peak hot day hours (form 9 AM till 3 PM).

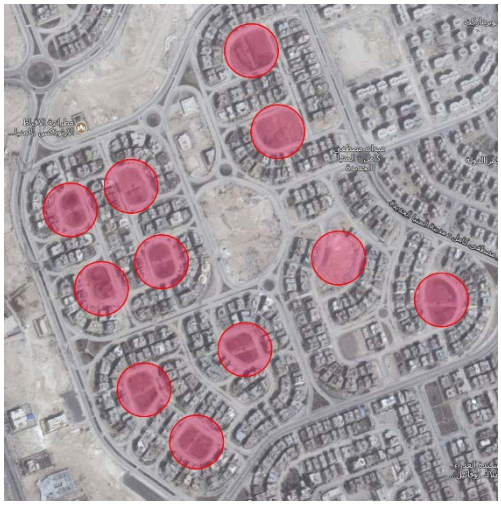

Fig. 4 Part of Al Minya Al Gdida Residential area, publci parks highlited in red color (Google maps, 2017) edited by research using Adobe Photoshop

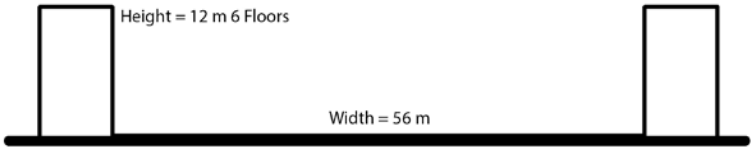

Fig. 5 Illustrative section for the width to height ratio (researcher, 2017)

3.1. *Al Minya Al Gdida Thermal Comfort Simulation*

The used index in order to initiate the thermal comfort assessment simulation in Al Minya Al Gdida is the PET (psychological equivalent temperature), because of its ability and accuracy in simulating the thermal comfort in the outdoor environment as concluded from the literature review. The software that will be used in the simulation is Rhinoceros V.5 for building the urban context and grasshopper plugin for the simulation process as it uses the plugin Ladybug for the environmental simulation because of its accuracy, ability to simulate complex geometries and visualizing the date as a 3D environment which make it easier to understand (Vanos, 2010).

The meteorological date for Al Minya Al Gdida obtained from "Energy Plus Weather Date", which is such a reliable source that applicable for all the environmental analysis software. The simulation takes place for the zone (see fig. 6) that colored with yellow outline, as the buildings context had been built to be integrated as a shadow factor in the simulation.

Fig. 6 Simulation zone modelling (researcher, 2017) using Rhinoceros software

The simulation time is the 21 of August as it considered the peak of the summer weather and consider to be the assessment summer point in the environmental simulations (Aljawabra, 2014). Three simulation takes place at three periods (8 - 9 AM, 11 AM - 12 PM and 2 - 3 PM) (see fig.7), as from 9 AM till 3 PM are the peak sun radiations hours and called the “Sun Window” (Höppe, 1993). The simulation takes in concern all the parameters that affects the PET value which are: Dry Bulb Temperature (air temperature without moisture), Mean Radiant Temperature (Sun radiation temperature), Dew point Temperature, Relative Humidity, Wind speed, Total sky cover (amount of clouds that block the sun), Solar radiation energy (KWh/m2), Body characteristics (which setup to be as a walking made age man with summer closes).

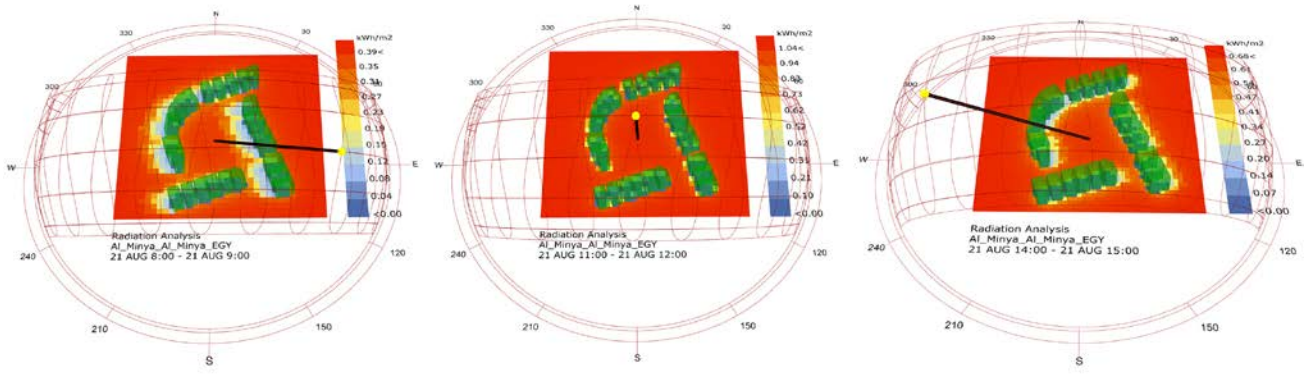

Fig. 7 the simulation; period of 8-9 Am of the left, 11 AM - 12 PM in the middle, and 2 – 3 PM on the right side (researcher, 2017) using Rhinoceros software, Grasshopper and ladybug plugins

The simulation output is composed of multiple sections which are the PET value, PET level, and weather the results state thermally comfortable or not (see fig. 8), all of this results change instantly once the date, time, inputs, and modeling changes. After running the simulation 3 times with changes in hours’ variable the results were as follow:

- For 9 AM, 21 of August, the results were that the PET Value = 21.6, PET Level = 0 which means it comfortable.
- For 12 PM, 21 of August, the results were that the PET value = 39, PET Level = 3 (Very hot) which means it uncomfortable.
- For 3 PM, 21 of August, the results were that the PET value = 40, PET Level = 3 (Very hot) which means it uncomfortable.

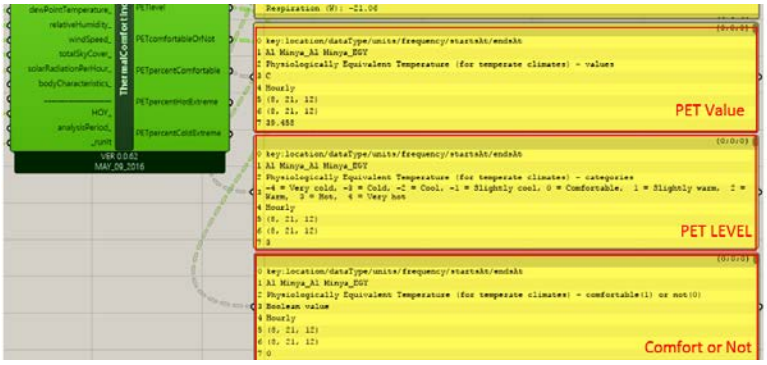

Fig. 8 A snap from the numerical results of the simulation (researcher, 2017) using Grasshopper and ladybug plugins

4. Analysis & Results.

The simulation case study had showed that most of the day is out of thermal comfort as at 9 AM there will be a thermal comfort because the buildings block a big portion of the direct sun radiation, as well as the temperature of the sun radiation is relatively low (see fig.9). After 9 AM the sun starts to get perpendicular on the park between the building till 12 PM, which makes the buildings ability to block the sun decrease and became approximately zero in addition the sun radiation temperature starts to increase resulting in a solar radiation high factor and increased PET value that makes the outdoor park thermally uncomfortable (see fig.10). From 12 PM till 3 PM the case is the same; the park is thermally out of comfort, according to the simulation as the buildings did not block the sun radiation efficiently, also the radiation temperature is so high which resulting a high PET values for the park users (see fig.11).

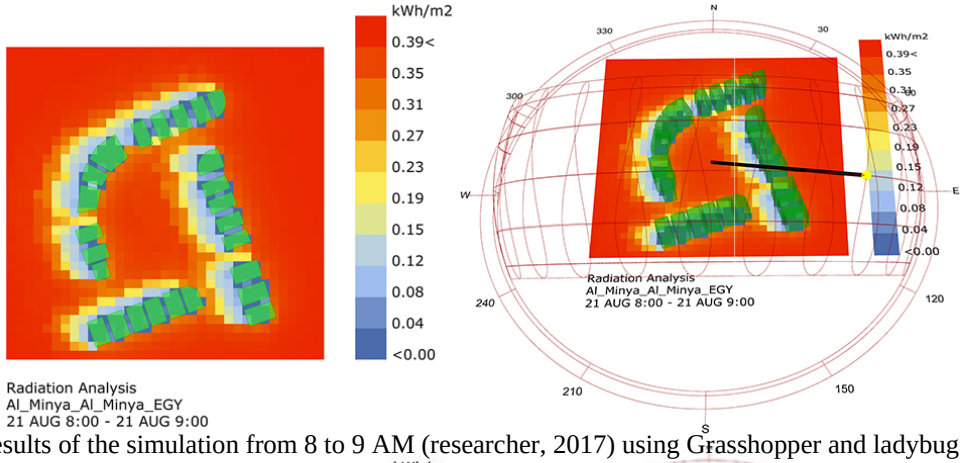

Fig. 9 results of the simulation from 8 to 9 AM (researcher, 2017) using Grasshopper and ladybug plugins

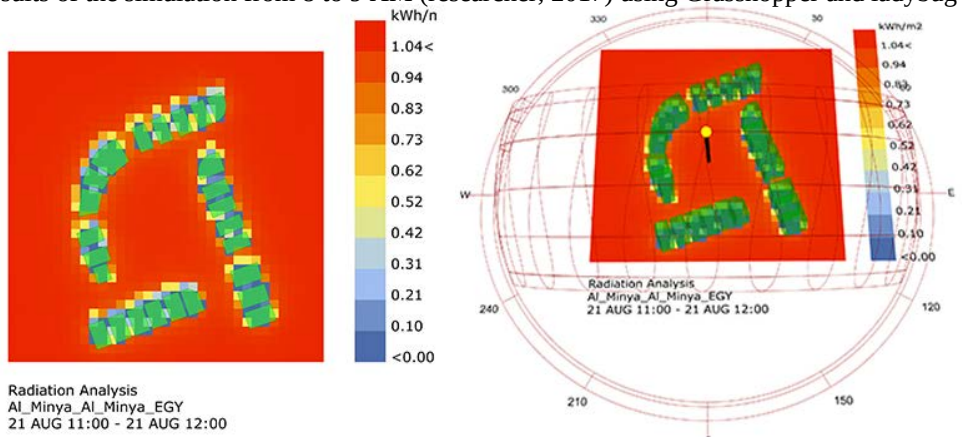

Fig. 10 results of the simulation from 11 AM to 12 PM (researcher, 2017) using Grasshopper and ladybug plugins

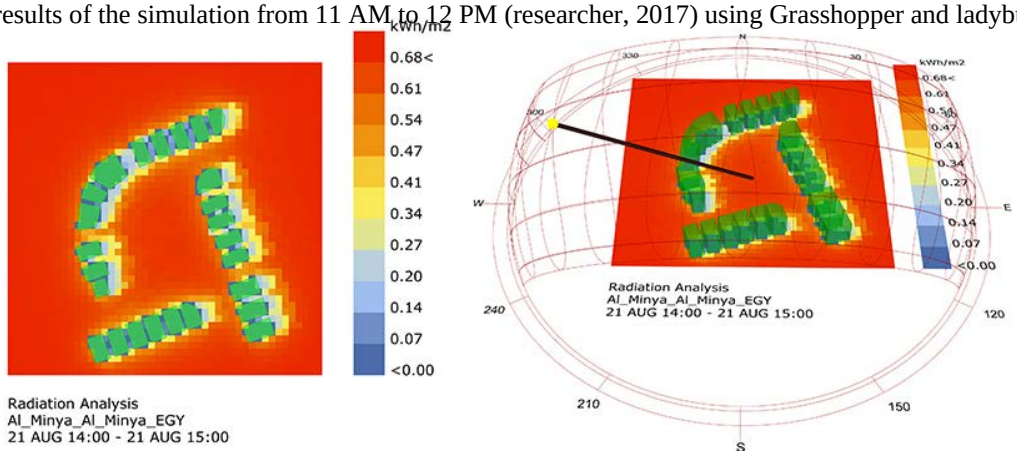

Fig. 11 results of the simulation from 2 to 3 PM (researcher, 2017) using Grasshopper and ladybug plugins

5. Conclusion

Among many thermal comfort indices there are three effective indices which can be applied on outdoor simulations which are PMV, PET, and UTCI. Through literature the PET index proofed that it is the most apprppirate to be applied on a human height level since the UTCI require inputs above 10 meters from the ground. Moving on the case study results analysis, it can be concluded that most of the summer day in the public parks that lies between the residential buildings within the "Al Minya Al Gdida" is thermally uncomfortable for the users. The most influential meteorological factor that affect the outdoor thermal comfort for this case is the Solar Radiation, due to the high temperature and the building and urban spaces width to height ration that enables a huge amount of solar radiation to enter that urban space. According to the highest radiation record. The lowest one is at 9 AM (0.39 KwH/m2) then it increases to reach the highest at 12 PM (1.04 KwH/m2) and decreases again to gets at 3 PM (0.68 KwH/m2) (see fig.12). Which means that the period from 11 AM till 3 to 4 PM need to be under cover from the direct solar radiation in order to be thermal comfortable for the users of the public parks.

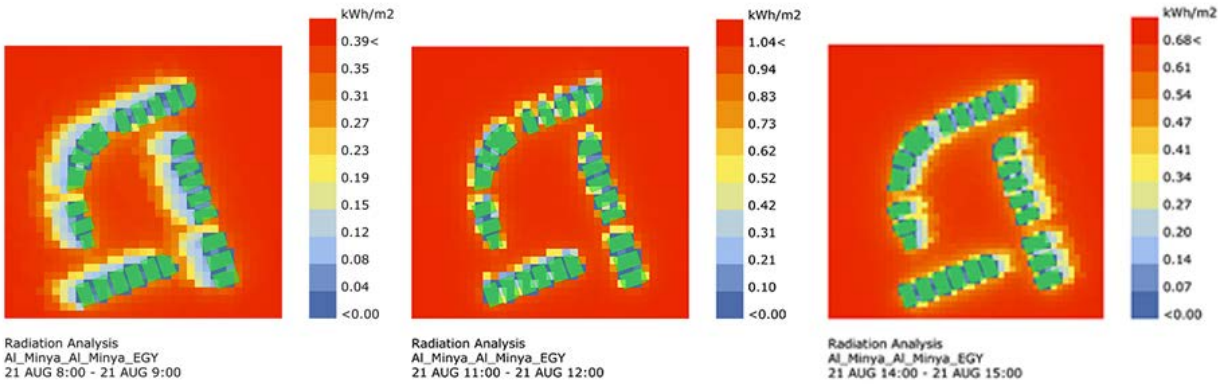

Fig 12 the Visual results of the simulation for Comparison (researcher, 2017) using Grasshopper and ladybug plugins

6. Recommendations

- Shading is in high need for those public parks which could talk any shapes, a either be natural as trees and palms of artificial as tensile membranes and other shading devices, also it could be high tech, since the solar radiation amount is to high it can be used to generate electricity at least for the lighting purpose of the park at night, by using photovoltaic cells above the shading devices, hence it could solve two problems at the same time.
- The shading could be oriented towards the radiations that cause thermal discomfort only; to be oriented towards the sun at 12 PM and the sun at 3 Pm (see fig.13).
- For further development in Al Minya Al Gdida the building and road width to height ration should be revised in order to solve issue like the outdoor thermal comfort.
- Vegetation cover is needed to decrease the solar radiation reflection towards the buildings and the citizens.

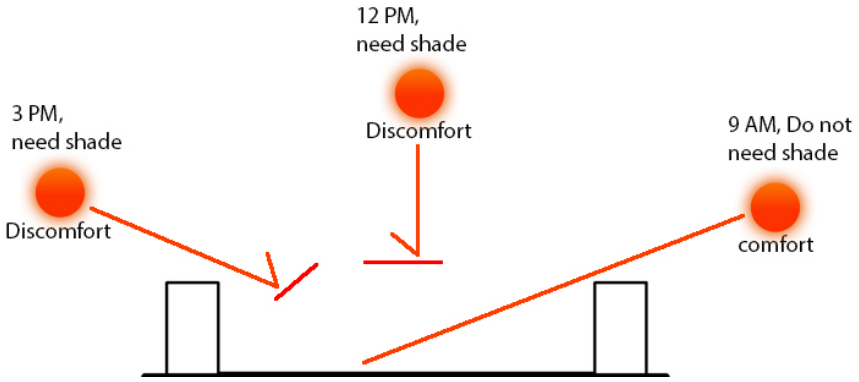

Fig 13 Illustration for the shading recommendation (researcher, 2017) using adobe Photoshop

7. Acknowledgement

Firstly, I would like to thank Prof. Ahmed Ouf, head of the architecture department at Cairo University, as some of the paper information were prepared in his course “Urban Planning Studies” in 2017 as an assignment. Secondly, I want to thank the developers of Ladybug plugin. Finally, I want to thank the conference for hosting this paper.

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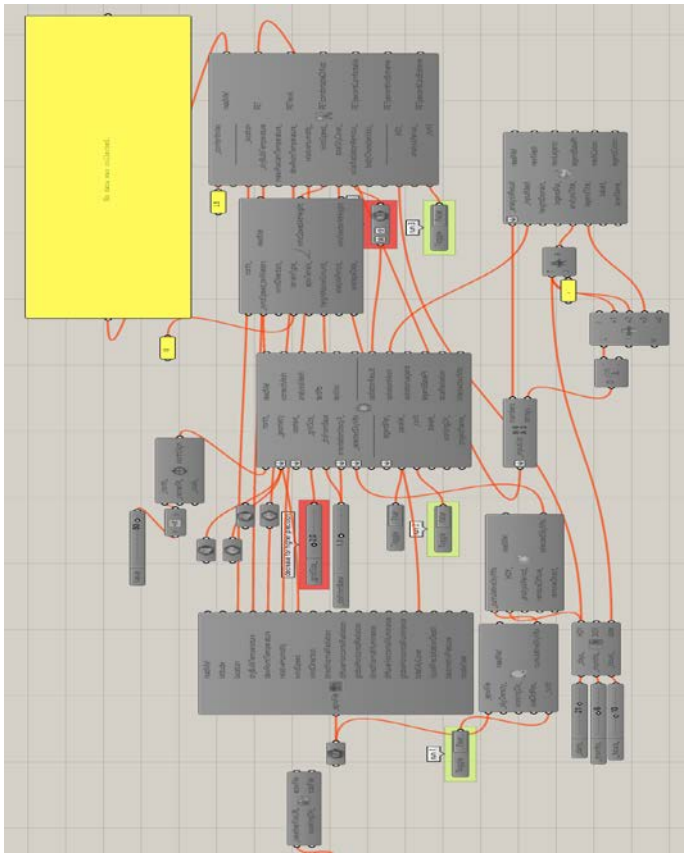
Appendix:

Grasshopper code for the PET simulation



Kinetic Origami shapes: a futuristic theory for dynamic structure stability

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Abstract:
In the historical development from static to dynamic perception of space there is always a change in the concept of architectural style. Materials get to be lighter, structures more energetic and spaces get to be more dynamic. Architecture becomes liquid; fighting force would no longer be by mass but by inertia. It represents the end of typology and the rebirth of morphology. Our task is to investigate and develop a new structural system capable of articulating the dialectics between material, structural systems and spatial perception. It will be the new architecture style for the next millennium. The Origami formations and its effect of structural stability is the basis of this argument, where the rationality of the right angle will be overcomed by the irrationality of floating and defying gravity. It will be the new DNA in architecture and it will represent the marriage between science, technology, structure and spatial perception.

Keywords: Origami, crease lines, gravity, dynamism.

1. Introduction

The twentieth century began with an overflow of committed manifests from architects praising the qualities of new building technologies to dematerialization and the loss of weight. Hardly did visionary designers predict the dark side of industrialization. For the Master of Architecture, manufactured products were related with freedom and limitless imaginations. In the historical development from static to dynamic perception of space there is always a change in the concept of architectural style. Materials get to be lighter, structures more energetic and spaces get to be more dynamic. In it geometry, departs from Euclidian to Non Euclidian geometry (Tezidis,2006). Architecture becomes liquid; fighting force would no longer be by mass but by inertia. It reflects the end of typology and the rebirth of morphology. The gene of a historical building with the gene a new morphology is the Secret DNA code for a new potential in contemporary architecture. Architecture and the power of now will be reshaping our time. Using steel in design represents one of the most crucial construction developments in history, shifting allowing architects to create dynamic structural forms in scales they never thought they could. Our task is investigating and developing a new structure system that is capable of formulating and implanting the dialectics between material, and space. In it Architecture becomes liquid; fighting force would no longer be by mass but by inertia. Energy is the basic element of this new structural language, since it is capable of articulating the emerging concepts of and dynamic space in a new architectural form. It is a new state in architecture shifting from static, to dynamic and finally to vibration. it is revealing this veiled dimension to be an innovative reality with new architectural style for the new millennium. It is the marriage between technology, science, structure and architecture.

Different from other discipline, Architecture fights with the relative importance of cutting all the processes originating its methods of construction and design from imitations of its past, conventions of the present, or the creation of its future. Either chaos or cosmos, any order-of-systems or system-of-order in architectural technology must inspect the flow between matter and materials, space and place, systems of production and structure, the natural environment, and finally the role of technical equipment, processes, and theories in both designing and building.

fig. 1 Free Navigation of Forms and new Axes of Suspension (Artwork of Kazimir Malvisch)

2. Origami from art to architecture

The originally Japanese art of forming artistic paper work represents a source of forms inspiration in architecture to generate sophisticated forms (Lang,1988). With their exclusive mechanical properties, by manipulating the flat crease patterns representing unfolding and dynamic folding movement of origami, architects are able to design creative kinetic art that can form waves as Origami architecture. These generated origami forms initial compressive strain waves, effecting the other part of origami structure to has tension first rather than compression that will follow under impact. This dual dynamic mechanism based on motion, reflects a highly efficient impact structure system, (Ismail,2004).

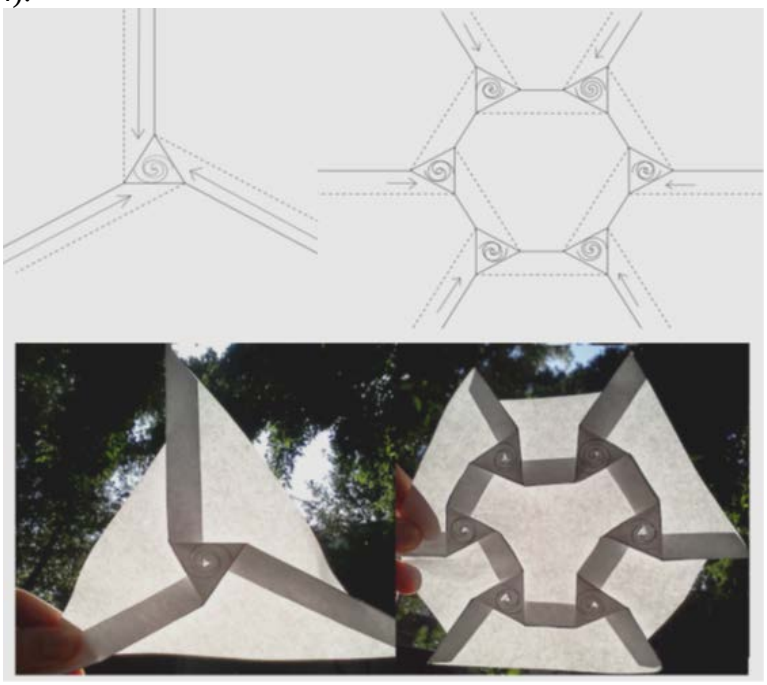

fig. 2 Crease patterns (Kawahata, 1994)

3. Mechanical motion

Mechanical motion of origami forms offers new dimensions in achieving nonconventional properties in architectural forms. Structural wave guiding, create the ability to achieve a futuristic form based on the dynamic relation among material, structure and finally a new space concept. Origami spatial formations can serve as an ideal playground in realizing highly versatile and tunable architecture formations. By introducing crease lines into the periphery of the proposed structure, different origami structures are formed, which can offer enhanced stiffness and multi-stability. Regardless the scale of origami, its nature based on folding, let it applicable easily in a wide range of scales. This origami-based structure system has been applied to a diverse set of architecture design principles.

fig.3 Plans and Shapes and Dynamic Formations in Space (Author)

The analysis of dynamics of origami-based structures is a common next step to a new structural system that can be applied in our futuristic architecture. The connection between the origami wrinkled pattern and the dynamic folding characteristic of origami itself has been unexplored. It is characterized by coupling between rotational and axial motions.

Applying compressive effect results in generating tensile wave called solitary. This wave propagates ahead of the initial compressive strain wave and thus making the latter part of the middle zone affected with tension first instead of compression, thus exhibiting a wave guiding principle that is the main cause of the structural stability of the final form as presented in figure 3. Based on mathematical equations parametrically modified origami forms can be generated. This origami generated form represents geometrical relations between angels, with their faces, by modifying angles directions or magnitudes new forms are generated.

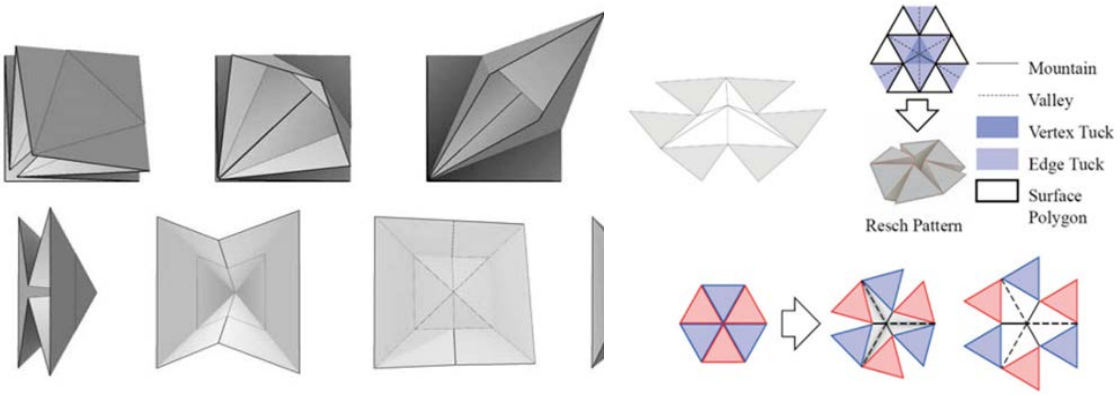

fig.4 Parametrical relations in order to generate variations for the final form. (Ismail, 2014)

The origami geometrical forms are generated based on parametrical relations in order to generate variations for the final form(Ismail, 2014). Based on parametric design, variations of different origami forms can be easily generated. Every modification in the width or height in sections generates different origami forms (Tedeschi,2011). Also, designing an origami previously studied unit structurally could facilitates it applications, when it is arrayed vertically or horizontally.

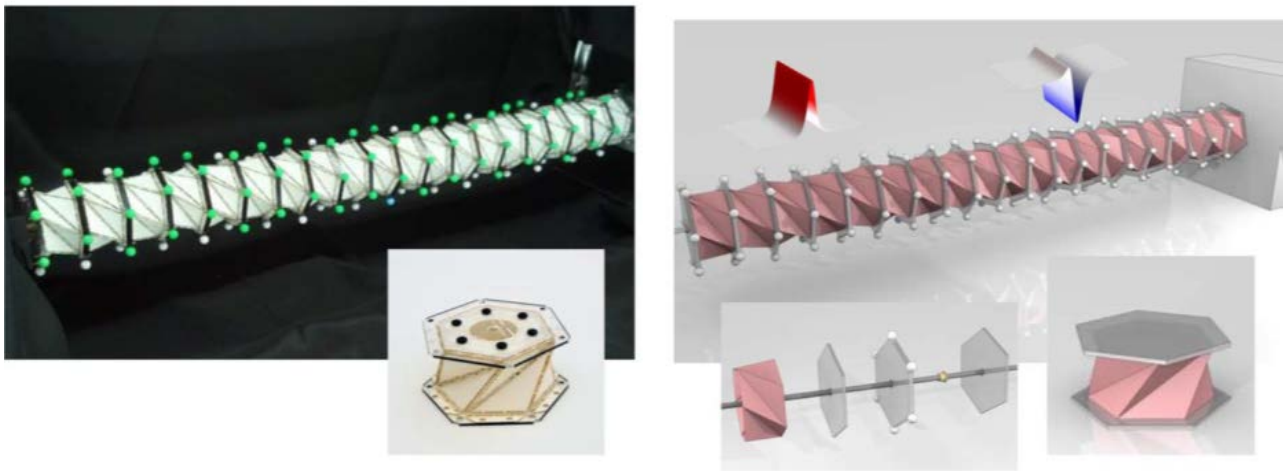

fig. 5 A tensile wave as a guiding principle in the structural stability. (Yasuda, 2019)

4. Origami structure

The structure based on tensile solitary wave has centrally twisted motions that affects each other, and transforms strain form a unit to the other. The folding motion can transform the solitary waves as shown in figures 6 and 7. This folding motion is characterized by using the axial displacement. The tensile and compressive waves in shown system represent wave propagation to be highly noticed. It is an axial nonlinear mechanical wave propagation that could be linked with the volumetric origami cells. (Yasuda, 2019)

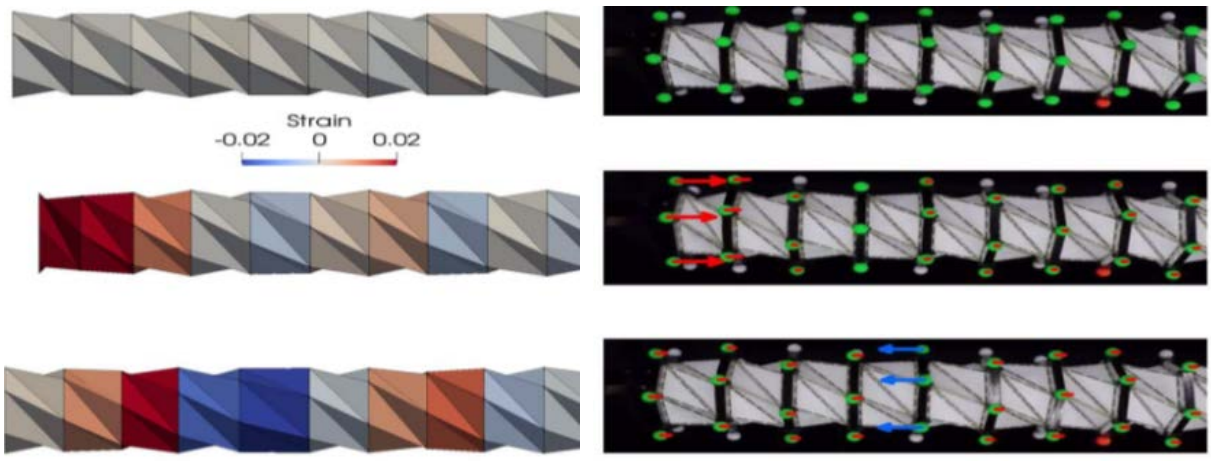

fig.6 Static compression versus Tension in the Periphery of the structure (Yasuda, 2019)

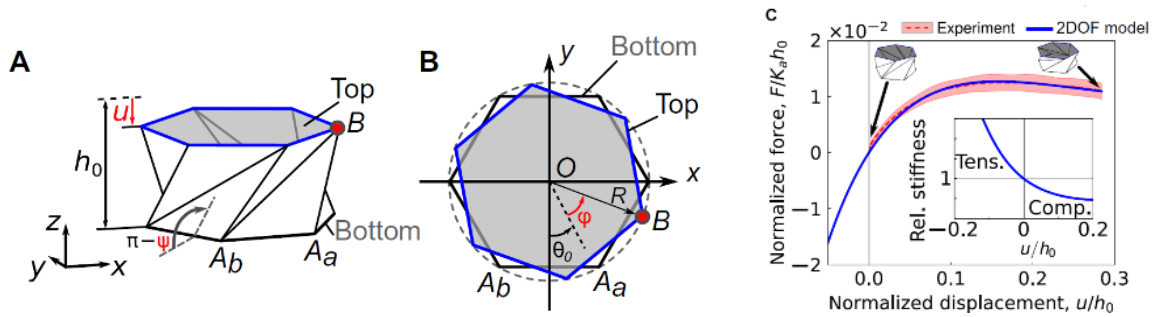

fig.7 Static compression versus Tension in the Periphery of the structure (Yasuda, 2019)

These relevant dynamics of the form coupled with the moment of inertia of the external architectural shown unit (diamond like) including the bearing properties of the material used, is responsible for the stability of the entire structure.

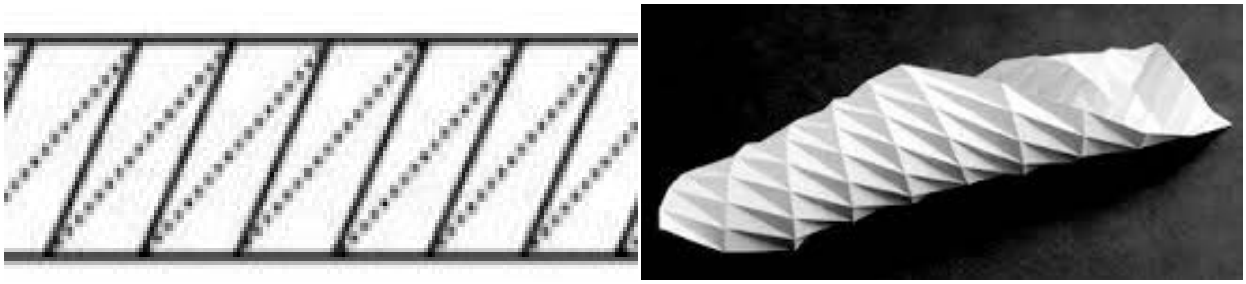

fig.8 Diagonal Origami Formations. The Art of Folding leading to Structural Stability (

One of the noticeable features in the origami formations is that the first rotation of cross-section has the maximum force influence during loading. The following cross section of the form rotates with similar magnitude, each curve traces a similar path. Thus, the energy dispersion starts decreasing significantly, and gradually then the slope of the energy dispersion curve gains a moderately small value. This cyclic conditioning process causes a highly consistent and uniform folding behavior.

fig.9 This cyclic conditioning process causes a highly consistent and uniform folding behavior within the spatial formation. ((Hernandes, 2008)

As with many of his designs, Santiago Calatrava was inspired by the theme of origami conception in structural analysis and stability for the tall twisting skyscraper.

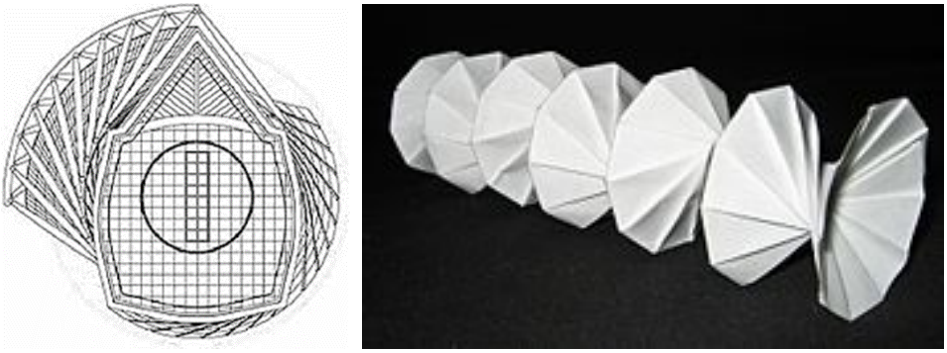

fig.10 Rotational and vertical Motion of the Structural System- restless Architecture. (Capanna, 2012)

The curved design offered two major benefits to the structure of the building. The curved outline design added extra structural benefits to the building. In curved designs like that in Turning Torso (by Santiago Calatrava) strength is added to the structure. In addition to the added strength, the curved external outline can act as a wind force minimizer.

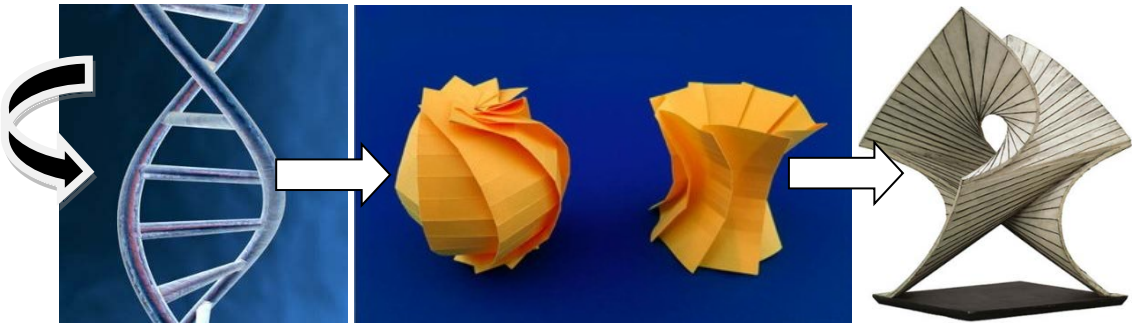

fig.11 The new DNA in Architecture: A new sense of geometry leading to Complex architectural forms. The Crease Line in The Form (Author)

In rectangular plans the flow of wind adds more pressure on the exposed facades of the building. The movement of air around it, causes a suction applied to the leeward facades. So, the skeleton of the building is stiffened by dynamic wind damper or structural stiffeners to counteract the sway in tall buildings.

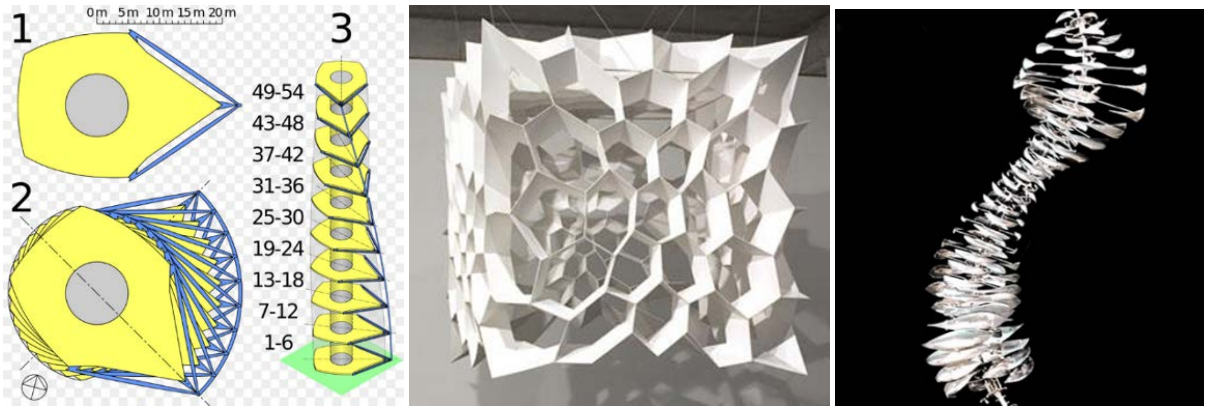

fig.12 New axes of suspension & Kinetic interpretation of Space

5. Conclusions

For several millennia, up to the end of the nineteenth century and the mass production of wrought iron and mild steel, durable and large buildings were constructed of masonry (stone or brick). The structural systems of the column, pier, wall, arch, vault, and dome were in compression. During the same period, less durable (fire, water, termites) wood was used for internal structures (floor and ceiling beams, stairs) and lightweight moving structures (ships, carriages). The twentieth century saw the growth of structural systems in flexure or bending. In this era, braced frameworks in steel (bolted, riveted, welded) and concrete (reinforced or pre stressed) replaced those earlier masonry and wood systems. Late twentieth-century experiments with tensile fabric roofs of planar textiles and linear ropes, in steel or polycarbonate, have become one of the preferred structural systems of the technological avant-garde - another is the combination of tensile cable-trusses and glass skins.

As a result of this, the figure of the buildings changed from an expression based on structure in the form of inertia, mass, to the express of force as a novel concept of interdisciplinary idea of architectural configuration versus structural aspects. It is a new form finding which will be inspired by origami formations this giving birth to astonishing spatial richness and kinetic vocabularies. It is a new interpretation of complex geometries.

There is always a need for a new space perception that heightens the sense of dynamism in architecture. Dynamic forces give birth to a vital new architectural form, reflecting a new concept of aesthetics based on motion and dynamism.

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Egyptian I-cities Planning Based on Deep Learning

Future Egyptian I-cities

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Abstract:
Recent years, in Egypt, have witnessed developments and changes that in turn make significant improvements in cities planning and designing to cope with the digital transformation age. There is an urgent need to develop Egyptian cities services to be adapted with modern technology.
Intelligent Cities (I-cities) solutions have to be multi-disciplinary including socio, cultural, environmental, and technical aspects. This paper will shed lights on the modern-technological transformation happening around us with a focus on I-Cities and how they are planned based on deep learning; furthermore, an analysis will be conducted for all services offered in planning an I-City based on monitoring collected data related to energy and water consumptions to minimize and optimize waste based on the feedback system and ensure an efficient utilization for the clean energy sources. The paper will explain the required services that should be offered to present an integrated I-City. The offered services are planning of buildings, small organizations, mall for entertainment, state of the art wide security services, and markets supported by different sensors based on sensor fusion and deep learning; hereafter, no need to check out. Moreover, the user in the I-City will have the facility of shopping from inside his smart home using Virtual Reality (VR) technologies. Besides that, a museum inside the I-City is to be established, where pictures of known-men-of-honour are to be presented. The user can easily call upon the information about every picture in the museum using VR techniques, hence allowing a new level of interaction.

Keywords: Deep learning, Virtual Reality, Digital transformation

1. Introduction

This paper aims to shed lights on the modern-technological transformation happening around with a focus on smart cities and how they are shaped using deep-learning-based technologies and methodologies, accompanied with conducted studies aimed into classifying and elaborating smart cites and their technical infrastructure.

Smart cities (SC) can be put from the research point of view into six aspects: Environment, economy, governance, living, mobility, and people. It was pointed that these combination of strategic policies are crucial for such an outstanding SC if one wishes to promote such an SC with better-no-risk conditions, hereafter, deep-learning-based technologies are to be implemented on the infrastructural level. These techniques are vital for these applications involving SC since they do offer a wide variety of assists; the assists do include: resources optimization, networking, urban development, VR, and structural-wide-based security system.

VR has been playing an inseparable role in modern-technological transformation, as it has been implemented in several of daily application to offer easiness and comfort. It is only fair that VR will also emphasize its importance in SC. VR is used in varieties of applications which contributes dearly such as; sales training and what it offers of simulation training, medical training known also as functional training which uses the same methodology to train and preform dangerous surgeries on virtual dummies enabling more risk-free zones, moreover it can be clearly seen in i-shopping and i-museums technologies, hereafter widening our interactions levels. The coming section will explain the difference between SC, connected cities and the proposed I-cities, presenting their facilities. Afterwards, the paper will discuss the embedding of VR technology in shopping and entertainment. Finally, in this paper, a layout and an urban section of the I-city including all services will be presented.

2. I-Cities services based on IoT and Deep learning

There are two expressions which are commonly used nowadays: connected cities and smart cities. The facilities of connected cities and Smart cities are currently used for Urban designing so this work will start by explaining the difference between these expressions and the meaning of I-cities. The difference depends on the data which can be accessed and collected from all services in a city to make a future decision that is beneficial to the citizens. The design of connected cities leads to smart cities as the connected cities concept describes big data collection from all services through electronic IoT devices and sensors (IoT networking). Whereas, the data collected from citizens should be processed and analyzed to monitor every entity in the city services such as transportation system, buildings, healthcare, education system and entertainment, we approach smart cities concepts shown in Figure (1) to manage services in an efficient way to detect crimes and manage the waste (Cohen Z. , 2014).

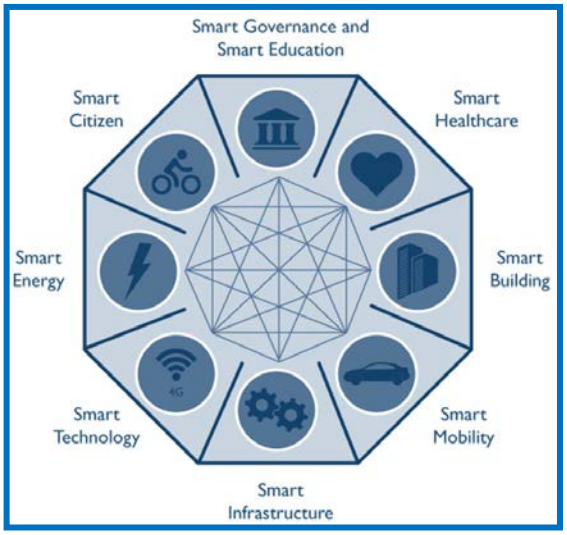

Fig. 1 Smart cities concepts

(Cohen B., 2015) mentioned three generations of smart cities, in this work, we consider his classification to move from the connected cities as 1st generation to smart cities as the 2nd one toward the I-cities as we call it in our paper. I-cities generation combines smart devices, big data analysis and "citizen co-creation" as Cohen called the third generation.

IoT can clearly be seen as a founding base or rather a helpful hand in I-city, from the varieties it allows to widen the horizon of our movement within. The IoT leverages several ubiquitous services in I-cities as: monitoring and managing devices remotely, taking actions based on the analyzed pre-collected data from various real-life traffic data-streams, which in return can decrease road traffic congestion, and improving citizen's safety (Hammi, 2017).

When it comes to energy production; Artificial Intelligence (AI) can start gathering each facility included in the I-city to start distributing the right and sufficient needed energy. These energies can be of any form, rather renewable or not, hereafter it is important to forecast the energy production, which is surprisingly the same methodology of energy-saving, this can be foreseen -in a little detailed matter- as; the connected buildings allow to monitor data, therefore, it allows the detection of uncommon situations, deducting these said situations allows energy consumption optimizing. Objects in I-city i.e. smart houses (SH) well-being can be preserved by somehow-similar technique, as the whole household is interconnected smartly, the detection of the brightness for example from outside (sunshine) we automatically adjust the curtains, detection of humidity well start to adjust the ventilation system accordingly, if a fire or an electrical shortage would occur the system would identify the faulty area and start to act respectively, etc (Nigon, 2016).

On the other hand, the shopping process, entertainment and the security issue of all entities in the proposed I-city will be discussed in the coming sections.

3. Virtual Reality Technology

3.1. *An overview of Virtual Reality (VR)*

To shape the living reality and make meaning of the surroundings, the five main senses are used by humans. The sight being the most used sense of the five, VR technologies take advantage of the human sight and hearing as well to immerse the user into a man-made reality using graphics and sounds.

3.2. *VR Systems' major structure*

VR is a relatively new method of interaction with computers to generate a 3D virtual environment that can be discovered and explored by the user. It has become relevant and possible with the exponential advancement and improvement in the tracking sensors technologies, and the graphical interfaces. VR systems have a variety of components. As mentioned before, they can be used in many applications, the number of components and accessories varies and heavily depends on the application or task the VR system is going to be used for and the level of immersion required. The main components of any VR system are explained in Figure (2).

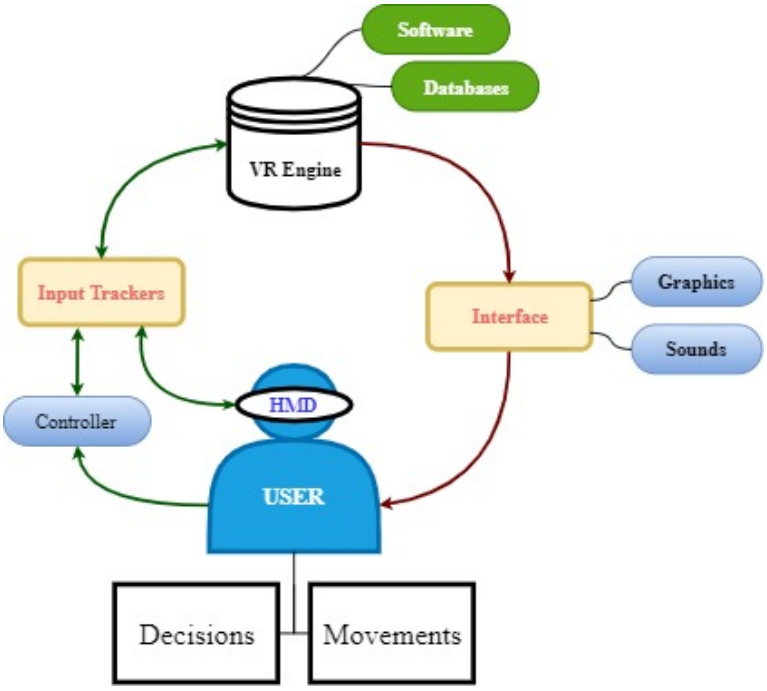

Fig. 2 VR system main components

These components work as a medium of information transferring devices between the user and the computer (VR Engine) containing the software and databases that generate the virtual world (Burdea & Coiffet, 2003). Figure (3) summarizes the system components in terms of the user and computer. It explains how the user interacts with the VR system components.

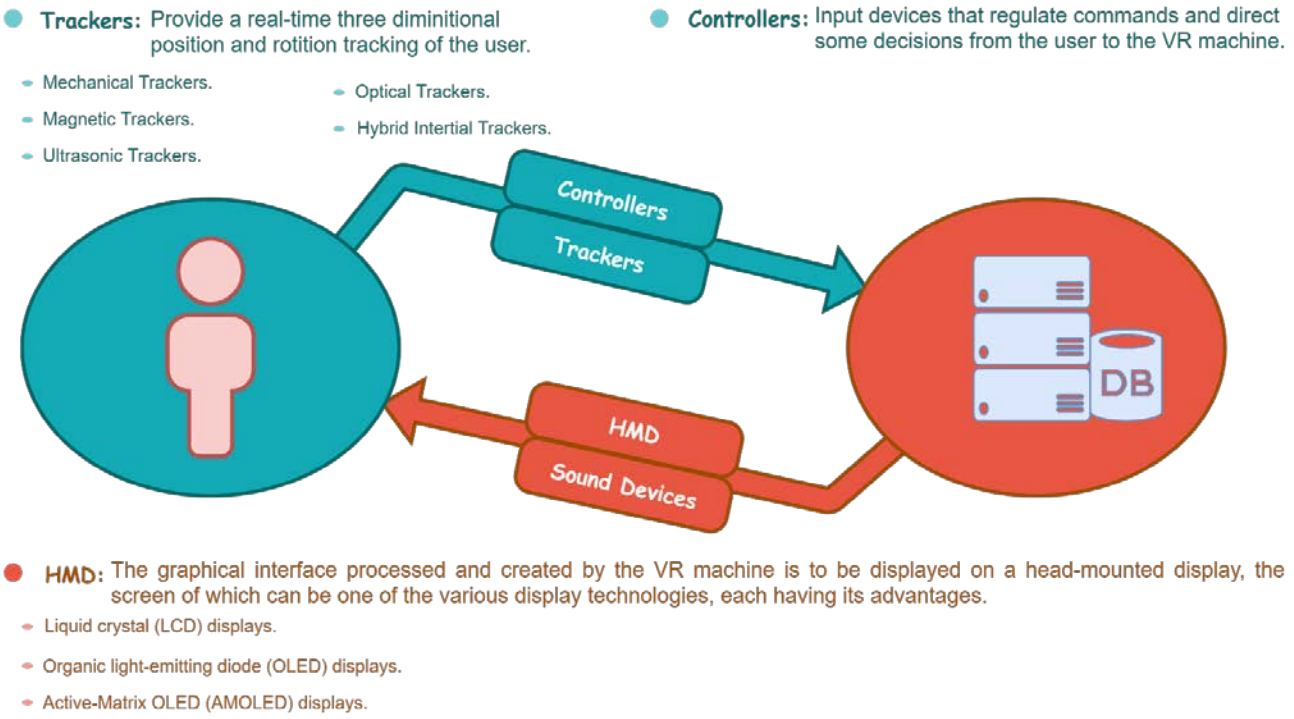

Fig. 3 User interface with VR system

4. I-Cities offered services (or Highlighted offered services)

4.1. *I-Shopping using VR technology*

Shopping, the act of searching for things to buy, dates as far back as the Middle Ages (Davis, 2007). It has since become essential for every modern city planning to account for the need for shops and shopping places. From a consumer point of view, the ultimate goal is to make the process as less time-consuming and effortless as possible without stripping the activity from its fun from those seeking entertainment doing it. Hence comes the idea of implementing VR technologies in shopping and wrapping it around the VR concept. VR technologies allow the user to be immersed in a virtual simulation of near-complete shopping experience. This application of VR would attain the advantages of both traditional shopping and online shopping as follows:

- Cutting down on the time consumed.

Just like online shopping, shopping though VR would eliminate the time wasted going to and back from the shopping location; furthermore, it is a more viable option for a consumer searching for a certain product. This should be made possible as the virtual shopping environment is to be based on a cloud connecting the contributing shops inside the I-city.

- Achieving the same goals with less effort.

Traditional shopping had the restraint of time and place. On the other hand, online shopping is not restraint by time or place. VR shopping offers the same advantages. In addition, it allows the process of comparing product prices and quality just like online shopping. This could be further improved using VR by models of the products that could be represented inside the virtualization.

- Maintaining the entertainment element of shopping.

One of the great strength of the traditional method of shopping is the interaction with other consumers and the enjoyment of the visual marketing, all of which could be present inside the virtual made environment with the option of customizing the experience.

- Allowing users with special needs to enjoy the process.

VR shopping is not physically bounded. This gives the opportunity for some consumers with handicaps to use the shopping simulation provided through VR technologies to experience the shopping process.

4.2. *I-museum using VR technology*

VR technologies have a lot to offer when it comes to its implementation inside a museum experience. Having fewer boundaries relating to the physical world of reality, a realization of how museum virtualization easies the constraints of the physical world has come to mind a few decades ago. Tsichritzis and Gibbs (1991) realized that using VR would allow using “virtual settings” for artefacts that have no size, shape or any other real-world constraints giving flexibility to the options presented. VR technologies in history museums could be used to display virtual information about known-men-of-honour, as in history museums, artefacts may not be available. Through most of the current museum experiences using VR, a suggested intelligent museum is presented in Figure (4) explaining the entertainment component of the proposed I-city.

Fig 4 VR implementation inside the I-museum

In figure (4), the idea of a museum presenting the achievements, of historical individuals and their contribution to the development of the Egyptian nation in many different categories, could be in the form of pictures, videos and walk-through models ”virtualized environment” using VR technologies. As an example, the VR exhibit of the National Museum of Finland in 2018 where VR was used to walk through a virtually created model of the inside of R. W. Ekman’s painting ‘The Opening of the Diet 1863 by Alexander II’ to interact and experience these historical moments (Zoan, 2018); likewise, VR would be used in the I-museum to display a layer of interactivity and immersion in the honoured historical individuals history.

4.3. *Security services*

In this section we will be discussing the overall I-city security with a focus on AI- interactions based on deep-learning and feedback systems, however, this matter is too vast to cover, hereafter interested readers are redirected to list of references at the end of the paper.

4.3.1. Using neural networks to determine structural integrity

The main part of the presented analysis is the infrastructure of the introduced I-city and how much it should be secured, so this section will present the methodologies that should be applied to monitor the structural health and detect damages at their earliest stage on buildings and roads using deep learning technology. Previous researchers like Kudva (2006), Wu (1992) and Spillman (1993) used the Artificial Neural Networks (ANN) due to its capabilities in classification and pattern recognition to identify the damage in steel bridge or detect damage in composite cantilever beams. They have detected damages locations but they could not expect the damage’s severity. Many efforts have been exerted to train the neural network by Frequency Response Functions (FRF). Satisfying results have been gained in damage detection. The limitation of using FRF is that it needs a huge size of required data set to get a numerical structural model using a number of sensors.

In 1994, Tsou, P. and Shen have used three multilayer- neural network to detect the damage’s location and severity by using limited data required for detection and detecting different damages. Recently, in 2017, Ahmed Abdelgawad and Kumar Yelamarthi presented a platform to develop the Structural Health Monitoring based on IoT using piezoelectric (PZT) sensors that in turn convert mechanical stress into electrical charge. They used the measured values collected from these sensors to detect the damage location and size based on a suggested mathematical model. To monitor and track the damages in the proposed I-city, we suggest to use this platform combined with deep learning using multilayer ANN, Figure (5) explains the flowchart of the monitoring process and detecting the damage location and severity then report the responsible organization to apply the required maintenance and achieve the security for citizens.

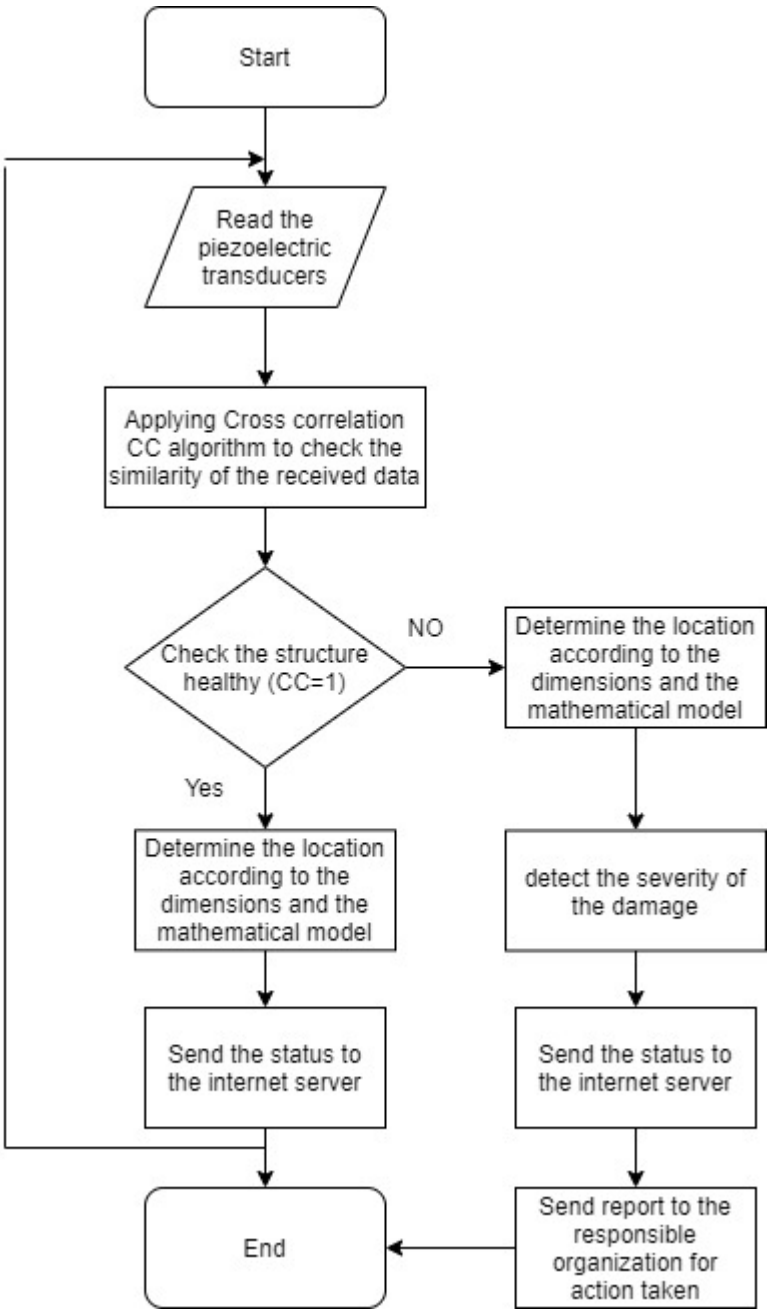

Fig. 5 Monitoring process Flowchart

4.3.2. Theft detection using collected data via the cloud

In a city, a major problem we do encounter is theft; fathoming such a problem and solving it is crucial for an I-city. Our main objective is to utilize a full-on mechanized observatory approach to the said framework that does identify theft, utilizing human conduct examination. Hence, robotizing the reconnaissance wherein human recognition is not needed. In literature, there has been indeed a substantial amount of research on surveillance analysis based on human behaviour.

Kuklyte in his paper proposed a general-purpose framework for detection of unusual events. i.e. A trolley being dragged outside the window when the area in the shop was unnoticed. It was detected only by the sensor cameras and alerted the human controller (Kuklyte et al., 2009). A similar approach was introduced by Stauffer and Grimson (2007); they proposed tracking activities like thieving, by learning the common patterns of individuals' activities over time, hereafter, solely

depending on feedback system and deep-learning. However, this approach is not sufficient enough when applied on a start-up base, as data collection will take time rendering said areas defenceless. Hence applying behavioural detection with pre-loaded datasets and room for machine-self-improvement will render effective and efficient. This can be interpreted as creating models of behaviours that can be used to describe behaviours, these models will enable pro-active surveillance. Moreover, to unfold such behaviours advanced methods for sensor data are to be implemented and extracted, thus detect the existence of -potentially- threating behaviour by means of smart tracking as shown in Figure (6) by Kamala, Ranjini and Manjula (2015).

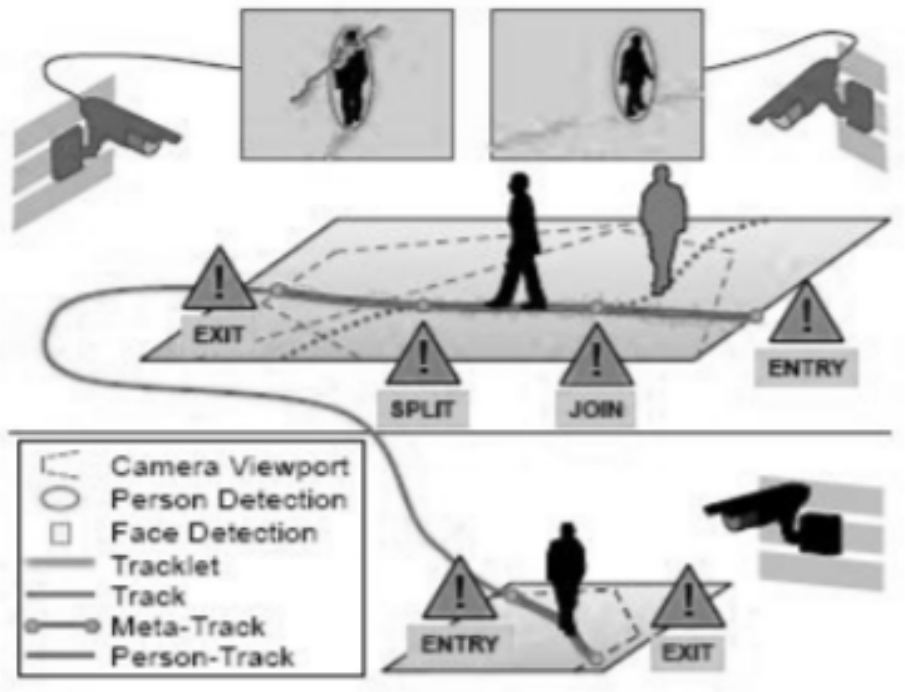

Fig. 6 Rough sketch of the tracking mechanism in action

Once the objects within each sampled video frames are isolated, an analysis is made of their relative movements with respect to the other objects. For example, subsequent differencing signals may reveal that an individual's arm is moving to a high position, such as the upper limit of that arm's motion at a fast speed. This particular movement could be perceived, as a hostile movement with a possible criminal intent (Kamala et al., 2015), hence flagging that personal as possible threat and sending a notification with facial information to the authorized connected device so caution can be taken along with the appropriate action(s) if needed. If a theft situation to a citizen or a mere shopper were to occur the said system can be slightly altered in a counterpart with a crowd flow smart system to provide the functionality on a much higher scale. Thus, providing a sensible theft detection and prevention system.

5. I-city layout

I-cities embrace the citizens to help in a smarter environment. Figure (7) presents the proposed layout for I-city explaining a general view for the city structure and the proposed services, which have been discussed in previous sections, connected to the cloud via the IoT network. This layout summarizes the facilities that can be applied in Egypt to construct the I-city.

Fig. 7 The proposed model for I-city in Egypt

For the deep analytical illustration, Figure (8) presents a proposal for an urban section of the I-city to explain the used tools to apply the offered facilities. From these facilities, the security facilities that have been analyzed through three aspects: building a prevention system using CCTV (Closed-circuit television) Cameras, Severity management system using piezoelectric sensors for Structural Health Monitoring (SHM) and building intelligent transportation system to control and monitor the traffic jam which is considered as a very important issue with the increasing of population and transportation utilities. The last aspect has been achieved using pressure sensors as shown in Figure (8) to detect the crowded zones that increased the delay for drivers and fuel consumption as well. All these systems and the resulted big data are collected via an IoT platform designed to take the appropriate actions on time.

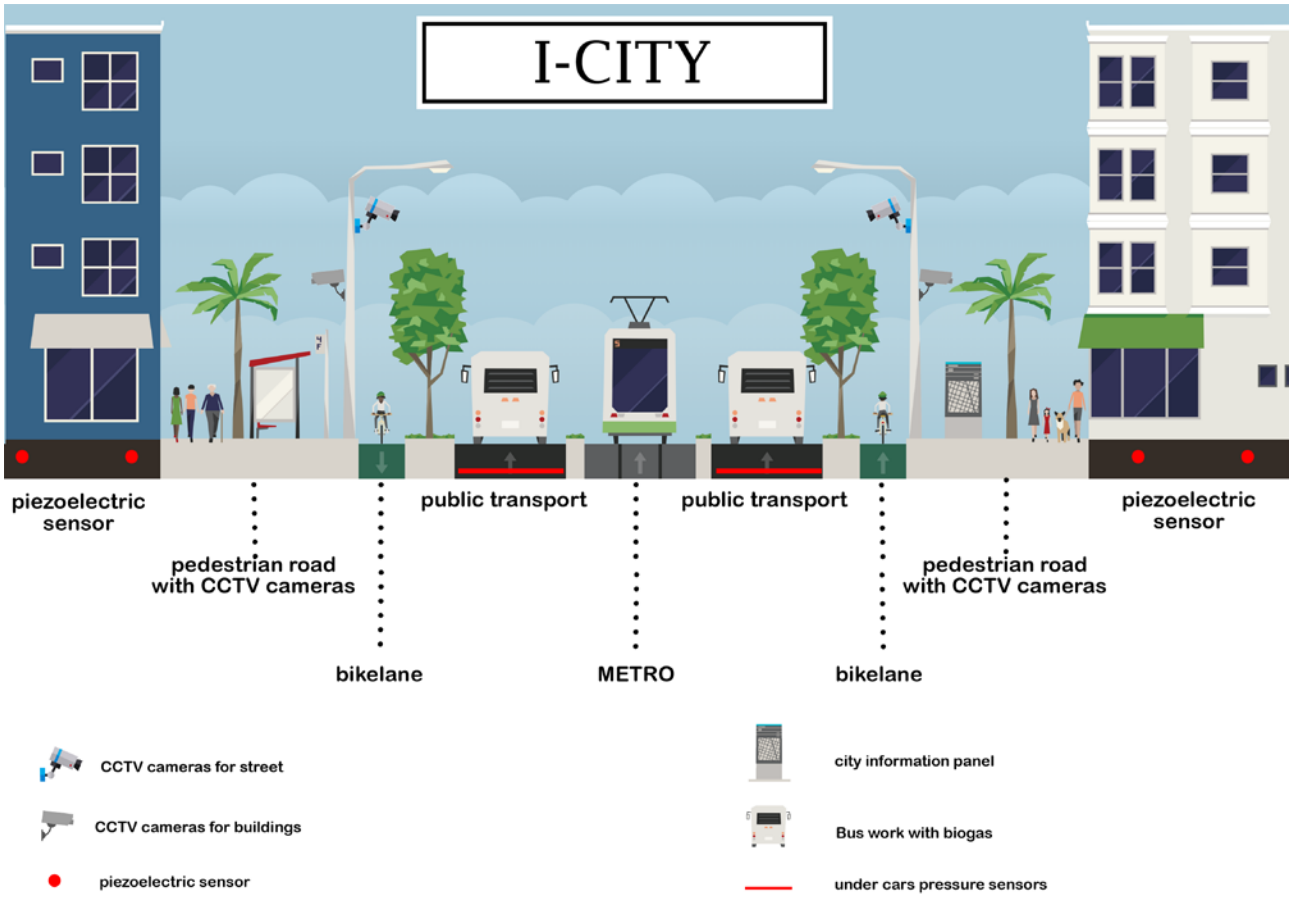

Fig. 8 A proposal urban section of the I-city

6. Conclusion

This work will open the way to set an infrastructure and basics to build an I-city serving all automated facilities that can be monitored and controlled via big data analysis. The establishment of I-cities in Egypt has become very vital to cope with the modern technology age and connect every entity with the internet to save the citizen's time and efforts and to be fully automated without any human interference. Throughout this paper, the proposed model focuses on connecting facilities of the city and how citizens can interact with these intelligent services. The proposed model is based on deep learning and using VR technology for shopping and entertainment facilities. Besides that, the security aspects have been discussed.

7. Acknowledgement

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Visual and thermal effect of contemporary buildings' facades on urban spaces

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Abstract:
A Striving for a comfort urban district, form, urban geometry and material design are key-decision drivers to avoid the urban heat island (UHI) effect. Commonly, contemporary buildings' façades are associated with modern materials that aimed countermeasure only the microclimate indoor. Recently, microclimate outdoor found to be highly responded with the surrounding materials on account of their optic and thermal properties. The perception of the occupants indoor is differently from outdoor for same material. Although researchers taking into account the horizontal material properties for the outdoor spaces, consideration of vertical elements are mandatory to prevent visual distraction and overheating for multifunctional urban districts. It is found that studies were limited for investigating the visual and thermal comfort of facades material to prevent UHI. So, this paper aim to investigate the contemporary glazing/opaque materials that define a relationship between indoor and outdoor comfort. The study also presents a review of the data collection methods utilized by the research studies that aim to highlight the recommended optical and thermal properties of materials. It creates an open discussion on the possible materials that has a property of comfortability in outdoor space to prevent the effect of UHI. The paper provides a concise starting point for future researchers interested in the cities' outdoor comfortability.

Keywords: Urban spaces, Outdoor comfort, Optical properties, Thermal effect, Materials

1. Introduction

Contemporary cities strive for highest comfort urban public spaces among several aspects. These aspects are relying on environmental and design factors. Environmental factor as air quality, climate status while on design factor, it relates to enhancement public spaces, human thermal comfort, social integration and hospitality. Among all of these factors, the thermal comfort considerations are gaining the top priority because it influences the comfortability, productivity and space engagement (Nazarian et al. 2019). Outdoor comfort is a factor that is connected to the macro-climate and effect of human-made features, design implementations. Comparable to indoor comfort, larger thermal boundary should be considered (Nazarian et al. 2019). However, to reach the satisfaction by users, not only the thermal comfort that should be enhanced, but also, the visual comfort. The visual comfort would define the perception of the surrounding urban public spaces by human being. The last mentioned two types of comfort, are critical factors contributing to desirable urban spaces.

Nomenclature	
UHI	Urban heat island
PET	position of
Tvis	transmissivity
U-value	coefficient of heat transmission
g-value	solar factor

1.1. *Urban heat island and thermal effect*

The urban heat island (UHI) effect is a phenomenon happening due to imperfections of the weather conditions and design factors in urban spaces. In other words, it is high stress of thermal effect in urban spaces due to environment factor or human-made designs features. In terms of design, the UHI is influenced by the urban form, geometry and surface's thermal and optical properties. However, in terms of the environmental factors, the UHI influenced by wind velocity, temperature, albedo and air quality (Id, Id, and Presciutti 2017). While in terms of design consideration, it includes the horizontal surfaces' properties e.g. pavements, seating materials and vertical surfaces' properties e.g. opaque, glazing facades and vegetation. Also the ambient temperature getting higher than the suburban rural areas in case of hard surfaces thermal effects (Mohd fadhil Md Din et all,2012). These hard surfaces includes the building materials, horizontal and vertical surfaces (e.g. asphalt, concrete) (Mohd fadhil Md Din et all,2012). Accordingly, designers should aim at ensuring lower effective albedo (Mohd fadhil Md Din et all,2012). In hot seasons, the urban surface's solar absorption is the main dominant issue that cause the UHIs (Method 2018). Additionally, the high reflectance materials in the urban spaces as glazing facades could result in double effect: thermal and visual perception dissatisfaction. when solar radiation hit the surface, it absorbed, reflected and transferred. And, the lower surface reflectance, the higher absorption of the solar radiation (Method 2018). Also, the higher reflectance, the high visual discomfort. Accordingly, investigating innovative cladding materials are strongly suggested in order to produce a well comfort urban space (Method 2018). Importantly, the design choice of outdoor materials is significantly reflected on indoor microclimate and energy performance of buildings envelopes. Nevertheless, "*due to the significant urban surface and air temperature reduction potential of reflective technologies, heat mitigation solely focusing on "cool" materials those with high solar reflectance and high infrared emittance applied to building envelopes (roofs and walls) and urban structures (roads, squares and footpaths) dominates current scientific research and the global implementation of UHI mitigation technologies*" (Method 2018). Although in another study in Iran (hot climate), they demonstrated the weak relation between the UHI mitigation and enhancement of the thermal comfort in case of higher surface temperature. Meanwhile, they stand on health problems due to heat stress from heat stroke to death. These lead to important of investigating the parameters and elements to overcome the UHI phenomena especially in hot seasons. These elements could be classified into surrounding materials, urban form, anthropogenic heat, evaporation surfaces and vegetation coverage (Farhadi, Faizi, and Sanaieian 2019) (Mohd fadhil Md Din et all,2012).

1.2. *Thermal comfort*

The thermal perception in urban public area should be achieved in comfort levels. Contemporary designs go for architectural solutions without a real consideration of the advanced building design with respect to human comfort aspect in term of thermal comfort. Since UHI could happen due to inappropriate material selection, guidelines should be adapted (Mohd fadhil Md Din et all,2012). Reflectivity of materials proofed the high importance of contributing to thermal comfort and energy consumption as well (Álvarez et al. 2014). The reflectivity of materials is applied to either glazed or opaque surfaces. Either vertical or horizontal surfaces in multifunctional urban districts are under investigation. On the vegetation implementation aspects, increasing the vegetation coverage by 10 % will increase the urban thermal comfort and reducing PET by 9.36 °C (Farhadi, Faizi, and Sanaieian 2019). Also, a study done by (Bozonnet et al.,2015), recorded a reduction in cooling load by 13% in buildings near parks compared to those away from the same park (Mehaoued and Lartigue 2019a). In other words, the larger area of opaque, translucent material of surroundings results in higher heat stress.

1.2.1. Adaptive glazed facade

Generally, the ideal adaptive façade is the one that reduces the energy indoor and improve the micro-climate comfort (Favoino, Overend, and Jin 2015). Recently, this adaptivity extended to the outdoor comfort as well. The three main properties that define the glazing performance are *Tvis, g-value* and *U-value* (Favoino, Overend, and Jin 2015)(Giovannini et al. 2017). These thermo-radiative properties are responsible for the quality of glass selection for building envelopes. *According to Eurocode EN 410:2011, the light transmittance is the fraction of the incident light that is transmitted by glass, while the g-value is the total solar radiation that is transmitted by the same glass .On the other hand, Eurocode 673:2011 defines U-value that it is the glazing parameter that defines the ability of the central part of the glazing to transfer heat.* In hot regions and seasons, due to the solar radiation energy received by the glazing due to its quality, the stored energy within the glazing façade will be released. On thermal equilibrium concept, the heat stored will release to be in thermal equilibrium between the inner boundary condition (indoor) and outer boundary condition (outdoor). Therefore, UHI will be occurred more at night when outdoor temperature is lesser than morning. This usually occurs in all materials but more in glass depending on it is type due to higher translucency. Usually, the maximum heat urban stress occurs after 3 to 4 hours after sunset (Chow and Roth 2006). The path to vertical buildings due to lack of land and aesthetics of curtain walls in envelopes design, lead to face energy consumption challenge. Using glass, rises the energy consumption, cooling loads in hot regions and heating loads in cold and temperate regions indoor. The glass has higher solar radiation reflectivity that could reach between 30-90% to increase the micro-climate thermal comfort. This property has dual effect; enhancement of energy efficiency in building and surplus heat stress in urban spaces (Mehaoued and Lartigue 2019a).

A Case study held in Algeria, studied the effect of the reflective glass façade on microclimate indoor and outdoor. They found that near air temperature to surfaces are much higher than those away. Also, they proofed that the reflective glass has a negative thermal and visual effect on the urban spaces (Mehaoued and Lartigue 2019a). A comparative analysis done in Portugal; the aim was to analyze the smart glazing that recently introduced to the market to enhance the indoor thermal comfort. The analysis based on the optical properties of 4 different glazing (solar control translucent and green, low-emissivity, and self-cleaning), especially the transmittance of each. The results indicate the efficiency of glazing in daylight transmittance and solar gain as well (Sacht et al. 2016). As seen in Fig. 1, the 4 types were varying in transmission %, the highest, the lower indoor cooling energy efficiency and vice versa. Each glazing is good depending on the location and accordingly, climate, where, solar control would be very good in hot arid climates as it reduces the solar gain. (Sacht et al. 2016). According to chart developed by Favoino, another smart glazing technologies are plotted and compared to static single glazing type, it concluded the in-linear behaviour of these new glazing technologies when connecting between the minimum and maximum values of *Tvis and g-value*, see Fig. 2 (Favoino, Overend, and Jin 2015).

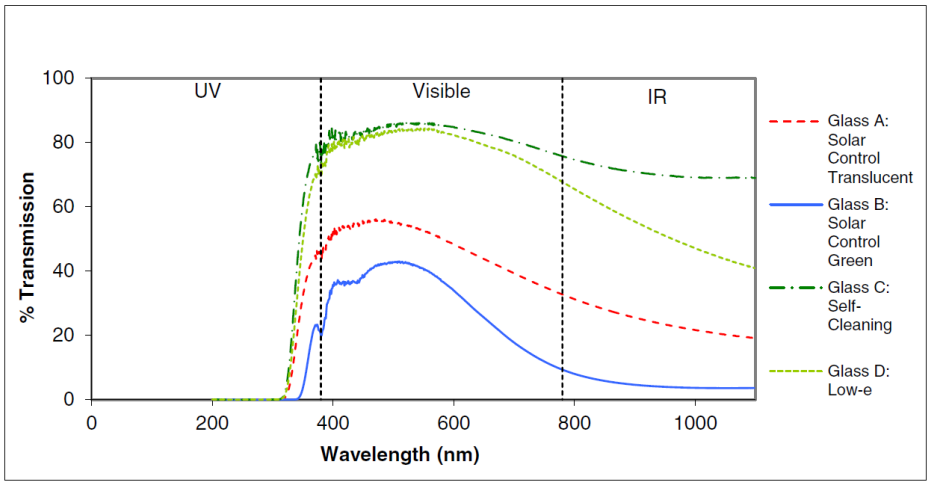


Fig. 1 comparative analysis for 4 smart glazing types: transmission curves vs spectrum distribution. (Sacht et al. 2016).

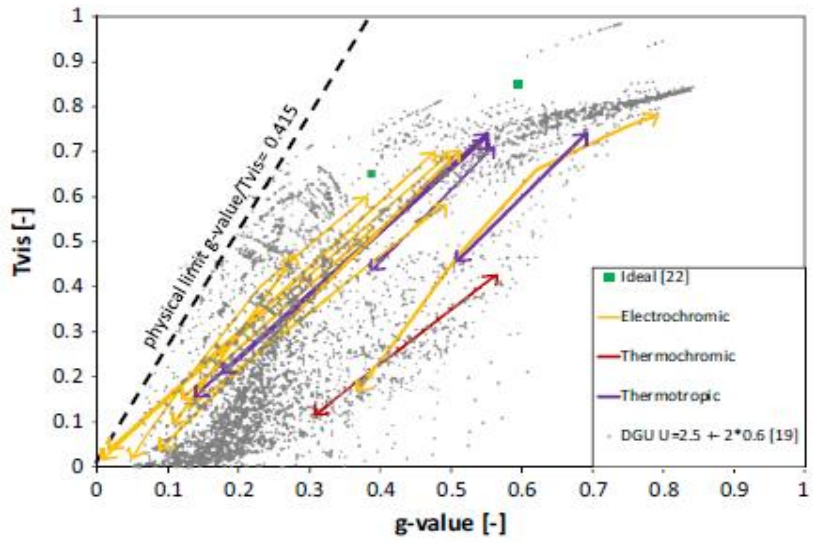


Fig. 2 Tvis and g-value comparison of different smart glazing technologies to single glazing type (Favoino, Overend, and Jin 2015).

1.2.2. Opaque

Designing an urban multifunctional outdoor, includes several categories of materials assigned. The opaque materials can be divided into two main categories; pavements and vertical elements eg. Claddings. Technically speaking, *"Albedo"* of a surface is a paramter that defines the fraction of the incident sunlight that the surface reflects (Coakley 2003). The albedo is depending on material type, yet, vegetation records low albedo value means low sunlight reflection. Generally, vegetation albedo is various upon seasons between 0.16 and 0.20. According to a study done in rome to analyze the thermal and visual effects of historical materials on urban spaces, the results show that the pedestrian's outdoor micoclimate comfort is influenced by vertical mateials eg. Building envelope and not the pavement(Rosso et al. 2018). The higher the albedo, the more inter-reflection of sunlight, accordingly, negative thermal effect of the user perception (Rosso et al. 2018). These inter-reflections result in increase the air and mean radiant temperature (Rosso et al. 2018).

1.3. *Visual distraction*

During the early design stages of any architectural project, ideas of integrated comfort: outdoor and indoor should be the driver for designs. Since thermal comfort is the margin in design, same importantly, the visual comfort is driver for design concepts. Humans spend most of their time in indoor spaces and urban districts (Al Horr et al. 2016). Accordingly, the designers should ensure all comfort aspects including visual and non-visual comfort. As visual helps good perception of urban space and non-visual enhance the human health and his productivity (Elareef 2019) .On the other hand, unappropriate surface material selection could lead to visual distraction. Due to the pervious, the design should provide a non-distraction high reflection of materials' surfaces and at the same time reflection property within limits in order to reduce solar radiation gain. The reflective glass of building's envelope results in high probability of outdoor glare effect due to high reflectivity surface property outside (Mehaoued and Lartigue 2019a), see Fig. 3. According to ISO 9050: the optical property of glass is defined by absorptivity a (-), transmissivity **τ** (-), reflectivity q (-) (Favoino, Overend, and Jin 2015). Where, solar reflectivity is responsible for visual comfort outdoor. On the other hand, transmissivity and absorptivity are responsible for indoor micro-climate comfort and should be controlable to achieve low cooling/ heating enegry consumption. Accordingly, compromisation of optical and thermal materials' properties should be maintamed inorder to achieve comfort urban district and nearly zero energy buildings.

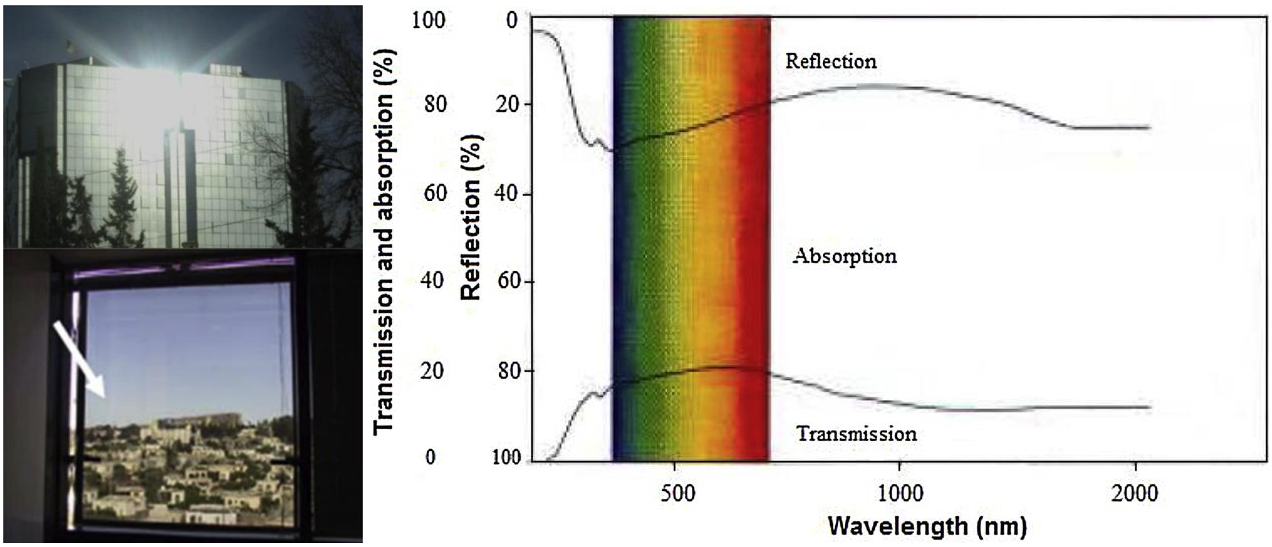


Fig. 3 case study building from outdoor urban space (above) and internally (below), using blue reflective glass, 0.32 solar reflection. The spectrum distribution of this glass is explained on the right in relation with reflection % as well as transmission absorption % (Mehaoued and Lartigue 2019a) .

2. Methodology

To investigate the possible materials that could be basic for building construction, a review of common materials has been studied. The corresponding materials should be studied in comparison of specific properties. Since the main aim of this paper is visual and thermal effect of materials, Fig, 4 is listing the materials properties.

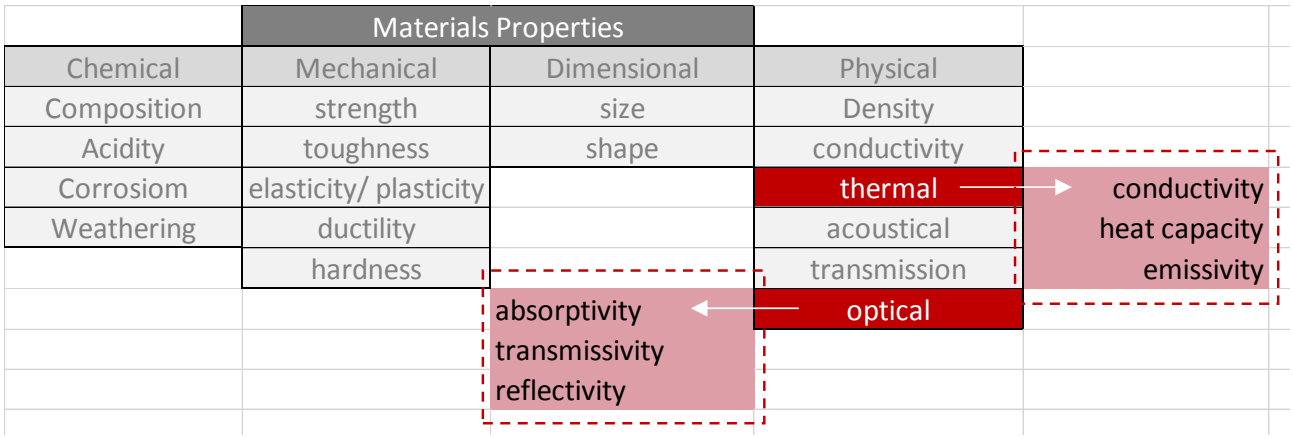


Fig. 4 Methodology adapted for the paper's work including all possible material properties and highlighting the studied ones in red.

2.1. *Common digital tools for thermal and visual investigation.*

One of the main phases of technical consideration, is the type of tool that is used for testing every material. Usually, the testing is done by the manufacturer in accordance to compulsory codes and regions standards. While it is more important to conform the quality of testing of such materials. The main tool used for measuring the surface reflectance is spectrophotometer. The Minolta Photospectrometer CM-2002 is a compact, hand-held instrument for measuring the spectral reflectance of surfaces with a diameter of more than 8 mm. This instrument uses the optical fibres as passage for light to measure the light intensity to the normal that are received by the surface (Mark Boulton, n.d.). It is important to mention that these instruments are being updated continuesly. Yet, infrared cameras are to documenting the thermal diagrams of construction component, not only the surface behviour, but the construction componenet system as whole function("Investigation of Thermal Effect on Exterior Wall Surface of Building Material at Urban City Area" 2012).

2.2. *Proper materials*

Towards a comfort urban public multifunctional space, adequate materials should be assigned. These materials should be having a thermal and an optical good performance indoor and outdoor if it is applied building envelope. For that purpose, a collection of common studied and used materials are gathered below. In

Table **1**, although light concrete has high conductivity (1.63) but high albedo (0.7) as well, so, is considered as cool materials that result in decreasing the surrounding temperature (Farhadi, Faizi, and Sanaieian 2019), see Fig.5. In same way, construction of concrete (albedo=0.5) as pavements decreasing the surface temperature by around 7 ℃ comparing to asphalt (albedo=0.2). But the higher the albedo, the higher visual distraction as in white mortar (albedo= 0.66). Accordingly, an aproperiate compromise should be attempted (Rosso et al. 2018).

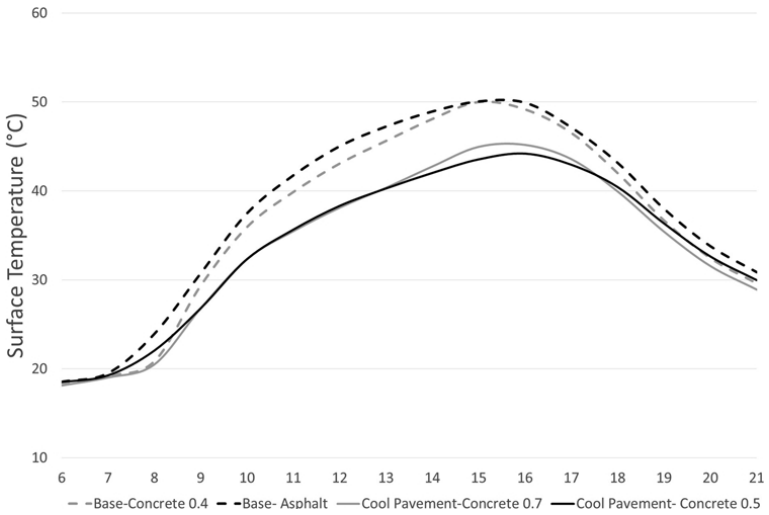
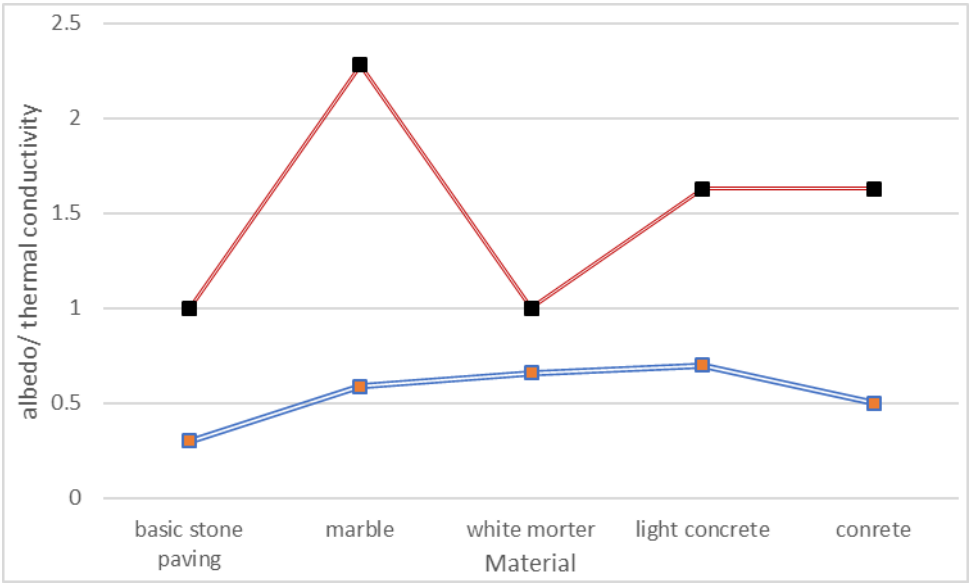


Fig. 5 surface temperature changes according to material changing, higher albedo result in lower surface temperature (Farhadi, Faizi, and Sanaieian 2019)

Table 1 Optical properties of opaque materials

In accordance to previous studies, selected materials and their optical and thermal properties explained below;

Material	albedo	Thermal conductivity
Basic stone paving	0.3	1.00
Marble	0.59	2.28
White mortar	0.66	1.00
Light concrete	0.7	1.63
Concrete	0.5	1.63



On the other hand, a case study in the Malaysia it shows different materials that have thermal effect on the surrounding environment of the building according to its heat impact, see Fig.6. Some of those material have a thermal impact on the vertical surface according to its thermal behavior as bricks, granite, concrete and white concrete tiles. (“Investigation of Thermal Effect on Exterior

Wall Surface of Building Material at Urban City Area" 2012). According to various studies, results showed that the bricks during the investegatment had the capability to store and absorb heat better comparing with the other materials. Those studies contrbute to increase the designers and planners' awearness when they take any decision for choosing facades' materials without looking only for their esthetical aspect but also on energy consumption of buildings and the local climate. ("Investigation of Thermal Effect on Exterior Wall Surface of Building Material at Urban City Area" 2012). Some of those expermients used infra thermograph to detect thermal performance of some selected buildings.

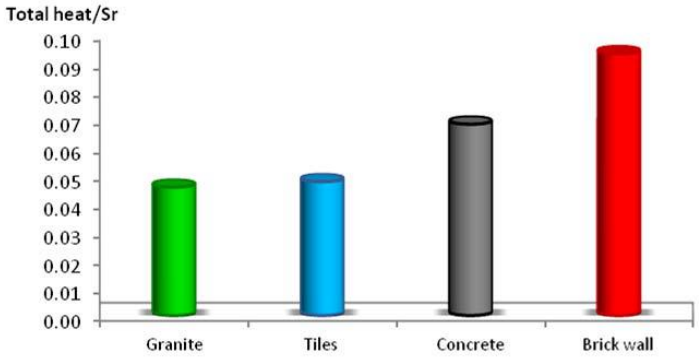


Fig.6 Normalized heat (total heat/solar radiation) using average heat of convection (qconv), heat of radiation (qrad) and solar radiation (Sr) ("Investigation of Thermal Effect on Exterior Wall Surface of Building Material at Urban City Area" 2012)

According to this case study, the result shows that the least sensitive material that doesn't absorb and store heat a lot were in the following order: white concrete tiles > granite > concrete > brick. As a result, we can agree that white concrete tiles and granite are the most suitable material for covering the external vertical elevations of the building which can provide a comfort atmosphere for the surrounding outdoor environment and make the urban microclimate better.

3. Conclusion

From the previous study, it is clear that early material design and selection of any construction, would enhance the micro and marco climate as well. The designers should compromise the decision of selecting materials within certain limits. In order to provide dual indoor and outdoor visual comfort, glazing reflectivity should not be high enough to cause glaring and low enough to increase the cooling indoor energy consumption. Also, design considerations should include vegetations and multi-green areas of different functions. Where the vegetation factor is highly important as it is reducing the surrounding temperature in multifunctional urban spaces. The opaque material selection based on it is albedo could be differently if it is vertical or horizontal insallation. On horizontal opaque surfaces as pavements, the higher elbedo, the lower surface temperature but high risk of visual distraction. Oppositly, the higher albedo of vertical surface, will reduce the surface temperature, but not ensuring the micro-climate in cold seasons.

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Branding Museum

Framework for Integrating Interactive Display Techniques Through Movies

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Abstract:

Since the 20th century, museums are a vital aspect in the country which create a strong cultural identity, improving the economy through raising the tourism rates, providing source of learning, and sense of place for visitors. The roles of the museums were shifted from being just preserving artifacts and monuments in glass boxes to be an interactive educational tool where visitors are attracted more to lively museums that convert them from consumers to active participants. In the light of this role, some movies started to integrate museums leading to new attraction magnet that leads to cinema growth. As an interactive tool in cinema, IMax started to increase allowing people to engage in this experience virtually. Branding museums through movies is one of the innovative applications of smart technologies used lately causing the cities to be much stronger, improve resources allocation, strengthen communication and social cohesion. Museums integration in movies affect the emotions and visual perception of watchers that consequently increase their willing to visit museum.

The aim of this research is to design a framework to integrate the movies and interactive display techniques for branding museum to enhance visitor's engagement and experience. This research will pass through qualitative method which is based on analyzing the museums integrated in movies and its relationship with the display techniques and the visitor's engagement. This guideline should enhance the museum's experience and enhance visitor's engagement.

Keywords: Interactive Display Techniques, Museum Visitor's Engagement, Museum Movies Branding

1. Introduction

Museums have always been known for collecting and displaying objects that have cultural, religious or historical importance (Arinze, 1999). Displaying monuments should be designed very well. Accordingly displaying should not be restricted with the concept of saving the monuments for the future generations through displaying them in glass cages, security guards and do not touch signs. Visitors lately are no longer encouraged by being passive consumer instead they want to involve, participate and interact with what they went to see. Consequently, the following figure shows a graph that explains that the museums is one of the least destinations targeted by different age group in Australia. The question that is raised why the museums became last option in the visiting list In the 20th century the competition is transforming the traditional static museum to active museums to engage visitors to visit and revisit museums not any other places (Black, 2005). Besides using display techniques which not only encourage children and adults but also help them to have a memorable experience inside the museum (Evans, 2015). Lately the whole world is working to shift their museums from the perspective of function and interaction. Furthermore, some museums already started this transformation. Basically, contemporary art museums and natural history museums are well known for encouraging visitors to be more active and responsive. In

Egypt, tradition displaying techniques of the cultural and heritage monuments is one of the vital issues that needs attention and should be considered in the Egyptian museums. Moreover, not only the interactive display techniques will add value for the collections but also will make the museums more attractive by meeting the visitor's (Black, 2005).

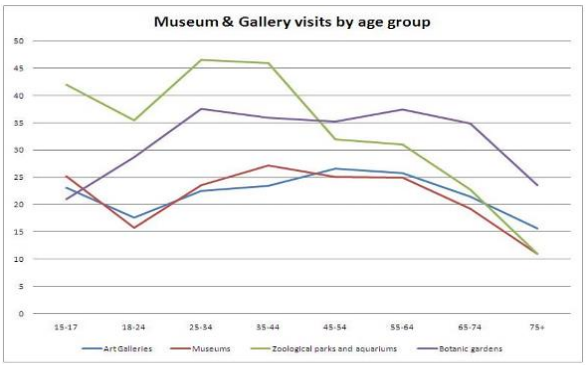

Figure 1: Museum visitors' percentage, (Evans J. W., 2015).

In the past decades, many countries faced a challenge of including different cultures and wide range of monuments and artifacts with a poor technique for displaying them to public. On the other hand, today's generations are used to advanced level of technology and interaction that leads to another complicated challenge (Shamsidar A. et al, 2018). Lately designing a museum took a different approach to transform it from place for displaying and preserving monuments, to place based on visitor's needs and interest, allowing them to live the story inside it (Shamsidar A. et al, 2015). Museums have critical roles toward its country as it contributes in raising economy, improving tourism rates, reflecting culture and preserving history. While its roles toward the visitors is being an educational source and entertainment place to visit. Accordingly, designers should be aware of providing unforgettable experience and allow the visitors to memorize what they felt (Black, 2005). As a result, museums are passing through a transformation to reconsider its traditional roles and create new context, experience and atmosphere (Marinescu, 2018). On the light of these needs' movies are considered one of most effective techniques to use as tool to influence public, create the needed atmosphere and experience in addition to brand museums. Moreover, movies create a story of museum and its displays in which affects the watcher curiosity and willing to experience what they only see on reality and interact with it (Wasson, 2005). For example, MOMA (Museum of Modern Art), Smithsonian, met (Metropolitan Museum of art) were used in the movies and achieved a very high revenues cinematic wise and increase the number of visitors of these museum (Groff, 2017). The aim of this research is to design a framework to integrate the movies and interactive display techniques for branding museum to enhance visitor's engagement and experience. In addition to the qualitative methods this research will be passing through between qualitative the phenomenology research design.

2. Literature Review

In this research, three pillars will be discussed; museums, display techniques, and branding museums through movies. Museum's types, evolution, roles, problems, visitor's engagement will be discussed in the first pillar. In the second pillar types, roles, and challenges of display techniques will be explained briefly. While in the third pillar branding museums through movies roles, effects and examples will be presented. To conclude all the previous data, a framework will be conducted that measures the relation between movies, museum's display techniques and the visitor's engagement.

Museum is a global concept since its establishment in the 3rd century B.C. it is essential to find at least one museum in any country regardless how small the country is (Arinze, 1999). The

old museums were always dreary and uninspiring as their essential role was to collect, preserve, study, and display the artifacts to public and save them to future generations. As a result, museums were only attractive place for educated people and exclude the general public (Haban, 2015). Museum's focus is transformed from object centered to visitors centered as shown in figure 2 (Vermeeren, et.al , 2018). Museums participates in many disciplines in the community such as increasing the rates of tourism, increase country's economy, revive country's history, reflects the country's culture, considered as a source of different types of learning: formal, informal, and self-directed and finally it could be one of the most entertaining places (Shamsidar, et.al, 2018). In order to deliver all these roles, ways of displaying should be designed very well. Although some visitors prefer the traditional ways of reading label or hand manual, others prefer to interact and engage with creating new sense of experience (Vermeeren, et.al, 2016). Hence, visitors could be classified in to four categories to figure out their needs (Shamsidar, et.al, 2015):

- Socially- motivated visitors which are 48% of museums visitors
- Intellectually- motivated visitors which are 39% of museums visitors
- Emotionally-motivated visitors which are 11% of museums visitors
- Spiritually-motivated visitors which are 3% of museums visitors

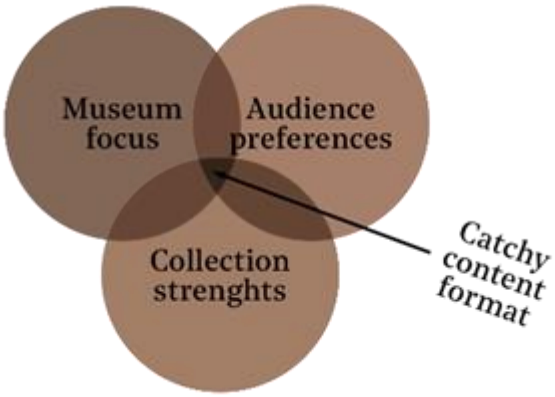

Figure 2: Catchy zone based on museums lately focus, (Vermeeren, et.al , 2018)

Transformation of museums lately required by the new generations to integrate technological engagement, and nonstop demands of entertainment, makes it very difficult to grab visitor's attention (HASSASSIAN, 2018). Moreover, most of the people are interested on the storytelling, they expect to watch and listen to history, environment, transporting, or conservation process of the artifacts (João, et.al, 2018). Displaying means showing something in certain place to be available for everyone, however, some aspects should be considered while designing museum displaying techniques such as outer environment trends and visitor's needs (GATERE, 2010). Displaying is not only a factor that could affect on visitors either engage them to visit or discourage them from visiting the museum but also is a cornerstone of communication between museum and visitors (ELDamshiry, 2018). Visitors vary from each other, however, there are two common things in visitors; their emotions and curiosity that could be reflected in need of touching, physical interaction, being surprised out of expectations, or visual interaction with displays (Dixon, 2015). Thus, museum designer would strive to improve this link by integrating new methods of displaying either in museums or to involve it in museum movies (Griffiths, 2015). The research classifies display techniques according to the way of displaying such as static or interactive as shown in figure 3 or according to the function as shown in figure 4 (ELDamshiry, 2018).

Figure 3: Display Techniques Types

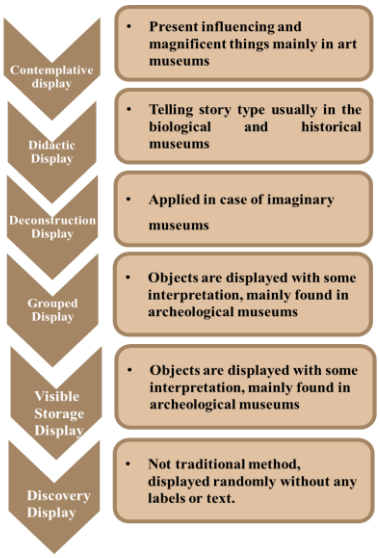

Figure 4: Display Techniques Types

Branding as a technique means adding value for product or place in order to engage people for using it frequently (Sammut-Bonnici, 2015). Museums are used to brand the history of countries, culture, and monuments. Furthermore, branding museum itself is one of the interactive techniques used to convince and attract visitors to the museums (Caldwell, 2003). Thus, from the perspective of the museums the nature of collections, museum location, architecture should be highlighted in order to be able to communicate with visitors and influence them (Sammut-Bonnici, 2015). Cinema affects on people's perceptions positively or negatively depends on the material presented to the public. Museums are involved in the movies in different ways as shown in figure 5 (Wright, 2015).

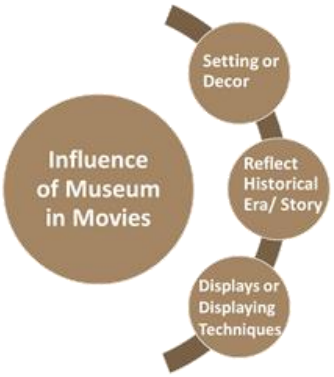

Figure 5: Influence of museum in movies

Cinema industry involve a lot of parties to produce an effective movie. Supposing everyone is responsible for a certain role in the movie (Sallie Deysel, Sam Tomlinson, 2015). Figure 6 shows the main participants that should be involved in museum movie making.

Branding main target is to allow visitors creating a clear instant recognition of museums in a various form. For example, museums brand could be a logo, name, location perception, presenting collections these aspects called a touch points (Europa, 2016). Non-profit organization such as some museums need many factors to be implemented in order to be able to survive with the other competitors. Branding is useful if it motives the way museums wants to be reflected or matches with their vision (Kim, 2008).

3. Methodology

The methodology in this paper is a qualitative method based on the concluded framework of the literature review which is divided into two parts. The first part is the selection of five movies that integrate museums as case studies are analyzed through the framework. The second part in the framework includes the relation between the type of movies, the display techniques used and the setting used in the movies. The experience of visitors is shown in the second part of the framework which compare between the numbers of visitors of the museums the year the movie was produced, the movie revenues, and the experience the users get either it is educational, exploration or leisure. The increase of the visitor's numbers is measured in the year after the movie released to be able to measure its effect on the public willing to visit. This would test the experience and perceptions of people which is called phenomenology research design and the relation of the display techniques and movies types that results engagement.

Limitations of this research:

- People age will cause different perceptions of the movies and display techniques
- Diversity of personalities and needs
- Types of museums involved in movies always used to be either NHM or Art Museums
- Movies Duration
- The entry of some international museums are free which lead the paper to measure only the number of visitors not the museum revenue.

4. Results and Discussion

The results of this research depend on the reactions of people after the two experiences they will be involved in. According to the aim of this research using interactive displaying techniques and involving the museums in movies will enhance many aspects as mentioned before from community, museum, and visitor's perspective. In addition, proving this proposing idea will create a framework and guidelines for many parties in different majors that will cooperate such as the architects, designers, writers and many others.

Movie 1: The New Rijksmuseum, Amsterdam

This movie is considered a documentary shows the process of museum renovation that took 10 years instead of 5 years and stopped in the middle due to funding issues. This movie is one hour and half and it was not interesting for people as it only reflects the process of renovation of the museum and the curing process of it's displays. The museum influence in this case was setting and the displays story. This movie did not neither encourage visitors nor affect their curiosity or emotions. This movie provided informal education due to the unexpected data given through out the process mainly related to the design of museum wise not data about museum itself or its displays. The increase of the visitor's numbers is measured in the year after the movie released to be able to measure its effect on the public willing to visit.

Movie 2: Black Panther Movie High Museum of Art Atlanta

This movie is thriller mystery that involves a story of man called T'Challa, after his father's death, he returns home to Wakanda to inherit his throne. However, a powerful enemy related to his family threatens to attack his nation. Certain artifact is displayed in the high museum of art that is named the British museum. The museum influence in this case is being a setting to the robbery scene and providing some brief information about some displays. This movie compared to the other cases got the highest movie revenues and percentage of viewing. In addition to the increased number of visitors after the movie has been released which is not the highest compared to the other case studies.

Movie 3: Ocean's 8, MET Museum, New York

This movie is thriller crime that presents women is released from jail and gathers a special crew of seven women to steal a diamond necklace, value 150 million dollars, from the Met Gala. The robbery scene is hosted in the MET museum. Consequently, the museum influence in this case is setting and history of the diamond which is one of the museum's displays. The informal education presented in this case about the museum itself and the value of the diamond. This movie has the highest percentage of viewing compared to the other cases. However, it did not increase the number of visitors comparing to other movies.

Movie 4: Paddington, British NHM, London

This movie is fantasy adventure and considered as a family movie that involves a story of a bear that came from the jungle to London, and hateful British natural history museum taxidermist director started haunting the bear to add it to the other monuments in the museum. Here comes the influence of the museum as a setting in the chasing scene between the bear and the director. Although this movie is suitable for different ages, but it did not increase the number of visitors as much compared to the other cases in addition to the percentage of viewers is the second highest percentage compared to other case studies. In this movie the museum displays are shown as décor not as displays history.

Movie 5: Night at the Museum, Smithsonian NHM, Washington

This Movie is fantasy comedy that presents a museum guard that was surprised that the museum displays come to life at night and starts the story of how to manage these displays and save them every night. Unlike the other case studies in this case study the museum influence is setting, displays story, and the displaying techniques. This movie was new for introducing the museum branding in 2004. The visitors experience of this case study as shown in the matrix used two types of education informal and self-directed. Not only educational but also the leisure experience shows the museum itself interesting. In addition to the exploring experience watchers and visitors were able to explore the environment transformation and museum itself as design, section. In the movies revenues is the highest compared with the other case studies and the second highest in the number of visitors increased after the release of the movie.

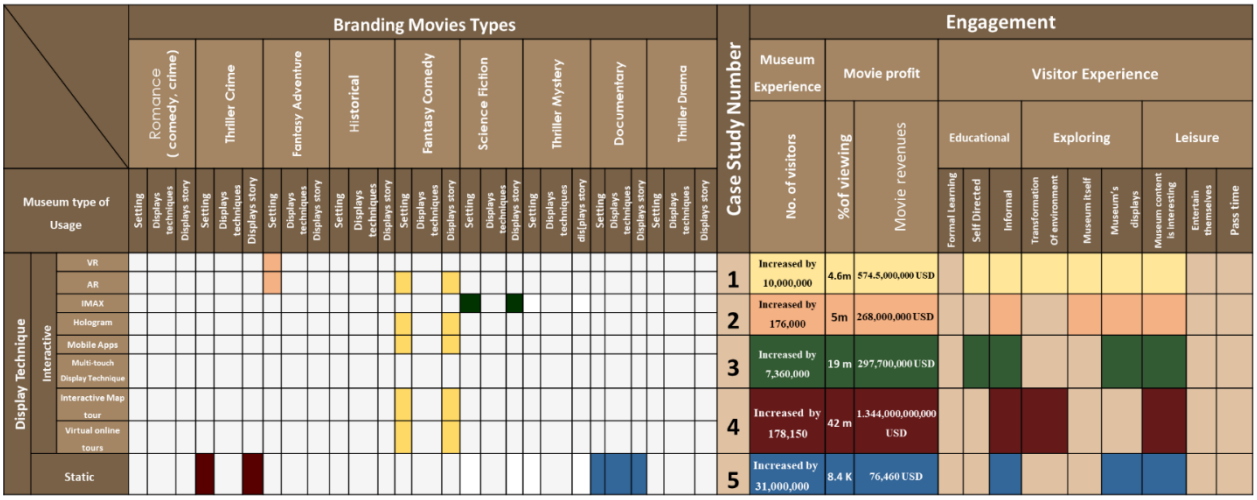

Figure 8: Framework of the 5 movies

Movies key:

- The New Rijksmuseum, (Amsterdam)
- Black Panther (High Museum of Art, Atlanta)
- Ocean's 8 (MET Museum, New York)
- Paddington (British NHM, London)
- Night at the Museum (Smithsonian NHM, Washington)

Figure 9 shows the highest percentage of visitors' numbers after the production of the movies which in movie 1 and 5 are the highest. This means the more the interaction of users in the movies, the more the numbers of visitors increase.

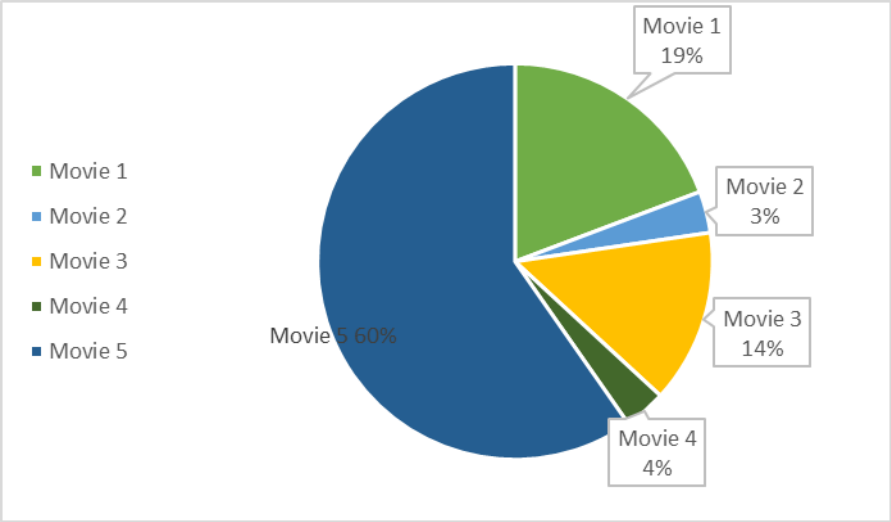

Figure 9: The percentage of the museums' visitors after the production of movies

It was observed from the matrix results the most effective and successful movies involve the story of the museum or the displays of the museum not only the museum as a setting and décor for the scene. The number of visitors increased in some museums after producing the movies. Most of the movies were integrated as an educational tool which affect the users' experience.

5. Conclusion

This research highlighted the roles of museums within the society throughout time, vacillating between main role of preservation of exhibits in addition to cultural education, and the current role of leisure and social interaction. Most of the previous studies were concerned with the exhibition functional design and only few studies were concerned by the effect of the display techniques on museum visitor's engagement, either in form of experience or on their learning identity and behavior in their visits and revisits. The main aim of this research was to brand the museums through innovative applications of smart technologies such as the interactive display techniques, strengthening communication and social cohesion through movies which is the most effective tool on people's perceptions and emotions. The results showed that these two techniques were very successful not only for increasing number of visitors or enhancing the visitor's engagement but also for the country socially and economically.

6. Recommendations

This proposal should be presented to the ministry of tourism, antiquities, and culture to help in working on enhancing the museums. To expand the findings from this research, there are some recommendations for upcoming research can be expressed. This study faiths to make known the powerful implications of Innovative applications of smart technologies in museums to make cities stronger and well known by its culture and history, in addition of improving its resources allocation, strengthening communication between museum and its visitors (social cohesion) and. One specific advice that can be offered from conducting this research, for designers when dealing with the integration of technology they must understand the people needs, ways of satisfying them, and external trends of their culture. It is also recommended to the ministry of antiquities, tourism and culture to develop an official entity for developing and monitoring the museums and preserving their history in an innovative way. While there is a request for the movies scenarists to involve the museums in their movies either as a setting or for museum's story or its display history. This allow participating in raising the number of the visitors where they would gain cinematic profit and raise the percentage of viewers.

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Hydrophilic Building Design for Green Roofs in Arid Humid Regions

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Abstract:
Adding green roofs to buildings is an efficient way of incorporating greenery and biodiversity in urban environments. Green roofs increase a buildings' aesthetic appeal and generally improve a buildings' energy performance whilst increasing its amenity value. The implementation of green roofs is commonly halted due to many issues. Among these issues is that green roofs require regular irrigation and maintenance, which significantly adds to the overall cost of constructing green roofs.
This paper discusses the possibility of using hydrophilic design as a means of providing a sufficient and sustainable source of irrigation to integrated green roofs in arid-humid regions. This will be conducted through investigating different passive methods of water harvesting from air humidity and analyzing different types of green roofs and their water requirements. This paper will present a framework that will enable users to identify the appropriate hydrophilic, water harvesting method that will produce the necessary amount of water to irrigate each type of green roof.
Employing these hydrophilic design approaches will allow green roofs to be self-sufficient by cutting the required costs for the maintenance and irrigation processes.

Keywords: Hydrophilic Design, Green Roofs, Passive Water Harvesting,

1. Introduction

According to the Oxford dictionary, the term "hydrophilic" refers to an object or a property that attracts water molecules (Oxford dictionary, n.d). Its opposing term is "hydrophobic", meaning "tending to repel or fail to mix with water." (Oxford dictionary, n.d).

A hydrophilic design approach is an approach that attracts water in all its states, whether as atmospheric vapor or as a liquid. Hydrophilic/hydrophobic design approaches have been used in many aspects in the architectural field, sometimes as a theory and other times in the form of a material or a mechanism designed to attract or repel water.

Water harvesting methods can be categorized to mechanical techniques and passive techniques. Passive techniques rely on the use of hydrophilic materials, natural sources of energy and specially designed architectural elements for water catchment.

Water harvesting methods utilize natural resources for water production. These sources include, rainwater (Tammadun, 2018), dew **(**Carvajal, 2006), fog (Klemm, 2012), air humidity (Talaat et al, 2017) or the desalinization of seawater (Gebreeyessus, 2019).

Arid-humid regions are characterized by their relatively low precipitation rate of 400mm annually. Arid-humid regions represent more than one third of the worlds' land surface. (Wickens, 1998).

This study focuses on using hydrophilic building design to generate water from air humidity in arid-humid regions and redirecting the collected water to an integrated green roof. Therefore, a comprehensive study will be made on different scientific approaches and examples of passive water harvesting methods from air humidity and the different types of green roofs present.

This paper will then present a table with the appropriate corresponding hydrophilic building design solutions and passive water harvesting methods as a means of providing the different types of green roofs with water. Thus, creating a self-sufficient, low maintenance green roof typology.

Nomenclature	
A/D	Adsorption/Desorption
E/C	Evaporation/Condensation

2. Passive Water Harvesting Methods from Air Humidity

Whilst mechanical water harvesting methods rely on the use of electricity and non-renewable sources of energy in the water production process, passive water harvesting methods rely on processes that are more sustainable and environmentally friendly.

Most methods created to extract water from air depend on two simple scientific approaches. The first approach is the adsorption/desorption of air humidity. The second approach is the evaporation/condensation of air humidity. *Figure 1* shows the different scientific approaches used and their application.

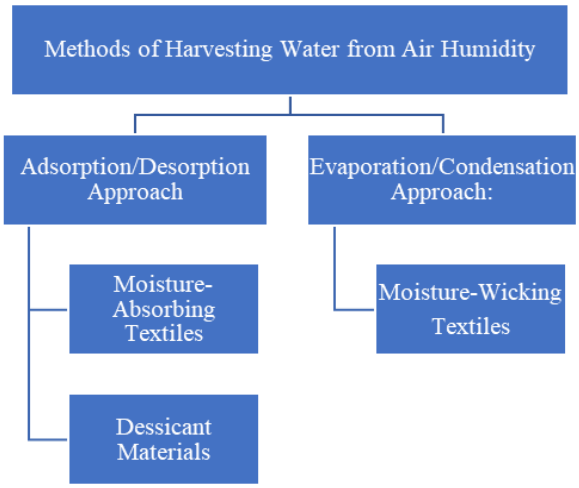

Fig 1 Showing scientific approaches used in water harvesting from air humidity and their relevant applications (researcher, 2019).

2.1. *Adsorption/Desorption Approach*

The adsorption/desorption method can be simplified into two steps. The first step includes adsorbing atmospheric water moisture into a medium, allowing that medium to become saturated. The second step includes the extraction, or the desorption of the saturated water using heat (Roy, 1993).

Most water extraction methods from air humidity that use the adsorption/desorption process rely on the use of hydrophilic/hygroscopic textiles, substances or materials for adsorbing the water, whilst depending on heat from sunlight to extract the water. A hygroscopic textile is a textile with properties that allow it to both attract and adsorb water and moisture (Oxford dictionary, n.d).

The adsorption/desorption method can be applied through utilizing many different materials that enable the process to function. Examples that use the adsorption/desorption approach are analyzed below.

2.1.1. Moisture-Absorbing Textiles:

Moisture-absorbing textiles are textiles that have a high capacity for water vapor absorption. They are commonly used in the clothing industry to produce garments that absorb and capture sweat (Feng et al, 2015).

An example of moisture-absorbing textiles used in the water harvesting process is a product named Sponsh. Sponsh is made from a hygroscopic, moisture-absorbing textile coated with a temperature-sensitive polymer coating. It is developed by a chemical engineering professor, Dr Catarina Esteves (Sponsh, 2018). The textile absorbs moisture during night-time when temperatures are low and humidity levels are high. In the daytime, high temperatures trigger the material into releasing the water stored inside.

With every adsorption/desorption cycle, Sponsh produces approximately 1.3 liters per $1m^2$ of product (Sponsh, 2018).

Currently Sponsh is being used in reforestation, landscape and irrigation projects to provide a source of water for vineyards and young trees (Sponsh, 2018).

Fig 2 Sponsh used in irrigating vineyards (Sponsh 2018)

2.1.2. Desiccant Materials

Desiccants are materials with hygroscopic properties.They are commonly used in food preservation as their chemical composition allows them to absorb water from many different mediums (Abasi et al, 2017).

Desiccant materials can either be solids or liquids. Examples of solid desiccants include hydrogel, silica gel, montmorillonite clay and molecular sieves etc. Examples of liquid desiccants include calcium chloride and lithium chloride solutions. Composite desiccants are desiccants made from two or more materials with different chemical or physical properties that combine to create a material with improved properties (Singh, 2018).

The use of desiccants in water extraction is very beneficial as their chemical compositions allow them to absorb humidity even in the driest climates (Hao et al, 2017). A desiccants' efficiency in absorbing air humidity depends on characteristics such as pore volume, aperture size and the number of voids in between the molecules.

Figure 4 shows the three desiccants that will be explored in this section and their applications in extracting water from air humidity (Singh, 2018).

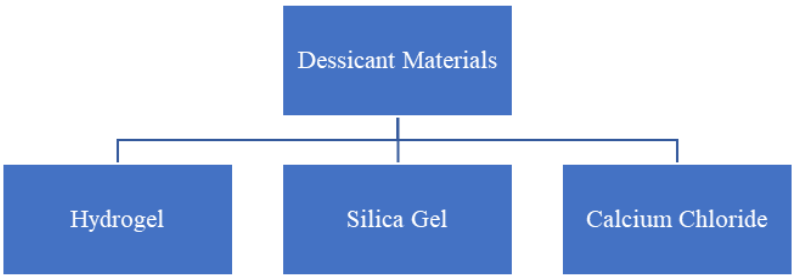

Figure 4 The three types of desiccant materials discussed in this paper (researcher, 2019).

- Hydrogel

Hydrogel is a relatively newly developed solid desiccant material. Hydrogel is commonly used in agriculture to increase the water-holding properties of soil and other growing media (Montesano et al, 2015). Hydrogel is a super-hygroscopic substance with the ability to absorb water from humid air and release it when exposed to sunlight (Nandakumar, 2019). Hydrogel comes in three forms, powder, crystals and spheres (Rathee et al, 2014). The smaller the size of the gel, the greater it's surface area and the better its' adsorption.

Researchers in Singapore placed small amounts of spherical hydrogel on glass plates and placed it on a floating surface above sea water (for maximum humidity) to measure the amount of water that can be extracted (Nandakumar, 2019). Hydrogel was able to absorb water up to 420% of its own weight and desorb up to 98% of the water within 15 minutes in the appropriate climatic conditions (Rathee et al, 2014). The temperature of the glass plate containing the hydrogel was measured to investigate the temperature at which desorption occurred and it was found that most of the desorption process occurs at temperatures less than 45-50°C (Nandakumar, 2019).

Hydrogel is highly durable and can be used for up to 1000 adsorption/desorption cycles. Using multiple adsorption/desorption cycles, it is possible to harvest up to 10 litres of water per kilogram of hydrogel daily (Nandakumar, 2019).

It is important to note that the hydrogel expands considerably as it absorbs water and returns to its original state after the desorption process, this must be taken into consideration (Rathee et al, 2014). Hydrogel's expansion and desorption rate was tested in Barcelona, Spain's climatic conditions, where annual temperatures range from 10-24°C (Autodesk Green building Studio, 2019). Hydrogel spheres took 6.5 hours to fully expand from 4mm to 20mm in diameter after being exposed to water and took 4 days for the hydrogel to discharge all the water it adsorbed and return to its original state. Hydrogels' slow water discharge rate is due to their spherical shape having the smallest surface area compared to hydrogel in powder or crystal forms (Rathee et al, 2014)

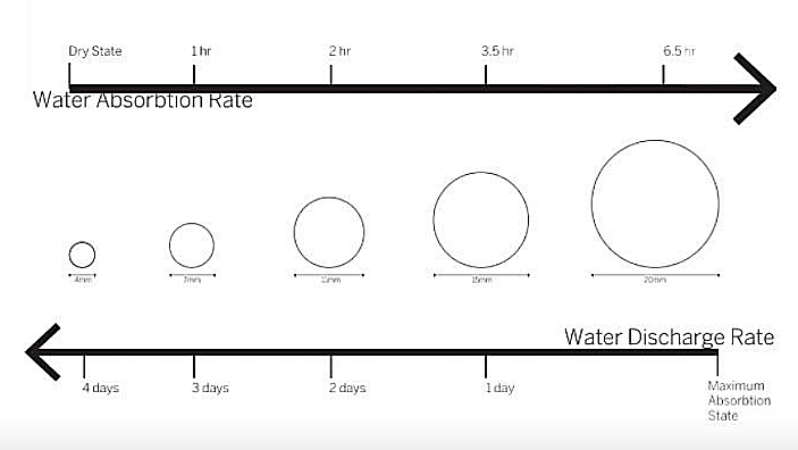

Fig 5 Illustration showing Hydrogel spheres' growth during the absorption/desorption process (Rathee et al, 2014).

- Silica Gel

Silica gel is a solid desiccant material. Its' uses and properties are similar to that of hydrogel. Silica gel is considered less efficient than hydrogel in moisture absorption. Silica gel can only adsorb approximately 40% of its's weight in water (IMPAK corporation, n.d).

As stated by Chen, silica gel's adsorption works best at ambient temperatures. However, the rate of adsorption may be compromised at higher temperatures (2017). Silica gels' capacity for adsorption was measured and compared to that of clay (a desiccant material). It was found that the higher the humidity the greater the capacity for water vapor adsorption (Chen, 2017). The table below shows the amount of water extracted against the relative humidity levels for both silica gel and clay. In order to completely desorb the silica gel of the adsorbed water, it would require a temperature of approximately 110°C (Chen, 2017)

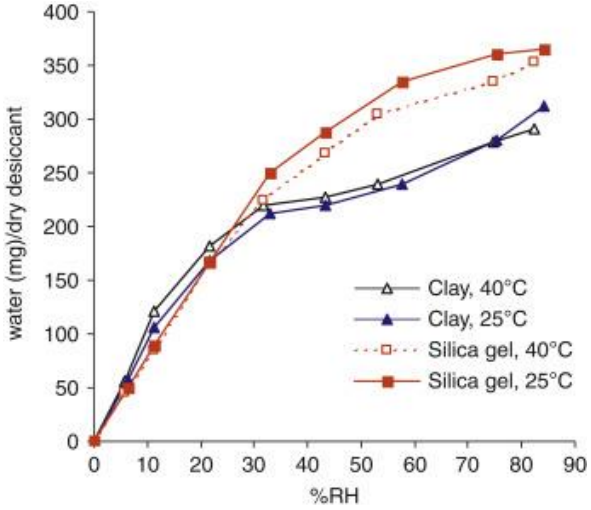

Fig 6 Amount of water extracted from silica gel in relation with the relative humidity levels (Chen, 2017)

All though silica gel is cheaper than hydrogel, it collects a considerably lower amount of water and requires much higher temperatures for extraction compared to hydrogel. In addition, they withstand a much lower number of adsorption/desorption cycles, making them less durable. (Nandakumar, 2018).

On the other hand, silica gel does not expand or change in shape upon the adsorption of moisture.

- Calcium Chloride Solution

Calcium chloride solution is a widely available composite desiccant. It is commonly used as a food additive and preservative, due to its efficiency in absorbing moisture.

A prototype was made by researchers at Mansoura University (Mansoura, Egypt) to investigate the use of calcium chloride solution in extracting water from air humidity. The prototype consists of 5 components. The first component absorbs moisture and consists of a thin layer of black, cotton cloth soaked in calcium chloride solution with a concentration of 30%. Thin metal wires were used to support the conical shape of the cloth. The second component is a 1mm thick, conical, transparent cover made of polyvinylchloride (PVC) the third part is a telescopic stick used to support the first two parts. The fourth and fifth parts consist of a hose to redirect water into a flask located at the bottom of the prototype (Talaat et al, 2017)

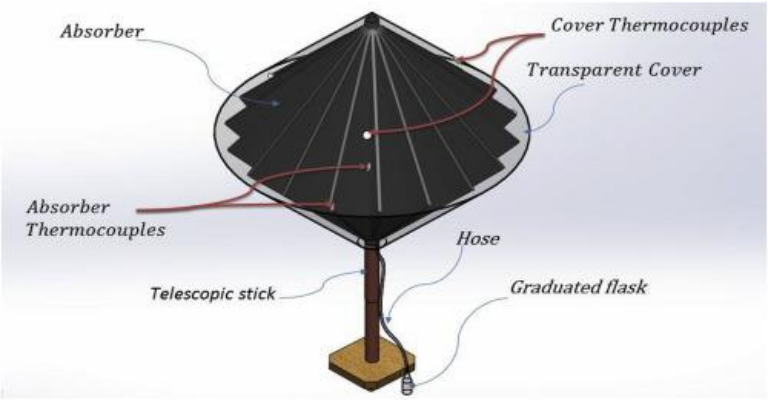

Fig 7 Schematic diagram of the prototype (Talaat et al, 2017).

At night the cloth with calcium chloride solution is exposed to the atmosphere in order to absorb water vapor. In the day, the heat from the sun raises the cloth's temperature. The vapor condenses on the walls of the PVC cover and is redirected through the hose into the flask.

The prototype was carried out over several days and produced water between 0.3 to 0.6kg/m^2 daily (Talaat et al, 2017). Theoretically, pure calcium chloride can absorb approximately 97% of its own weight in water (Kallenberger & Froba, 2018)

2.2. *Evaporation/Condensation Approach*

The evaporation/condensation method consists of two steps. The first step is having warm, humid air filled with water vapor. The second step is having the water vapor condense as they touch a cold surface (Zhakovsky, 2019).

Most projects that use the evaporation/condensation approach are set in humid locations where the water vapor content in the air is reasonably high. For the condensation part of the process, most projects rely on the use of materials with low thermal mass to act as a condensation medium. (Zhakovsky, 2019).

An example of the use of the evaporation/condensation approach is analyzed below:

2.2.1. Moisture-Wicking Textiles

Moisture-wicking textiles are textile that transport water instead of absorbing it (as opposing to moisture-absorbing textiles). When water comes in contact with moisture-wicking textiles it moves around the fabric, until it eventually evaporates or drops down to the ground (Houshyar et al, 2017). An example of the use of moisture-wicking fabrics in the water production is the *Warka Water Tower.*

Warka Water Tower is an inexpensive, conical-shaped bamboo structure, designed to harvest and store water from air. The tower is 10 meter-long and consists of a frame made of bamboo supporting a moisture-wicking polyester mesh with an area of 30m^2 (Warka Water Incorporated, n.d). Water vapor condenses on the cold surface of the mesh, forming beads of water. Afterwards, the water runs along the surface of the mesh into a storage reservoir at the base of the structure. The collected water is then redirected into a tube that functions as a water faucet for the local communities in the tower (Azzi, 2015).

The tower is constructed in north-east Ethiopia as a response to freshwater shortages in isolated, rural villages. The tower is designed to produce around 40-80 liters of water per day, depending on the climate conditions of the area it is built in (Warka Water Incorporated, n.d).

Fig 8 Warka Water Tower (Warka Water Incorporated, n.d.)

3. Green Roofs

Green roofs are vegetated surfaces on top of buildings. They can be used for recreational or agricultural purposes. Green roofs have many social, economic and environmental benefits. They create aesthetically pleasing environments, add amenity value to a building whilst increasing the natural biodiversity in a location (Semaan & Pearce, 2016).

3.1 Types of Green Roofs

According to the Royal Horticultural Society (RHS), green roofs can be classified into three categories. The first category is "extensive" and they are identified by their thin substrate layer and limited type of vegetation. The second category is "semi-intensive" that are characterized by their moderately thick substrate layer. The last category is "intensive" which has the largest substrate layer and the most diverse plant selection (Vijayaraghavan, 2016). Table 2 summarizes the categories and their different characterizations and properties.

	Extensive Green Roof	**Semi- Intensive Green Roof**	**Intensive Green Roof**
Type of Vegetation	Mosses, Sedums, Succulents, Herbs & selected Grasses	Selected Perennials, Sedums, Ornamental Grasses, Herbs & small Shrubs	Perennials, Lawn, Putting green, Shrubs & Trees
Cost	Low	Intermediate	High
Approximate Amount of daily irrigation required	0 - 9.0 L/m^2 (Depending on type of vegetation)	9-44 L/m^2	44 + L/m^2
Maintenance	Low	Intermediate	High
Use	Inaccessible	Partially accessible (depending on type of vegetation.)	Accessible

Table 1 Showing properties of different types of green roof (RHS, n.d.)(Vijayaraghavan, 2016)(Schweitzer, 2013) edited by researcher, 2019.

4. Results

The table below shows a comparison between the capacity of water generated from different water harvesting methods from air humidity.

The table summarizes the scientific approaches used and states the applications for each method along with the how these applications where implemented on an architectural level. Some architectural applications were integrated within buildings whilst others functioned as separate structures from the buildings.

It is important to note that the capacity of water produced in each application highly depends on the environmental and experimental factors that these applications were tested under. The environmental factors include the geographical locations, temperatures and humidity levels where the application was conducted. The experimental factors could be reflected in the design elements that may have affected the efficiency of the prototypes created (Ex. Size of the experimental prototype).

Method of Water Harvesting	**Mechanism used**		**Architectural application**	**Capacity of water Generated**
	Scientific approach used	**Applications**		
From Air Humidity	A/D	Moisture-Absorbing Textile *(Sponsh)*	Building Landscape	1.3 L/m^2 of product/day
		Desiccant Materials	Separate Structure	Hydrogel:420% of its own weight Silica Gel: 40% of its own weight Calcium Chloride Solution= 97% of its own weight
	E/C	Moisture-Wicking Textile *(Warka water tower)*	Separate Structure	40-80 litres/ day

Table 2 Showing capacity of water produced corresponding with appropriate type of green roof

5. Analysis

In order to find out which water-generating application is suitable for irrigating which type of green roof, a comparative table must be produced. The comparative table will use information provided in the previous sections to produce a table with identical units for the capacity of water generated from each application. This will be done through using the information provided from the previous sections and conducting simple mathematical conversions to unify the units mentioned in each application.

In these calculations, the weight of a single sphere of hydrogel and silica gel is 1 gram.

Application		**Average capacity of water generated daily**	**Type of Green Roof that can be irrigated according to capacity of water produced**
Moisture-Absorbing Textile *(Sponsh)*		1.3 L/m^2	Extensive
Desiccant Material	Hydrogel	25 L/m^2	Semi-Intensive
	Silica Gel	0.4 L/m^2	Extensive
	Calcium Chloride Solution	0.45 L/m^2	Extensive
Moisture-Wicking Textile *(Warka water tower)*		0.5 L/m^2	Extensive

Table 3 Showing average capacity of water generated daily from each application with corresponding type of green roof that can be irrigated according to capacity

6. Conclusion

After conducting a comprehensive research on different passive water harvesting methods from air humidity and different types of green roofs, a comparative table was made (Table 3). The table determined which type of hydrophilic, passive water harvesting application would be appropriate for which green roof. The table concluded that most passive water harvesting applications produced enough water to irrigate extensive and semi-intensive green roofs. However, none of the applications can produce the necessary amount of water to irrigate intensive green roofs.

7. Recommendations

In order to test the mechanism of using hydrophilic design in irrigating green roofs in arid-humid regions, a prototype will be produced. The prototype will be tested under the climatic conditions of New Alamein City, Egypt. New Alamein city has a comparatively high relative humidity in comparison with the rest of Egypt's climate (Autodesk Green Building Studio, 2019).

8. Acknowledgement

We would like to express our deep gratitude to Dr. Hesham Safwat for his guidance and support.

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Upgrading Resilience

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Abstract:
A review study of literature dealing with resilience in psychology and psychotherapy and how to upgrade human resilience using patterns of Neuro Linguistic Programing (NLP) as a promising methodology to replicate excellence in life in different aspects such as in self-actualization and resilience.
Living nowadays in a world full of wars, insecurities and natural disasters (earthquakes, tsunamis) and with global media spreading all scenes of oppressions and victims all over the world, comes the need for resilience as a way of dealing with such a mess facing humanity.
Resilience, as a positive psychological concept, refers to the ability of humans to successfully cope with stressful life adversity situations without being stuck or manifesting post traumatic disorder syndrome (anxiety, self-pity) and depression. Stressful situations might be daily stresses, death of beloved, separations, chronic illness, losing money or losing social status.
Resilient people experience unpleasant thoughts and feelings but handle them in ways that prevent them escalating into more serious long-term problems such as anxiety and depression.
Resilience in positive psychology generates more with experiencing the social world from more self-awareness and more self-directed. It is more a need for detachment and privacy. People are here determined by inner rather than outer world as they are more fully focused on themselves as fully complete mature humans able more to face realities and whatever it brings.
Resilience refers to a way of thinking and behavior aligned with this thinking, it needs to apply what really in thinking in appropriate output behavior. It is a behavior to be learned and a meaning level to be analyzed. In another way, resilience can be considered as a skill to carry out a task to achieve the intended results within proper timing. Resilience is an acquired skill to restore to the inner resources as a human being to cope with whatever challenges may face in the shortest amount of time to avoid trapping in the negative consequences.
Neuro Linguistic Programming (NLP) has a role in upgrading resilience as it clarifies the way people apprehend (map) their sense of realities. Through this clarification, it offers patterns to transform human experience. It enriches human abilities and the understanding of life.
This study will review techniques used in psychotherapy and NLP to upgrade resilience and to help people with stressful situations to develop resilience.

Keywords: psychological resilience - neurolinguistic programing - NLP - cognitive psychology - mind fullness

1. Introduction

Resilience, as a concept of bouncing back, has roots in wide varieties of human activities e.g. engineering, ecology, biology as well as humanitarian sciences. It has deep roots in psychology and psychotherapy of human. The aim of this article is to elucidate the role of resilience in psychology and psychotherapy and the newly developed NLP.

Resilience could refer to mental strength with the ability to face hardships and challenges of daily life including overwhelmed work stresses, separations, divorce, money problems, social anxieties and/or sudden chronic illnesses. Resilience may not only just to be able to overcome and successfully deal with such current life diversities in a productive way but it also means to anticipate them and to be prepared to face them using past learnings. It is more of a positive life style, mind strength and acquired skills helping to bouncing back successfully.

2. Evolution of concept of resilience

In reviewing resilience studies, it is challenging to determine what resilience is to be, as a process or as an outcome.

The Overseas Development Institute (ODI)[1] has been intensively and continuously researching on resilience. Resilience researches are expanding in the following ways Including:

- culturally-variant concepts of resilience.
- Account for multi-level approaches to resilience.

In 1950s and 1960s resilience studies in psychology started when they noticed that some children emerged from very disadvantageous circumstances unharmed, this discovery led to the construct of resilience in these studies. They defined resilience as psychological trait that allows individuals to face successfully challenging circumstances. Further studies in children tried to find out what makes some children emerge unharmed in facing life unpleasant circumstances. Behavioral psychology described the way for a child to attain resilience through the psychological environment enriched with an appropriate satisfaction for physical and psychological needs which will lead the child to feel both safety and trust in himself and in the world around him. If a child lives in healthy environment which is ready to respond to his innate needs, this readiness itself enable the child to acquire self-awareness and self-esteem and a feeling of the ability to control the environment. In such environment, the child will deal and interact with himself and others in basis of positive trust which is one of the components of resilience. Some studies focused on the importance of family support in the highly resilient children (Werner and Smith, 2001). Others highlighted the importance of self-esteem as a factor defining resilience in children (Luthar et al., 2000).

Studies in resilience in adulthood emerged mainly from studying people in traumatic events and how some people get out unharmed while others stuck in more deep harmful symptoms. Some studies pointed out the importance of the person coping skills and past history of dealing with daily stresses and social relationships. Rogers (1961) referred to the fully-functioning human, who is completely able to use his abilities, to develop his flexibility and to strengthen his mind endurance ability to be self-actualized human, or flexible human coping with whatever life brings. This implied our today resilience.

Researchers in resilience in early stage were concerned about three domains to be answered; trying to identify the risk factors, to search for the existence of proactive factors or traits and to highlight the adversity of humans' responses to life events. Early studies for a psychological trait in children that contribute to resilience had been conducted scanning social circumstances that

[1] Overseas Development Institute, 203 Blackfriars Road, London SE1 8NJ, www.odi.org

fundamental to resilience in adulthood, then emerged recent studies to widen the search for how humans vary along continuum in facing life adversity. In 1980s, researchers in psychology stressed that with the existence of psychological protective factors related to social support are too important domain contributing to resilience in human adults as long as there are no pathological preventive causes (Masten and Wright, 2010). Studies started to show cultural differences and to identify how resilience is correlated to culture and community (Clauss-Ehlers, 2008).

Psychological researches in resilience focused in different aspects as traumatology (studying the adult responses to traumatic events). Developmental psychologists were interested on the child performance in different life challenging situations while positive and humanistic psychology concerned with flourishing humans' relations and humans' meanings about life adversity and development.

Recently there are three key principles of resilience theory as it has developed within the last 10-15 years. First: Resilience is a developmental process, unfolding over time and circumstances. Second: Resilience involves a complex interaction of multiple mechanisms ranging from the individual-level to the structural. Third: Resilience captures how people not only survive a variety of challenging circumstances, but thrive in the face of such adversity.

3. Concept of resilience

The term resilience has been used by different specialties. The standard definition from dictionary for the term resilience itself refers to the capacity of the material to automatically resume its original shape after being bent, stretched, compressed or misshapen some way. Resilience is linked to things like flexibility and elasticity, and the word itself derives from the Latin term "resiliens" which means to spring forward or leap back into position. The term is used in biology and medicine to refer to the ability of the organism, such as human being, to recover from stress, injury or illness. It is used by engineers to refer to the stability in the design, it is used in ecology and biodiversity conservation. All efforts related resilience to the dynamic, interrelated individual, social, ecological process facing stresses and shocks.

Resilience in humanity can be a developmental process to face adversity or traumatic events and it is developed through life experience and through meaning-making. It is interrelated dynamic process between individual and structure of society.

Resilience involves the flexibility in adaptation. Resilience is more than good adaptation in face of diverse situations. It is how people more likely to fight for something meaningful in a chronic mess, poverty or abuse. It is more complicated interrelated with mind strength that lead the individual in facing challenges.

Matson (2011) emphasized that the core concept of resilience in many studies is the positive adaptation in face of life adversity situations that enable people to successfully manage adversity situations. The important characteristics that facilities positive adaptation is called the protective mechanisms helping to promote wellbeing and protecting individuals against risks.

The protective mechanisms are considered interrelated traits working with or without intervention and they are not related to risk factors making individuals at more risk. They help

individuals to adapt a system of thinking allowing them to respond positively in face of risk situations. They operate differently to reduce the impact of risks, to reduce or break negative chain reactions, to establish and maintain self-efficacy and/or to open up new opportunities (Rutter, 1990).

Protective mechanisms are sometimes located in the individual himself and sometimes located in the social environments surrounding him. It is more about the interaction between the individual and the social environments. It depends on the individual's interpretation of the adversity of the situation in a way that constitutes a resilience process and leads to adaptive outcomes (Fergus and Zimmerman, 2010).

Social support can be perceived by the individual in the form of family support or significant support from friends or social community. Good parental relationships and protective family environment are considered crucial protective mechanisms prevailing in most of resilience studies (Ahern, 2006).

Some of the personality characteristics proved to contribute to resilience. Coping strategies are considered as a core factor in resilience. Good problem-solving ability helps to make smart plans with a wider perception to events searching for options with more positive attitude. The ability to regulate emotions which include understanding emotions, dealing with feelings and controlling them contributes to resilience. Healthy self-esteem and awareness of personal resources are important in achieving resilience.

4. Resilience in life span

In 1970s, researches in resilience focused on children and studied factors contributing to their resilience, then similar interest shifted the focus to apply these factors to study resilience in adults.

In children, resilience is considered a dynamic process achieved through the continuous interaction with older family figures helping the child to achieve his developmental stages, demands and needs (physiological needs, safety needs, belonging and love). All of these are essentials for the human child to have a balanced psychological development. A loving supportive caregiver would help the child to pass any setbacks or challenges he might face and show the child the model of resilience. This is achieved through helping him to build up his protective factors by adopting coping skills and maintain cultural, community and social relations.

Everall et al. (2006) defined resilience in youth as a process that a youth uses his internal and external resources to overcome whatever challenges he may face in daily life. Social resources (as the existence of understanding caregiver) are considered an example for external resources. The internal resources are emotional resources (self-awareness of one's emotion and his ability to express it) and cognitive resources (the ability for a wider perception towards goal thinking attitude, new goals and more options shifting from problem).

In adolescence, when peer relationships become more developmentally significant, supportive friendships can also prove to be important mechanisms of resilience (Collishaw et al., 2007; Drapeau et al., 2007; Graber et al., 2015).

In adulthood, developmental challenges are different and more influential. Adults already developed their own coping mechanisms so these adaptations techniques now challenged by different circumstances as health decline, work and business changes, income changes, and declining family and social roles. Accordingly, adult resilience in this stage of life needs completely different strategy focusing on social support, spiritual help, psychological and physical care (Beutel et al., 2010; Ong et al., 2006; Ong et al., 2009).

Resilience is considered a continuous process throughout life stages. Researchers have been interested in studying out how resilience in one stage could influence the person in his following stages. Psychological researches have tried to answer if coping successfully with life stressors or adversity in children is related to well-being in later life.

Collishaw et al. (2007) studying adults who faced abuse or neglect in youth showed that rates of difficulty in personality, health, relationship stability and criminality were better among resilient abused participants than among non-abused participants. This study related children ability to be resilient with their outcome to achieve better life abilities in their development.

Another concern of researchers was the role of adversity situations to differentiate between situations that is manageable towards developing resilience or the situations related to maladjustment. Rutter (2013), when assessing adversity situations as manageable in his study, showed the following results:

- Resilience is fostered by controlled exposure to manageable stresses and adversity, rather than avoidance.
- Success in areas outside the family (such as school) can foster mechanisms that are keys to resilience, such as the development of planning, self-reflection and personal agency.
- Later recovery or resilience from early adversity may be possible when ‘turning points’ are encountered and open up new opportunities.

Coping with adversity and managing stress situations isn’t the person job alone as there is family support, social relations and even environmental resources.

Ungar (2011) in an optimistic study referred to several take-home messages from facing adversity:

- Not only can a person bounce back from substantial adversity, but he or she can actually grow through their challenging experiences.
- Having psychological problems in childhood or adolescence does not preclude psychological well-being, good adjustment outcomes and satisfying relationships in adulthood.
- Parental relationships remain a cornerstone of developing resilience. However, peer relationships, mentors and supportive romantic partners can have resilience-promoting effects later in life.

5. Risk factors

Reivich& Shatté (2002), emphasized risk factors of various situations in life that can cause stress-related problems or more serious mental-health disorders which influence the life of the individual. There are four main types of challenges that are typically seen calling for resilience:

- *Childhood problems:* Struggling in life circumstances, living with abused adults, living in broken homes and/or whatever considered challenges for mental and physical development for a child requiring more resilient coping strategies.
- *Coping successfully with daily stresses:* Resilience has a big role in dealing with daily problem arguments in various relations, problems in work places, everyday challenges, relationships conflicts and disagreements in daily work stresses.
- *Recovering from major setbacks:* Resilience is required to face events like divorce relationship break-up, bereavement, serious illness, violence victims and/or natural disasters victims.
- *Reaching out for greater meaning and purpose:* the process of expanding beyond our comfort zone and trying to reach out our new goals, is one aspect of being resilient.

Gender has been differentially identified as a risk factor across various contexts. The ways in which gender proves protective are highly contextual first to culture and second the specific risk under consideration. Links between culture, socialization and biology can be difficult to undo. Being female can be protective in the face of abuse and neglect, health risks, low socioeconomic status, psychological risks associated with aging and certain conflict contexts (Gallo et al., 2009; Graber et al., 2015; Jordans et al., 2010; Netuveli et al., 2008).

Boys and men are more susceptible to the negative impacts of risks, such as violence, substance use and low socioeconomic status and are subject to cultural pressures more than females.

Studies in resilience risk factors tended to search for signs of successful coping mechanisms that lead persons throughout life challenges situations to control negative feeling and thoughts and replacing them with more positive ones. Psychotherapy emphasized a new cognitive approach in dealing with risk factors throughout understanding negative feelings and thoughts accepting them rather than trying to eliminate them.

6. Approaches and Interventions to build resilience

It is a fact that a resilient person faces challenging situations and not allowing them to hinder him back or to drain his energy to go forward. To upgrade resilience, different interventional tools have been used by positive psychology, psychotherapy and neurolinguistic programing (NLP).

In psychology, ‘intervention’ refers to a non-clinical program or a clinical treatment aimed at altering behavior, cognitions, attitudes, emotions, relationships or outcomes. A resilience intervention aims to promote resilience processes and/or adaptive outcomes. Psychosocial interventions affect psychological and social processes. They often implicitly or explicitly use behavior change techniques such as skills training, information sharing, practice, behavioral modelling, stress management and planning social support (Abraham and Michie, 2008).

Robust resilience interventions depend on a good understanding of the risks facing the target population and of the protective processes and strengths that are desirable, useful and feasible for individuals to access through the self, family and wider support systems (Bonanno, 2004; Rutter, 2013).

When implementing interventions to traumas, shocks and conflicts, it is useful to assess and ameliorate daily stressors (such as poverty), as well as the catastrophic event, since individuals' capacities to cope will be affected by their cumulative experiences of stress (Miller and Rasmussen, 2010).

Similarly, individuals exposed to sustained adversity and ongoing conflict benefit from holistic support addressing their specific needs (Tol et al., 2013).

Cheon (2008) recommends the following interventions:

- Clearly articulate goals.
- Target at-risk young people.
- Calibrate to the developmental stage.
- Incorporate community-wide or school settings.
- Structure alternative activities.
- Use social-behavior education.
- Support peer leadership and mentoring.
- Involve families.
- Employ media advocacy.

Experts recommend focusing interventions on fostering a supportive socioecological context as well as individual level resilience processes. Resilience interventions promote adaptive outcomes and processes at individual, family, school and community levels through diverse mechanisms including:

- Skillful coping.
- Community cohesion.
- Self-efficacy.
- Parental effectiveness.
- Family relationships.
- Life skills training.
- Positive emotions.
- Meditation.

It is essential to target the right interventional tool to suit the population for best results.

The American Psychological Association (APA)[2] published a research-based public leaflet entitled "The Road to Resilience", their ten recommendations for developing resilience:

[2] The Road to Resilience: From the American Psychological Association, © 2014 American Psychological Association, 750 First St. NE, Washington, DC 20002-4242. www.apa.org/helpcenter/road-resilience

- *Make connections.* Good relationships with close family members, friends or others are important. Accepting help and support from those who care about you and will listen to you strengthens resilience. Some people find that being active in civic groups, faith-based organizations, or other local groups provides social support and can help with reclaiming hope. Assisting others in their time of need also can benefit the helper.
- *Avoid seeing crises as overwhelming problems.* You can't change the fact that highly stressful events happen, but you can change how you interpret and respond to these events. Try looking beyond the present to how future circumstances may be a little better. Note any subtle ways in which you might already feel somewhat better as you deal with difficult situations.
- *Accept that change is a part of living*. Certain goals may no longer be attainable as a result of adverse situations. Accepting circumstances that cannot be changed can help you focus on circumstances that you can alter.
- *Move toward your goals*. Develop some realistic goals. Do something regularly even if it seems like a small accomplishment that enables you to move toward your goals. Instead of focusing on tasks that seem unachievable, ask yourself, "What's one thing I know I can accomplish today that helps me move in the direction I want to go?"
- *Take decisive actions*. Act on adverse situations as much as you can. Take decisive actions, rather than detaching completely from problems and stresses and wishing they would just go away.
- *Look for opportunities for self-discovery*. People often learn something about themselves and may find that they have grown in some respect as a result of their struggle with loss. Many people who have experienced tragedies and hardship have reported better relationships, greater sense of strength even while feeling vulnerable, increased sense of self-worth, a more developed spirituality and heightened appreciation for life.
- *Nurture(develop) a positive view of yourself*. Developing confidence in your ability to solve problems and trusting your instincts helps build resilience.
- *Keep things in perspective*. Even when facing very painful events, try to consider the stressful situation in a broader context and keep a long-term perspective. Avoid blowing the event out of proportion.
- *Maintain a hopeful outlook*. An optimistic outlook enables you to expect that good things will happen in your life. Try visualizing what you want, rather than worrying about what you fear.
- *Take care of yourself*. Pay attention to your own needs and feelings. Engage in activities that you enjoy and find relaxing. Exercise regularly. Taking care of yourself helps to keep your mind and body primed to deal with situations that require resilience.

Additional ways of strengthening resilience may be helpful. For example, some people write about their deepest thoughts and feelings related to trauma or other stressful events in their life. Meditation and spiritual practices help some people build connections and restore hope.

6.1. *Cognitive Behavioral Therapy Approaches*

Cognitive behavioral therapy approach (CBT) and Rational-Emotive behavior therapy (REBT) are two psychological therapies focusing on cognition and behavior when dealing with emotions. Neenan (2009) explained in details how CBT approach is the basis for the methods of resilience building.

Problem-solving approach (PST) is considered a simple method derived from behavioral therapy but it may not be that beneficial if it causes the person to just concentrate in the problem or loop in the situation and become part of the problem.

Applied and progressive relaxation is an old approach dated since 1920 and continually updated. It is used as a therapy to preventatively build physical and emotional resilience.

Social skills training and assertiveness: Assertiveness training originated from behavioral therapy is using social skill including assertiveness, empathy, communication skills as way of gaining social support.

The Penn Resilience Program (PRP) is a tool developed to minimize depression on school children. Its function is more preventive than curative. It has been proved effective and successful in treatment of depression and anxiety. The version of the Penn Resilience Program as described by Reivich& Shatté (2002) consists of:

- Monitoring your thoughts: Learning to catch your unhelpful thoughts as they occur and to understand how they influence your feelings and actions.
- Spotting (thinking errors) or the traps among thoughts such as excessive self-blame or jumping into conclusion.
- Identifying unhelpful beliefs: Identifying unhelpful beliefs and evaluating them.
- Challenging unhelpful beliefs: This includes problem solving and new option for different solutions.
- Challenging thinking worries: this include dealing with (what if) question or unrealistic worries.
- Rapid calming and focusing strategies: Coping skills for use in real-world situations, it is used to calm stressful emotions and distractions.
- Real-time resilience: This method is replacing unhelpful thoughts with resilient ones.

Master Resilience Training (MRT) Seligman (2011) designed a training program based on (PRP) to be applied on adult but he added additional component:

- Keeping a gratitude journal: Recording positive events and their personal meaning.
- Building stronger relationship by developing an active response, praising specific behaviors and through assertiveness training.

6.2. *Mind Fullness and Acceptance-based Approaches*

These approaches emphasize the importance of the personal attitude towards adversity and coping behavior. it is one’s thoughts and ideas that determine level of resilience and ability to overcome, steer through, and bounce back when adversity strikes (Reivich & Shatté, 2002).

When facing challenges, stresses, disasters, accidents, illness, divorce and whatever obstacles encountered, there is a power to choose how to respond to them. It needs practice to train the brain to respond to life's challenges in a more effective way to be resilient.

These approaches suggest that it is not so much the content of our thoughts and attitudes that matters as our relationship with them, i.e., how we respond to them. As the name suggests, these approaches generally recommend relating to unhelpful thoughts with mindfulness and acceptance rather than challenging and disputing their content. This fundamentally differs both from traditional CBT and from resilience-building approaches like PRP.

6.3. *Neurolinguistic Programing Approaches (NLP)*

The term NLP was first coined in 1976 (based on the term "neuro-linguistics" used by Alfred Korzybski in 1930), so that the entire field is currently only less than 50 years old, and some of the most significant techniques were developed within the last few decades. Richard Bandler was a fourth-year student in Dr John Grinder's linguistics class at the University of California in Santa Cruz, in 1972 when the two of them began the development of NLP (Bandler& Grinder, 1979).

Some NLP techniques are simply "modelled" on techniques used and researched in other fields (Ericksonian Hypnosis and Classical Conditioning being the two main examples) and in these fields NLP is an accelerated methodology for learning these techniques, rather than the originator of them. NLP techniques include reframing, setting outcomes, parts work, metamodel, metaphor, trance, time line work, anchoring, belief changes, submodality shifts, strategies, and trauma-phobia process (Bolstad, 2002).

A study of NLP use in Psychotherapy was organized by Martina Genser-Medlitsch and Peter Schütz in Vienna, Austria in 1996. A full range of NLP techniques had been used. After treatment 1.9% of clients who had had NLP therapy felt no different, 38,9% felt better and 59.3% felt considerably better (Genser-Medlitsch& Schütz, 1997).

Psychologists list the three main types of response to disaster as:

- *Resilience*: People feel bad for a while, but they still manage to get good sleep, to eat healthily, and to plan successfully. They quickly get back to high level functioning in the new situation. This is the response NLP aims to install.
- *Recovery*: For a couple of months, people may be so distressed that they cannot function in their job, and cannot relax, sleep well etc. Then, they bounce back to normal.
- *Chronicity*: People are so distressed that they cannot relax, cannot function in their job and do not bounce back normal. They get worse.

Which of the three patterns will occur is determined by one's pre-existing thinking style and model of the world, previous experience of similar trauma, the severity of the current traumatic events and the social support available to him (Bonanno, 2004).

NLP introduces several patterns that help in dealing with people in disaster. NLP considers pacing and reframing useful in the moments of disaster events happening. At that time, what is

useful to say includes encouraging people by telling them that they are doing well, that now the event has happened and the worst is over and they can continue to work out what to do. However, physical actions to provide safety, water, food, community support and eventually electricity and sewage become priorities rather than NLP sessions in the immediate aftermath of disaster. In an earthquake, aftershocks continue to happen for some weeks and alertness about danger is a realistic response. Once people feel safer physically, most people will be remarkably resilient and even helpful to others around them, and their unique way of being resilient does not need to be "fixed" with NLP. After some months, 5-10% of people, depending on the cultural situation, will continue to be sleepless, panicking and will benefit from the NLP trauma process. Some people who have traumatic responses to older events will have them re-stimulated by the current crisis and may benefit from NLP time line therapy process, mostly in relation to the earlier events (Bolstad, 2002).

7. Conclusion

All interventions to enhance resilience whether positive psychology, psychotherapy, mind-fullness and NLP try to achieve resilience through different techniques based on training the mind to acquire coping responses to life adversities.

Life is full of challenges such as catastrophes, emergencies, stressed relations and separations. No matter how hard we tried, we cannot avoid them. So, if we cannot control what life might bring to us, our role is to control how we respond to the coming challenges.

The first phase of human response in facing a disaster is a trial to fix the external problem out there in sake of feeling better inside. Of course, it is important to work in the outside external circumstances when there are available resources, and to learn to cope well again and again that is what resilience is all about. It is all about how we perceive and respond to what is "inside" to any external stressor outside triggering our emotions. Our capacities and perception are the most important factors that determine our ability to be resilient.

Whatever happened from life events, one key for coping is shifting our perception (attitude) and our response (behavior) in a more successful and positive way. As long as we cannot control whatever life throws on us while indulging in life, we face life stressors choosing to shift our perception (attitude) and our response (behavior) to the most effective choice. This can be achieved through focusing in how we are coping and shifting attention from outside to our inner recourses shifting the person changes from victim to impowering. We can then change any negative message about how poor we are to how strong coping persons we are. Seeing ourselves as resilient helps to increase resilience. All capacities that help in developing resilience keeping calm in the middle of crises, seeing all options and shifting attention are deep in our minds.

The mind can learn new responses and habits. It can grow new neurons and connect these neurons in new circuits whenever the person needs to learn new habits. The mind abilities to learn, develop and change is one of the amazing scientific discoveries of modern neuroscience. This ability is the engine of learning in life span.

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"An Approach to Re-evaluating the Heritage Urban Site of Matmata, Using WELL Rating System"

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Abstract:
Historical buildings are facing many challenges to prove their durability and resilience through time. The concept of resilience involves getting adapted with continuous changes of social, climatic and environmental trait. The Southeast Tunisian cave dwelling of Matmata is a well-known example of historical urban form which formation takes into account the geological and geomorphological context of the site. Matmata provides an interesting example of geo-heritage on which was developed an important cultural and architectural heritage. The study discusses the main characteristics of Matmata in light of the WELL rating system, which was established in 2015. The WELL system focuses on the impacts of buildings over human health. It gives credit to designs that promote physical and psychological health of the users. The study reveals some of the pros and cons of Matmata cave dwellings and provides recommendations for further modifications to assure further resilience to climatic changes and human relief. The historical dwellings has proven good performance in relation to thermal comfort, acoustic comfort, daylight interaction, solar glare control and fitness promotion. It needs further modifications to fit air purification needs and clean water supply as well as altruism encouragement and social interaction with others.

Keywords: Historical cities, Matmata, WELL rating system, Health Promoting Design.

1. Introduction

Urban resilience is "the measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability. A resilient city assesses, plans and acts to prepare for and respond to all hazards – sudden and slow-onset, expected and unexpected. By doing so, resilient cities are better able to protect and enhance people's lives, secure development gains, foster an investible environment, and drive positive change. (UN Habitat Definition, http://urbanresiliencehub.org/what-is-urban-resilience/).

2. WELL Rating System:

The WELL Building Standard, established in 2016, is the first standard of its kind that focuses solely on the health and wellness of building occupants. It was administered by the International WELL Building Institute™ (IWBI™), and is third-party certified through IWBI's collaboration with Green Business Certification Inc. (GBCI), the certification body for the LEED Green Building Rating System. WELL Certified™ spaces and developments can lead to a built environment that helps to improve the nutrition, fitness, mood, sleep, comfort and performance of its occupants. This is achieved in part by implementing strategies, programs

and technologies designed to encourage healthy, more active lifestyles and reducing occupant exposure to harmful chemicals and pollutants.

Vernacular architecture, such as Matmata, have been created through the evolutionary process of adaptation to the particular natural and built environmental conditions make up an intricate set of various aesthetic categories, interconnected and intertwined. These aesthetics categories are integrated in order to create the general aesthetics of the architectural object as a compositional whole, and of the whole comprising the building and its environment.

The reason of choosing WELL as an evaluation tool that it is the only rating system that gives credits to aesthetics and poetics of architectural space. While beauty may often be subjective, research demonstrates that beauty produces a positive emotional experience in the observer, enhancing feelings of happiness and well-being.2 Considering the role of beauty in design is crucial to "successful" architecture and opening the way for people to feel engaged, included and healthy in a space. In the WELL Building Standard™ (WELL™), the Beauty and Design feature has always been a Precondition - a requirement for all projects. This is because WELL experts do believe that the incorporation of beauty in design is integral to creating spaces that truly enhance human health and wellness.

2.1. WELL Categories and Features:

WELL is categorized into 100 features, subdivided into "Preconditions", that must all be met, and "Optimizations", which are supplementary to achieve WELL's goals. the main seven categories are shown in Table (1).

Table 1. Main categories of WELL Rating system

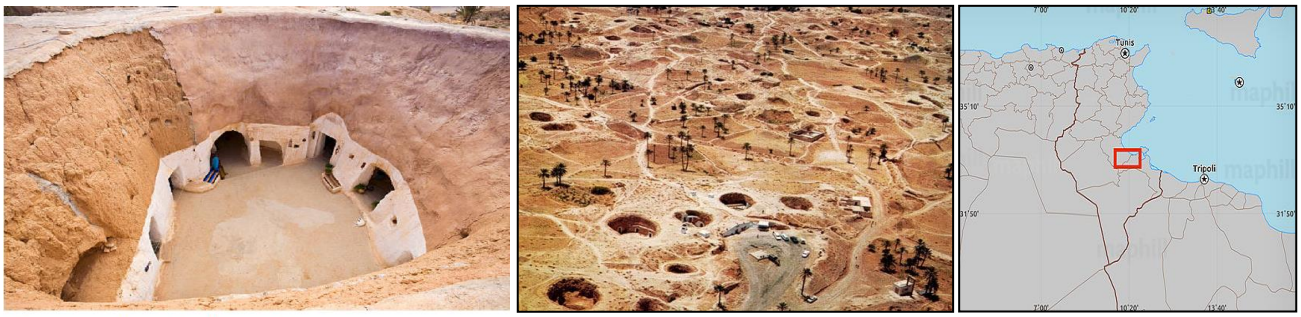
CONCEPT	PRECONDITIONS	OPTIMIZATIONS
Air	12	17
Water	5	3
Nourishment	8	7
Light	4	7
Fitness	2	6
Comfort	5	7
Mind	5	12
Total Score	**41**	**59**

3. Matmata:

Matmata is considered one of the few remaining Ber-ber villages in southern Tunisia. Best known for its underground houses carved into the stone, Matmata's unique architectural structure and treasured Berber heritage make it a popular spot. it is thought to be named after a tribe that sought refuge in the moun-tains during the Islamic conquest. The village used to be called Athwab in Amazigh, which means 'the land of happiness and well-being.

It is a famous ecolodge destination where architecture and environment complement each other. Matmata dwellings area great example of sustainable architecture, they are energy efficient, environmentally friendly, and economical. They are a great source of inspiration for a number of fields such as architecture, economics and environmental studies and even eco-tourism; these dwellings can easily ensure the economic sustainability of the whole settlement.

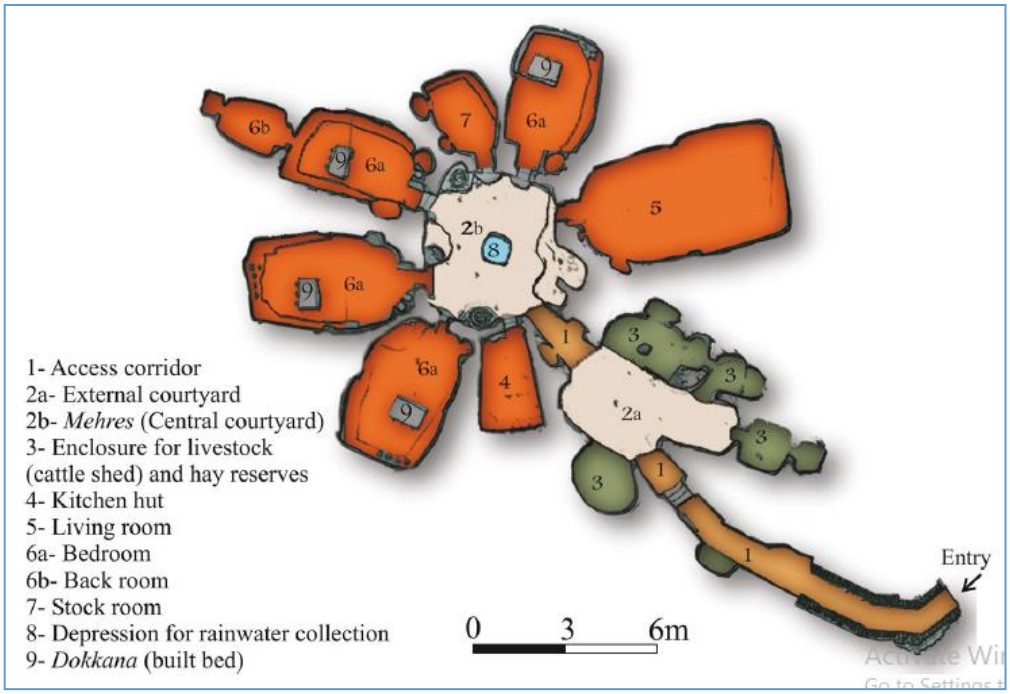
Matmata's troglodytes (earth-sheltered dwellings) are considered to be one of the most unique examples of North African vernacular architecture. A troglodyte can be simply described as a vertical shaft dug by man into soft sandstone, forming a circular courtyard, and then rooms are dug into the walls created by the courtyard. Matmata has many of the best examples of troglodyte architecture in the world.



***Figure(1)** : Dig pit dwelling in Matmata (left), Overview of matmata village (Middle) , Matmata site in Tunisia (right).*

Matmata's troglodytes are appropriate building types that served the functional and aesthetic needs of its inhabitants. These earth-sheltered dwellings are remarkable instances of human beings successfully adjusting to an often inhospitable environment. This achievement has resulted from continuous experimentation and experience that has been passed from one generation to the next.

Most of Matmata dwellings consist of a main courtyard surrounded by several rooms (caves) dug into the soil as shown in fig(1). The main entry of 12 meters long delivers into an external courtyard serving for ventilation of surrounding livestock rooms. After-which the pathway continues downwards till it delivers into a main court serving as a main living and ventilation area for living and sleeping spaces. The main court has slopes towards its center point for rainwater collection in a huge tank underground used as a water well around the year.

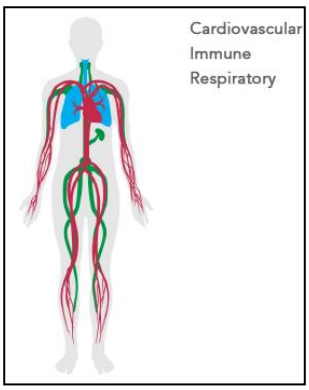


***Figures (2)** : A typical Matmata's dwelling floor plan showing main rooms and uses.*

4. WELL Features in Matmata:

Among the 100 features of WELL system, we list here the main matching points with historical houses of Matmata:

4.1. Healthy Entrance:



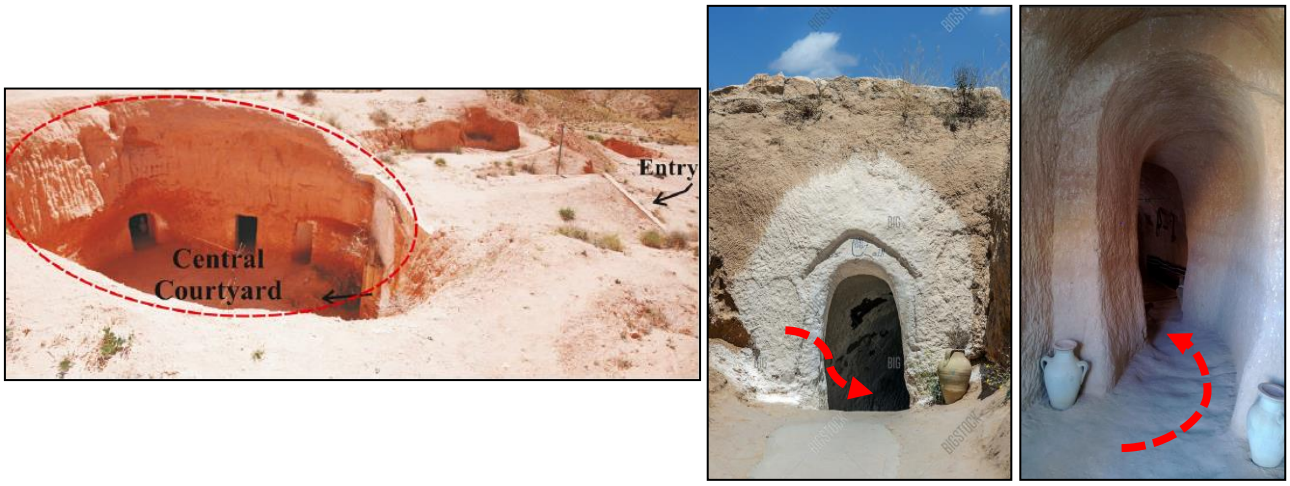
Occupants often track harmful contaminants indoors, including bacteria, heavy metals, lawn and agricultural pesticides, among other toxins. In addition, as occupants walk through entry doors, potentially polluted air can enter the building. Both of these modes of introducing outdoor pollutants to the indoor environment highlight the need for measures that minimize or prevent the introduction of potentially harmful substances to indoor spaces.

Healthy Entrance affects the following systems in the human body: Cardiovascular, Immune, and Respiratory systems.

WELL encourages that regularly used entrances of the building to have:

- grilles, grates or slots, which allow for easy cleaning underneath, as well as long in the primary direction of travel.
- Material manufactured as an entryway walk-off system, at least the width of the entrance and 3 m [10 ft] long in the primary direction of travel.
- Building entry vestibule with two normally-closed doorways.
- Revolving entrance doors.
- At least 3 normally-shut doors that separate occupied space from the outdoors.

Matmata houses use long narrow entrance passage which starts from earth surface and downwards to the main court as shown in fig(3). The exterior inlet point of the passage has a tilted walkway to assure privacy and protection against sandstorms and attacks of other tribes. This design assures protection against contaminants and harsh weather year-around.



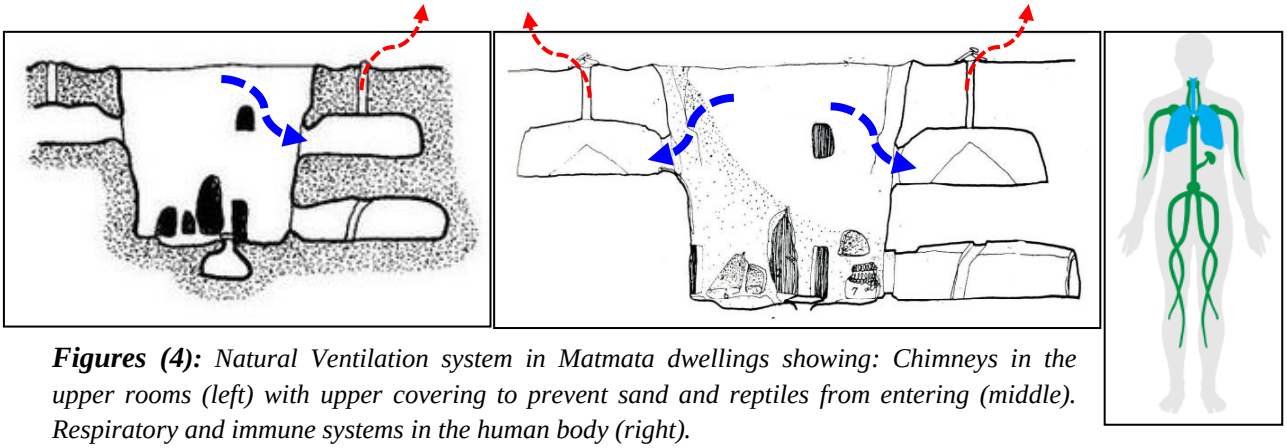
Figures (3): *Entry of Matmata Dwelling: an overview (left) and view of being steep descending (middle) and being twisted to avoid storm and pollutants (right).*

4.2. Direct Source Ventilation:

Air pollution can be created from a number of indoor sources, including cleaning products, humid environments and chemical storage which can be a source of harmful vapors, including VOCs that are linked to cancer, organ and central nervous system damage. These contaminants can trigger asthma and allergies in susceptible individuals. Poor access to outdoor ventilation may spread air-borne diseases which affect both respiratory and immune systems in the human body.

WELL features encourage the use of direct outdoor ventilation and that air gets exhausted so that all air is expelled rather than recirculated inside the building.

Matmata dwellings depend completely on natural air and passive ventilation all year round. All rooms have direct access to the central court from which they get their fresh air supply. Some dwellings have upper level where rooms are ventilated mainly from the court and then air is exhausted from an upper opening works as chimney as shown in fig(4). These chimneys assure continuous supply and exhaust of fresh air all day long.



Figures (4): *Natural Ventilation system in Matmata dwellings showing: Chimneys in the upper rooms (left) with upper covering to prevent sand and reptiles from entering (middle). Respiratory and immune systems in the human body (right).*

4.3. Biophilia:

Biophilia, or the idea that humans have an affinity towards the natural world, is an emerging field that aims to address our psychological need to be around life and life-like processes. Exposure to views and images of nature can help to speed up healing and recovery time, boost positive feelings and reduce negative ones. Interior environments that are cold, sterile and devoid of life, on the other hand, can diminish our experience, mood and happiness. Modeled after the Living Building Challenge, the biophilia requirements involve conducting historical, cultural, ecological and climatic studies to inform biophilic elements.

and creating a biophilic framework that tracks biophilia at each design phase of the project.

Biophilia affects the Nervous system inside the human body as shown in fig(5).

WELL features require that the project must incorporates nature through the following:

a. Environmental elements.

b. Lighting.

c. Space layout.

It also requires that the project incorporates the following:

a. Nature's patterns throughout the design.

the project provides sufficient opportunities for human-nature interactions:

a. Within the building.

b. Within the project boundary, external to the building.

Matmata's dwellings incorporate nature by planting palms, trees and native plants inside the main court to provide shade and food (i.e., olives and fruit) for the inhabitants. The dwelling also incorporates daylight, natural elements and environmental elements as shown in fig(5).

Figures (5): *Native plants and biophilic elements inside Matmata dwelling court (left and middle) and the nervous system of the human body affected by biophilia and human connection with nature (right).*

4.4. Right to Light:

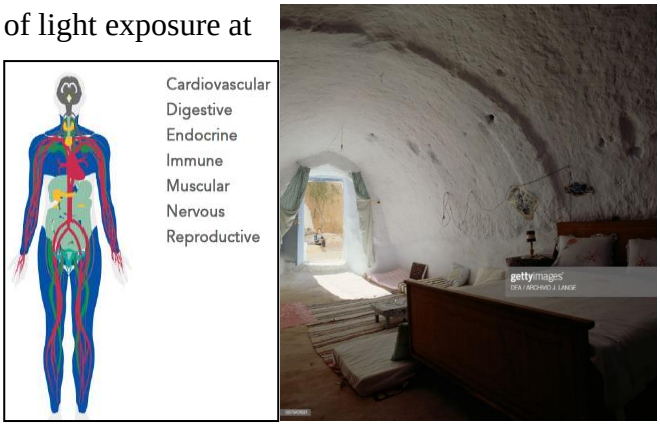
Exposure to adequate levels of sunlight is critical for health and wellbeing, for effects ranging from visual comfort to potential psychological and neurological gains: there are measurable physiological benefits to receiving the quality of light provided by the sun, as well as positive subjective reports from occupants able to enjoy access to sunlight. Proximity to windows, outdoor views and daylight in indoor spaces are some of the most sought-after elements of design. As such, buildings should utilize daylight as a primary source of lighting
to the greatest extent possible.

Exposure to day light affects the following systems in the human body: Cardiovascular, Digestive, Endocrine, Immune, Muscular, Nervous and Reproductive systems.

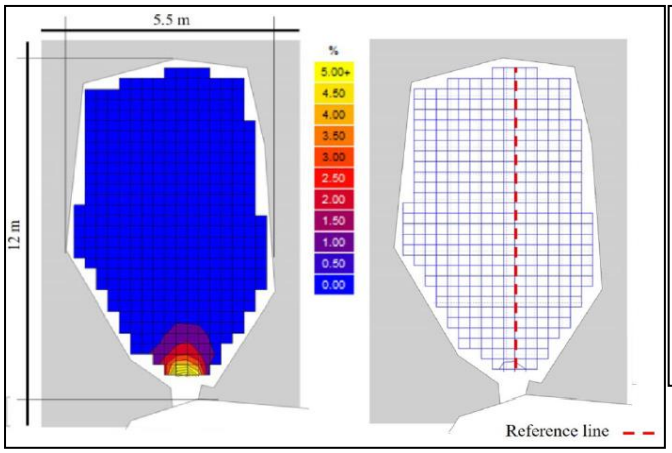
WELL features encourage that:

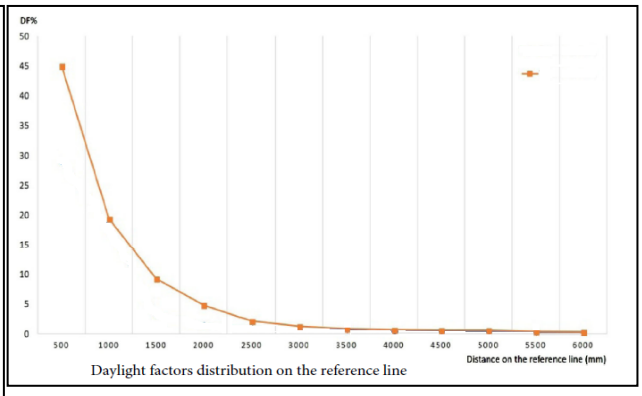
- 75% of the area of all regularly occupied spaces is within 7.5 m [25 ft] of view windows.
- 75% of all workstations are within 7.5 m [25 ft] of an atrium or a window with views to the exterior.
- 95% of all of workstations are within 12.5 m [41 ft] of an atrium or a window with views to the exterior.

According to simulation done by Omrani, et.,al.,2019, to Matmata houses, rooms don't have enough daylight all day long due to long depth of the rooms which may exceed 10 meters long. The study showed that north-facing rooms have day light factor distribution ranging from 45% to about 0% measured at the reference line shown in fig (6). This low level of light may be done on purpose to assure low level of light exposure at bedrooms and resting spaces as shown in fig(6).



Figures (6): *(up) light level in north-facing room in Matmata during summer noon (right) and the main systems affected by light exposure in the human body (left)- (down) Daylight factors distribution on the analysis grids of Matmata room, Omrani, et.,al.,2019*



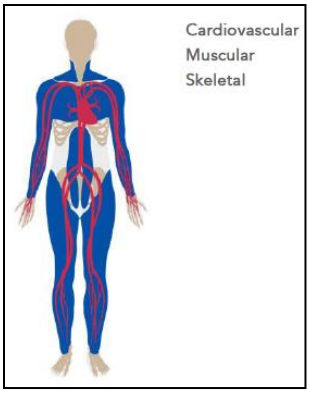


4.5. Interior Fitness Circulation:

The integration of interior pathways and stairs within the built environment can provide a convenient way to incorporate short periods of physical activity into the workday, thus reducing sedentary tendencies. Stair climbing is a low-impact, moderate-to-vigorous intensity physical activity that burns calories and has been associated with improved cardiorespiratory fitness and a lower risk of stroke. To encourage greater use, pathways and stairs should be aesthetically pleasing and easily accessible from high-traffic routes.

Interior Fitness circulation affects the following systems in the human body: Cardiovascular, Muscular, and Skeletal systems as shown in fig(7).

Figures (7): *The main systems affected by interior fitness circulation in the human body (WELL Guide book,2017)*



WELL features encourage intermittent bouts of physical activity and reduction of sedentary behavior through accessible, safe, and visually appealing
stairs, entryways, and corridors. This is done by the following requirements:

1: Stair Accessibility:

In projects of 2 to 4 floors, at least one common staircase meets the following requirements:

- Stairs are accessible to regular building occupants during all regular business hours.
- Wayfinding signage and point-of-decision prompts are present to encourage stair use (at least one sign per elevator bank).

2. Stair Promotion:

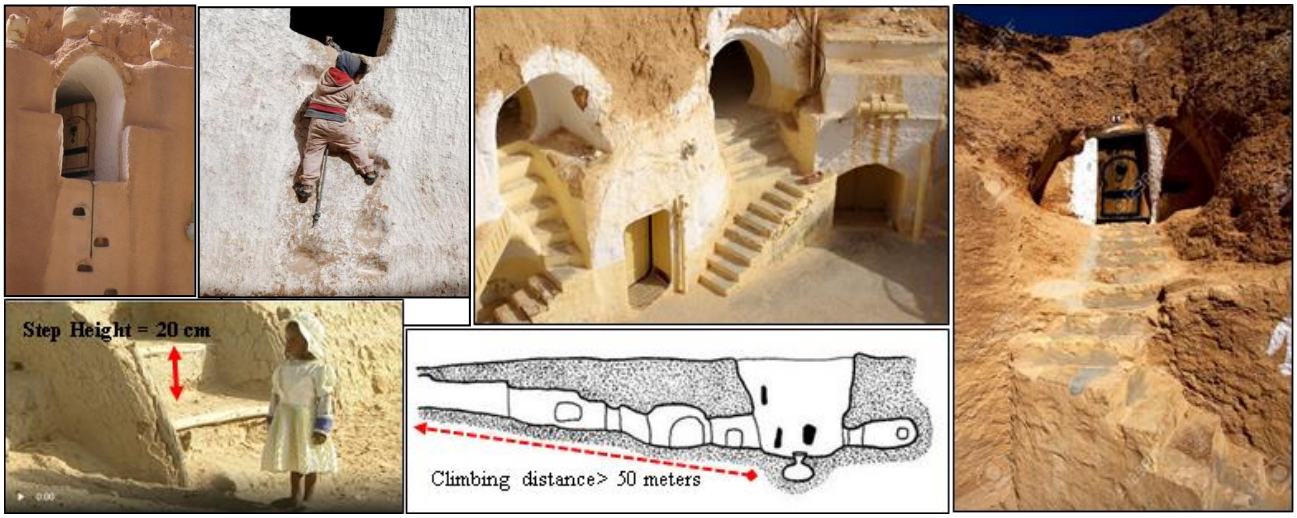
In projects of 2 to 4 floors, at least one common staircase meets the following requirements:

- Located within 7.5 m [25 ft] of the entrance to the building or the edge of its lobby:
- Clearly visible from the main entrance to the project, or located visually before any elevators
- present upon entering from the main entrance.
- Stair width set at a minimum of 1.4 m [56 in] between handrails.

3: Facilitative Aesthetics:
In projects of 2 to 4 floors, both common stairs and paths of frequent travel display elements of aesthetic appeal by incorporating at least 2 of the following:

a. Artwork, including decorative painting.
b. Music.
c. Daylighting using windows or skylights of at least 1 m^2 [10.8 ft^2] in size.
d. View windows to the outdoors or building interior.
e. Light levels of at least 215 lux [20 fc] when the stairs are in use.

Matmata houses promote physical activity by forcing the dwellers to climb more than 50 meters long and 10 meters high upstairs to reach street level. They also apply indoor stairs within the house to connect downstairs rooms to upstairs ones. Some dwellings depend on wall holes rather than stairs which the dwellers climb using their hands and feets as shown in fig (8) to reach upper rooms. Furthermore, long walkway distances inside the court and surrounding spaces promote physical activity as well. Indoor stairs climbers enjoy full access to daylight, aesthetic plantings, and fresh air supply.

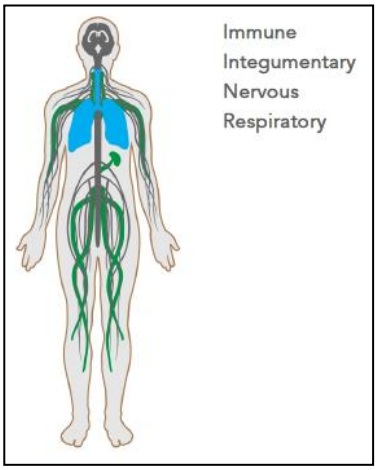


Figures (8): *(up) Wall holes installed in Matmata houses to reach upper rooms(left) and interior stairs inside the main court to reach : upstairs level (middle) and main door leading to the exit passage (right) – (down) step height of the indoor stairs in Matmata house (left) and cross section showing average climbing distance inside the main entrance passage (middle).*

4.6. Thermal Comfort:

Thermal comfort in the body is provided through homeothermy, the balancing of heat gains and losses to maintain the body's core temperature within its narrow range, 36-38 ° C [97-100 ° F], and regulated by the hypothalamus. Thermal comfort can affect mood, performance and productivity. However, temperature preferences are highly personal and differ from one individual to another. Balancing the energy requirements of large buildings with the varied occupant preferences can thus be challenging.

Thermal Comfort affects the following systems in the human body: Immune, Integumentary, Nervous and Respiratory systems as shown in fig(9).



Figures (9): *The main systems affected by indoor thermal comfort in the human body (WELL Guide book,2017)*

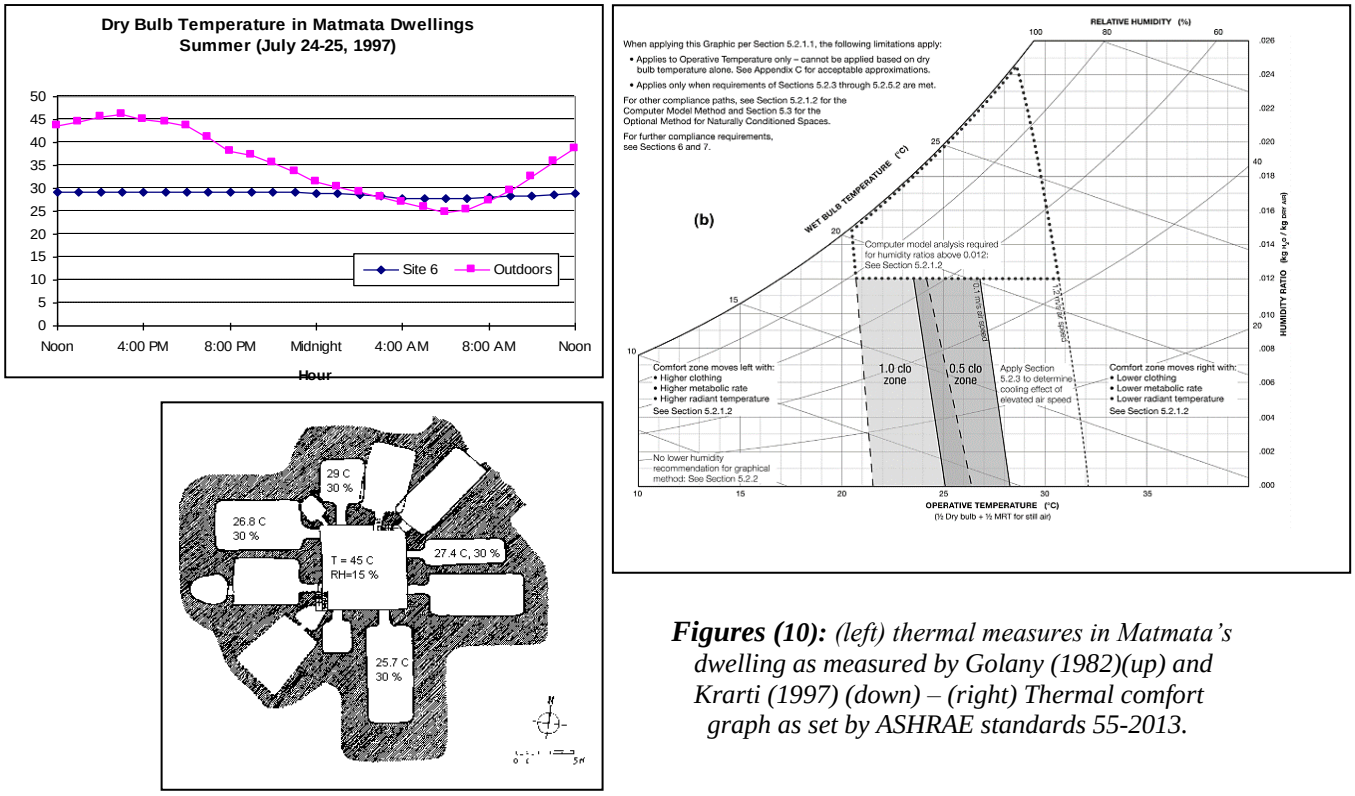
WELL features aim to promote occupant productivity and ensure a sufficient level of thermal comfort by applying the following:

Natural Thermal Adaptation: All spaces in naturally-ventilated projects meet the following criteria: ASHRAE Standard 55-2013 Section 5.4, Adaptive Comfort Model.

In fact, a sunken courtyard has the ability to combat the harsh climate and decrease energy consumption by 25–35% (Al-Temeemi & Harris, 2004). Studying thermal comfort of sunken courtyard in a hot-arid area (Matmata, Tunisia), Golany (G. S. Golany, 1988) showed that "the temperature of the rooms facing the sunken courtyard was about 17°C cooler in mid-summer and 9°C warmer in mid-winter than the maximum and minimum outside dry-bulb temperatures respectively". The thermal performance of Matmata dwellings was thoroughly studied by many researchers. Krarti (1997) measured the indoor temperature in both main court and surrounding rooms in six different houses during the hottest season of July. He found out that the temperature was nearly constant all day hours at 29 C inside the rooms, while it varied from 25 to 46 outdoor the dwelling. The relative humidity was 30% at all sites while it was 15% (desert dry weather) outdoor in July. Comparing this performance with ASHRAE standards 55-2013 Section 5.4, these measures are within the comfort zone of naturally ventilated spaces.

Dwelling Type	*Subterranean Dwelling*		*Above-grade Dwelling*	
Season	Winter	Summer	Winter	Summer
Outdoor Temp. Outdoor RH	6.6 ºC (44 ºF) 70 %	41.1 ºC (106 ºF) 11 %	6.6 ºC (44 ºF) 70 %	41.1 ºC (106 ºF) 11 %
Indoor Temp. Indoor RH	15 ºC (59 ºF) 48 %	25.5 ºC (78 ºF) 38 %	10.5 ºC (51 ºF) 60 %	36.5 ºC (98 ºF) 20 %

Table 2. Main thermal measures in Matmata's Dwelling as measured by Krarti (1997):



Figures (10): *(left) thermal measures in Matmata's dwelling as measured by Golany (1982)(up) and Krarti (1997) (down) – (right) Thermal comfort graph as set by ASHRAE standards 55-2013.*

4.7 Beauty and Design:

A physical space in which design principles align with an organization's core cultural values can positively impact employees' mood and morale. Integrating aesthetically pleasing elements into a space can help building occupants derive a measure of comfort or joy from their surroundings. The incorporation of design elements and artwork to a space can create a calming environment able to improve occupant
mood.

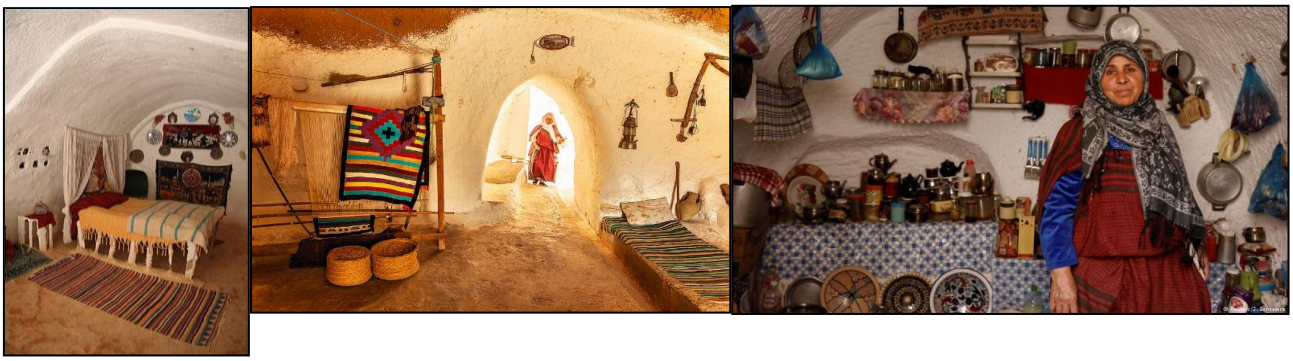
Beauty and Design affects the Nervous system in the human body.

WELL features require that the project contains features intended for all of the following:

a. Human delight.
b. Celebration of culture.
c. Celebration of spirit.
d. Celebration of place.
e. Meaningful integration of public art.

Matmata houses have the character of vernacular architecture where art work is present all over the indoor spaces.

Pots, ceramics and earthenwares decorated with beautiful local motifs are used for food storage and water gathering. The colorful woven mats, curtains and bed sheets are handmade by local women or by the house dwellers themselves for their own use. Storage boxes made of twined straw and date palm leafs, giving special character for the space and attracting tourists to enjoy the local heritage of this unique place.



Figures (11): *Local motifs of Matmata dwellers: colorful woven mats, curtains and bed sheets(left), twined straw boxes (middle)and food storage ceramic pots (right).*

4.8 Circadian Lighting Design:

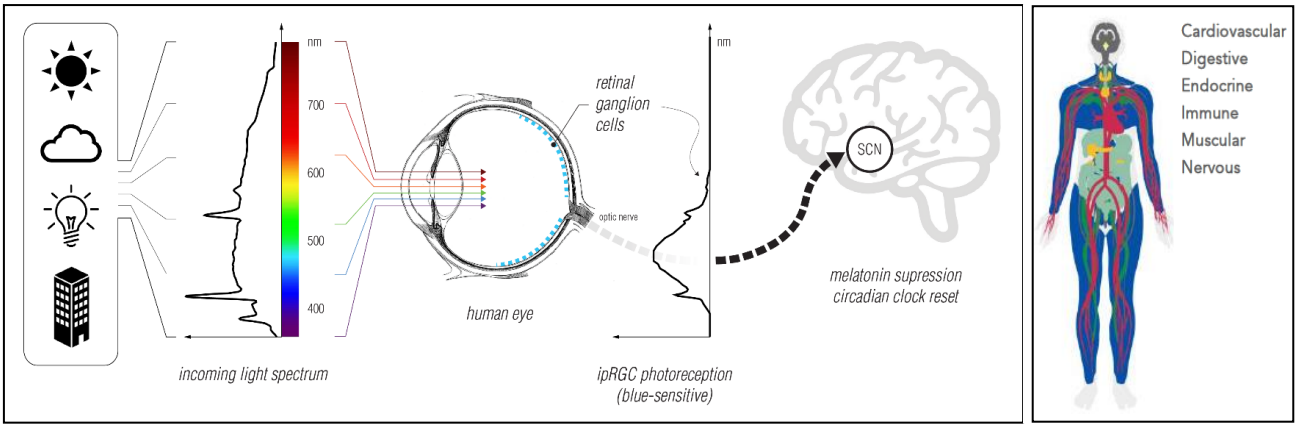
Light is one of the main drivers of the circadian system, which starts in the brain and regulates physiological rhythms throughout the body's tissues and organs, affecting hormone levels and the sleep-wake cycle.

Circadian rhythms are kept in sync by various cues, including light which the body responds to in a way facilitated by intrinsically photosensitive retinal ganglion cells (ipRGCs): the eyes' non-imageforming photoreceptors. Through ipRGCs, lights of high frequency and intensity promote alertness, while the lack of this stimulus signals the body to reduce energy expenditure and prepare for rest.

Circadian Lighting Design affects Muscular, Nervous and Skeletal system in the human body as shown in fig(12).

WELL features require support circadian health by setting a minimum threshold for daytime light intensity.

Matmata's dwelling depends basically on the natural daylight cycle by utilizing sun light as the main source for illumination of interiors. The biological cycle of the dwellers is synchronized with sunlight cycle by the interaction of daylight and light receptors in the brain of the dwellers. This assure good sleep times and high alertness during morning hours with minimal ache and fatigue.

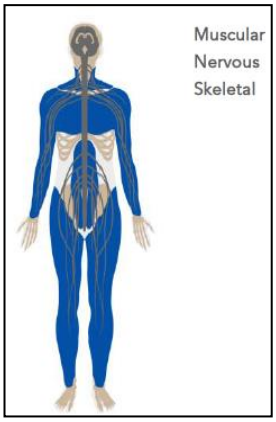


Figures (12): *The main systems affected by indoor circadian lighting design in the human body (WELL Guide book,2017) (right) - and the mechanism of melatonin suppression in the brain bby the incoming light spectrum received by retinal ganglion cells (left). Erren TC,et.al. (2010).*

4.9 Solar Glare Control:

Though bright light during the day is conducive to good health, uneven levels of brightness in the visual field can cause visual fatigue and discomfort. Glare, or excessive brightness, is caused by light scattering within the eye (intraocular scattering), thereby creating a "veil" of luminance that reduces the luminance contrast as received by the retina. In buildings, sources of glare are often unshielded or poorly shielded light, or sunlight directly hitting the eye or reflective surfaces.

Solar glare affects Muscular, Nervous and Skeletal system in the human body as shown in fig(13).



Figures (13): *The main systems affected by solar glare incidence in the human body (WELL Guide book,2017)*

WELL features encourage the avoidance of glare from the sun by blocking or reflecting direct sunlight away from occupants, using the following tools:

1: View Window Shading:

At least one of the following is present for all glazing less than 2.1 m [7 ft] above the floor in regularly occupied spaces:

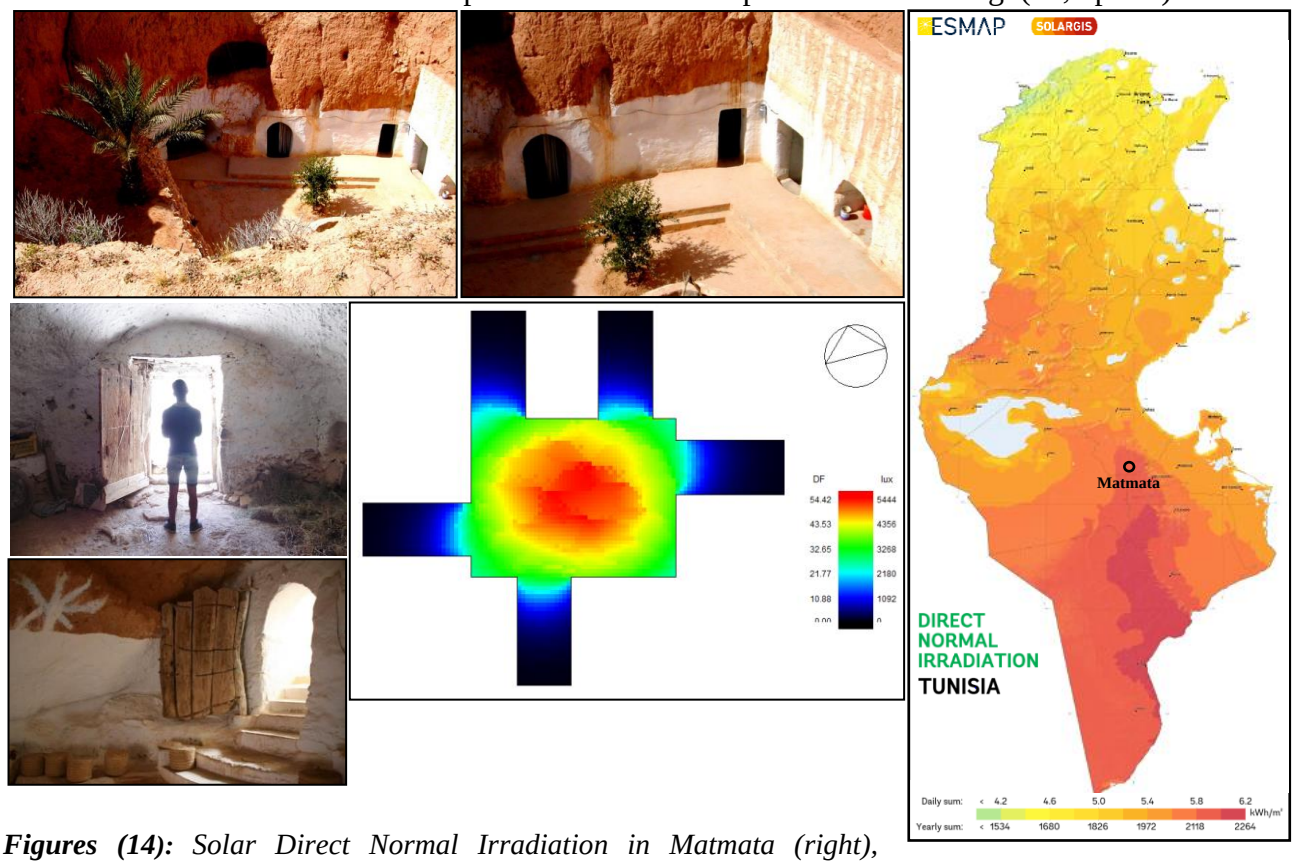
- Interior window shading or blinds that are controllable by the occupants or set to automatically prevent glare.
- External shading systems that are set to prevent glare.
- Variable opacity glazing, such as electrochromic glass, which can reduce transmissivity by 90% or more.

2: Daylight Management:

At least one of the following is required for all glazing greater than 2.1 m [7 ft] above the floor in regularly occupied spaces:

- Interior window shading or blinds that are controllable by the occupants or set to automatically prevent glare.
- External shading systems that are set to prevent glare.
- Interior light shelves to reflect sunlight toward the ceiling.
- A film of micro-mirrors on the window that reflects sunlight toward the ceiling.
- Variable opacity glazing, such as electrochromic glass, which can reduce transmissivity by 90% or more.

As part of the Tunisian desert, Matmata receives about 5.8 kWh/m^2 of direst solar irradiation each day as shown in fig.(14, right). That's why solar glare has been an important issue in Matmata. Glare has been controlled by applying the troglodyte structure which depends on cave dwelling (underground dwelling) type. The sides of the main court are shaded alternatively due to high depth of excavation. Shaded sides don't suffer the "glare" problem while the unshaded sides are exposed to direct sun exposure as seen in fig. (14, up left).



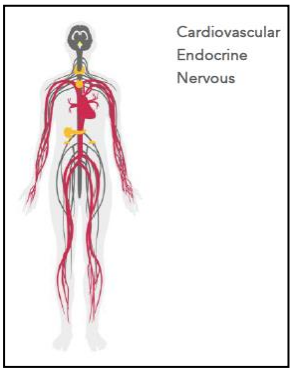
Figures (14): *Solar Direct Normal Irradiation in Matmata (right), shading on side walls of the main court during day hours (up left), thich stone narrow openings of interior rooms (left down), and day light factor performance in similar structure done by the researchers (down middle).*

This problem was faced by applying small narrow doors and openings of the surrounding rooms to minimize the sunlight intrusion in side living and resting rooms. Shading coefficient as well as thick narrow mouths of the rooms both had minimized the incidence of glare, (fig.14: down left). A light analysis has been made by the researchers using "Design Builder" tool at both the main court and the surrounding rooms during the hottest season of the year. The analysis shows that the daylight factor in all rooms start with 10.8% at the entrance and ends with 0% at the bottom, fig(14,down middle).

4.10 Exterior Noise Intrusion:

Loud or repetitive exterior noises can be a source of stress and a risk factor for certain health outcomes, particularly in urban areas. Studies show that individuals exposed to traffic noise have a higher risk for diabetes, stroke and heart attack, and those exposed to road traffic and aircraft noises have a higher risk for hypertension. In addition, exposure to noise can lead to reduced reaction time and increased levels of annoyance. Preventing excessive exterior noise from reaching building interiors can help improve occupant comfort and well-being.

Exterior Noise Intrusion affects the Cardiovascular, Endocrine, and Nervous systems in the human body as shown in fig(15).

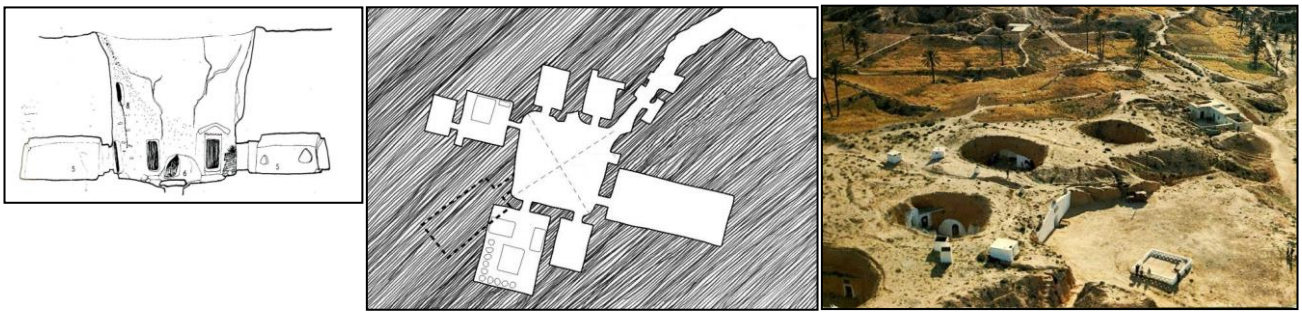


Figures (15): *The main systems affected by noise intrusion in the human body (WELL Guide book,2017)*

WELL features encourage the reduction of acoustic disruptions by limiting external noise Intrusion, this is applied by assuring that :

Average sound pressure level from outside noise intrusion does not exceed 50 dBA in each regularly occupied space as measured when the space and adjacent spaces are unoccupied, but within 1 hour of normal business hours (WELL Guide book,2017***)***.

One of the main advantages of sunken courtyard is that their central yard can reduce noise levels from the buildings in the neighborhood and the surrounding streets (Taleghani, Tenpierik, & van den Dobbelsteen, 2012). Thus, the central yard as one concept and underground as another, can perfectly reduce disturbing sound from outside (Hassan & Lee, 2014). Furthermore, the cellular type of Matmata's dwellings which are separated by thick layers of earthen material led to complete isolation from exterior disruption as shown in fig(16). Many occupants of earth-sheltered buildings suffer from lacking access to external world and the feeling of isolation and extreme disconnection. (Fatemeh Amirbeiki, et.,al,2018).



Figures (16)*: Deep excavation heights as well as the cellular type of Matmata's dwellings separated by thick layers of earthen material, both had led to isolation from exterior disruption.*

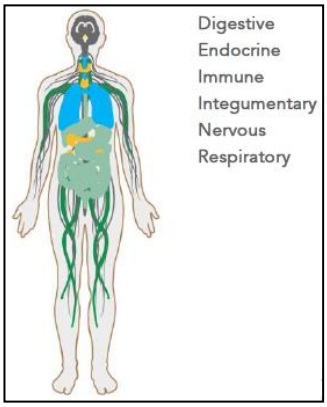
4.11 Olfactory Comfort:

Excessively strong or distinct odors can disrupt physical and psychological comfort, and even trigger eye, nose and throat irritation, nausea and headaches. Limiting these odors is a simple strategy that

can greatly contribute to occupant comfort and well-being.

Olfactory comfort affects the digestive, endocrine, immune, integumentary, nervous and respiratory systems of the human body as shown in fig(..).

Figures (15): *The main systems affected by olfactory disruption in the human body (WELL Guide book,2017)*



WELL features intend to maximize olfactory comfort by reducing the transmission of strong smells and odors within the building by the following:

Source Separation: All restrooms, janitorial closets, kitchens, cafeterias and pantries prevent strong odors from migrating to workspaces through one or more of the following separation methods:

a. Negative pressurization.
b. Interstitial rooms.
c. Vestibules.
d. Hallways.
e. Self-closing doors

In Matmata's dwellings, the odor-generating spaces like cattle sheds and hey reserves are separated from the main dwelling by a narrow path with a shutting door and a vestibule as shown in fig (..), which minimizes the odor intrusion to occupants. Furthermore, all rooms are separated from the main court with narrow openings (necks) to assure minimal intrusion of heat, glare, noise, and odor into living and resting spaces.

5. Conclusion:

The houses of Matmata have some design privileges that promote human health and welfare. Some of these privileges are related to high thermal comfort even during the hottest season of the year, interior physical circulation that promotes health and fitness, natural daylight supply which improves visual and mental health, and regulates circadian rhythm and improves the sleep-wake cycle of the inhabitants, minimal noise intrusion that assures quiet environment and improves blood pressure and hormonal secretions, reasonable olfactory comfort that improves respiratory and digestive systems and prevent allergies and respiratory ailments. Matmata dwellings also have the privilege of direct natural ventilation, solar glare control which prevents headaches and visual impairments, as well as the beautiful applications of native planting, motifs, and artwork that all help enrich both visual and spiritual joy.

6. Recommendations:

Historical site of Matmata is a good example for health-improving dwellings applied hundred years ago. Though being ancient, the construction is durable and able to resist harsh weather and climatic problems. It can be a good shelter against catastrophic events like storms, wars, and earthquakes. The form of Matmata's vernacular house and the analysis of its aesthetic characteristics has shown the strong affinity between man and nature. Houses were made in response to harsh climatic features and people's culture and lifestyle. The design had respect to natural and morphological characteristics of the terrain, and climatic conditions, as well as the needs of the inhabitants for many generations. The design has considered energy efficiency, indoor comfort and health issues in relation to form and beauty. However, Further modifications are needed to improve the health performance of these dwellings to assure clean air supply, safety against heavy rains and floods, good social contact with neighbors, clean water supply and affordable modern sewage system, as well as better energy performance and acoustic isolation for exposed courtyards.

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Climate Change adaptation; Vulnerability Assessment of the Historic City of Rosetta, Egypt

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Abstract:
The complexity of the vulnerability of historical cities to climate change comes from its fragile assets and composite nature. The city of Rosetta was inscribed in the world heritage tentative list for its outstanding tangible and intangible values and its unique coastal position. Rosetta is subjected to multiple climate change risks; this has called for the importance of taking actions.
Data and methods: Previous studies adopted various approaches to determine sectorial vulnerability of the city; the approach that is used here is based on UN-Habitat's Cities and Climate change initiative (CCCI) as it has been field tested in several locations. It started by documenting climate change primary and secondary impacts, then, carrying vulnerability assessment which is a function of exposure analysis identifying possible climate change scenarios, sensitivity analysis and adaptive capacity analysis or responsiveness.
Results and discussion: The paper identified thresholds, threat levels represented in influence diagram and risk plotting methods. This paper determined the most vulnerable places, institutions, populations and sectors in Rosetta; it identified where adaptive efforts should be focused through vulnerability assessment.
Conclusion: the paper rated current capacity level and preparedness degree through the vulnerability assessment summary matrix described in degree from high to low in order to prioritize risks, vulnerable groups and then preliminary recommendations were suggested as a guideline for adaptation actions.

Keywords: Vulnerability Assessment- Climate Change- Historic Cities

1. Introduction

This paper discusses the vulnerability assessment of Rosetta City, Egypt as an initial step to a boarder approach. The UN Habitat Cities and Climate Change Initiative (CCCI) seeks to enhance the preparedness levels of developing countries to climate change, it is a part of a boarder initiative "Planning for Climate Change: A strategic Value based Approach for Urban Planners" (Ingram and Hamilton, 2014)

The rationale of using this approach comes from the fact that it targets the requirements of cities in low- and middle-income countries where planning for climate change is challenging. CCCI is strategic ultimately concerned with making the best decisions with the available resources. It is value based tends to include local communities' values and objectives and fits in the existing objectives of the city plans and strategies. CCCI is participatory to connect multi-layer stakeholders to ensure that the measures resulting from the planning process are supported by different

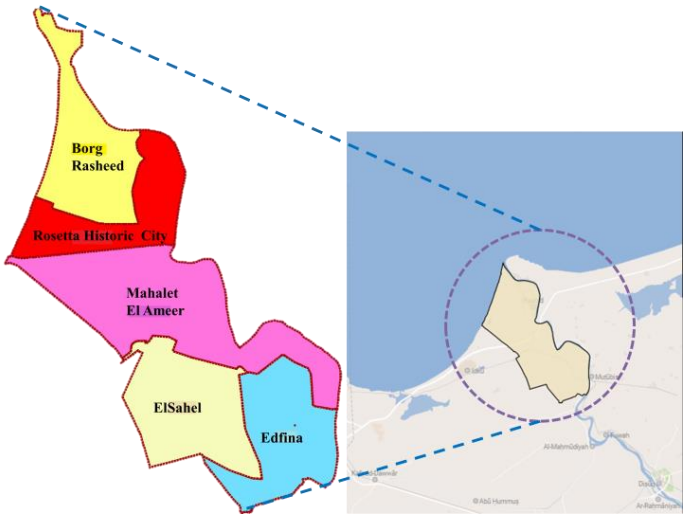
stakeholders and are responsive to local community interests and values and integrated aiming to mainstreaming the climate change action plan policies through the existing city plans. According to CCCI, Vulnerability assessment is a product of Exposure and sensitivity counteracted by the city's adaptive capacity where: Vulnerability= (Exposure+ Sensitivity)- Adaptive Capacity

The empirical part of this paper was carried out through a field study took place from 14th -17th of April, 2019, and other one day visits; interviews with Rosetta Municipality, Rosetta Environmental Management Unit (EMU), Random local residents including youth, women, men and children through different areas of the city; heritage center, informal areas, fishermen, taxi drivers, ferry boats owners and boat manufacturers. Sample survey included; 20 farmers, 20 fishermen, 10 boat manufacturers, 20 women, 20 of other jobs and 10 individuals from EMU and Rosetta Municipality. The aim of the field study was to assess the current situation compared to the literature review and to understand local observations on Climate Change.

2. Rosetta Context and Climate profile

On the north tip of Al Behiera Governorate along the western bank at the mouth of Rosetta branch of the Nile 65 km away from North-east Alexandria lays Rosetta city with its historic core. Rosetta was inscribed in the World Heritage site tentative list for criteria (ii), (iv), and (v) (UNESCO, 2019). Its history goes back to the era of Pharaohs, throughout history it acted as a defensive portal of Egypt and was confirmed as a tourist destination by the Egyptian law 113/1986. (Fig. 1)

Fig. 1: Shows the location of Rosetta City on the north tip of Rosetta Promontory and the Coastal zone of Egypt and



Rosetta's administrative areas

Rosetta's mean minimum monthly temperature for the period 1989-2015 is 15 ^{0} C. The mean annual precipitation level is 330 mm. (GCF, 2017) the mean wind speed for the period 2009-2017 is 8 Kts in the NW direction. The coastal winds range between 25-30 cm/sec (Wind finder database, 2017) the mean sea level temperature measured through the period of 1985-2015 is 21.5 ^{0} C. The mean significant wave height for the period 1979-2015 is 1 m with maximum of 6.5 m. (Global Ocean Waves database, 2017)

Rosetta represents a unique meeting point for biological elements of Sandy beaches, Salt Marshes and Sabkha (GCF, 2017) these are mostly covered with scattered vegetation shrubs. A natural heritage strip of palm groves encompasses the Million Palms City which is well known with date production. Groundwater renewable aquifers of Nile River Basin and Delta are constantly supplied

from Nile River leakage; it is used to provide cities and villages with clean drinking water after purification, because of its low treatment costs. (UNDP, 2011)

3. Exposure

Exposure explains how the city is susceptible to climate change defining current and projected impacts. (Ingram and Hamilton, 2014) AlBeheira was identified as one of 5 hotspots on the northern Coast of Egypt. Rosetta's promontory is protruded for 10 km in the sea in the northwest direction and around 8 km westward; it is a low relief below 2 m above sea level and a light slope from south to north. The natural ground level is between 0.3- 1.3 above sea levels (GCF, 2017)

3.1. *Sea Level Rise*

3.1.1. Coastal Flooding

The International increase in SLR in the last decade is around 3 mm/year. Local Sea level is already rising in the Nile delta region due to coastal 3 to 5 cm/year subsidence, 20 cm tidal range, erosion, and reduced sediment (IPCC, 2014; Mccque, 2011). Also, Beheira governorate is the second largest ground water source (645 × 106 m3/year); pumping ground water cause major land subsidence (Gebremicheal et al, 2018) According to Smith, et al., (2013) SLR is estimated to be 1.6 mm/year combining both SLR and land subsidence effect, it is assumed that by 2100, 12% of the total percentage of the Nile Delta would be inundated assuming the presence of Mohamed Ali's wall and zero elevation from SL for coastal lagoons. According to UNDP (2011), Rosetta lies in sub zone 3 that contain natural and artificially protected shores those were identified as the most vulnerable places in need for future adaptation, the areas at the west and east of Rosetta are considered to be in subzone 1 where there is no protection and are highly vulnerable (GCF, 2017).

3.1.2. Coastal Erosion

Rosetta was shaped by the sea water; the sediments from the Nile expanded the land into the sea. Since the construction of the High Dam in 1965, 100 million tons of sediments are being trapped in the southern part of the Aswan reservoir causing the submergence of 2 Km of the coast and the continuous erosion and subsidence. (GCF, 2017)

Darwish et al., (2016) compared Rosetta's promontory coastline through the period between 1945-2015 and concluded that the coastline along Rosetta Promontory is the most fragile segment of the Nile Delta coast as the highest erosion had occurred in front of the promontory and along the west side, it's change was greater than 4000 m (3% of the Coast). A study by Masria et al., (2015) also concluded that within the last 30 years 1.6% of Rosetta promontory was eroded, 9% was accreted and 3.1 % of wetlands were changed to agriculture lands, it also concluded that protection work on Rosetta promontory decreased the shore retreat from 124 m/year to 37 m/years.

3.1.3. Salt water intrusion and salt salinity

Abdelaty et al, (2014) stated that, 25 cm SLR would cause Sea water intrusion up to 73 km, 50-100 cm SLR would result an intrusion to 73.25-73.75 km. Under the combination of other factors; increase water extraction and decrease surface water, salt water intrusion would reach 76.25 to 79.50 km at Rosetta. Nahry & Doluschitz (2010) compared soil salinity results from Nile Delta through the period of 1978-2008; this has shown the increase in the salinity. This would affect crop production, degradation of ecosystems, and decline in health/living standards as a result of decline in drinking water quality.

3.2. *Precipitation Levels*

Due to lack of information, the direction and amount of change is uncertain by 2030, for 2050 a 4 % decrease is expected with high uncertainty and low statistical confidence. (USAID, 2015) The World Bank (2019) stated that, the linear trend for seasonal average and decadal variability indicates a reduction since 1960 and projections of future rainfall indicate a 7% reduction.

3.3. *Drought*

Estimates for 2030 and 2050 are highly uncertain due to rainfall projections uncertainty. Egypt receives little rain, and agriculture is not basically dependent on rainfall, yet decrease in rainfall along with raising temperatures inducing evapotranspiration and affecting the Nile flow would impact the supply of water. (GCF, 2017)

3.4. *Extreme weather events*

Studies has shown that the average disaster number has increased from an average of 3 natural disasters/year in 1980; to an average of>15/year in 2006, along with the increase of severity of storm surges. (UNDP, 2019) Flash floods; short and local heavy rains leading to flood risks, there is evidence that severity and frequency of flash flooding has increased over the recent years in Rosetta according to site visits and data collection. (USAID, 2015; World Bank, 2019)

3.5. *Increased Temperature*

On National basis, IPCC (2014) complies that, the increase in temperature on Egypt is estimated to be 0.1 ^{0} C/year to reach 2.3^{0} C increases by 2050 consequently Egypt will face; fresh water supply decrease by 15%, legume production decrease by 40%, irrigation demand increase between 4-18%, population growth and demand increase may escalate irrigation demand to 22-74% leading to further deterioration in water quality. (Cramer et al, 2018) (Fig. 2)

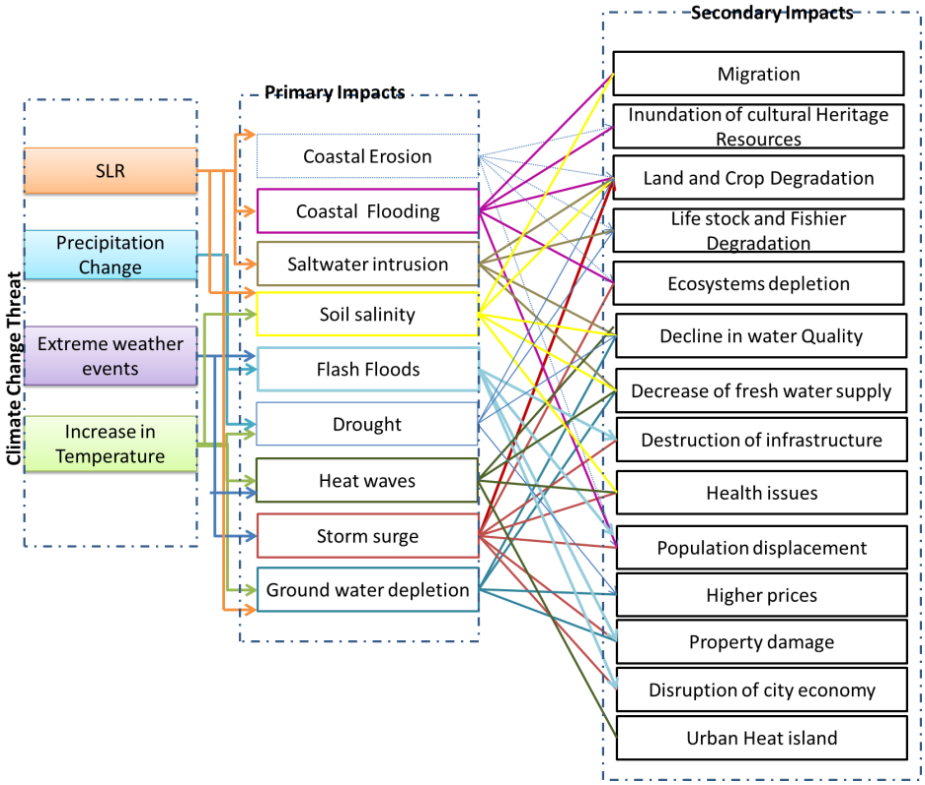


Fig. SEQ Fig. * ARABIC 2: Influence Diagram shows the interrelated connections between Climate change threats, primary and secondary impacts. The Author based on CCCI 2019

3.6. *Site Visit observations*

The increase in the intensity of flash floods and storm surges through the months of December to April, the degradation of crops, life stock, fishers, and water quality are the most reported observations among local residents. Other important one is the increase in levels of underground water leading to the buildings and monumental building foundations ruin. Most Families of "Borg Rasheed" had to leave their homes and migrate from the area fearing inundation leaving it desolated. The locals encountered withdrawal of the coastline to the shore where it used to be fishing huts that served as resting place for them 40 years ago, now the area shrunk even though it is protected with breakwater artificial walls, fishermen stated that those walls didn't protect them but destroyed their boats that crashed to the walls during storms. (Fig. 3)

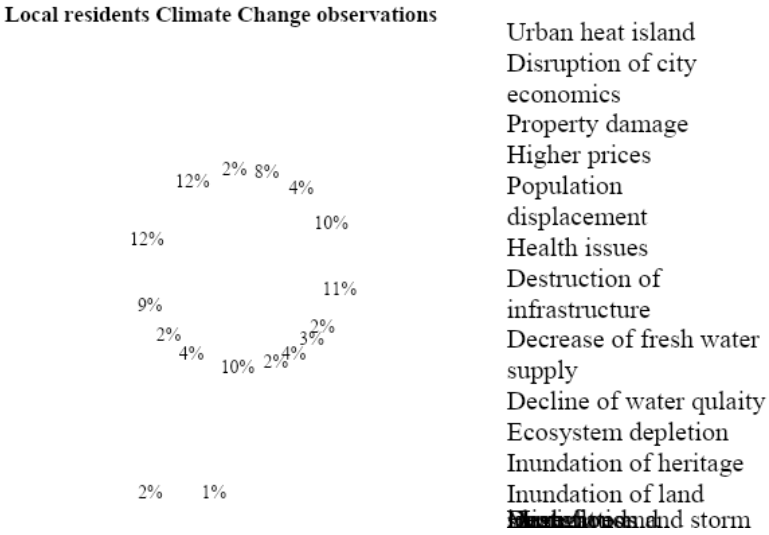


Fig. SEQ Fig. * ARABIC 3: Local residents Climate Change observation. The Author, 2019

In order to assess the Exposure of Rosetta City, indices based on those suggested by the Green Climate Fund proposal (GCF), (2017) along with thresholds indicated by the UN-Habitat Planning for Climate Change, (2014) and World Bank (2019) were used. (Table 1)

Table 1. Indices used for assessing the Exposure or Rosetta. (GCF, 2017; PfCC, 2014; World Bank, 2019)

Indicator	Based on	Score
Beach type Indicator (BTI)	Exposure to erosion and flooding	5
Human disturbance Indicator (HDI)	The degree of anthropogenic(pollution) change of the coastline	5(> 50 %)
Coastal Type Indicator (CTI)	CTI= (BTI+HDI)/2	5
Flooding	Highest flooding rates 0.6 m from 1979-2015	5
Erosion	Based on sediment transport (STI) and Longer-term Erosion indicator (LTI)	5

Salt water intrusion	Thresholds between low-medium and medium-high have been established as 10 cm and 20 cm of SLR	5
Extreme weather events and flash floods	A week of 45^0 C cause increased incidents of Heat strokes and dehydration. Flash floods are more than three consecutive days with daily amount ≥ 50 mm (World Bank, 2019)	3
Precipitation levels	Precipitation threshold> 20 mm: in Egypt ≥ 1 mm/min (World Bank, 2019)	1
Drought	Drought: Absolute value threshold, Standard Precipitation Index < −1 mm (McKee (1993) not present for Egypt	1
Temperature increase	Agreement increase in mean temperature, warm nights more frequent than cool nights, 8°C threshold which broadly represents a comfortable living environment (World Bank, 2019)	5

Table 2. Exposed features and sectors in Rosetta. (The Author, 2019)

Climate hazard		Exposed feature (People-Places-Institutions)	Exposed sectors
Coastal erosion		Beach- Ports- Palm Groves-Environment and ecosystems- Golden triangle area -Heritage sites- petroleum projects- Coastline Tourism targeted projects	Agriculture -Tourism Economy- Environmental- Social-
Coastal flooding		Ecosystems Beach- palm groves- petroleum projects Agriculture lands and farmers- fisheries and fishermen-Tourism Projects-Housing –Infrastructure-Transport (Regional Road)-Heritage sites (Historic center)	Agriculture Economy Housing-Environment Tourism- Transportation Infrastructure
Salt water Intrusion		Agriculture land, palm groves and soil salinity- Heritage sites- Ecosystems and Nile Aquifer Fishers, Farmers and livestock Ground water quality-Water supply Housing and infrastructure	Agriculture- Economy Housing- tourism Infrastructure- Environment
Extreme weather events and flash floods		Beach- heritage sites Housing and infrastructure fishermen and boast manufacturers	Health- Economy-Services, Agriculture Housing and infrastructure transportation
Precipitation levels /drought		Coastal Agriculture- Society	Health- Agriculture infrastructure Economy
Increased temperature		Society- Soil and agriculture	Health- Agriculture- Economy

4. Sensitivity Analysis

Sensitivity is the degree to which climate change impact the exposed people, places, institutes and sectors, either positively or negatively at preset time and in the future. Sensitivity analysis is based on socio-economic and physical realities that represent the stressful causes for climate change impact. The sensitivity factor is in fact a complex to be directly measured and observed. In order to

carry sensitivity analysis for Rosetta Egypt in a quantitative way, proxy variables are chosen for observation. The approach suggests indicators to be observed and assessed; the researcher compared those proxies to those suggested by Moss et al, (2001) in the Vulnerability resilience indicator prototype or the (VRI) Model and the added proposed Heritage indices. (Fig. 4) (Table 3 &4)

Table 3: Indicators for Sensitivity. The Author, 2019

Index	Type	Issue
Settlement and infrastructure	People affected by Impacts	High: 1/3 jobs will be eliminated. 2 million people will be affected in the Delta with no adaptation, With adaptation only 700 are expected to be affected.(WHO, 2018)Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to approximately 47 deaths per 100,000 by 2080 compared to one death per 100,000 annually between 1961 and 1990.
	Access to Basic Needs Fresh water Sanitation	High; 150 Lday/person. Smith, J. et al., (2013), reports that countries with less than 1,000 m3/capita /yr are considered to be in water poverty Households connected to sanitary sewage system = 31.04% on governorate level. Lack of adequate Solid Wastes disposal landfill and resources. The medical wastes incinerator in Rosetta's public hospital is not functioning.
Ecosystems	Land management	Low: The land is of 81.22 acres; 22.09% residential uses, 3.5% is economic and includes areas of industries, craft activities and recreational uses and desert and vacant lands represent 9.84% of the total study area. (RUSPS,2008)
	Fertilization usage	Medium High: Egyptian farmers consume more than 1.8 Million ton of fertilizers annually (Food and Agriculture Organization, 2006), mainly using nitrogen, phosphorus and potassium in different forms.
Food Security	Cereal production	Medium High: Decrease in all scenarios as Crop yield (capacity per feddan) decrease. Nile flow decrease 12%- Agriculture production decrease by ¼. Nile flow decrease by 1/3 - Agriculture production decrease by ½. Wheat -19.2%, vegetables -28%, sugar cane -15.2%, Rice-11%, lentil -28%
	Animal usage per capita	Medium average protein supply from animal origin, is 24 gr/capita/day in Egypt, compared with 31 gr/capita/day for the World
Water sources	Renewable supply	Medium Low: water quality problems, water not connected to poor villages (site visit observation)
Heritage (indirect)	heritage knowledge	Low (Site visit observation and sample survey)
	Condition	Low 69% are in good condition while the rest are in need of intervention
	Maintenance	Low (Site visit observation) maintenance projects by Arab Contractors under the supervision of the New Urban Communities Authority upon contract with ElBeheira governorate
	Depletion of monuments	Low The number of heritage buildings has decreased from 52 in 1963 to 37 in 2006 (RUSPS, 2008)
	stakeholders Consensus	Low (reports and site interviews)

Infrastructure	Land use	Low: Heritage represent 0.37%, administrative 0.42%, Social 0.42%, vacant land 9.84%, commercial 1.66%, under construction 5.82%, educational 2.82%, entertainment 0.9%, crafts 0.98%, religious 41.1% , mixed use residential 20.99%, barren land 2.88%, tourism 0.42%, health 4.52%, industrial 0.36%, army 8.61%, squares 0.79%, green areas 0.02%, cemetery 0.06%, services 1.18%, farms 0.36% (RUSPS,2008)
	Land value	Medium-High: ground water
	Infrastructure (Indirect)	Low: lack of sanitary sewage, poor roads, no waste disposal resources,
	Materials Indirect)	Low: 54.81% are bearing walls, 24.43% are concrete structure and 20.76 %are adobe with other material rooftops.
	Condition Indirect)	Low: 71% of buildings are cracked, 21% are in moderate and good condition and 8% are dilapidated (RUSPS,2008)
Housing	Informal Settlements Indirect	Low: 5 informal settlements; Hassan Ali 5.5 % of residents. Behind transformers represents 35% 36% of residents, QatQat represents 20% of residents, Abou ELreish represents 20% of residents. Alkasara 5.5 % of residents. (RUSPS, 2008)
	Occupancy rates	Low: The crowding rate is about 1,193/km2 in 2018. And average family number=4
Welfare and Human Development	Average income	Low: Mean weekly wages for Rosetta is 523 LE which is considered to be from the 5 lowest governorates in Egypt (CAPMAS, 2018)
	Poverty rates	Medium High: 22% of population live below poverty line
	Life expectancy at birth	Low: Infant mortality in Rosetta is estimated to be 4.3 in every 1000 child (Environmental description of AlBiehera, 2007). National basis decreased from 37/1000 in 2000 to 17.5/1000 in 2019(worldbank, 2019)
	HDI	Medium: 115 over 180 country, medium developed country (UNDP, 2018) Yet it faces many social, political and economic problems
Human Health	Life expectancy	Low: Death rate has been reduced by more than 40% since 1985 (World Bank, 2011a). The life expectancy of the typical Egyptian is 70 years, an increase of 10 years over the last 25 years (CAPMAS, 2018)
	Fertility	Low: Fertility has decreased from 3.5 per woman in 2014 to 3 per woman in 2018 (UNFPA, 2019)
Demographics	Gender	The population is 2018 it is 110,048 55935 males and 54113 females
	Children and elderly	Low: Percentage of elder people more than 60= 6% Percentage of children younger than 10= 36% (CAPMAS, 2018)
	Literacy	High: Illiteracy: 34.2% (CAPMAS, 2018)
	Educational levels (Indirect)	Low: 2% PhD, 8% MSc 11%, High Diploma, 9% University, 19% Technical schools (CAPMAS, 2018)
	Economic Dependency	High Unemployment: 8.17% Dependency rate: 3.54/family (CAPMAS, 2017)

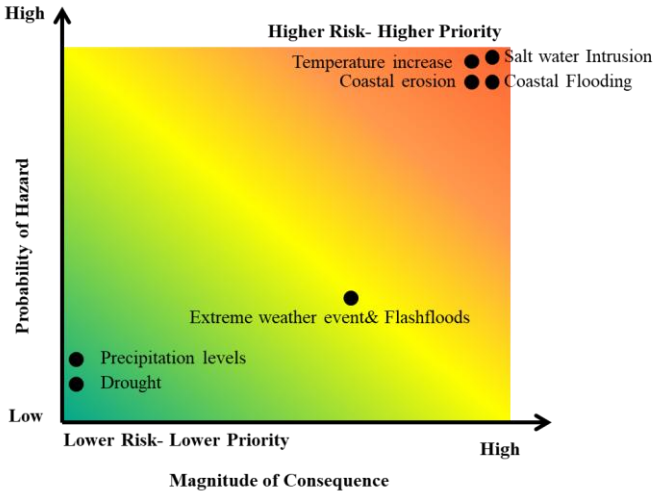


Fig. SEQ Fig. * ARABIC 4: Risk Plot according to Exposure and Sensitivity, The Author, 2019

Table 4: Sensitive features and institutions, the Author, 2019

Hazard	Primary/Secondary Impacts	Sensitive features (People- Places- institutions)	Sensitive sectors	Threat level
Sea level Rise	Coastal flooding Coastal Erosion Salt water Intrusion Societal displacement Agriculture and Economy Food insecurity Soil salinity	Coastal ecosystems Agriculture land inundation Salt water intrusion impact Palm groves natural heritage and the foundations and materials of Heritage Port flooding, Fishermen, fisheries Poor residents in Borg Rasheed Petroleum area flooding Tourism facilities flooding Qaitbay castle and historic center- Housing and infrastructure.	Agriculture Tourism heritage Economy Housing and infrastructure Environment	High (high confidence) to east and west of Rosetta
Extreme weather events	Flashfloods Storm surge increase Dust storms	Housing and infrastructure Residents especially in Borg Rasheed, Abou elReish area rural and informal. Coastal tourism projects Tourism facilities (historic center) Farmers and residents (crops)	Agriculture Housing Tourism Economy Environment Infrastructure	Medium low (medium confidence)
Precipitation levels and Drought	Coastal Agriculture Water security Food security	None in Rosetta and on national scale does not depend on Rain for Agriculture.	Health. Services transportation, and Agriculture Housing and Economy infrastructure	Medium Low (Lack of Data)

Temperature change	Nile flow Heat waves. Cold spells Drought, Water security Quality of water Soil salinity Agriculture Ecosystems and fishers	Heritage Sites (change in humidity levels impact sites, impact on materials, foundations,) Agriculture (crop reduction) Poor informal areas residents Local residents	Health Tourism Agriculture Economy Water resources and irrigation	High (high confidence)

5. Adaptive Capacity

Adaptive capacity of a city answers the ability of a city to adapt, the resilience of people, intuitions, places and sectors according to previously identified hotspots. According to IPCC (2018) it is the ability of a system to respond to climate change. It depends on the awareness, available resources, institutional capacities and governance. In order to identify the adaptive capacity of Rosetta; a questionnaire-based interview was held during the field study with the Representative of Rosetta Municipality. Questionnaire was based on the suggested proxies; answers were recorded according to answers and current situation observations. (Table. 5) Appendix 1

Table 5. Adaptive Capacity of Rosetta. The Author, 2019

Hazard	Threat	Wealth		Technology		Institutions		Infrastructure		Information		Social Capital		Adaptive Capacity
Coastal Erosion		Dedicated resources	MH=4	Short term technology	M=3	Plans for adaptation	M=3	Short term	M=3	Institutional local	MH=4	Aware but inactive	M=3	20/5=4
Salt water intrusion		No designated resources	L=1	No designated resources	L=1	Authority, Academics, MWRI	M=3	None dedicated	L=1	Institutional, authority, academics	H=5	Out of society scope centralized	L=1	12/5=2.4
Coastal Flooding		Ongoing Renewal program	MH=4	Artificial technology	MH=4	Authority, MWRI, SPA	ML=2	Low designated	ML=2	Institutional, Local knowledge	H=5	Out of scope of public	L=1	18/5=3.6
Extreme weather events		No designated resources	L=1	Low capacities	L=1	Authority, EEAA, SPA	L=1	Low	L=1	Low	L=1	Out of scope	L=1	6/5=1.2

Precipitation levels		Agriculture depend on the Nile	MH=4	Low capacities	L=1	EEAA, Authorities	M=3	Low	L=1	Low	ML=2	Out of scope	ML=2	13/5=2.6
Drought		Insufficient	ML=2	Ground water	ML=2	Plans for desalination	MH=2	Not on local level	M=3	institutional	M=3	None	M=3	15/5=3
Temperature change		Insufficient financial resource	ML=2	Heating and cooling methods expensive	M=3	No plans	L=1	Not on local level	ML=2	Institutional and local	MH=4	None	MH=4	13/5=2.6

6. Conclusion

The IPCC identifies vulnerability as how prone communities are to Climate Change impacts and their inability to cope with. (IPCC, 2014), it is a function of exposure to impacts, sensitivity of people, institutions and sectors and their adaptive capacity. Applying the equation; Vulnerability= (Exposure+ Sensitivity)- Adaptive Capacity

Table 6. Vulnerability Assessment Summary, the Author, 2019

Exposure		Sensitivity	Adaptive capacity	Vulnerability
Hazard	Threat level			
Coastal Erosion	H=5	H=5	3.6	6.4
Salt water intrusion	H=5	H=5	2.4	7.6
Coastal Flooding	H=5	H=5	4	6
Extreme weather events	M=3	ML=2	1.5	3.5
Precipitation levels	L=1	ML=2	2.6	0.4
Temperature changes	H=5	H=5	2.6	7.4
Drought	L=1	ML=2	3	0

The table above shows that Rosetta is highly vulnerable to Salt water intrusion along with Temperature increase. Coastal erosion and coastal flooding come next, then Extreme weather events presented in flashfloods, and the least hazards are Precipitation levels and drought.

7. Recommendations

This research followed the UN-Habitat CCCI Approach to assess and evaluate the vulnerability of Rosetta city to climate change in order to identify where adaptation efforts should be allocated. Rosetta city is rich with tangible and intangible heritage and require a comprehensive adaptation plan. The study concluded that Sea water intrusion and Temperature increase are the highest threats

confronting Rosetta. From site visits, artificial methods for SLR adaptation are highly expensive, need constant maintenance, replacement and renewal. In order to achieve resilience; adaptations should target long term and constant altering changes in climatic scenarios through the ability of carrying feasible upgrading to those methods. Eco-based methods have proven to be more efficient and lower in cost and maintenance; A pilot project lying 50 km from Rosetta utilized ecological methods such as sand fences, clay core dikes and geo tube like dike. These Eco based adaptations performed efficiently through multiple flashfloods and storm surge and succeeded in preventing salt water intrusion and flooding. (Ali et al., 2018). For the raising temperature, Rosetta's gift of natural palm groove heritage should be maintained and expanded, forestation of palm grooves along would act a climate proof for Rosetta. Last but not least, the CCCI approach notion is based on building social awareness to climate change as poor, climatic ignorant and marginalized populations are the most vulnerable to climate change and methods of adaptation that takes place excluding society are proven to be inefficient. Participation and climate knowledge are an important tool to achieve resilience.

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1. Appendix A

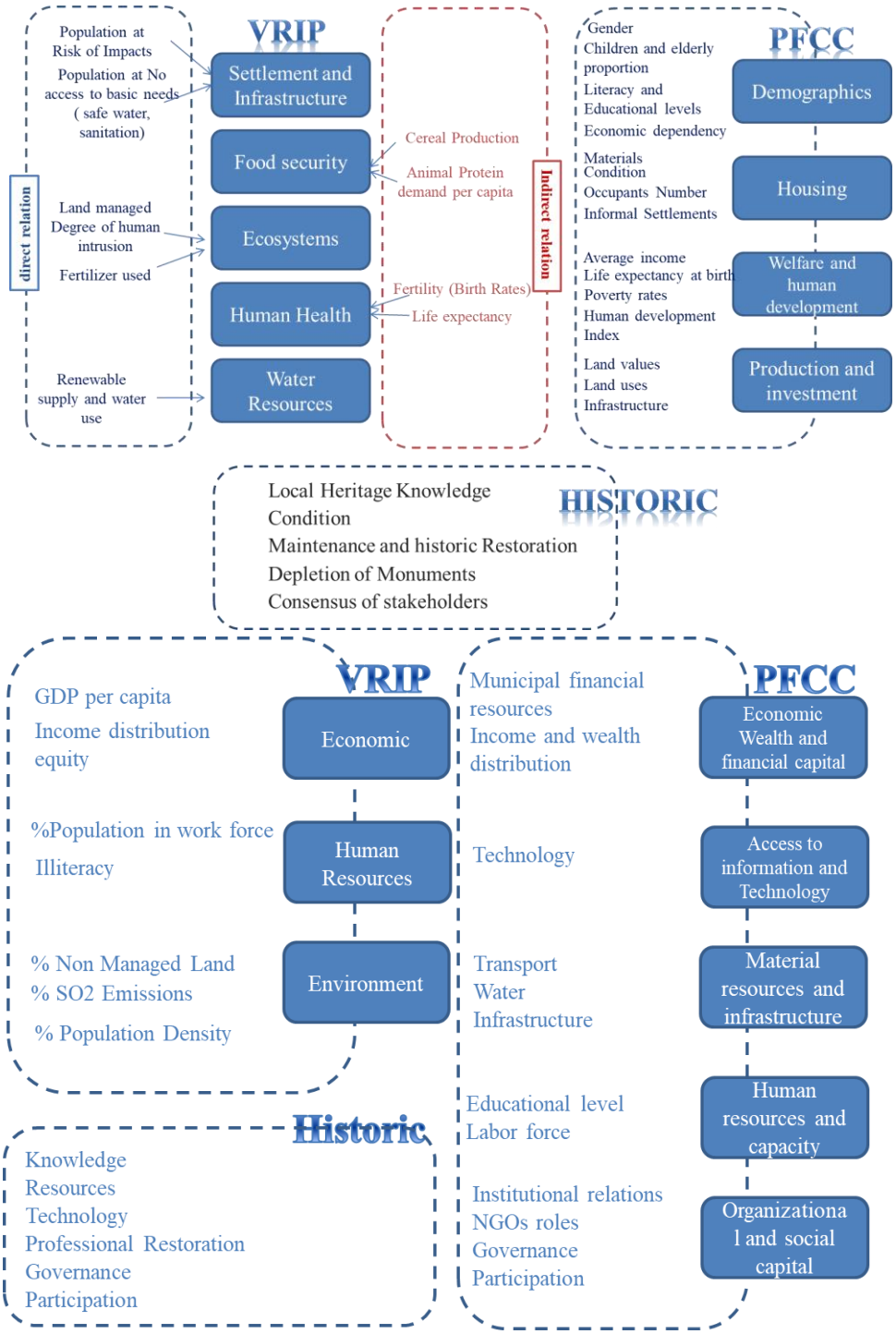

Figure SEQ Figure * ARABIC 1: Indices and Proxies for .sensitivity based on VRI, PFCC and the proposed heritage proxies

Table 7: Questionnaire sample, the Author, 2019

Adaptive capacity assessment criteria	**yes**	**no**	**why**
Economic wealth			
Is there an adequate financial resource dedicated to Climate change?		√	● There is lack in financial resources ● lack of adequate management of resources
Are there people with available resources that would help in case of climate hazard?		√	● Lack of public awareness ● There is no community plan taught and practiced on reacting in such cases. ● Local residents resource deficiency
Do you have an efficient staff and assigned time to plan and implement Adaptation actions?	√		● Lack of professional capacities ● Through previously encountered threats, the army forces had to interfere
Technology			
Is there a communication method to directly reach the people/sector impacted	√		Communication takes place through mosques and schools.
Infrastructure			
Is there sufficient and efficient transportation, water infrastructure, sanitation, energy supply and management?		√	● No adequate transport ● Fresh water scarcity ● Insufficient sanitation ● Week management of resources
Is there any major infrastructure or facility located in hazard subjected areas?		√	● Rosetta is highly subjected to flashfloods incidents, heat waves, salt water intrusion, groundwater inundation
Do people in the affected area have access to safe, clean drinking water in the event of a hazard occurrence?		√	In general: ● Water does not match qualifications. ● Rosetta strait winter blocking increase pollution ● AlGedya water station receives water from drainage with high SO2 levels ● Only Edfina station supply fresh water
Are there adequate medical services close to possibly impacted areas?		√	● Insufficient medical basic service especially in informal areas and depleted areas.
Information and skills			
Are decision-makers aware of climate change and potential Impacts?	√		National and local studies were carried
Are there trained emergency response teams for this?		√	There is no trained teams or planned response
Are stakeholders in the area aware there are potential impacts?	√		Environmental Municipality Unit (EMU)Rosetta, Environmental Agency affairs al Behaira department, technical Unit
Were there previous efforts to study and address the climate change potential impact?	√		Mainly National studies, EEAA studies, UNDP, UNEA, UnHabitat, Academics
Institutions and social capital			
Is there readiness to assign resources to build adaptive capacity?		√	On one level political willingness targets financial resources and economic prospects
Are there community "leaders" that can lead people in the event of a hazard existence?		√	Depending on Mosques and Schools
Are there existing processes that you can integrate with?	√		Existing city strategic plans 2019
Are there any existing plans, including emergency response?		√	Flashfloods preparation

Are there specific agencies, community groups, NGOs that have the mandate and skills?		√	● Poor access to technology ● Lack of local expertise. ● Inadequate local capacities
Heritage			
Is there appropriate knowledge concerning the value of the cultural heritage and assets? Programs, trainings.		√	● Heritage is out of scope of locals ● Unprofessional capacities dealing with heritage
Are there enough resources for restoration/on and maintaining heritage?		√	● No, lack of funding and resources, Ministry of Antiquities depend on few resources such as tickets for Rosetta museum and Kiosks rentals ● The New urban community authority assigned the Arab contactors company to restoration process.
Are there adequate technologies to restore and maintain heritage?		√	● No. depending on site visits
Are there appropriate technological means to restore awareness of the value of heritage as assets?		√	● Poor technological means ● Poor resources ● Out of scope
Is there governance concerning heritage management and preservation?		√	● No, centralized decision making and out of scope for local residents
Is public participation enabled in heritage management and preservation?		√	● No, based on site visits and surveys

Table 8: Hazards impacts according to CCCI, 2014

High	Substantial dominant injuries or loss of lives – Deteriorated conditions and loss of employment - Irretrievable widespread damages and loss to environment and infrastructure.
Medium High	Remote occurrences of serious injuries or loss of lives - local economic impacts and stagnation. Serious impacts on livelihoods - prevalent decline in life quality – enduring damage to infrastructure and environment - Services struggle to function efficiently and at risk of failure.
Medium	Remote public injuries - Isolated but significant cases of environmental and infrastructure damage that might be reversed with intensive efforts - Services under severe pressure
Medium low	Minor public injuries – reversable minor cases of environmental and infrastructure damage - Isolated instances of government services being under severe pressure
low	Appearance of a threat but no actual harm to public safety - Minor impact on livelihoods - no or insignificant infrastructure and environmental damage - Minor instances of disruption to local government services

An Integrated Framework for the Sustainable Development Through Adaptive Reuse of Heritage Buildings

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Abstract:
The adaptive reuse proved an efficiency in protecting the heritage buildings against deteriorations by adding new values to those buildings which have lost their original function. The development of heritage buildings, should be compatible with the significant cultural values and sustainability pillars within the needs of the local community.
The research proposes a framework contains an assessment criteria in addition to a guideline for practical implementation to evaluate the development of heritage buildings by proposing sequential steps to be followed through three main phases (before, during and after) the adaptive reuse, to create an integrated system consisting of two main levels the first is the practical application, and the second level is the assessment criteria.

Keywords: Heritage, Conservation, Sustainable development, Assessment criteria, Burra Charter.

1. Introduction

Adaptive Reuse is considered one of the most important strategies to protect heritage buildings , by offering new uses for these old buildings in order to achieve the continuity in local communities, which is considered to be the main goal of sustainable development as a result this research aims to combine the principles of conservation for heritage buildings presented in Burra Charter with the four main pillars of sustainability to propose an integrated framework without causing any conflict between the principles of conservation and sustainable development. As many heritage buildings suffer from the current use is not compatible with their cultural value due to its conflict with the heritage values of these buildings, so the need to create criteria accommodate the needs and traditions of the local community without diminishing the value of these heritage buildings, by following the principles of sustainability as a result the proposed framework aims to develop a fully integrated system which contains;

- An assessment criterion to evaluate the adaptive reuse project through the pillars of sustainability by implementing specific indicators for each one of environmental, economic, cultural and social pillar of sustainability.
- A proposed practical guideline with sequential steps to be followed the practical side is divided into three main phases (before, during and after) the adaptive reuse project to produce a reference for anyone involved in the heritage development process.

By following the proposed assessment criteria and practical guidelines developers will identify the requirements to achieve both sustainable and successful heritage development through adaptive reuse.

2. Rehabilitation as a preservation strategy

The rehabilitation allows the reutilizing of old depleted structure by assigning them new functions through the use of new materials, technologies, and introducing contemporary solutions to the historical buildings, without damaging their historical identity.
Rehabilitation involves the widest range of preservation activities, the three processes of renovation, adaptive reuse, and remodeling (in order of the increasing intervention).

2.1. Adaptive reuse

Adaptive reuse is a process that changes a disused or ineffective item into new item that can be used for different purpose.

The adaptive reuse of historic buildings should have the minimal impact on the heritage significant of the building and its setting. Developers should gain an understanding of why the building has a heritage statue, and then pursue development that is sympathetic to the building to give it a new purpose. Adaptive reuse is a self-defeating if it fails to protect the building's heritage values. (Hawas,2013).

2.1.1. Sequence of decisions and actions according to the principles of the adaptive reuse "Burra charter process"

- Identify the heritage building (Secure the place and make it safe)
- Understand the significant value of the heritage building (Gather all available information about the heritage building).
- Assess the cultural significance (identify the heritage values of the building including architectural, symbolic, urban, and functional value)
- Prepare a statement of significance
- Identify obligations arising from significance (Future needs, resources, opportunities)
- Develop policy (Consider options and test their impact on significance)
- Prepare management plan (Define priorities, resources, responsibilities and timing)
- Implement the management plan (Implement strategies through a management plan)
- Monitor and review the results (Australia ICOMOS,2013).

2.1.2. Assessing the performance of conservation

It is important to provide a simple and reliable means to measure how well the desired outcome, value or criterion has been achieved. The indicators are useful for creating long term evaluating system, these indicators should be simplified to be practical and dedicated to the aims of conservation by values linked to the cultural heritage that needs to be protected.

Existing assessing systems of the adaptive reuse	
Heritage development checklist	**Principles for the adaption of historic buildings and sites to new uses**
This checklist was made by: heritage branch department of heritage protection, state of Queensland assessing authorities, to use this guideline in assessing the impact of development activities of heritage buildings or places. (NSW Heritage office,2008) No 40	This assessment system was made by: the heritage council of new south wales, according to the Burra charter; ICOMOS charter for the places of cultural significance which is key document guiding conservation practices in Australia. (State of Queensland, 2013)

3. The proposed assessment framework

The application of Burra charter principles on heritage buildings to make the adaptive reuse of the built heritage contribute environmental, economic, cultural and social balance in human affairs by applying principles of Burra charter through sustainable pillar to achieve sustainable development through adaptive reuse. The proposed assessment framework focuses on utilizing international and local studies to form an assessing system with its practical implementation.

3.1. *The proposed assessment criteria*

The proposed framework tries to combine the principles of conservation science with sustainable development, as a result, the main goal of this proposed assessing framework is to assess the adaptive reuse projects through four main sustainability pillars to form an assessment criteria as an integral part for any adaptive reuse project, where these elements of assessment are not aimed to be weighted. (Shehata,2019) unlike the proposed GBC the historic building protocol which aimed to wight the different points and categories. GBC assessment doesn't consider the social and economic pillars of sustainability as its main focus is the environmental and historical values. (Baggio, 2016).

3.1.1. Environmental assessment criteria

Existing energy efficient aspects and other aspects of environmental sustainability should be assessed alongside conservation principles, this assessment criteria reviews LEED of new construction and LEED of neighborhood development which can be – with some modification – helpful for developing a framework for assessing heritage building from the perspective of environmental sustainability.

The framework for assessing heritage buildings from the perspective of environmental sustainability is categorized into six main categories. (Shetabi, 2016)

Site and geographical location: Focus on the orientation, surrounding landscape and climate to evaluate the building passive survivability which allow the heritage building to function without depending on offsite energy sources and mechanical system.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Site and Geographic Location	Micro climate	Prevailing winds
		Solar orientation	Light pollution.
		Heat island reduction	Rainwater management
		Open Space and area landscape	

Urban setting and linkage: Look at the surrounding development, infrastructure and building and looking for alternative modes of transportation.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Urban setting and linkage	Infrastructure proximity	Compact development
		Access to quality transit	Access to bicycle lanes
		Access to walkable Streets	
		Connected and open community	
		Surrounding developments	

Water efficiency: The usage of wells, cisterns, runoff catchment system and water storage tanks that were traditionally used to manage water.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Water efficiency	Rainwater management	Wastewater management
		Outdoor water use reduction	
		Indoor water use reduction	

Energy and resources: Investigate thermal performance, heat sink, heat loss, solar gain and thermal behavior.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Energy and resources	Recyclable fabric	Heat loss
		Waste management	Thermal behavior
		Heat sink	Energy use assessment

Envelope and fabric: Examine the design, materials, type of construction, size, shape and durability of building component.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Envelope and fabric	Type of construction	Durable material
		Indigenous material	Repairability
		Sustainable design strategies	
		Life-cycle impact reduction	

Indoor environmental quality: Assesses the day lighting, view, thermal comfort and natural air movement through focusing on windows, doors, wind catchers and roofs to sustain the occupant's comfort.

Sustainability Pillars	Assessment Criteria	Aspects	
Environmental Sustainability	Indoor environmental quality	Acoustic performance	Quality views
		Thermal comfort	Interior lighting
		Indoor air quality assessment (Lombardi, 2015)	

3.1.2. Economic assessment criteria

Economic aspect of the proposed framework is evaluated through several factors such as jobs, amount of household income and value added through rehabilitation process.

Economic assessment is categorized into four categories;

Value of heritage building: The value of heritage property is measured through the actual transaction of money in the marketplace and the following aspects are used to assess the value of heritage property.

Sustainability Pillars	Assessment Criteria	Aspects	Options - Alternatives
Economic Sustainability	Value of heritage building	Economic Sufficient use	Conservation costs
			Providing return to the owner
			Enough income for maintenance

Direct value: The direct value can be measured by looking at the level of rent, capital value or direct fees.

Residential value: Heritage building in residential use (whether built originally for residential use or any other purpose) can get higher prices than new buildings, furthermore it can be enhanced by being in a neighborhood of heritage building. Residential value is evaluated through;

Commercial value: The commercial schemes of the adaptive reuse has a higher value than a new-build development and can be the basis for regenerating the local economy, through finding commercial uses for these heritage buildings, so that shops rent can be just high as modern retail areas, although the size of the units can be issue for multiple retails.

Tourism value: Historic preservation is considered to be an entrance for what known as heritage tourism because reusing heritage buildings as a tourist destination as the increasing number of visitors is considered an indicator of success through direct income coming from ticket fees the economic assessment of the tourism value of heritage or historic property comes through number of visitors, duration of stay and daily expenditure. (Shehata, 2014)

Sustainability Pillars	Assessment Criteria	Aspects	Options - Alternatives	
Economic Sustainability	Direct Value	Residential value	Age of property	garage spaces
			Number of residential units created	
			Number of residential units created	
		Commercial value	New business created	
			Business expansion	
		Tourism value	Duration of stay	Expenditure
			Number of visitors	

Indirect value: This value is conferred on neighboring properties or wider economic and social values created in the area through inward investment to create employment, stimulate economic growth and create a wide range of income earning opportunities, which are reflected back in sustaining the local intangible heritage revival of craftsmanship, these indirect values are difficult to be quantify but is one of the most easily observed impact of successful adaptive reuse economically.

Sustainability Pillars	Assessment Criteria	Aspects	Options - Alternatives
Economic Sustainability	Indirect value	Immediate economic	Increasing of Expenditure
			Increased local distinctives
		Strategic economic	Integration of latent economic assets
			Creation of new economic quarters

Output: The impact of regenerating the heritage buildings in terms of economic value which include: the number of direct and indirect jobs created, number of business created, Number of buildings or sqm refurbished or taken off Heritage at Risk register by the numbers of rehabilitated building and façades improvements and level of investment through created jobs and household income. (English heritage, 2012)

Sustainability Pillars	Assessment Criteria	Aspects	Options - Alternatives	
Economic Sustainability	Output	Direct and indirect jobs created		
		Number of business created		
		Number of rehabilitated building		
		Façade improvement		
		Level of investment	Jobs created	Household income

3.1.3. Cultural assessment criteria

The framework assesses the adaptive reuse as the value of heritage building from the culture aspects through significant values.

Cultural assessment is categorized into two categories

Tangible heritage: The impact tangible heritage can be measured by the following aspects., Firstly, by Conservation of architectural value through achieving some principles which include minimizing intervention, avoid unnecessary changes, provide changes to be reversed., Secondly, by visual compatibility which can be achieved through explicitness of both external and internal alteration.

Sustainability Pillars	Assessment Criteria		Aspects		
Cultural Sustainability	Tangible Heritage	Conservation of architectural style	Minimum intervention		
			Avoid unnecessary changes		
			Provide changes to be reserved		
		Visual compatibility	Explicitness of external alterations	Walls	Roof
				Security	Services
				Doors and windows	
			Explicitness of internal alterations	Room layout	
				Doors and windows	

Intangible heritage: The impact of intangible heritage can be measured firstly as heritage interpretation which include several indicators as access and understanding, information sources, context and setting, authenticity and inclusiveness., Secondly, safeguard intangible heritage through training the builders and craftsmen to upkeep traditional methods of construction and traditional handicrafts and encouraging traditional music literature and other oral traditions in addition to education sessions for local community members to create a connect with the deep root in the culture heritage.

Sustainability Pillars	Assessment Criteria		Aspects	
Cultural Sustainability	Intangible Heritage	Heritage interpretation	**Access and understanding**	personal experience
				Connection between heritage building and surrounding environment
				Public accessibility
			Information sources	Information accuracy
				Documentation - presentation programs
			Context and setting	Respect all time periods
				Existence of intangible elements
			Authenticity	Negative impact on cultural value
				Sensitivity of interpretive elements
			Sustainability	Budgeting and management
				Public awareness
				Sustainable elements
			Inclusiveness	Respect of owners and local community
				Community participation
		Safeguard intangible heritage	**Upkeep traditional methods of construction**	
			Encourage traditional music and oral tradition (Rotondo,2016)	

3.1.4. Social assessment criteria

The interaction between stakeholders and local community plays an important role in the project outcome resulting the influence and success of the adaption project.

Social assessment criteria categorized into three main categories:

Social capital and sense of community: Social capital depends on the trust of individuals on each other, as well as on the association capacity of groups, and can be increased trough the interaction between the local community members and stakeholders trust and association capacity can be measured by interviews which individuals are asked questions about their social life.

Usability: The reuse of old heritage buildings is considered one of the best ways to restore or increase the livability trough preserving streets and neighborhoods built at human scales and the increasing of livability for the heritage buildings by usability comes through public use and the accessibility resulting social benefits.

Livability: The dimensions and indicator of livability according to culture location or situation, this thesis will focus on two main indicators of livability which are social to be assessed through social contact and relationship between neighbors, this will be measured by surveys and questionnaires and the other indicator is safety and crime dimension. The feeling of security and this indicator of livability can be measured by crime statistics comparison before and after the reuse of heritage building and by making interviews with people to know their feeling of safety (Mousavi, 2013).

Sustainability Pillars	Assessment Criteria	Aspects	
Social Sustainability	Social capital and sense of community	Membership	Influence
		Integration and fulfillment of needs	
		Shared emotional connection	
	Usability	Public use	
		Accessibility	Vehicular accessibility
			Non – vehicular accessibility
			Street scape
			Safety roads
		Safety and crime dimension	Social (Shishavan, 2013)

4. The proposed practical guideline.

The proposed practical guideline link the assessment criteria with the practical implementation on site by proposing sequential steps to be followed through three main phases (before, during and after) in order to create fully integrated system for the adaptive reuse, where the guideline for the practical application represents the first level to be followed to ensure the success of the adaptive reuse process during the evaluation performed by the assessment criteria mentioned earlier, which is the second level of this integrated framework (Gewirtzman, 2016).

4.1. *Before adaptive reuse*

A number of points related with the collection of information to identify the unique architectural value and evaluate the architectural elements associated with significant value.

4.1.1. Identify heritage buildings.

Before proposing plans for the adaptive reuse of the facility or property it should be identified as a heritage building according to law NO. 144 for the year 2006 which define the standards and the classifications of the historical and heritage buildings in Egypt.

4.1.2. Understand significant values

Understanding heritage significant helps to establish and determine the most appropriate level of protection to those building with heritage values to save and protect them for future generation which is the main concept of sustainability so understanding significance is an essential step before considering changes to the heritage place through alterations, development or other activity.

4.1.3. Assess the significant value

For any building registered as a heritage building it must include a statement about the cultural heritage significance related to cultural heritage criteria and this can be done by identify distinctive values through significance indicators this can be performed through the following points;

- Identify heritage significant value.
- Identify features contributing unique character of building.

4.1.4. Identify features, fabric elements and material contributing to significant values of the heritage buildings.

In buildings with heritage values, the significance values of the features and elements of the buildings should be identified which intended to be the tangible heritage, in order to analyze and evaluate the level of significance for the building fabric, individual spaces and elements of heritage buildings through the following points;

- Suggest a systematic analysis for the level of significance.
- Assess the level of significance of the building features, fabric elements and material.
- Assess the environmental performance of the building.

4.1.5. Find appropriate use to heritage significance of the building

Choosing the proper use is considered the most important step in all the adaptive reuse projects for what it contains of suggestions to the new uses through following the principles of the adaptive reuse and setting goals of development of heritage building for the local community, the main principles to choose the proper new use are;

- Suggest proposals for development of heritage building.
- Identify interested people and organizations to be informed about proposed development.
- Set a schedule for dialogue about proposed development with interested people and organization.
- Share information collected about significant values with interested people and organization.
- Document the engagement process.

4.2. *During adaptive reuse*

Considered the most important stage as it contains the conservation of physical features elements and material, then assessing the impact of conservation activities.

4.2.1. Conserve physical features, element and material contributing the significant values of heritage building.

In this step the proper methods of interventions should be chosen with considering the traditional methods of constructions and how those interventions suit the current building codes in order to protect the significant fabric of the heritage building and this can be achieved through;

- Identify elements with physical deterioration and propose proven methods of conservation.
- Identify and resolve building code requirements without unnecessary changes to significant values.
- Protect significant fabric until the development is completed.

4.2.2. Assess potential impact on physical features, elements and material contributing significant values of heritage buildings.

In this stage those responsible about the adaptive reuse of the heritage buildings should assess the potential impact on the physical features, elements and material by suggesting and assessment methodology from several indicators such as the heritage importance of any heritage elements and the impact on physical features and material environmentally, the potential impact is assessed through;

- Suggest heritage impact assessment and mitigation measures.
- Assess the impact on physical features and material environmentally.

4.2.3. Design new building and additions by respecting culture heritage significance.

In case of adding new building or additions to the heritage building, some steps should be followed to guarantee that the additional structure to be compatible, distinguishable and reversible without disturbing the relationship between open and built space, the principles for new building and additions are;

- Respect the cultural significance of the place through compatible, distinguishable and reversible new building or additions.
- Take care of the environmental aspect during new design or additions.

4.2.4. Implement proper interpretive program during conservation activities.

During conservation process some interpretation activities can be carried out through revitalizing important features to the heritage building.

4.3. *After adaptive reuse*

The third step in the practical implementation deals with management of heritage buildings after the interventions. In addition to maintenance and interpretation.

4.3.1. Use and manage the heritage building in a that conserve it in the future.

After the construction works a management plan for proper use and future conservation should be immediately implemented and this management plan contains of both maintenance and interpretation programs successful management plan is achieved through;

- Implement maintenance management programs for the building.
- Implement interpretation programs for heritage building.

5. Discussion

This integrated framework through the assessment criteria and the practical guidelines is intended to evaluate the sustainable performance of adaptive reuse projects of heritage buildings and avoid conflict between architectural conservation and sustainable development, as the main enemy for heritage building sustainability is to be left behind without being used, as a result the main goal of this research is to develop heritage buildings on both levels strategically and practically, where the assessment criteria considered to be the strategic aspect of this system and serves as a reference for the practical guidelines which represent the practical aspect and evaluated by the main four pillars of sustainability.

The following system both strategic and practical answers the following questions

- What the expected environmental, economic, social and cultural benefits from the rehabilitation of heritage building through the adaptive reuse.
- How to use the principles of sustainability in the adaptive reuse of heritage building.

6. Conclusion

The application of Burra Charter principles on heritage buildings to make adaptive reuse contribute environmental, economic, cultural and social balance in human affairs, as well as proposed assessment framework with its practical guidelines to suit the local community, as it is often noted that in reusing heritage building the culture aspect has the main attention and the environmental, economic and social aspects are neglected.

The practical guidelines in this proposed system links the assessment criteria with the practical implementation on site through sequential steps to be followed in three main stages (before – during – after) to create a fully integrated system for the adaptive reuse.

The importance to provide reliable indicators to measure the environment, economic, cultural and social impacts of development activities of heritage building or place, as this part analyze some of the existing assessment framework of the adaptive reuse.

This paper focuses on creating a fully integrated framework with reliable indicators considering the environmental, economic, social and cultural elements. As most of previous studies dealt with only one pillar of sustainability resulting unbalanced rating or assessment system for the adaptive reuse. As some studies focused on environmental and historical aspects only such as GBC Historical Building Protocol, proposed by Green Building Council in Italy and Heritage Conservation and Environmental Sustainability, proposed by Linda Shetabi.
And other assessment systems focus on heritage and social aspects only as shown in Heritage development checklist and Principles for the adaption of historic buildings and sites to new uses.

7. Recommendations

- Combining culture and heritage with environmental, economic and social pillars of sustainability to achieve the sustainable development because the main objective for the sustainability of heritage buildings is to ensure the continuity of descendant values as well as maintaining the use of non- renewable resources consumed for the heritage buildings.
- The need to develop LEED for assessing heritage building from the perspective of environmental sustainability.
- The proposed practical guidelines for the adaptive reuse of heritage buildings should be applied as a case study for a specific heritage building to be evaluated by the assessment criteria through the four main pillars of sustainability.
- The proposed integrated assessment criteria should be developed and generalized to be applied for all heritage development applications.
- The need to identify a specific methodology in order to choose the appropriate new use of heritage buildings to be compatible with significant values and the sustainable development.

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Assessing the Implementing Lean Construction in Real-Estate Compounds to achieve resilient cities

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Abstract:

The construction industry is one of the most challenging and dynamic industries nowadays. These factors contribute in making this construction a high-risk industry, and there are many challenges facing the construction manager these days. . Residential compounds are becoming one of the most important projects these days, some of these projects become landmarks for a country and bring significant prosperity, but some become unforgettable catastrophes. Lean construction is helping to assure a better construction process especially to cities where could enhance moving towards resistance.

This paper is focusing on the construction of the residential compound as these kinds of project are growing quickly. For a construction company, lean construction means that the company can complete more jobs and produce significantly less waste which in turn increases profits and keeps costs down. It helps construction firms to make more money in less time than with traditional construction practices.

The purpose of this paper is identify the problems that raises during the construction of these kind of projects and how applying the lean management in the real-estate compounds' construction can avoid these problems benefiting the construction process and the value of the product presented to the customer which achieves resilience in cities.. The method used will be literature review depending on qualitative analysis from textbooks, academic journals, professional magazines, conference and seminar proceedings, thesis, organizations and government publications as well as Internet and related websites. The results of this paper would help to achieve resilience in cities.

Keywords: Lean Construction (LC), Lean Management (LM), Project Management (PM), Resilient cities, Work-in-progress (WIP), Real-Estate Compounds.

1. Introduction

The construction industry around the world is facing various obstacles and problems. Building projects are considered to be over-budgeting, late and burdened with creeping scope. Figure 1 demonstrates the "Scope triangle," showing the relationship between the three tradeoffs in cost, time and value of a design.

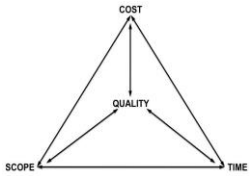

fig. 1 Project management triangle – Nicholas - 18, Apr, 2016

Therefore, in an attempt to overcome the damage caused by the current economic situation, a new methods and solutions should be created and applied to the industry and faced with all the new challenges that arose after the revolution by reducing all the non-added values to the industry. Lean construction is a way to design production systems in a building environment with the goal of reducing time, energy, and material waste (Tyler Riddell) (April 18, 2017). It is estimated that 55% of the respondents are not aware of the lean theory but have high potential to use new management techniques / approaches to improve the performance of the projects.

Lean construction can help in achieving resilient cities as its concepts and techniques helps in avoiding the waste, preventing the risks.

Resilience refers to equipping cities to cope with future shocks and stresses caused by climate chan ge and dwindling supplies of oil and fuel and crises. Defining the word ' resilient ' means having int ernal strength and resolve.

1.1. *Objectives:*

The main goal of this paper are to present Lean Construction concepts, discussing its implementation on residential compounds to achieve resilience in cities.

1.2. *Research Methodology:*

This paper depends on literature review dealing with the subject of implementation of the lean construction and its benefits in the construction of residential compounds to achieve resilience in cities.

2. Literature Review:

The project manager is expected to work out a number of common obstacles to completion of the project in order to keep progress on track. Some of the problems and obstacles facing the traditional project management especially in residential projects are the following:

- Undetermined goals: The project manager must be careful to ask the right questions and avoid undefined goals in order to create and communicate clear goals from the beginning.
- Scope Changes: Describing the changes happening to the scope of work beyond the original goals because the changes are not scheduled, they usually cause delays and cost money not in the budget.
- Inadequately Skilled Personnel: The Project Manager must decide the necessary skills and review the available workers. Training, as well as exporting the job and hiring additional staff, can be recommended if necessary.
- No transparency: When team members are not responsible for their priorities and tasks, the PM should provide guidance to guide the team to the goal laid out in the plan.
- Improper Risk Management: To prevent weaknesses in risk management, the PM learns to obtain information, build trust among team members, and have a good idea of which parts of the plan are likely to turn off track.

- Poor communication: Communication and feedback between senior management and team leaders, as well as other stakeholders, should remain open to the PM.
- Lack of Stakeholder Engagement: The project manager should seek to keep contact open and facilitate feedback from all at each project step.

All those obstacles affect the time, cost and scope which affects the quality of the project. Lean concepts come up with solutions to some of these problems.

2.1. *Definitions of Real -Estate compounds:*

In the coming part of this paper a number of definitions related to real-estate compounds will be dicussed:

No.	Definitions	Author
1.	A real estate compound is a property that has multiple buildings in one area.	(Steve Lander) (June 18, 2018)
2.	Real estate is property in the form of land and buildings, rather than personal possessions. A compound is an enclosed area of land that is used for a particular purpose.	(Collins Dictionary)

Table 1 – Definitions of real-estate compounds

2.2. *Definitions of Lean Construction:*

This part of the paper discusses number of definitions of the lean construction

1.	Lean Construction extends from the objectives of a Lean production system—maximize value and minimize waste—to specific techniques, and applies them in a new project delivery process.	(www.leanconstruction.org) (Lean construction institute) (Chapter 4 – Lean construction defined)
2.	Lean construction is a way of designing production systems in a construction environment with the aim of decreasing time, effort, and a waste of materials.	(www.esub.com/leanconstruction-care) April 18, 2017 by Tyler Riddell
3.	The most important thing is that Lean Construction is based on theories about the project's nature. Originally the Transformation-Flow-Value theory	[Koskela 2000]
4.	"The purpose of Lean is to provide every customer's value in the most efficient and effective manner possible."	(Ebbs 2017)
5.	"Lean construction is systems thinking, respecting people, pursuing continuous improvement, and so much more."	(Iris Tommelein)(2018)

Table 2 – Definitions of lean construction

2.2.1 Lean Construction versus Traditional Construction:

In a study by Marwa Gamal Swefie (Fall 2013) (Improving Project Performance Using Lean Construction in Egypt: A Proposed Framework) a comparison has been held in order to compare traditional and lean construction, this comparison was built on comparing eleven factors; transparency, performance, collaboration, centralization, continuous improvements, value, control, work techniques, Interactions and dependencies, variations, under loading.

Activity	Traditional PM Approach	Lean Construction Approach
Transparency	Transparency approaches are not considered by traditional management techniques.	Increasing transparency between all project participants to allow people to make decisions that minimize the need for central management (G.A. Howell, What is Lean Construction 1999).
Performance	All management's efforts are focused on separately optimizing each activity, thus reducing overall performance that's in the traditional approach,(Sicat 2012)	The main objective is to optimize project-level quality with minimal waste to ensure efficient workflow (Sicat 2012) (G. Ballard, Lean Project Delivery System 2000).
Collaboration	Such a strategy is not applicable in traditional methods	LC continues to support suppliers through the development of new commercial contracts that have given suppliers incentives for reliable workflows and for participation in overall product improvement (G. A. Howell, What is Lean Construction 1999).
Centralization	Decision making is sometimes centralized through a manger.	Decision making through transparency including project participants in the production control system and motivating them to take action (Sicat 2012) (H. G. Ballard 2000).
Continuous Improvement	Traditional method is not so much concerned with continuous improvement.	Lean construction considers continuous improvement in the workflow and process (G. A. Howell, What is Lean Construction 1999).

Value	Considering a lower cost as a value. In addition, the customer should define all of his requirements at the outset of the project, irrespective of the changes in markets and new technologies (Sicat 2012).	The project is managed as a value-generating process where customer satisfaction is initiated and developed over the course of the project (G. A. Howell, What is Lean Construction 1999).
Control	Project management in tracking performance (schedule and cost) and taking corrective action after finding negative variances as shown in figures 2.3 and 2.4 (H. G. Ballard 2000).	Project control's function is to ensure efficient workflow by measuring system performance evaluation and Performance (Sicat 2012)
Work techniques	Push-driven schedules help the release of information and material (Sicat 2012). (e.g. the material shall be ordered to arrive on site on a pre-determined schedule before the work is carried out. If the stock is not used, the supplier shall continue to deliver on schedule.)	Pull-driven schedules manage the flow of information and materials (H. G. Ballard 2000). And so on. The team is working backwards (pulls) from the end date to the start of the phase to identify the activities needed to reach the "end" target. (Building only what is required, when it is necessary, without waste in the process)
Interactions and dependencies		Managing the combined effect of dependency and variance on activities is critical because it affects the time and cost of any project (G. A. Howell, What is Lean Construction 1999).
Variations	Management and variation's mitigation are not considered	Attempts to mitigate variation in respect of work rate and end product quality (H. G. Ballard 2000)
Under loading	PMI does not consider any adjustments	The production unit capacity is adjusted as well as the inventory in order to be able to absorb variation (H. G. Ballard 2000).

Table 3 - Differences between the traditional approach and the Lean approach (H. G. Ballard 2000, Sicat 2012, G. Ballard, 2000, Howell, 1999) – (Marwa Gamal) (Improving Project Performance Using Lean Construction in Egypt) (Fall 2013)

2.2.2. Definition of resilience:

This part of the paper discusses number of definitions of resilience.

No.	Definitions	Author
1.	Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks (economic, environmental, social & institutional). Resilient cities promote sustainable development, well-being and inclusive growth.	www.oecd.org
2.	Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress — such as family and relationship problems, serious health problems or workplace and financial stressors. It means "bouncing back" from difficult experiences.	www.apa.org
3.	The definition of the term ‘resilient’ means possessing inner strength and resolve. Thus a resilient city takes into consideration appropriate form and physical infrastructure to be more prepared for the physical, social, and economic challenges that come with depleting carbon-based fuels and climate change.	(MARNI EVANS)(Resilient City Overview and Urban Design Principles)

Table 4 - Definitions of resilience

2.2.3. Principles of Lean Construction:

According to Howell and Lichting (2008), The goal of approaching projects as production systems is to adjust the design and construction work structure to maximize project performance (Howell and Lichtig 2008). Lean principles present process optimization by cooperation, continuous development, waste elimination and customer satisfaction through providing the required value to the end user (Enache-Pommer, et al. 2010). Lean construction thinking applied to on-site production systems has increased awareness of the benefits of stable work, the pull flow of teams and materials to reduce work-in-progress inventories and the transparency of processes for all involved (Sacks, Treckmann and Rozenfeld 2009). Lean construction concentrates efforts on defect prevention (O. Salem, et al. 2006).

Originally, Womack and Jones outlined the Lean methodology's five key principles as follows (Bertelsen 2002):

1- Identifying Value: Value is defined by defining the needs of the client.

2- Value Stream: value-stream mapping is identifying the actions that take this service through any process. That process can be in design, production, procurement, HR, administration, delivery, or customer service.

3- Create Flow: After removing the waste in the process, we have to confirm that the remaining steps flow smoothly with no interruptions or delays.

4- Establishing Pull: By improving the flow the time to the client will be improved, which will help to deliver the service as needed as in “Just-In-Time” delivery which means that the client can pull the product when needed without building products in advance.

5- Seeking perfection: As gains continue to increase, it is important to remember lean is a dynamic system and requires constant effort and care to perfect.

Fig. 2 The five-step thought process for guiding the implementation of lean techniques. Image copyright 2016, Lean Enterprise Institute, Inc. All rights reserved. Used with permission, (James P. Womack and Daniel T. Jones) (1997)

2.2.4. Techniques and tools of Lean construction:

There are several Lean tools and techniques that can be used in the construction industry to improve performance and to ensure effective processes in a project's pre-construction, construction and maintenance phases. Some of the lean tools and techniques are briefly described below:

1- Flow Process:

The lean construction system sees production as a flow of material, information, equipment and labor from the raw material to the product (Yong-Woo Kim and Bae 2010). Stable flow is one of the main principles of lean thinking (Sacks, Treckmann and Rozenfeld 2009). To order to improve the flow system and reduce waste, several lean methods are used. These methods include:

1-1- *Reduce Process Variability:* During the duration of the projects construction, projects are subject to several variations creating uncertainty and process instability (Hook and Stehn 2008)**.** Fail-safe devices are used in lean manufacturing to prevent defects from automatically entering the next process (O. Salem, et al. 2006). Fail-safe procedures can be applied on all on-site operations to ensure quality compliance at the source and prevention of defects. Both activities can be resolved through the implementation of an overall quality assessment and safety action plans in the initiation of the project (O. Salem, et al. 2006).

1-2- *Reduce time cycle:* Reducing variability would reduce the time of the work cycle. Reducing cycle time in construction is followed by reducing activity duration and reducing inventory (Sacks, et al. 2010), which involves a team effort to change the process in order to make it more flexible and effective.

1-3- *Reduce batch size:* Reducing batch sizes enhances workflow. It also helps to reduce the process ' cycle time (Sacks, et al. 2010).

1-4- *Increasing Flexibility:* This can be achieved by rapid changeover and multi-skilled teams. Reducing changeover times from one activity to another improves efficiency levels (O'Connor and Swain 2013). Furthermore, the use of multi-skilled teams helps to reduce cycle time and thus improve workflow (Sacks, et al. 2010).

2- The Pull approach:

Pull scheduling is considered one of the primary lean strategies for improving construction workflow (Thomas, et al. 2003). In a pull system, flow is a method of controlling product flow in which the quantity of work in progress inventory (WIP) is minimized between process stages and only products demanded by the ultimate "pulled" by the ultimate "customer" process are produced (Sacks, Treckmann and Rozenfeld 2009).

2-1- *Last Planner System (LPS):* It is one of the related strategies to the pull method as it supports the predictability and efficiency of construction production in which the planning of the look-ahead is implemented. The last planner is

simply the field supervisor who assigns work to the crew as it requires sufficient level of discussions between the site management and the trade foreman to avoid critical issues from happening on site. LPS activities in construction include tender process management, design process, as well as design and construction production in the context of integrated project delivery (Mossman 2012).

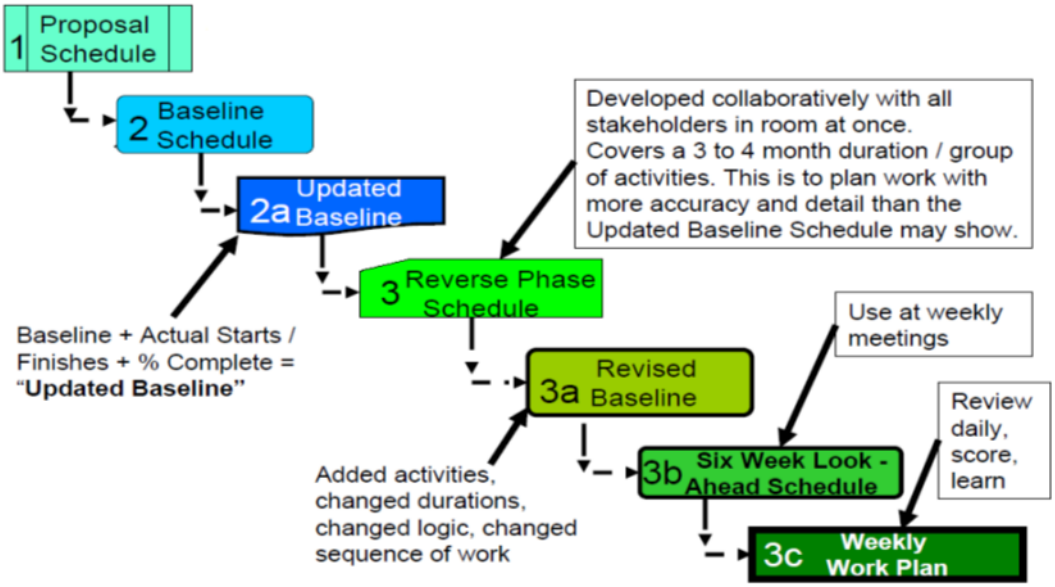

Fig. 3 Last Planner System (Zettel 2008)

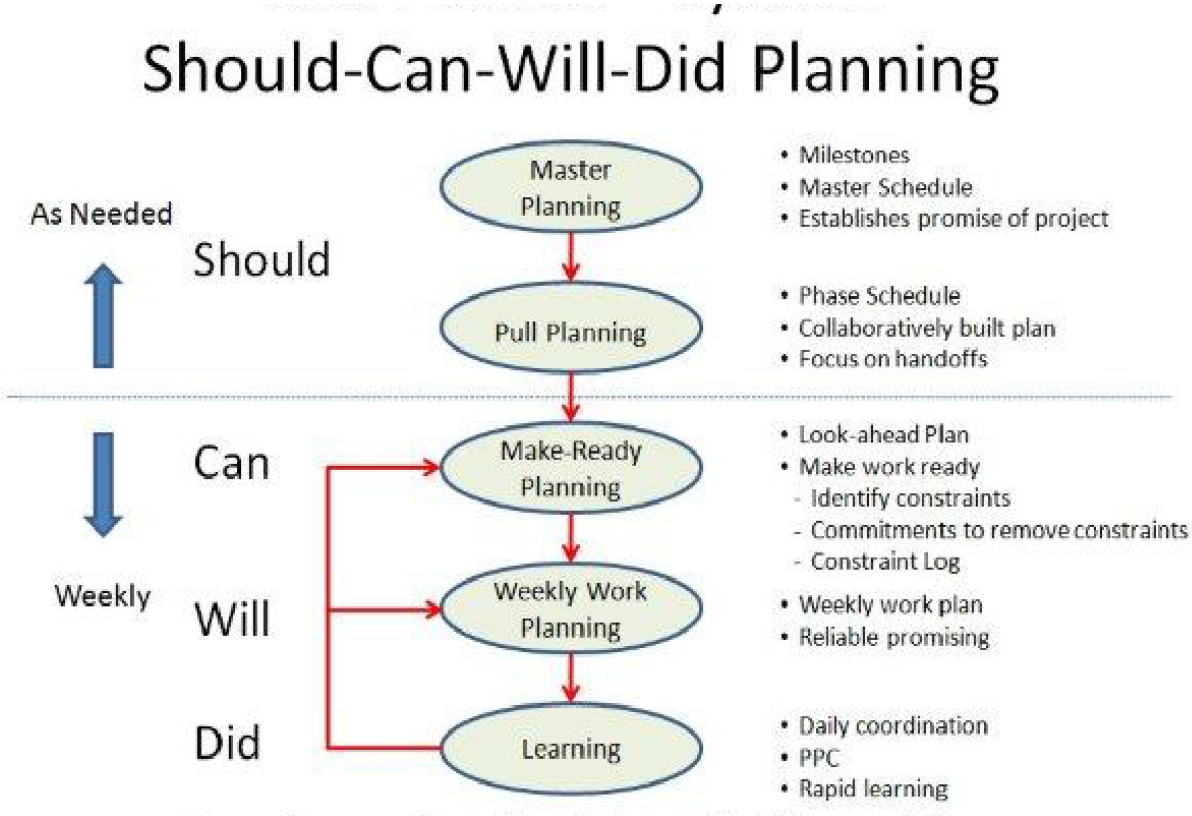

Fig. 4 Last Planner System conversations (Australia 2012)

2-2- *Just-in-Time technique:* Just in Time it means producing only what is needed, when needed, and the amount needed. It is a pull system that responds to actual customer demand, which in turn reduces inventory (and space) and improving the productivity of equipment (Australia 2012).

2-3- *Collaborative Planning:* This technique depends on bringing together representatives from all stakeholders involved in a construction project to develop an agreed target program together. It can be used to regain any time or cost overrun that may occur at any point in a project's life cycle. It requires five steps:

- High-level collaborative master target programme
- Detailed level collaborative master target program
- Short-term detailed production plan
- Daily brief
- Weekly production control

Integrated Project Delivery (IPD) is one of the ways to successfully apply the idea of collaboration. The American Institute of Architects (AIA) defines integrated project delivery (IPD) as (Dave, et al. 2013):

"A project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction". IPD allows early involvement by the use of new technologies for all stakeholders in the project. Sharing benefits and risks among all participants is one of the fundamental principles of IPD. All these benefits, however, will be enabled if represented by a legal agreement with the IPD (Dave, et al. 2013).

3- *Continuous Improvement:* Continuous improvement can help to reduce variability and improve workflow (Sacks, et al. 2010). The theory of continuous improvement is supported by all lean methods (O. Salem et al. 2006). Continuous improvement of the construction process can be classified into two types: improvement of the process and improvement of the operation (O'Connor and Swain 2013).

3-1- *Improvement of the process:* Improving the process means setting up an efficient method for delivering a project to improve the overall process by reducing the overall lead time through the end-to-end process. Implementing this approach has the major advantages like increasing work productivity, clarifying process and responsibilities, eliminating waste and decreasing lead time (O'Connor and Swain 2013).

3-2- *Improvement of the operation:* It's about improving the execution method of work activity. Improvement of operations targets reducing cycle time to complete work, increase efficiency, ensure' right first time ' quality and encourage safe working by removing non-added value activities, tracking and controlling performance and optimizing resources (O'Connor and Swain 2013).

4- *Transparency:*

4-1- *Five S':* Originally, the five S ' was used in manufacturing to define plant housekeeping as in lean manufacturing, any resource that does not lead to better performance is considered to be waste that should be excluded from the process (O. Salem, et al. 2006). The five S's are sort, straighten, standardize, shine, and sustain. In construction, the implementation this tool (5 S's) allow for

a transparent job site, at which materials flow competently between warehouses and the pertinent jobs in site.

4-2- *Visual Management:* Visualization is important to avoid any uncertainty in the information in the construction process. This also assists in identifying the workflow and raising awareness of on-site action plans (O. Salem, et al. 2006). The strategy involves displaying the completion status of the previous tasks, the availability of resources, any layout changes and other resource locations. Pursuing the above steps can improve production. Planning and control performance and the tendency for process errors (Sacks, Treckmann and Rozenfeld 2009). Mobile signs, notice boards, electric wiring, safety signs, and project milestones are some of the visualization forms that can be used in construction projects (O. Salem, et al. 2006). In their research, Sacks et al. (2009) explains how computer-aided visualization can be used to support Lean criteria (Sacks, and Treckmann)

3. Achieving Resilience:

'Resilient ' means cities that can last, make it through crises, have inner strength and resolve, as wel l as adequate built-up form and physical infrastructure (Peter Newman, Timothy Beatley and Heather Boyer) (Resilient Cities: Responding to Peak Oil and Climate Change)

3.1. *Areas that drive resilience:*

1. Economy:

- Several number of industries
- A dynamic economy for growth
- Conditions allow creation to take place
- Jobs, schooling, programs and skills training are available to people.

2. Society:

- Inclusive and cohesive society.
- Active citizen networks in communities.
- Safe neighborhood.
- Citizens live healthy lives.

3. Governance:

- Clear management and leadership.
- Leaders take strategic and integrated approaches.
- Public sector has the right skills.
- Government is transparent and open.

4. Environment:

- Sound and diverse ecosystem.
- Infrastructure can meet basic needs and requirements.
- Adequate natural resources are available.
- Coherent policy towards land use.

Fig. 5 Measuring city resilience - Taku Honiden - 2018 - www.oecd.org Resilient Cities

3.2. *Elements that makes a city resilient:*

1. Renewable Energy City: urban areas will be powered from region to building level by renewable energy technologies.

2. Carbon Neutral City: It will be carbon neutral for every house, community, and sector.

3. Distributed City: Cities will shift to small-scale or neighborhood-based services from large centralized infrastructure, water and waste systems.

4. Photosynthetic City: the ability to harness renewable energy and supply local food and fiber to urban green infrastructure.

5. Eco-Efficient City: Cities and regions can switch from linear to circular and closed-loop systems where the waste streams supply substantial amounts of their energy and material needs.

6. Place-based City: Renewable energy will be more generally understood by cities and regions as a way to build local economy and nurture a special and unique sense of place.

7. Sustainable Transit City: Towns, communities and regions will be planned to save energy by offering walkable, transit-oriented alternatives for all electric vehicles supplemented.

4. Relation between lean and resilience:

Lean manufacturing is aimed at reducing work-in-process and maintaining inventories close to zero, and resilience is about rapidly responding to disruptions impacting production systems. Companies in today's construction industry are typically well aware of the demands that can be made upon them during normal working conditions. A resilient organization masters the art of managing and dealing with unexpected events and the consequences of disruption. An underlying principle in Resilience Engineering is that understanding failure to prevent it from repeating is clearer as we understand how safety is created by people in workplaces with more and more-changing sources of risk and unavoidable differences between safe and productive actions.

5. Case studies on Lean construction in Real- Estate compounds:

This chapter analyzes existing case studies related to Lean Construction's application in Real-Estate compounds. The cases were selected based on the availability of data and with the goal of illustrating situations in different countries and continents.

The order in which the cases are presented in this paper has no effect on the importance or specific effects.

Ana Reinbold conducted a study in Brazil to examine the effectiveness of implementing lean construction in real-estate compounds (housing) (19.07.2017)

5.1 Brazil:

This case study was conducted in 2014 by Villa, Silva, Silva, Santos and Diniz and published by Revista de Trabalhos Acadêmicos Universo Recife, Recife Universe Magazine for Academic Papers1, V.1/N.2/2014. The Brazilian Federal Governor sponsored this construction project as part of the federal government's housing policy "Minha Casa, Minha Vida." This program is aimed at reducing the housing deficit, particularly for low-income and low-income citizens. The cost of the project was R$ 1,075,000,00, around US$ 400,000,00. The first step in Lean Construction's implementation was to identify the waste in the construction sites. In order to do this, the site inspection and analysis was undertaken in the context of previous projects. The information gathered during this phase encouraged the identification and quantification of raw materials and labor-related waste.

The table below shows the waste by category, raw material, labor and total waste:

Location	Number of houses	Labour Waste	Raw –Material Waste	Total Waste

City A	40	14%	21%	17.5%
City B	31	20%	18%	19%
City C	43	14%	22%	20.5%
City D	44	16%	17%	16.5%

Table 5- Waste identification and quantification.

From this study, the City C is the project site, and all data on implementation is related to this project.

To increase the probability of success during Lean Construction implementation, the decision was to choose one phase of the project to begin the cultural shift required by the new concepts.

Previously, the Brazilian case study raised concerns about the partial application of lean construction concepts in a project to build 43 affordable houses in the country's north-eastern area

It is a very good decision to choose one process as a pilot process. It enables people involved in project design to understand the concepts and also retains the emphasis on visualizing and evaluating one of the systems, preventing misunderstanding or overlap between the two separate streams.

Quantifying and converting the raw materials and labour waste into cost analysis is a valuable tool for communicating the findings once all construction workers have a good understanding of the building costs.

The authors of the case study concluded that a large-scale implementation plan can be driven by this first implementation and the positive results.

The LC concepts were applied according to the following approach to solve the waste problems:

1) Reduce the share of non-value-added activities – the construction design analysis results in distributed stocks, eliminate unnecessary detachments during the production of tasks and the non-value-added movement-related activities.

2) Improve performance quality by consistently addressing customer requirements–internal customer feedback showed that the lack of standards for executing the tasks caused delays in the resulting project and even the need for frequent rework. Job monitoring has been developed from this method.

3) Reduce variability – Variability of processes is linked to lack of standard during processes. This variability will be reduced by implementing standards

4) Reduce cycle time – worker preparation and analysis of the construction site design strengthened the cycle time reduction.

5) Simplify by reducing the number of steps and components – after the activity flow review, redundant steps for task creation have been reduced. Industrial waste has been significantly impacted and consumer waste has also been reduced.

Five of the eleven LC concepts were applied in this case of the study. The waste reduction was significantly improved after the actions took place.

The authors measured and concluded that after the implementation of the action plan, the waste cost decreased from R$ 29,753.68 to R$ 8,523.55 after the implementation of the LC implementation.

With the decreasing waste, cost savings were R$ 493.72 per house built.

The authors suggest that an estimate of this savings would produce a saving of R$ 987.440,00 if the LC is applied in all the company's construction sites, which has 2,000 units of affordable houses.

It is possible to conclude from the published paper that the other Lean Construction theories can be applied and will bring benefits

The lack of data on post-implementation monitoring on how LC is still being applied 50 on and on the results, if there are still positive results after implementation, does not allow for a long-term analysis.

5.2 Nigeria:

Adamu and Howell (2012) conducted a study in Nigeria that aimed to evaluate the effectiveness of the implementation of the Last Planner System (LPS), by comparing it with the traditional method. The comparison was made to calculate the completion time of 50 buildings. The 50 houses managed with the Last Planner Management System had shown a positive overall impact on the plan. In order to reduce idleness, only an average of 7 to 10 people are attached to each block of a building. The last planner system schedule program was done within 65 to 72 days. And the remaining houses are handled by the rest of the team using traditional production management methods; none have been completed in less than 120 days

Schedule	Last Planner System	Traditional Management
Master Schedule	120 days	120cdays
Actual completion time	65 to 72 days	Not in less than 120 days

Table 6- comparison between LPS and traditional management by time period

The paper analyzed Last Planner's implementation as a Lean design method in the construction industry in Nigeria.

5.3. USA:

A study was carried out in a USA design and construction company. Through the implementation the firm, the time and costs of its projects have been reduced through up to 30% and the workflow on sites improved. (Lean Construction Institute 2004).

5.4. India:

Ingle & Waghmare (2015) conducted a study in India to highlight the costs and benefits of the possible contribution of lean construction to increasing efficiency and minimizing waste in the construction industry

and the degree to which lean construction is applied in India. The results of this study are Proper Training and Application of Lean Concepts and Practices in Indian Building Projects can be successfully implemented and many coordinated players in the industry have increased interest. The enabling factors including dedication to top management and site leadership, as well as the organization's culture and processes will be key strengths in India's lean construction performance.

6. Conclusion

All the case studies shown above conclude that using the lean methods in the construction of residential compounds will help in decreasing the waste and the costs in the construction industry which will in return increase the value of the product. All of these benefits will help in achieving a better construction technique that will adapt to face of adversity, trauma, disaster, challenges or major causes of pressure. It will also be able to absorb, recover and prepare for future shocks (economic, ecological, social and institutional). For sustainable development, well-being and balanced growth, resilient cities promote, because it is done with a step by step management which can make to easily install any technique while construction to achieve resilient cities.

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Resilient Cities and Architecture

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Abstract:

Wars represent an extreme form of political conflict that escalates into violent confrontation between rivals possessing. When the city becomes the theatre of this conflict, it becomes in a state of ambivalence; each side will have their own interpretation of the architecture and of the spaces of everyday life. As such, the architecture of the city is no longer perceived with its mere physical characters, instead, new meanings and different functions are identified following the visions and goals of the combatants; for instance, what is assumed to be a shelter for one side, can be seen as target for the other. This interpretation of architecture is directly correlated with perception of its position as a war medium; whether a base or target, protected or attacked, it is much related to the interpretation of its subjectivity and objectivity. This duality of position, which architectural and urban elements hold in wars, is a crucial feature that depicts in strategies and tactics of both attackers and defenders. The subjectivity of the architecture replaces its objectivity, and exposes it to new meanings and functions for its users whether they were civilian residents or military commanders.

This paper aims at analysing the position of the city and its architecture in warfare, in terms of its perception and deployment in military operations and resistance. First part of the paper highlights and reviews relevant literatures tackling the relation between the city and its architecture with war . Second part of the paper considers the invasion of the city of Nablus in Palestine by the Israeli army in April 2002 as a study case to go in deep analysis of this expanding urban phenomenon. The case of Nablus presents how the city and its architecture are used for both military control and resistance and socio-spatial resilience. Using the concept of inverse geometry by the Israeli Army, the analysis demonstrates how several pre-established concept of visibility, frontier, wall, outside, inside, domestic and public are blurred and reinterpreted in moments of crises to adapt to needed situation being military control or resistance that in many times happen in the same space and time but on different X, Y and Z coordinate. Consequently, reflecting the multiplicity and complexity of architecture and its space that this paper calls Nakatomi Space; a space that has the capacity to be bended wherein buildings reveal near-infinite interiors, capable of being traversed through all manner of non-architectural means and composes a larger scale Rizhom.

As such, it can be understood that city as a 'battle space' has a subjective feature; this subjectivity is inseparable from its dual position as target or defence line. The duality of the city as a battle space can be considered a dominant character of the new urban warfare where the city is being seen as site for offensive as well as defensive activities, a space of destruction as well as production/reproduction, an obstacle as well as a tool of war and resistance at the same time. The duality of the city as war medium grants the Architecture its instrumentality as war agency.

1. CITIES AND WAR: LITERATURE REVIEW

Cities predate the modern nation-states by several millennia, representing centres of power as well as culture, economy, religion, politics and other aspects of everyday life. As centres of human life, and due to their the practical and symbolic importance, cities have always been focal points in

military strategy. However, the nature and tactics of modern urban warfare, witnessed since the beginning of WWII, have differed significantly from those of ancient, medieval and early modern urban fighting tactics; the frontier lines have not only moved from the fields to the city boundaries, but also moved from the city walls into city streets. The World War II has provided numerous and different cases of direct combat inside the cityscape, these cases have witnessed the very nature of urban combat where the Architecture of the city matters. Many lessons have been drawn on the role of architecture as an active as well as a passive agent of war (DiMarco, 2002).

In the post-cold war era, a new type of warfare has evoked; cities became the key sites of it, "*Warfare, like everything else, is being urbanised*"[1]. The city-as-target shifted to become the site, the stage and the field of warfare. The classical symmetrical confrontation between state armies in open fields came to an end. Wars are now entering the cities from within; city spaces, public and private spheres, places of everyday life and urban services have become to be the new sites of war. This new generation of war, new shape of confrontation, brought the city to be perceived as "*very medium of warfare- a flexible, almost liquid medium that is forever contingent and in flux*"[2]

The urban platform of war is not static but dynamic, ever changing, and differs from one city to another and this is one of the significant differences between urban and countryside fields. Cities and towns are different in their shapes, sizes, layouts, population and style of Architecture. Spencer and Amble (2019) argue that current and future urban warfare will attack different types of cities including megacities, medium size and even small urban centres, with each typology of settlement requires a unique approach.

Furthermore, modern cities are getting larger, containing several districts and suburbs, allowing the city to be divided into dozens of individual mutually supporting miniature fortresses. The occupation of one part of the city not necessarily achieves the objective of the operation; the city will still work in other parts of this 'organ' and will use its network and the urban system to attack and counterattack the assault. In addition to that, each district contains different microenvironments, ranging from wide streets to narrow alleys and through corridors and courtyards to rooms, terraces and rooftops (Evans, 2007). Moving from one microenvironment to another, being dominated by elevated buildings, and having no clues about what is hiding behind walls, doors, windows, or what is up the roof and below the pathway evolve psychological and physical exhaustion for soldiers[3].

Accordingly, and due to the vertical and horizontal complexities, the City has the capacity to 'swallow' larger manpower than open fields. Eyal Weizman (Weizman, 2007, p. 186) describes the absorption of manpower during the battle of Nablus 2002 as "*Although several thousand soldiers and hundreds of Palestinian guerrilla fighters were manoeuvring simultaneously in the town, they were saturated within its fabric to a degree that they would have been largely invisible from an aerial perspective at any given moment*". The built environment creates a network of highly physically structured but fragmented sequence of enclosures that require large quantities of personnel, with lack of possibility to regroup or reinforce[4].

In the last few years, bloody and intensive urban battles invaded different regions, most particularly in the Middle East, during these battels new, or renewed, tactics by non-state war fighters as well as regular armies were employed. For example, underground tunnels were largely and efficiently used in the Raqqa battle in Syria against ISIS in 2017. Battles have also involved a widespread use of

snipers, armed drones, IEDs, suicide vehicle-borne IEDs (SVBIEDs), remote-controlled weapons, in addition to multiple camouflaging techniques like the 'murder holes' for snipers or hung sheets between buildings to hide movement and weapons[5].

2. ARCHITECTURE AS A POLITICAL PRACTICE

The twentieth century is particularly rich in examples of architecture being harnessed in the service of political, especially totalitarian ideology. One recalls the Nuremberg rallies, for instance, and Adolf Hitler's vision of the New Berlin, to be renamed Germania, with its massive, new-classical architecture and grandiose dimensions.

The clausewitzian understanding considers war as an extension of politics, or in other words, a political instrument. Tom Vanderbilt in his article "War as Architecture" argues that Architecture can become a weapon of such war. He farther draws examples from Eyal Weizman's[6] presentation (part of a panel entitled "Architecture, Violence, and (In) Security") showing how the Israeli settlements in the West Bank are erected as "panoptican" structures overseeing Palestinian villages and towns, in addition to how the Israeli highways connecting these panoptican structures soar over Palestinian farmland creating sovereignty in three dimensions.[7]Weizman interweaves military and political history, astute three-dimensional mapping, a deconstruction of archaeological discourse and a wry of disquisition on the Israeli military's appropriation of situations theory. Weizman uses the word 'architecture' in a double sense, indicating both the built structure that sustain the occupation (Walls, bridges, tunnels , settlements, checkpoints and military basses) and a metaphor of a constructed nature of political issues.

On the other side, the destruction of architecture can also be a political asset. From a political point of view, buildings become targets not because they are political but because they are politicalized; why and how, and by whom they were built, regarded or destroyed[8].That's why the ruin of particular building or structure can become in itself a very clear political statement, because the environment reflects a specific form of politics[9] for instance, the tearing down of Berlin Wall and the levelling of the Presidential Palace in Grozny. Coward[10] goes on to point out that there are three principle interpretations of the destruction of the built environment, each understanding it through different notions: military, through accepted norms of military action; symbolic, as an element of cultural heritage; and metaphoric, which provides for political analysis.

'*To destroy a building is… to destroy that which comprises the condition of possibility of a community in the context of which individuated modes of existence are possible*'[11]. The individual accounts of destruction, together with the reading of larger context of urban space and its devastation, give way to examining the 'imaginative geographies trough which political violence work'[12]. This is complementary to the opinion that contemporary warfare and terror now largely boil down to contests over the spaces, symbols, meanings and support systems of urban areas or structures[13]. In regards to this concentration on the destruction of cities in modern war, Ken Hewitt[14] has come up with the term 'place annihilation'. After all, now wars are no longer subject to Clausewitz definition of the battlefield, and one never knows where terror would strike. The built environment, the city, has become the new theatre of operation. Thus, urban structures become victims. And this total war against urban structures starts to resemble urbicide; namely, the total razing down to the ground of every single structure is reminiscent of the compete erasure of an

ethnicity. As it is noted: '[t]he concept of genocide entails an understanding of destruction in relation to that which is destroyed' [15].

3. ARCHITECTURE AS WAR AGENCY

Considering enclosure as conceptual framework to understand architecture, we find that Architecture embodies the physical boundaries that create the distinction between interior and exterior. This distinction between these two spaces can be assumed to expand including the division between visible and invisible, veiled and unveiled.

Enclosure, then, materializes the concepts of visibility, and protection. The inside, the invisible, and the protected are all located on one side of the enclosure limits, whereas the outside, the visible and the unprotected at the other end. Bernard Tschumi states that "Architecture is defined by the actions it witnesses as much as by the enclosure of its walls"[16]. Hence, Architecture can be perceived as an advanced form of enclosure that, in addition to the concepts of visibility and protection, it includes a structural embodiment of social interactions for people using it. And here exactly lies one of the major differences between the urban and open battlefields; Architecture demonstrates, whereas nature diminishes these clear limits that define the enclosure.

Paul Virilio [17] demonstrates that "*for men at war, the function of the weapon is the function of the eye*", the battlefield is in fact a field of perception, thus, visibility and the perception it creates is vital and decisive factor in war, and this is what brought the art of camouflage to the tactics of war. Camouflage, as an 'art' of alluding the visual perception of an object, has been used to protect what was expected to be a target for the offensive airstrikes at the end of WWI and during the WWII[18].

Architectural elements are physical manifestations of concepts like 'limits' including the visual ones as well as the concept of compartment that define specific ranges of view or control. The visual power of domination over inmates demonstrated by the panoptical prison emerges not only from the arrangement of architectural elements it encompasses, but also from the perception it creates in the imagination of inmates. The axial line of sight that has a direction toward the observation tower at the centre without seeing the guard himself, in addition to closing other lateral options of view, facilitate the switch of authority perceived by inmates. The tower itself as a physical entity exchanges the role with the guard; this exchange might not occur without the change of perception imagined in the mind of the inmate and without this direct visual relationship[19]. This might lead us to conclude that the interpretation of the architectural elements is what accounts more when fighting within architectural context as we will show in Nablus case study. As noted earlier, visibility, protection and social experience distinct architectural context from open field, and consequently, their respective battlefields. The range of view and range of weapon are shorter and restricted by buildings[20]. The artillery and aircrafts have proved ineffective in street fighting, tanks also are difficult to move through the narrow rubble-filled streets, and due to the restricted field of view they have shown inefficiency in targeting fighters on rooftops or even to lower their guns enough to destroy basements[21].

Buildings offer good field of fire, observation and surveillance capacity over the adjacent spaces. These characters can be usually exaggerated inside the dense urban fabric and can be also modified by other man-made constructions. The 'panoptical' domination is exaggerated by the fact that the

architectural elements as ‘observation towers’ can be in any direction, and they are not only observational, but rather lethal instruments. A Palestinian fighter caught in the battle of Nablus 2002 said:” *Israelis seem ‘to be everywhere: behind, on the sides, on the right and on the left. How can you fight that way*?[22]. Buildings are not only used to establish ambushes and hideouts for snipers and anti-tanks groups, but they can also be knocked down to obstruct and block routes of movements used by the attacking army; in other words, even demolished structure is being used as means of domination and control over the battle space, a fact that shows the implicit power inherited in the physical characters of Architecture.

Defenders may use the city overground and underground features to hinder the attackers mobility, in addition to employ heavy fire power against the offinsive forces. Buildings, as well as rubbles, barraicades alongside with the underground elements like sewers, subways, basements, and tunnels all together define the enclosures limits between the interior and exterior spaces and zones of control[23]. The ability of controlling these sites by the combatants and of creating a matrix of enclosures or battlefield is an exclusive feature to the nature of built environment; this complexity of interconnected elements cannot be established in an open field battle space.

Weaponized Architecture & Rhizomatic spaces: Nablus during the Israeli military invasions 2002

Nablus is the largest Palestinian city and is located 70 Km to the north of Jerusalem (Fig. 1) Nablus was founded by the Arab Canaanites in the middle of the third millennium BC, located at the eastern entrance of the actual city on a large hill that is now called "Tel Balata". Nablus has struggled with a lot of invaders and occupiers throughout its long history. It was invaded by the Egyptians, ancient Hebrew tribes, the Assyrians, Babylonians, the Persians, Greeks, Seleucids and in 63 BC the city finally felt in the hand of Romans. In 72 AD the historic city was destroyed and Nablus was rebuilt by the Romans on its present place[24]. The urban fabric of the old town core of Nablus (Traditional Arabic city morphology) has attracted the Palestinian resistance to take refuge in its maze-like alleys since the first intifada of 1987. The density and morphology of the Old Town hampered Israel’s capability to control this space and move within it. This, in turn, has led to the mythical construction of Nablus as the “impenetrable city,” the “Castle of Resistance,” and the “Mountain of Fire”[47] in the Palestinian discourse according to Doumani[25].

These factors influenced how both the Israeli military and the Palestinian resistance prepared for the event of Israeli military re-occupation in April 2002. On the Palestinian side, the legendary immunity of Nablus urban fabric reinforced the perception that the Israeli army would not risk entering the Old Town or try to hold it in any military operation on the ground[26].

After a series of suicide bombings in Israeli cities, the military decision to launch ‘ Operation Defensive Shield’ and a reoccupation of the Palestinian cities was launched. On the Eve of the 3rd of April, 2002, the Israeli military troops invaded Nablus city from different access and directions. The Israeli army used the main military bases and Israeli settlements surrounding the city as their headquarter from which the military operation took place. During its main attacks, the Israeli army was well equipped with detailed maps and aerial photographs of the Old Town.

Walking through walls: rizhomatic and inverted spaces

The old town of Nablus has an urban fabric that is significantly different from the modern districts of the city. The modern city features wide open streets, detached houses, apartment buildings, setbacks, and open spaces. Whereas the high dense built up area and attached urban structures creates masonry terrain that made the Old Town permeable only by a buzzle-like pathways with hierarchical flow; from wide open straight to very narrow irregular bent paths.

Once the Israeli Army surrounded the old city there were five days of fighting concentrating in two parts of the old city: the Kasbah and al-Yasmeneh. The Israeli soldiers had good street maps and aerial photos of the town, they seemed to know where to go and what houses to enter and search.

Recalling its previous experience in the Old Town, the Israeli army saw the morphology and structure of Nablus itself as the major line of defence preventing it from controlling the city. Consequently, re-organizing this space and destroying the city became the only possible effective strategy to establish military control over Nablus. This is evident in the Israeli army commander Aviv Kokhavi's view of how the Old Town should be reorganized, despite the fact that it is a densely populated area:

Kokhavi [chief of military units] was adamant that the only way to "control the flow of terrorists out of the city" is to exercise some basic acts of urban planning, in effect to reorganize the complexities he so admired into a simplified urban layout that will serve his operational needs, and to dig deep trenches all around the city "and [build] a road running across its length from east to west, channeling all access in and out of the city into two check points" one at each side of the city."[1]

The Palestinian fighters[27] closed all the entrances of Nablus old city ahead of the Israeli military invasion to the city hearing the news from the previously invaded Palestinian cities like Ramallah Bethlehem and Jenin; they knew it was the turn of Nablus which was the last to be invaded. The entrances were blocked with sand bag and trash cans filled with sand and planted home-made mines[51]; thus blockading the logic of movement. Palestinians followed the classical perception of paths as routes of movement and facades of city buildings as impermeable edges. However, Once Israeli troops surrounded the old city; they started to penetrate within the urban fabric in counter-classical way.

The Israeli Army understood urban fighting in Nablus as spatial problem. The surveillance that architecture offers for those who live inside is significant. The axial, linear perception of the battle space imagined by the Palestinian defenders has been encountered by non-axial, non-linear swarming principle that was more effective to negotiate and navigate with the irregular non-linear spatial context of the Old town. As such, the Israeli Army had its own perception of architecture on the city, it was an "inverse geometry" interpretation; paths are no longer routes of movements,

[1] The description , battle reconstruction and analysis of Nablus old city is based on field work between 2003 -2007 as well as between 2014-2017. The survey included: mapping of existing neighbourhoods and buildings that were a target of the Israeli army in the second intifada, spatial flows, as well as interviews with local inhabitants of these neighbourhoods.

rather they are edges, impermeable and forbidden elements. Instead, walls, ceilings, and floors became the potential entrances and markers of new paths within the city. The dense urban fabric inspired the Israeli commanders to adapt the technique of walking through walls to conceal their movement, "*soldiers moved within the city across hundred-meter-long 'overground-tunnels'* carved through a dense and contiguous urban fabric." Their movements were thus almost entirely camouflaged, with troop movements hidden from above by virtue of always remaining inside buildings[28].

One of the tactics the Israeli army used was to drill in and explode holes into the thick walls, moving from one house to another or from one enclosure to another, so they stay in the invisible, protected, interior side of the battlefield. The soldiers marked these holes with entrances and exits to guide them through; paths, then, became imagined lines that connect two successive points, demarcating directions of movement only by labelling those holes; a tactic used before in Balata refugee camp on March the same year and used later in the military invasion of Jenin 2002.

Penetration went in parallel from different directions, from Western entrances from Al Fatimyeh School. This route was not completed, it appears to be very long to reach inside the old town, instead the bulldozers were used to clear out the blocked western entrance of Alhadadeen market. They entered the city from the southern neighbourhoods, going through two routes, along Alaqabeh stairs, and Alyasmeeneh quarter (fig. 2). From north they swarmed along Suq Albasal market. It was noticed that the forced routes technique as documented on the ground and reconstructed from interviews[2], was used mainly in the southern parts of the city, and near the main northern entrance of Alhusien main square outside the old city borders. The other northern eastern entrances were opened by bulldozers.

They came through the roof, ran down the stairs here and went straight to the children's' room - that's right there", says Aisha as I follow her down the narrow staircase leading from the roof terrace to her apartment on the first floor of the family home in the old city of Nablus. "I begged them not to scare the children, but they just laughed in my face and started overturning the furniture, emptying the drawers, making so much noise - the children were crying, they were so frightened. But the soldiers didn't care". We continue to the next room, the living room, where she points to a wall with a built-in bookcase: "And this is where they left. They blew up the wall and continued to our neighbour's house"[29]

From this example, we see that Israeli Army has invaded the entire environment of life inside the old town, merging private and public spheres and forming new frontier lines. They were in fact deforming and converting the hierarchical, geometrical and Cartesian territoriality into another flexible, shifting and nomadic one. Aviv Khkhavi explains the conceptual framework of this strategy saying: "*A state military whose enemy is scattered like a network of loosely organized gangs . . . must liberate itself from the old concept of straight lines, units in linear formation, regiments and battalions, . . . and become itself much more diffuse and scattered, flexible and swarm-like. . . . In fact, it must adjust itself to the stealthy capability of the enemy. . . . Swarming, to*

[2] Interviews with around 170 inhabitants who witnessed the events of destruction, invasion of their houses to be used as military outpost or as a passage for Israeli soldiers to other adjacent houses in the neighbourhood.

my understanding, is simultaneous arrival at a target from a large number of nodes if possible, from 360 degrees."[30]

These tactical units were swarming inside the old town fabric. "*Swarm has no form, no front, back of flank but moves like a cloud*" said Shimon Naveh describing the movement of Israeli soldiers which seems to be a realization of the rhizomatic spaces[31] by perceiving the city as a set of organizational pattern that is composed of a multiplicity of small groups progressing according to the circumstances, and flexibly reacting and accommodating with different contingencies. In other words, the urban life that is structured in the built environment is attacked; it was a process of deconstructing and reconstructing the structure of urban life;

Moving like a cloud, or "*Like a worm that eats its way forward, emerging at points and then disappearing*"[32] was penetrating and moving between specific points within the urban structures of the town. It sounds to be like a process of structuring and urbanizing of nomadic life style; Nomads move according to specified key sites, based on spring or tree for example, and each site becomes a point of reference by itself with no one point determines the end of the journey a very strong representation of the concept of Rizhom. If the site is good they stay longer, if not they just proceed for the next destination[33]. Like Nomads tribes, the sites identified by the Israeli Army inside the Old Town are scattered and cannot be mapped and bounded as exclusive territory, rather only paths between key points of reference. As such, the Israeli 'worm' was neglecting boundaries and territories but claiming key points and this contradicts with the natural urban behaviour. Urban architecture structures the everyday life of its users. This explains the difference in the special interpretation perceived by both sides. City residents were stuck to their houses, city defenders thought that interior spaces are untouchable and open spaces will host the fight. Accordingly, in the 2002 invasion of Nablus some buildings could host the three human components of urban fights inside their limits. Inhabitants, defenders and attackers are at the same building with floors, ceilings and walls separating them. The invisibility offered by the architectural enclosures transferred homes into ambivalent spaces. Fig.(2,3) However, the Palestinian fighters took some time to understand the inversed nature of the battlefield; hence some of them kept waiting and hiding at streets corners. Israeli soldiers who dominated the interior of surrounding buildings could eliminate them by sniper outpost inside the old town houses taken over by the Israeli army see fig(4).

In response to this new nature of confrontation, Palestinian fighters started to conceal themselves and tried to use their knowledge of the space to counter the Israeli surveillance, the Palestinian resistance members used more elastic method; we might describe it as Parkour principle. Once the Israeli Army could penetrate within the tissue of the city, the wanted resistance members had to hide and conceal their movement as much as possible. Some have been captured or eliminated but many were swallowed by the city fabric. The cognitive map that Israelis follow was encountered by mental map by Palestinian resistance members, and the destructive tactics of motion was encountered by smooth methods of penetrating within spaces.

The Palestinian armed resistance the claimed target of the Israeli operation though poorly armed could manoeuvre inside the old town relying in their deep knowledge of the spatial structure and hierarchy of the city fabric. The fighters had the capacity of flexible movements and efficiently

hide due to their familiarity with the city and its complex spatial structure.. Basem Abu Sareyah[3], was one of wanted Palestinian gunmen described his journey to get out of Israeli ambush in one of Israeli invasion in 2004. He skilfully used his mental image of the space to navigate his escape route. After being noticed in a cave with other Palestinian fighters, Israeli soldiers fired gas bombes against them. He knew that this cave is connected with another house by tight tunnel that is closed by brick wall at the end. He moved along the tunnel, broke the brick wall and surprised the Israeli soldiers at the kitchen of that house; they thought that he is a suicide bomber and escaped to the living room; he proceeded to another room where he found another Israeli soldier who was not expecting him. A window that opens to a small courtyard rescued him, through which he knew that he can climb the sewer pipes of neighbour's house and disappear inside that building. From the neighbour's house he could move to the roof top and completed his journey out of the Israeli ambush.

Snipers and military outposts became common during Israeli invasions into Nablus; figure 4 shows the location of the 28 positions have been registered inside the Old Town alone[4].The dense urban fabric, irregularity of building orientations and asymmetric arrangements of openings through walls and rooftops offered snipers several options of key points; structures like mosques minarets, bridge-rooms over streets and screened walls were visibility control agencies that forced an optical phobia over residents and fighters as well, they create a panoptical domination over private and public spaces. This domination is exaggerated by the irregularity of buildings and openings as man cannot predict where the sniper might be positioned. Abujidi[34] argues that snipers and forced routes played important roles as surprise elements in the battle of April 2002; these two techniques were not usually employed during the first Intifada. These strategies enabled the Israeli army to control the battlefield with its heavy machinery, and were an important developmental shift in the Israeli military's strategy inside Palestinian urban areas. During military invasions special measures are added to the Israeli surveillance and military control network. Between 2002 and 2005, frequent military Israeli invasions occurred in the Old Town of Nablus and the nearby Balata refugee camp. In all instances, the Israeli army used its existing physical network of control to infiltrate and control urban space and dominate the city. During these events new, temporary physical networks of control were superimposed on the existing networks (figure 4), consisting of sniper and military outposts, iron gates, temporary roadblocks, trenches, and a dividing system. This system divided Nablus New Town into east and west with a physical demarcation line, called "Tora Bora" by the residents as shown in figure. This comprises a mound of dirt constructed by the Israeli army near the destroyed governorate building (Muqata'a) and the city prison.

The trauma and experience of transforming inhabitant's houses into military base or routs of movements reflects this dual role of houses inside the old town where a temporary spatial reconfiguration of the house spatial layout take place to serve both the soldiers and displaced families.

[3] In an Interview with one of the Authors (2013)

[4] The Israeli army normally occupies strategic buildings, forcing the inhabitants either to evacuate to neighboring buildings or to stay in one room of the house (or one apartment, in case of multi-family buildings) along with the soldiers.

The Dilal family's home was occupied, and twenty people had been stuffed in one room for almost 48 hours. Among them were two elderly people with heart problems, one pregnant woman, and eight small children. The rest of their home had been transformed into a military base where soldiers could rest and meet between operations.

The Awad family was also confined to one room of their home while soldiers took over the rest of the house. One floor was reportedly transformed into an intelligence centre, another into a prison, and the basement into a makeshift interrogation centre. We had already begun to hear stories from young men returning from interrogation — affectionately referred to as "Hell" in Arabic — while others went missing. In alleys we would find men handcuffed and blindfolded, being led into jeeps while soldiers aimed their guns in our direction as an unspoken warning against speaking or photographing.[35]

These examples embody the capability of architectural enclosures to be subdivided into catalogue of stimulating unorthodox functions of spaces. One room of the house is used as survival container while other rooms are serving offensive missions. In both cases, the architectural enclosures were not meant to serve the way they are used now.

Nablus the Inverted City: Domestic Space as Military Domain (inverse geometry)

The notion of privacy disappears during times of invasions as public and private are reconfigured by military fiat. A private house can be the target of a search operation, can be used for interrogation, or can be transformed arbitrarily into a "temporary" military outpost—challenging notions of ownership and privacy on the grounds of "security." The Israel army has a unique power to immediately transform any portion of urban or rural space by declaring it a "military area."

Giorgio Agamben describes this issue in his definition of the state of exception:

It is obvious that we frequently can no longer differentiate between what is private and what public, and that both sides of the classical opposition appear to be losing their reality. The state of exception consists, not least, in the neutralization of this distinction[36].

Many public buildings, such as schools and mosques, are transformed into temporary shelters for the city's displaced inhabitants. Another issue is the curfew laws that confine people to the interior of their houses, regulating the use of public space outside. They also restrain the use of private houses, making looking from a window or sitting on a balcony a risk in itself. Thus, here, most intimate private space is invaded and redefined:

Go inside, he ordered in hysterical broken English. Inside! I am already inside! It took me a few seconds to understand that this young soldier was redefining inside to mean anything that is not visible, to him at least. My being "outside" within the "inside" was bothering him. Not only is he imposing a curfew on me, he is also redefining what is outside and what is inside within my own private sphere[37].

This is a realization of new definition of enclosure, of inside. The visible is outside even if it was inside the limits of the enclosure, meaning that what defines the limits is not only the physical boundaries, but more importantly the visibility through these boundaries.

4. Conclusions

In The Occupied Palestinian Territories Architecture has been weaponized as early as 1948 Israeli Arab war in which architecture has been instrumentalized as a political weapon in different forms either by the building of war architecture to suppress the Palestinian subject by building the Israeli colonial apparatus of Surveillance and control (Jewish settlements, Israeli only bypass roads, checkpoints, military bases and the Apartheid Wall) or by targeting the Palestinian architecture and built environment (Houses demolishing policies, and destruction during military invasions). The third form is in transforming or manipulating the Palestinian architecture and its spaces to serve military operations objectives. Thus, by admitting that the city is inherently a battlefield, we then acknowledge the impossible neutrality of everything that takes part in this city, architecture, objects, bodies and their behaviours. The terms of ***battle*** does not refer to a fatalistic violence between the bodies, but rather, a systematic violence that bodies have to face in the way relations of power are structured[38]. The city intensifies such violence as it frames it. This is why the city does not become a battlefield at a precise moment, it simply changes — sometimes drastically — its degree of intensity when framing a more explicitly stated conflict than usual. In Nablus during that battle, soldiers moved within the city across hundred-meter-long 'overground-tunnels' carved through a dense and contiguous urban fabric." Their movements were thus almost entirely camouflaged, with troop movements hidden from above by virtue of always remaining inside buildings. Although several thousand soldiers and several hundred Palestinian guerrilla fighters were manoeuvring simultaneously in the city, "they were so 'saturated' within its fabric that very few would have been visible from an aerial perspective at any given moment." to bend space to your own particular navigational needs as Geoff Manaugh[39] argues. Manaugh branded the liminal territories that are tactically occupied in the *Die Hard* series as "*Nakatomi Space*: wherein buildings reveal near-infinite interiors, capable of being traversed through all manner of non-architectural means."*Nakatomi Space*; an interesting concept that so succinctly describes such a complex idea – what Gilles Deleuze and Felix Guattari would call 'Rhizomatic Space', which, at its most basic, is a theoretical, non - hierarchical space constructed of elaborate connections and multiple points of access. Such rhizomtic space lends itself and its capacities to the resistance and multiply its techniques and appropriation of spaces in multiplicities discussed as 'Rhizomatic resistance' by Abujidi 2014. This could be seen in using different forms of spatial configuration. The Palestinian Resistance employed the urban fabric and its architecture for resistance using different forms and techniques. From barricading the city to the re-colonization and appropriation of occupied Palestinian land architecture (Bab Alshams movement) or tunnelling Gaza 2014,

Hence Architecture being weaponized "or decolonized the power of architecture as a political weapon is at its highest (many other sites of the world) in which cities and architecture proved to be a crucial agent of oppression and emancipation.

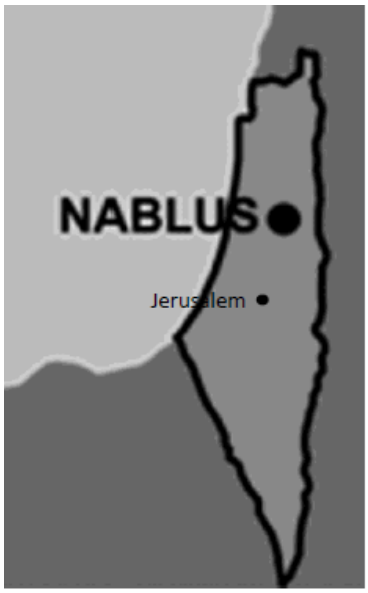

Fig.1 Nablus Location

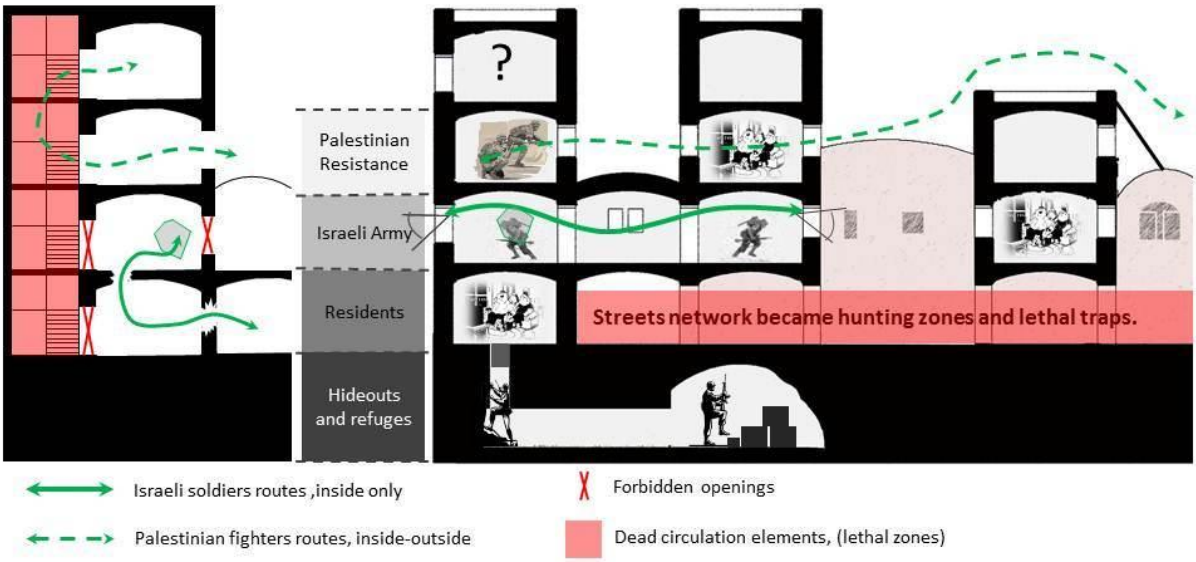

Fig. 2 Section to demonstrate the spatial flows layers for the Israeli army and Palestinian resistance during military invasions. based on field work – (Kittana)

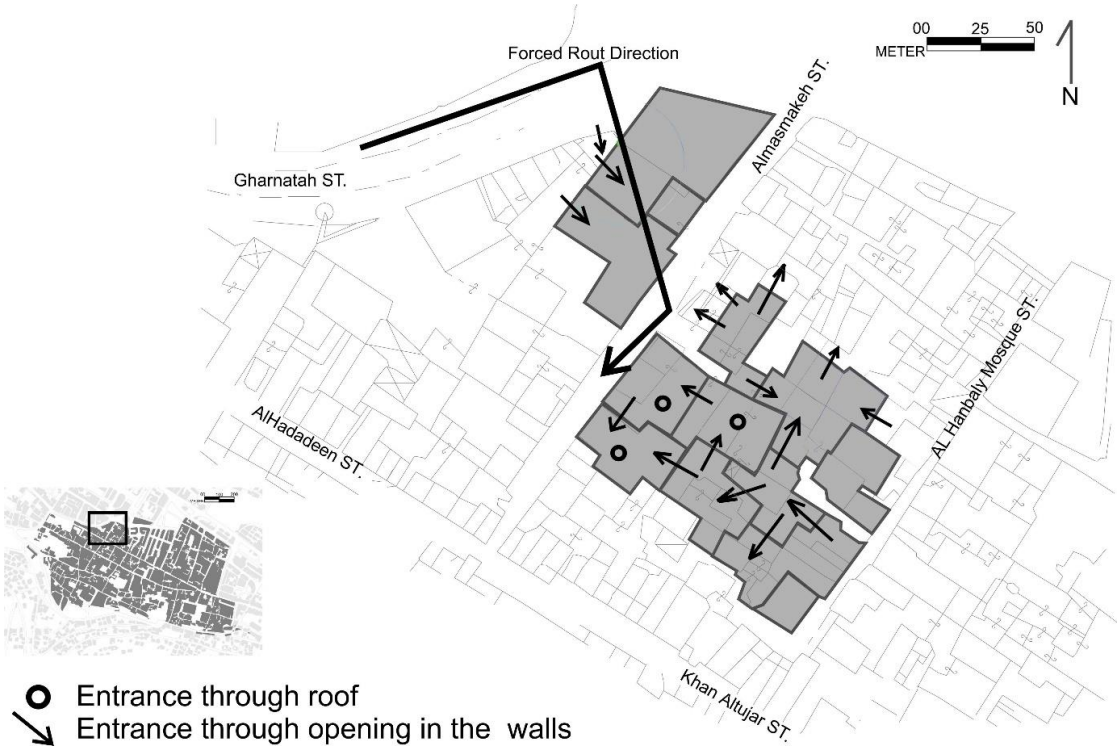

Fig. 3 Routes enforced by the Israeli army within Nablus old town fabric. Fieldwork 2004. (Abujidi)

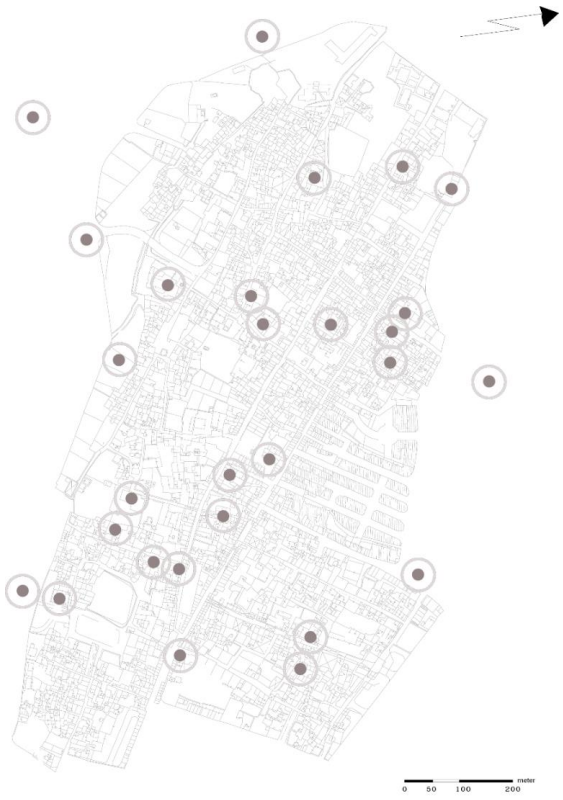

Fig. 4 Location of snipers outpost inside Nablus old town during the Israeli invasion 2002. (Abujidi)

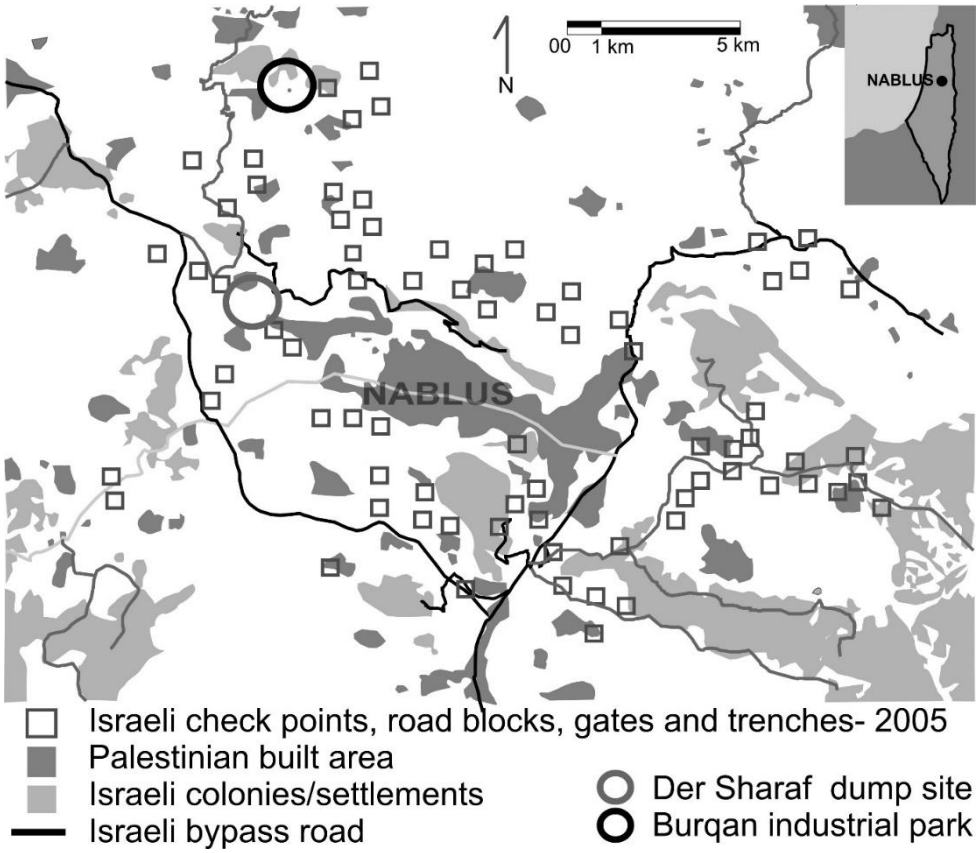

Fig. 5 A reconstruction of the Israeli military invasion in 2002. (Abujid)

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Dynamic Architecture as a Sustainable Urban Solution to Adapt with Sea Level Rise in Coastal Line, Egypt

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Abstract:

Climate scientists predict an expected global temperature rise of 1.5 O Celsius by 2050, which may lead to a sea level rise of 18-40 cm by 2050, flooding large areas of coastal and delta cities with water. The problem will be exacerbated by the fact that the lands of the Delta are falling geologically at a rate of 5 millimeters each year, which is expected to increase the erosion of their lands and submerge them with water, thus sinking the urban and agricultural areas will forcibly displace them. Dynamic architectural solution can be considered to adapt to the continuous rise of water levels and interact with it by moving the building vertically. The study discusses the problem of sea level rise which threatens coastal cities with floods, causing mass migrations seeking environmental refuge. This problem has many impacts over urban, economic, social and environmental aspects. The study discusses using VDB which is vertically dynamic Building to avoid drowning. The suggested design adapts with the expected sea rise by its dynamic resilience and ability to move downward and upward as needed. Details are given about the design and its pros and cons. This type of urban construction can preserve our cities, prevent environmental refuge, save our historical areas and preserve our urban fabric. It may also help transforming areas subject to sinking into touristic areas with more attractive pattern similar to Venice. Dynamic architecture can be a good form of city resilience and resistance against tides and floods in Egypt's coastal region.

Keywords: Climatic change - Anti-flood buildings - Sea level rise- Dynamic buildings - Resilient Architecture.

1. Introduction

"Many of the poor urban areas in Developing World are facing growing problems of severe flooding, increased storm frequency, and intensity related to climate change." (1) . Coastal areas are dynamic places that attract urban developments and most important urban centers are located along shorelines. (2)

The research provides an engineering solution to the problem of coastal cities in the coastal strip and the Nile Delta of Egypt, as it is exposed to the risk of drowning due to continuous rise in sea level. Studies expect a rise in the sea level ranging between (18 - 40) cm by the year 2050 .Due to three main factors : -

a) The geological land drop due to oil , groundwater withdrawal and The construction of Aswan Dam on the Nile River which resulted in decrease of silt deposition along Rasheed & Damietta Branches .

b) Coastal Erosion which result from continuous ebbs & flows .

c) Global Warming which led to ice caps melting thus sea level rise .

2. Review of Literature

There were many previous attempts to solve this problem , most commonly are :-

2.1 Soft Construction Techniques

This method suggested shaping the city's coast with sand to prevent further erosion of the beach. This method may be a temporall solution ,not a permanent one .Fig(1,A)

2.2 Barriers

This method suggested constructing movable dynamic barriers to control tides whenever needed .Complex design & High cost are the main disadvantages. Fig.(1,B)

2.3 Armoring

This method creats a path of rocks inside the sea and close to the shore to break up the sand carried by the wave thus reduce its erosion to the line . This method requires a mountain near the site for easy transportation of rocks plus its environmental impact due to change of natural habitat of Aquatic Systems. Fig.(1,C)

2.4 Elevated Development

this method suggests leaving the ground floor unused to comply with expected submerge whenever needed .Fig.(1,D)

2.5 Floatable Development

This method is characterized by the construction of wood on the surface of the water and it is widespread in East Asian countries. However, it is not possible to make several repeated floors in the building. Fig(1,E)

2.6 Floodable Development

This method is the" Hope Waters Dome" is designed to combat the twin dangers of rising sea levels and food scarcity in the water locked nation, and it could be built using locally-available materials such as bamboo and plastic . This solution is not durable and not for long term use. Fig.(1,F)

2.7 Living Shorelines

The idea is to collect water on an underground floor in the whole city or region. And take advantage of this water after the flood ends. Suitable only for rainwater floods not for saline sea water floods, see Fig.(1,G)

2.8 Managed Retreat

This method is featured by a network of bridges allover the city road network to allow escaping for trapped people during floods .Its suitable for seasonal floods not for permanent solution , see Fig. (1,H)

2.9 Amphibious flood house

The plan was to excavate around 1,000 tons of earth, digging to a depth of about four metres below the average water level; the vast hole would then be lined with solid reinforced concrete. Inside this dock, a concrete box forming the basement of the house would float if and when flooding occurs. Mechanisms known nautically as dolphins keep the structure level, while a prefabricated timber frame sitting on top provides the living accommodation.

2.10 Legal Development Regulation

By forbidding any construction along the shoreline with various widths .

(A Soft Construction Techniques , B Barriers , C Armoring , D Elevated Development , E Floatable Development , F Floodable Development , G Living Shorelines , H Managed Retreat ,I Amphibious-flood-house)

Previous solutions for Sea Level Rise

Fig 1 (Ref (1,2,3,4,5,6,7,8,9)respectively)

3. Vertical Dynamic Building (VDB)

3.1 Description of the Model

VDB is a pyramid-like structure as shown in Fig (3).The building has three floors :-

a) The first floor is left free for circulation and yachts landing.

b) The second floor is a 2 appartments floor , 70 m2 each of 140 m2 , as shown in Fig (2).

c) The third floor consists of roof & light well .

The building is supplied with several water sensors installed along the exterior walls of the ground floor . These sensors are responsible of giving signals to the main hydraulic system to start moving upwards or downwards as needed . The mark for the sensors in the image is for illustration only and without scale , see Fig (2) and Fig (3) .

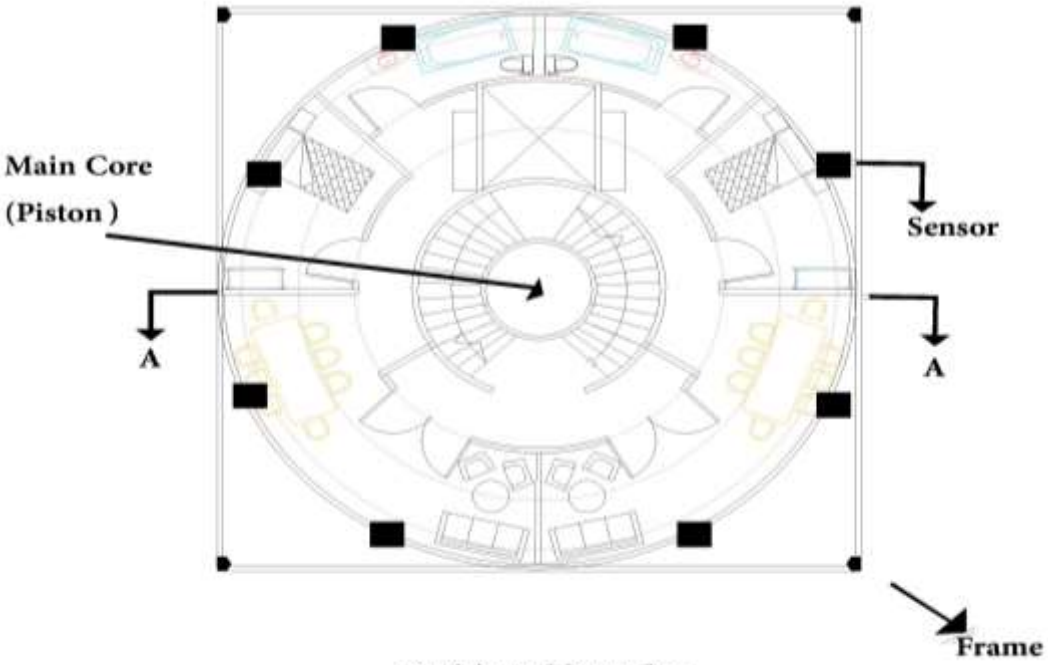


Fig (2) Building Plan

Scale 1 : 150

The figure shows a plan of the building as it is a circle with a diameter of about 13 meters in the middle of which is a hydraulic piston with a diameter of two meters surrounded by the stairs.

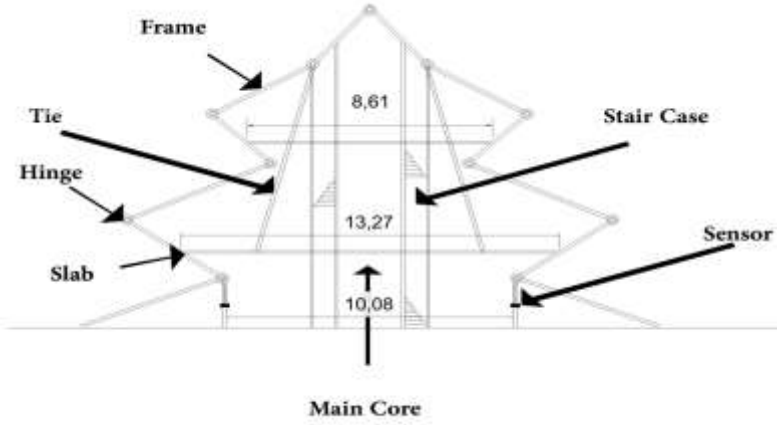


Fig (3) Section A – A

A section shows the location of the sensors at the bottom of the windows on the ground floor, and they are 8 sensors.

3.2 VDB Structural System

the VDB is constructed of a main piston located at the core of the building on which all the loads are carried .

The building façade is covered with a steel frames which deliver all loads from the slab toward the main core , see Fig (4) .

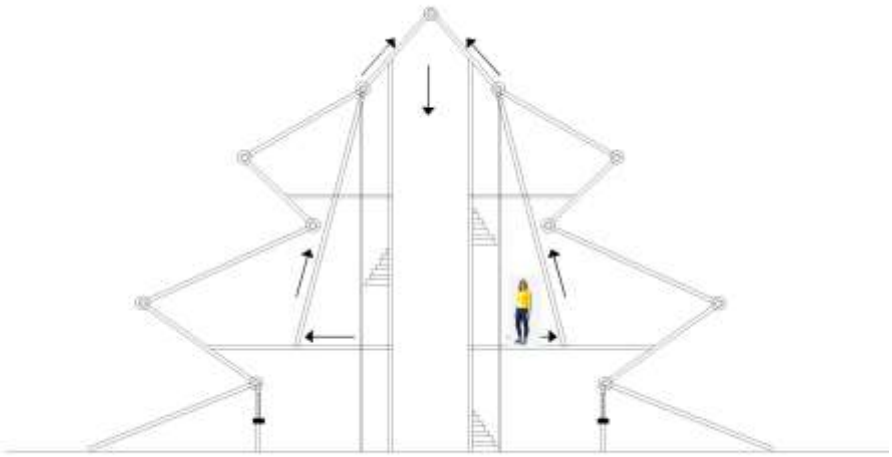
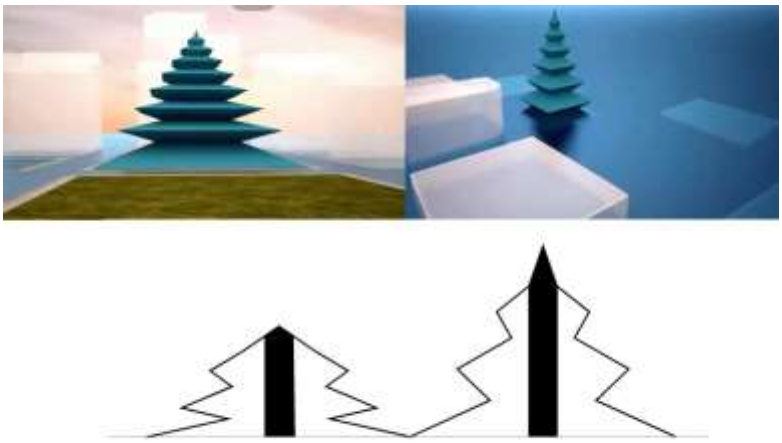


Fig (4) Load Path

3.3 How it works

The building is supplied with several water sensors installed along the exterior walls of the ground floor . These sensors are responsible of giving signals to the main hydraulic system to start moving upwards or downwards as needed , see Fig (5) .



Fig(5) .How it works

The building shifts its loads up through four steel frames so that the building ends up being loaded onto a hydraulic piston that carries the load to the foundations and then to the soil. The building has an elongation to the extent of the height of the water level around it, and this elongation will be spread over all the building's roles in proportion With the original height of the single floor, the building has four frames in the form of zigzag and at each break in this frame there is a hinge, so the single floor has four hinges in the middle of the height of the floor at the pillars, and each roof tile around it has four hinges in the corners as well, and these hinges control the net height The role One of the increase or decrease, depending on the amount of the total height that will happen to the building .

3.4 Architectural Features

The floor consists of two studio apartments with one room suitable for a small family, and the area of one floor can be increased taking into account the change of construction loads. The apartments enjoy a good view, All rooms have exterior view to landscape .

3.5 Layout & Urban Pattern

VDB can be arranged as quadral blocks grouped with each other as shown in Fig (6), this pattern allows the move of yachts & small boats around the block to reach each appartment easily .

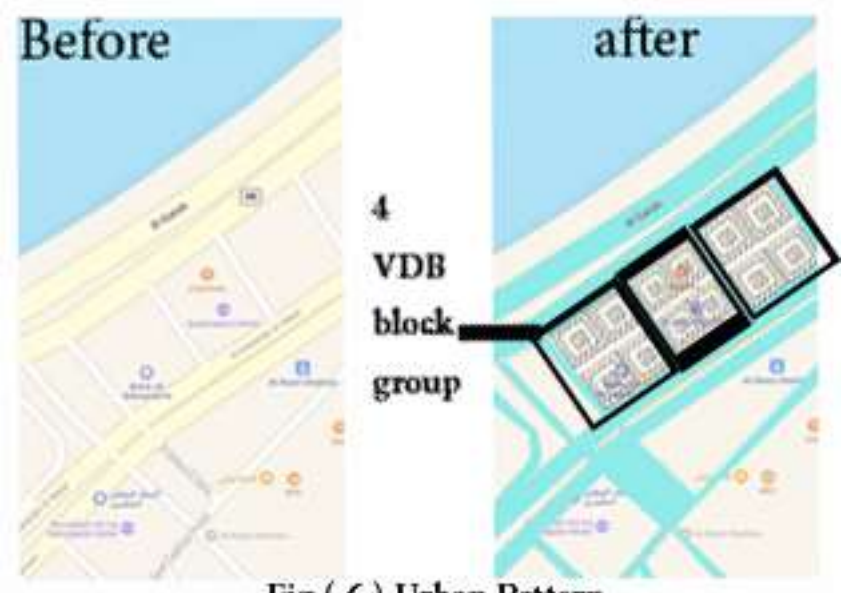


Fig (6) Urban Pattern

VDB block can be designed in wide variety of dimensions , to fit inside the original urban form of the historical city .

VDB is inspired basically from Leonardo Da Vinci Design of Winch , shown in Fig (7) the Crane was a creative method elevating heavy loads with minimal effort .(12)

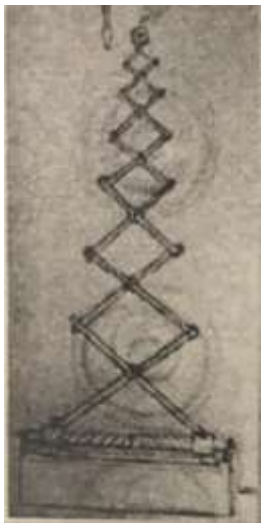


Fig (7) Da Vinci Design

4. Pros & Cons

4.1 Pros

This building is structurally safe and the stay in it will be more comfortable and an opportunity for recreation, except that the cost of constructing such a building will not terribly large, compared to fixed metal buildings the cost will be from (2.5 - 3) times the cost of the fixed metal building.

4.2 Cons

a) It needs maintenance every period .

b) It needs thick sections of steel .

c) This building needs qualified engineers to implement it

5. Conclusion

This building is good for adapting to an ever increasing sea level. It is quick to construct and it is also quick to disassemble and install and thus achieves the element of sustainability in buildings because it has a long life in terms of elongation

The cost of this dynamic building is large when compared to the cost of an equal of reinforced concrete. If a tower is designed from the same construction method used in this building, it will require many criteria in design such as wind movement, water speed and estimate of horizontal forces

6. Recommendations

We recommend a further development of the idea structurally, so that the building is able to withstand more loads and more roles, it is also recommended that the Municipalities in coastal countries at risk of flooding begin to set Laws and Regulations regarding building permits to determine the difference between the waterfronts of buildings and the internal façades far from the coasts . We also recommend that countries threatened with drowning apply this technology, especially the areas closest to the sea instead of using fences that are costly and expensive , as they have adverse effect on aquatic biosystems .The countries start applying this technology in the first rows towards the sea, then inward, farther and farther because the closest It is the most threatening one, so we have time for this because the water crawl happens slowly. The following table summarizes the meaning .

Building type	residential
Architectural form and characteristics	A symmetrical dynamic metal structure capable of vertical linear motion upwards
Position of movement	The whole building
Purpose of movement	Security purpose
the engine	Hydraulic
control	direct
Structure and movement of the structure	Moving spaces - linear motion - integrated
Structure material	Stainless steel frame with hydraulic fluid (dynamic mechanical)
Wall or cladding material	The external walls are metallic chassis with flexible membrane of poly-tetra fluoro ethylene, and the internal walls of gypsum board insulated sound insulation

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The Resilient Environment of Coastal Cities

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Abstract:
Coastal cities are becoming vulnerable to natural phenomena brought about by climate change. Over the last three decades, the implementation of various emerging smart technologies, infrastructural advancements, and awareness management has helped in understanding and mitigating the harmful impact on coastal cities. However, cities, which were historically identified as collective settlements and public domains, are now becoming more "grand" and are called mega-urban areas. Although the extensive research and progressed applications' development in various areas of the city, including the environmental monitoring, water management, biodiversity and ecosystems services, surveillance, lighting management smart services, and crowd-sensing, there is a clear gap in the application of urban design concepts in the creation of a resilient environment. This research focuses on constructing conceptually a resilient approach that can be part of the solution to the pressing problem of the flooding phenomenon of Jeddah city in Saudi Arabia. The paper aims to portray the impact levels on the city and city inhabitants while exploring the required components that develop smart parks' systems and their applications to withstand the flooding phenomenon. The main objective of this study is to suggest design guidelines for city parks that accommodate water retention systems to create district parks that are able to serve people in a flooding time in a responsive manner.

Keywords: flooding in coastal cities, resilient urban environments, resilient city parks, city prosperity index, Jeddah in Saudi Arabia.

1. Introduction

Coastal cities represent a historical urban phenomenon, and they continue to be an example of rapid urbanization and population growth worldwide (WEF, 2017). Their significance is linked to the various visual, economic, and social benefits derived from its location by the seaside. However, coastal cities are becoming vulnerable to natural phenomena, which brought about mainly by climate change. The natural effects include storm surge flooding drove by tropical storms and hurricanes (Helderop, E. et al., 2019), deterioration of biodiversity ecosystems, and human impacts upon coastal waters and global strategic goals (McPhearson, T. et al., 2014).

Over the last three decades, the implementation of various emerging smart technologies, infrastructural advancements, and awareness management has helped in understanding and mitigating the harmful impact on coastal cities' ecosystems, biodiversity, and landscape. However, cities are now more sophisticated and are called mega-urban areas. The emergence of the concept of "smart cities" and the increasing use of sensors, reassuring that the value of big data for understanding urban, climatic, and biodiversity systems will increase with time (Knox, P., ed., 2014). Coastal cities provide a naturally significant landscape that is related to the seascape and its natural and humanmade shoreline. Coastal cities, in particular, have underlying forces that are far from equilibrium and require massive amounts of dynamism to maintain their urban environment. Many coastal cities display vital properties of complex adaptive systems that can be highly interconnected and unpredictable while having integrated subsystems that convene redundancy to allow for a more resilient environment (McPhearson, T. et al., 2016).

Cities and urban areas are critical to ensure global sustainability. One can witness that much of the sustainability progress is happening in cities, especially in terms of energy efficiency (Slavin, M., 2011), climate change adaptation (Rosenzweig, C., 2010), and socioeconomic advancement. (Bettencourt, L., 2007). Although research and progressed applications' development in various areas of the city, including the environmental monitoring, water management, surveillance, lighting management smart services, and crowd-sensing, there is a clear gap in the application of urban design concepts in the creation of a resilient urban and biological environment. Dealing with complexity in urban environments is challenging as it integrates people, landscapes, and climate; and will dictate that urban design collaborates with and incorporates methods, tools, and approaches from complex adaptive systems (Meerow, M. et al., 2019). It is only through such collaboration and incorporation that a resilient urban design may emerge to offer a better quality of life for the city's inhabitants.

2. Coastal cities and the Ecosystem

Coastal cities became aware of their sensitive situations according to the different researches that have been done since the 1980s. Accordingly, coastal cities have developed and implemented sustainability plans to undertake the long term adjustments required for their survival. Meanwhile, they have not explicitly addressed urban resilience, which often conflates with sustainability; or both are used interchangeably (Redman, C., 2014). Resiliency means to look back and forth to create a resilient environment. Resilient social-ecological systems incorporate diverse mechanisms for living with and learning from changes and unexpected shocks. Lack of resilience to social, ecological, and economic disturbances can shift urban system trajectories away from sustainability.

Recently, however, cities are beginning to develop specific plans for resilience targets, and show improving resilience (Carpenter et al., 2001), especially in sensitive areas of urban systems experiencing climate change, urbanization, and development pressures (Solecki et al., 2011). Coastal cities, in particular, are increasingly concerned with resiliency, especially for reducing disaster risks and vulnerabilities to climate change (Pickett et al., 2004; Elmqvist et al., 2014). Disaster management requires multilevel governance systems that can enhance the capacity to cope with shocks, uncertainty, and surprises by collecting various bases of resilience. (Adger, W. N. et al. 2005). Many urban planners and designers are increasingly considering how new development plans and projects can contribute to and foster resilience to climate change and its effects (Rosenzweig et al., 2010). In coastal cities, for example, mitigating and planning for disasters and repercussions of sea-level rise including coastal flooding and storm surge, is a growing mandate (Hammer et al., 2011). Resilient supply of non-disaster related ecosystem services (ES) provided within urban areas has received little attention. Though some cities are beginning to consider how ecosystems in cities can help mitigate climate change effects or create spaces that increase existing adaptive capacity for post-effect recovery, in most global cities services provided by urban ecosystems remain poorly connected to urban planning, design, and management for resilience (Scarlett and Boyd, 2013). Similarly, the United Nations Human Settlements Program, UN-Habitat, notes that "global agendas having resilience as a key concept will ensure that the call for sustainable and resilient cities leaves no one behind" (UN-Habitat 2018).

The following diagram presents modeling for the factors affecting coastal cities. The graph shows that clear influential elements are natural factors and anthropogenic factors. Natural factors are related to the effects of time, including recurrent, cyclic laps, and duration and impacts of place, including geography and geology. The diagram also shows the effect of the anthropogenic factors that include human's planned and unplanned activities in the city.

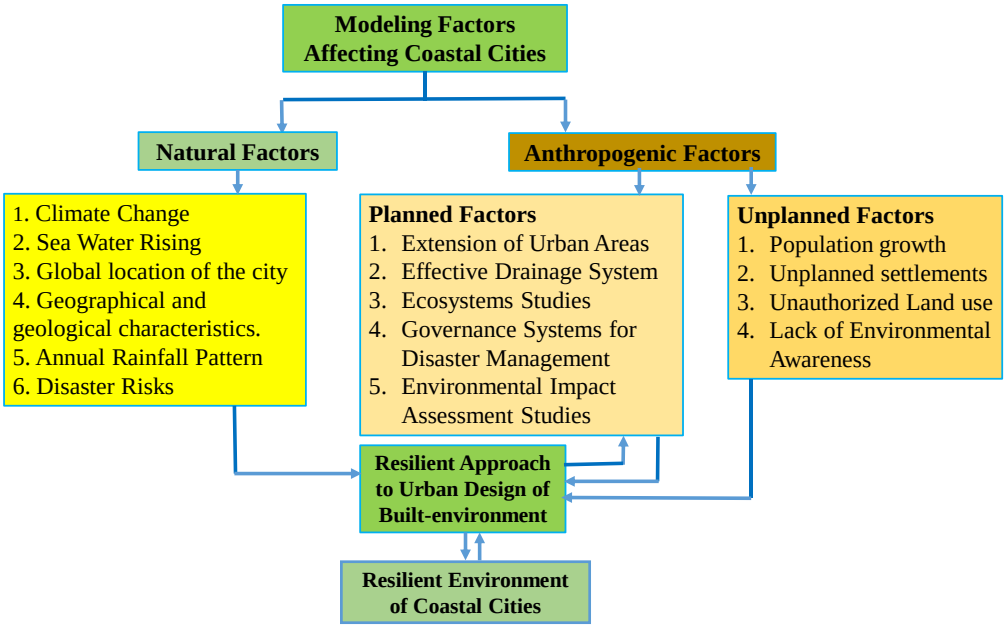

Fig. 1: Modeling Factors Affecting Coastal Cities

This paper argues that cities will need to plan and manage the urban resilience approach that offers to understand the required ecosystems for a continuing supply of services in the dynamic urban environment affected by global environmental change and human activities. Therefore, the proposed resilient approach is associated in two ways: First, resilience can be fostered by incorporating the urban planning, design, and management of urban social-ecological systems. Second, cities can safeguard resilient built-environment in the long-term to ensure urban inhabitants' well-being (McPhearson, T. et al., 2014). The paper is taking the city of Jeddah in Saudi Arabia as a case study for an example of a coastal city in an arid region that encounters challenges with climate change and needs a resilient approach to urban development.

3. Jeddah's Urban Challenges

Jeddah city in the west of Saudi Arabia accommodates about 4.1 million residents in an area of approximately 1765 km². The city has a hot and dry desert climate with high humidity, and temperature ranges between 28°C and 40°C. Jeddah receives an annual average rainfall of about 54 mm, usually during the winter season and occasionally in the spring (FSCP et al., 2018). Jeddah is the second-largest city after the capital Riyadh, it is known as the Bride of the Red Sea, and it is considered the economic and tourism capital of the country (Jeddah Municipality, 2019). Historically, Jeddah was a fishermen village that goes back to around 3000 years when groups of fishermen used to settle in it after their fishing trips. In 647 AD, Jeddah transformed into a port to welcome Pilgrims-*Hajji*- coming by sea for the pilgrimage in Makkah. To this day, Jeddah is the main gate to the two holly Islamic cities and the route for both sea and air pilgrims in addition to those traveling by road.

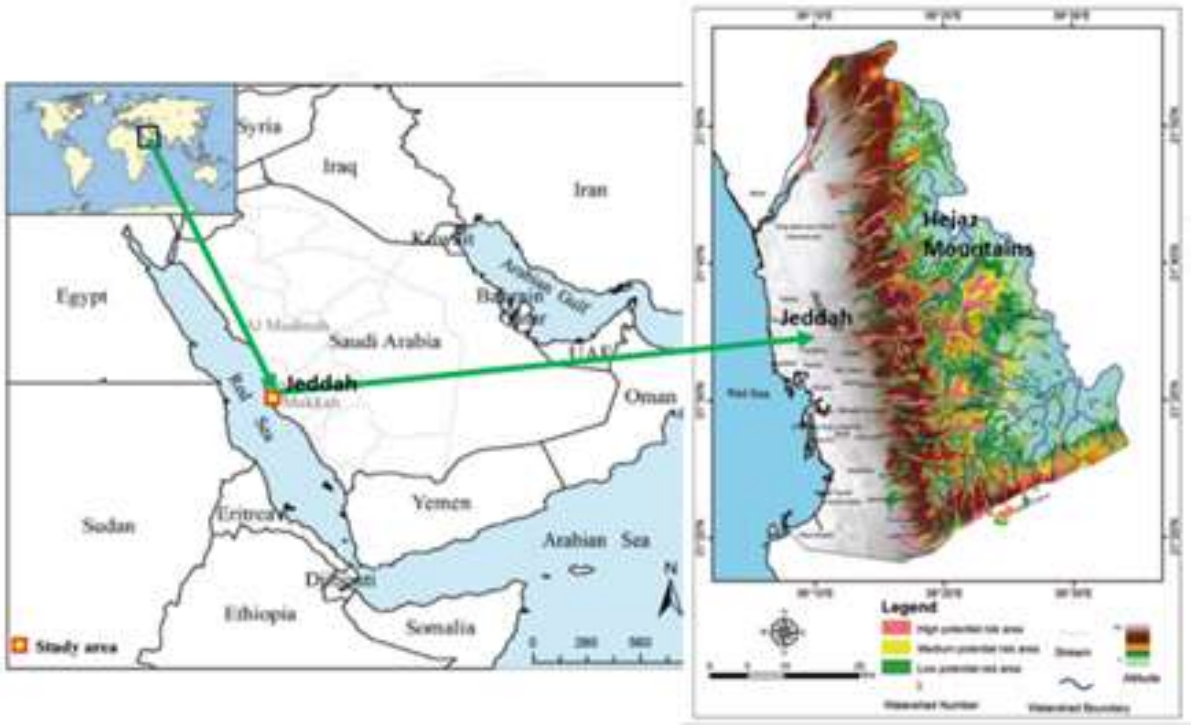

Fig. 2: Jeddah City: Geographic Location and Natural flood and torrent risk map (Source: Al Saud, M. 2010)

Jeddah has grown during the last two decades of the 20th Century, during the 1980s oil boom, which made the city a center for money and business in the Kingdom of Saudi Arabia and has included an important and essential port for exporting and importing goods for the country. Meanwhile, the subsequent influx of rural and foreign migrants to Jeddah started to put pressure on the housing market in the city, which mandated a new planning approach to be considered for the future development of the city (FSCP et al., 2018). The planning approaches for the development of different phases of Jeddah's expansion needs were not successfully met. (El-Shafie, M. 2010). Thus, this situation triggered a much faster growth of the informal settlements without any planning control over them (El-Shorbagy, A. & El-Shafie, M. 2014). By 2005 many of the unplanned sprawls happened at the east of the city at the areas located immediately after the narrow parts of the valleys -*wadi*, which put many properties at risk (Al Saud, M. 2010).

Jeddah city faced three critical challenges the population growth, climate change, and the expansion of unplanned informal settlements. These aspects caused increasing pressure on the current drainage systems, an increasing level of pollution in drinking water and stormwater, and the climatic effects on the level of precipitation each year that might cause unexpected flooding every several years. The main problem of the drainage system is the lack of adequate rainwater drainage systems in Jeddah city (Daoudi, M., & Niang, A. (2019). The comprehensive water drainage system in streets and tunnels, which prevents flooding of storm and rainwater from happening, is needed in Jeddah, as only 25 from 113 districts have an adequate sewage system that acts as a rainwater drainage system as well. On the other hand, 37 districts were partly covered by the network of sewage and 22 other districts did not have any drainage services (Jeddah Municipality, 2019).

Fig. 3: Jeddah City Catastrophic Floods in 2009 and 2001 (Adopted from: Daoudi 2019)

Poor urban planning is another aspect that increases drainage and floods issues. The lack and absence of drainage system are causing a lot of streets and tunnels to be shut down when the city faces a rainfall. Moreover, the high sidewalk, due to poor planning and urban designing, keeps the rainwater subsequently in the traffic way, which causes more floods to happen. The Mayor's office of Jeddah city responded to the widespread damage from the floods of 2009 and 2011 by creating a high-level "Special Initiative" for risk management to maintain the city's safety and security. This initiative included rescue stations at critical locations in the city, review and maintain the structure of all bridges and flyovers, and support the under-bridges with underwater pumps.

Jeddah's Municipality confirmed that total expenditure on these projects during the last 39 years amounted to 1.6 billion Saudi Arabia Riyals to cover the implementation of 30 projects (Al Manea, S. 2010). However, the proposed projects were modified and changed several times, which proves the lack of careful study and analysis at the time these projects were prepared for the implementation phase and the inadequate administrative capacity at that time. In 2016, the Ministry of Finance announced that an additional 2.2 billion Saudi Arabia Riyals were prepared for the Jeddah Stormwater drainage program, which is still in process. This significance project might decrease the entire drainage problem and prevent flooding. Another project that will have a positive impact is the sewage network and household lines projects; however, until 2019, a significant part of the city still lacking such a facility.

4. Responsive Urban Environment

Jeddah Municipality and Jeddah Local Urban Observatory (JLUO) have been working under Ministry of Municipal and Rural Affairs (MOMRA), the Future Saudi Cities Program (FSCP), and the UN-Habitat on developing urban statistics and spatial information using Geographic Information System (GIS) to provide relevant urban information that strongly support decision-

making processes on urban development and urban planning in the city. UN-Habitat introduced the Cities Prosperity Index (CPI) as a monitoring framework that aims to measure the level of inhabitant's satisfaction in their city. The system also tracks how cities progress on the path to becoming prosperous. The CPI consists of a composite index with six carefully selected dimensions that capture all-important elements of a prosperous city. This index is supported with a conceptual matrix, The Wheel of Urban Prosperity, and a Global Scale of City Prosperity are intended to help the city's stakeholders, including authorities, decision-makers, and citizens to use existing evidence to understand and formulate clear policies and interventions for their cities (SFCP, et al. 2018). At the UN-Habitat III conference in October 2016, congregates proposed the CPI to be used to complement the monitoring framework for Sustainable Development Goal 11: "Make cities and human settlements inclusive, safe, resilient and sustainable" and other SDGs with urban-based targets (UN-Habitat, 2018).

4.1. *Overall City Prosperity Index for Jeddah*

Jeddah city has an overall prosperity index score of 51.3%; thus, it falls in the moderately weak prosperity factors range (50-60) according to the Scale of Urban Prosperity (SUP). According to the SUP, prosperous cities should have the right balance of all the indicators of prosperity to satisfy the needs of its inhabitants. Cities with a combination of too low and too high rates of the SUP prosperity indicators are undesirable. Jeddah has observed weaknesses linked mainly to the weak dimensions, such as environmental sustainability with 29% that is significantly influenced by the 0% use of renewable energy, urban governance with 42%, and equity and social inclusion with 59%. However, the city has some 'moderately strong' dimensions, such as 'productivity' with 63%, 'infrastructure development' with 60%, and 'quality of life' with 68%. The fig. 3 shows the imbalance between these dimensions expressed by the blue line in the radar chart (SFCP et al. 2018). For the focus of this paper, only the dimensions of the CPI indicator "Quality of Life" will be further investigated.

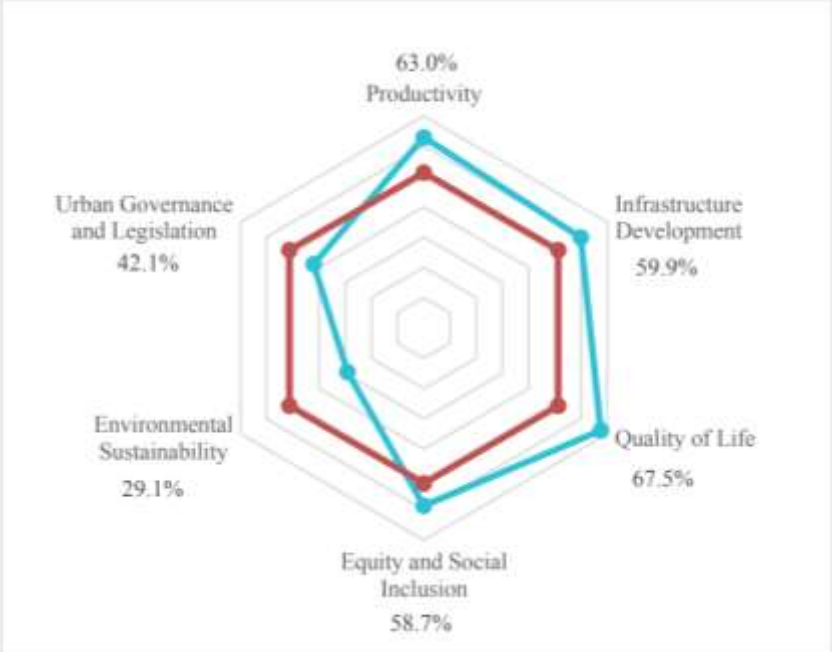

Fig. 4: Modeling CPI Rates for Jeddah City (After: SFCP 2018)

4.2. *The Quality of Life Dimension*

Quality of life is the overall well-being of individuals inhabiting the city. For the CPI, this dimension is the embodiment of life satisfaction encompassing the physical health of family members, education, employment, economic level, safety and security, religious beliefs, finance, and the environment. The quality of life dimension measures the city's achievements in providing essential ingredients that motivate a high quality of living that enables people to maximize their potentials and enjoy their habitat. For Jeddah city, the scoring index of 68% indicates that the city has a moderately good quality of life. According to the analysis of the city, the good quality of life in the city is associated with a sound healthcare system (77%), moderately good education sector (60%) and very good safety and security (96%). The health sector is strong as a result of the high life expectancy rate (74%). The education dimension is rated as moderately strong mainly because it combines one set of very strong indicators (literacy rate 82%, and mean years of schooling 88%) and another set of weak indicators (Early childhood education 17% and Net Enrolment in higher education 55%). Safety and security are rated very strong because all its indicators are up above 90%. However, these are diminished down by lack of adequate public spaces in the city particularly in relation to the low green area per capita (37%) (SFCP, et al. 2018).

Table 1. Analysis Quality of Life Dimension of Jeddah City (Source: SFCP 2018)

Sub-Dimension	Indicator	Actual	Units	Standardized	Comments
Health (76.9%)	Life Expectancy at Birth	74.50	Years	74.0 %	Strong
	Eradicate Maternal Mortality	10.30	#/ 100,000 live births	66.7 %	M. Strong
	Eradicate Under-5 Mortality	8.62	%	69.1%	M. Strong
	Vaccination Coverage	97.70	%	97.7%	V. Strong
Education (60.4%)	Early Childhood Education	17.30	%	17.3%	M. Strong
	Net Enrolment in Higher Education	54.91	%	54.9%	V. Strong
	Literacy Rate	84.18	%	81.5%	V. Strong
	Mean Years of Schooling	15.70	%	87.9%	V. Strong
Safety and Security (95.5%)	Homicide Rate	1.94	#/100,000 inhabitant	91.1%	V. Strong
	Theft Rate	13.12	#/100,000 inhabitant	100.0	V. Strong
Public Space (37.3%)	Green Area per Capita	5.60	M2/ inhabitant	37.3	V. Weak
	Accessibility to Open Public Space	-	%	-	-

The Jeddah CPI Profile Report shows the application of the CPI framework and dimensions. The report provides a summary of the basic information and urban statistics about Jeddah and gives an overview of the city's achievements, opportunities and potential areas that contribute to its prosperity. According to the SFCP report, Jeddah has a young population: about 41% of its population is below 24 years, half the population is below the age of 30 years, and only about 3% of the population is 65 years and above. The ratio of male to female is about 1: 1.27. The population of Jeddah comprises of about 60% Saudis nationals and about 40% non-Saudi.

5. District Parks in Jeddah as a Resilient Environment

The analysis of the CPI dimension of Quality of Life shows two important factors, the positive factor of the demographic structure within the population of the city (76.9%) and the negative factor of the low green area per capita (37%). These two factors can support a resilient approach to land use in the city and encourage a new perspective on the development of district parks in significantly selected locations across the city. This approach will serve the city in two-fold, on the one hand, it will satisfy the need of providing green areas that are appropriate to the activities and well-being of the young population, and on the other hand, it will work as a tool to reduce the catastrophic flooding effects on the city. Using the district parks as green open spaces in addition to their role as runoff /rainwater reservoirs might be a major sustainable approach if it is well implemented in the urban development plans. Therefore, the paper aims to portray the impact levels on the city and city inhabitants while exploring the required components that develop smart parks' systems and their applications to withstand the flooding phenomenon. The main objective is to suggest design guidelines for city parks that accommodate water retention systems to create district parks that are able to serve people in a flooding time in a responsive manner in a resilient environment.

The Saudi vision 2030 has the theme of "Vibrant Society" as one of its three main pillars. Accordingly, Jeddah has the potential to be an attractive node in the Middle East region for both businesses and living by adopting the notion of "Vibrant City" to target its future urban development plans pertaining to green open spaces. When urban development is efficiently planned, it could deliver an approach that encompasses a number of important urban functions and qualities that would ensure a resilient environment. This approach presents pioneering "green" solutions to the city, including urban design elements, such as green roofs, terraces, ponds, and infiltration areas. The highly integrated urban nature in buildings and other structures in the city creates a range of prospects for recreation, in addition to urban farming that could contribute to enhanced food security and socio-economic interrelation. (Bogis, A., et al. 2018).

The problematic issue of how to find a suitable space to establish a district park in a crowded city is universal. City mayors and councils, as well as regular citizens, always wish to get parkland free of charge through donation, land exchange, no-cost lease, or some other easy solution. Those methods proved to be successful sometimes. Nevertheless, there are more cases where a compromise deal ended up getting the parks in unsuitable locations, or with poor drainage capacity, having bad soils, or with accessibility problems. Therefore, the most successful way to deal with a shortage of land in a crowded city is to spend money and buy the right land. Historically, the land was purchased for some famous parks such as Central Park in New York, Druid Hill Park in Baltimore, Piedmont Park in Atlanta, and many others (Harnik, P. 2010).

In Jeddah, land use is very much influenced by land ownership, especially in the inner areas of the city. This might hinder the right choice of locations for district park projects. Accordingly, it might be a political challenge to allocate governmental money for parkland, but it is not impossible if the local citizens will be convinced. A call for the notion of Vibrant City involves making a convincing case to the public including explaining benefits for children, showing a vision for the future city, and encouraging pride of Jeddah. It requires public leadership and the enthusiastic

support of park advocates to stand for the reactions of the opponents and the good use of governmental funds.

The landscape development of about 15 KM along the coastline of Jeddah Cornish came as a compensation for the city's citizens after the catastrophic event of the 2009 and 2011 floods. The new Cornish project cost over SAR 20 Million (Jeddah Municipality 2019). The well-designed landscape offered the citizen a nice outdoor on the seaside, which they were enjoying for a long time as a natural landscape. Therefore, the new development did not add to the ratio of green open spaces per capita. In addition, the green lawns needed continues maintenance, which became a big trouble for the municipality to deal with. Furthermore, the limited coastline due to existing streets and buildings did not offer the resilient environment that is required in the inner city districts to withstand climate change.

Fig. 5: Landscape of Jeddah Cornish Jeddah

Fig. 6: Proposed Locations for District Parks in

(Source: Jeddah Muncipality Website)

This paper proposes the establishment of five district parks in the location affected the most during the flooding. Fig. 6 shows the location of the four parks along the middle north/south axis of the city. The fifth park, for example, could be located at the end of King Abdullah Road east of Al-Harameen Road. The main idea is to allow the rain and stormwater to run to an open space ready to exploit part of it by catchments and reservoirs and save the neighboring area from an excessive impact on the drainage system. Fig. 7 presents the four pillars of park design that should be taken into consideration while designing. The four-fold design guideline considers Safety, Walkability, Aesthetic, and Sustainability as main parameters for a successful landscape design for an urban park. This proposal is just an idea that needs further investigation and elaboration on its required resources for implementation, technical possibilities, and long term sustainability outcomes. This proposal could help the city to create a resilient environment that is capable of meeting the future challenges of climate change.

Fig. 7: District Park Design Guidelines

6. Conclusion

Jeddah has an opportunity to transform technological and governance solutions to the problematic challenge of developing urban resilience. Major projects of drainage systems and landscape of open spaces show that Jeddah can embrace climate change policy and integration of the concept of sustainability into land-use planning. It can also play a valuable role internationally to raise greater awareness of climate change in coastal cities in arid regions and their need for adaptive strategies for resilient future risk management. The study on urban resilient assessment in Jeddah contributes to a better understanding of how urban development is required in the city core the same as it is needed in the extensions within its region. Furthermore, the study of Jeddah shows that the city centers and inner areas provide a range of environmental issues that should be prioritized and emphasized within urban planning and governance. The focus of future research should be on identifying and assessing the associations between diverse urban development projects in order to achieve a holistic approach to the city's developmental strategies. The paper revealed that the adaptation process to climate change had faced challenges of dealing with inadequate administrative capacity resulted in catastrophic events. Recently in Jeddah, the municipality has started to expand the authorities to deal with flood and drainage problems. Planning around Lake Alarbaeen is a good example of the governmental initiative of climate change adaptation addressing a range of risks including the rise of sea level, risk of flooding, effects of extreme weather events, dust and sand storms, climate change-driven diseases, effects of climate change on energy use and water availability. The contribution of urban resilience to planning for choking events is not much discussed in Jeddah. Finally, the growing need for data and information on the flooding paths for urban development use requires intensive studies to respond. Such studies will necessitate an interdisciplinary methodology and combination of qualitative and quantitative information on ecological, social, and economic factors, taking into consideration the anticipated growth in urbanization in Jeddah.

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"The Resilience of Alexandria waterfront transformation and development."

"Waterfront physical-functional dimension"

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Abstract:
Alexandria is the second largest city in Egypt. It is a seashore city on the Mediterranean and its main port. Generally water is a very attractive element for all different cultures, ages and classes of people. The Waterfront has the ability to give a good public space for different users to practice various social activities. In the past years Alex waterfront has witnessed several changes that affected the usage of citizens and their way they connect to the city.

This research aims to investigate whether the formation and transformation of waterfront throughout the years and based upon the usage of its public spaces resilient enough to embrace all the expected activities for all users or not.

The research will focus on the physical -functional approach for Alex waterfront. It will study the interaction between the cornice urban space and its physical attributes. The first quality targets the waterfront physical elements like the form, legibility, etc. The second quality focuses on the functional dimension like vitality and comfort.

It is an ongoing research that will document the changes over almost the past ten years of one space point along the cornice to measure the resilience of the urban spatial -physical functional existence and its impact of the public space usage. A Framework with all subject elements will be the tool to measure these changes .The study will be surveyed by direct field observations and photography to reveal the types of users, their activity patterns, in relation with the design features. The results will be put in a table in order to come out with a conclusion and recommendation to this research.

The main issue will be documented through this research is whether the city resilient enough to maintain its positive impact on users life and cope with the changes throughout the years or not.

Keywords: Resilience-waterfront –public space –- transformation –functional-spatial dimension.

1. Introduction

There is a lot of magical effect caused by Water. The waterfront has a great function as both psychological and a physical it is a reflecting surface in day caused of sun and in night caused in lights of city. The waterfront makes its context special that should be used in the city life integration and responding to its people wishes. (Ragheb, 2014) Due to the waterfront vitality and its mission to improve and develop the city, the redevelopment the waterfront has many trials which appeared in the 1960 s in USA to transform the city from industrial to service. In the 1970 s, the first development action for water took place to transform the unused lands of the harbors and ports to residential, social, recreational, and economical hub. This movement approach and this waterfront redevelopment went all over the world for different interests and the waterfront was looked at as a challenge and motive urban cities .Sustainable city term appeared and contained the waterfront

lands redevelopment as one of its elements which showed in many international urban design and planning projects. On the other hand rare projects are to find in the Middle East in spite of the existence of a lot of water sources that can have the potential to be a development catalyst for these cities. That's the reason why it is important to focus more on to the waterfront development and redevelopment strategies and to achieve a comprehensive integrated vision for cities with sustainable development. (Omar, Saeed , 2019)

The research main aim is to examine the factors that affect the contextual integration resilience between water, waterfront development and redevelopment that contain changing factors that occur and to set a recommendation proposal that can be achieved by studied standards to improve the vision for waterfront development resilience. This goal will be achieved through secondary aims; identifying the waterfront physical and functional dimension. Determining waterfront urban and spatial characteristics and evaluating urban waterfront design and planning.

2. Structure

The research has a three work plan phases. The first Phase is the literature and theoretical data. The second Phase is the analysis of international examples and case studies. The third Phase is the analysis of data, its results, conclusion and recommendations. This methodological

1. Descriptive Approach: it will be used for describing the theoretical part and the literature review that review the study aim and problem.

2. Data Collection: collecting the framework elements reviewed in the literature review and international examples analysis and case studies based upon these points. Field observation, photography were key elements in the examination of the case studies.

3. Analytical Approach: SWOT analysis that analyses data from all frameworks.

4. Recommendation phase: concluding and recommending new strategies for better resilient waterfront usage.

3. Resilience term & City Resilience

Resilience general definition is a body ability to recover its shape and size after a caused deformation .Generally, to adjust and easily recover from any changes occurred. . *(resilience.* 2019, December 13) Resilience is how good one can adapt to any changeable event in life and recover from any facing problem .Resilience exists in everyone it just differs on how well and quickly you recover and balance. It is the way you deal with dramatic change and you still feel its intensity. (Harold Cohen, 2018) Resilience is like any other skill that can be learned at any stage of life, it just needs a great will to do so. Resilience can be increased by having supportive and positive relationships.

Urban resilience has been identified as the "measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming towards sustainability". That's the reason why, a resilient city is a city that plans, assesses and prepares for and respond to hazards, both human-made and natural ones, expected and unexpected, happened on a sudden or slowly. Urban resilience focuses mainly on three threatening; natural disasters, climate change, and terrorism. *What is Resilience?* (2018, October 8)

Another notion of resilience theory is that cities are seen as a high complexity of adaptive systems. This requires a better understanding of the types of practices and tools that contribute to

building urban resilience. This approach is different than typical other approaches, it is based on network science that allow minimal interference in the function process of cities. The network science allows a way to link the city size with the form of networks which make cities work differently. It can give ways to the effectiveness of different urban policies.

The whole system of cities resilience depends on investing on decisions that make priority activities that have alternatives. Those decisions should take into consideration non-sureness and future risks. Disaster planning and emergency program are important, because risk can never be fully eliminated. Resilience can be improved by frameworks for Disaster risk management. The main resilience challenges of our time is natural hazards and climate change, poverty, social inclusion, an environmental sustainability, can be found or not found in in cities. The growth of people and climate change, make resilience term important because it makes communities face and cope with stresses. Also take the chances and allow development Transformation. Urban resilience holistic articulation index showed twelve universal drivers that deal with city resilience. The drivers are categorized in four main levels of the urban resilience framework: Health and well-being, Leadership and strategy, Infrastructure and environment, Flood flow in urban environment, economy and society, Adapting for flood resilience, urban greening, and Flood-water control. (Urban resilience,2019).

4. Urban waterfront and open space

This research investigates waterfront within the following points .The first one is about the waterfront locational and spatial character. The second one is concerned with the physical and functional waterfront character. Public space definition will help understanding waterfront physical and social aspects.

The waterfront spatial activities are influenced by the water presence and character. And the human activities also affect the nature of that waterfront open space by the urban space creation. The physical aspect of well-designed spaces as in Fig (1) is concerned with the elements of urban design which supports the sustainability and the performance of urban efficiency.

It is the interference of physical space, social architecture, identity and activity of people. To reach high levels as sociable, legible, identity and social, the physical aspect is very important base. It contains the following points clear in Fig (2): comfort and image, access and linkage, uses and activities, and sociability.

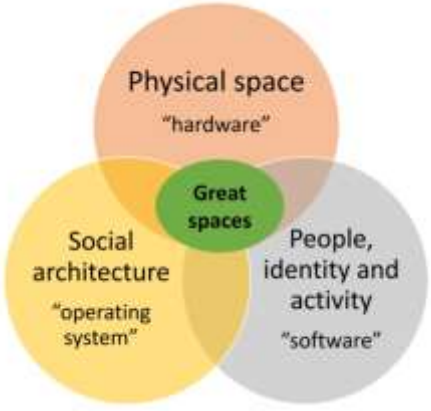

Fig. 1 place making diagram

Fig. 2 elements of successful place

4.1. Open space

Public spaces are publicly open and accessible places for people who go individually or in group. Some of the places are public others are private but opened for the public. Four elements are important in defining public space or any space within the built environment: access, control, use and ownership. Public spaces are recognized to be there for the society majority. There are also two types of public space: the formal ‘and informal. (Ansari, 2009).

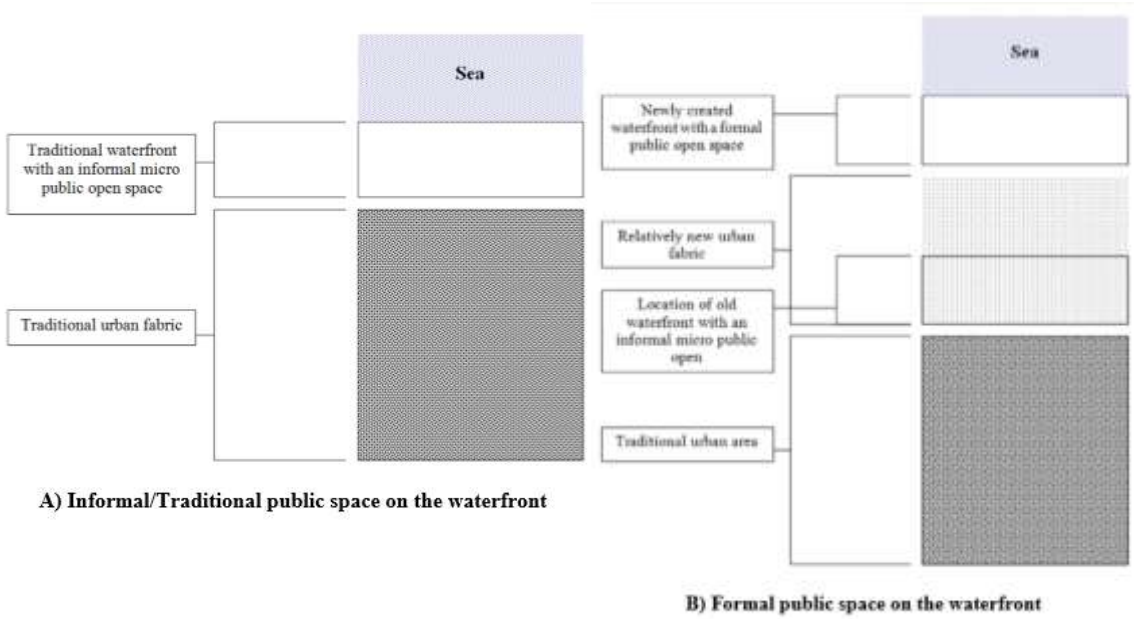

Fig.3 Different Configurations of Open Space on the Waterfronts

4.2. Waterfront

Waterfront spaces are held to be one of the challenging and important urban spaces that give a great chance to city development .The concept of the waterfront is about waterfront transformation that has three various phases which are waterfront establishment, the decline of waterfront and the waterfront redevelopment which show in Fig (4). Important points are categorized based upon, the physical, functional and the user experience. It is vital to integrate the previous three aspects in order to achieve good response of the waterfront towards water.(Abdul Latip,2011).

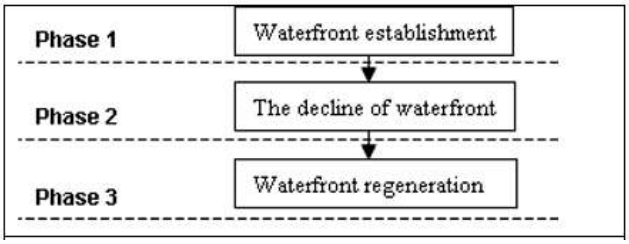

Fig.4 : the phases of water transformation

The following elements in Table 1 were idenified in the first phase, the waterfront establishment as the response of waterfronts towards the water which are the water physical character, accessibility, waterfront function, building form and activities.

Table 1: Attributes behind the response concept of waterfront taken from phase one.

	Phase One
1	Physical character of water
2	Accessibility
3	Function of waterfront
4	Activities
5	Building form

As for the waterfront responses of phase two , the decline of waterfront , the following elements are shown in Table 2. Waterfront responses towards the water contain several elements from the context. They can be classified into both physical and functional aspects and related user responses.

Table 2: Attributes behind the response of physical and functional related to users.

	Phase two
6	**Function of water**
7	**Visual access**
8	**Comfort**
9	**Perception of people towards use of place**
10	**Awareness of the place**
11	**Association with the water**

There are also three main aspects in Table 3 : physical, functional and the related user response of the area. In order to achieve good result of the waterfront towards water ,the connection between the previous mentioned three elements must be taken into consideration.

Table 3 : relationship between concept ,esponse,human relayion and dimension of urban design

Related attributes of the response of waterfronts	Related Principles	Dimensions	Result of the response of waterfronts in relation to human experience	Related Principle
Topography/	Good Form	Physical	Perception on use of the place	
Physical character of water				
Building Form				
Direct access	Legibility		Awareness of the water	Meaning
Visual Access				
Comfort	Comfort	Functional		
Activity	Vitality		Association with water	
Function of waterfront				
Function of water				
Building use				

5. The physical dimension

The water physical character is categorized in the following , accessibility, activities building form, and function of the waterfront

5.1. Good form

Good form is a vital element in the integrative theory of urban design. In the past building without consideration of the surrounding area was dominant. Then this main question revealed if the one should satisfied with the place or not and if public places should be isolated or integrated.

5.1.1. The physical character of the water

The water physical character is a vital element in the waterfront response matter towards the urban water. Users recognize what kind of water (canal, sea, river or lake) by its natural appearance of the edge treatment. Many studies have shown that the best conditions its natural one. (Abdul Latip, 2011)

5.1.2. Development oriented towards the water

It is important to have buildings, make development, or even recreational areas and parks at the waterfront, as component of the whole water area and to be water oriented. The reason lay in its benefits that the waterfront works like a development catalyst. It is vital to strengthen the waterfront area and attract people to it; also the building should be oriented towards a water view vision to make clear awareness to the people. (Scoffham , 1993).

5.2. Legibility

5.2.1. Continuity of water pedestrian linkage

A continuity of paths allow an experience of 'the sequence of space and form' for the user and also allow them to understand the order more clear , while being able to have a natural expressive

and functional image of the space. They also explained the 'imaginable' term related to the city that should be made for the observer to have a mental image of the surrounding area. (Lynch and Hack, 1984) Also it enhances safety aspects and the quality of life of the area. Furthermore, many revitalization efforts enhance living quality when accessibility to the water is allowed using promenades along the water. (Hoyle, 2001).

The urban waterfront character is the main attribute. There are four basic factors that lie under the main headline of urban and spatial characteristics: urban form, identity, physical barriers, architectural heritage and land-use. The following keywords will be explained: urban form, urban complexity, and urban continuity.

5.2.2. Waterfront accessibility (public access)

There are two issues concerning the waterfront and public spaces .the first is the public space availability on the waterfront and the second is public accessibility in general. The better the accessibility is, the more successful the design and implantation of the general planning. General, visual, physical, and symbolic points are the three main accessibility levels. (Carr et al. 1992) Concerning the waterfront spatial accessibility it also has three sub-levels: City-waterfront connectivity, Inter-waterfront zone continuity and, Waterfront-water connectivity as in Fig (5).

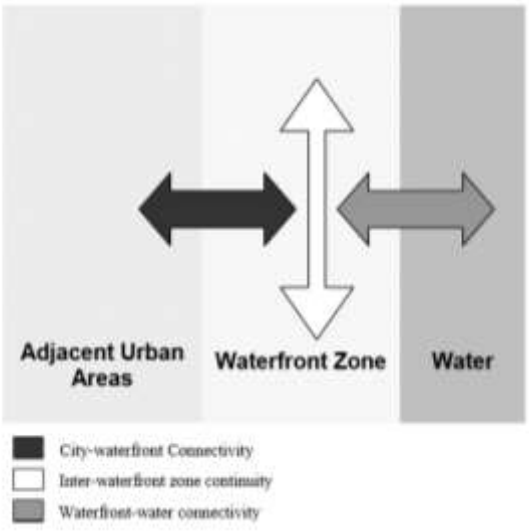

Fig.5 waterfront accessibility

The Accessibility, to have the right to be physically in the place, is a main factor to decide whether the space is private or public (Mitchell 1995a). Public space should be accessible to everyone.

Integration with Water is the waterfront zone integration with the water and the city integration with the waterfront zone with regard to the continuity of the urban form or the waterfront accessibility. Concerning city-waterfront connection, it is not easy to achieve physical integration between both zones; especially the point of street pattern continuity and the building scales maintenance. The empty waterfront can have the chance to have projects with large scale that can't be built in old city parts. Increasing the waterfront depth zone is a tool to improve the city-waterfront integration. (Krieger ,2001)..He suggests that the waterfront line is never a thin line that separates water from land. this line is the connection that should be made of public spaces system that widen the inland

and connects the city openly with the water‘s edge. Connections can be functionally done by the variable types of activities that shape the public waterfront. Also it could be made through individual buildings public spaces that lead to the water in a form of public spaces network. (Fisher 2004: 56) As visual aspect, buildings should a gradual declining height line in the water direction, to permit other buildings to have a visual access with water. (Mak et al. 2005; Sayan & Ortacesme 2002)

5.2.3. Visual accessibility

Visual accessibility is connecgted with the ‘direct access’ dimension toachieve legibility . Legibility term in the context of the development of waterfront with the water can be associated with users clear vision of water edge accessibility . the visual accessibility between the waterfront and the urban sea is assessed by the quality of view, it is most integrated where there is sea direct view. It is less integrated when there is a view with obstacles like hedges ,railings and others. It is the lowest when there is a total block to waterfront by stable structures. It is determined accordig to the length of waterfront in relation with the visual accessibility in comparison to the whole length of the sea (corniche) in each zone. (Ansari,2009).

6. The function dimension

6.1.Comfort

Comfort was considered the most basic of needs as there are five main purposes why people go to public places :‘comfort, environment passive engagement ,the relaxation, environment active engagement ,the and discovery’.(Carr et al.,1992) There are elements that play a role in comfort in public spaces like seating which plays a big role on how people interact with the space. Also shade that is which is considered a shelter from or way to the sun. add to that lighting element which is esential to give an integrated context between the waterfront and the water .it is another attribute concerning comfort that is identified as being important in promoting contextual integration is lighting

6.2.Vitality

It is vital to see the functional aspects related to the uses and activity at the waterfront area , to understand the contextual integration more .There two main elements that define the vitality as function dimension ,the first is the continuous activities at the buildings along the waterfront and the second is the activities variety that permit the user to stay for long at the water area.

6.2.1. Along the waterfront continuous activities

In order to create an open space enclosure it is vital to have a front continious wall of that public space . It also gives activity setting to the place by which peple can interact with both the waterand the waterfront. The the continuous wall and the frontage’s character are the most vital elements in deceiding the public place’s failure or success.it is the activities differences in various scale, shape, and locations that brings meaning and pleasur to the place experience . (Trancik ,1986)

Waterfront continuous activities will balance the built environment and natural environment and encourage sustainability through an lively and attractive urban sea. It also provides positive integration between the water and the waterfront

6.2.2. Diversity of use

People get invited to the area with other people around, because they feel safe in their presence. They opinwhat really gives the sense of safety in a place is the activities existence much more than the place physical design importance .Two parameters can define waterfront ,the land use type and water dependency. in this context Land use refers to the type that the waterfront is mainly used for for ex.industry, resort areas, commercial, , working waterfronts or has a mixture of residential, commercial ,recreational, and transportation. the water dependency of the uses is an important difference between waterfronts which is categorized in Table (4) . (Wrenn et al ,1983)

Table 4 : three categories of waterfront dependency

Table 8 Three categories of waterfront dependency (Wrenn et al., 1983)		
Type	**Function**	**Example**
Water dependent	activity that depends on the water without which it cannot function	port, marine construction and repair, ferry and passenger service, marina and moorage and tug and barrage company
Water related	activities that have the advantage of being close to the water but can also function in other areas	lumber mills, seafood processing plants, resorts, park, restaurant and aquariums
Water independent	activities that can function equally in other areas of the city without the water	hotels, apartment buildings, warehouses, residential and retail

The diversity of use is important to avoid building use that pollute the water by integrating the waterfront development with the water.In Fig 6 the elements of both dimenions in the contextual integration between the waterfront and water bodies ,

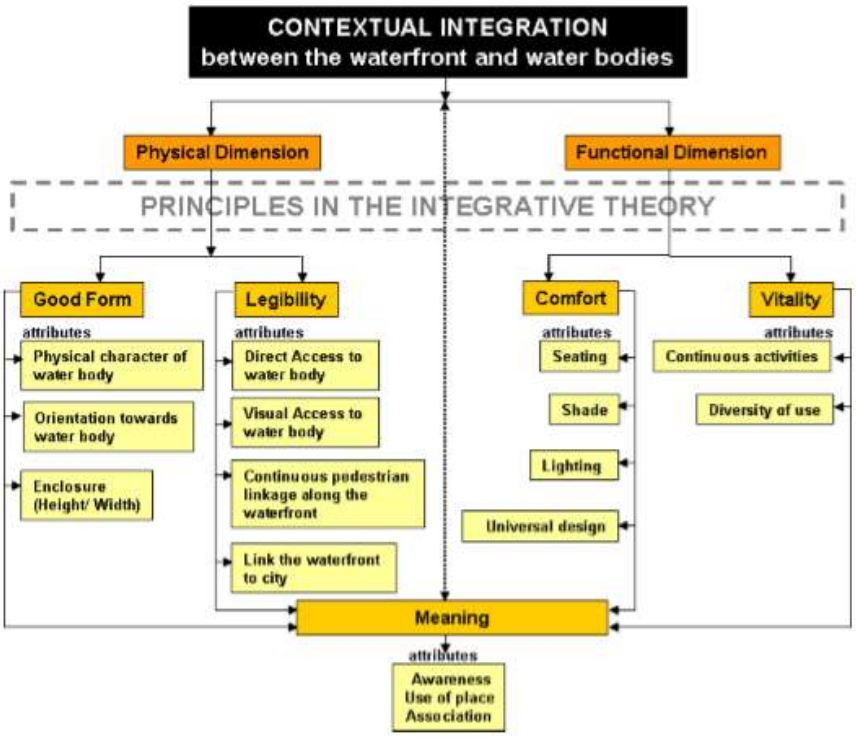

Fig . (6) : Theoretical framework example of an urban context

7. Urban and Spatial Characteristics

The urban waterfront character is the main attribute. There are four basic factors that lie under the main headline of urban and spatial characteristics: urban form, identity, physical barriers, architectural heritage and land-use. The following keywords will be explained: urban form, urban complexity, and urban continuity.

Urban Form is generally two levels of the waterfront urban form and the relation between that area and the city urban form, in the physical and the functional levels. There are three levels under the two major levels. The first is urban complexity; the second is urban continuity and the third is the water integration. The key element of these three categories is Public space. (Marshall 2001b: 8) *Urban Complexity* is the functional dimension of the urban design which relates 'better' places can be designed and developed.

Urban Continuity is the physical re composition of the waterfront, and the different activities done there. (Bruttomesso ,2001)

Urban Identity is related to the cultural and natural dimensions. It is established based upon the human practices interaction towards the city areas that include the waterfront areas. It is negative that by urban and population growth, the heritage and culture identity to be lost. The waterfront development is a great chance to preserve the identity of the city. The waterfront design and planning success is to control the city's aura and prosperity through all the changes.

Place Making Quality

a. Livable area

Livable area is very essential to the waterfront development project success. By having mixed uses areas, residential areas with range of housing types and unique character, facilities and services, recreation and entertainment activities. The various uses of waterfront should bring different people and visitors to the edges waterfront to make waterfront vital and livable .Add to that the movement on the water itself which creates a certain level of water vitality, it can be achieved by introducing terminals and costal ferry. (Nermeen A. Omar, 2019)

b. Image

The image of the city becomes important especially in waterfront cities. The waterfront urban character is a result of society thinking, historical development, etc.

8. International examples (waterfront cities)

8.1. Example one

Example one: Pier Public Space / Diseños y concepto
Reason of selection: This project has the same area shape as a long strip along shoreline.
Location: Barranquilla, Atlántico, Colombia.
Area: 174000.0 m²
Year: 2019

Background
The project designed with taking into consideration the urban, practical and the place identity. Moreover it aims to reestablish the relation between the city and the Magdalena River. (Ott, 2019)

Master Plan /Urban context

Pier Public Space revival the relationship with the river. It is an architectural and urban design project type which formed by three strips along four and a half kilometers of Magdalena River's shoreline as shown in Fig (7). (Ott, 2019)

Fig (7) layout source: (Ott, 2019)

Approaches

The strip along shoreline has five main approaches as a corridor between the industrial zones as shown in Fig (8)

Fig (8) Shoreline Approaches (Ott, 2019) (The researcher)

Zones main activities

The project consists of four main zones activities as in Fig (9) as port and ship services, entertainment, sports, and cultural zones.

Fig (9) Main zones activities (Ott, 2019)

Zoom in a selected zone in Fig (10) to show to projects detail in Fig (11)

Fig (10) selected zone (Ott, 2019) (The researcher) **Fig (11)** project zoom in detail (Ott, 2019)

Cross section

The project transit people from road to the main platform connect to river through six transition areas (main vehicular road- avenue- wheels road- pedestrian sidewalk- green zone path- lower platform) as in Fig (12)

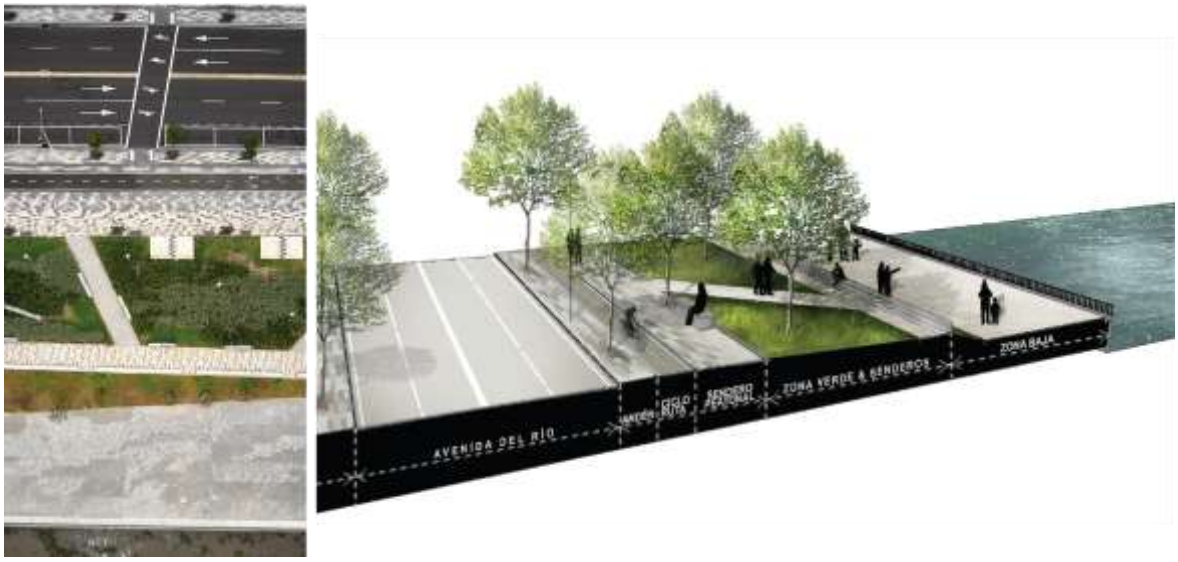

Fig (12) cross section (Ott, 2019)

The hierarchy between zones level allow visibility to all visitors as in Fig (13)

Fig (13) zones level hierarchy (Ott, 2019)

Conclusion

Pier Public Space turns the industrial area to a lively space with several activities.
The buffer zone between river shoreline and street made a visual block for the industrial buildings.
One of the positive points is the bike lane that was separated from pedestrian and vehicle paths.
The design with two platforms levels made all users can view the river.

8.2. Example two

Example two: Bay of Luanda Waterfront
Reason of selection: This project has the same urban context and sea shoreline shape to Alexandria
Location: Luanda, Angola, Africa.
Area: 510,000 m²
Year: 2010 - 2013
Background: The lunda bay has obtained the main characteristics of the urban and architectural features of Angola. Over time it has been the most important public space for social and economic activities. The bay has been connected to the city downtown and the major urban networks.(Bay of Luanda Waterfront, 2019)
Master Plan /Urban context
According to the rabidly transform of the city downtown, the bay seek to contain it is legitimized urban pattern. The seashore becomes a large urban park to maintain the vitality of the public life of Luanda as in Fig (14). (Bay of Luanda Waterfront, 2019)

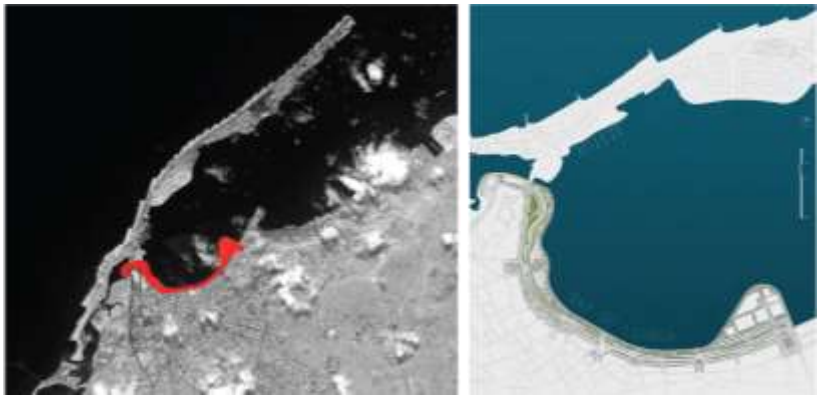

Fig (14) Luanda bay layout (Bay of Luanda Waterfront, 2019)

Approaches
The strip along shoreline has direct connection to Main Street as in Fig (15)

Fig (15) Luanda bay shoreline (Bay of Luanda Waterfront, 2019) (The researcher)

Zones main activities

The project contains a various zones a in Fig (16) for different activities which allows for social interaction and encourages cultural activity such as: meeting public area, rest benches area, sports area, cafes with sitting benches, bike path and walking area along the seashore.

Fig (16) various activities along the bay (Bay of Luanda Waterfront, 2019) (The researcher)

Gardens and Plazas

Gardens and trees spread all over Luanda bay as shown in Fig (17)

Fig (17) layout and perspective view for garden and plazas (Bay of Luanda Waterfront, 2019) (The researcher)

Cross section

The project has gardens with trees and bushes. Grasslands buffer between street and the bike and pedestrian paths. There is a direct connection between pedestrian path and the sea without any kind of barriers as shown in Fig (18)

Fig (18) cross section and perspectives showing the passage details (Bay of Luanda Waterfront, 2019)

Conclusion

The redevelopment to Luanda Waterfront bay with a new several activities area improves it is a role in the city. Designed according to visitors needs and taking in considering the variety of users (living level, age, etc.)The direct connect to the seashore line make great atmosphere of connectivity and view continuously Include a car park in several points. A long length cycle path with 3,200 m

9. Study cases

9.1. Agadir waterfront, Morocco

Reason of selection: it is a good example to show a waterfront with only pedestrian waterfront continuous path and public spaces
Location: Cornice ،Agadir 80000, Morocco.
Area: 416,120 m²
Background: the Agadir waterfront is designed to have parallel lines and continuous pedestrian passage which contain different activities.

Master Plan /Urban context

It lies in the southern Atlantic coast. It is famous with the hilltop Kasbah which its walls still remains. And the marina is below the hill as shown in Fig (19).

Fig (19) Master plan (Google, 2019) (The researcher)

Approaches
The project is accessible from five main entrances from the main street lead to a secondary street that parallel to the sea shoreline as shown in Fig (20)

Fig (20) Approaches (Google, 2019) (The researcher)

Zones main activities

The beach has some activities despite the swimming like a sitting area with shading related to the hotels and public beach zones and small cafes beside sport devices along beach path as in Fig (21)

Fig (21) Main zones activities (Google, 2019) (The researcher)

In Fig (22) showing the activities ,patterns and layers of agadir waterfront and in Fig (23) hills and waterfront view pictures

Fig (22) site pictures (The researcher)

Fig (23) Agadir waterfront and hill picture (Google, 2019)

Paths classification

The Agadir waterfront is designed in Fig (24) to have parallel paths lines , the first is the sea line ,then the public sea shore (sand line) , then the hotel square spaces on sea shore line (sand line), the pedestrian path patterned line , then the hotels line ,finally the street line and the city behind .

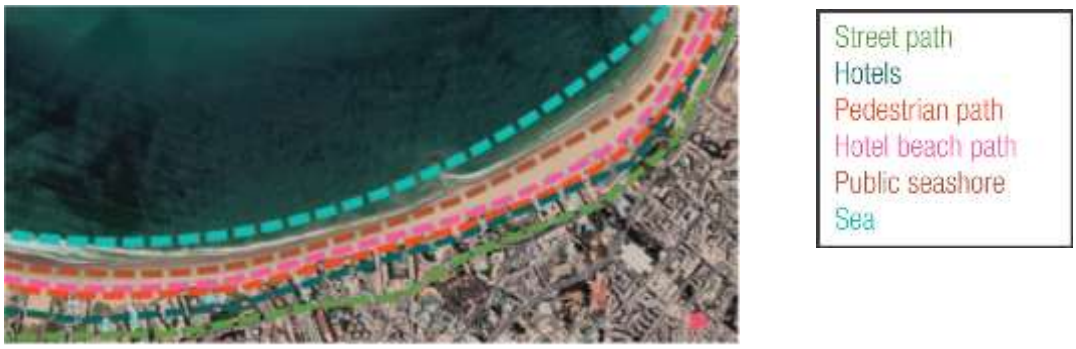

Fig (24) paths classification (Google, 2019) (The researcher)

fig (25)parking area behind the hotels line

fig (26) consumption and services buildings on perpendicular paths Google maps (The researcher)

Conclusion

The waterfront open space in Agadir is designed as follows
It is only a pedestrian area
Water – wide sand land area – wide walk passage with plants units and red brick pattern – the hotel double line– the main street-the city
At the end of the waterfront line the marina with the hill behind (kasabah) takes place
There is a possibility of having private beaches concerning the hotels, but they are a square area at the beach end
There are a lot of activities like sports and services like café s and restaurant.

10. Alexandria city

Alexandria in Fig (27) is Egypt's second largest city; it is 32 km in the northern part of Egypt on the Mediterranean Sea .it has 4.1 million as population. Its potential development is limited between the northern coast and to the south Lake Maryout. It is the main port of Egypt and tourist resort. The Waterfront of Alexandria is chosen as a case study due to its uniqueness and its potential for waterfront urban development**.** (Ragheb, 2014)

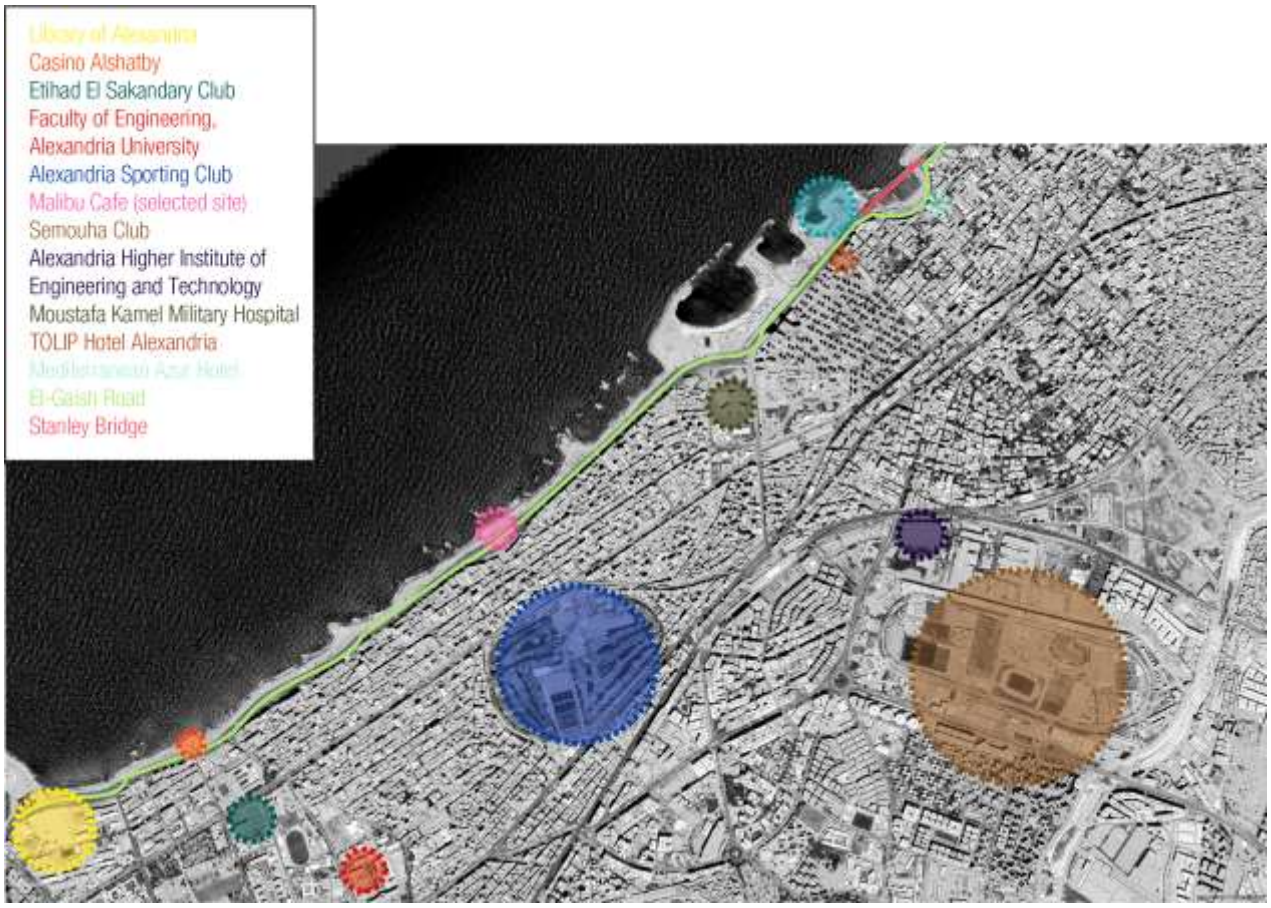

Fig (27) alexandria urban context (Google, 2019) (The researcher)

10.1. Selected study area (Malibu Café) timeline in Fig (28)

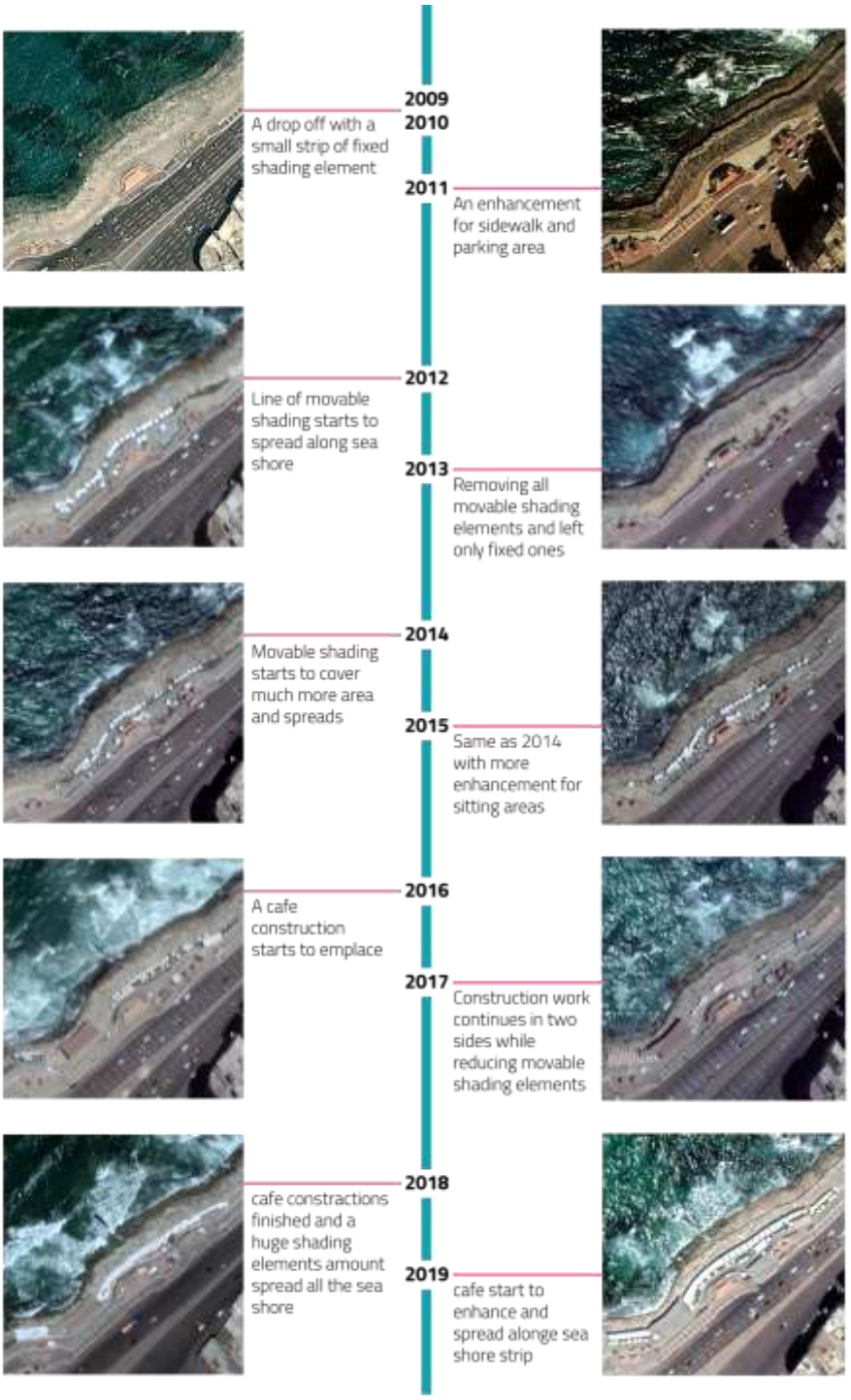

Fig (28) study zone timeline changes (Google, 2019) (The researcher)

Reason of selection

The establishment of Malibu in the beginning of the apparent period which cafes spread on the Alexandria Corniche and next to a public car park

Location: Sporting Tunnel, Sidi Gaber, Alexandria, Egypt

Area: 2135 m²

Year: 2016

Background: Malibu cafe constructed to serve visitors with an arranged sitting area and foods while enjoying the seashore view.

Master Plan /Urban context

The cafe is located as in Fig (29) on the seashore line among many other cafes but it is attached to a public parking area

Fig (29) master plan (Google, 2019) (The researcher)

Approaches

The cafe has five main gates as in Fig (30) with fence and then there fourteen openings with steps to reach cafe platform

Fig (30) approaches (Google, 2019) (The researcher)

Zones main activities

Malibu cafe has three zones activities in Fig (31) like sitting rather indoor or outdoor and a kid playing area

Fig (31) main activities zones (Google, 2019) (The researcher)

Solid and Void / Gardens and Plazas

The cafe has five main gates with fence and then there fourteen openings with steps to reach cafe platform as shown in Fig (32)

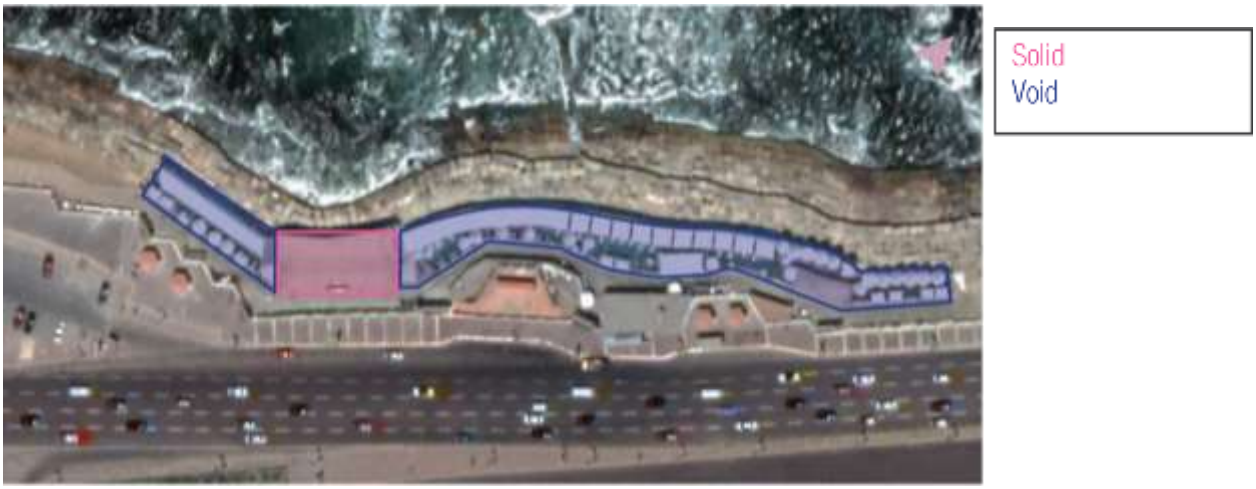

Fig (32) solid and void (Google, 2019) (The researcher)

Dimensions

Malibu cafe‘s area is 180 m long along the waterfront (length) and from 8 to 6 m width (from sidewalk) as in Fig (33).

Fig 33 dimensions (Google, 2019) (The researcher)

Cross section

Malibu cafe has two different types of sitting area outdoor area with shadings and indoor area connected to a semi outdoor area looking to the sea as in Fig(34).

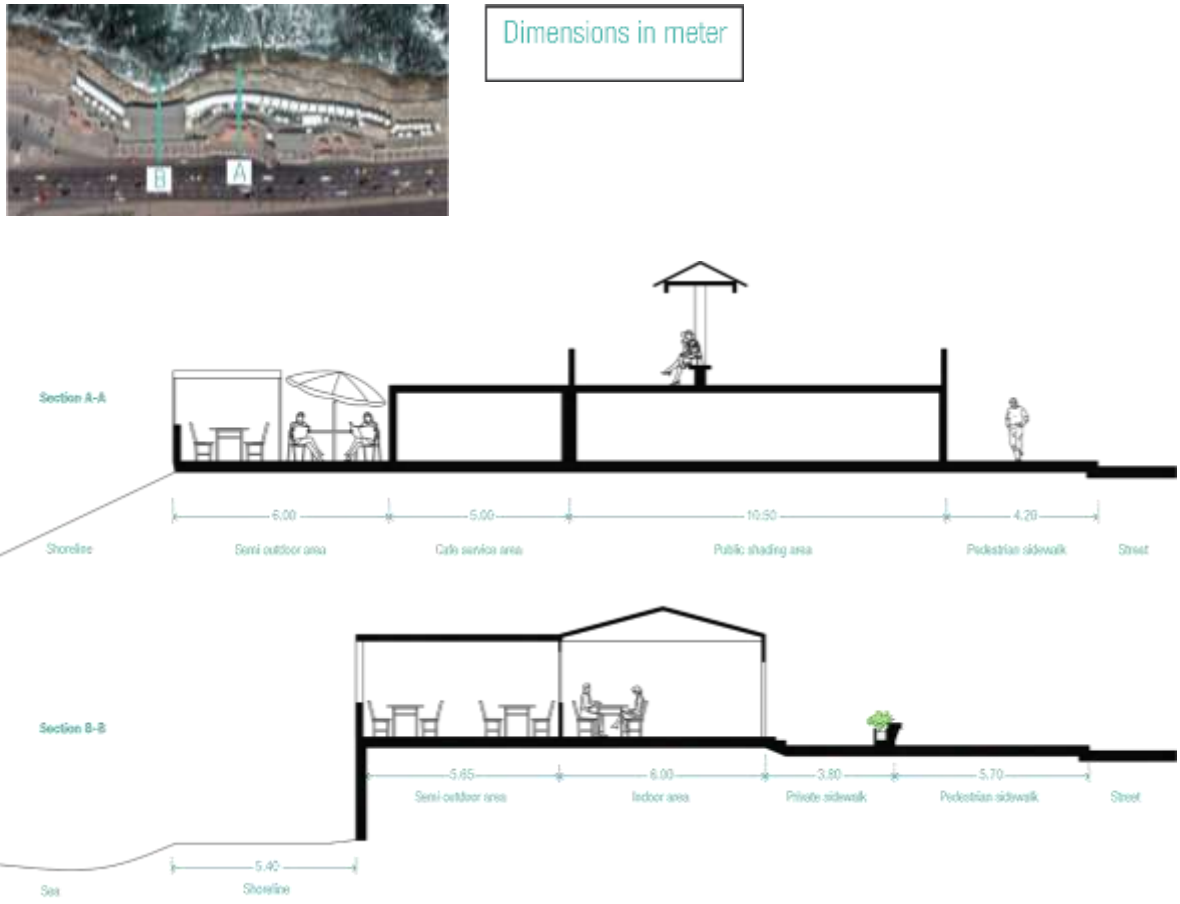

Fig (34) cross section (The researcher)

Paths

There are two circulation paths in the cafe zone, one public path outside the fence that surrounds the cafe for all passer-by and tunnel users and another one behind the fence for cafe users as in Fig (35)

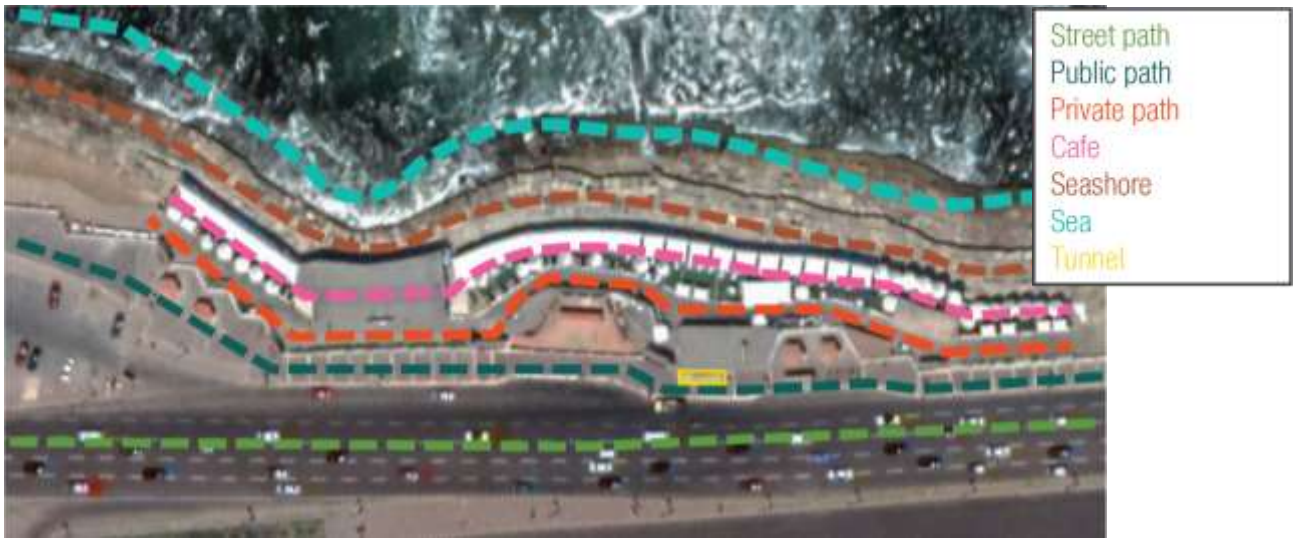

Fig (35) paths lines (Google, 2019) (The researcher)

Site pictures

Malibu cafe from street side in Fig (36)

Fig (36) real pictures from street point of view (Google, 2019)

Fig (37) Malibu café(Facebook page, 2019)

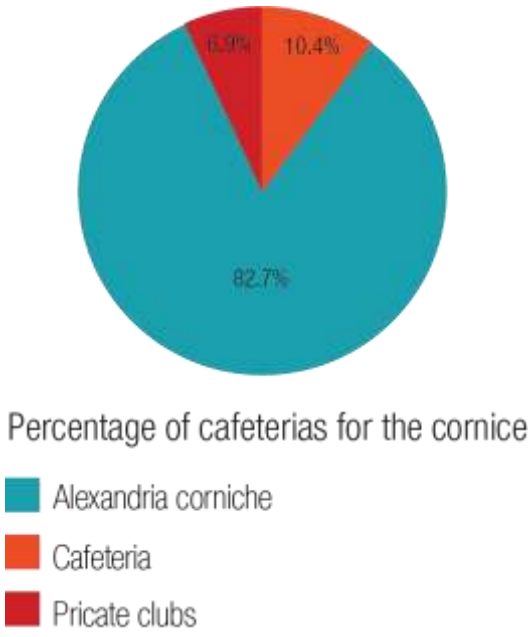

Chart (The researcher) (HCSR, 2019)

Alexandria sea shoreline start to have a cafes syndrome in the last few years as along the seashore there are many private cafes which serve approximate medium to high level of services with budget. There are still a few public spaces along sea shoreline with limited services. Along 3 kilometer there are six cafes, and four near existing public parking.

In the last three years cafes have expanded. The total length of cafeterias as in Fig (38)on the Alexandria Corniche reaches 2083 meters, out of 20 km. Private clubs along the Corniche from Qaitbay Castle to Montazah Palace reaches 14 private clubs on an area of 1830 square meters, or 6.9% of the length of the Corniche and the build-up area about 17.5% of the Corniche area, Include private clubs, cafeterias and restaurants. With 58 beaches along the city's coast, from the Abu Qir region to the Sidi Kerir region. (HCSR, 2019)

Fig (38) uses of cornice (café –parking pattern) (Google, 2019) (The researcher)

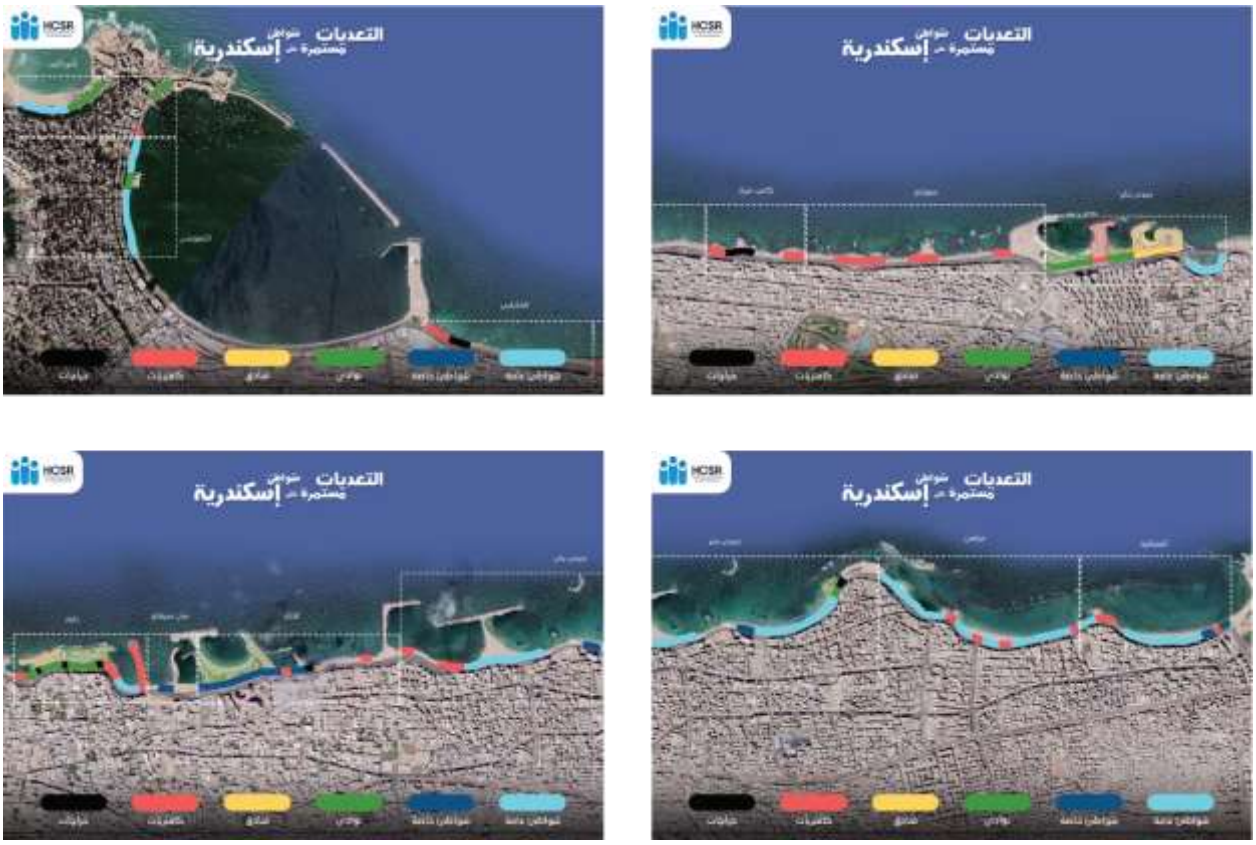

Fig (39) land uses of cornice (HCSR, 2019)

10.2. Table 5: Factors that affect the contextual integration level concerning Alexandria Case study

Principle	**Factors that affect the level of contextual integration**
Good form	
Physical character of the water body	Seashore with concrete blocks
Form oriented towards water	Main street cornice, sidewalk ,border, cornice passage ,concrete blocks
Enclosure (ratio height and width)	Buildings behind the main wide street are with medium height.
Legibility	
Direct access to water	On the cornice street
Link waterfront to the city	It is blocking the city from waterfront
Continuous pedestrian linkage	It permits continuity but behind the waterfront edge (from behind the café with narrow passage) or the main sidewalk
Visual access to water	The cafe has strong visual to water
Vitality	
Diversity of use	Consumption –service use
Continuous activities along waterfront	Eating ,drinking while enjoying the view ,kids playground
Comfort	
Shade	Shaded with light structure
Seating	Sitting areas available
Lighting	Lightning for night vision
Universal design environment	It is good place for a lot of consumers but it is not good for poor people and it is blocking the view for other people that pass by or don't use the place

Conclusion

This design of café / parking plot on sea is good for certain type of users (semi private space) they can easily park and enjoy the view while eating and have their kids play in a very nice setting but it is not good for other users who cannot afford or don't want to pay for the sitting hours and it is blocking the sea line for them and for the pass by pedestrian and cars which affect the waterfront city image too.

Recommendation

The pedestrian path along the seashore (cornice) should be continuous and not interrupted by café that's why it is recommended to move the café behind this path.

The blocking view gained from street can be lessened by using different orientations for buildings and shades and by using lighter materials.

11. Conclusion

Generally waterfront is a very rich source in a city. It is an element for attractiveness and distinctness for the city. Also the waterfront city has a very special image. It can offer great open public spaces if it is well designed urban wise. The waterfront strategies should work on its development and being resilient environmentally, socially, physically and functionally. The waterfront cities deal with its open spaces and water –waterfront -city relation differently. The urban design of open spaces sometimes strengthens its relation and other time weakens it.

12. Recommendations

- Waterfront open spaces should be accessible for everyone with no blocking for the view.
- It should be accessible and legible with a visual accessibility
- Urban continuity should be respected on waterfront spaces.
- The image of the waterfront should also be studied.
- The variety of activities that should be provided to satisfy all users' needs like sports facilities, bike lane, consumption, etc
- Comfort facilities should be provided like seats and shades ,also lights for safety

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Analytical Study for The Impact of Urban Transformation in Historical Areas

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Abstract:
Historical areas directly reflect urban transformation and the change of social life shaping the environment of cities. However, they have been experiencing rapid transitions due to rapid population growth, economic development, and urbanization. Here, the research aimed to reach guidelines to guarantee that urban transformation will successfully face the rapid transition occurring in historical areas. That can be occurred through integration of conservation experience and strategic planning in practicing urban transformation. The indicators of achieving urban transformation in historical areas have been identified. Those indicators have been deduced from principles of both urban transformation and historical areas. Each principle contains several aspects that can be improved through the indicators. These indicators have been comparatively analyzed in urban transformation of two historical examples. The analysis arranged the importance of each indicator of urban transformation in historical areas. Finally, the research shows that urban transformation can be successfully occurred in historical areas by improving its principles through indicators.

Keywords: urban transformation–historical areas–heritage–sustainability.

1. Introduction

Urban transformation carries the best holistic term when trying to understand the contemporary development trends as a whole. It took the different components and structures of the urban together not separately. It is important to differentiate between sustainable urban development and urban transformation. Camagni (1998) defines it as "a process of synergistic integration and co-evolution among great subsystems making up a city (economic, social, physical and environmental). Urban transformation guarantees the population a non-decreasing level of well-being in the long term, without compromising the possibilities of development of surrounding areas and contributing by this towards reducing the harmful effects on the biosphere". (Mccormick, Neij, & Anderberg, 2012)

Urban transformation is a term that includes both urbanization and de-urbanization that is growth as well as negative urban development. Thus, the term urban transformation is dynamic and changeable. Although a certain similarity in the conception of transformation and transition in terms of 'change' exists, there are differences defined between the 'transformation' and 'transition'.

- 'Transformation' is a continuous process, while a 'transition' refers to a swing from one system to another in terms of dynamics in the systems, which is not about the re-orientation of an existing path, but about a new path;
- 'Transformation' is more process-oriented, and 'transition' is considered as more of a turning point and a move from one state to the another.

From the perspective of management, 'transformation' is a well-planned, continuous process mainly driven by endogenous forces (e.g. poverty, economic growth, governance); 'transition' is a non-linear change process mainly driven by exogenous factors (e.g. fundamental changes to a political or economic system, energy crisis, climate change). (Laursen, 2009)

2. Driving Forces of Urban Transformation

The driving forces of urban transformation are divided into two parts: urban development process in terms of social, environmental and economic processes, and urban sustainability. The studies on urban transformation have recommended the forces that drive cities towards sustainability are better governance, sustainability-oriented policy, economic growth and technology. Those key forces that drive cities away from sustainability are consumption behavior, market-driven economy, governance. Under this situation, six basic driving forces are recognized as factors to the urban transformation process (Eger & Maggipinto , 2009). They are **population, governance, policy, economic growth, technology and lifestyle**. (McCormick, Anderberg, Coenen, & Neij, 2013)

3. Principles of Urban Transformation

As an urban environment is both a physical and a social entity in its creation, functioning, and future, the principles of urban transformation will look at the development of the natural environment, built environment and human well-being within the urban transformation process (Figure 1).

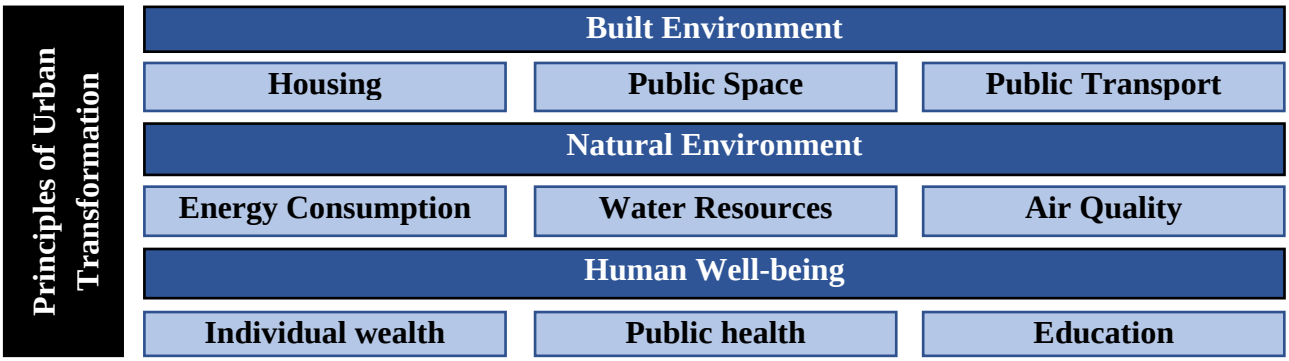

Figure 1. Principles of urban transformation, source: (Adams, 2006)

3.1. *Built Environment*

The **built environment** refers to the manmade surroundings that provide the setting for human activities. It comprises some aspects such as housing, public space and public transport:

- **Housing:** Creating affordable, attractive, comfortable and sustainable buildings, which help their occupants to mitigate contributions to climate change, utilize renewable energy.
- **Public space:** The revitalization of districts and city centers, urban public spaces and the interconnection of fragmented urban landscapes.
- **Public transport**: Sustainable urban transport research and practice has focused on pollution, road safety and on various measures and their effects. (Adams, 2006)

3.2. *Natural Environment*

The natural environment encompasses natural resources and physical phenomena such as air, water as well as energy, not all of which originate from human society.

- **Energy consumption:** Energy has an important role in the country's rapid socio-economic growth and improvement of the quality of life.
- **Water resources:** Fresh water is essential for human health. It is used for everyday activities. Globally, the availability of water per person has declined markedly in recent decades.
- **Air quality**: it varies depending on the region, local and long-range emission levels and sources, as well as the season. (Gulersoy & Gurler, 2011)

3.3. *Human Well-being*

The **human well-being**, characterizes the socio-economic system of cities: it comprises some aspects such as personal income, education and health.

- **Individual wealth:** Inequality individual wealth comes at the expense of a less stable and less efficient economic system.
- **Public health**: it concerns on creation of green space to promote physical activity, social integration, and better mental health.
- **Education:** The focus on the child's well-being in education thus supports a vision of education. (Rogers, Jalal, & Boyd, 2012)

4. Indicators of Urban Transformation:

According to the drivers and principles of urban transformation a limited set of indicators can be used to mark the achievement of urban transformation progress toward or away from sustainability. The main criteria for selecting indicators for urban transformation in this paper are the following:

- A limited number of indicators will simplify the decision-making process with which decision makers evaluate different alternatives, and progress towards goals.
- The indicators are easy to measure and data should be readily available.
- The indicators are easy to understand so that citizens and other stakeholders can understand.

According to these criteria, this paper presents thirteen key indicators to measure urban transformation process. Figure 2 gives an overview of these indicators. (Milojevic, 2012)

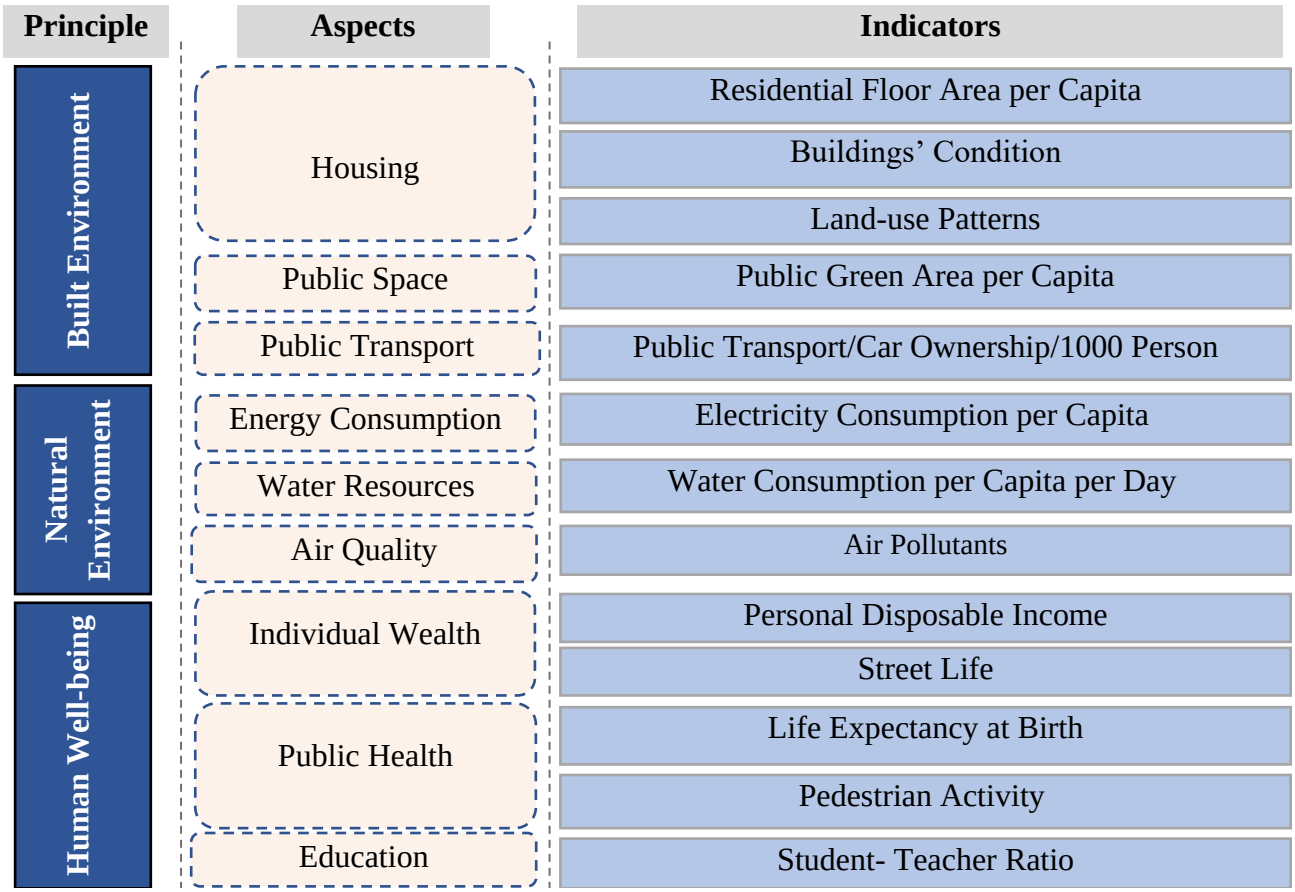

Figure 2. Indicators of urban transformation of historical areas, source: (Milojevic, 2012)

This paper investigates the most indicators affecting the principles of urban transformation in historical areas according to the following methodology. This investigation will be carried over two case studies in the following section.

- Stage 1: Showing the location of the case studies and its historical background,
- Stage 2: Analyzing the driving forces affecting urban transformation of the case studies,
- Stage 3: Investigating the principles of urban transformation through analyzing its indicators.

5. Carol Park Area, Romania

The studied area, called "Carol Park Area" has approximately 150 hectares (1.5 km^2) and its population is approximately 32 000 inhabitants, and it is bounded by Coşbuc Blvd, Unirii Blvd, Dimitrie Cantemir Blvd, (Calea) Şerban Voda Str., Viilor Str. (including the future junction with the new NS arterial: Buzeşti-Berzei-Uranus) as shown in Figure 3. (Mihaela, 2013)

Figure 3. Location of Carol Park Area, Source: Google Map Analyzed by the researcher, 2019.

5.1. *Historical Background*

The studied area consists of 'Tangible Cultural Heritage' presented in group of unique areas:

- Valuable architectural, urbanistic heritage, consisting of a large number of monuments in the perimeter of 14 protected areas. Many of these are citywide cultural and recreational targets, having also a great potential to become very attractive touristic objectives.
- Topological centrality (the area is located close to the historical center core).
- The vicinity of People's House which is a major tourist attraction of the city as shown in Figure 4. (INHERIT, 2007)

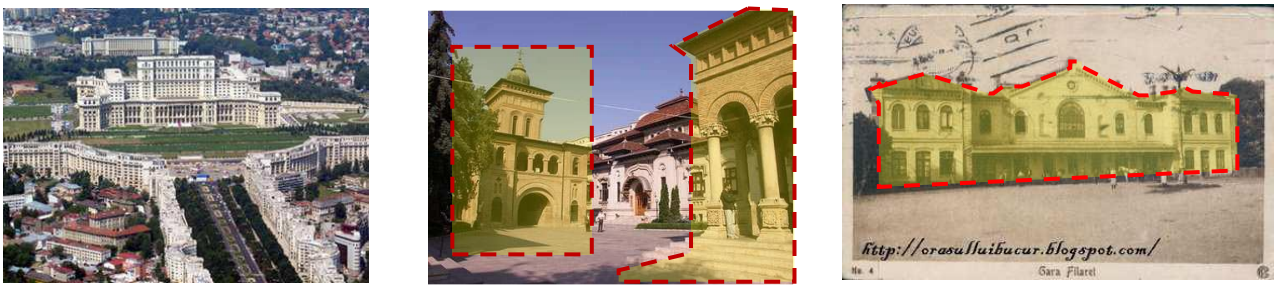

Figure 4. Buildings of late 19, early 20 centuries, Source: (Mihaela, 2013)

5.2. *Driving Forces of Urban Transformation in Carol Park area*

According to the driving forces mentioned above, there are several major causes which makes physical and functional decline. (Mihaela, 2013)

- **Governance:** The absence of good government leads to the physical and functional separation of the area from its urban surroundings as shown in Figure 5.
- **Policy:** The physical and functional split of the area from the central historical and touristic core of the city. Additions of new buildings significantly different from the character of the area, as dimensions and architectural style as shown in Figure 6.
- **Economic growth:** The absence of high standard economic activities which, along with the many historic buildings of cultural and recreational interest, to be attractive touristic cluster.

Lifestyle: The quality of life decreased due to the poor quality of public spaces largely caused by the unconditional adaptation of the whole city to the excessive demands of automobility.

Figure 5. High buildings separating the area from the surrounding area. Source: (INHERIT, 2007)

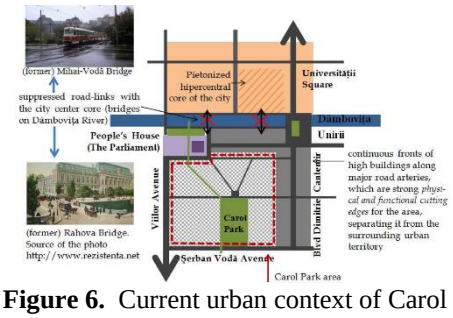

Figure 6. Current urban context of Carol Park Area Source: (Mihaela, 2013)

5.3. *Principles of Urban Transformation in Carol park*

5.3.1. Built Environment

Housing: Regeneration of the historic buildings to re-use them for touristic purposes and increase housing of area.

Public space: Reconfiguration of public spaces with a concern for the urban landscape and pedestrian's comfort.

Public transport: Improving the accessibility of the area. Restructuring the mobility within the area aiming at the reduction of individual motorized travels. (INHERIT, 2007)

5.3.2. Natural Environment

Energy consumption: Reduction of energy consumption through limiting motorized transit traffic within the area.

Air quality: Limitation of the negative impacts through the development of green space playing the role of a barrier for the expansion of the urban restructuring process. (INHERIT, 2007)

5.3.3. Human Well-being

Individual wealth: Increasing the individual wealth of the area through creating an attractive business context in a beautiful urban environment with touristic and cultural vocation can make the area "profitable".

Public health: Encouragement of pedestrian activities and creating attractive area. (INHERIT, 2007)

5.4. *Indicators of Urban Transformation in Carol park area*

At this part the research analyzes urban transformation principles by converting the improvement of each indicator into numerical values to be then represented in graph presentation.

Table 1. Analysis of indicators of urban transformation in Carol Park area, Source: researcher, 2019

Built Environment		Total: 9	
Aspects	Indicators	Analysis	
Housing	Residential Floor Area per Capita	Partially improved	1
	Buildings' Condition	Improved	2
	Land-use Patterns	Improved	2
Public Space	Public Green Area per Capita	Improved	2
Public transport	Public Transport and Car Ownership per 1000 Person	Improved	2
Natural Environment		Total: 3	
Aspects	Indicators	Analysis	
Energy consumption	Electricity Consumption per Capita	Partially improved	1
Water resources	Water Consumption per Capita per Day	Not Available	0
Air quality	Air Pollutants	Improved	2
Human Well-being		Total: 4	
Aspects	Indicators	Analysis	
Individual wealth	Personal Disposable Income	Partially improved	1
	Street Life	Partially improved	1
Public health	Life Expectancy at Birth	Not Available	0
	Pedestrian Activity	Improved	2
Education	Student- Teacher Ratio	Not Available	0

Figure 7 shows the relation between the different aspects at each principle, explains analysis values of the previous Table 1. The analysis shows that this example concerned about natural environment principle more than the other principles. It neglected the improvement of public transport and car ownership per 1000 person and life expectancy at birth indicators.

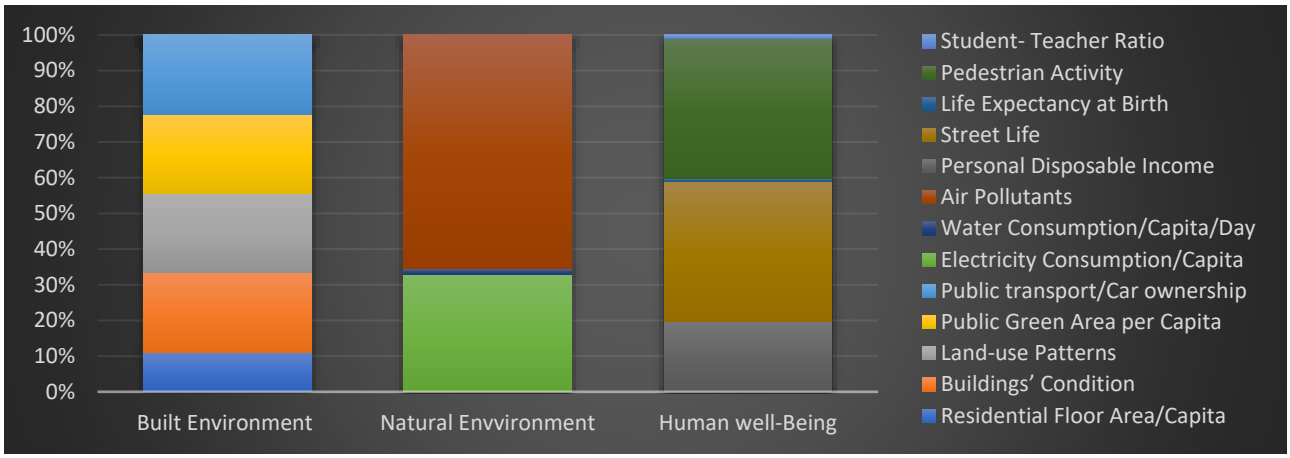

Figure 7. Carol park area graphical presentation of principles analysis, Source: researcher, 2019.

6. El Darb El Ahmar, Egypt

El Darb El Ahmar considered as a historical area within the historical Cairo. It is located at the Fatmid Cairo where it is bordered from the east with Mamluk's desert and Salah El Din's citadel while from the west with El Megharbeleen and Port Said street. From North with El Muez street and the forts of Salah El Din stretched from the citadel. While from the south bordered with El Sultan Hassan's Mosque and Mohamed Ali street as shown in Figure 8. It has approximately 140 hectares (1.4 km^2) and its population is approximately 35 000 inhabitants.

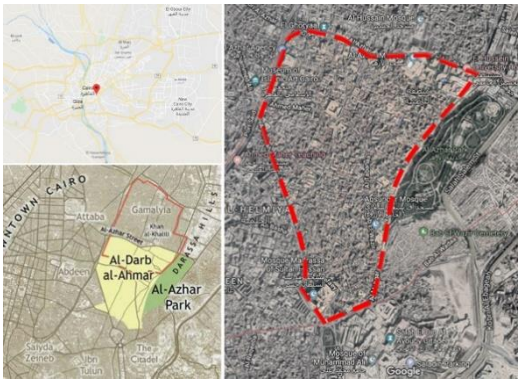

Figure 8. Location of El Darb El Ahmar, source: Google Map Analyzed by the researcher, 2019.

6.1. *Historical background*

This historical area represents the largest number of historical buildings representing most periods of the Islamic reign in Egypt which are considered one of the main sources of the cultural wealth. (Siravo, 2001)

Concerning the urban fabric of El Darb El Ahmar, it is homogenized where it is bordered by Ayyubid fortress, stretched along Bab El Wazir Street till the east at Bab Zewila as shown in Figure 9.

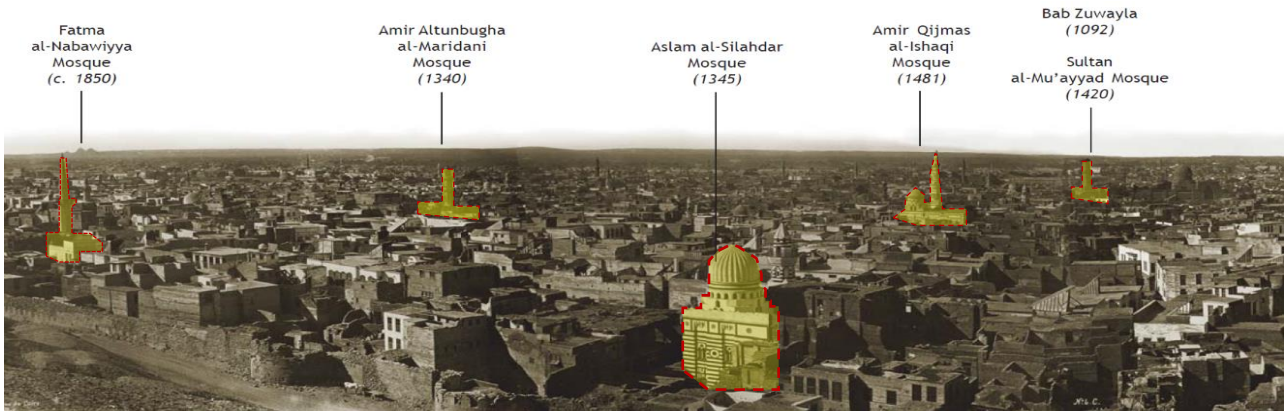

Figure 9. Historic buildings in El Darb El Ahmar, Source: (Siravo, 2001)

6.2. *Driving Forces of Urban Transformation in El Darb El Ahmar*

There are several major causes which makes physical and functional decline as shown in Figure 10.

- **Population:** Increasing the population in the last 50 years led to appear the rapid urban transition through replacing historic buildings with new building.

- **Governance:** Appropriation of shop owners and street vendors for public spaces. Construction of public service facilities on public sidewalks.
- **Economic growth:** Expansion of street vendors all over the street causing traffic problems. Street vendors only acknowledge the fact that El Darb El Ahmar is a public and commercial street, thus an opportunity to be exposed to a large number and variety of clients.
- **Lifestyle:** People realized the transformation and the elevated level of violence in the fights across the years. The reason behind these actions is unemployment. (Shehayeb, 2014)

Figure 10. Driving forces of urban transformation in El Darb El Ahmar, Source: (Shehayeb, 2012)

6.3. *Principles of Urban Transformation in El Darb El Ahmar*

6.3.1. Built Environment

Housing: The housing rehabilitation raised living standards and create attractive environment.
Public space: Redesign of public spaces in that area through removing the street vendors.
Public transport: the transit network has been improved. Enhancing this transit node to function as a complete mass transit system. (Shehayeb, 2012)

6.3.2. Natural Environment

Energy consumption & water resources: Primary infrastructure and connections serving El Darb El Ahmar to increase the efficiency of water and electricity of the area.
Air quality: Improving the air quality through increasing the green areas and upgrading the national youth club. (Shehayeb, 2011)

6.3.3. Human Well-being

Individual wealth: Creating community service and urban upgrading that would benefit surrounding neighborhoods.
Public health: Encouragement of pedestrian activities as a result of designing recreational areas. (Shehayeb, 2012)

6.4. *Indicators of Urban Transformation in El Darb El Ahmar*

Table 2. Analysis of indicators of urban transformation in El Darb ElAhmar, Source: researcher, 2019

Built Environment		Total: 8	
Aspects	Indicators	Analysis	
Housing	Residential Floor Area per Capita	Partially improved	1
	Buildings' Condition	Improved	2
	Land-use Patterns	Partially improved	1
Public Space	Public Green Area per Capita	Improved	2
Public transport	Public Transport and Car Ownership per 1000 Person	Improved	2
Natural Environment		Total: 5	
Aspects	Indicators	Analysis	
Energy consumption	Electricity Consumption per Capita	Improved	2
Water resources	Water Consumption per Capita per Day	Improved	2
Air quality	Air Pollutants	Partially improved	1

Human Well-being		Total: 5	
Aspects	Indicators	Analysis	
Individual wealth	Personal Disposable Income	Partially improved	1
	Street Life	Improved	2
Public health	Life Expectancy at Birth	Not Available	0
	Pedestrian Activity	Improved	2
Education	Student- Teacher Ratio	Not Available	0

As shown in Figure 11, which show the relation between the different indicators at each principle, explains analysis values of the previous Table 2. The analysis shows that this example improved built natural environment principles more than the third principle. It neglected the improvement of student-teacher ratio and life expectancy at birth indicators in human well-being principle.

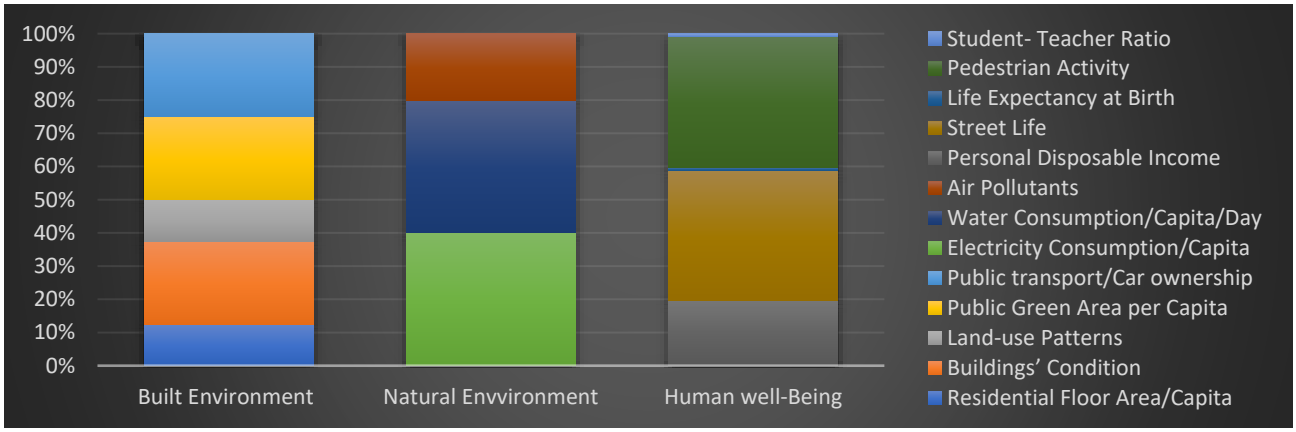

Figure 11. El Darb El Ahmar graphical presentation of principles analysis, Source: researcher, 2019.

7. Discussion

Table 3 shows the analysis values for all indicators of the two examples at all principles. Figure 12 demonstrates the comparative analysis for all these indicators in graphical chart.

Table 3. Comparative analysis for all indicators of the two examples according to the urban transformation principles in historical areas, Source: researcher, 2019

Principles		**Example 1**	**Example 2**
Built Environment			
Aspects	Indicators	Analysis	
Housing	Residential Floor Area per Capita	1	1
	Buildings' Condition	2	2
	Land-use Patterns	2	1
Public Space	Public Green Area per Capita	2	2
Public Transport	Public transport and car ownership per 1000 Person	2	1
Natural Environment			
Aspects	Indicators	Analysis	
Energy Consumption	Electricity Consumption per Capita	1	2
Water Resources	Water Consumption per Capita per Day	0	2
Air Quality	Air Pollutants	2	1
Human Well-being			
Aspects	Indicators	Analysis	
Individual Wealth	Personal Disposable Income	1	1
	Street Life	1	2
Public Health	Life Expectancy at Birth	0	0
	Pedestrian Activity	2	2
Education	Student- Teacher Ratio	0	0

The analysis arranged the indicators according to its effectivity in improvement of principles in the two examples:

- Building's condition, public green area per capita and pedestrian activity considered as the most effective indicators of all principles.
- Life expectancy at birth and student- teacher ratio considered as the least effective indicators of this principle.

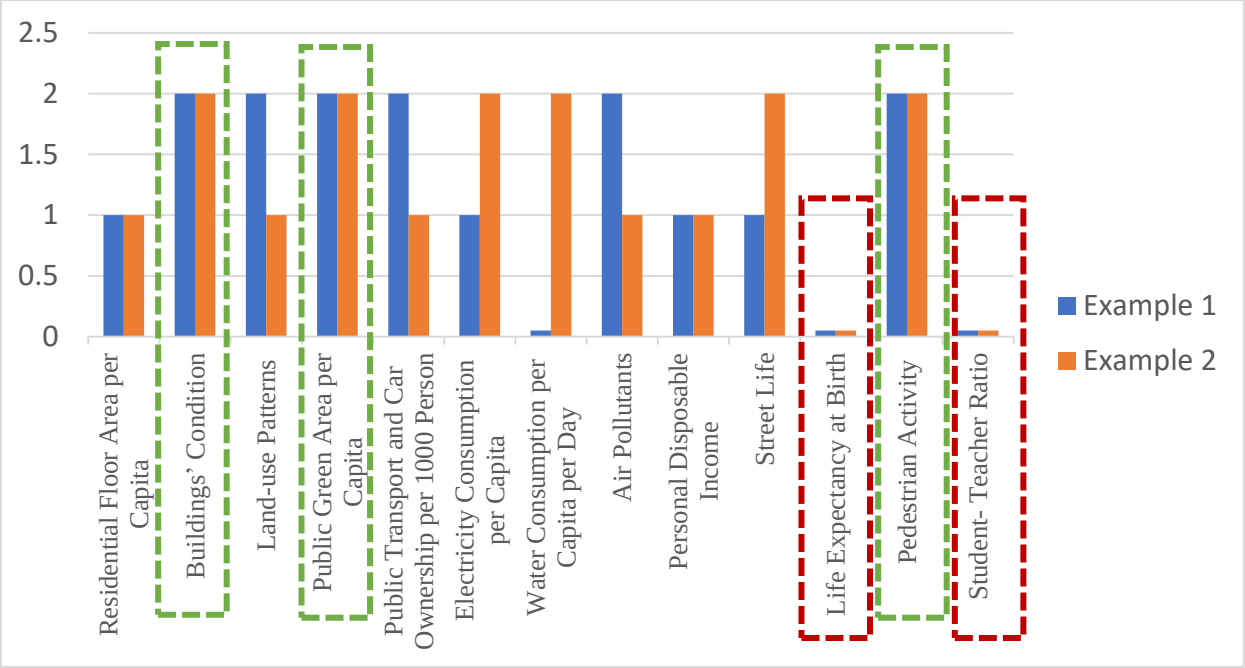

Figure 12. Comparative analysis with graphical presentation for all indicators of the two examples according to the urban transformation principles in historical areas, Source: researcher, 2019.

8. Conclusion

Urban transformation is a dynamic process that involves a variety of actors, such as decision-makers, investors, managers, planners, citizens. The old urban system refers to an urban equilibrium, current or original state of a city. The new urban system refers to a more sustainable urban equilibrium, planned or targeted state of a city. The new system is an innovation beyond the old one, targeting at sustainability. This research illustrated the process of the urban transformation in historical areas. The research mainly aims to identify the driving forces that affect urban transformation, and mention the main principles of urban transformation with finding its indicators. The indicators of urban transformation have been analyzed through studying two different historical areas. Some key issues have also not been adequately addressed because of a lack of sufficient information based on necessary statistics, for instance, the energy consumption per capita, residential floor areas per capita. The various processes of urban transformation have long-term implications. According to the comparative analysis of the two examples, it is obvious that the indicators don't have the same impact on urban transformation. The analysis arranged the importance of the indicators according to its impact in all principles. Therefore, urban transformation can successfully face the rapid transition in historical areas through applying these principles.

9. Recommendations

The following recommendations are set for different stakeholders who are responsible for urban transformation in historical areas:

- **Urban Planners & Architects:** More public spaces with public green areas to be conserved in Historical areas that will affect positively on the urban transformation process.

- **Government:** Rehabilitation of historical buildings should be carried on instead of demolishing them to build new buildings.
- **Researchers:** More research could be done in order to enhance the effect of educational level on the urban transformation process in historical areas

10. Acknowledgement

We would like to appreciate the support provided by Arab Academy for Science, Technology & Maritime Transport university in Port Said branch.

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Investigating The Effect of Social Capital on The Resilience of Furniture Industry Grassroot Economies in Damietta, Egypt

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Abstract:
Social Capital is a vital asset that contributes to the development of professions as well as communities, specifically in small scale urban settings with a dense social structure. This paper aims to investigate and map Social Capital for furniture industry grassroot economy in Damietta-Egypt. Furniture enterprises in this context form the main economic base of the city socially inherited through generations. The research examines the hypothesis of Social Capital being the main success factor of this economic cluster, building on Porter's Competitive Advantage theory and Putnam's Social Capital theory, linking networking, trust and norms to the spatial distribution of furniture enterprises in the city (Network Theory).
The case study's complexity related to current challenges in light of recent development directions that compromise the existing coherent urban and social patterns. Quantifying a generally qualitative measure such as social capital provides data-driven commendations for community-oriented decision-making towards socioeconomically sustainable development.
The methodology adopts a mixed methods approach, starting with pilot interviews that verify a geospatial GIS network map based on field survey. The research utilises Network Theory and geolocation data to quantity Social Capital. The output is a framework and visual toolkit (GIS mapping) for Social Capital that can be appropriated to other industries and urban settings that resemble similar characteristics to Damietta.

Keywords: Grassroot Economies, Economic Agglomeration, Furniture Industry, MSMEs, Network Geospatial Mapping.

1. Introduction

The dynamics of how people and their economies interact and evolve formulates space and the environment around us, and since these dynamics occur as a result of interaction between actors (Coleman, 1990), understanding the networks related to people and the economy becomes crucial for urban development. However, social systems manifest uniquely within each context as culture, lifestyle and many other variables come into play. The type of economy and how people relate to it is also a significant variable to interpret a given context with its potentials and challenges. Within this context, environmental and economic sustainability and risk become critical where social structures display signs of vulnerability which at the same time offer solutions towards resilience.

For industry-based cities, in which a certain industry or craft is imbedded in the culture and livelihoods of the community, most of the economic activities are directly or indirectly related to this industry and passed down from one generation to the next. In such a dynamic, the small scale of the economic interactions form a strong "cluster" (*Porter, 1990*) that functions and evolves within its context according to the possibilities and challenges. In this research, the context of local scale economies (grassroot economies) is investigated within an industry-based city (Damietta) towards understanding the effect of the social capital (including networks) on the dynamics of the industry in this city.

This research attempts to draw connections between social capital components, community structure and spatial proximity. The main hypothesis is that social capital is correlated with the spatial distribution of small-scale grassroot economies in Damietta; enterprises with higher connectedness in terms of trust, network and norms (Putnam et al., 1993) are expected to be spatially proximal to one another and to exhibit higher "control" (Lin, 1999) in the market. In relation to community structure, its definition –open or closed– (Wallman, Vidali, Lo Conte, & Bond, Virginia, 2018) is also a reflection of the nature of the dimensions of social capital.

Contrasting to conventional municipal perspective, Ruzek (2015) suggests that embracing local economies (including those informal in nature) can allow for more sustainable economies. Research in economic sustainability argues that local economies offer an alternative way to capitalism and can shift the global focus from a globalized capitalist society to eco-localism. Literature supporting the notion of an inclusive economy, or as defined by Gibson-Graham as the diverse economy, highlights the importance of acknowledging that more than half of the economies in both rich and poor countries are non-capitalist in nature (Gibson-Graham, 2006).

2. Background and Theoretical Underpinning

This research investigates social capital as a variable that affects small-scale economies in an industry city. From this notion, the dynamics of grassroot economies and how they function within the context of profession-based social capital becomes a quite significant inquiry. The complexities that accompany investigating a dense and enclosed community such as Damietta also adds variables of meaning behind social and cultural bonds between individuals in the community. The argument in this sense transcends economic profit and becomes a mapping of a specific pattern of living that evolved in the city within the context of overlap between many factors.

This paper builds on the works of Putnam (2002., 1993), Coleman (1988, 1990), Lin (1999, 2003), Bourdieu (1986), Hunt (Hunt, Durham, & Menke, 2015) and Burt (Burt, 1992, 2015) to investigate the theoretical underpinnings that relate to social capital in literature. The work of Ruddick (Dissaux & Ruddick, 2017; Ruddick, 2015; Ruddick, Richards, & Bendell, 2015) has guided the theoretical base for understanding grassroot economies and social capital as alternative currency, in addition to Porter's Competitive Advantage Theories, which describes the situation in Damietta as an economic cluster (Porter, 1990).

2.1. *Social Capital as a Theory and System*

The concept of social capital can simply be explained as "investment in social relations with expected returns" (Lin, 1999), which is highlighted in various ways in the works of Putnam (1995, 2002), Coleman (1988), Lin (2001) and Hunt (Hunt et al., 2015). This implies that engaging in networking interactions produce profits. In other words, social capital is "resources embedded in relationships among actors" (Hauberer, 2011).

Social capital has evolved as a concept through the works of different theorists. Although Bourdieu's (1986) work includes discussion of cultural capital theory, he also provides a structural view explaining and aggregating social capital, one which focuses on the size and volume of the capital possessed by members, and how the interactions of any given members enforce the mutual recognition of those members in the network (Lin, 1999). Coleman (1990) stresses on trust, norms, sanctions, authority and closure as forms of collective social capital, while also emphasising the individual's use of socio-structural resources in gaining better results (Lin, 1999).

Debated issues around social capital include relating the aggregation of collective values of economic, political, cultural or social connections/relations, with other collective terms such as trust and norms. Literature includes a display of substitutable terms or measurements that all convey solidarity and social integration with no specificity of each term's place in theory. Lin (1999) argues that social capital must be distinguished from collective assets such as culture, norms and trust. It is a relational measure with which other collective assets (such as trust) causally correlate without being defined by one another.

According to Coleman (1990), A fundamental social network consists of two types of elements: 1) The Actors, and 2) The things over which they have control and in which they have interest. The latter can be classified into resources or events according to their characteristics. The relations between actors and resources/events can either be control or interest as earlier mentioned. These relations can be broken down into the dimensions of social capital; trust, networks and norms.

2.2. *Social Capital Dimensions*

Social capital has been studied as a domain and its dimensions have evolved through various researchers' additions over time to include more dimensions and concepts. Building on the works of Putnam (1995, 2002), Coleman (1988), Lin (2001) and Hunt (Hunt et al., 2015), a comprehensive assortment of social capital factors of measurements have been identified, namely; Social Cohesion, Networks and Norms as the main divisions. Social cohesion includes measures of social solidarity, trust and reciprocity. Networks includes Embedded Resources and Network Locations. Lastly, Norms comprise belief in activities collegiality and agreeing with collective rules. The following diagram illustrates the measurements adopted in the study for evaluating the volume of social capital.

Within sociological literature, trust has been identified in one of three ways: as a property of an individual, as a property of social relationships or as a property of the social system based on individual actions of actors (Misztal, 1996). This research focuses on the third perspective which understands trust as a valued public good, sustained by the actions of actors in the society. Putnam's work explains that trust is a fundamental factor for achieving democracy (Putnam et al., 1993) as being part of the social capital which is essential for "effective, responsive and representative institutions" (Misztal, 1996; Putnam et al., 1993).

Among the three Social Capital dimensions, networks are the most measurable and tangibly quantitation elements. According to Burt (2000), focusing on network mechanisms that affect social capital offers a more transdisciplinary perspective across theory with empirical evidence rather than loosely tied metaphors and indicators used in a number of social capital research. The empirical work of Burt (1992, 2000, 2001) and Coleman (1990) investigating Structural Holes Theory versus network closure as social capital provides a tangible quantitative base for measuring social capital. Burt argues that the two network mechanisms work differently and can bring various additions to the magnitude of social capital if utilised collectively within a "more general model of social capital" (Burt, 2000).

The concept of a "norm" works quite differently from the other two dimensions. A norm is "a property of the social system, not of an actor within it" (Coleman, 1990). Norms arise from collective individual actions, and are usually used within sociological research to investigate and explain individual behaviour. One of the vital questions regarding norms was posed by the work of Durkheim about whether an individual's behaviour is affected by the social system in which they are (Coleman, 1990).

Examining the three dimensions of social capital collectively opens up a variety of lines for exploring the nature of social capital as a system as well as on the level of individual actions. In the case of the industry-based urban setting of this research, this investigation would be paired with an analysis of the physical space and the spatial factors that assist or hinder social capital concentration in the city.

2.3. *Grassroot Economies and Competitive Advantage*

"Grass- roots Economy – We Work Together" was written on the Bangladesh Business Network (BBN) Committee vouchers (Ruddick et al., 2015), which illustrates the concept that "grassroot" signifies. Grassroot economies operate on a small scale (formal and informal), giving way to a more sustainable economic pattern that fits smaller societies (Ruddick et al., 2015). Examples of this are Bangladesh and Kenya which have adopted projects that capitalise on small scale economies and introduced the concept of alternative currencies.

From the collective city economy perspective, Porter argues that competitive advantage is created and sustained through a highly localised process, where competitive success is a reflection of differences between competitors in culture, economic structure and history among other factors. Within the same line of thought, competitiveness of a cluster first and foremost depends on the capacity of its industry to innovate and upgrade, hence it is achieved through acts of innovation (Porter, 1990). Reflecting on Damietta's market, the inherent identity of the furniture industry and the interconnected social spatial and economic cycles between the businesses, as well as the cultural correlation between the city and the industry in the wider consumer background in Egypt; are all factors that can be highly utilised as catalysts for creating a sustainable competitive cluster based on local economies. In Damietta, the culture of spillover and local buzz is inherited through generations of residents working and exchanging knowledge on the "craft" for decades.

3. Damietta's Furniture Industry Dynamics

Damietta's economic nature has always been associated with the entrepreneurial essence of its furniture industry. It is a unique context where cluster economies (similar to Sassuola, Italy) has evolved through decades and has been passed down from one generation to the next.

The Egyptian furniture industry is a well and long-established domain that is linked to geographical advantage with notable access to major markets, reasonably low costs, and highly experienced labour with regard to woodworking skills. The wooden furniture industry in Egypt dates back centuries with mostly distinct styles that incorporate Islamic, British and French elements into the design, as well as part of the sector also producing rather international style designs. Exports in the furniture sector started in the 1960s and 1970s pursuing the Soviet Union and Eastern Europe. By the 1980s, the export market shifted in Egypt towards Arab countries to respond to the increasing demand for furniture resulting from booming urban growth in the region (International Labour Organization, 2016).

According to the latest Egyptian Census data in 2013, the furniture industry accounts for 2.1% of total production in Egypt (International Labour Organization, 2016) (illustrated in **Error! Reference source not found.**). Although this figure is relatively small compared to other industries' production, a more significant figure for this research is that of the number of establishments the furniture industry, which is by far the highest among all industry sectors. The furniture industry is also among the highest in number of employees in the sector, which are approximately 11 percent of employment in the Egyptian manufacturing sector. The highest

concentration of the furniture industry is located in Damietta, Cairo and Sharkeya respectively (International Labour Organization, 2016).

Table 1. Number of establishments and employment by selected sectors, 2013 (International Labour Organization (ILO), 2016, from Census Data 2013)

ISIC Division Code	ISIC Rev 4 Description	Number of Establishments	Shares of total manufacturing (%)	Total Employment	Share of total manufacturing (%)
10+11	Manufacture of food products and beverages	77,289	20	612,512	25
31	**Manufacture of furniture**	**104,250**	**27**	**270,222**	**11**
14	RMG (Manufacturing of wearing apparel)	48,715	13	254,937	11
25	Manufacture of fabricated metal products, except machinery and equipment	53,065	14	184,926	8
13	Manufacture of textiles	10,481	3	184,684	8
23	Manufacture of other non-metallic mineral products	12,587	3	158,275	7
16	Manufacture of wood and of products of wood and cork, except furniture;	38,855	10	98,766	4
24	Manufacture of basic metals	1,518	0	87,650	4
20	Manufacture of chemicals and chemical products	1,903	0	75,846	3
22	Manufacture of rubber and plastics products	3,735	1	54,825	2
	Total Manufacturing	**385,578**	**100**	**2,416,460**	**100**
	Grand Total	**2,410,353**		**9,351,137**	

The dominance of micro and small-sized enterprises in the furniture industry landscape in Egypt is undoubted even with discrepant figures from different data sources (International Labour Organization, 2016). The following **Error! Reference source not found.** shows not only the dominance of micro and small enterprises, but the notable rise of their numbers between the years 2006 and 2013. Hence, micro, small and medium sized enterprises (MSMEs) in the furniture industry represent 99 percentile of total number of enterprises, with about 95 percent being micro businesses (less than 5 employees). Although this data dating back to 2013 can hardly be used to reflect the numbers today, the ratios they reflect feature undeniable patterns that are most likely still present in 2018 with new values yet to be updated.

Table 2. Distribution of Enterprises in furniture industry as MSMEs categories (International Labour Organization (ILO), 2016, from Census Data 2013)

Year	Total number of employed persons	Total number of enterprises	Number of enterprises according to employee				
			Less than 5 employees	5-9 employees	10-24 employees	24-49 employees	50+ employees
2006	255,065	89,209	8,729	7,069	285	70	56
2013	270,222	104,250	98,728	5,006	369	56	91

4. Methods

This paper is part of a research project towards quantifying and mapping social capital networks for a spatially concentrated industry. Aligning with this purpose, adopting case study strategy illuminated the set of variables, decisions, processes and relationships (Yin, 2014) connecting social capital to small businesses in the local industry in Damietta. The research involves several data collection methods: 1) semi-structured interviews with furniture workshop owners, 2) Systematic Observations and 3) an offline geospatial survey of the social capital. The research proposes a cross-sectional study (snapshot) (Saunders, Lewis, & Thornhill, 2016) of the dynamics of the social capital in a Damietta city at the time of the study. This is due to the fluid nature of the social capital and the acknowledgment of the possibility of continuous change in variables and weights of the different indicators in the study. This paper focuses on the exploratory phase of the research, which exhibits the semi-structured interviews analysis.

4.1. *Interviews*

The interviews aimed at investigating and understanding the dynamics of the industry and how social capital fits within the different levels of the value chain in a rather enclosed community of the small city of Damietta. Seven semi-structured Interviews were conducted with business owners of furniture industry workshops in Old and New Damietta cities, on two levels, namely; large-scale factories/workshops and micro-scale workshops. Participants were residents of New and Old Damietta, all born and raised in the governorate (whether in the city or small surrounding towns).

The interviews primarily targeted issues in the social cohesion, network density and norms (as the main measured variables from Putnam's Social Capital Theory). Other themes have been discussed as well including current socio-economic situation in Damietta and the drawbacks of the new megaproject currently taking place outside the boarders of the city (Damietta Furniture City / DFC). Interview questions were carefully framed to adapt to cultural preferences of the interviewees, as well as the delicacy of the issues discussed. For example, the measure of a business's financial success is a difficult issue to ask in order to get viable answers (where participants would not resort to misleading answers).

The qualitative strand of the research (interviews) also contributes towards developing an outcome measure as well as developing an intervention (Creswell & Plano Clark, 2018). This takes place through including open-ended questions about the challenges that face Damietta city's furniture industry. Hence this data would be used as a final filter to evaluate the current situation of the industry from a point of view of social capital and produce recommendations for a grassroot-based development direction for Damietta.

4.2. *Systematic Observations*

In order to capture the essence of built environment, the researcher combined the interviews data with photo observations of different typologies of industry-related buildings in Damietta. Photos targeted a geographic representation as well as typological one. Geographically, photos were taken in three main urban areas representing the major urban fabric patterns in the city, namely; 1) compact organic urban areas in the centre of the city, 2) less compact areas on the periphery of the city with more relation to the entrance main roads to the city, and 3) waterfront area directly related to the Nile and crossing to the other side of the city (highlighted in the map below). Regarding typology, the researcher targeted missed use and commercial buildings with at least the ground floor exhibiting the function of a furniture industry workshop. All the typologies that existed within the three earlier-mentioned areas were added to the observations.

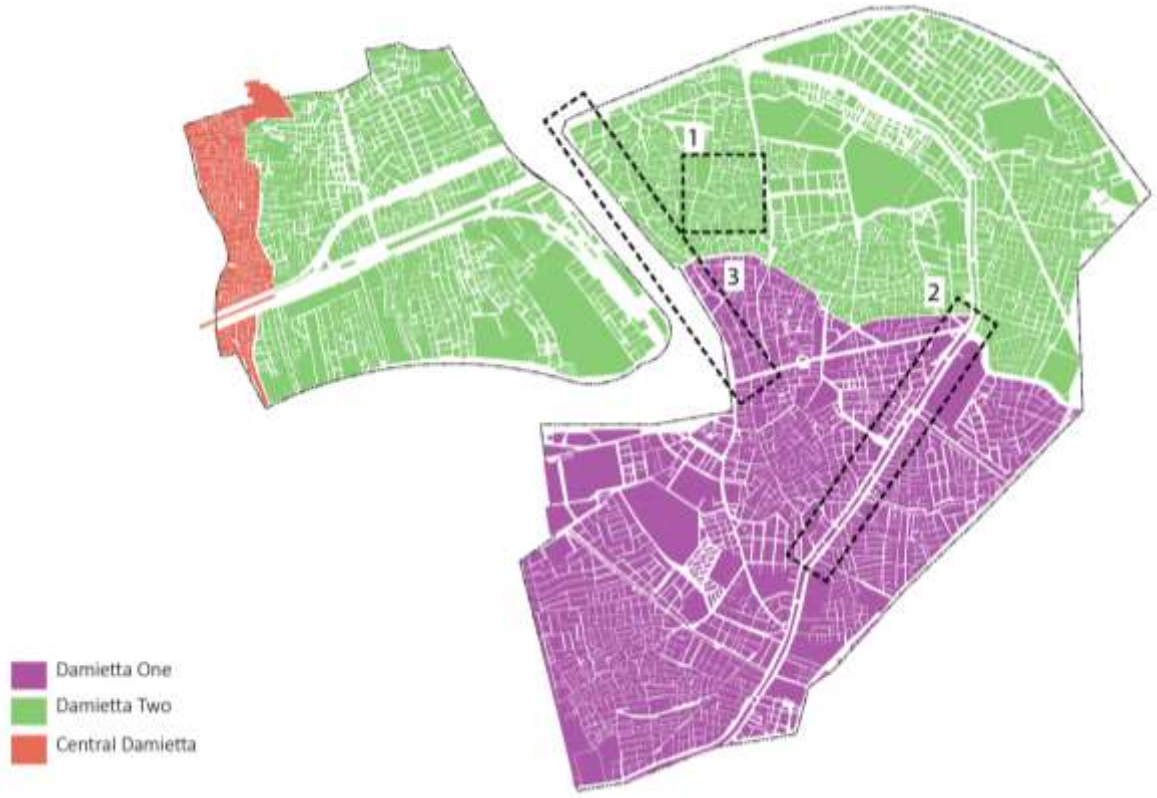

fig. 1 Selected areas for urban observations (Google Maps, 2020).

4.3. *Survey*

Following is the quantitative primary data gathering through a survey of enterprises (filled in by each enterprise's owner (who is usually the main worker in SMEs). The survey will measure; (1) the dimensions of social capital, (2) data on employees and size of enterprise, and (3) the spatial locations of enterprises and relation to each other. These will be through dividing the survey into 2 question-based sections, and a third section which involves pointing the locations on the map.

The sample size is composed of 306 enterprises within the study area. The sampling frame is divided into 5 categories according to the size of enterprise (0-4 employees, 5-9, 10-24, 24-49, and 50+) (International Labour Organization (ILO), 2016, from Census Data 2013). The sampling strategy adopted is stratified random sampling (Saunders et al., 2016). The choice was made according to an examination of the characteristics of the sampling frame, generalisation needed, geographic concentration and relevant strata as shown in the figure below. The strata divisions and sample sizes for each stratum were decided according to two stratification variables, which are: size of enterprise and type of economic activity within the furniture industry value chain.

Table 3. Sample size with strata divisions (calculated by author from furniture industry data and population info (*CAPMAS, 2019*).

				Total number of enterprises	Strata (Categories)				
					Less than 5 employees	5-9 employees	10-24 employees	24-49 employees	50+ employees
Target Population in study area				6,343	6,006	304	22	3	5
					94,7%	4.8%	0.35%	0.053%	0.087%
Calculated Minimum Sample Size				**306**	**289**	**14**	**1**	**1**	**1**
Furniture Industry Strata									
All in house enterprise							1	1	1
Design	Design	1	Design		18				
Inbound	Inbound	2	Purchasing		18				
		3	Inbound logistics		18				
Manufacturing	Manufacturing	4	Cutting and Carpentry		19	2			
		5	Carving		18	2			
		6	Veneering		18	2			
		7	Finishing (staining, polishing etc.)		18				
	Assembly	8	Upholstery		18	2			
		9	Assembly		18	2			
	Testing	10	Testing		18				
Outbound	Outbound	11	Value added services		18				
		12	Packaging		18	1			
Marketing, Sales and Distribution	Marketing, Sales and Distribution	13	Marketing		18				
		14	Distribution and Sales (wholesalers, retailers, contract buyers and showrooms).		18	2			
Services and support	Services and support	15	Transportation		18	1			
		16	After sales support		18				
Total Sample Size				**306**	**289**	**14**	**1**	**1**	**1**

5. Findings

5.1. *Urban Patterns Analysis*

During the interviews, one of the most interesting discussions was about the home-work pattern of the expansion of the cities in the past decades. A given resident invests in purchasing a land plot in the city and builds a workshop on the ground floor with his residence on the first floor. This would ensure efficiency and comfort in handling work issues, as well as security of logistic paperwork, which is usually kept in his residence. As the family expands with children, the owner can add an extra floor to cater for this expansion. Usually the children work with their father in the workshop, where they learn the craft and get introduced to the network in the neighbouring workshops. When a member of the second generation decides to get their own business, the original owner gives part of the ground floor to him for this activity, where the expansion of the residential component follows. In other cases, the second generation choose to invest in independent business by investing in a new piece of land, hence contributing to the horizontal expansion in Damietta.

It is worth mentioning that the whole process is predominantly male-dominated. Owners of the original workshop usually want their male children to continue working with them in the business, while in the case of their female offspring, the encouragement is towards getting married -usually to another trusted workshop owner who would have their own similar cycle of ownership and development of the building pattern.

Another remark about the urban fabric in Damietta related to scale: the scale of land plots is relatively small and the road infrastructure is equally small. The majority of the land plots in

Damietta are between 200 and 400 sqm, which makes the development of the city quite compact and vertical in relation to the land area.

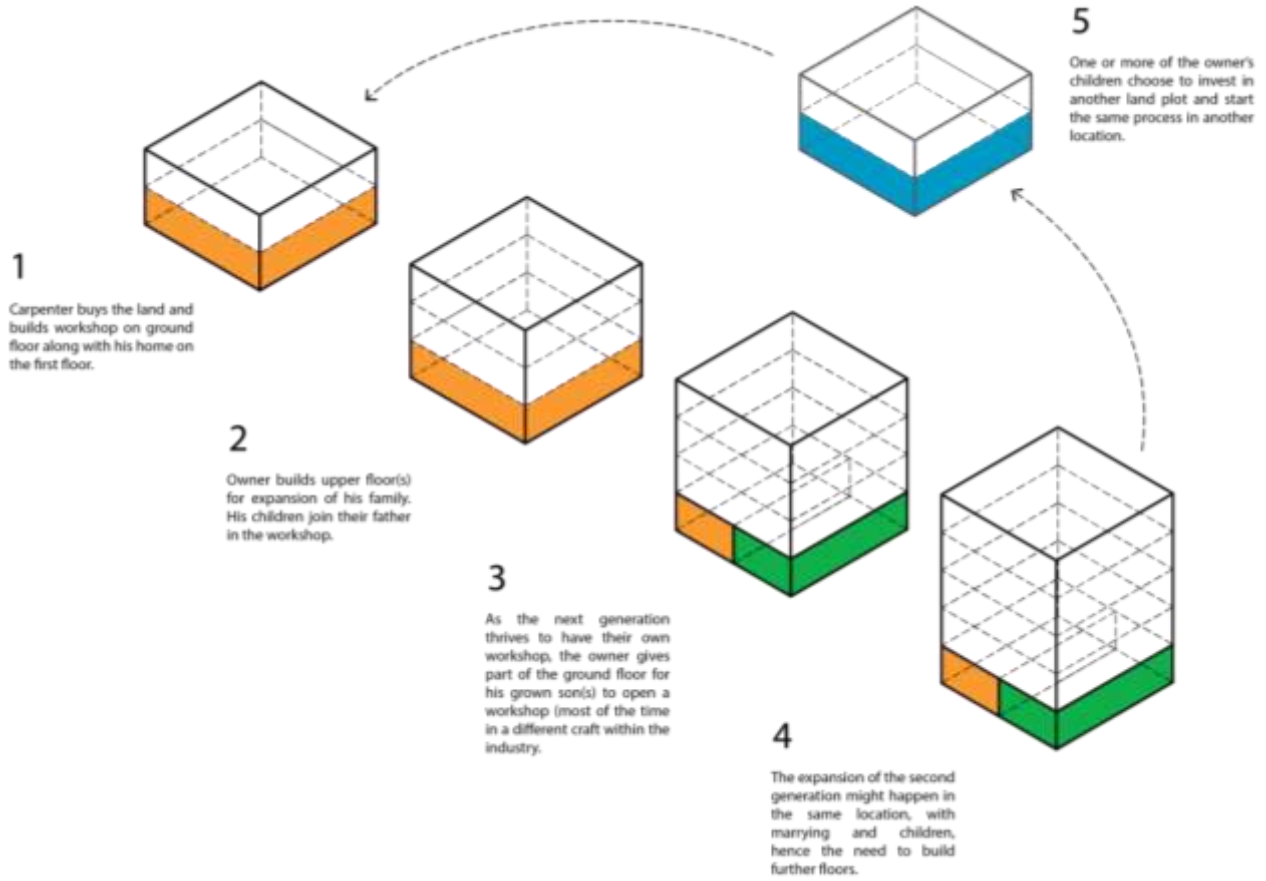

fig. 2 Development of home-work pattern and its effect on the development of the urban fabric (developed by researcher from interview data)

5.2. *Urban Observations*

Observing the different patterns of mixed-use buildings and commercial buildings, the following patterns existed simultaneously within the three zones identified in the map in figure 1, which were the basis of the analysis of building patterns and scales introduced in figure 3. This study was based on urban observations through photos and linked to data from interviews.

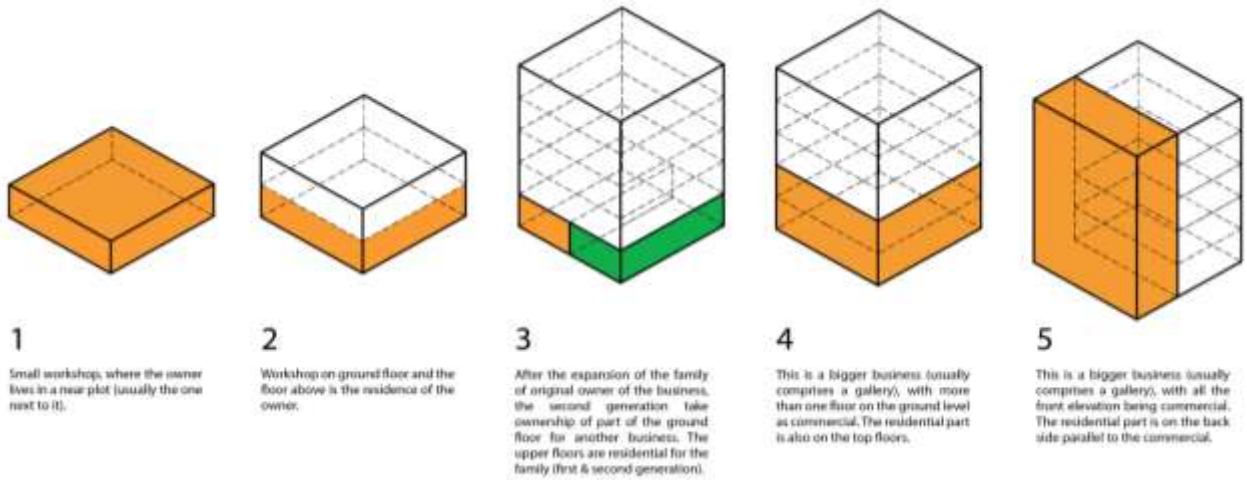

fig. 3 Different patterns of mixed-use buildings in Damietta (source: Author, based on observations)

6. Discussion

The first output from the analysis was mapping the value chain in Damietta's furniture industry, as well understanding the process through which social actions occur among actors (business owners). There are three patterns by which the production process takes place: 1)Enterprise sequential process through which the product is transported from one workshop to the other along the value chain until being finally sold at a gallery (as in Figure 2 below), 2)Product order-based, where one central business owner orders out pieces of the final product (stages) from different trusted partners, given that the final assembly and selling would take place within the central owner's enterprise, and 3)Inhouse process, which is only adopted by major enterprises in the market (top category within MSMEs classification), where the whole process takes place within the enterprise itself without the need of any partners. It is worth mentioning that major enterprises switch between the different processes, as preference to the social cohesion approach of "profit and let profit", keeping strong bonds with their trusted neighbours and friends who work in the field.

The thematic analysis revealed a high emphasis on trust between business collaborators, and the importance of history of transactions for future business dealings. All interviewees stressed that their preference in selecting their networks relate to either personal trust or the referral from a trusted intermediary. The concept of intermediaries is also another vital aspect that appears in the furniture industry context in Damietta. Almost all business owners have a double role of acting as intermediaries for other businesses on different levels of the value chain. For example, supportive industries such as glue factories act as intermediaries for business owners in the manufacturing and the assembly stages, since their business deals with both simultaneously, which circles back to the significance of referral and trusted word.

7. Conclusion

The primary hypothesis of this research which claims the existence of social capital agglomeration within the economic cluster of Damietta has been supported through the data. The findings exhibit evidence of the vitality of trust, networks and norms as a main structure of business interactions between MSMEs. The spatially dense urban fabric of the city also suggests a link between proximity and social capital, which will be further investigated through the following phases of this research. Even though this case implies clear industry-related indicators, the potential for generalisation lies in the common factors found in global south cities with local industry concentration, small-scale (MSME-based) economic cluster, and a strong long-term social structure. Through context examination and consideration, the research methodology can be replicated in different contexts for comparable industries.

Beyond the work presented here, the research adopts a geospatial mapping using Geographic Information Systems (GIS) to locate social capital networks as related to proximity in Damietta as a second phase of the project. The qualitative outputs of this phase inform the following quantitative stage of the research.

Suggested further research could incorporate the investigation of the bridges that link Damietta to the international market, which can also be compared to other cities (such as Sassuola or similar examples of industry-based urban contexts) in terms of internal social capital versus external links to the global market. Another direction could incorporate a closer focus on the nature of bonds between enterprises in Damietta, capitalising on Burt's work towards investigating the reasons behind the rise or demise of certain relations that highly affect the market.

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Improving Students' Social Interactions Through Designing Sustainable Academic Landscape

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Abstract:

Landscape is the art of planning, designing and management of land, applying natural and man-made elements, through the implementation of cultural and scientific information with, mentioning resources management so that appropriate landscape can serve a useful, healthy and enjoyable objective. The academic landscape is philosophical concept toward the enviroment, social, and economic characteristics of campus and education that varies inside a region for the process of preservation, transfer and production of knowledge. the academic landscape in the field of education philosophy. Generally, the characteristics of this concept are described within other ways to represent the reality of education as: vitality, spatiality, sustainability, contextuality, and rhythmicity. In universities, the design of landscape plays a significant role to achieve better environmental and social interaction of students, so that the absence and lack of landscape in universities is a big fault in the design, which effect on the social interaction of the students. The method of this research will follow four phases starting with analyzing the strategies and goals of academic landscape. Followed by discussing the criteria of sustainable academic landscape. Then defining the exciting academic landscape elements in the university. Finally analyzing the cognitive map errors to show level of social interaction. The aim of this research is to determine the impact of academic landscape on the students' social interaction. The expected results will set out a checklist based on the strategies, goals, criteria, cognitive map and urban design elements of academic landscape that urban designer can use to measure the social interaction in the university.

Keywords: University, Academic Landscape, Students' Social Interaction, Sustainable Landscape

1. Introduction

Landscape is the philosophy of designing, planning, arranging, and modifying of open spaces to create urban and rural environment (Kaplan, 1993). Landscape mainly defined as fine art which main function is create and reserve the beauty in the surrounded area of people and give senesce of natural in the place (Stephen S. Y. Lau & Yang, 2009). Landscape deals with the beautification and organization of environment with the presence of the organization of places with enough recognizing of the main principles of design landscape (Sun & Chiou, 2019). It is a fundamental part of the culture and plays a significant role in the balance of environment features as economic welfare of the users as well as the physical and psychological health of them (Olanibi Julius Adekunle, Joseph omoniyi Basorun, 2016).

Many researchers have shown that the presence of landscape in outdoor areas is the best way to provide and enhancing the value of people's life (Tzoulas et al., 2007). Landscape is one of the most active tools for developing and get sustainable quality of the environment whether in university environment, schools, city, the suburbs or the whole country (Olanibi Julius Adekunle, Joseph Omoniyi Basorun, 2016).

Presence of landscape in university can play a significant role in providing students' health, improving social interaction and providing safety (van Kamp, Leidelmeijer, Marsman, & de Hollander, 2003). Campus landscape is defined as the design of university outdoor area to achieve better academic and social behavior, so the lack of designing landscape in university is a big mistake that affect the academic performance and social interaction students. (RADWA MEDHAT, INJY KENWAY, 2016).

Students in universities are subjected to face a great level of stress because of the load of studying and assignment (Huang, Cheng, Gou, & Zhang, 2019). This leads to decrease in their academic performance and social interaction. Recent researchers have shown that academic landscape may be one of the main important factors that enhance the social interaction for the students (Rached & Elsharkawy, 2012). This draws to the main research problem that will apply the strategies, goals, criteria and elements of academic landscape, to deduct a comparative analysis between three main pillars (academic landscape theories', current landscape in the university, Students point of view) to pinout the similarities and difference between them and how this affect the social interaction of students. As current Urban Design is not following the policies and plans for academic landscape (Stephen Siu Yu Lau, Gou, & Liu, 2014).

Designing landscape in universities have a great impact in reducing academic stress and shaping students' behavior (Muresan & Gogu, 2012). Hence, applying academic landscape Strategies, Criteria, Goals, and Elements are playing a significant role in controlling students' social interaction. As recent researchers proved the great influence on student (Su, Li, & Li, 2015).

2. Overview of Sustainable Academic Landscape

Related to landscapes, sustainability based on various natural dynamics of ecosystem. It integrates the nature's efficiency and complexity to human landscapes (Honeywill, 2008). The academic landscape is as the buildings of campus that can categorized as the physical embodiment of campus's value. It is an important part of campus's life, providing a space for live, study, play, communicate, outdoor events, and aesthetic appreciation (Walton & Sweeney, 2014). The sustainable academic landscape has to integrated with the efficiency and complexity of nature enviroment into landscapes to restore damaged ecologies and increase biodiversity, providing human health, and enhance life in campus (Rached & Elsharkawy, 2012). The sustainable campus must achieve the efficiency in energy, save resources, and providing quality of enviroment through educating how to reach sustainability and make healthy enviroment (Ulrich, 1986) (Payne, 2009). The process of sustainable campus needs to encourage many to make changes in their own life to improve energy efficiency, preserve appreciated resources, and reduce excess (Yunos, 2015).

3. Strategies and Goals of Sustainable Academic Landscape

Pleasant and beautiful campus landscape is the main character of the university design which can lead students to have a moral attitude. To meet students' needs to improve their behavior, there're various strategies and goals to optimize and design the academic landscape from many perspectives (Yan, 2015). The strategies and goals are stated in order to make the campus more sustainable where the educational and behavior functions improved. The strategies are: construction of campus in order to inheriting the historical traditional culture, improve the value of academic landscape by continuing university spirit, meeting the requirements of communication diversity and creating communication spaces for multi-levels, improving the image of campus landscape and enhancing the sense of place

for staff and students (Zhang & Schmidt, 2016). In order to apply the optimization strategies of landscape and meet the requirements of diversity of communication for students, it is efficient to make optimization design of campus landscape with many perspectives (Yan, 2015). Researchers have set out the goals of optimal design of academic landscape which are combined putting forward the goals of university campus landscape design to the basis of educational goals, social goals, cultural goals, ecological goals and economical goals in order to significant use of each of them to improve the academic performance and social interaction of students (Macintyre, Ellaway, & Cummins, 2002).

4. The Criteria of Sustainable Academic Landscape Development

The idiom of sustainable campus landscape can define as the application of capability and natural behavior into landscape to enhance the ecosystem, promote the living quality, provide campus pleasing and secure living. So, campus landscape must be sustainable through environmental, social, and economical (Walton & Sweeney, 2014).

The development of sustainability in campus refers to the consistent relationship between social, economic, and enviroment activities(van Kamp et al., 2003). The definition of sustainable development is also defined as the development which can meet the requirements of nowadays without cooperating the ability of future generations to meet their own needs (Yunos, 2015). The criteria of sustainable landscape in universities believed in the importance of sustainability in university campus. The framework of sustainable academic landscape consists of three elements which are enviroment, social, and economic which are the main subjects to create this criteria (Yunos, 2015).

5. Landscape Elements Needed to Enhance Social Interaction in University

According to the paper of Paul Selman, there're various views for the definition of sustainable landscape. Many researchers showed it is linked to the decision making and participation (Moore-Colyer & Scott, 2005). Other researchers defined it as the relationship between the human and enviroment (Montanari, 2007) and this connected to the feeling of safety and security which is linked to the quality of individual use. The definition of term "social sustainability" is related to the relationship between humans such as friendship formation, communications...etc. Defined by the surrounding physical items which tackled in this research, these items joined together to form the social sustainability concept (Karudan, 2016). The studies about the relationship between people and landscape showed that the communication of various users has an effect on landscape and being affected at the same time (von Haaren, Warren-Kretzschmar, Milos, & Werthmann, 2014). According to the transactional theories, people don't stand away from the landscape, but they participate in the landscape as a "Behavior forming landscapes and landscapes forming behavior" (Nassauer, 1995).

5.1. *Different Types of Social Interaction*

According to Peter H. Mann, there're three main types of social interactions (Mann,1954):

- **Apparent interaction**: this interaction happens when a group of people have a plan to gather and spend time, which is considered as planned event such as: performances, greetings, or demonstrations.
- **Latent interaction:** this happens when two of strangers meet and interact because of the necessity
- **Spontaneous interaction:** this happens when two people knowing each other but interact accidentally without planning for that.

5.2. *Elements Affecting Social Interaction in University*

5.2.1. Friendship Formation

The friendship formation is defined as *"The formation of friendship is based on backgrounds and interests"*(Kyle & Chick, 2007). Theses interests are hobbies, family, or careers which allow people to form new friendships that are affected widely by opportiunity (Hartig & Staats, 2006). People form friendships at universities, school, work, neighborhoods, and communication spaces such as clubs that make communication a significant part of process (Deasy & Lasswell, 1985). According to Granovetter, not all the students in universities could be different or one type. Some students may be sociable, having a large scale of friendship formation, while others could be less sociable and have limited circle of friends. Due to the differentiation in the levels of sociability, students prefer a large scale of privacy, spots for isolation, relaxation, or privacy. Landscape architects should into consideration all of these aspects while designing the campus landscape to provide students social interaction and academic performance (Granovetter, American, & May, 2007).

5.2.2. Group Membership

As an extension of friendship formation, group membership shows the nature of humankind. Most of students prefer to join small groups as it considered as easy way for social interaction and provide representing themselves as well as taking decisions as a part of contribution (Rached & Elsharkawy, 2012). Social interaction studies showed 71% of groups in outdoor spaces contain of 2 individuals, 21% contain 3 individuals, 6% contain 4 individuals, and 2% contain 5 individuals (Deasy & Lasswell, 1985). Because of the preference of students to gather in small groups, it is important to take into consideration providing landscape with seats. On the other hand, in large groups, gathering is different such as parties, receptions, and fairs which make students tend to move around, so that social groups change in size frequently (Submittal, 2008).

Generally, groups are occurred in the areas with high social interactions and activities, so that it is significant to provide the concept of positional social interaction for friendship formation. The presence of social activity promotes group formation and social membership (Orenstein, Troupin, Segal, Holzer, & Hakima-Koniak, 2019).

5.2.3. Communications

Communication in campus is considered as a human nature which people do to understand the surrounding enviroment. The landscape architects must provide proper ambient for the communications to perform easily and comfortably. The architects should take into consideration these factors (Hamin & Gurran, 2009):

- Creating appropriate surrounding conditions that facilitate and encourage communication between people.
- Provide clear and signs to support communication between the institute and the user to clarify the different areas, buildings and activities.
- The provision of suitable ambient conditions that facilitate and foster communications between people.
- In places with heavy traffic, providing a side parking area is necessary to facilitate passenger communications.
- Places known as a gathering spot should be equipped with seats. Flexibility of seats to be appropriate according to preferences. In case of non-flexible, it is having to spread over 90 degrees to provide communication between people.
- Provide a proper color of light. This tends to help in the clarity between people.

- Reducing different activities that may cause interference prohibiting smooth communication between people.

5.2.4. Identity as a Social Quality

Identity is defined as the sense that users feel by their individual feelings developed by their daily experiences and a wide social interaction (Mahmood, 2018). The place creation process has a great effect on the creation of user's identity and group identity. The individual user and group create their identity to place and how the engage with the place itself (Kyle & Chick, 2007). Researchers see that university campus can lose its social identity due to many reasons: the huge amount of diversity and less community gathering, busy life, dividing the physical spaces of campus and no provision of spaces for gathering. It is important to the campus to allow gathering in order to enhance this social identity of the campus community.

5.2.5. Different Social Distances

In many cultures and societies, people always like to leave a proper distance between other people and themselves. These distances are different in interaction, the condition and the social sympathy for people who working together. The distances are different because of cultures and traditions. These different distances are intimate distances, personal distances, and social distances (Deasy & Lasswell, 1985).

5.2.6. Spatial Separation due to Social Characteristics

People are classified according to the level of community they are belong to. Students in campus are classified according to activities such as athletes, geeks, parties, politicians…etc. Some of these classes are present in all universities, while others are limited to some of them(Adevi & Mårtensson, 2013; Kyle & Chick, 2007). The separation of students in these cases is not healthy and students who can adapt with different levels can easily interact and more social. For example, in the faculty of engineering, Ain Shams University, the social separation of different social groups, one of the courts which close to the cafeteria called "CH" mentioning to Christians. Most Christians are there. It does not mean that students from other religious groups should not present, but it shows the spatial separation because of different social characteristics (Amr, Gohary, & Hamhaber, 2015). Also, at the American University in Cairo, the fashionable students are present in some spots which called "Gucci corner" those students are enthusiast about brands.

5.2.7. Gender Differences Affecting Social Quality

The gender differences depend on whether the university is public or private, the level of community, and the culture of students. According to a study on the University of Jordan, in all spaces of campus, men are the dominant gender while women are having hidden corners than men that shows designers have to provide a proper spaces that suits and be comfort for both of genders (Aydin & Ter, 2008). Now in Egypt, this is not the case in many of the contemporary university campuses. The gender social separation is not existing now anymore. The only difference is the type of activities that a certain type of sex can prefer compared to other sports activities which are not found in many cases.

5.2.8. Public participation and its Impact

According to Relph, he discussed the importance of places regrading to people and it should be constructed through the participation of people who work and live in it (Relph, Seamon, & Sowers, 2014). Generally, people enjoy the feeling of having control on what they live or agreement with. The surveys, observations and interviews are an effective way

to gather data about the users and to get them involved. People can protect and improve the service they get when they are more involved which is a part pf controlling. The participation process is very essential, many of landscape designers refuse it, some suspects have been placed on his proficiency and some have claimed that they can only do it in a very limited group. Others think they are not well trained or adapted to deal with engagement procedures (Thompson, 2008).

5.2.9. The Relation Between Physical Spaces and Social Interactions

According to a study conducted at the University of Jordan, 80% of campus members prefer non-academic outdoor spaces attached to recreational activities. When choosing a majority, the uniqueness of the space is combined with the activities they wish to perform (Aydin & Ter, 2008). Social interactions are improved in utility spaces, such as shade, seats, food outlets, good view ... etc.

To sum up, there are some of recommendations to improve social interaction of students in university campus:

- Visibility and connectivity activities can create a good environment.
- Flexibility and providing seating for dense areas for users will also enhance social interactions.
- Providing a suitable atmosphere and shelter to protect against bad weather conditions is essential for the ease of communication and social gatherings.
- Provide adequate lighting and a suitable color of light to support better communications between users at night.
- Create a balance on campus between the availability of crowded social spaces and spaces that correspond to privacy.
- User participation in designing a campus view is crucial because users can touch and deal with issues that the designer cannot perceive from office.

6. Cognitive Map as a Tool for Measuring Social Interaction

The cognitive map will be used as a tool to determine the level of social interaction in university. The students asked to draw their own cognitive map within their experience of social interaction spots in the campus and it will be applied on a sample of students in each campus. All cognitive map has common errors that will be illustrated in the following table as shown table 1, depending on this percentage of errors, the level of social interaction that students have in each campus will be determined.

Table 1: shows the common errors of cognitive map

Error	Description
Incompleteness	When students draw cognitive maps, they will always have things that are familiar and familiar to them and ignore things they have never noticed or learned.
Distortion	It is also very common. Rarely any student in university can draw a map without any formula of distortion. The size will be overrated or squeezed. Usually those known things are more common, and of course in more detail.
Augmentation	The least common and most confused type of errors. Augmentation happens when something that does not belong there is added. This often happens when someone mixes one place with another and includes elements of both.

7. Research Method

The research adopts multi criteria mixed approach methodology by collecting qualitative and quantitative date and this will be divided into four phases. These phases have been deducted from analyzing the literature review to conduct checklists to be applied by the urban planner to measure the impact academic landscape on the students' social interaction.

Phase 1: analyzing the strategies and goals of academic landscape, Phase 2: discussing the criteria of sustainable academic landscape, Phase 3: defining the exciting academic landscape elements in the university. And finally Phase 4: analyzing the cognitive map errors of the users to show its indication and impact on social interaction. All of phases will be integrated and populated in a checklist as well as each dimension has its sub-dimension and indicators.

8. Discussion and Results

There was no specific application of previous integration in the previous studies. The previous studies were recommended to determine the impact of academic landscape on the students' social interaction, but it required more research and more potential methods to determine the level of social interaction in campus. As long as the strategies of sustainable academic landscape aims to use strategies in a specific situation of the university campus landscape to make the campus more sustainable (Zhang & Schmidt, 2016). Another recommend method set out the goals of optimal design of academic landscape which are combined putting forward the goals of university campus landscape design to the basis of educational goals, social goals, cultural goals, ecological goals and economical goals in order to significant use of each of them to improve the educational function of students (Macintyre, Ellaway, & Cummins, 2002) but it still require more research. Subsequently, the proposed criteria of sustainable academic landscape development that carry out the checklist of sustainable academic landscape consists of three elements which are enviroment, social, and economic. These elements are the main subjects to solve the issue regarding Sustainable Campus landscape (Yunos, 2015). Finally, the method that determined the social interaction elements of sustainable campus landscape applied by studying the relationship between people and landscape (Nassauer, 1995). Therefore, it is important to propose more advanced methods to determine the impact of academic landscape on student social interaction in university.

The contribution of this study suggests a pilot integrated checklist to be used by urban designers for determining the level of students' social interaction in university. The proposed checklist have been deducted from analyzing and integrating the previous studies using the cognitive map as a tool. The method conforms to a relevant study by (Kandasamy & Smarandache, 2003) that made assessment by using the cognitive map. The results divided into four sections as follows;

8.1. *Measurement for the strategies and goals of academic landscape*

There are various strategies and goals0 for the academic sustainable landscape have to be followed to enhance the level of social interaction in the space. The following table will show the checklist that will applied on the chosen case studies as shown in table (2) & (3).

Table 2: shows the checklist for strategies through dimension, subdimension and indicators

Dimension	Sub-Dimension		Indicators	✓
Academic Landscape Strategies	Inheriting the historical culture of campus	Old campus	Protection of campus historical culture	
			Carrying forward the historical humanities spirit of campus	
		Contemporary campus	Applying landscape construction strategy	
			Integration and improvement of cultural enviroment	
	Improving the value of academic landscape	University Spirit (Influence on shaping the ideas of college students)	High Quality	
			Medium Quality	
			Low Quality	
	Creating a Multi-Level Communication Space	Building variety space (Build a three-dimensional multi-level higher participatory communication space)	High variety	
			Medium Variety	
			Low Variety	
	Enhancing the sense of place of campus landscape	Enhance Sense of belonging (The sense of belonging makes students feel pleasure to learn, live, contact, step forward in campus landscape environment)	High Quality	
			Medium Quality	
			Low Quality	

Table 3: shows the checklist for goals through dimension, subdimension and indicators

Dimension	Sub-Dimension	Indicators	✓
Academic Landscape Goals	Educational Goals	Academic performance of students (Enhance the materials of education)	
		Campus enviroment (Enhance the design of campus landscape in order to achieve high academic performance)	
	Cultural Goals	University culture development (Continue in developing the campus to enhance its culture)	
	Ecological Goals	Campus design concept (providing campus with high quality materials and plants)	
	Economical Goals	Low Carbon Society (Applying low carbon society concept that colleges should use all its advantages and apply the concept of low carbon in and out of the campus)	
	Social Goals	Campus Development (keeping campus cultural characteristics, it is significant to strengthen the unique spiritual culture of campus)	
		Behaviour Development (enhance relationship between campus and students	

8.2. *Measurement for the Criteria of Sustainable Academic Landscape Development*

The checklist of sustainable academic landscape consists subjected to the social dimension as shown in table (4).

Table 4: shows the checklist for the criteria of sustainable academic landscape development

Dimension	Indicator	If Applicable on site ✓ / ✖	
Social			
Aesthetic Consideration	An aesthetic pleasing campus garden and landscape Rural		
Outdoor Study	Garden		
	Pocket Garden		
Outdoor activity	Meeting		
	Gathering point		
Health and wellness area	Reflexology path		
	Jogging track		
	Par course station		

	Outdoor gym station		
Amenities for campus communities	Bank		
	Food kiosk		
	Café		
	Convince shop		
Recycling Facilities	Recycle disposal station		
	A recycling programs		
Shaded provided by trees	Cool the campus area		
	Bring shade to the users		
Promote walkable and cycling to campus communities	Reduce carbon emission		
	Protect the enviroment from pollution		
	Compost dry leaves can return the soil nutrient		
	Reuse sewerage water treatment plant for landscape purposes and toilet purposes		
Research and development	Serve as living labs for collaborative research by student, staff and faculty		

8.3. *Classified Checklist the Academic Landscape Urban Design of University*

The checklist was generated from theoretical bases to be applied on the case studies. It will be checked through site observation for the chosen case studies to populate the following check list with (applied, partially applied, not applied, not applicable, & needs deep investigation of design) as shown in table (5).

Table 5: shows the checklist for the academic landscape urban design of university through checked elements and their indicators

Element	Indicators	Campus 1	Campus 2
Spaces	Prevention of space initiation to the outside or at dead spots on campus.		
	Accessibility, functionality and interactivity of spaces.		
	Presence of central space for activities.		
	Consistency of materials, styles and identity of spaces.		
	Presence of spaces enhancing social interactions.		
	Humane proportions of designed spaces. (enclosure and heights)		
	Variety of uses and activities of different spaces on campus.		
	Definition of spaces using buildings or vegetation.		
Facilities	Availability of parking lots at reasonable distances on campus.		
	The presence of special parking lots for disabled people.		
	Provision of low heighted vegetation surrounding parking areas in order not to block vision		
	Provision of deciduous trees on parking islands to prevent heat island effect		
	Flexibility of furniture and durability of materials		
	The use of local materials to produce the site furniture		
	Compatibility of furniture to users' movement without blocking any movement axes.		
	Comfortability and suitability of furniture to different users		
	The provision of adequate amount of light without extras that only consumes energy without being beneficial		
	The usage of LED lights.		
	Availability of buses' and taxis' stops.		
	Carpooling support or availability of access to public transportation.		
	Solution of parking problems (if available) by remote or underground parking.		
	The usage of intelligent lighting or lighting operated by clocks, PV cells or photocells		
Wayfinding	The campus should be divided into zones to facilitate legibility.		
	Provision of landmarks to create memorable points.		
	Provision of sufficient signs and maps in the positions of decision making.		
	Signs should be readable according to regulations		
	Pathways having an ecological value serving the environment.		
	The presence of contrast between the text and the background of signs.		
	The designed wayfinding system has to comply with fire and safety codes.		
	Sustainability of used signs: (Recycled materials- flexibility of fixation and disassembling e.g. bolted rather than welded- efficiency in the number of signs).		

Element	Indicators	Campus 1	Campus 2
Connectivity	Safety of paths. (lighting- accessibility-suitable for disability)		
	Permeability of pedestrian network (short links- numerous intersections - minimal dead ends).		
	Balance between vehicular and pedestrian networks.		
Gateways	Uniformity in the design of different gates.		
	Indicating the presence of the campus (place-marker).		
Pedestrian circulation	Pedestrian are having the priority in campus design of circulation.		
	Pathways varying from 1.52 to 4.5 meters (proportionate to the amount of users).		
	Consistency of visual design of pathways and bypaths		
	Separation or solving of pedestrian- vehicular connections.		
	Pathways having an ecological value serving the environment.		
	Attaching pathways to activities or connection between indoor and outdoor to provide revival and security.		
	Paths should accommodate the accessibility of emergency vehicles.		
	Good protection of pathways according to the climate.		
	Application of "desired lines" concept to make sure that the used paths are the best option.		
Cycling circulation	Provision of bicycle lanes with signs that are minimum 3 meters and of 5% maximum slope.		
	Provision of shading and lighting for night use of bicycle lanes.		
	Provision of bicycle racks at the important spots of the campus.		
	Offering of encouraging facilities of cycling on campus (i.e bicycle services- awareness classes.		
Vehicular circulation	The presence of drop offs at the important spots.		
	The separation of the service circulation from the main vehicular circulation.		
	Roads should support different types of vehicles as buses or trucks.		
	The internal connections between different parking areas to prevent bottle necks for cars' way while searching for parking lot.		
	Provision of narrow and slow roads to provide safe pedestrian movement.		
	Limiting roundabouts and cul de sacs.		
	Highlighting physically the spots of pedestrian crossing.		
	Provision of shared streets including pedestrian, bicycles and cars.		
	Efficient hidden parking lots for garbage and services should be provided.		
	Incorporate ecological solutions to vehicular roads to serve the environmental sustainability.		
Vegetation	The used vegetation has an ecological benefit and supports the ecosystem. (air quality- water consumption and quality- biodiversity- soil quality)		
	The vegetation types are relevant to the site.		
	The use of sustainable, recycled or organic products for cultivation and maintenance.		
	The vegetation types are checked to be not of the invasive types for the site and won't turn into one by time.		
	The vegetation types were checked to be grown on site in a nursery		
	The vegetation are fulfilling design intends.		
	Some vegetation are used to reduce the heat island effect in parking.		
	Using vegetation for the purpose of wind breaking or microclimate modification.		
	Application of phytoremediation concept through used vegetation types to purify collected or recycled water.		
	Protection of useful salvaged vegetation initially present on site (pruning-supplemental watering-mulching-fertilizing- protection against wind). Separation new from old vegetation when re-cultivating		
	Availability of variety of vegetation with different age ranges which reduces the impact of diseases and facilitates the tracking of defects.		
	Keeping enough distances from hardscapes, structures that could affect the vegetation.		
	The provision of vegetation that supports wildlife habitat: (open canopy- flowers or fruits-branches near the ground- diversity of species- disturbance)		

Element	Indicators	Campus 1	Campus 2
Safety	Absence of different types of hazard: Clearance hazard- object hazard- collision hazard- stability hazard.		
	Provision of surveillance or different activities over different spaces.		
	Provision of security systems, cameras and sufficient lighting.		
	Keeping a distance of 4.5 m as defensive distance from any obstacle.		
Identity	Creating an identity through buildings, building elements or colors.		
	Creating an identity through landscape elements.		
	Creating an identity through style.		

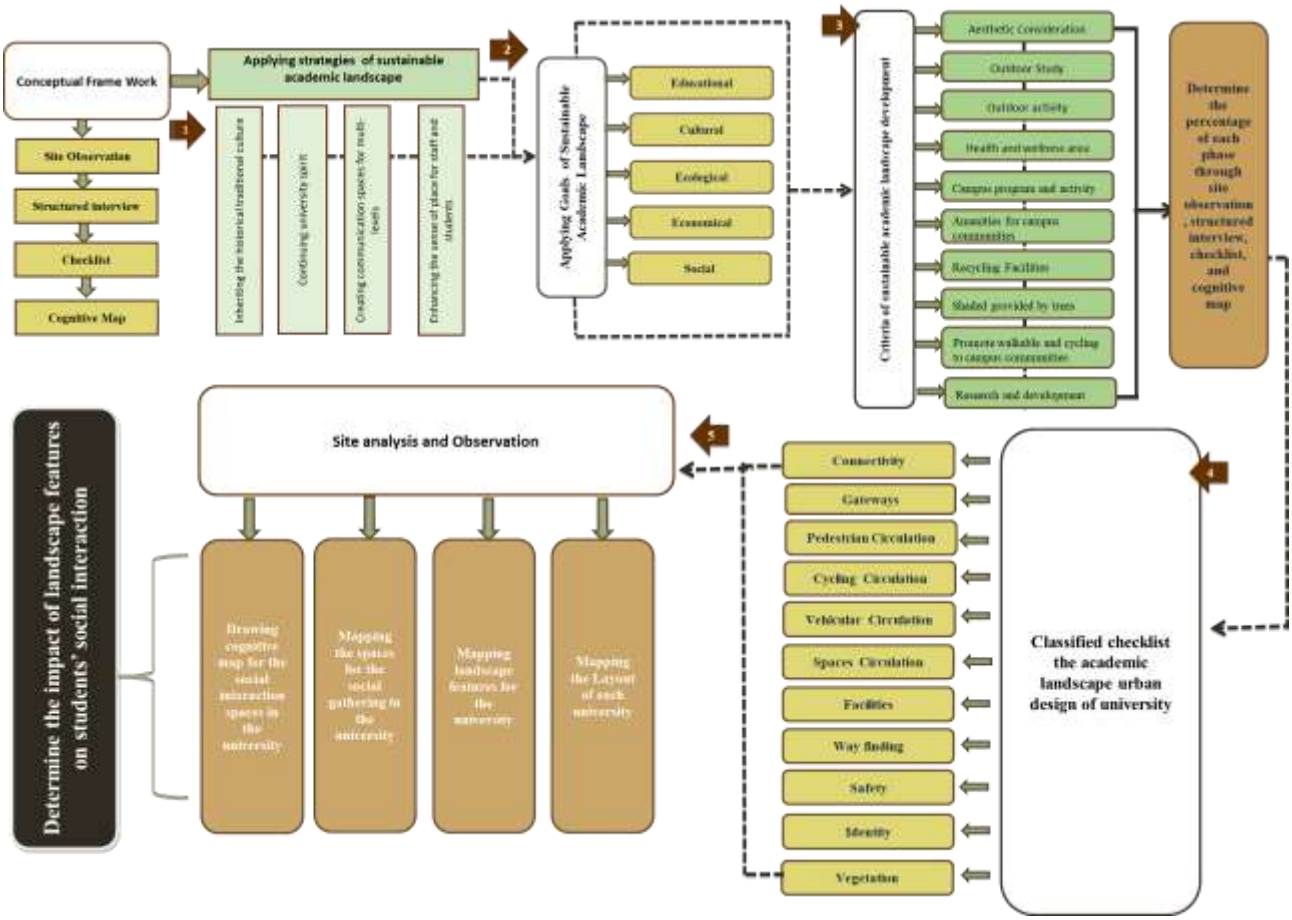
8.4. *Using cognitive map as a tool to determine the social interaction*

From the previous discussion about the errors drawn by the students in the cognitive map, it can be concluded that; if student doesn't mark a certain space of social gathering this means that the space is not noticed for him/her and vice versa. If large number of students draw the same space in different cognitive map with the same importance for the space this means that the space is a landmark for their social gatherings. When there is deformation on the map, this indicates the importance of the space to the students. If the space is drawn over its size, this means that this space is important. When there is a place familiar to the student, he draws it shorter than it is in the real world because there's no impact of space on his social interaction. Spaces with distinctive landscape are remembered much more others and appear much longer on the cognitive map because of the its features.

9. Conclusion

Recent researchers studied the relationship between the users' and surrounding landscape and how this affect the users' behavior. Others categorized the different types of Landscape, and new terminology about Academic Landscape has been appeared to be adopted by the researchers. However, few attempts analyzed the impact of academic landscape on users' social interaction. Hence, this paper attempts to set out an integrated criteria that combined strategies and goals of academic landscape, the criteria of sustainable academic landscape development, urban design elements needed to enhance social interaction and using a cognitive map as tool to measure the social interaction in university together as shown in the figure (1). This considered as a pilot checklist can be used by urban designers to measure the level of students' social interaction and how academic landscape affects this interaction.

Figure1: shows framework for the deducted integrated criteria



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Outdoor spaces spirit and its impact on heritage building

The pillars affecting heritage-building condition

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Abstract:

The heritage monuments are known for their spectacular architecture and cultural value that creates a dynamic, vivacious and exceptional spirit for the surrounding context. As a consequence of that, this sort of buildings usually has the main attention of the government to prevent its deterioration regards to natural disasters and climate changes, whilst the urban space surrounding the heritage building in cities is widely seen as a massive resource that impacts the heritage building condition. The research aims to pinout the importance of the users' activities practiced and urban facilities provided in the urban space to show how the space spirit affect the heritage building. The result contributes towards setting criteria divided into three phases. Phase one will target the users' behavior and how they deal with the space, phase two will target the space urban design and landscape, phase three will observe the historic building and how it is affected by the first two phases. This considers as pilot criteria that can be used by urban designers in order to deduct the main factors that affects the heritage building condition either positively or negatively.

Keywords: Heritage building–positive outdoor spaces - negative outdoor spaces- urban facilities - heritage conservation

1. Introduction

Over the past years, the Ministry of Antiquities of Egypt has done development plans to preserve heritage sites from degradation. Regarding this fact that there is a growing acceptance of the value of historical and monumental buildings by UNESCO, which declared about seven sites in Egypt from 1979 until 2002 to be under its protection. This comes beside the single heritage buildings that listed into the world heritage buildings by UNESCO, especially at the Fatimid Cairo (El-Moez street now) that embedded about thirty historic buildings declared by UNESCO. (UNESCO, 2012).Despite the ongoing studies and strategic plans that aimed to preserve those buildings from deterioration either by the ministry of culture or UNESCO, the threat of the heritage building's condition is linked to other aspects that have not been quite realized yet. The continuous negligence of surrounding urban spaces that surround heritage-building influences negatively on its condition (Lopes, Macedo, Brito, & Furtado, 2019). There is still a gap in understanding the relationship between urban spaces and preservation of the heritage building (Osman 2018)(The impact of urban sprawl on cultural heritage in Herat, Afghanistan: A GIS analysis 2018), Thus in order to take precautions to induces heritage buildings' preservation, the three pillars that shape the urban space must be analyzed and taken into consideration which is Users, Space, and Surrounding building.

Preserving heritage buildings in Egypt usually treats the monuments as single units (El-saeed 2013), since it is believed that natural disasters and climate change considered as the main factors that threaten the building condition. This comes in contrast to the contribution of recent researches that argued the spirit of surrounding urban context and its impact on a heritage building that

includes activities accommodated within the space(Aniss 2014), in addition, the urban facilities provided to these spaces. Accordingly, the research is going to highlight the main pillars that shape the urban space to shows their positive or negative impact on the heritage building.

2. Overview of urban spaces in a historic living city

Urban space is comprising different needs, demands and desires that is essential for people and fundamental of the city's identity (Cattell V1, Dines N, Gesler W 2007) therefore, the lifestyles of people in these spaces have a substantial effect on the usage of spaces whether positively or negatively. This behavior reflects the spirit of the surrounding context, for example, spaces in between heritage buildings, and the yards in front of the entrances of historic buildings as shown in figure (1) and (2). However, the impact of urban spaces is not just limited to peoples' activities. Over time the urban facilities provided within the places are significantly contributing to the identity and spirit of the place. This comes through various facilities, such as the sitting areas that provide a chance for pedestrians, visitors and tourists to enjoy the surrounding context and their journey comfortably, regardless the site is a small heritage area or street (Ramezani et al. 2009). There is no doubt of the massive role of urban facilities provided within urban spaces on the spirit of heritage sites, especially where traditional festivals and local actives taking place (Heidi Dumreicher. 2007). This has been inherited in decades that is considered as the source of the city's liveliness. On the other hand, it is reflecting the culture and heritage spirit of the place worldwide, thus it is encouraging the understanding of the operative system of the city and the way people respond to behave within.

Figure 1 shows people's' activities along historical street

Figure 2 shows people's' activities within heritage buildings' yards

2.1. *The spirit of urban space in perspective of people's' collective memory*

As in the aforementioned paragraph, the spirit of the space depends on different pillars, one of those pillars is the relationship between the collective memory of people and urban space. Mainly the collective memory of users includes the activities and events accommodated within space, and the built environment and natural environment elements exist within the place, which affects the users' activities as well. It is noticed that the activities accommodated by people whether inhabitants or exterior visitors are playing a massive role in shaping the spirit and identity of the space (Ghahremani and Asadi 2013). The activities of public spaces have an important impact due to their contribution to the spirit of the place, besides its impact on the quality of the environment (Design, 2008). In addition, to highlight, the reasons why the exterior visitors seek to visit this space. Thus, the comforting image and availability of certain activities provided to people within urban spaces is the perimeter of evaluating whether this urban space is positive or negative. The daily activities such as sitting, walking and standing differs from person to others and

from context requirement to another. Do people prefer to walk freely without being pushed or disrupted or in separate paths, is there a shaded sitting area provided for preventing potential hazards due to solar radiation or not? (Lak and Hakimian 2019) in addition, the eating and drinking avenues become one of the essential needs of all ages, therefore the mentioned facilities encourage the visitors to repeat their visit to this space and have a good impression in their memory about the experience within the space. Accordingly, this affects the users' cognition map that specifies the most facilities that have their concern and priority

2.2. *The spirit of space based on urban facilities*

The role of urban facilities is considered a large equation, contains two main factors that must be completing each other to bring out sufficient results. As the first factor is social communication which can be defined as providing dynamics areas filled with different facilities for users (Ramezani et al. 2009). The social communication facilities appeared in four physical characteristics. Firstly, the outdoor street furniture, whether benches or chairs or seats should differ according to the age of the user an include disabled people. The seats and benches should be placed at the edges of open space, where the sitters' backs are protected. The street furniture provided is preferred to be shaded by a number of sunshades and to protect people from different weather conditions (Z. Samadi et al. 2012a).

Secondly, The safety standards of urban facilities and security with the help of governmental agencies increase the effectiveness of space, especially towards disabled people and children (Arabi, Saberi Naseri, & Jahdi, 2019). This contributes widely to the effectiveness of social communication of the space, preserving the spirit of the space from peoples' infringements as shown in figure(3),(4). There are various alternatives accelerating the operation of preventing the users' infringements such as putting barriers that block entry of motored vehicles at areas of restricted access which mainly required in heritage urban spaces, where spaces between heritage buildings are too narrow, almost suit pedestrians(Arabi, Saberi Naseri, and Jahdi 2019). Furthermore, the trees and plants, the green elements in heritage urban spaces provide an optical connection between site and buildings, creating psychological comfort and being landmarks within heritage spaces(Stanley et al. 2012).

Figure 4 shows the peoples' infringements of using the between urban spaces of heritage buildings at El- Ghoria

Figure 3 shows peoples' infringements in moez street

Third, the outdoor flooring and electrical features, the floors considered as the linkage between buildings and space, as it represents its identity, function, and activities that occur within the place, whether it is for walking, waiting, cars or for pedestrians (Z. Samadi et al. 2012a) (Z. H. Samadi and Hasbullah 2008). In addition, the urban facilities are responsible for displaying the

richness of buildings' architecture beside creating living spaces in day and night (Arabi et al., 2019), through adopting special lighting devices for the linked areas between heritage buildings and its yards, to encourage the external visitors of enjoying these spaces all day and to prevent these spaces from turning to crime scene. Finally, the positive urban space creates a sense of belonging for external visitors by considering the needs and requirements for those visitors. It also offers them introduction information about the space and clear maps cover the facilities of the space, to reach their destination safely with no need of asking the strangers(Cheung and Hui 2018), hence urban facilities should include direction signs, district map for the external visitors and tourists, besides regional information boards for tourism purposes. Urban Spaces in between historic buildings.

3. Urban spaces between historic buildings

The void in between the solidity of heritage buildings and the spaces lied on its borders is considered within the urban domain space. Therefore, these spaces have spirit and properties that affect the heritage building. The spaces between heritage buildings could be categorized whether positive urban space or negative space (Z. Samadi et al. 2012a).According to the concluded criteria discussed in the previous paragraph, mainly identifying the type of the urban space depend on the urban facilities provided within this space, and the activities accommodated by both the external visitors and inhabitants of the space. Positive urban space should have multifunction activities. It can be identified as an outdoor space with exact plan geometry, provides multifunction activities, acting as a living room space that providing a social linkage between people and the surrounding environment. It also obtains an interactive exercise point such as a photo-taking point in the case of having a landmark point within the space which will contribute to raising the value and visual appropriateness of the whole space (Outdoors 2015). Unlike the negative space that expressed by shapeless space, has neither spirit nor useful sociability purposes. The tangible impact of the negative spaces demonstrates in the visual disorganization, commonly surrounds the buildings that viewed as good structure, thus these structures affected negatively on heritage buildings, in addition, it accelerates its deterioration, regardless they are streets, buildings or both. In conclusion, the negative urban spaces difficult shaping the net geometric form or provided sociable features and lively as shown in figure (5).

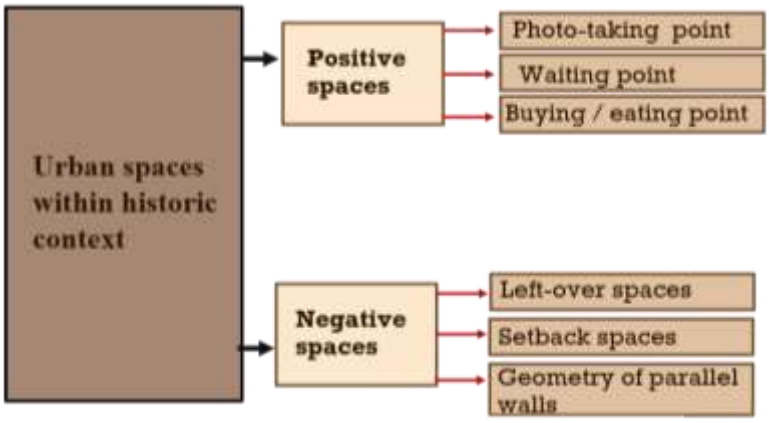

Figure 5 shows the types of urban spaces in historic context

3.1. *Negative urban spaces*

The negative space defined as a wasteland with no major function. These spaces are mainly shapeless and have no geometry shape, thus it provides no spirit to the surrounding environment, and in addition, it considered as a deterioration, abounded spaces and has neither value nor architecture aesthetic. This type of spaces formed around buildings that viewed as positive and iconic. Moreover, it suffers from the absence of safety and accessibility. Although these spaces can be seen as potential for future development and various functions, these spaces still get the least attention of all urban spaces' development plans consideration.

3.1.1. Left-over space

The unplanned space considered one of the reasons that responsible for the existence of space in between buildings; hence, it became a leftover space. Those spaces are a fundamental part of an urban system that can have potentials and threats (Azhar, Gjerde, and Vale 2018), depends on the action plan that will be applied to redevelop these spaces. However, the leftover space defined as lost space that has a negative impact on the environment. This space could be seen in an open park, street or sidewalk or abandoned historic building yards and dockyards (Qamaruz-Zaman, Samadi, and Azhari 2012). These areas classified as uneconomical and considered for any further development. Therefore, the continuous ignorance of the actual implementation that planed by authority to dedicated these spaces for green area, caused infringements by the inhabitants and external visitors, through using these spaces for rubbish disposal or to use it as a shortcut to access to specific neighborhoods or alleys (Cheung and Hui 2018)(Z. H. Samadi and Hasbullah 2008).

3.1.2. The Geometry of the parallel wall

Usually, the geometry and physical size of spaces reflect the activities of those spaces such as the geometry of the parallel wall, which at most of the cases creates too tight space which barely could fit two persons passing by (Z. H. Samadi and Hasbullah 2008). Thus, the alternative function for these spaces is to be for pedestrian and landscaping purposes as all trade functions.

3.1.3. Setback spaces

The setback space is defined as the horizontal separation required between each building or structure to another, according to specific regulations by a local authority (Building Setbacks 2019), although those spaces implemented to maintain the area's character, it is misrecognized as negative spaces. Due to the lack of maintenance provided to those spaces and the misperception, it ended up making the end-users take advantage of those spaces economically by selling goods or collecting charges from the public in return to provide parking lots for them on these spaces. Positive urban spaces.

3.2. *Positive urban spaces*

Positive urban space is defined by its shape as it has an exact plan geometry include various functions and activities, it provides social linkage between people and the surrounding context(Z. H. Samadi and Hasbullah 2008). There are many categories and facilities provided by positive spaces but in this research, it focuses would be on the interactive exercises such as having photo-taking point to enhance the visual appropriateness of the whole space, and the waiting point to create social interaction within its main purpose of meeting the dwells needs or transportation needs.

3.2.1. Photo taking point

Part of urban facilities in historic buildings area is providing a suitable space for visitors or tourists to take photographs and record their experience. These spaces already exist within the street of heritage buildings. Hence, upgrading these outdoor spaces to be a taking photo point will improve the quality space of the area. In addition, it is essential for maintaining the spirit of the space and condition of the buildings, moreover, strengthen the relationship between people and the place (WRI Ross Center 2017) (Z. H. Samadi and Hasbullah 2008), allow the tourists to enjoy the visit safely and prevent harassing them by the local pedestrian.

3.2.2. Waiting Point

The waiting point is considered as one of the important positive spaces provided by urban facilities, in order to meet the dwellers' needs with suitable seating's for different purposes (Z.

H. Samadi and Hasbullah 2008) whether for transportation purposes or as an attempt to improve peoples' interaction with each other. However, there is a unique function that provided by urban design through waiting point spaces in between heritage buildings, known as breathtaking spaces shown in figure(6) (Nefs 2006). This space contains sitting areas to rest and re-energizing for a little time before continuing the tour, considering the comfort of different genders and ages (women, men, the old people, and the disabled). The aim of providing this facility within the heritage context is to remain the interaction between the human soul and the spirit of the surrounding context, to enhance the overall experience of the tour (Sanches 2010). They will end the tour with the same spirit they start with, especially when the heritage buildings are along the street and has open paths. Hence, inserting the waiting seats within the spaces between heritage buildings will emphasize the feel of belonging (*ITU Faculty of Architecture Department of Industrial Design 2005), therefore the function of those spaces will reflect the spirit of the place on visitors.

Figure 6 shows implementation of breathtaking space within heritage buildings yard

4. Relationship between urban spaces and historic buildings

In light of the above-mentioned analysis that showed the peoples' life stylings, activities, and urban spaces facilities role in affecting positively or negatively on the spirit of the heritage spaces, including buildings and landscape. The conservation of heritage is proposed in an attempt to protect the condition of historic buildings and enhancing the abounded areas that mainly be narrow, twisted, or large void span, due to the nature of the old buildings plan that include large yards in front of its entrance. However, these spaces are considered as a possible chance for future development (Harun 2011). Due to the strong impact of peoples' behavior on the surrounding context, the human aspects should be considered while adopting the heritage conservation approach. The expected plan should provide sustainable solutions for the abandoned spaces that surrounding the heritage buildings, in which support the social and functional diversities (Bolici, Gambaro, and Giordano 2017). There is a need for integrating the people's needs and requirements within the spirit of heritage context, as it is considered one of the pillars to obtain effective heritage conservation. Conservation defined as the retention of the existing buildings without altering or destroying the architecture and its character. Conservation also guarantees the protection of the open spaces that surround the building as well. The challenges that slowing the conservation process should be identified as much as possible. This is a massive procedure for prolonging the life of the building while respecting the existing structure and character of the building. "Without the understanding and support of the public at large, without the respect and daily care of the local communities, which are the true custodians of world heritage, no amount of funds or army of experts will suffice in protecting the cites." —Mr. Koïchiro Matsuura, Former Director-General of UNESCO.’’

In the end, the following graph summarizes the aforementioned content.

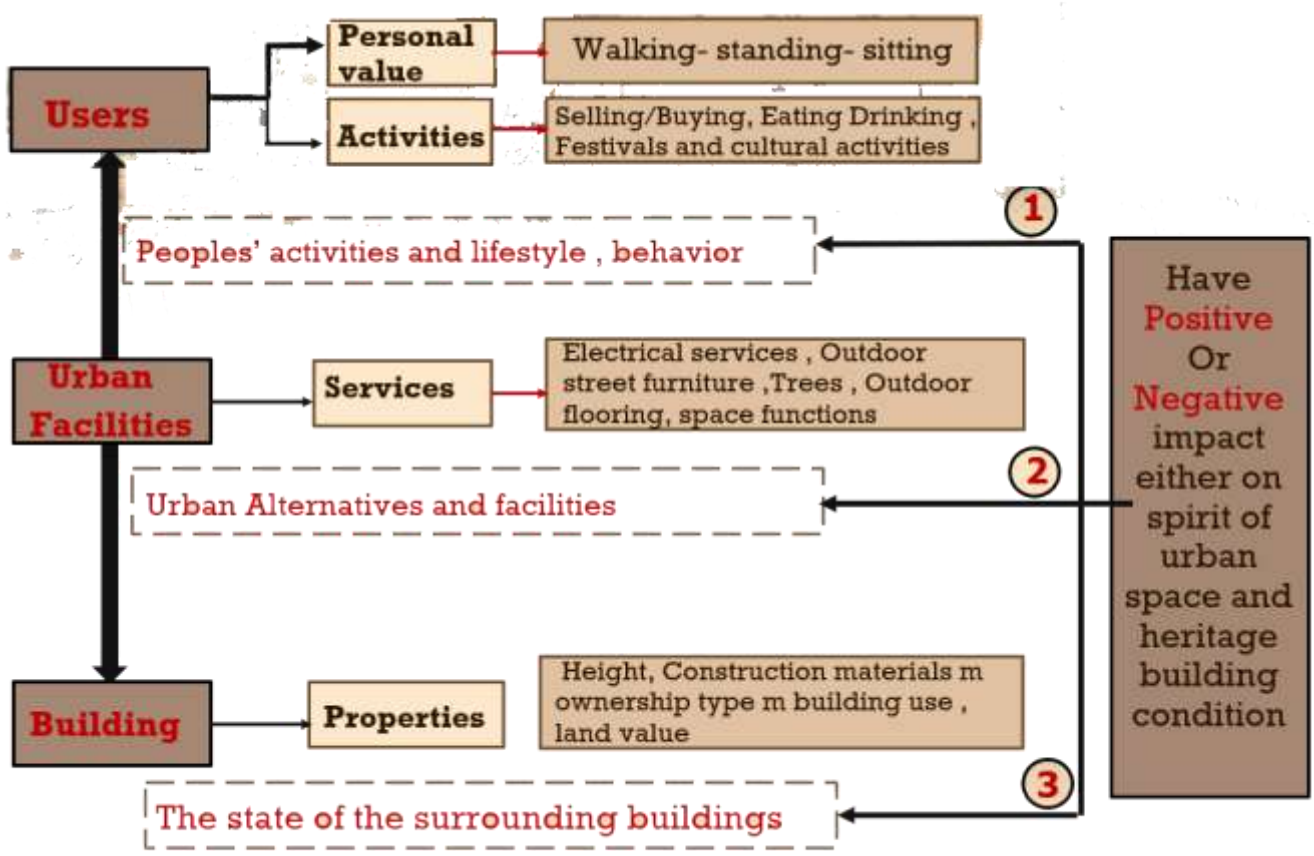

Figure 7 shows the three pillars affecting the spirit of urban space

5. Heritage Buildings conservation

Since the main target of the heritage building conservation is to prolong the life of historic buildings (General 2013), it also requires different needs according to its current condition and its evaluated grade system. There are various conservation actions that could be applied which are preservation, restoration, reconstruction, adaption, and rehabilitation or a combination of more than a method (Mbbl 2004). The decision of choosing which method should be applied to conserve heritage building is based on both cultural and historical concerns, as well as the uniqueness of its architecture. It also considers the techniques and materials used as the main priority in conservation progress (Harun 2011). However, if there is a lack of awareness and understanding of the need for preserving the architectural facades, in addition, the importance of bringing the harmonious relationship between past and present, this will end up failing any accommodated conservation method (Aniss 2014). Hence, there is the main categorization should be followed to choose the most suitable method in preserving heritage building based on its grade system as shown in the following table.

Table 1 The Heritage building grading categories. Source: Researcher

	Grade (I)	Grade (II)	Grade (III)
Definition	Include buildings of importance of historic and national that embodying high level in architectural style, designs, aesthetics details and material usage, these buildings may be	include buildings that of importance of local and regional although it has lower scale than grade (I), it has special architectural style, aesthetic and contribute in the	The importance of these buildings related to townscape, as it can be seen through identify the character of locality which represent the lifestyle of specific community, it is lower

	related to great historic event or personality and remain as prime landmark of the area	culture and identity of the area these buildings refer to work of craftsmen or ornamentation to be suitable for the climate of the location	than grade (II) but it enjoys the architecture style and/or special character by facades unity or height or width
Objective	Highly Deserves preservation	Deserves intelligent and creative conservation	It needs special protection to its unique features with an intelligent application
Scope of changes	The interventions of exterior or interior of the historic building will be permitted only in necessary case, as the main purpose of these procedure to prolonging the life of the building and strengthen it, hence both minimum and essential changes will be allowed with providing output results that look as much as the original	It allowed the internal changes and/ or adaptive re-use but under strict scrutiny, ensuring careful conservation of special aspects for what listed in heritage grade (II) .Moreover, at some case the extension or additional of modern buildings in the same plot of the area could be allowed but it can't be detract from the facades and height of the existing heritage buildings	
Procedure	The permission of development changes will be given based on the heritage conservation committee advice	The same procedure of grade (I)	The same procedure of grade (I)
Surrounding development	All development related to the surrounding of the grade (I) heritage buildings will ensue that it doesn't affect the view or grandeur of heritage thus it should be carefully controlled	The same consideration of grade (I)	The same consideration of grade (I)

6. Research Method

The research adopts multi criteria analysis method using both qualitative and quantitative data. These data have been deducted from analyzing the literature review to evaluate the common positive and negative aspects exist that affect the spirit of urban space and heritage building. The method divided into three phases, the first phase will target the users' behavior within the space, the second phase will deal with the urban facilities and designed landscape within the space. Finally, the last phase will tackle the heritage building condition and how it is affected by the first two phases.

7. Discussion and results

There was no certain consideration of highlighting the link between the urban space facilities and people's behavior within heritage preservation precautions. There was an integration of the outdoor space spirit in between heritage building and its impact on heritage building conditions that its aim is to identify the negative spaces surround the heritage building and revitalize these spaces(Z. Samadi et al. 2012b) (Z. H. Samadi and Hasbullah 2008). Although it has been argued that the people's activities play a massive role in the spirit of the space (Lak and Hakimian 2019)(Cheung and Hui 2018), but it is still leaving a gap in integrating the urban facilities of the space and users behavior role in heritage building preservation. This gap aims to deduct the impact of both spirit of outdoor spaces in addition the people's behavior and activities accommodated within the space on the heritage building condition. In addition, there was an integration of studying

and analyzing the impact of the surrounding buildings on heritage building condition in terms of its heights, ownership type, the construction materials used, and the main use of the building (Yunus et al. 2013). This type of integration has not been used or adopted with a strategic preserve heritage building. Therefore, it is necessary to introduce more advanced integration, which considers the urban space facilities, users' activities, and surrounding buildings within heritage preservation process.

The contribution of this study suggests criteria to be used in identifying the main aspects, which impact the heritage building conditions. The deducted criteria combine the three contributions affecting heritage building conditions and the spirit of urban space, which are the users' behavior, urban facilities, and surrounding buildings.

7.1. *Users sample (activities)*

A shown in table (2) The various activities that include the daily ones, social, cultural are contributing to shape the users' image and memory of the place. Thus, these activities will be evaluated through the following table

Table 2 Users sample include various activities

Characteristics/Functions rooted in urban space	**Sub Functions**	✓	✗
Active space	-Selling & buying spots -Celebratory (yearly- monthly -weekly events (traditional/culture) -Reading spots -Eating &drinking venues		
Comfort Image	-Waiting points (tourists-inhabitants) -Barriers that block entry of motored vehicles, and other barriers to block entry to areas of restricted access -shaded pergolas, chairs, benches -Safety in evening -Cleanness -Green -Pedestrian footpath suitable for all ages		
Sociability	-Regional information boards for touristic purposes, special introductions -Information booths and stands that belong to building complexes -Street life reflect the spirit of the surrounding context		

The following developed tables target the personal image value of users dividing it into two categories the inhabitants of the selected area and the external visitors to evaluate the impact of the

daily activities on the concluded criteria, the age and gender of both will be considered in the evaluation method.

Table 3 walking activity sample

Walking activity	**Age**			**Male**	**Female**	**Total**
Walking freely without being pushed or disrupted	**20-30**	**35-50**	**50-65**			
Mothers with baby carriage are freely moving						
Handicap moving freely						
Users prefer a separate path for walking away from residential units						

Table 4 sitting activity sample

Sitting activity	**Age**			**Male**	**Female**	**Total**
Users prefer to use moveable or stable benches	**20-30**	**35-50**	**50-65**			
Users prefer orientation of the benches face the space / building						
Users prefer finding seats in between narrow historic buildings space for spirit experience						
Other places the users prefer to sit rather than benches						

Table 5 standing activity sample

Standing activity	**Age**			**Male**	**Female**	**Total**
Standing under shade	**20-30**	**35-50**	**50-65**			
Standing next to columns						
Standing in the transitional zone between one space and the next buildings' space for spirit ex						
Other places the users prefer to sit rather than benches						

As a completing for the phase that tackle the users' impact on the spirit of urban space, showing in the following series of open-ended questions for the interview with both inhabitants and external visitors, who were selected based on an accidental sampling.

Table 6 Inhabitant questionnaire sample

Gender: Female / Male Age: Period of residence: Native / 2-10 years / More than 10 years
Do you think this place is Comfortable ☐ Safe ☐ Welcoming ☐ Clean and well maintained ☐ Palace where it easy for visitors to find services, names of sub-roads, information about the place without asking the pedestrian ☐
Of the six statements above, which do you feel could be most important? and why?
Are you ….? Very satisfied 1 Satisfied 2 Non-satisfied -1 Extremely not satisfied -2 The design of the garden & services provided pleases me as it is ☐ I like the design / services, but it can be improved ☐ Doesn't please me, must be changed ☐ Doesn't please me, preventing your presence and visiting this place again ☐ I don't like it; it doesn't encourage me to sit/ rest in it ☐
According to the nature of the place that is considered a tourism spot /spot for external visitors, did this influence the economic activities & needs of you in positive, negative way? why?

Table 7 External visitors questionnaire sample

Place: Gender: Age:
Why do you visit the …… ? To have sightseen walk ☐ To rest/Meet someone ☐ To buy souvenirs ☐ For school/study purposes ☐
How Long do you stay in …… ? From 10-30 Minute ☐ 1 hour ☐ From 2-6 hours ☐ All day ☐
How many times do you visit the …… ? 1 time a week 1- 2 times in month 1- 2 times if more than 2 times in month/ year did you notice any improvement in the services? When do you prefer to visit the …. ? Yes ☐ No ☐
What are the most memorable events which take place in .... ?
Do you find conflicts in the…. ? which ones? why?
Do you think that the place adapts to the change of users?
From your point of view what are the positive and negative aspects of … ? what do you want to change or add to the place?

7.2. *Space (urban facilities)*

In this phase the on-site observation will be taken with wide scope by scanning the plan of the space exploring the facilities provided and the associated activities, hence all the targeted urban facilities will be classified in the following table.

Table 8 Classification of urban facilities sample

Main element	**Sub Elements**	✓	✗
Electrical services	Enough artificial light columns Covered indoor spaces Covered outdoor spaces		
Outdoor street furniture	Exist Good distance between each seat Suitable for old people Concern handicapped people		
Trees & Plants	Exist Good distance between each Tree Its place well-chosen Exploit for seat shading		
Outdoor living room	Suitably located toilet cabin ATM cabins garbage cans venue for food and drink Markets Direction signs and information, boards, maps, signs		
Outdoor flooring	Footpaths physical character suitable for surrounding context Footpaths physical character suitable for old people Footpaths physical character suitable for mother's children cars		

As it has been noted most dominate activity in the heritage urban space is commercial activity such as markets the selling and buying. its time classification and function classification will be identified in the following table.

Table 9 Classification and function of the existing markets

Time		**Function**		**Urban Form**
		Specialized	Non-Specialized	
Seasonally				
Monthly				
Weekly				
Daily				

7.3. *Surrounding Buildings*

Mainly the most urbanization impact analyses focus on changes related to the total amount of the selected land area but since this study is about the effect of this urbanization on the heritage buildings therefore this phase depends on field observation with help of photo documentation of the researcher with the help of the following checklist.

Table 10 the checklist of surrounding buildings condition

ID	Building Height	Num of occupants	Land value	Ownership type		Building Use			Construction materials	
				Owned	Rented	Residential	Commercial	Mixed	Match the heritage context	Doesn't match

7.4. *Heritage building condition sample*

The lack of paying attention to the impact of urban space spirt and peoples' behavior on heritage-building condition is accelerating its deterioration. Hence, after evaluating the aforementioned pillars that contribute in heritage building condition, the following table will be used for the field observation to observe the current condition of the heritage building and investigate if that pillar influence the heritage building positively or negatively.

Table 11 checklist of heritage building condition sample

Building ID	Type		Function	Grade	Building condition		
	Monument	Complex		I II III	Boundary	Exterior façade	Landscape features
					Abounded- Active	Good- Fair- Poor	Walkway Plants

8. Conclusion

the Egyptian antiquities is looking forward to encouraging heritage resilience through adopting preservation strategies and developed plans to eliminate heritage deterioration by 2050. However, there are very few studies attempt to identify both negative and positive impact of the urban spaces spirit on heritage building preservation. Hence, this paper attempts to fill this gap, as it investigates the peoples' behavior and urban facilities in addition surrounding buildings as a pilot criteria proved foreseen outcomes out of the site observation to highlight the main aspects that affect positively or negatively on spirit of urban spaces. Therefore, observing how far the suggested criteria affected the heritage building. This considered as pilot criteria that can be used by urban designer to pinout the factors affecting the heritage building condition as well as identifying the positive and negative urban spaces as shown in figure (8).

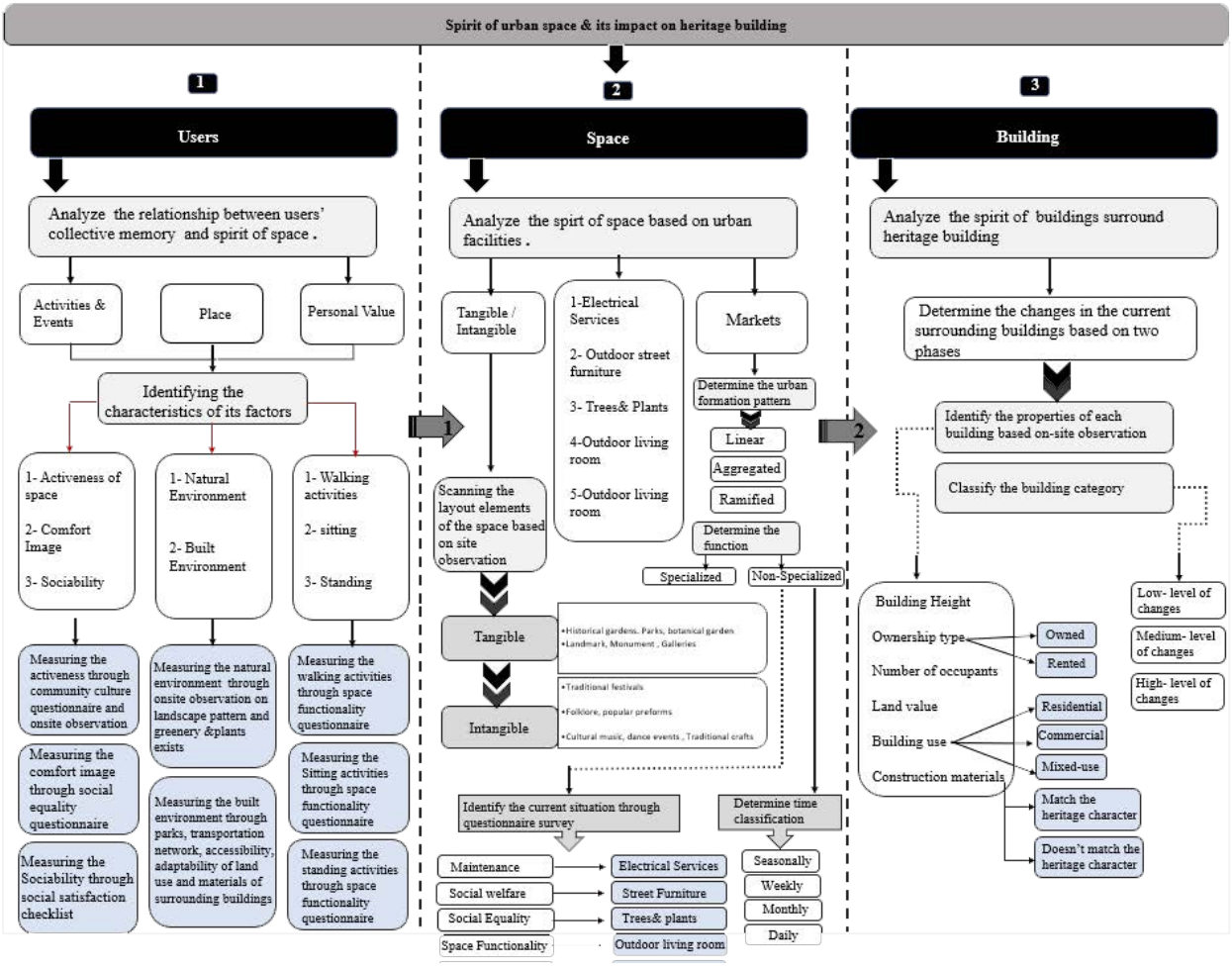

Figure 8 Deduced method chart

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Assessing Sustainable Neighborhoods Concept in Egypt

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Abstract:

Neighborhoods face various urban challenges and risks that has a great impact on the environmental, social and economic development currently and in the future. Different rating system have been developed by developing countries and relevant to the rapid urbanization such as BREEAM Cities, CASBEE for Urban Development, Estidama Pearl Neighborhood Development, DNGB Urban Districts, Green Star Communities, LEED for Neighborhood Development and STAR Community to foster sustainable city and urban development. Since the start of the 21st century, developed countries are utilizing neighborhood sustainability assessment methods to assess their progress in meeting sustainable development targets. In Egypt no formal assessment method has been implemented till now to assess the construction and development of neighborhoods. The research aims to develop a neighborhood rating system criteria for the following three categories, Site selection, Water and Energy. The results deducted a pilot checklist for the for-mentioned categories that suits the Egyptian Context and can be applied by planner in Egypt.

Keywords: Neighborhood sustainability assessment tools, Sustainable Design, site selection, Energy Management, and Water Management.

1. Introduction

Cities and community are an interconnected system. It is extremely vulnerable to treats from natural disasters and hazards, subsequently the retention and adjustment to them through strength are exceeding essential to guarantee the operation and upgrade of urban framework (Fatani, Mohamed, & Al-Khateeb, 2017). Sustainability is the practice of reducing or eliminating environmental impact and improving quality of life for communities(Sharifi & Murayama, 2013). The Community rating system is an International standard that is implemented in the early stages of urban planning and design. It provides a comprehensive structure with key target goals which strengthens the understanding of and effect on the long-term ecological, social and economic aspects of development by decision-makers.in the developed countries they started to use the neighborhood sustainability assessment tool to achieve their goal for sustainable community and this will make a great impact on the environmental social economic aspects(Park & Rogers, 2015). Although, In Egypt no formal rating system assessment criteria has been developed to assess the neighborhood sustainability planning models. Hence, Egyptian urban planners should adopt to use suitable rating system that suites the Egyptian context. As it has been widely believed that applying the rating systems in planning new communities improve environmental, social, and economic aspects. As the

national current urban planning do not maintain sustainability aspects and the future plans seems to lack a theoretical base for such practice.

2. Overview of neighborhood sustainability assessment tools

A neighbourhood is a key component of a city and a good starting point to build a more healthy society. In last two decades, the interest over environmental sustainability and ranking of buildings has rapidly(Diaz-Sarachaga & Jato-Espino, 2019). Increased so some countries all over the world, projects have been initiated to build the path to making communities sustainable and several methods have been created to evaluate the viability of the proposals and their progress in the pursuit of development, recognizing the importance of neighbourhoods as a frontline in the fight for sustainability (Park & Rogers, 2015). Neighbourhood Sustainability Assessment (NSA) is a method for measuring and analyzing community performance with a set of standards, to measure the success of communities in their approach to sustainability objectives (Doussard, 2017). There are many methods for analyzing urban communities such as BREEAM Cities, CASBEE for Urban Development, Estidama Pearl Neighborhood Development, DNGB Urban Districts, Green Star Communities, and LEED for Neighborhood Development.

2.1. *LEED*

In 1998, the United States ' Green Building Council (USGB), the Agency containing leaders of business, academics and policy, unveiled the first project Leadership in Energy and Environmental Design(Doussard, 2017). A rating system for neighbourhood planning and development certify that exemplary development projects that perform well in intelligent growth, New Urbanism and green infrastructure and building(Clouston, Hoque, & Fisette, 2008). It emphasizes the selection, design and construction elements of a site that combines structures and infrastructure into one neighborhood and connects the neighborhood to its landscape, local and regional contexts. It covers seven categories as shown in table (1) and figure (1):

Table 1 LEED categories and weighting

Categories	LEED%
Sustainable Sites	24.5
Water Efficiency	5.5
Energy and Atmosphere	33
Materials and Resources	13.5
Indoor Environmental Quality	14
Innovation in Design	6.5
Regional Priority	4
Management	NA
Integrated Design Process	NA

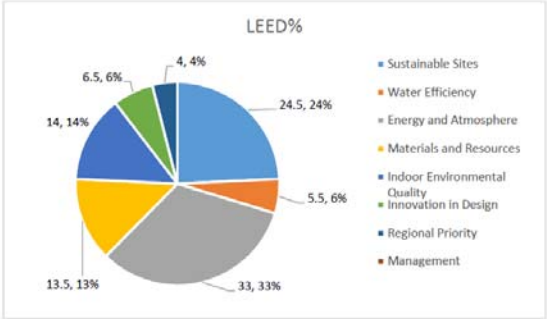

Figure 1 LEED categories and weighting

- Smart Location and Linkage
- Neighbourhood pattern and Design
- Green Infrastructure and Buildings
- Innovation and Design Process
- Recognizes exemplary and innovative performance
- Regional Priority
- Innovation in Design

2.2. *BREEAM*

The Building Research Establishment Environmental Assessment Methodology (BREEAM) was established in the UK in 1988. Throughout 2011, BREEAM is dedicated to increasing the community of stockholders that will contribute, both geographically and at local level(bream, 2012). This ensures by integrating sustainable design into the master planning process to improve, measure and certify the social, environmental and economic sustainability of large-scale development plans(Bernardi, Carlucci, Cornaro, & Bohne, 2017). It covers six categories that are shown in table (2) and figure (2):

- Governance (GO)
- Social and economic well-being (SE
- Resources and energy (RE)
- Land use and ecology (LE)
- Transport and movement (TM).
- Innovation (Inn)

Table 2 BREEAM categories and weightings

Categories	BREEM
Sustainable Sites	20.5
Water Efficiency	2.5
Energy and Atmosphere	33
Materials and Resources	13.5
Indoor Environmental Quality	13
Innovation in Design	6.5
Regional Priority	
Management	12
Neighborhood Pattern.	
Sustainable Buildings.	
Integrated Design Process	

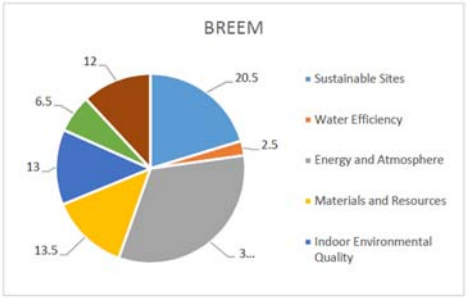

Figure 2 BREEAM categories and weighting

2.3. *ESTIDAMA (PRRS)*

Launched in May 2008, it is Abu Dhabi's contribution to the global debate on how to create sustainable communities, cities and enterprises, which means' sustainability' in Arabic(*The Pearl Rating System for Estidama Community Rating System*, 2010). The Executive Board Order of May 2010 states that the 1 pearl standard starting in June 2.010 is to be complied with all proposed community developments.it must be compatible with the respective Plan 2030(Bin, Rahim, Mohammed, & Baqutayan, 2015). It covers seven categories as shown in table (3) and figure (3):

- Integrated Development Process
- Natural Systems
- Livable Communities
- Precious Water
- Resourceful Energy
- Stewarding Materials
- Innovating Practice

Table 3 PRRS catacories and weighting

Categories	PRRS
Sustainable Sites	16
Water Efficiency	25
Energy and Atmosphere	25
Materials and Resources	16
Indoor Environmental Quality	20
Innovation in Design	
Regional Priority	
Management	
Neighborhood Pattern.	
Sustainable Buildings.	
Integrated Design Process	7

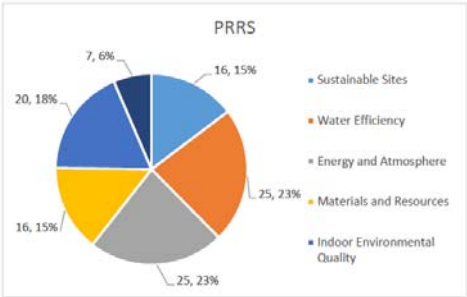

Figure 3PRRS catacories and weighting

3. Research Method:

The research method divided into two phases, phase one conduct a comparative analysis between the three rating systems (site selection, energy, water) to choose the most important categories the research will analyze. Phase two address three main categories concluded from phase one (site selection, energy, & water), and illustration for the credits of each category have been conducted. A proposed a checklist for the above for mentioned categories including its credits and requirements.

Phase 1:

As shown in the previous discussion the three rating system have different weights and Priorities,(El-hafeez, El-mokadem, Sallam, & El-mowafy, 2014) some of them have different categories than the other the priorities of the categories in four phases as shown in table (4):

1. High priority (From 40%-30%).
2. Medium priority (From 30%-20%).
3. Low priority (From 20%-10%).
4. No priority (Under 10%).

Table 4 the pirority of catagories

Categories	LEED%	priority	PRRS	priority	BREEM	priority
Sustainable Sites	24.5	Medium	16	Low	20.5	Medium
Water Efficiency	5.5	No priority	25	Medium	2.5	No priority
Energy and Atmosphere	33	High	25	Medium	33	High
Materials and Resources	13.5	Low	16	Low	13.5	Low
Indoor Environmental Quality	14	Low	20	Medium	13	Low
Innovation in Design	6.5	No priority	NA	N/A	6.5	No priority
Regional Priority	4	No priority	NA	N/A	NA	N/A
Management	NA	N/A	NA	N/A	12	Low
Integrated Design Process	NA	N/A	7	No priority	NA	

Based on this comparison is that In Pearls, the priority is obviously given to **water conservation**, which goes beyond LEED and BREEAM. This is at the cost of the large **energy mortgages**, which account for a smaller proportion of the rating system than in LEED and BREEAM (24% less). This is also at the price of Site Selection grants and investment, which are lower in Pearls than BREEAM and LEED. This is due to that the most important elements of the rating system are national environmental issues. There is a shortage of one or more commodities in every part of the world. Countries in a desert area like the Middle East suffer from lack of water and warm weather that require cooling systems. Nevertheless, they have plenty of energy. Europeans and North America, on the other side, suffer from electricity shortages more than water resources and have cold weather, which needs heat facilities. In fact, the global warming opportunity (GWP) and ozone depletion potential (ODP) are undergoing worldwide. It ensures that any region in the world has unique credits in its rating system that assess the environmental goals and challenges. Furthermore, it will have general credits that serve the global challenges in its program.

Phase 2:

It is concluded that the priority and important categories of the previous mentioned rating systems are (site selection, energy, and water).so illustrating the different categories and its points are shown in the following tables (5), (6), (7):

Table 5 site selection rating system illustration

Category	LEED		BREEAM		ESTIDAMA	
Site Selection	Credit Title	Points	Credit Title	Points	Credit Title	Points
	Smart Location	R	Ecology strategy	1	Natural Systems Assessment	R
	Imperiled Species and Ecological Communities	R	Land use	3	Natural Systems Protection	R
	Wetland and Water Body Conservation	R	Enhancement of ecological value	3	Natural Systems Design and Management Strategy	R
	Agricultural Land Conservation	R	Landscape	5	Reuse of Land	2
	Floodplain Avoidance	R			Remediation of Contaminated Land	2
	Preferred Locations	10			Ecological Enhancement	2
	Brownfield Remediation	2			Habitat Creation and Restoration	6
	Access to Quality Transit	7			Food Systems	2
	Bicycle Facilities	2				
	Housing and Jobs Proximity	3				
	Steep Slope Protection	1				
	Site Design for Habitat or Wetland and Water Body Conservation	1				
	Restoration of Habitat or Wetlands and Water Bodies	1				
	Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	1				

Total		28		12		14

Table 6 Energy rating system illustration

Category	LEED		BREEAM		ESTIDAMA	
Energy	Credit Title	Points	Credit Title	Points	Credit title	Points
	Minimum Building Energy Efficiency	Obligatory	Energy strategy	11	Light compliance	R
	Building Energy Efficiency	2	Existing building sand infrastructure	2	Energy monitoring & reporting	R
	Existing Building Reuse	1	Sustainable buildings	6	Renewable energy technologies	1
	Historic Resource Preservation and Adaptive Use	1	Low impact materials	6	Energy – educational learning	1
	Minimized Site Disturbance in Design and Construction	1	Resource efficiency	4		
	Heat Island Reduction	1	Transport carbon emissions	1		
	Solar Orientation	1				
	On-Site Renewable Energy Sources	3				
	District Heating and Cooling	2				
	Infrastructure Energy Efficiency	1				
	Recycled Content in Infrastructure	1				
	Solid Waste Management Infrastructure	1				
	Light Pollution Reduction	1				
Total		16		30		2

Table 7 Water rating system illustration

Category	LEED		BREEAM		ESTIDAMA	
Water	Credit Title	Points		Points	Credit title	Points
	Minimum Building Water Efficiency	obligatory	Water pollution	3	Water efficiency	R
	Building Water Efficiency	1	Water strategy	1	Water monitoring & leak detection	R

	Storm water Management	4	Rainwater harvesting	3	Storm water management	R
	Wastewater Management	2			Improved water efficiency	1
	Water-Efficient Landscaping	1			Water features	1
					Improved Storm water management	1
					Water – educational learning	1
Total		8		7		4

4. Discussion and Results:

Aforesaid there are different way of implanting neighborhood rating system correspondingly neighbourhood development and urban development and communities development and on large scale city development(Haapio, 2012) .there are some studies that study the rating system and their categories and credits and requirements and discuss the different between different rating systems add who each of them achieve the concept of the sustainability . In recent studies, their made a comparison between LEED, BREEAM AND ESTIDAMA .they compared between the categories and the process and The comparison shows that while Pearls Rating System has many parallels with the LEED and the BREEAM rating systems, it is an independent rating scheme. In addition to other inspiring sources Estidama seems to have selected some elements from the two systems, yet developed a very progressive system that is clearly local. The degree to which a program with such a high bar will be used on the market is still to be decided as project teams interact with the system(Karim Elgendy, 2010.).In other studies, they used LEED-ND and the green pyramid for the building to make a proposed green neighbourhood rating system with categories and requirements it concludes the rating system proposed develops the GPRS for a neighborhood scale. It addresses all of its components in the neighborhood to ensure that every item reduces energy consumption and achieves sustainability. Connecting all components to create a city that allows effective use of renewable energy sources(El-hafeez et al., 2014).

The contribution of this study proposed a neighborhood rating system that suits the Egyptian context with highlighting only three categories site selection, energy and water. The proposed checklist address the credits and requirement of each category.

4.1. *Site selection category*

A sustainable site plan has the least impact on environmental issues while meeting the business goals of citizens. It is not sustainable if it stores only half of the vehicles expected to be used for the project and costs twice the number predicted. Site selection can significantly affect a project's environmental impact. Selecting a location must consider certain basic criteria. Proposed six categories:

- Site location as shown in table (8)
- Habitat conservation as shown in table (9)
- Agricultural land and water conservation as shown in table (10)
- Disaster avoidance as shown in table (11)
- Reuse of Land as shown in table (12)
- Sustainable Transport and Connectivity as shown in table (13)

Table 8 site location requirements checklist

Site location	Points
Locate the project at an existing water and wastewater facility site	
Locate the project within the publicly owned and legally adopted area	
Total	

Table 9 Habitat conservation requirements checklist

Habitat conservation	Points
Identify and monitor, according to the best available scientific information, the habitat and the correct barrier, not under 100 ft. (30 meters)	
Analyze technology risks and establish a control and management strategy that removes or dramatically decreases challenges when the on-side defense can be achieved	
Protect the habitat and reserves established for life by contributing or selling land or land management services to an authorized land trust, environmental group or government agency	
Total	

Table 10 Agricultural land and water conservation requirements checklist

Agricultural land and water conservation	Points
The project does not disturb soils and agricultural opportunities.	
Water bodies is not affected or damaged by new development.	
Total	

Table 11 Disaster avoidance requirements checklist

Disaster avoidance	Points
Sites without Flood hazard Areas Location which is entirely outside of any region of flood hazards on the flood danger map that is legally adopted or otherwise designated by the local authorities or by the Government.	
Projects located outside of any floodplain without a legally adopted flood hazard map or official designations are subject to 1 % or more of a chance of flood in any given year.	
Total	

Table 12 Reuse land requirements checklist

Reuse land	Points
Describing existing construction or adjacent land uses identifying existing structures and hard-country areas.	
Plan drawing on site (or an aerial photograph, including a graphic scale) of new or earlier development, which shows the proposed development boundary.	
Calculations indicating that at least 75 percent of the new site area has been built previously.	
Total	

Table 13 Sustainable Transport and Connectivity requirements checklist

Sustainable Transport and Connectivity	Points
Provide the site's pedestrian walkways and access points and key amenities to: Public transit stations situated on and near the site	
Provide secure crossing points for footpaths crossing streets in the region. Bicycle Parking Include convenient bicycle parking facilities according to the table within 30 meters of the main entrances and major facilities located on site.	
Having a nave at least 1.5 m long behind any of the appropriate bike parking areas so that bicycle maneuvering room can take place (where the parking space is adjacent to the sidewalk, the maneuvering area will touch the right)	
Total	

4.2. *Energy*

Positive energy neighborhoods are areas where annual urban energy consumption is less than annual energy supplies. Our energy infrastructure is, and contributes to, the efficient operation and stability of larger energy networks. The aim is to encourage the incorporation of sustainable distributed power generation into larger electricity networks and provide the lowest possible energy demand and environmental impact to an efficient, healthy, and user-friendly environment. Proposed five categories:

- Renewable Energy as shown in table (14)
- Energy Monitoring & Reporting as shown in table (15)
- Lighting Compliance as shown in table (16)
- District Heating and Cooling as shown in table (17)
- Infrastructure Energy Efficiency as shown in table (18)

Table 14 Energy Monitoring & Reporting requirements checklist

Energy Monitoring & Reporting		Points
Demonstrate that total energy usage is estimated in the site and that clearly-labeled energy sub meters that can track energy minimum are easily accessible	1)External lighting	
	(2) irrigation	
	(3) houses or building groups	
	(4) energy-generating devices on-site	

	(5)Ended 10 kW automated dispensing screens	
Only one power sub meter is needed for projects of less than 25kW with a complete linked load		
Buildings with their own power supply link are exempt		
Total		

Table 15 Renewable energy requirements checklist

Renewable energy	Points
Demonstrate that the viability of photovoltaic (PV) and solar thermal systems was tested at the concept design stage	
To Demonstrate that 50% of the total annual demand for outdoor lighting (kWh) from PV system(s) is to be made	
To demonstrate that 50% of the annual total consumption of energy from solar thermal systems (kWh) is to be produced. Specific sources of sustainability may be suggested	
Total	

Table 16 District heating and cooling requirements checklist

District heating and cooling	Point
Include a district-heating and/or cooling system for air conditioning of new buildings and/or water heating (at least two building blocks total) so that a local facility is responsible for at least 80% of the project's annual heating and/or cold consumption. The estimate may exclude single family homes and existing buildings of any kind	
Total	

Table 17 Lighting Compliance requirements checklist

Lighting Compliance	Points
an astronomical time switch or a p photocell is required for every lighting scheduled for dusk-to-dusk service	
All lighting not for dusk-to-dusk service shall be operated by either combining a photocell and a time switch or an astronomical time switch	
All time controls must be able to retain programming and set times for at least 72 hours after power loss	
Important and non-essential lighting must be managed separately. It shall provide illumination in the sporting areas and other facilities where running times that vary	
Travel / transition lighting circuits shall be independently regulated with respect to different set-up times and project-specific requirements from accent / landscaping lighting circuits. Lighting on the carriageway and traffic lights are removed from this credit	
Total	

Table 18 Infrastructure energy efficiency requirements checklist

Infrastructure energy efficiency	Points
Design, buying or working in collaboration with the Municipality in order to achieve a 15 percent annual decrease in electricity under the projected energy use for that system in base services (for example traffic lights, street lights, water and wastewater)	
Assume the use of lowest first-cost infrastructure	
Total	

4.3. *Water*

Water is one of the construction sector's largest natural resources and is widely consumed. All current rating systems, including those discussed in this literature review, seek to save local water resources. Water is an essential human need and one of sustainability's most important categories. During buildings ' lifecycle, sustainability and water quality are critical. This aims to ensure development is designed to minimize water demand through efficiency and suitable options, taking into account current and predicted future water availability in the region. Proposed five categories:

- water efficiency as shown in table (19)
- water monitoring & leak detection as shown in table (20)
- storm water management as shown in table (21)
- water features as shown in table (22)
- waste water management as shown in table (23)

Table 19 Water efficiency requirements checklist

Water efficiency	Details	Points
Demonstrate that the average criteria for landscape irrigation in all public areas	1) Not more than 4.5 l / m2/day is required for all public areas in total	
	2) Not more than 2.5 L / m2/day is required for all public urban spaces in total	
	3) The public open spaces are planned areas for leisure, entertainment and play facilities with < 70 percent hardcover cover	
	4) The total number of streetscapes in general is 2.0 l / m 2/ day	
	5) Public urban open spaces with hardscape coverage are public open space of > 70%	
Demonstrate that the water-efficient irrigation system has been included into all public areas	1) Eliminate all components of surface spray (except in sport fields)	
	2) Irrigate for non-daylight hours only (exclusive of subsurface)	
	3)Provide independently-checked irrigation areas with plant water requirements (hydro-zone)	
	4) To minimize evapotranspiration using mulch and/or soil alteration techniques	
Total		

Table 20 Water Monitoring & Leak Detection requirements checklist

Water Monitoring & Leak Detection	Details	Points
Monitoring Prove that clearly labeled water meters are provided that they are easy to access and are capable of monitoring water use for at least the following applications	1. Irrigation	

	2. Irrigation Outside plants	
	3.Air characteristics	
	4.Any other essential criteria for public realm water (e.g. pools)	
Leak detection Explain the implementation of a leak detection system covering all the main water distribution networks in the area		
Total		

Table 21 Storm water Management requirements checklist

Storm water Management	Points
Quantity Control shall demonstrate that the project has developed a storm water management system that prioritizes infiltration, sustainable urban drainage systems and, where necessary, uses structural solutions	
Demonstrates that the peak runoff rate and quantity after development of 2-year 24-hour design storm does not, through either structural or non-structural methods or a combination of them, surpass the peak runoff rate and sum before growth	
Regular system control and maintenance protocol	
The storm waters approach of the project will not adversely impact the methods for ensuring the growth of neighboring areas	
On-site erosion management techniques	
Total	

Table 22 Water Features requirements checklist

Water Features	Points
Prevent spraying	
Integrate an automated pumping system in the event that evaporative losses are severe for hours out of use	
Avoid high evapotranspiration water features (e.g., prevent the formation of water cascades over large areas)	
Using or recirculating water with gravity, or using power from a renewable energy source	
They are located in areas which are accessible, OR Credit can be obtained if there are no external water functions installed	
Total	

Table 23 waste water management requirements checklist

Waste water Management	Points
Design and construct the project to retain on-site at least 25% of the average annual wastewater generated by the project (excluding any existing buildings	
Wastewater to replace potable water.	
Provide on-site treatment to a quality required by state and local regulations for the proposed reuse, whichever is more stringent.	
Total	

5. Conclusion

Egypt 2030 vision targets developing sustainable communities through real implementation for the rating systems across the building or Neighborhood. Noted drawbacks for Green Pyramid rating system across the building are related to the absence for the rating system across the neighborhood and pitfalls in the implementation process across practitioners. Accordingly, the paper develops proposed checklists for the most important three categories (site selection, water, and energy) across the neighborhood. This is useful to overcome the challenges facing the Egyptian context to design and implement sustainable neighborhoods. Yet, it is worth mentioning choosing best site selection based on the suggested criteria will Enhance and renovate existing and new towns, Reduce car movements and driven miles (VMTs), and Enhance the public's health Protect biodiversity and agricultural land. Adding to this applying the energy checklist will reduce the energy consumption and targets the use of renewable energy. Finally addressing the water check list will reduce the water consumption and recycling the waste water.

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Building Information Modeling As An Approach for increasing the competitive advantage of Architectural Design Firms in Egypt

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Abstract:

Recently, the development of new technologies results in continuous change in the construction industry that causes pressure on both local and worldwide markets. Nowadays, many Egypt companies face a number of problems in the market due to the adoption of outdated strategies that make them unable to compete globally. Therefore, it is significant for the firm to maintain competitive advantage in order to survive in the market; this could be achieved in various methods such as adopting new techniques and developing competitive marketing strategies. Accordingly, this research will be focused on the application of new technology such as building information modeling as a process to enhance competitive advantage in architectural design firms and the challenges that face in the adoption of these technologies. The research will study international case study that overcame these problems and managed to compete in the construction market. Finally it is an approach for implementing the Building information modeling technology in the architecture design firms in Egypt.

Keywords: Competitive Advantage – Architecture Design Firms in Egypt – Building Information modeling – Implementing BIM.

1. Introduction

“Competitive advantage” refers to the process of providing the maximum value to the customers either by (a) lowering the cost or by (b) offering them great advantages than those offered by other competitors. However, it could also be defined as the firm’s ability to design, produce and promote products that are more desirable than those provided by their competitors considering its financial and non-financial qualities (Mansor et al., 2014).

Recently, the development of new technologies results in continuous change in the construction industry that causes pressure on both local and worldwide markets. Therefore, it is significant for the firm to maintain a competitive advantage in order to survive in the market; this could be achieved in various methods such as adopting new techniques and developing competitive marketing strategies (Mansor et al., 2014). However, this research will be focused on the application of new technology such as building information modelling as a process to enhance competitive advantage in architectural design firms. BIM is known as the method that provides and manages the construction information throughout its life cycle through utilizing software which provides a three-dimensional, real-time, dynamic building modelling. In turn, this helps with reducing the time and sources that are would have usually been wasted in the design and construction of buildings (Boukara & Naamane, 2015). Additionally, BIM is an advanced model-based system which offers a vision for support and guidance in planning, designing, building, handling buildings and infrastructure. BIM extends beyond standard CAD models by offering intelligence to distinctive building elements. As well as, offering system-wide data and understanding (system flows or building loads), in addition to basic dimensional relationships.

Therefore, the main purpose of this research is to enhance the implementation of the building information modelling (BIM) within the practice of architectural design firms in Egypt, to increase the firms’ competitive advantage within the construction industry.

2. Literature Review

2.1. Chapter Introduction

Competitiveness is a broader definition than performance or efficiency related concepts. Competitiveness is about having better skills and capabilities than competitors, involving both past results and perception of a company's future potential. Competitiveness can be analysed at several levels in the construction industry: country, industry, company, and project. However, several authors have drawn attention to the relevance of the company's competitiveness. In "Micro Foundations and Macro Competitiveness" (1999), Christensen claims that nations can only prosper if they can compete with their businesses. Porter (1990) states that "it's businesses, not countries

that succeed on international markets." Other scholars such as Dangerfield et al. (2008) and Ambastha and Momaya (2004) have endorsed its importance.

The aim of this chapter is to understand the factors that lead to competitive advantages and applying strategies that could increase the competitive advantage in architectural design firms. In addition to studying the significant benefits of adopting building information building in the architectural design firms as well as understanding its effect in increasing competitive advantage.

2.2. Competitive Advantage

2.2.1. Defining competitive Advantage

Competitiveness is a multi-dimensional term with various meanings at different theoretical scales. Specific competition metrics include market share, productivity, growth rate, and company-level ability to deliver low-cost or high-quality products or services. Referring to Dangerfield et al. (2008), competitive advantages are defined as offering the higher value of the consumer either through lower prices or by offering more advantages that better justify higher prices than competitors. Meanwhile, the company has to develop wide competitive marketing strategies that enable it to gain competitive advantage through superior customer value. Rousan and Qawasmeh (2009) view competitiveness as a company's ability to design and promote or market products that are higher than those offered by competitors in terms of price and non-price quality.

2.2.2. History of competitive advantage

The paradigm shift is uncovered by a quick review of relevant literature. The common strategy for remaining competitive in the 1980s was the fair use of capital, while more focus was put on the multi-dimensional and adaptive complexity of competitiveness in the 1990s and early 2000s. Market trends have become more focused on innovation in knowledge and learning than on physical capital. Many people often assume that only organizations that are capable of transforming human and corporate information capital into tactical capabilities can gain competitive advantages and succeed.

2.2.3. Porter's 4 competitive strategies

The standard tactics of Porter explain how a business pursues competitive advantage across the reach of its defined industry. Three / four generic strategies are available, either lower cost, differentiated or focused.

Figure 1 Porter's competitive strategies by author (2020)

2.2.3.1. Cost Leadership Strategy

When catering to cost-conscious or price-sensitive consumers, this strategy involves the company gaining market share. This is achieved by having the lowest prices or at least the lowest price-to-value ratio in the target market sector (price relative to what consumers receive). The business must be able to operate at a lower cost than its competitors in order to succeed by delivering the lowest price while still maintaining sustainability and a strong return on investment.

2.2.3.2. Differentiation Leadership Strategy

A differentiated approach is suitable where the target customer group is not price-sensitive, the market is competitive or crowded, consumers have very specific needs that may be under-served, and the organization has unique resources and skills which enable it to address such needs in hard-to-copy ways.

2.2.3.3. Focus Strategies

This dimension is not a separate strategy for big companies due to small market conditions. Big companies which chose applying differentiation strategies may also choose to apply in conjunction with focus strategies (either cost or differentiation). On the other hand, this is appropriate strategies for small companies especially for those wanting to avoid competition with big ones. In adopting a narrow focus, the company ideally focuses on a few target markets (also called a segmentation strategy or niche strategy). These should be distinct groups with specialized needs.

2.2.4. Competitive Advantage in construction industry

Construction industry is one of many countries most important industries as it usually represents a significant proportion of gross domestic product (GDP) (Ericsson and Henricsson, 2005; Flanagan et al., 2005a). The current situation on the sector, characterized by intense global competition, has

caused the need for businesses to be more innovative to thrive. In addition to the more conventional problems of construction management in this field, this hyper-competitive era has generated the need for clear competition management (Ambastha and Momaya, 2004).

2.2.5. Effects of competitive advantage on the performance of the company

Maintaining competitive advantages when they want to succeed is always a challenge for any contractor. With the development of new business methods and technology, the construction industry is constantly changing. Building companies must therefore adopt different technologies and implement suitable approaches in order to be more successful in this market and to prosper in their sector. Competitive pressures, both in domestic and global markets, moved the desired outcomes of relationship management away from conformity with the actions of workers to a more constructive approach to clients and business needs. People are individuals who carry to corporate existence their own experiences, beliefs and qualities, and when effectively managed, these human traits may offer tremendous benefits to organizations. Creating companies, as something of a survival strategy, strive to cut manpower, maintain and retrain the more skilled employees or those whose skilled employees could be less easily replaced.

2.2.6. Factors and Indices of competitive advantage

At the company level, two main types of variables can be identified:

(1) Factors that determine a company's competitiveness performance; and

(2) Indexes that measure and demonstrate the company's competitiveness position

In turn, factors of competitiveness can be divided into endogenous and exogenous factors.

2.2.6.1. Factors

Fifty-eight endogenous factors are described in at least two different sources as important to competitiveness. The factors were grouped into seven categories by affinity:

(1) Strategic management;

Leadership and company image and reputation, voted by more than 80 percent of top managers, were considered the most relevant factors in this category. Considering leadership as a decisive factor indicates that many assumes management has a significant performance-influencing role. Company emphasis earned 75 percent of the votes, suggesting that top managers value good customer relationships and work to keep them satisfied and achieve loyalty. Around 30% of top managers showed a specific interest in achieving a competitive advantage by customer relationships. The most common practices in this regard are: Good contract collection to bid on; customized service; current customer satisfaction surveys; transparency; prevention of conflicts;

and even lower profits to improve customer loyalty. Top managers know that price is the most important criterion for awarding contracts, but they also realize that increasing numbers of customers (public and private) are now becoming aware that other factors give them more value than just price. 67 percent of top managers voted in favor of performance emphasis, stating that neglecting value is not a choice.

(2) Project management;

From the viewpoint of top managers, with a more tactical emphasis on project management, contract negotiation was perceived to be the most relevant factor (92% of votes). As described previously, companies are more conscious of how disputes can be resolved through very straightforward and well-defined agreements, with provisions that delegate threats to those who can manage them best. The relevance of this factor is also related to customer focus as contracts are a tool for avoiding conflict and maintaining a positive and productive relationship.

Health and safety planning (83%) was the next most voted consideration of project management. Top managers are well informed of this topic's significance and view it as central to any task.

(3) Human resources management and organizational culture;

Top managers focused on the importance of cooperation, with a keen interest in maintaining a team spirit within their companies. Yes, one of the top managers reflected on their personnel's willingness to sacrifice and adaptability as one of his company's most critical advantages. There are also practices in this same organization that promote tolerance for anyone at any point. Other factors such as training, incentive and reward system, and employee engagement and motivation received 83% of the votes.

(4) Innovation, research and development (R&D), technology factors;

The most important factor in this category was technical and technological skills, with consensus among top managers. As a top manager said, the lack of technical expertise in some projects is a reason not to compete for them. It is why top managers are obsessed with using experienced staff and current technology to allow them to surpass the requisite task requirements.

Item, service and system creativity (voted by 92 percent) is a relevant topic for most contractors as it provides a competitive advantage as a consequence of competition. In this regard, several actions have been taken by top managers, such as attending international construction conferences as sources of ideas to be innovative in the use of equipment and processes, using special formworks to increase productivity, having staff assigned to find new technology or processes, developing prototypes of equipment and creating reward systems to encourage initiatives in the field.

(5) Financial capacity;.

All top managers recognized a healthy and stable financial status as one of the most important competitive factors. Second was the ability to secure funding (75 percent of votes), although some noted that their businesses rely primarily on their own capital.

(6) Institutional and business relationships;

Top managers prioritize three forms of corporate and business relationships: (1) customer relationships and alliances (83%), which correlates to the importance provided to customer emphasis in the strategic planning category; (2) vendor relationships and alliances (75%), backed by literature on economies of scale and partnerships; and (3) Subcontractor relationships and alliances (67%), similar to supplier relationships, but with the additional complexity that they are physically involved in project processes and have a major impact on costs, quality and time. Top managers have expressed concern over subcontractor operations and sought to find ways to work with them more effectively and efficiently.

(7) Bidding factors.

Both top managers decided that the most relevant factor for this class is the business background. We still accept, though, that the most relevant bid appraisal parameter is cost (voted by 75%). Price reflects a client's short-term mindset as other relevant factors are set aside which cannot be quantified. Top managers have recognized that this can turn into a vicious cycle because there are vendors with the same strategy. Nonetheless, the customer-oriented strategic approach adopted by several top managers indicates that this is evolving or at least an interesting submarket where consumers are taking into account certain intangibles, such as performance, consistency, efficiency, technical ability, credibility, and ethics.

2.2.6.2. Indices

Competitiveness is a complex concept that requires many performance measures (i.e. indexes) according to the elements in its description. It is possible to organize such indexes into nine categories:

(1) Financial indicators;

Top managers selected three indexes as the most representative to measure a contractor's financial status: (1) profit margin (gross profit / total income – 67%); (2) cash flow or liquidity (67%); and (3) equity return (ROE – 50%).

(2) Non-financial productivity;

Productivity attributable to manpower, machinery and equipment is typically tested at task level by all firms, but at company level, 83 percent of top managers did not have metrics of productivity. We concentrated more on economic productivity (e.g. ROE).

(3) Traditional project performance indexes;

Equally relevant to profitability are reliability, energy, price, and health and safety. Top managers had trouble picking just three of them, so we're going to take all of them to the next level.

(4) Client satisfaction;

Customer satisfaction in strategic planning and top managers decided on the three main aspects of this category:

a) Satisfaction with the service provided;

b) Satisfaction with the timely delivery; and

c) Satisfaction with the brand itself.

83 per cent of top managers voted for each of them. Many managers mentioned service satisfaction by providing personalized service, avoiding conflicts, frequent surveys of satisfaction, etc. All of these actions helped make the contractor feel comfortable with the client. There have been no more reports on the other two indexes, but they are equally important according to the number of votes.

(5) Market share;

Most top managers evaluated market share indicators of both size and growth as not relevant to their strategies. Instead, most of the focus is on exceeding their own set minimum construction volume to have a presence in the industry and to cover their fixed costs. Their aim is to have managed growth in project management without any loss of control. Most of them said they were focused primarily on profitability rather than building volume.

(6) Society satisfaction;

Top managers believe that compliance with laws and regulations (83 percent of votes) and environmental awareness (67 percent) are the most relevant indexes in this category. With these issues being viewed as necessary, the actions of management will encourage and support them, resulting in higher quality standards and not just following the required mandated requirements. Despite the fact that community support obtained only 58 percent of the votes of managers, it is of great relevance to those firms that are continuously developing rural projects.

(7) Personnel satisfaction;

Top managers find two factors as the most important to assess worker satisfaction: morale of workers (92 percent of votes) and career prospects and growth of employees (75 percent). Top

managers generally agree that the morale of employees, and specifically their internal encouragement, is particularly relevant to the performance of the company.

(8) Future capabilities;

Another relevant index for measuring competitiveness is what firms can do (i.e., their potential) in the near future. Top managers appreciated the ability to reduce expenses (92 percent) and adapt technological advances to task implementation (83 percent) in accordance with this and according to the dominant Chilean market. The former reflects the belief of top managers that price will continue to be one of the most important criteria for bidding, as cost reductions will increase their profit margin. Valuing technological advances demonstrates the concern of top managers to innovate and acquire state-of - the-art technology to stay ahead of competitors and gain a competitive advantage.

(9) Bidding effectiveness.

Top managers gave more votes to contract volume growth (83 percent), because at least they want a higher rate of growth than inflation. The percentage of contract awarded (75 percent of votes) is also a concern of top managers, so several of them are trying to concentrate their efforts on projects where their businesses are more likely to win the award. Even in times of economic crisis, when top managers are trying to be very selective about their bids, percentages of effectiveness have dropped from around 40 percent to 15 percent based on the experience of two top managers interviewed.

2.3. Building Information Modelling (BIM)

2.3.1. History of BIM

BIM origins returned to the parametric modeling research conducted in the United States in the early 1970s, the theory first studied at the Georgia Tech School of Architecture on Professor Charles Eastman's works. Building Description System (BDS) was the first technology built from the system data processor (PDP) code repository for individual library components due to the introduction of personal computers. Similar information systems were developed in the United Kingdom later in the 1980s. Wider uses and implementations using the same principle are feasible with the advent of the personal computer.

Graphisoft Company developed ArchiCAD software in 1984 and incorporated the idea of virtual building. The new software power came from its ability to use Geometric Description Language (GDL) to built-in programming environment from its parametric library component. The AEC sector has basically started implementing BIM in mid-2000s ventures, where a corporation has created the Revit software written in C++ and used a groundbreaking parametric system. Autodesk later bought the Revit program in 2002 and invested heavily in developing the program that

provided a transitional approach to BIM (Dobelis, 2015). The software developed gives increased control over time, price, and performance to the industry.

2.3.2. Definition of BIM

BIM as' an advanced process of planning, development, building, operation and maintenance using a structured machine-readable data system comprising all relevant information generated or obtained in a format about that facility. In other terms, there is much more to a virtual 3D rendering than a realistic picture.

BIM is a smart model-based system that provides insight to help you plan, project, build and manage buildings and infrastructure. In contrast to basic spatial relationships, BIM moves beyond conventional CAD models by supplying insight for individual building elements (e.g. doors, walls or chillers) as well as system-wide and structure-wide data and understanding (system flows or building loads).

2.3.3. Advantages of BIM

1. Improved information flow

Because a virtual model provides a cohesive definition of a structure, it can significantly improve the flow of information at all levels of a building's layout, development and life cycle The digital model can be used by designers, MEP technicians, builders, building managers and owners at various stages of the building life cycle to incorporate, delete or change details. The initiative has a clear vision of encouraging informed decisions, increasing mistakes and enhancing efficiency.

2. Better design visualization

A crucial part of the design process for architects and engineers is the ability to predict how residents, tourists, and neighbors may react to and communicate with a house. Nevertheless, the digital construction template generated during the BIM phase often provides an important advantage in helping MEP engineers refine the HVAC system configuration within the building design space constraints. By installing an air handler in a mechanical room or running pipe or ductwork, the opportunity to remotely design and physically inspect the HVAC system in 3D can provide further confidence that all parts can suit before construction starts.

3. Improved cost estimating

Due to the depth and accuracy of the information it offers, BIM can improve and also produce better cost forecasts. The relative ease with which product and installation amounts can be derived from the prototype will improve forecasts ' speed and accuracy, providing a better gage of the effect of development changes in order to proactively resolve budget concerns.

4. Improved energy analysis

Again, BIM will reduce and improve the accuracy of the energy assessment because the information needed to carry out this research remains in the electronic building template.

5. Reduced construction costs

Even before building starts to show that sections of the project share the same area, clash identification can be used. Throughout building, this can reduce or eliminate the need for field changes. BIM designs can also be used to help with trust in the prefabrication of building components such as vent runs or tube runs. This can save on the manufacturing and installation costs.

6. Building history

The electronic template will function as an important information repository to owners and service providers as building moves through development, installation and occupation. Of instance, if a building component fails, it is important to use the building information system to classify its source, supplier, model number, quality characteristics, and other relevant data to repair or replace the component more effectively. If a part of the structure is being remodelled, it is important to use the structural details template to classify hidden components such as plumbing, ductwork, and electrical equipment and facilitate informed decisions on remodelling layout.

2.3.4. Implementing BIM in construction industry

Effectively applying BIM requires significant changes in the way construction companies function in the construction process at almost any stage. In other terms, this involves not only learning new software applications, but also reinventing the system, training staff and defining roles, and changing the way infrastructure is modelled.

2.3.5. Importance of BIM to increase competitive advantage

The BIM models require spatial or / and specific architectural requirements to be elucidated and form the basis for renderings, so that in a competition a design can appear attractive. But these systems will also provide incentives for early economic estimates, for instance through the allocation of experience-based values per square meter on the feature spaces of the system. Where a precise precision is not needed for the first application, the second application does. Architects ' innate curiosity in visualizing potential construction projects has helped spread the idea of BIM among the stakeholders in the industry.

2.3.6. Implementing BIM in Egypt

The literature describing the methods of BIM implementation in Egypt is minimal. Three research, however, can be found in or near the topic. Next, (Elyamany, 2016) addressed 102 emerging BIM activities in the building industry in Egypt. Third, (Khodeir & Nessim, 2017) addresses BIM and

power modelling in Egyptian architecture companies, and eventually (Gerges, et al., 2017) explores the application of BIM in the Middle East and the report describes Egypt. The three experiments used a statistical method as questionnaires were created and disseminated for data collection to a wide number of participants. The difference in the three experiments was that there was no face-to-face discussion with the interviewees to get a closer look at the Egyptian development firms ' introduction of the BIM. (Gerges et al., 2017) sent digital questionnaires to 297 respondents throughout the Middle East, 200 of whom are correct at a response rate of 67.34 million. Egypt accounts for 19 percent of respondents who use BIM in their businesses. The report stated that in utilizing BIM for infrastructure projects, Egypt came after the UAE. Nonetheless, 37 percent of Egyptian respondents said this was attributed to the international projects in which they operate with their businesses Figure 4-19. (Elyamany, 2016) performed an online survey and sent it to 120 contracting firms and 10 consulting firms, the response rate was 17.2 percent and the writer clarified that the poor response rate could be due to a lack of understanding of BIM in Egyptian businesses. As a result of the survey, the participants believe that BIM is a tool that helps build sustainable buildings and is expanding in the construction companies.

However, the study referred to the lack of any federal intervention in the introduction of BIM where 79 percent of the respondents believe the government is not on the right path towards BIM adoption and the government's engagement would drive the BIM adoption process. The research also addressed a number of important issues related to BIM implementation in Egyptian firms; for instance, the survey found that most respondents are still not sure about the central principle of implementing BIM in the construction industry. We recognize the benefits of BIM use in the construction industry, though, and agree that BIM innovation is key for green building design. However, 84 percent of the respondents agreed that BIM artifacts should be given by vendors to use accurate data in template development. However, 70 percent of the respondents agreed that more information regarding BIM is required by building players (Elyamany, 2016). (Khodeir & Nessim, 2017), this report was sent to 98 architectural organisations, 22 "room of knowledge" and 76 multi-disciplinary architecture companies dealing with sustainable buildings. BIM is still in its early stages in Egypt, the research found. The report also reported that businesses are using BIM because they recognize their ability in teamwork, clash identification, and time-and resource-saving, contrary to the two above-mentioned studies that are returning BIM acceptance among Egyptian firms to the rising 104 market for BIM use in international projects. In addition, the study reported that in the design phase, 62 percent of respondents use energy modeling software, which is not a practice in Egyptian companies and may be linked to survey sampling. However, the report claimed that the obstacles to BIM adoption in Egypt were due to the lack of customer demand, education

and studies relating to the return of investment of companies on the introduction of BIM. The report further suggested that architecture firms play a leading role in Egypt's implementation of BIM.

2.3.7. Strategies to implement BIM

Therefore, the successful application of BIM requires significant changes in the way construction companies work within the building process at almost any stage. In other terms, this involves not only learning new software applications, but also reinventing the system, training staff and assigning roles, and modifying design models (Bernstein and Pittman, 2004, Eastman et al, 2008). It thus suggests that the sector may benefit from a straightforward set of guidelines detailing an effective strategy and procedure for the corporate application of BIM (Bernstein and Pittman, 2004).

2.3.8. Challenges of implementing BIM in ADFs

There is some evidence to suggest that the profession of architecture is beginning to be pressured to adopt BIM. While BIM has been around for over 20 years, it is only in recent years that building owners are becoming conscious that BIM is aiming to make building planning, construction and operation much more organized and effective (Coates et al, 2010). Owners are beginning to demand that BIM be embraced by designers and other development firms, building managers and construction companies (Mihindu & Arayici, 2008). On the other side, the application of BIM in design activities is daunting such as:

• Overcoming opposition to reform and bringing people to understand the benefit and usefulness of BIM over 2D drafting

• Adapting current workflows to lean-oriented systems

• Training workers in BIM or identifying staff who embrace BIM

• Considering the high-end computer infrastructure and networking facilities needed to successfully operate BIM programs and software

• Solid awareness of the roles of various participants in the new process by building lawyers and insurers (Arayici et al, 2009a, Arayici et al, 2009b, Eastman et al, 2008)

• Effective coordination, alignment and interoperability between structural and MEP designers / engineers

2.3.9. Identification of Competitive Advantages from BIM Implementation

Cost leadership, distinction, cost efficiency; differentiated emphasis and cooperation are established as the competitive advantages by SWOT. In all these areas, BIM has the potential to provide advantages. Through can both the time and effort to produce design data, BIM can provide JMA with the opportunity to offer proposals the most attractive bids. JMA has the ability to distinguish

itself by providing a better service to BIM while eliminating delays and increasing the need for information requests from the web. The competitive advantage of price concentration is achieved by running other aspects of the cycle cheaper than rivals. Problems of sustainability are becoming increasingly important for the design of housing. JMA was able to analyze environmental factors at a lower cost when implementing BIM. BIM offers a number of possible differentiated focus areas. The BIM framework has significant potential for use in running services and controlling the life cycle. BIM's main advantage is through a central focus on teamwork between the building team and through the coordination and cooperation of all partners in the building process, expense, performance and time savings will be made.

The use of BIM models for fast prototyping via 3D printers is one of the potential gains from SWOT analysis. This has the potential to give an additional understanding of a scheme as it develops. The SWOT analysis also showed how to make savings by adopting Lean principles. Seminars on "price" and "lean values" are conducted in the office. Discussing lean values; reducing duplication and relying on procedures for generating quality has provided a good counterbalance to the ideals of ISO 14000.

2.4. Chapter conclusion

This chapter focused on the factors that lead to competitive advantages and applying strategies that could increase the competitive advantage in architectural design firms. In addition to studying the significant benefits of adopting building information building in the architectural design firms as well as understanding its effect in increasing competitive advantage.

3. Case studies

3.1. Case Study: JOHN MCCALL'S ARCHITECTS (JMA)

3.1.1. Background Information

John McCall Architects in Liverpool focuses primarily on social housing and regeneration, private housing and one off homes and large extensions. JMA works with many stakeholders from design through to building construction process and the associated information is very fragmented. Projects in which JMA are involved include many stakeholders and need considerable interoperability and information exchange.

3.1.2. Case Study Objective

This case study aims to demonstrate a BIM adoption process for mapping and reengineering the strategic and operational processes of the company at the organizational level of SMEs. It adopts a

socio-technical view of BIM implementation in that it not only considers the implementation of technology but also considers the socio-cultural environment that provides the context for its implementation. An action research oriented qualitative and quantitative approach for discovery, comparison, and experimentation has been employed in the research. This is because, the KTP project with JMA also provided an environment for "learning by doing" (Boshyk and Dilworth, 2009).

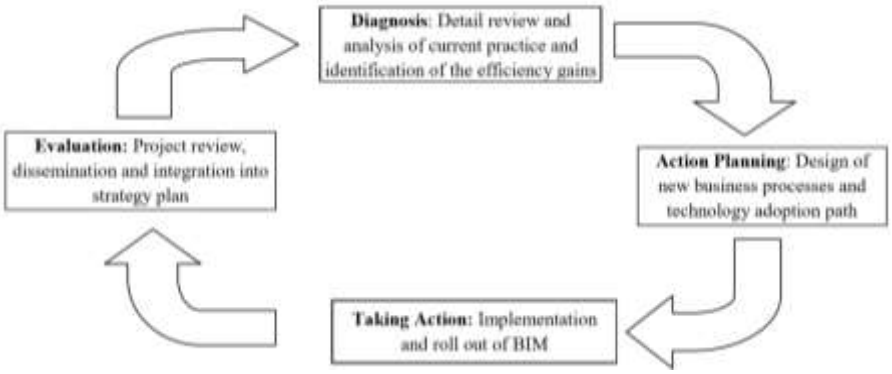

Figure 2 Action Research Process adopted

3.1.3. Introduction

Historically JMA has used a 2D CAD tool for two decades. The company also has its own procedures and templates to optimize its practice. However, the current practice with this 2D CAD tool brings about some inefficiencies such as timescales, deadline pressures, duplications, lengthy lead times, lack of continuity in the supply chain, over processing, reworking, overproduction, distractive parallel tasks, lack of reliability of data and plan predictability, lack of rigorous design process, lack of effective design management and communication. Hence, the company need to improve its capacity for i) greater integration and collaboration with other disciplines in the production process, ii) adopting technology change to provide a more effective business process, iii) effective intelligent real time response, iv) moving into related building sectors. At the strategic level, lean principles (Liker, 2003, Koskela, 2003) which are: i) eliminate waste, ii) increase feedback, iii) delay decision, iv) deliver fast, v) build-in integrity, vi) empower the team, vii) see the whole have been utilized and they formed the seven pillars of the BIM implementation strategy. There was no practical understanding and awareness of BIM in the company at the beginning of the project. Yet, senior managers of the company had some visionary understanding of BIM for investment to attain competitive advantage and better position in market place and provide sustainable green design solutions in the future.

3.1.4. Case Study Process

1. <u>Diagnosis: Detail Review of Current Practice and Identification of Efficiency gains</u>

I. Production of the Current Design Process Flowcharts

To make lean process improvements it is necessary to understand the existing practices used at JMA.

The overall flow chart was produced by mapping out a typical project undertaken by JMA. This was divided up into the RIBA (Royal Institute of British Architects) stages of work and by taking into consideration the other disciplines involved in the design project that collaborated with JMA as external partners. The artifacts at each activity stage were identified and reviewed.

II. Soft System Analysis

Soft systems methodology (SSM) is a systemic approach for tackling real-world problem situations (Checkland & Poulter, 2006). It sets out to build a model of what a Human Activity System must do if it is to achieve the purposes defined.

III. Review of IT Systems and the BIM Tool Selection

The IT System at JMA was integral with the production processes undertaken by the practice.All the different types of software result in a lot of duplication of data in different file formats. The IT system was overseen by the computer manager and CAD management was devolved to the team members. The IT system was on a rolling programme of upgrade and subsequently staff skills were upgraded while hardware and software were upgraded. The underlying observation from the review was that the data used by the company was very fragmented. The inefficiencies are mainly because the software tools used do not have bidirectional interoperability.

Most of JMA's work is within the housing sector and therefore certain criteria will be required by the BIM system chosen.

An evaluation of alternative BIM systems took place for a period of three months.

Although these activities helped to short-list three potential tools (ArchiCAD, Revit and AllPlan), they were not sufficient to determine which BIM authoring tool should be best suited to JMA's priorities and the intended competitive advantages to be gained through the BIM adoption. Thus, it was also necessary to conduct comparative evaluation of the potential BIM tools in a quantitative manner. Thus, a list of 40 criteria was produced via brainstorming sessions for the matrix analysis of the potential BIM authoring tools. It was now time for the JMA staff to test and experiment with the three remaining BIM tools on past projects of JMA. This provided the opportunity to compare the three BIM tool with each other. The test results were logged into the checklist document by the three testers individually to form the basis of the quantitative assessment.

Facet	Weight	ArchiCAD					Revit					Allplan				
		J	K	P	T	TW	J	K	P	T	TW	J	K	P	T	TW
The ability to input data to dimensional accuracy	1.00	4	4	4	12	12.00	2	3	5	10	10.00	5	4	4	13	13.00
Ease of creation of site models with building units referenced in	1.00	5	4	4	13	13.00	4	4	4	12	12.00	2	2	2	6	6.00
Can the BIM info be issued to other consultants	1.00	4	3	2	9	9.00	2	2	5	9	9.00	5	3	2	10	10.00
Ease of export to other file forms and re import accuracy	0.95	4	5	4	13	12.35	2	2	2	6	5.70	5	4	4	13	12.35
Easy input of dgn, skp, dwg, ifc, dxf , pdf and model file	0.95	5	5	4	14	13.30	1	2	2	5	4.75	5	5	4	14	13.30
Ease of creation of fixed export eg PDF etc	0.95	5	5	4	14	13.30	1	3	2	6	5.70	5	4	4	13	12.35
Market Share	0.95	4	4	3	11	10.45	5	5	5	15	14.25	3	2	1	6	5.70
3D pdf capability	0.95	5	5	5	15	14.25	1	2	2	5	4.75	5	5	3	13	12.35
The ability to schedule doors, windows doors etc	0.90	5	5	4	14	12.60	3	4	5	12	10.80	4	4	3	11	9.90
Easy of setting up drawing sets	0.90	5	5	4	14	12.60	3	2	4	9	8.10	4	4	3	11	9.90
Ease of multiple people working on a single model	0.90	5	5	5	15	13.50	3	4	4	11	9.90	4	4	2	10	9.00
Print management	0.90	5	5	4	14	12.60	1	3	3	7	6.30	4	5	4	13	11.70
Presentation quality control and line weights etc	0.90	5	4	3	12	10.80	4	4	4	12	10.80	5	5	2	12	10.80
Virtual reality engine	0.90	5	5	5	15	13.50	2	3	3	8	7.20	2	3	3	8	7.20
Drawing issue management	0.85	5	5	4	14	11.90	2	2	4	8	6.80	4	4	4	12	10.20
Ease of setting up standards, templates and macros	0.85	5	3	4	12	10.20	3	3	4	10	8.50	4	3	3	10	8.50
Ease of producing kitchen layouts with 3D components	0.85	5	3	3	11	9.35	3	3	3	9	7.65	4	3	3	10	8.50
Eco Linking	0.85	5	5	4	14	11.90	3	3	4	10	8.50	4	3	3	10	8.50
Parametric ability to alter floor levels and walls	0.85	4	5	4	13	11.05	4	5	5	14	11.90	5	5	3	13	11.05
The ability to input a range of windows, doors, and wall types	0.80	4	4	4	12	9.60	2	2	2	6	4.80	5	5	4	14	11.20
Input and modification of stairs	0.80	5	4	3	12	9.60	4	4	4	12	9.60	5	4	3	12	9.60
Development of details Jambs, Heads etc	0.80	5	3	4	12	9.60	3	3	4	10	8.00	4	3	4	11	8.80
The ability to use geographic origins	0.75	4	4	4	12	9.00	1	1	2	4	3.00	4	4	4	12	9.00
Ease of changing one wall or window type to another	0.75	5	4	4	13	9.75	3	4	4	11	8.25	5	5	4	14	10.50
Size of exist object types and libraries available	0.75	4	4	3	11	8.25	3	4	5	12	9.00	5	5	3	13	9.75
File size of models created	0.75	4	4	3	11	8.25	2	2	3	7	5.25	5	5	4	14	10.50
Support	0.75	5	3	4	12	9.00	3	3	4	10	7.50	3	3	3	9	6.75
Training Arrangements	0.72	5	5	4	14	10.08	4	5	4	13	9.36	3	4	2	9	6.48
Ease of control of the visibility of graphics	0.70	4	5	3	12	8.40	3	4	4	11	7.70	5	4	3	12	8.40
Ease of input of land topography	0.65	5	4	4	13	8.45	4	4	4	12	7.80	5	4	2	11	7.15
Ease of input of constrains eg fixed stair widths or corridor widths	0.65	5	4	2	11	7.15	4	4	4	12	7.80	5	4	2	11	7.15
Ease of navigation around the BIM model	0.60	4	5	4	13	7.80	3	4	5	12	7.20	5	5	3	13	7.80
Clash Detection	0.60	3	3	1	7	4.20	4	5	4	13	7.80	2	2	1	5	3.00
The ability to address complex construction shapes curved walls etc	0.50	4	4	3	11	5.50	3	4	4	11	5.50	3	5	3	11	5.50
Adding in of street furniture	0.50	4	4	3	11	5.50	4	4	4	12	6.00	4	4	3	11	5.50
New material input	0.50	5	5	4	14	7.00	4	5	4	13	6.50	5	5	4	14	7.00
Revision control management	0.50	5	5	2	12	6.00	3	3	4	10	5.00	4	3	2	9	4.50
Cost of Licience	0.50	4	4	4	12	6.00	3	3	3	9	4.50	2	2	2	6	3.00
Service Cost	0.50	4	4	4	12	6.00	4	4	4	12	6.00	3	3	3	9	4.50
Design Options	0.50	3	1	3	7	3.50	4	3	5	12	6.00	4	1	3	8	4.00
Demonstrate rendered image quality	0.40	5	5	4	14	5.60	5	5	5	15	6.00	4	4	3	11	4.40
Ease of creating concept models	0.25	4	4	2	10	2.50	4	4	4	12	3.00	4	4	2	10	2.50
Network capabilities	0.25	5	5	5	15	3.75	4	4	4	12	3.00	4	4	4	12	3.00
Programming and Configuration	0.25	3	3	3	9	2.25	3	3	4	10	2.50	3	3	2	8	2.00
		198	185	158	541	**400.38**	133	150	168	451	**319.66**	180	167	130	477	**352.28**

IV. Stakeholder Review and Analysis

An important part of the project has been the buy-in by the senior members of staff. Since the BIM implementation will affect both internal and external stakeholders, contextual design technique was used to see how the existing stakeholders interact with the present process.

V. Identification of Competitive Advantages from BIM Implementation

SWOT analysis was undertaken to assess the competitive advantages for JMA. Both internal and external positions of JMA at the current time and in the future have been examined; looking into the company's strengths, weaknesses, opportunities and threats.

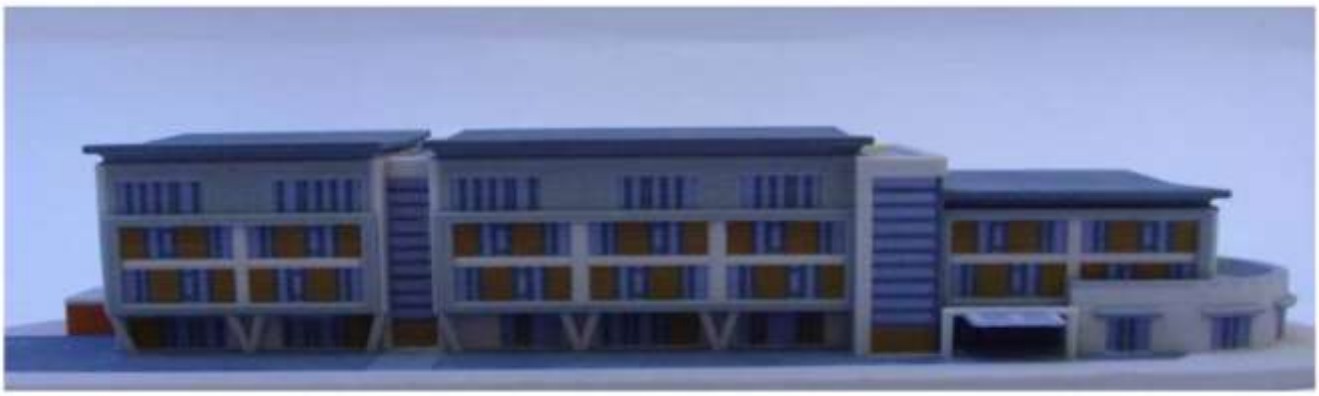

Figure 3 Rapid prototyping exercise with BIM Modelling

2. Action Planning Stage: Design of New Processes and Technology Adoption Path

I. Identification of Lean Efficiency Gains

Findings from the SWOT analysis helped to identify the efficiency gains that are treated as Key Performance Indicators (KPIs) to undertake quantitative and qualitative assessment.

II. Development and Documentation of Lean Process and Procedures

Development and documentation of lean process and procedures highlights how, data, information and knowledge could be handled better at JMA via creative processes.

III. Development of Knowledge Management Database

The major advantage of BIM is to input to a single information model and the multiple representations and extraction of that single information model. Therefore, critical data that is commonly duplicated in spreadsheets, word documents and emails have been reviewed and populated into a relational database that has been developed for the use of JMA's staff. The resultant schema that is being worked towards is to capture knowledge and experiences from past projects and from experienced staff via this knowledge database in the future as illustrated in figure 4.This also proves the importance of linkage between BIM and Knowledge Management.

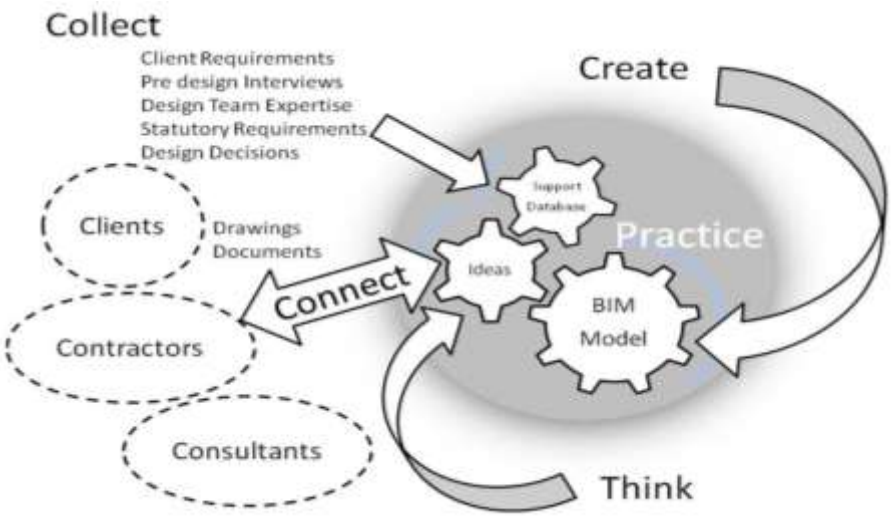

Figure 4 Combined model of architectural practice with the design information encapsulated in BIM and the project support information encapsulated in the knowledge database

IV. Documentation of BIM Implementation Plan

This stage was the preparation and planning of the actual implementation of the new BIM system and the processes on to past, present and future projects. When developing the BIM implementation plan, it was specifically required to make it appropriate for JMA.

In addition, particular consideration in the planning process was given to when and how the BIM object libraries and also office BIM standards were to be developed. The BIM implementation plan was then presented to all in the company.

3. Taking Action Stage: Implementation & roll-out of BIM

I. Piloting BIM on Past, Current and Future Projects

In the piloting exercise, it was important that the piloting projects were representative of typical projects undertaken by JMA. The past project selected was the Grow Home project. This was an award winning design that received recognition in the RIBA's Lifetime homes competition. Initially, the BIM authoring tool was used to recreate the Grow Home design. Although the concepts of the design solutions were complex, the resultant form of the proposed building was relatively simple. This exercise proved positive in some respects.

Figure 5 BIM model of the Millachip project produced with ArchiCAD

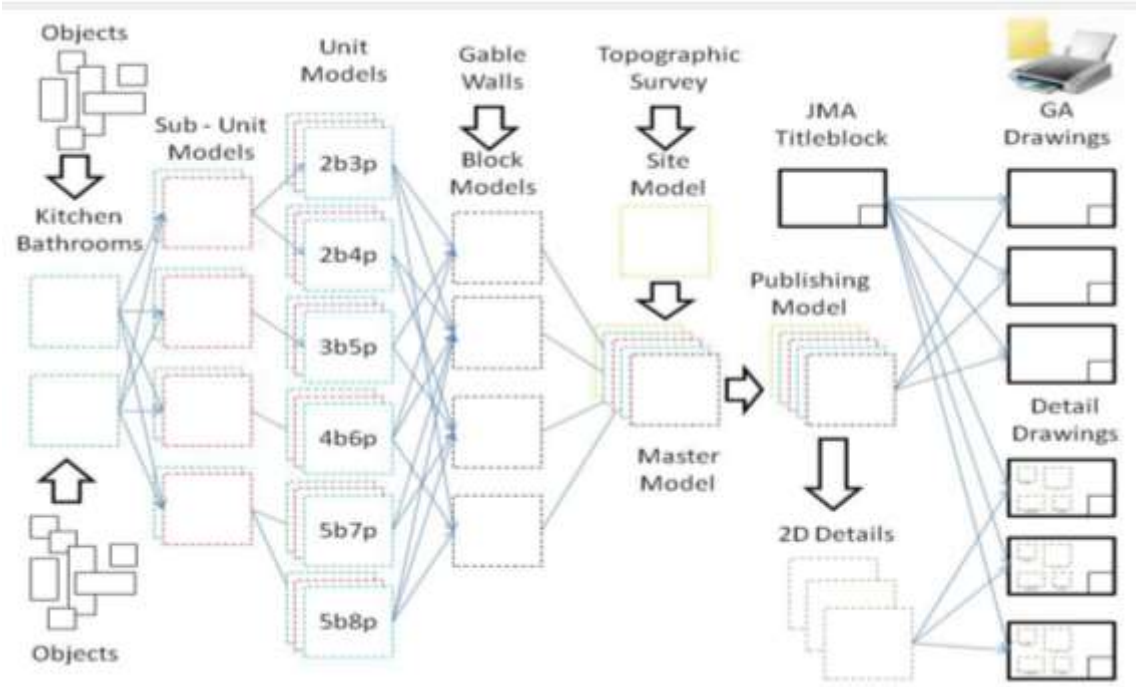

Figure 6 schematic structure of the BIM object library under development

II. Training of JMA Staff and Stakeholders

Overall, four areas of training were organised and conducted. These are:

1) Basic Operation Skills,

2) JMA modelling standards,

3) JMA methodology of model construction,

4) How to work with external parties.

III. Devising and Documentation of companywide improved capabilities

As the adoption of BIM and Lean thinking are at the core of the way JMA operates, it is important to continually review and benchmark the new process and procedures and to document them in accordance with JMA's ISO 9001 quality system. Several new quality procedures have been written due to the operational changes during the BIM adoption such as a revised incoming document handling and new email handling procedures.

4. Evaluation Stage: Project review, dissemination and integration into strategy plan

Since stage 3 has not been completed yet, the evaluation stage has not been formally started according to the project plan yet, assessment and discussions have been taking place as findings and efficiency gains are realized through stage 3 activities simultaneously in a collaborative manner involving all parties in the KTP including JMA staff. Lean thinking is an ongoing journey that JMA can now more effectively undertake through the demonstration of Lean practices.

I. Lean Efficiency Gains and Benefits Log Summary

While this benefits log will help to note the short term efficiency gains, it will also help to formulate the mid and long term efficiency gains,

• Linking project information to marketing via knowledge database

• Effective reuse of information via knowledge database as it stores information centrally and facilitates search via some criteria such as house types, materials used, code for sustainable home rating, client, etc

• Storing lessons learnt and experiences from the past projects as company asset via knowledge database

3.1.5. Case Study Results

The BIM adoption and implementation at JMA is well advanced. JMA's practice in eliminating the risk of duplication, misinterpretation of design, improving communication, streamlining processes, providing collaborative practice and, ensuring control and sharing of documentation. Thus, it is believed that it will provide a clearer vision and roadmap with detailed strategies, methods and techniques for successful BIM implementation

In the JMA case study, no one had any knowledge or experience of BIM prior to this BIM implementation project apart from a few forward thinking top management members, which shows that top management support is also critical to the success of BIM adoption. However, after 18 months, the company has already made significant progress in up skilling staff, technology infrastructure development and lean process improvements. This progress has not been stopped.

The intention is to ensure that the company has sufficient capacity to maintain the continuous improvement and to become more competitive.

4. Discussion and results

A brief overview of the paper was introduced in the first part explaining research background stating the problem tackled and why it is important to solve and addressing its causes as well. The second part presented a thorough overview of the research pillars, concluding with the criteria analysis in form of matrix. However, implementing building information modelling has achieved critical point that increases competitive advantage. By analysing a case study of a company that had implemented building information modelling with the target of increasing competitive advantage. This analysis is applied through the matrix that the case study will be analysed according to it. The matrix is clarifying the points that each case study have gained in order to achieve its main aim.

5. Conclusion

In conclusion, cconducting a comprehensive **background research** concerns the definition of competitive advantage to point out the challenges facing the architectural design firms in Egypt and factors preventing them to be competitive globally. As well as, the implementation of new technologies and its effects for increasing the competitive advantage, this paper targets the implementation of Building Information Modelling technology for the sake of architecture design firms in Egypt to become more competitive in the current business environment. In addition to, proposing, examining and analyzing various **case studies** that highlight the importance of the implementation of BIM technology to increase competitive advantage within the firm, while signifying the advantages and challenges of BIM implementation. Following, **forming a survey** to be sent to architectural design firms in different countries with different economic conditions, to compare the competitive advantage between national and international firms.

6. Recommendations

This research discusses a topic that has not been made before in Egypt which is viewing the implementation of building information modelling (BIM) technology from a different perspective, as a process for increasing competitive advantage in architectural firms in Egypt. Moreover, it includes a study of the benefits and effects of the implementation of BIM technology that will help in the development and survival of these firms in Egypt.

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Mitigating the Effect of Urban Heat Island in Residential Areas by Using Landscape Elements

"Case study 10th of Ramadan"

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Abstract:

Urban heat island (UHI) is a phenomenon occurred by the accumulation of heat especially in metropolitan areas due to intense human activities. It is considered one of the most dangerous phenomena threating the environment. It affects humidity percentage, wind patterns, causes hurricanes, floods, heatwaves and Contributes in exacerbation of global warming. The increase in land surface temperature (LST) due to dark materials and reduced vegetation increases the effect of UHI by up to 4 Celsius degrees higher than the surrounding rural areas. This paper aims to investigate the effect of UHI in residential areas and how landscape compositions could be employed to mitigate its effects and creates a landscape designing guideline to 10th of Ramadan city. The results will be based on qualitative methods by collecting data about UHI and comparative methods through comparing the data collected about the two case studies. Moreover, simulative methods by using ENVI-MET and quantitative methods through using GIS.

Keywords: Urban heat island, Landscape elements, Land surface temperature, Vegetation, Land surface land use

1. Introduction

Urbanization process is developing all over the world, especially in developing countries such as Egypt. It causes a change in the landscape area, reduces the cultivated areas and increases dark materials which cause the urban area to be warmer than the surrounding rural areas (L. Yang, Qian, Song, & Zheng, 2016). The effect of UHI increases during nighttime and low wind level as the dark materials absorb sun rays during the day and radiate it during the night. Also, it increases in city centers where the rate of human activities is high as the buildings and humans radiate heat in a great percentage. It has a huge influence on climate, human beings, biodiversity and urban ecosystem (Jain et al., 2019).

2. Structure

The paper aims to create the most effective landscape design which can mitigate the effect of UHI in residential areas. Firstly, two case studies with different landscape designs were chosen to be analyzed: 10th of Ramadan due to its lack of landscape elements and Trio private compound due to its distinctive landscape design. In 10th of Ramadan city, 5 residential clusters were chosen to be analyzed. Secondly, calculating CO2 emissions by using GIS software. Then, simulating the effect of different landscape elements in order to create the best landscape scenario that achieves the minimum air temperature and LST. Finally, a proposal will be created considering all the previous factors to redesign the chosen area (Figure 1).

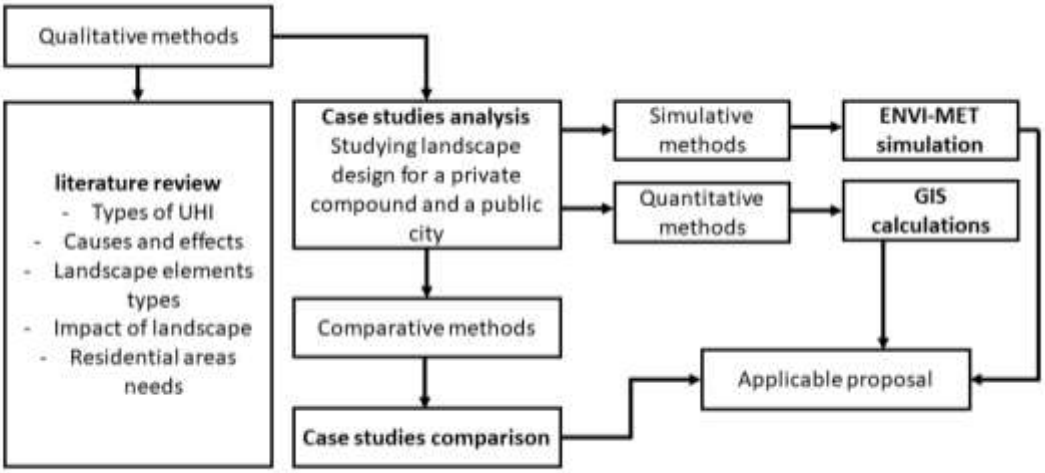

Figure 1 shows conducted method (Source: the author, 2020)

3. Discussion

3.1. *Urban heat island types*

Urban heat island is categorized according to the way it forms, the layer in which it forms and its impact (Peña, 2019).

3.1.1. Surface urban heat island

The changes that occurred due to urbanization leads to changes in Land Use Land Cover (LULC) over the area. These variations cause a change in evaporation rate, albedo and heat flux. Accordingly, the land surface temperature increases leading to the formation of surface urban heat island (SUHI) (Barat, Kumar, Kumar, & Parth Sarthi, 2018).

3.1.2. Atmospheric urban heat island

Affects air temperature and its influence increases at night as the dark materials absorb sun rays and radiate it at nighttime (U.S. Environmental Protection Agency, 2008). It could be canopy layer UHI that exists in the layer which extends from the ground to the top of buildings and trees. Or it is the boundary layer UHI that exists in the layer which extends from roof and trees top level to the point where landscape elements do not have an influence (1.5 km from the surface) as shown in Figure 2.

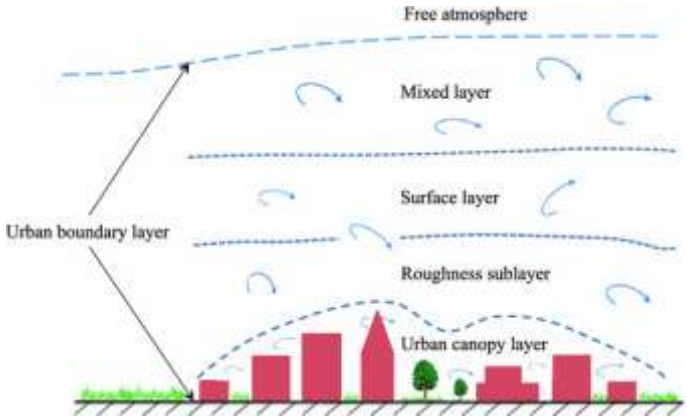

Figure 2 shows the urban canopy and atmospheric layer (U.S. Environmental Protection Agency, 2008)

3.2. Land Surface Temperature

When dark materials absorb heat, it increases LST and accordingly affects the air that exists above the surface forming SUHI and canopy layer UHI (U.S. Environmental Protection Agency, 2008).

3.3. Urban Heat Island Causes

There are several factors contribute in the formation of UHI such as weather, geographic location, urban geometry and anthropogenic activities (refer to table 1). Yet, this paper focuses on treating the effect of urbanization process by vegetation and landscape elements, as these factors could be easily directed with available technologies (U.S. Environmental Protection Agency, 2008).

Table 1 shows UHI causes (source: the author, 2020)

	Causes	Explanation
factors could be changed	Reduced vegetation	Reduce the cooling effect produced by evaporation and shading, caused mainly by **urbanization**
	Urban materials	Control the amount of absorbed heat and increase LST
Future factors to consider	Urban geometry	Height and existence of open areas between buildings affect the amount of absorbed and emitted heat
	Anthropogenic activities	Helps in increasing heat emission
Factors could not be controlled	Weather	Wind speed and sky cover can affect the formation of UHI
	Geographic location	Existence of water bodies and mountains can affect the wind and temperature and accordingly the formation of UHI

3.4. Urbanization Effect

Urbanization is the main causing factor of UHI as it leads to replacing the cultivated areas with dark materials which absorb more heat (Table 2) Accordingly, these dark materials leads to reduction in evaporation process, increase CO2 emissions and reduce water penetration which lead to an increment in air temperature and LST (Malley, Piroozfarb, Farr, & Gates, 2014).

Table 2 shows urbanization effect (source: author, 2020)

Effects	Explanation
Reduced vegetation	- Reduce shade and evaporation process - Reduce water penetration in ground
Dark materials	- Increase the amount of absorbed heat and radiate it in night-time
Heat from vehicles	- The increased number of vehicles helps in emit more heat to the atmosphere
Heat from buildings	- The dark materials used in buildings (concrete) help in absorbing more heat - The heat emitted from buildings due to using air conditioning
Anthropogenic heat	- Due to the large number of residents, anthropogenic activities contribute in UHI formation

3.4.1. Evaporation Process

Metropolitan areas are characterized by dark, dry surfaces and lack of cultivated green areas. Accordingly, the rate of evaporation process decreases and heat runoff percentage increases which leads to increasing LST (U.S. Environmental Protection Agency, 2008).

3.4.2. Water penetration

Dark materials do not only absorb heat, but also prevents the water from penetration into the ground which leads to rising the land surface temperature (Architects, 2018).

3.4.3. Carbon dioxide emissions

Carbon dioxide is a component of greenhouse gas (GHG) which is responsible for keeping the earth warm. Increasing the percentage of CO2 leads to an overabundance of GHG which consequently increases the earth's temperature. CO2 is not only affecting the environment; it also affects human health and economy (Lamb, 2018). As a result, urbanization among all causes is the most harmful one as shown in figure 3.

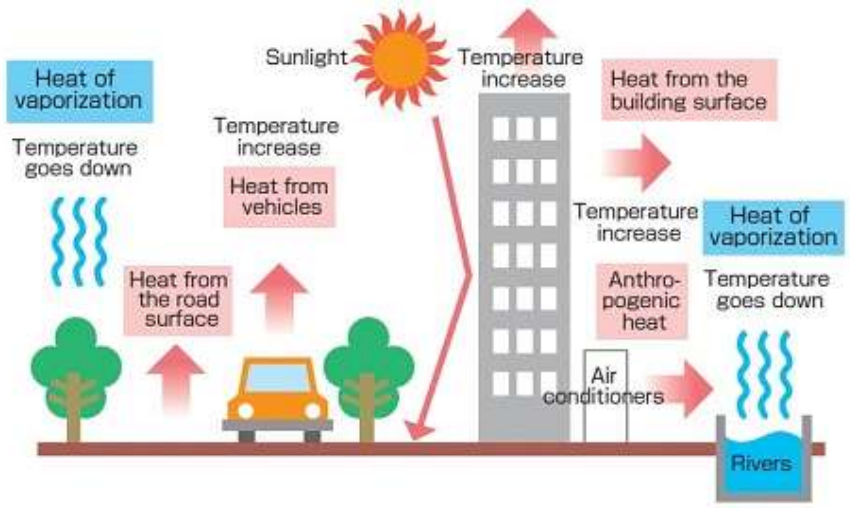

Figure 3 shows different causes of UHI (U.S. Environmental Protection Agency, 2008)

3.5. *Urban heat island effects*

3.5.1. Increase in air temperature and energy consumption

Elevated temperature resulting from UHI leads to increase in energy demand especially in the summertime for cooling. This happens at nighttime especially when the wind level is low (Jain et al., 2019). For each 0.6 degrees Celsius increment in summertime temperature, the electric consumption increases from 1.5 to 2 % per day (U.S. Environmental Protection Agency, 2008). The rising temperature over the last few decades leads to increasing the consumed electricity up to 10% to compensate the effect of UHI (Akbari, 2005).

3.5.2. Reduce water quality

Pavements and surfaces that have a temperature higher than air temperature transfer this heat to the water system causing water pollution. Increased LST can cause underground water to be 3°C warmer than agriculture or undeveloped area (Taylor, 2009). A study in Arlington, Virginia, recorded temperature increases in surface waters as high as 8ºF (4°C) in 40 minutes after heavy summer rains (U.S. Environmental Protection Agency, 2008).

3.5.3. Reduce the quality of life and human comfort

The effects of UHI are not only increasing temperature during daytime and reducing the cooling effect of nighttime, but also increasing the level of pollution that can cause human discomfort, exhaustion and heat-related mortality. UHI also can increase the influence of heatwaves and make it hotter and more humid. As a result, sensitive populations such as the elderly, kids and people with health problems could be affected by these circumstances (Sullivan et al., 1995).

3.6. *Landscape elements*

The scope of this paper is only dealing with the landscape elements that can affect the formation and mitigation of UHI. landscape elements especially greenery have an effective role in reducing the temperature by increasing the reflectance factor (W. Yang, Lin, & Li, 2018). This works through the high albedo of greenery which is 25% in comparison to 15 % of buildings and non-green surfaces (AboElata, 2017). The previous researches monitored that increasing the percentage

of greenery in an urban area could reduce the temperature by 4k. According to (AboElata, 2017) " the satellite measurements showed that the temperature of a green surface is 18k while the temperature of a dark surface is 88k under the same conditions". **Error! Reference source not found.** 3 summarizes the benefits of landscape elements in reducing the effect of UHI.

Landscape elements are classified into softscape and hardscape. Softscape which is the clearest and well-known element; includes the different kinds of plantations such as trees, ground cover, shrubs, flowers and climbers. The softscape will be explained in different new forms such as; green roofs and vertical gardens. Also, water features by all its shapes are considered softscape. Softscape elements are very effective on environmental cooling effects. Hardscape mainly will be shown its effect on pathways materials and all street furniture.

Table 3 shows effects of landscape elements (source: author, 2020)

Benefits	Explanation	Effect on UHI
Reduce energy consumption	-Trees and vegetation reduce needed energy by providing direct shading and cooling effect.	-Reduce the heat emission of buildings and AC unites.
Reduce air pollution and GHG emissions	- Leaves remove air pollutants through dry deposition. - Shading trees reduce heat emission from vehicles. - Vegetation reduce GHG emission by reducing consumed energy.	-Reduce LST and heat emission. -Reducing GHG will reduce the effect of global.
Improve health	- Vegetation can improve air quality by reducing pollution. - Reduce heat gain through buildings which lower health impacts due to heat waves.	-Reduce the impact of factors contributing in the formation of UHI. -Helps in reducing the negative effect of UHI on health and human comfort.

3.6.1. Trees

The existence of trees is the most important factor in mitigating the effect of UHI. It provides shaded areas, reduces the amount of absorbed heat by buildings, helps in removing pollution and helps in water penetration into the ground (Figure 4). Moreover, it helps in decreasing temperature by evaporation process and control wind. (AboElata, 2017)

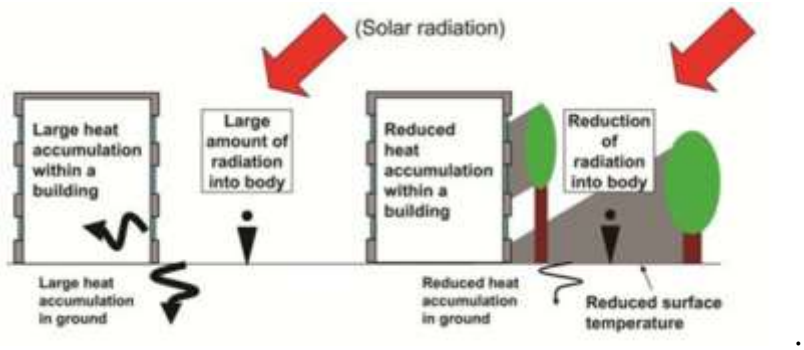

Figure 4 shows the effect of trees on solar heat absorption by buildings (AboElata, 2017)

Trees are categorized according to their size. The type and height of the tree should be chosen properly to avoid heat-trapping (AboElata, 2017) (Figure 5). Also, trees could be used as wind breakers to control the strength and movement of the wind. It can be accomplished by planting specific species that can withstand the effects of wind. It can reduce the effect of wind to a distance up to 30 times its length (SeçkİN, 2018).

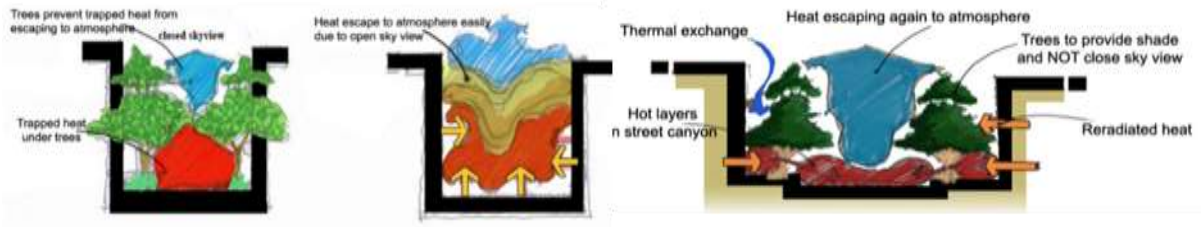

Figure 5 shows the effect of trees density (AboElata, 2017)

3.6.2. Ground cover

Ground cover presented in grass and shrubs create a cooling effect in urban areas by evaporation process, create shade and reflect sun rays due to their high albedo (Taleghani & Berardi, 2018). Shrubs are available in different heights. It could be small or medium in parks and green areas helping in reducing LST. Also, it could be large forming a wall to control wind and provide shade (Iqbal, 2013).

3.6.3. Green roofs and vertical walls

Green roofs can lower the temperature inside the building by 4 Celsius degrees than regular roofs. Moreover, it can lower energy consumption by 0.7% (U.S. Environmental Protection Agency, 2008). Green roofs have an effective role in mitigating UHI and isolating buildings. it has a higher albedo that helps in reflecting sunrays and lower the building temperature by evaporative cooling. Vertical walls have the same effect in cooling and reflecting solar rays (Architects, 2018). Green roofs could be intensive or extensive.

3.6.4. water elements

Water bodies could be added to landscape through artificial ponds, small streams, water walls, fountains or any form that can suit the surrounding (Sun, Chen, Chen, & Lü, 2012). The cause behind using water bodies, is the increased evaporation level during daytime which keeps the temperature low and adds a cooling effect (Steeneveld, Koopmans, Heusinkveld, & Theeuwes,

2014). As a result, air temperature over and surrounding water bodies is different from that over the land (Deepak, 2016).

3.6.5. Hardscape Materials

Using lighter materials such as off-white thin asphalt instead of regular asphalt could reduce LST and air temperature by 2.3°C in low wind speed times (Farhadi, Faizi, & Sanaieian, 2019). Also, using white materials in building envelope cover will reduce the amount of heat absorbed by buildings (Farhadi et al., 2019).

3.7. *Residential areas*

UHI formation rate is high in residential areas due to the excess heat from buildings, anthropogenic heat and vehicles. It is the most affected by UHI especially in the average and low levels.

3.7.1. Residential areas arrangement

Residential areas especially low and average levels usually have open areas and parking lots beside each cluster (Figure 6). It is important to choose the right materials and landscape elements to treat these areas and reduce heat radiation.

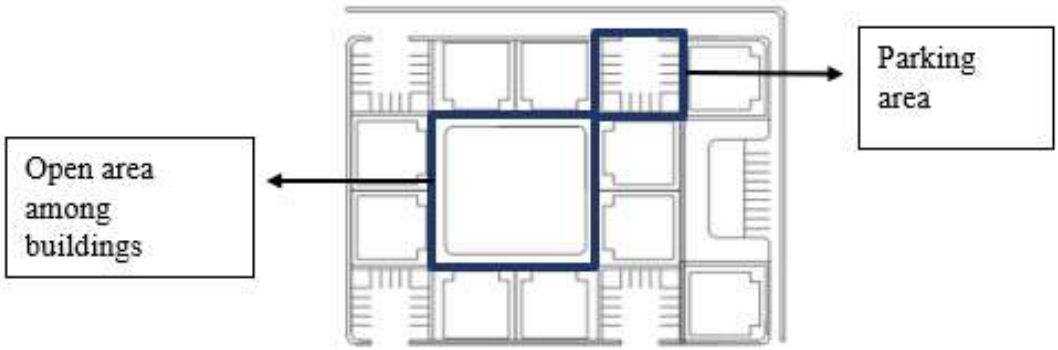

Figure *6* shows low level residential cluster (author, 2020)

3.7.2. Green areas

Green areas exist in residential areas in different percentages according to the area level. They should be connected with direct access to the buildings in order to improve the view and get the most benefit of trees and grass effect on air quality (Figure 7) (Keats, 1967).

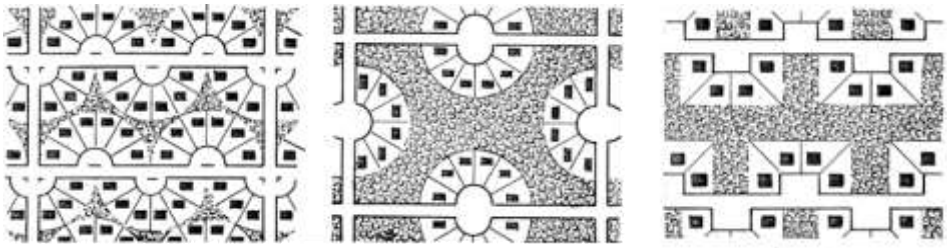

Figure 7 shows green areas in residential clusters (Keats, 1967)

3.7.3. Pathways

Public areas are usually connected to the buildings and other areas by pathways. The materials used for the pathways usually absorb heat in great amounts (Taleghani & Berardi, 2018). In order to reduce heat absorption, bright materials with high albedo should be used instead (**Error! Reference source not found.** 4).

Table 3 shows finishing materials' albedo value (Taleghani & Berardi, 2018)

Material	Albedo value
Asphalt	0.05 - 0.2
Concrete	0.1 – 0.35
Red brick	0.3
White marble chips	0.55
Gravel	0.72
White plaster	0.93

3.7.4. Furniture

The furniture used in residential areas are usually seats made from dark materials such as wood and metal. Accordingly, it absorbs and radiates a large amount of heat which affects human comfort and increases the temperature. Bright colours materials such as white wood could be used to reduce heat absorption see (figure 8).

3.7.5. Parking area

In order to reduce the effect of asphalt in parking, the lots could be covered with white painting or using off-white asphalt (figure 9). Also, parking areas could be covered with trees and shadings (Farhadi et al., 2019).

Figure 8 Shows recommended white furniture

Figure 9 shows white asphalt (Farhadi et al., 2019)

3.8. *Case study*

A high-density built-up area was studied and analyzed to figure out the most effective vegetation scenario to reduce the effect of UHI. A location with an area of 250m x 250m located in downtown, Cairo, Egypt was selected. Two matrices were developed to find out the relationship between UHI, residential area's level, residents' needs and landscape elements (Figure). Then, a simulation process using ENVI-MET (a grid-based three-dimensional model for simulating solar radiation, heat and vapor exchange in urban areas) was conducted on three vegetation scenarios which are

30% trees of outdoor spaces, 50% trees of outdoor spaces and 70% grass +30%trees of outdoor spaces (Figure). Also, the actual temperature was measured in the site for a duration of 24 hours. Finally, determining the used trees based on street width and height of the tree. Ficus Microcarpa tree was recommended to be used as it is more suitable in city streets and parking lots due to its large canopies. Its height and width are both 11m. Delonix Regi tree was also suitable in small and narrow streets. It has a width of 5m and a height of 12m (Aboelata & Sodoudi, 2019).

Figure 10 shows vegetation scenarios (Aboelata & Sodoudi, 2019)

3.8.1. Analysis matrix

Two matrices were developed to study the chosen area. The first matrix (Figure 11) identifies the relationship between the causes of UHI and the needs of residents in residential areas. The second matrix (Figure 12) identifies the level of the selected area and the existence of landscape elements.

UHI causes	Residential area needs	Residential areas level		
		Low	*Average*	*High*
Reduced vegetation	*Green areas*		✓	
Dark materials	*Pathways*		✓	
	Furniture		✓	
Heat from vehicles	*Parked vehicles*		✓	
	Moving vehicles		✓	
Heat from buildings			✓	
Anthropogenic heat			✓	

Figure 11 shows first Matrix; relationship between the causes of UHI and the needs of residents in residential areas (Source: the author, 2020)

Landscape elements			Residential areas level		
			Low	*Average*	*High*
Trees	*Low*			✓	
	Medium			✗	
	high			✓	
Ground cover	*Shrubs*	*Low*		✗	
		Medium		✓	
		high		✗	
	Grass			✗	
Vines				✗	
Green roofs	*Intensive*			✗	
	Extensive			✗	
Water	*Fountains*			✓	
	Water streams			✗	
	Water walls			✗	
	Artificial ponds			✗	
Finishing materials	*Light building materials*			✗	
	Light paving materials			✗	

Figure 12 shows second matrix; the level of the selected area and the existence of landscape elements (Source: the author, 2020)

3.8.2. ENVI-MET accuracy

ENVI-MET model performance was evaluated through the comparison between measured air temperature and simulated air temperature (Figure 13). The meteorological data were measured for 24 hours in 6 points in the Haram district (Aboelata & Sodoudi, 2019).

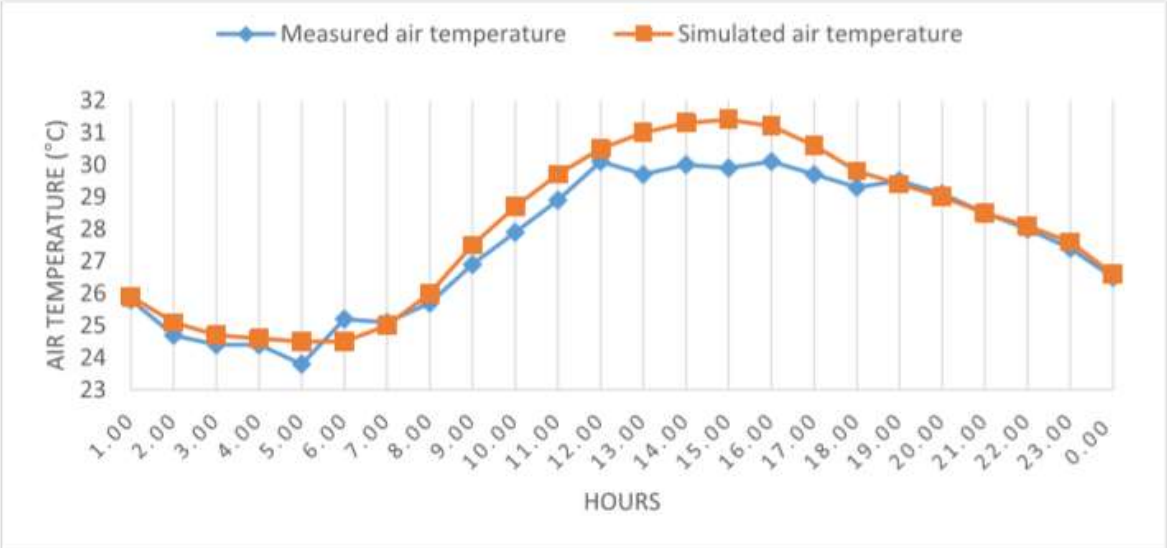

Figure 13 shows simulation and actual temperature (Aboelata & Sodoudi, 2019)

3.8.3. Results

Trees enhance air temperature in high-density built-up areas in Cairo such as downtown, which has an urban density of 50% with a street ratio of 1:2. 50% trees scenario is the most effective one as it decreases air temperature by 1K during the daytime and 0.5K during the nighttime, while the 30% trees and 30% trees +70% grass scenarios reduce the temperature by 0.5K during the daytime and 0.4K during the nighttime, respectively (see Figure 14) (Aboelata & Sodoudi, 2019).

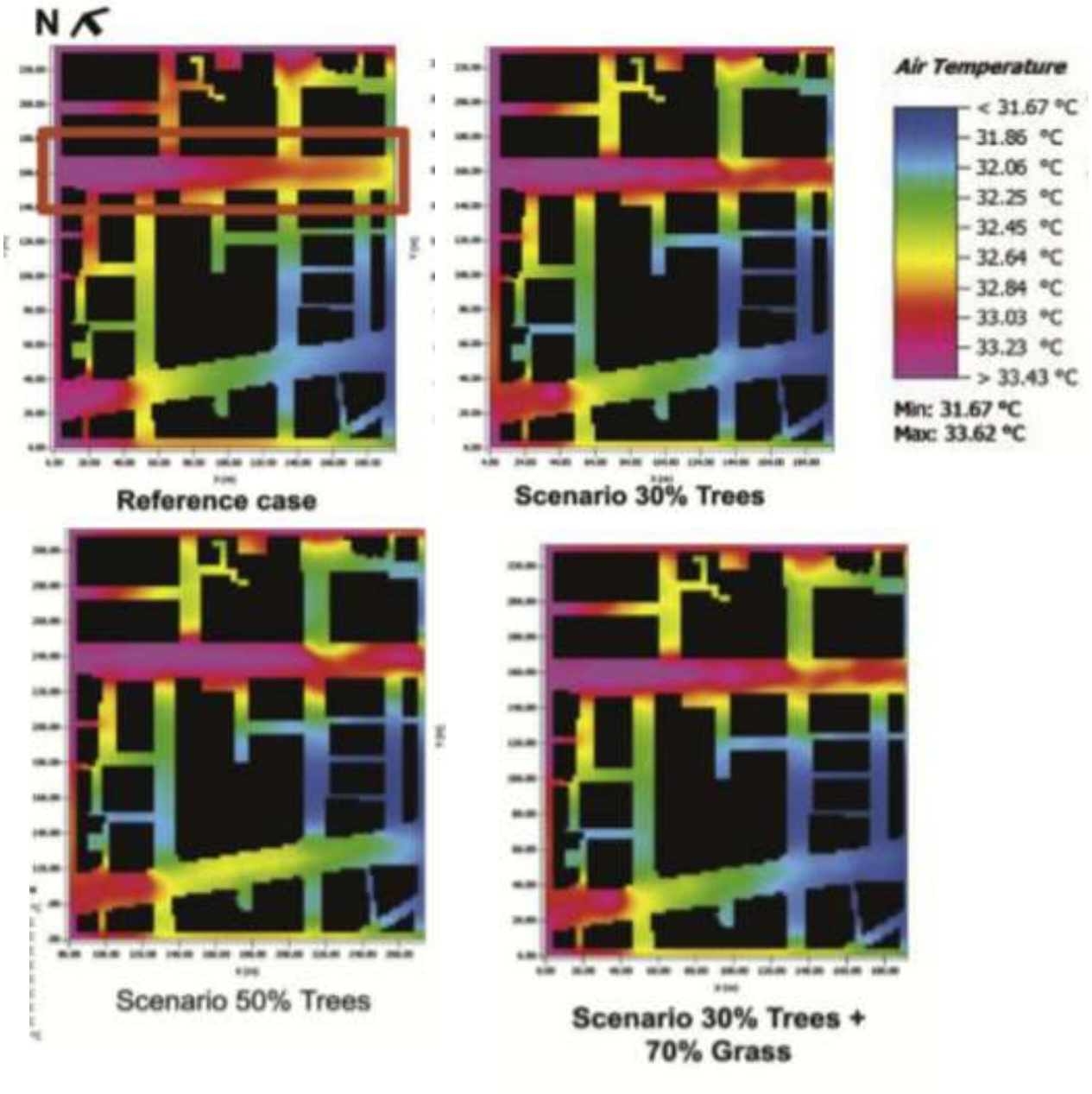

Figure 14 shows simulation results (Aboelata & Sodoudi, 2019)

4. Conclusion

This paper scoped on the formation and mitigation of UHI in residential areas. It provided a guideline for landscape designers and architects for the effect of each element and material used in residential areas. Moreover, explaining a strategy to mitigate the effect of UHI and the most effective materials and elements to be used. Figure 15 indicates the factors covered and discussed in the literature review. In addition, it reviewed a case study on a high-density built-up residential area and indicated the effect of vegetation on reducing air temperature through a simulation process and actual temperature measurement.

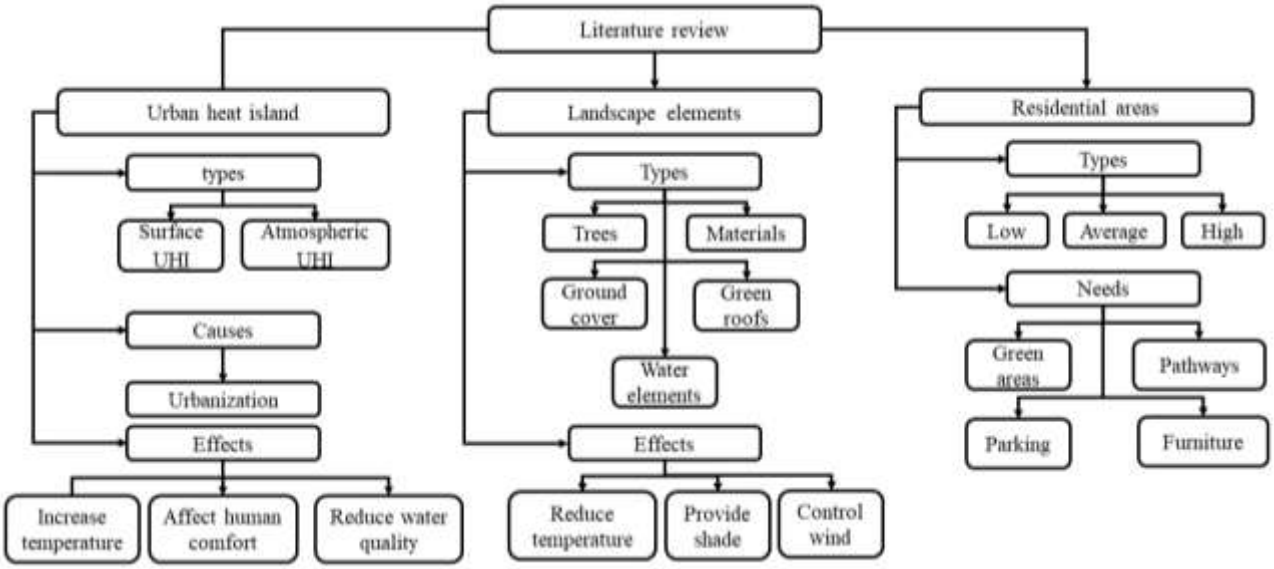

Figure 15 shows literature review conclusion (Source: the author, 2020)

5. Recommendations

In order to control the effect of UHI, it is recommended to study the effect of each element and material on temperature. Also, it is important to decide the position of landscape elements such as trees or water elements. Trees should not be located in northwest direction so they do not block the air while a water element should be located in wind direction, so it creates a cooling effect. In addition, the ratio between trees and grass should be determined according to the purpose of the area. In the case of more dense urban areas, it is recommended to use more trees to provide shade. Furthermore, hardscape materials should be chosen according to their albedo and thermal absorptivity. The materials should have light color with low latent heat. As UHI affects many aspects of life starting with human comfort and electricity consumption to global warming and increasing greenhouse gas emissions. These results should be taken into consideration in planning new cities or redesigning the existing ones. As these results were concluded from one case study in a specific area level, it will be more useful to apply the study on a large scale using the same analysis matrices (Figures 16,17).

Landscape elements			Residential areas level		
			Low	Average	High
Trees	Low				
	Medium				
	high				
Ground cover	Shrubs	Low			
		Medium			
		high			
	Grass				
Vines					
Green roofs	Intensive				
	Extensive				
Water	Fountains				
	Water streams				
	Water walls				
	Artificial ponds				
Finishing materials	Building materials				
	Paving materials				

Figure 16 shows relationship between landscape elements and area's level (source: author, 2020)

UHI causes	Residential area needs	Residential areas level		
		Low	Average	High
Vegetation	Green areas			
Dark materials	Pathways			
	Furniture			
Heat from vehicles	Parked vehicles			
	Moving vehicles			
Heat from buildings				
Anthropogenic heat				

Figure 17 shows relationship between UHI causes and area's need (Source: the author, 2020)

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Sustainable urban/landscape design and solving environmental problems

Integration Of Landscape Elements Into Office Buildings To Form Sustainable Biophilic Environment

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Abstract:

Nowadays, people spend most of their day indoors as in offices and classes. They are not exposing anymore to nature and gaining advantage of it. This paper investigates the idea of integrating landscape elements into office buildings. This can be done by applying contemporary landscape techniques indoors to achieve a sustainable, healthy and biophilic environment. Landscape elements are classified into two pillars; environmental and architectural. The environmental pillar as microclimate modifier, while the architectural pillar as a solution to environmental issues. A sustainable biophilic environment will reflect the impact of nature not only on people, but on architecture too. The aim of this paper is to study and examine the impact of landscape elements on people and buildings as well. The studies in this paper are carried out searching other papers discussing same topic, adding to some respondents and questioners done to different categories and gender of employees. Another method is a comparative analysis between; office buildings integrated with landscape normal office buildings without integrated landscape elements. Moreover, simulation method is done to examine the effect of nature on building environmentally as well. It is expected that there is a strong relationship between architecture and landscape elements as human and nature are related to each other as well.

Keywords landscape elements–office buildings-sustainable biophilic environment-biophilia-biophilic architecture

1. Introduction

Nowadays, Greenery is widely used in architecture to enhance environment. An architect takes into consideration heating, cooling and lighting when designing a building therefore landscape elements can be taken as significant component of effective building design. Landscape can work as wind breakers, shading devices, and light filters as well as it helps in the reduction of noise and air pollution forming environmental sustainability. These elements have a direct effect on people as well by offering comfortable atmosphere to work in therefore productivity is increased. Moreover, using nature in architecture helps in reducing energy consumption, allowing natural ventilation, filtering and shading sunrays, achieving a sustainable green building. On the other hands, nature affects people's creativity by making a connection with them forming a biophilic environment.

This paper is discussing the effect of nature and landscape elements on people as well as on architecture too. Also explaining the biophilia theory and how it can be shown on buildings not only human. The aim of this research is to know the impact of applying landscape elements onto office buildings for achieving a sustainable biophilic environment.

2. Methodologies

This paper is conducted by both qualitative and quantitative methods using deductive and inductive approaches. As for qualitative method, data collected in form of literature review and case studies analysis. On the other hand, quantitative data gathered by two techniques which are survey questionnaire and using design-builders program for simulations.

3. Literature review

Literature review aims to define and discuss the keywords of this paper. As well as providing the significant elements, that can be integrated into office buildings offering and forming sustainability and good working atmosphere. In addition, this chapter explains the biophilia theory and its effect on office buildings and its users.

3.1. *Landscape elements*

Landscape is classified into two categories; hardscape as pathways, shades & lighting posts and softscape as vegetation. On the other hand, Landscape compositional elements are Landform, Vertical structures, Horizontal structures, Vegetation, Water and Climate. (Sannuta, 2013) As this topic is about integration some of these elements into buildings, therefore vegetation and water are the applicable ones to be discussed.

3.1.1. Vegetation

Vegetation is a main natural element of landscape with many different types of plants. Some of the types that are used in landscaping are trees, shrubs, grass, Forbes, bryophytes, and fungi. Firstly, plants affects environmentally as it can be used as windbreakers, shading devices, offers natural ventilation and filters dust. As for the psychological effect, plants and green areas help to relive daily pressure as well as offering sense of community. (Elwazeer & Sayed, 2018) In addition, the presence of plants lower stress, develop performance and productivity, enhance comfort, and advance to physical health. (Kanamori & Brodsky, 2001) Applicable plants for this paper aim are shown in Table 1.

Table 1 Vegetation applicable types, (Source: the author, 2020)

	Trees			Shrubs	Climbers/vines	Ground covers
Shape						
Height	large	medium	small	0.5-3m	Vertical coverage	>0.5 m (15-30cm)
	>9m	6-9m	3-6m			

Function	- Wind breakers - Sun shading device	- Filters dust - Natural ventilation	- Sun shades - Erosion control	- Ground base layer - Erosion protection
Used in	- Green roofs - Courtyards	- Green roofs. - Courtyards	- Living walls - Courtyards pergolas	- Green roofs - Courtyards ground

3.1.2. Water

Water features take the designed landscape to a next level as it gives the space an appealing view and the sound of water changes the atmosphere to a comfortable relaxing one. This landscape element can be used both indoor and outdoor. It is defined in many shapes as fountains, pools, ponds, water gardens, curtain water and artificial waterfalls. (grunderlandscape, 2019) Water features affects environment in many ways like reducing energy consumption, less usage of water, and attracting wildlife like butterflies. (Wise, 2017) As well as, it affects psychologically by relieving stress, affecting satisfaction, and improving health and performance. (Kanamori & Brodsky, 2001) Preferred Water features to be constructed in buildings are shown in Table 2:

Table 2 Water elements (Source:the author, 2020)

	Fountains	Pools	Artificial waterfall	Water curtain
Shape				
Used in	- Entrance - Courtyard	- Roof - Courtyard	- Roof - Courtyard	- Entrance - Roof

3.2. *Office buildings*

Office buildings are a large-scale structures consisting of many spaces as management and administrative offices, human resources management and many other activities. (Sicola, 2017). The reason of selecting this type of buildings to apply on it some landscape elements, is that employees spend most of their day in offices and they must have good attractive working environment to increase productivity and spark creativity. Landscape elements with its aesthetic dimensions, appear to influence both the employee's perception of their workplace and the organization as a whole. (Bodin Danielsson, 2015)

3.2.1. Office buildings classification

Office buildings are categorized depending on either; size, quality as shown in Table 3, or type of spaces as shown in Table 4. Its indoor area must has not less than 75% of accommodation to its users, and area remained can be designed as restaurants, cafes, retail or other uses. (Sicola, 2017)

	Class A	Class B	Class C
Prestigious building	✓		
High maintenance	✓	✓	
Age>20			✓
Good quality	✓	✓	
Aesthetic	✓	✓	
Sustainability	✓	✓	
High technology	✓		

Table 3 office buildings quality classification

	Description
Traditional	-consists of cubicles and private offices
Creative	-Engagement of employees together -low walls showing duct
Co-working	Rentable spaces/desks
Executive	Similar to co-working
Flex	Offices and industry under one roof

Table 4 office building spaces

3.2.2. Users' needs and activities

Office buildings users are not only employees, but also owners, and visitors. Each has different needs and requires different spaces in the building. For example, visitors need lobby that must be appealing, atria or lounges for social purpose, and child care area as courtyards. (Conway, 2017) As for employees and owners, it is essential to feel safe, secured, relaxed and surrounded by comfortable sustainable environment that would get employees excited to go to work. As well as, the building must to be aesthetically pleasing to encourage its users to product and create more. (Sterkenberg, 2017)

3.3. *Sustainable biophilic environment*

Nowadays architecture seeks to long its lifetime by integrating different sustainable features and applying biophilia theory not on people only, but on buildings too. As discussed above chosen landscape elements to be integrated into office buildings to form the sustainable biophilic environment, the biophilia theory and its principles have to be explained first.

3.3.1. Biophilia theory

Biophilia can be defined in many terms as "humanity's innate need to connect with nature and the natural environment" (Sterkenberg, 2017). Integration of some of biophilic elements as green walls, green roofs or any feature that mimics nature create a positive working environment as if users are exposed to nature.

3.3.2. Biophilia principles

"Biophilic design seeks to create good habitat for people as a biological organism in the modern built environment that advances people's health, fitness and wellbeing" see (Figure 1). (Kanamori & Brodsky, 2001). There are 5 main principles of biophilic design which are:

- Engagement with nature
- People adaption to natural world
- Emotional connection to certain setting and places
- Develop interaction between human and nature

- Interconnected and integrated architectural solutions

Figure 1 Engagement with nature principle

3.3.3. Biophilia patterns

The patterns of biophilic design are classified into 3 categories which are:

- Nature of space
- Nature in space.
- Nature analogue. (Browning, Ryan, & Clancy, 2014)

3.3.4. Biophilia effect

Biophilic design has many results in a wide spectrum of physical, mental and behavioural benefits. As for physical effects, it includes improved fitness, lowering pressure, increasing comfort and satisfaction, and reducing illness by improving health. Adding to, Mental benefits range from enhanced satisfaction and motivation, less stress, to improved problem solving and creativity. Lastly, behavioural change by good coping and mastery skills, better concentration, and improved social interaction. (Kanamori & Brodsky, 2001).

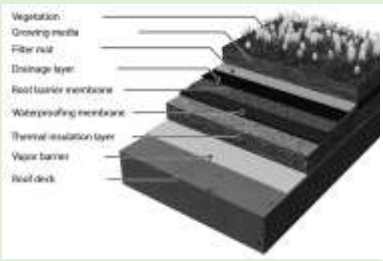
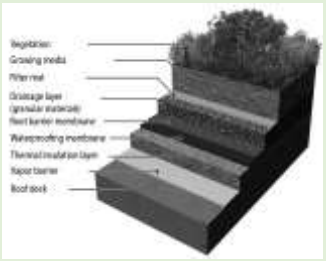
3.3.5. Biophilic architecture

"Biophilic architecture" term is obtained from green architecture umbrella, which can be defined as a green building using specific elements as plants, water, and efficient space usage to form a connection between human and nature obtaining sustainable environment. Authorizing certain features of green design to biophilic architecture as vegetation of roofs, green walls, courtyards, potted plants, curtain water and fountains. Biophilic design has great effect environmentally as energy consumption reduction and noise insulation. It also affects people psychologically due to the biophilia theory, forming positive sustainable atmosphere.

A. <u>Green roofs</u>

There are main three types of green roofs; extensive, intensive and Semi-intensive shown in Table 5. Extensive green roofs are for small sized plants, and cheaper than any other rooftop. Intensive roof garden is for all plant types and needs a lot of preparation for insulation. The semi-intensive can be divided but needs extra insulation too. (Besir & Cuce, 2018)

Table 5 Green roofs types, (author, 2020)

	Extensive	Intensive	Semi-intensive
Soil depth	Very shallow(2-15 cm)	>30 cm	Medium(15-30 cm)
Plants type	Small sized	All types(trees & shrubs)	Large sized
Weight load	Limiting factors	Large	Light
Cost	Cheap	Expensive	Expensive
Accessibility	✗	✓	✓
Water features	✗	✓	✓
	✗	✓	✓
Aesthetic			

B. Green walls

Green wall or called live wall is the method of planting a façade or applying greenery vertically and covering large harsh **surfaces. (Ragheb et al., 2016). This type of vegetation is categorized into two systems and two types, which are shown below in Figure 2.**

Figure 2 green walls in offices.

C. Courtyards

In past, courtyards were just open space without a ceiling for smoke to come out, but with time it developed to be a sky central space that affects its surroundings. It is classified into two categories, which are Physical attributes (functions as thermostat), and Intangible effects (functions as void). (Radha H., 2018).

Environementally wise, courtyards concept is to circulate air as the interior heats up air after entering building, then it passes through the courtyard and start rising up through the open space as shown in **Figure 3.** It helps to keep the building cooled and lower its temprature as well as using natural ventilation rather than HVAC.

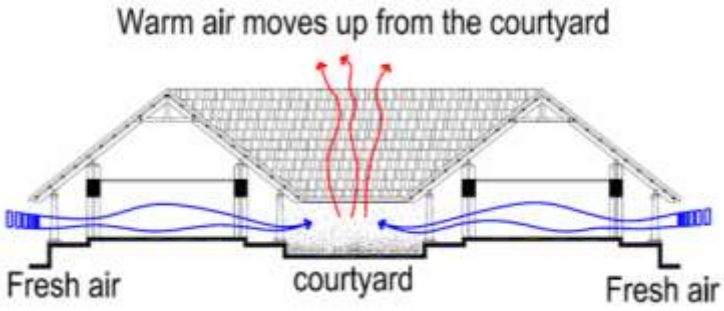


Figure 3 Air circulation in courtyards.

D. Potted plants

Indoor plants have a great impact on surrounded environment and many advantages like freshen up air by releasing oxygen and making users feel better, increasing productivity and improving concentration. As well as, it helps in reducing stress and boosting user's mood. At work, placing a plant pot on disk can arrange humidity and release positivity see Figure 4. (Lee, 2017)

On the other hand, offices benefit from plants by improving air quality, reducing levels of pollutants, and increasing humidity see Figure 5. In addition, noise is lowered as leaves absorb and diffract background noises and high frequency sounds. As a result, energy is saved forming sustainable environment. (Ambius, 2019) Finally green walls are one of the most preferable integration of landscape in office buildings see Figure 6.

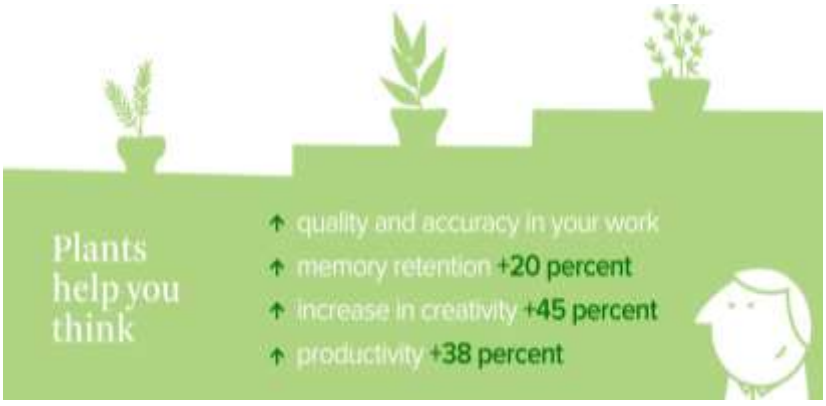


Figure 4 Benefits of plants

Figure 5 potted plant

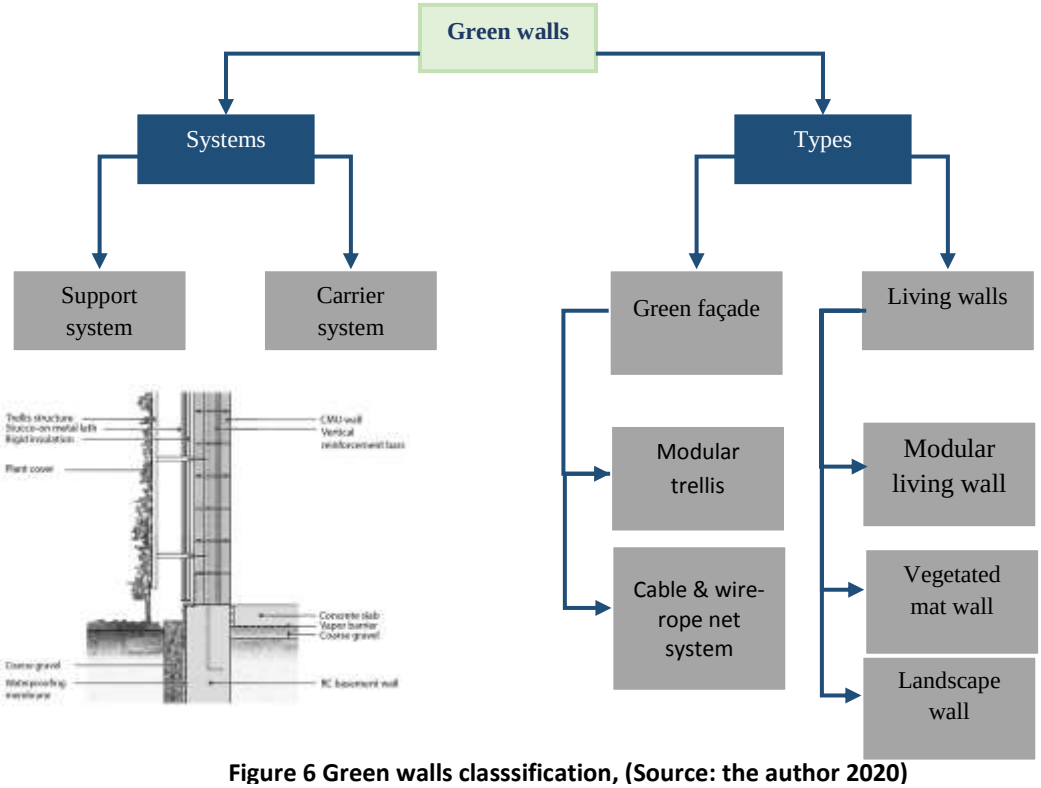


Figure 6 Green walls classsification, (Source: the author 2020)

E. Fountains

Fountains impact on building environmentally is in many forms as reducing temperature, which leads to less usage of HVAC and saving energy. Adding to, it acts as natural air humidifier by adding moisture to office space and improving air quality. Nowadays technology helped in creating an electric type of fountain that helps in reducing air pollution through attracting dust by negative ions. (Liddell, 2012). Fountains come in different natural forms as cascades and waterfalls to give a natural ambience inside the office as shown in Figure 7.

Figure 7 Fountain forms.

F. Water curtain

Water curtains are very attractive and eye catching architectural piece that can be used in offices. It does not need large spaces as it hangs on walls. These curtains offer appealing sight and relaxing environment. Another benefit from attracting visitors and giving them a memorable impression, it also provides soft background sounds leading to reduction in noise and helps users to relax and enjoy this comfortable working atmosphere see Figure 8.

This type of water feature can be used in office buildings with busy lobbies, or in courtyards. (Fountains, 2016).

Figure 8 Water curtain.

3.4. *CONCLUSION*

After studying all previous data of literature review, a matrix Table 6 is conducted. It consists of all preferred landscape elements and biophilic architecture features. Adding to, types of spaces and classes of office buildings. This matrix is applicable to analyze all of the case studies chosen in this paper.

Table 6 Concluded matrix, (Source: the author, 2020)				Case study one	Case study two	Case study three
Office buildings	Quality classes	A				
		B				
		C				
		Trophy				
	Space functionality	Traditional				
		Creative				
		Co-working				
		Executive site				
		Flex				
Landscape elements	Vegetation	Trees	Tall			
			Medium			
			small			
		shrubs				
		Climbers/vines				
		groundcovers				
	Water	Fountains				
		Pools				
		Artificial waterfalls				
		Water curtain				
Biophilic architecture	Green features	Green roofs	Extensive			
			Intensive			
			Semi-intensive			
		Green walls	Green facades			
			Living walls			
		Potted plants				
	Water features	Fountains				
		Water curtain				
	Courtyards					

4. Case study

In this study, the performance of building integrated vegetation (BIV) is examined concerning energy consumption measures (ECM). An area of 200 million sq. m in form of roofs all over UK can be transformed to green roofs. As for this analysis, an office building of six floors is modelled using '*EnergyPlus'* program. Building integrated vegetation (BIV) benefits are:

- Improving energy efficiency
- Purifying water and air
- Longing roofs life span

4.1. *Methodology*

Simulating an office-building model, using '*EnergyPlus'* by adding green roof or green walls to examine the effect on indoor air quality and measuring energy consumption. As in Table 7, all details of the office building are shown. *'EnergyPlus'* uses various sources for gathering climate files. As for London climate, is taken from IWEC weather data source1. (ASHRAE, 2001)

Table 7 Office-building details.

6-storey office building	
Location	London, UK
Height	3.7m per floor
Length x Width	30mx30m
Total floor area	5400m2
Construction	**Walls:** • Highly insulated • External Shading on glazing
	Roof : Un-insulated concrete slab
	Floor: Insulated concrete floor

Key vegetation and building dependents parameters are formulated for accurate analysis.

A. Green roofs:

As for vegetation, model depends on leaf area index (LAI) which represents the vegetation coverage area On the other hand; building dependents parameters includes internal comfort temperature (ICT).

B. Green walls:

The vegetation dependent parameters were not considered for the analysis of green walls. Instead, the optimized solution for vegetation parameters (vegetation coverage area) in

the green roof analysis are applied and assumed constant. The substrate depth is assumed constant as per general manufacturer's details. Orientation of walls, ICT, roof insulation and sun angle are considered the building dependents parameters of green walls simulation.

4.2. *Simulation results discussion*

4.2.1. Green roofs analysis

An un-shaded block-model of dimensions 30m*30m*3.7m, the top floor, was considered for analysis with highly insulated walls, airtight construction, but with an un-insulated roof for the base-case scenario. A vegetation layer was then applied to the roof.

A. **Effect on internal air temperature**

The range used for LAI is from 0.002 to 5 which is highly dense. As for the substrate depth is constant of 150 mm. The following Table 8 compares between indoor temperatures in summer & winter for base case scenario, and after adding green roof, taking into consideration that thermal comfort zone (TCZ) ranges from 18°C to 24°C.

Table 8 green roof simulation affecting internal air temperature, (Source: the author, 2020)

	Internal air temperature (IAT)	
	Summer day	**Winter day**
Base case	• Non-operational HVAC • Temperature varies 28°C-38°C	• Non-operational HVAC • Dry bulb varies 5°C to 9°C
Green roof	• Temperature curve: 25°C-28°C • Close to TCZ • Using LAI 5	At 12:30 • LAI 0.002: 4.7°C • LAI 5: 5.6°C

When the green roof was applied (Figure 10), both LAI models showed a similar trend with minimal variation in indoor air temperature. However, for the LAI 5 model, the temperature curve lies within the range of 25-28 C, which is much closer to the comfort temperature than for the base case scenario. Using the green roof with LAI 5 can reduce the average internal air temperature by 8 C compared with the base case. It can be seen from Figure 9 & Figure 10, that the temperature difference between the LAI variants is not significant. At 12:30 hrs. For example, the internal temperature for LAI 0.002 is 4.7 C whereas for LAI 5 it is 5.6 C, however for the base case it is -0.4 C.

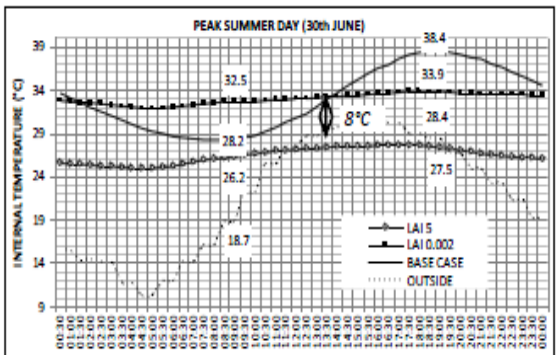


Figure 9 Internal temperatures on peak summer

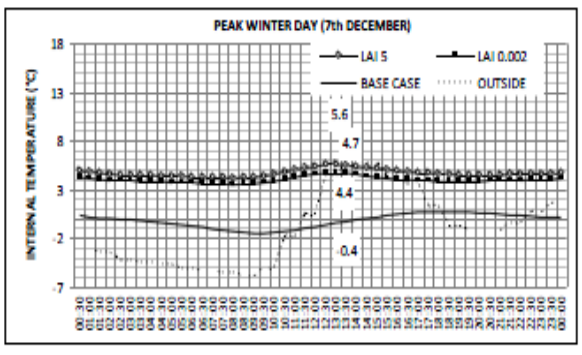


Figure 10 Internal temperature on peak winter

B. **Effect on energy consumption**

As shown Table 9, that adding green roof can reduce annual energy consumption by 15% using LAI 5 and substrate depth 150mm. while lower LAI (0.002) would reduce consumption by 13.5% annually. Hence, a lower LAI would have a slight effect on the heating loads, but increasing LAI in summer would almost double the energy savings.

GREEN ROOF (150mm substrate depth)	PERIOD	LOWER LAI (0.002)	HIGHER LAI (5)
Saving in Energy consumption	Annual	13.5%	15%
Saving in Heating load		15%	16%
Saving in Cooling load		3.2%	7%
Average internal air temperatures	Peak Summer	Same as base case	Reduces by 6.5 ℃
	Peak winter	Increases by 4.2 ℃	Increases by 4.9 ℃

Table 9 Summary of green roof findings

4.2.2. Green walls analysis

From the green roof analysis it was found that a green roof with denser vegetation coverage (LAI 5) and deeper substrate depth achieved the greatest reduction in annual energy consumption against a base case scenario. In a modular green wall Figure 11 (280mmx280mmx90mm) is modelled with LAI 5.

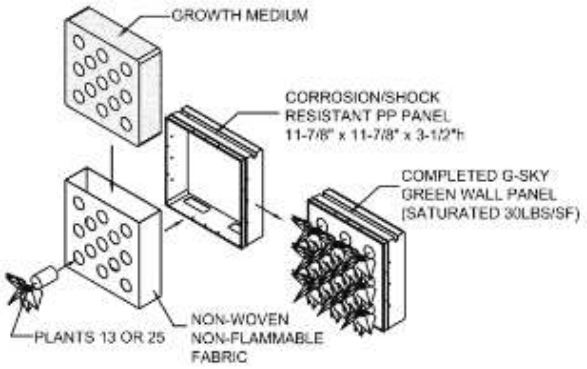


Figure 11 modular living wall

A. **Orientation of wall**

Loss or gain of heat mainly depends on wall orientation towards the sun. A study is conducted by applying vegetation on each façade or all of the four facades at once to obtain an optimum solution for energy saving. By vegetating all of the facades of the building, a 3.35% annual energy saving can be achieved as shown in Table 10 .When a singular façade of

any orientation is vegetated a marginal saving of 0.7-0.9% can be achieved in annual energy consumption see Table 11.

Table 10 Green wall simulation affecting energy consumption, (Source: the author, 2020)

Energy consumption saving	
Base case	• Highly insulated roof and windows • Un-insulated cavity walls • Internal air temperature: 24°C(cooling)-22°C (heating)
Vegetating four facades	3.35%
Vegetating single façade	Energy consumption: 0.7%-0.9%
	Cooling loads: increased 1.4-2%
	Heating loads: 1.3%

Table 11 summary of green wall findings concerning wall orientation.

GREEN WALL WITH LAI 5 90MM SUBSTRATE DEPTH	PERIOD	EAST FACING	NORTH FACING	WEST FACING	SOUTH FACING	ALL WALLS
Savings in Energy consumption	Annual	0.9%	0.9%	0.9%	0.7%	3.35%
Savings in heating load		1.3%	1.3%	1.3%	1.1%	5%
Savings in cooling load		None. Increases by 1.4%	None. Increases by 2%	None. Increases by 1.4%	None. Increases by 1.5%	None. Increases by 6.6%

B. Comfort temperature

"The heating set-point, which was originally taken as 22 ºC, was further decreased by 4 ºC to analyze the effect on the annual energy consumption." As shown in Figure 12, that lowering the set point temperature increases green walls efficiency.

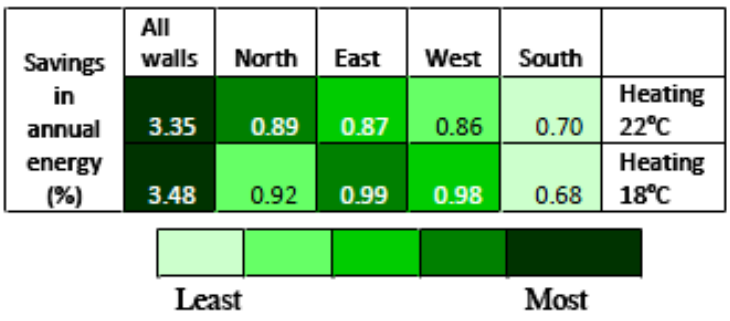


Figure 12 Energy saving for green walls for different set point

4.2.3. Conclusion

Briefly, determining energy savings effect using vegetation parameters for green roofs depends on seasonal climatic variation. For example, using low LAI in winter and high LAI in summer for annual efficiency. As for green walls, it depends mainly on building parameters like internal comfort and orientation of walls.

5. Conclusion

Narrowing down, the main aim of this paper is to provide design guidelines by using landscape elements to form biophilic environment focusing on the effect of landscape on office buildings environmental and psychological wise. In addition, using collected data from literature review and case studies comparison to achieve paper's aim and test hypothesis. Besides, a discussion of the results of simulating an office building to evaluate the effect of biophilic architecture by adding green walls or green roofs. Concluding, both features reduce energy consumption and modify internal air temperature.

6. Recommendations

After studying data collected, it is shown that using either vegetation or water as landscape elements helps in forming sustainability and biophilic environment. In order to apply landscape on buildings, it is necessary to study effect of each element and where to be placed for high functionality. As for trees, medium and small ones are more applicable due to their location, indoor. On the other hand, water is better to be located according to wind direction to modify internal air temperature and form comfortable atmosphere. Using biophilic architecture features plays a great role in forming sustainability. Concerning green roofs, using low LAI is better in winter and high LAI in summer for annually efficiency. As for green walls, it mainly depends on orientation of the wall therefore vegetating a north wall is most optimum to save energy and reduce temperature indoor. Other feature is courtyard, which is highly recommended as it ease the circulation of by getting rid of warm air upwards. Potted plants can be added on offices disks to lower pressure and give feel of warm and comfort. Finally, the sound of water forms comfortable atmosphere and offers relaxation for surrounded people hence water features are favored to be constructed in office buildings. According to literature review information, a matrix (Table 6), is executed to be applicable for case study analysis. It is recommended to use it for case studies comparison to ease the evaluation of the building.

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THE PATH TO CITY RESILIENCE
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Integration Of Urban Parks Within Residential Streets In Egypt

"Case studies; El-Rehab City and Nasr City"

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Abstract:
Residential landscape is considered to be the main important mean of creating comfortable environment for residents to live in. Though the residential landscape do not constitute a significant portion in our urban environment, reside in environment that is rich with residential landscape and good environment condition. "The World population in urban areas is projected to grow from 3.3 billion people in 2007 to 6.4 billion by 2050. Most population growth projected in urban areas will be concentrated in cities and towns of less developed regions (Low Choy, Wadsworth and Burns 2010). Recently, the increased urban population in Egypt is a product of internal migration from rural areas to cities. These new urban dwellers bring with them different expectations of the urban environment, such as: urban open space, better living conditions, ease of mobility, and diverse cultural practices. This internal migration has influenced the formation of the contemporary Egyptian metropolis during the mid-20th century. As a result of this phenomena, it became very important to integrate public open spaces and parks within the residential urban areas. (Maat, 2006). Moreover there is a huge lack of planning and designing a sustainable residential parks. These parks should fulfill the resident needs and increase the communication among people, which definitely will affect the residents in their social life. The objective of this paper is thus to purpose a criteria that should be enforced to guarantee an acceptable level of integrated parks within residential areas. Also this paper aim to develop a new method to maintain and assure ecological balance of green areas in residential urban areas, Qualitative research method was followed in order to tackle the paper objective; it was applied by means of a literature review, which included urban parks, its characteristics, and benefits of residential urban parks. Moreover, two pioneering examples for residential urban parks have been analyzed. Findings indicated that urban parks plays a vital role for human life. The study provides an evidence that, urban parks affect the residents behaviors in their social life and their feeling towards life. As it will also affect the environment that they are living in.

Keywords: Residential areas - urban parks - Social life- Mental Health

1. Introduction

Public parks and recreational facilities are locations which provide people opportunities for a wide range of leisure, sport and recreational activities. As such, public parks and recreational facilities are crucial for the social and economic health of cities and towns (Sallis, et al. 2004). Accordingly, there was a greater demand for creation of organized open spaces including public parks and open recreational facilities in the residential areas of the cities. These spaces have become one of the core urban functions and land uses in the city development plan. Although, a number of such public parks have been developed in the residential areas, it has been observed that except for a few major and organized ones, the others are barely utilized. The reason of underutilization of the public parks are attributed to many factors that include lack of amenities, inappropriate location, lack of attractiveness, lack of accessibility, behavioral issues like lack of time and lifestyle, social issues like crime or fear of crime to name a few.

Thus, it is crucial to evaluate the most important determinants, which influence accessibility of public parks in the residential areas of a city and then evolve planning and design guidelines to improve accessibility so that the parks will be more vibrant and optimally utilized. Therefore, the objective of this investigation is to identify the most important accessibility factors that deter the utilization of public parks and examine their level of influence on the utilization of public parks in the residential areas of Egypt.

1.1. *Research problem*

There is a huge lack of planning and designing a sustainable residential parks that should fulfill the resident needs and increase the communication among people that will affect the residents in their social life. Nowadays, due to the recent development that is taking place in different places in Egypt, a huge number of compounds and residential places and areas have been built rapidly with no respect to human and environment needs and that will have negative impact on the human and environment behavior. As in this case the average of utilization of residential parks will decrease and that will affect the surrounding environment in which resident's lives in. At some point, in the coming years more people will moves from Cairo and center of it to live in new settlements that contains residential landscape and parks, as residential parks has a huge impact on environment and the climate characteristics and residents behavior (health, Social life and safety) in which they are living in it, as well as it plays an important role in child growth and his gain of information and knowledge apart from the home or school, as many parents faces the huge problem of letting their children play in the yard that surround their home as there is no residential parks in it.

1.2. *Research Objective*

The key objective of the study is to purpose a criteria that should be enforced to guarantee an acceptable level of integrated parks within residential areas. This happen through gauging the different residential areas that can be suitable for evaluation (Rehab city and Nasr city). Moreover, the research aim to answer the following questions;

1.2.1 How the fundamentals defining the city parks in the residential areas should be?

1.2.2. What kind of aesthetic qualities do residents in Egypt desire in city parks?

1.2.3. How the existing parks in residential areas in Egypt look like?

1.2.4. What are the suggestions to improve urban parks in the residential areas in order to make them more attractive and livable spaces?

1.2.5. What criteria should be enforced to ensure an acceptable level of city parks within residential areas?

1.3. *Research Methodology*

The research way that has been done to attain the determinations of this study is based on the following;

1.3.1. Literature review: definition of city parks, architecture aesthetics of urban parks, residential areas, urban aesthetics and principles of built environment and finally the integration between public city parks in residential areas

1.3.2. National Case studies on different residential areas.

2. Urban Parks

This paper will discuss residential parks and landscape features, which is important for claiming private neighborhoods and fulfilling human needs. Then it will perceive dimension of parks within residential streets and idealistic parks meaning. And finally the effect of parks on residents behavior and how it enhance health. All these topics help in answering the paper questions and achieving the main objective of the paper.

2.1. *Defining urban parks*

"What are urban parks?" The fiction that describes urban parks is frequently uncertain and unclear; A large number investigators have utilized an assortment from claiming implications for the reason for serving book fans distinguish the thing that urban parks incomes for a point by point position or to diverse examination determinations, yet this is in the end vague. (Erickson, 2006) By urban parks, greatest people recognize this to nasty young land, or land without buildings. "This suggests absenteeism - places that are left open or vacant in the spatial fabric of a city". (Girling and Kellett 2005) Urban residential parks can be a massive wrapping of green astronomical in an urban area or a minor cover in the midpoint of the city. (Erickson, 2006)

Those expositive expression that characterizes green space will be wide. These territories need aid included clinched alongside A bigger framework for general population spaces that a number creators need redefined. Green spaces incorporate all that over urban communities with plants - if characteristic or growed. Otherwise called. "Land that consists predominantly of unsealed, permeable, 'soft' surfaces such as soil, grass, shrubs and trees. The emphasis is on the *'predominant'* character because of course, green spaces see Figure 1, may include buildings and hard surfaced areas". (Dunnet, Swanwick and Woolley, 2002)

Figure 1: Green Spaces (Dobson, 2018).

Figure 2: Civic spaces (Seldakhoy, 2020)

"Civic spaces" see Figure 2, occasionally discussed to "grey spaces", are a subsection of urban exposed space, containing of urban squares, marketplaces and other covered or solid landscaped areas with a public purpose (Carmona, et al., 2010), Figure 3 shows the contents of civic and green spaces;

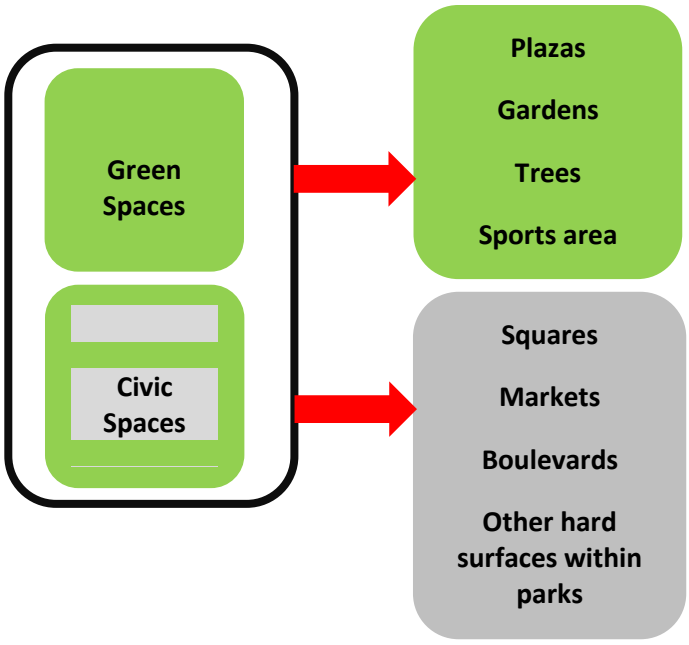


Figure 3: Residential parks components (Author, 2020)

2.2. *Related Landscape Features for urban parks*

The relevant of landscape features has been adapted from (Dr. Osama Tolba) which has divided the landscape features into the following elements:

2.2.1. Paths and pavements

They are the main importance elements in the landscape features as they allow the residents to enjoy the landscape, many parks were destroyed by poorly landscape paths and pavements while well designed paths will add great value to landscape and to the area, see Figure 4 .(Ferris, 2009)

Figure 4: Paths and pavement. (Ferris, 2009)

2.2.2. Design of the using area

These area may be open space as wooden areas, camping site, entertainment area or residential parks and landscape. Residential parks and green areas help the people to transfer from passive spectators to active participants, these residential parks and green urban areas have a huge role in accomplishing a lot of objective as it provides health and pleasure to the residents as it works as a piece of art. The residential landscape and urban green areas increases the quality of life by having a lot of recreational experiences benefits and performances of green spaces are measured by the user's level of satisfaction. (Muderriosglu, 2010)

2.2.3. Other landscape facilities

There are a lot of facilities that have positive effect on the performance of the site as tables, benches, kiosks, shades and so on as shown in Figure 5 and Figure 6.

Figure 5: Kiosks (Ferris, 2009)

Figure 6: Benches (Ferris, 2009)

2.2.4. Playground and courtyard

playground, courts, ground surface, this to swing/climb/stand or walk, etc… these features provide a place for children to play in and helps neighborhood in knowing each other and coming together and creating relationships and building sense of community see Figure 7. (Prow, 1999)

Fig 7: Playgrounds (Prow, 1999)

2.3. *Benefits landscape features within urban parks*

From the residents point of view the following benefits were found:

2.3.1 The paths and pavements provide the opportunity for residents walk in a peacefully environment, as they also provide a space that accommodate social activities as communication with residents and having the opportunity of strong relationship between each other. (Ferris, 2009).

2.3.2. Design of using area: have strong impact on understanding, security, identity and creativity. They also provide a chance to access information and informal learning is supported. These areas also help the people to meet, communicate, interact and cooperate with each other they help in bringing the residents together. The impact on security is also considerable as they provide environments where people feel free, safe and act freely. Therefore, it reduces violence and crimes. (Muderriosglu, 2010)

2.3.3. Landscape facilities: they apply security, participation and identity. They also provide shelters, air and maintain activates in the residential parks.

2.3.4. Playgrounds and court yards: they create a relation to freedom is interpreted in terms of contact with nature enhanced feeling of being free and provision of choices for visitors. Creativity is very well related to playgrounds as they allow visitors to play, learn, cooperate and help children to develop their artistic skills. (Prow, 1999)

2.4. *Perceived Dimensions of urban parks*

Patrick Grahn, a Swedish landscape architect, who is also an environmental psychologist, has developed eight different park properties, indicating the perceived dimensions of urban green spaces. Table 1 shows the dimensions of urban green spaces.

Table 1:perceived dimensions of urban green spaces

Dimensions	Explanation
Serene	This is a place which expresses silence, serenity and peacefulness, a quiet place with no annoying sounds and distractions. May contain attributes such as wind

	breakers and easily accessible paths, where safety and opportunities to reflection and spirituality are appreciated. You can usually notice sounds of the blowing wind, singing birds and pouring rain. No litter, no noise and not too many people should be disturbing (Grahn & Stigsdotter, 2009; Grahn, 2005).
Space	The most separate characteristics for this features are the notions of "being in another world" and to experience autonomy and lightness. No, the parks contains of a consistent structure, which enables inspection and reflection (Carmona, et al., 2010)
Nature	The park characteristics of wilderness are associated with green environments that appear to have no or little human influences" (Dunnet, Swanwick and Woolley, 2002). Local plants Furthermore animals rule those experiences, the place the association between people Furthermore nature need its coliseum. Nature will be Typically produced dependent upon for rocks, lichens Also mosses Furthermore acquires a unwinding What's more safe environment. It provides for the visitor An inclination of constantly done way for its identity or condition, due to its dynamic What's more innate vitality. (Grahn & Stigdotter, 2003)
Rich in species	This category of parks contains species variety and arbitrates a notion of a great diversity of flora and fauna, counting flowers, berries, lichens, butterflies (Grahn & Stigdotter, 2009) Adding water, barriers and millponds, gives the individual a further measurement. This capacity also be accompanying with vegetal gardens and the Garden of Eden (Grahn, 2005).
Refuge	A place where people can call, identify themselves, where feeling safe is extremely important (Grahn & Stigsdotter, 2009). The structures are surrounded by shrubs and high vegetation, encouraging children to play games, hiking and outdoor activities. Features like Flips, Slides, and Small Homes invite active and inactive games (Burgess, Harrison and Limb, 1988)
Cultural	This characteristic is related to human evaluation and history, in which a sense of belonging and identity is achieved. People have a desire to understand their environment by defining cultural and historical traits. These attributes may be human artifacts such as sculptures, fountains, statues, ponds, etc. in natural and cultural environments (Grahn & Stigsdotter, 2009). The place is of symbolic importance and drinks a historical and cultural imprint.
Prospect	The potential dimension of perceived urban urban parks is related to open fields, which are usually designed as well-cut lawn surfaces. Except for grassy grass, the environment can consist, for example, of sitting facilities, public toilets, trees in rows such as windshields, etc. Physical activities are the main achievement (Berggren-Bärring & Grahn, 1995).
Social	The social feature of the venue encourages social activities and personal meetings, where activities such as dancing, playing and eating may take place (Grahn, 2005). Various variants of entertainment, requiring seats, toilets, well lit and easily accessible tracks are included to facilitate the celebration. The locations of these green areas are usually located near urban centers, where disturbances may occur (Burgess, Harrison and Limb, 1988)

Research addressing the perceived dimensions of urban residential parks aims to guide future planning processes. Ståhle (2005) highlights the importance of high-diversity parks, because good recreational conditions not only serve the individual, but also help improve the quality of life within a community. Siren's advantage is generally the most preferred dimension, even for the most extreme and weakest (Grahn & Stigsdotter, 2009; Grahn, 2005). Quiet meets many needs. Sometimes all eight dimensions are included, which attract the majority of the population. Culture, expectations and social were the least favored, and rich species and shelter were found in the middle, right after space and nature (Grahn & Stigsdotter, 2009). Today the importance of residential parks is widely recognized in the field of urban planning. The green structure that combines open green spaces has a major impact on the quality of life, as the following section discusses the impact of gardens on the quality of life.

3. Effect of parks on the quality of life

A lot of studies debated that the residential parks have huge effect on the quality of life for increasingly urbanized compounds and cities. Many evidence and studies indicate that the presence of natural areas as (residential urban parks, green areas in compound) and the components within this areas contributes to quality of the life in a lot of ways. As it affect the air purification, wind filtration and noise filtration as well, these natural areas or residential landscapes provide psychological and social serviced which will increase the percentage of livability in this residential areas. As Ulrich said that “residential landscape or green areas may lead to reduction of stress” (Ulrich 1981)

3.1. *Importance of quality of life*

Nature plays an important role in the quality of life. Many people, who are living in private compounds or private residential areas with landscape, give an evidence that nature and connection to the outdoor landscape plays an important role in the quality of their life. It is found in more than one way or reason that may include improvement in their social life as shown in Figure 8, the evidence are;

3.1.1. Increasing the communication between people that are living in this residential area.
3.1.2. Increasing the sensor stimulation.
3.1.3. Connection with the wild life.
3.1.4. Having a good and pleasing view.
3.1.5. Having fresh air and good climate.
3.1.6. Physical exercising.
3.1.7. Changing the day routine for the people that will improve their ability in involvement and care for people in long term.

Figure 8: People communication (Grahn & Stigsdotter, 2009).

3.2. *The important of parks for residents life*

Developing constitution about examine gives confirmation supporting those go of profits over social, ecological and monetary spheres that parks give acceptable with occupants - reductions attained just when groups need entry to them. This segment plans on clarify the reason parks need aid person perspective of the urban surroundings that is about extraordinary vitality with Everyday life for individuals existing in residents zones (Woolley, 2003) Furthermore delineate the basic part previously, making healthier also a greater amount decent groups (Worpole, 2003).

3.2.1. Health and Social Benefits

For numerous ages, parks have been measured to have mental and physical health welfares (Woolley and Sherer, 2010). Solid indication that when persons have admittance to urban open spaces and parks, they are doing further (Harnick & Will, 2009). Consistent physical activity has been exposed to assistance community health and lessen the danger of numerous diseases, in addition to decrease indications of anxiety and depression, and indorse mental well-being (Sherer, 2006) individuals feel virtuous around their lives once they are patients with satisfactory admission to nature in the urban environment (Woolley, 2003). Those are the three main pillars of health and social benefits (Mental well-being, physical well-being and social wellbeing) which are shown in Figure 9.

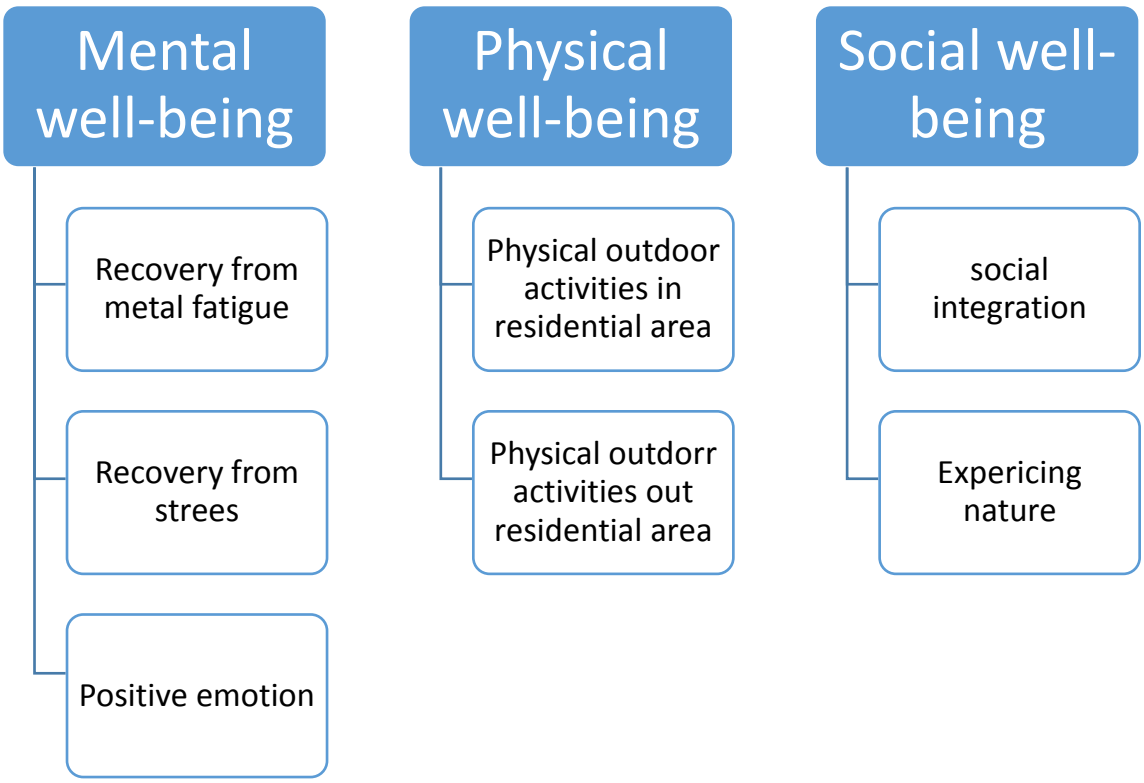


Figure 9: Health and social benefit. (source: the author 2020)

3.2.2. Environmental Benefits

The environmental benefits of urban parks extend to improving climate and the environment such as cleaning and returning water to the ground, reducing urban heat island (Girling & Kellet, 2005) and improving the possibility of coexistence with wildlife through the improved habitats of different species in the city (Woolley, 2003). They can also encourage the use of sustainable transportation (Gehl and Gemzoe, 2000).

3.2.3. Economic Benefits

Many studies have shown that urban parks and open spaces are essential to the environmental and social living of cities and their neighborhoods, and are essential to economic development (Garvin, 2000; Crompton, 2001). In a study conducted by the Trust and Public Land Trust Fund (TPL), Peter Harnick and Ben-Viel stated that although a specific dollar value cannot be allocated to every aspect of urban gardens - there are measurable benefits such as an increase in the value of real estate and savings in healthcare costs, (Because of the beneficial aspects of physical activity), community cohesion, clean water and fresh air can be clearly identified.s

4. Case studies

In the coming part of this paper a qualitative analysis of two pioneering examples those examples are chosen according to a number of criteria shown in the next section.

4.1. *Case study one (Nasr city)*

Nasr city is one of the crowded city that doesn't have sufficient green spaces within the residential building. They only have public parks like The International Park which considered by local

authorities, users and surrounding residents as the largest public park that inhibits almost all public events, culture and sports activities in Nasr City. The park is located in the eastern part of Nasr City, the 7th District, to the east of Cairo as shown in Figure 10. The city population has been estimated nearly 550,000 in 2017 within an area of 227.35 km2. The residents of Nasr City district are mostly upper middle and high income citizens. The pubic park was opened to public in 1987 as a theme park that hosts 16 pavilions representing 16 countries all over the world. Each pavilion presents the most famous features of its country see Figure 11.The construction of each pavilion was financed by its representing embassy in Egypt.

Figure 10: Land use of Nasr city

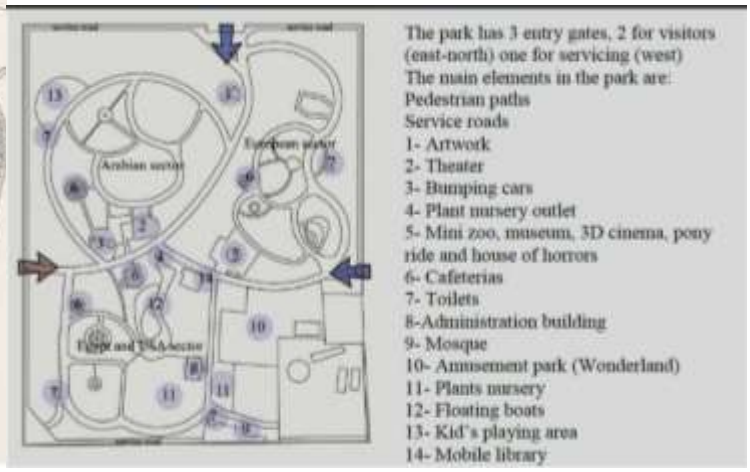


Figure 11: Distribution of activities and uses in the International Park of Nasr City (Abd Al Aziz, 2012)

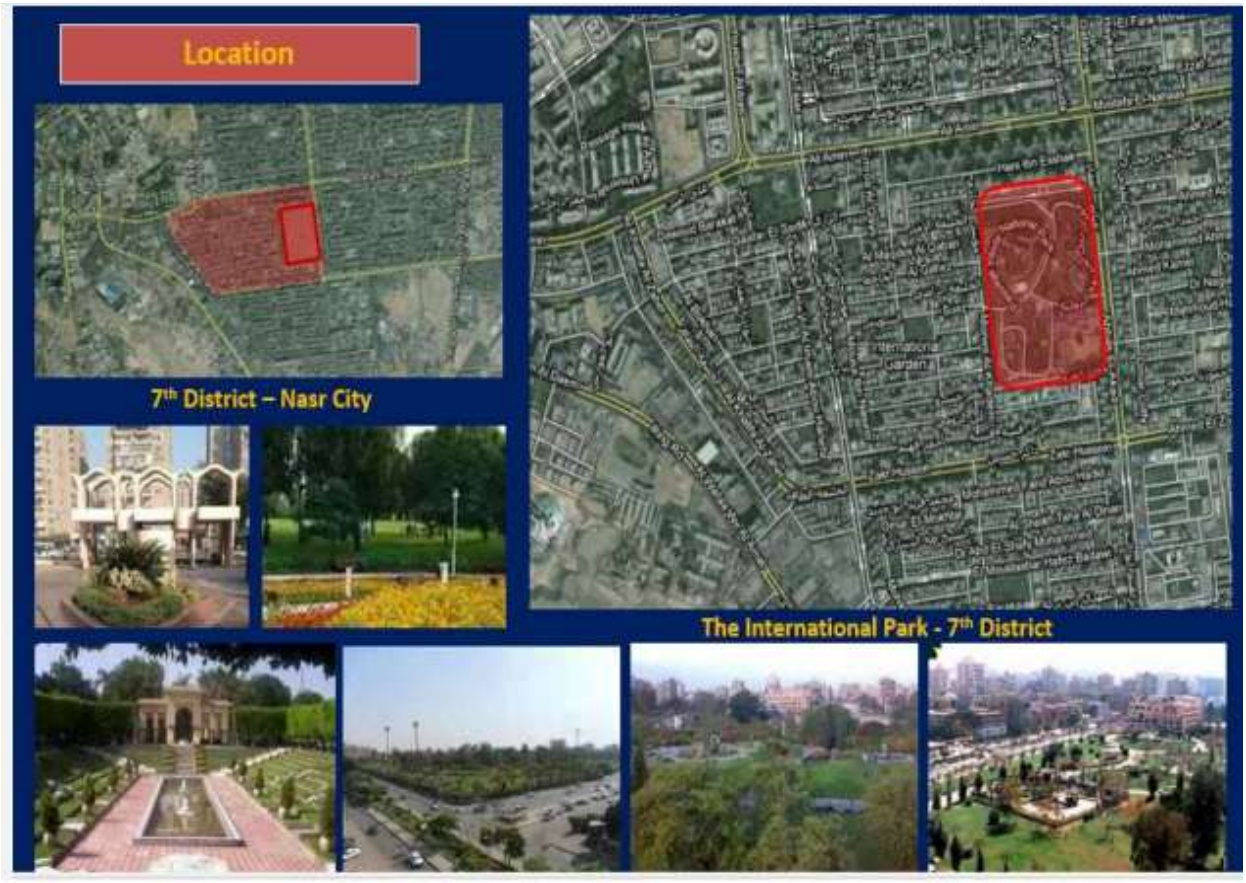


Fig 12: Location of International Park. (author, 2020)

The park area, 231000 m2, is divided into three main sectors, each was provided with service zone that includes toilets and cafeteria. The first sector, the Arabian Sector, includes the pavilions of Saudi Arabia – Kuwait – UAE – Morocco – friendship garden. The Second Sector, the European Sector, includes pavilions of France – Greece – Argentina – China – Korea – Japan – Romania – Holland – Germany). The third sector includes the pavilions of Egypt and USA as shown in Figure 12.

4.2. *Case Study two (El-Rehab City)*

It is one of the new settlements adjacent to the boundary of greater Cairo, established in 2000. The city is located out of the ring road west of Cairo to accommodate the increase in population of greater Cairo. The city is physically attached El Suez road and to El Sherouk. The location of the city is about 50km away from the center of Cairo. It covers an area of 10 million m2 to accommodate 200,000 residents. There are 10 phases, each covering an area of 220 feddans. Each phase is a complete district offering two kinds of housing arrangements: villas and apartments. All facilities are interconnected throughout the ten different phases to include educational, medical, commercial, sports club, recreational and maintenance facilities. As a result to the developing and the innovative residential gardening system, Residents of the apartments and villas in El-Rehab City enjoy the colorful residential landscaping and green areas within the city that will play a vital role in providing a healthy environment and improve the quality of life that they are living in to enjoy

every day see the master plan of El Rehab city Figure 13 and its land use see Figure 14, which shown the supposed existence of a neighborhood public parks.

Figure 13: Master plan of EL-Rehab city

Figure 14: Land use of El-Rehab city.

5. Discussion

This paper concluded a testing matrix to measure 'quality of life' in terms of 'human needs' and 'subjective well-being to be used in the analysis of any case study. It can help to evaluate the public park importance in any area.

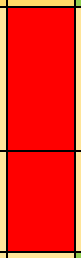
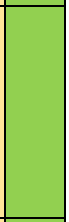
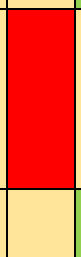
This matrix will help in evaluating the residential urban parks in Nasr city and El Rehab city areas see Table 2. The red tag represents that: this item included in the parks and the white tag represent that this item is not included in the park

Table 2: Matrix design (Source: the author, 2020)

Main points			Nasr City	El-Rehab City	Importance _ level		
					L	M	H
Parks elements	Green spaces	Plazas					
		Gardens					
		trees					
		sports area					
	Civic spaces	Squares					
		Markets					
		Boulevards					
		other hard surfaces within parks	Kids playing area	Food courts, kids areas, etc.			
Related landscape area within parks	Paths and pavements						
	Design of the using area	Camping site	**N/A**	**N/A**			
		entertainment areas					
		others	The park Including cinema, museum, bumping cars, theatre and artwork	The city including different activities in the green parks on it like garden for dogs walking			
	Other landscape facilities	tables					
		Benches					
		Kiosks					
		Others	Cafeterias, mobile library	Cafeterias			

	Playground and courtyard					
Perceived dimensions of urban parks (characteristics)	Serene	A noisy place surrounding with annoying sounds and distractions	A quiet place with non-annoying sounds			
	Space	the city not have a consistent structure	The city contains of a consistent structure, which enables inspection and reflection			
	Nature	The city not include green areas except in public gardens like international park	associated with green environments that appear to have no or little human influences			√
	Rich in species	The city not including flora and fauna and if it found it is very little, however the public park Including zoo, pond, flowers and butterflies	Not including animals but it includes many of ponds, flowers and butterflies			
	Refuge	The structures are not surrounded by shrubs and high vegetation	The structures are surrounded by shrubs and high vegetation, encouraging children to play games, hiking and outdoor activities			

	Cultural	The park includes many pavilions that represent different cultures. e park was planned to express the history and culture of the world and to be an international open museum, the Egyptian culture and history are expressed in a very shallow manner	**N/A**			
	Prospect	The city including public toilets but little, trees not many	Including sitting facilities, public toilets, trees in rows such as windshields, also includes many Physical activities			
	Social	The social feature of the parks there encourages social activities and personal meetings, where activities such as dancing, playing and eating may take place	The social feature of the venue encourages social activities and personal meetings, where activities such as dancing, playing and eating may take place			
Effect of parks of the quality of life		The International	The city gives			

				Park, as a public park, is no longer a tool to ensure social communication, interaction, and diversity that collectively bonds communities but rather became a source for class segregation and social unrest	Feeling of relaxation, Recovery from fatigue and give Positive emotions			
The important of parks for residents life	Health and Social Benefits	Mental well-being	Recovery from mental fatigue					
			Recovery from stress					
			Positive emotion					
		Physical well-being	Physical outdoor activities in residential area					
			Physical outdoor activities out residential area					
		Social well-being	social integration					
			Experiencing nature					
	Environmental Benefits		cleaning and returning water to the ground					
			mitigating the urban heat island					

		accumulate and extract pollutants from the atmosphere					
		cool urban temperatures					
		provide shelter from precipitation and in the summer					
		absorb and reflect solar radiation					
		Providing shade.					
		reduce energy consumption in buildings					
		reduce noise					
	Economic benefits	increase in property value	In the places beside the public gardens	**N/A**			
		savings in health care costs					
		community cohesion					
		clean water and clear air that can be clearly identified					
Residents preference	Residents prefer to life in place with urban parks and green spaces						
	Residents don’t prefer to life in palace with urban parks and green						

	spaces					

As shown in the previous matrix, there is a huge difference between Nasr city and El Rehab city in the existence of park elements.. On doing the comparison the shown in Figure 15, showing that El Rehab public parks, contains much high levels of importance elements and landscape relations than Nasr city. This part focused on the benefits of residential landscape in El-Rehab city and the effect of lack of residential landscape in Nasr city. Absence of parks can affect the residents health and well-being and the quality of life that they are living in.

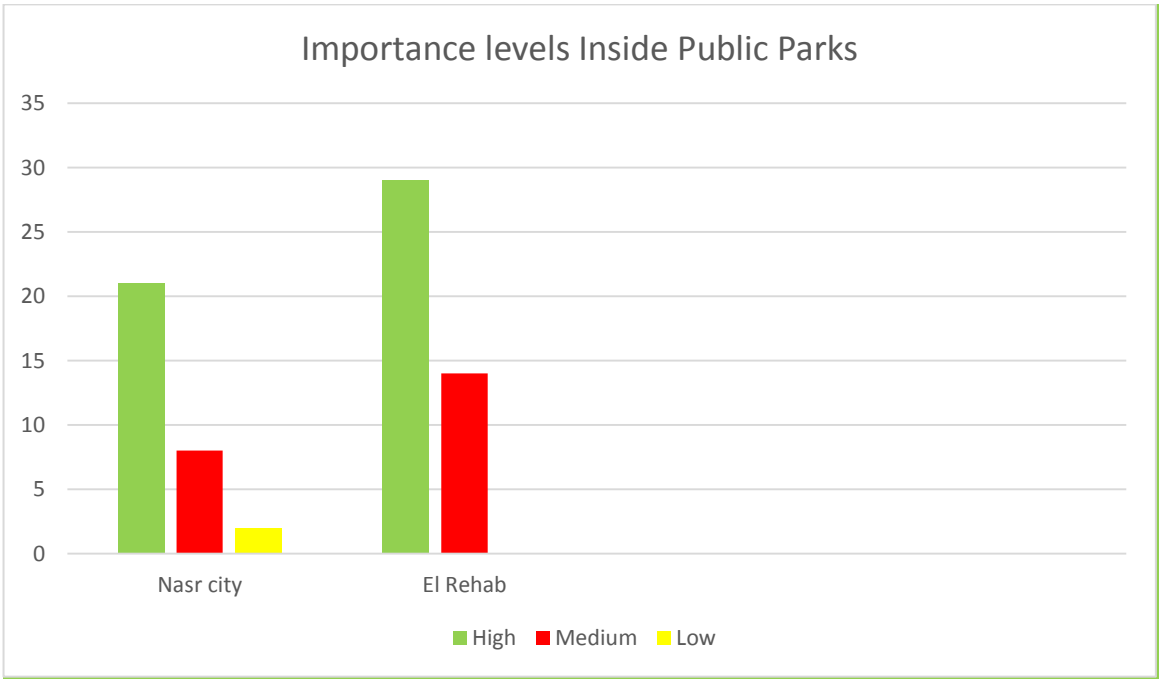


Figure 15 Comparison between levels of importance of public parks elements and landscape relations in Nasr city and El-Rehab city. (Source: the author, 2020)

6. Conclusion

Finally this paper identifies the impact of residential parks on quality of life and life satisfaction. In addition, this study explored the positive effects of residential parks and natural environment on meeting the human needs and well-being. The environmental, social and economic benefits of urban trees and parks for society have proved useful for architects, landscapers and urban planners. Urban residential park is no longer considered an aesthetic component of the city, but have come to be a part of the urban ecosystem. Analysis of results revealed that most park elements might contribute to human needs.

7. Recommendations

Careful utilization of such elements with careful study of social, economic and environment context will help in establishing sustainable quality of life in urban areas Parks, recreation, and public health professionals need to improve their researches and to do more than just showing an increase in park visits over time, they need to prove that residential park visits have some measurable benefit to human health, social life and economic income. Parks need to have some measurable benefit for

human quality of life. Talking all the evidence in the case studies that were reviewed into account, the idea of Residential landscape can have a positive effect on the health and well-being seems to be more reasonably and well substantiated. Those evidence includes the studies that occur outdoor activities, view of nature to residents, use of Residential landscape and its effect on the quality of life. The above case studies was based on an empirical primary data, but is supported as well by secondary Theoretical expectations researches and books which indicate the important of residential parks and indicate as well the potential discord of the absence of nature It is expected that the Residential landscape are agreeable and the absence of them is sensed possibly unconsciously as a stress factor. It is concluded the mixed results from the studies suggest that more research is needed in order to define possible effects and negative effects.

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لوحظ أيضا عدم وجود عناصر تشجير فنجد الشوارع بالحي بفترة الصيف شديدة الحرارة ولا يستطيع السكان السير صباحا بشكل مريح لعدم وجود مسارات مظللة مريحة، أيضا في فترة الشتاء لا يوجد مسارات آمنة من مياه الامطار لحماية السكان اثناء السير لقضاء حاجاتهم اليومية داخل الحي، كما تم ملاحظة تغيير اجتماعي في حياة بعض السكان بسبب التفكك الاجتماعي بين الاسر بعد إعادة توطينهم في مناطق متفرقة من الحي، لوحظ أيضا من آراء بعض السكان ان الاخلاق العامة للسكان بالحي أصبحت في انحدار بسبب تجمع سكان مناطق عشوائية مختلفة مع بعضهم البعض في مكان واحد فان تلك المشروعات تعتبر بوتقة واحدة تم تجميع بها مجموعة من سكان الاحياء العشوائية التي تنتشر بها الكثير من الجرائم والمخالفات القانونية، فان تجمعهم سويا بمكان واحد ينتج عنه انحدار أخلاقي أكبر حسب آراء السكان.

أما عن الحالة الاقتصادية، فوجد ان اغلب السكان تفتقد لفرص عمل فهم يشيدون بالوحدات السكنية الجديدة فحسب تعليق أحد السكان معبرة عن شعورها من ذلك المشروع قائلة "سترونا كنا عايشين في أوض" وفى الوقت نفسه عبر أحدهم عن الوحدات السكنية أيضا قائلة "الشقة مش هتأكلنا"، ومما سبق ومن الآراء الأخرى للسكان نجد ان المشروع يحتاج الى دعم اقتصادي قوي وتوفير فرص عمل أكثر من الموجودة بالحي، وزيادة حجم الاستثمارات بالقرب من الحي والدعوة لها من قبل الدولة مما توفر فرص للعمل بمختلف المؤهلات لتشمل وتناسب جميع السكان بمختلف خبراتهم دون اللجوء الى التعديات والمخالفات القانونية.

7. التوصيات

من اجل تحقيق التنمية المستدامة والوصول للمجتمعات المرنة القادرة على التكيف مع المتغيرات يجب تكاتف كل من الحكومة التي تتولى قيادة تحقيق تلك التنمية واستدامتها، المنظمات الدولية، والقطاع الخاص ورجال الاعمال، والمساعدة من المؤسسات الاكاديمية، كل من قطاعات التعليم والصحة والبيئة والجهات المختلفة، المجموعات المهنية التي تشمل المهندسين والمخططين والمعماريين وخبراء الاقتصاد والاجتماع، وأخيرا مشاركة المجتمع المدني الذي يشمل الجهات الغير حكومية والجهات التطوعية والمواطنون أنفسهم، أيضا من الضروري التركيز على النقاط الإيجابية التي يتمتع بها سكان المناطق العشوائية وتدعيمها في عمليات إعادة التوطين والتي تتمثل في محاور اقتصادية واجتماعية هامة تميز سكان تلك المناطق عن غيرها، فيجب ان تشمل سياسات إعادة التوطين توفير الدخل المادي وفرص العمل للسكان بخبراتهم ومؤهلاتهم المختلفة فهي تأتي في المقام الأول لاحتياجاتهم كبشر وكأسر تستطيع ان تستكمل حياتها بشكل طبيعي لتواكب الغلاء المستمر دون الحاجة لمساعدات بشرية، كما يجب الاخذ في الاعتبار ضرورة قرب مواقع إعادة التوطين للسكان من مواقعهم السكنية القديمة لعدم فقد وظائفهم او علاقاتهم الاجتماعية، او التعويض الفوري عن فقد ذلك بتوفير البديل في المواقع الجديدة، كما يجب توفير الدعم الاجتماعي للأسر التي لا يوجد بها افراد قادرة على العمل واعفائهم من التكاليف والايجارات مع تحديد حيازة الوحدات السكنية لكل الاسر، ويجب أيضا الاهتمام بزيادة وعي الاسر بالانتماء والحفاظ على الحي وذلك من خلال الاهتمام بالتعليم ومحو الامية لتلك الاسر حيث ان النسبة الغالبة لسكان تلك المناطق من الاميين، والتركيز على برامج تعليم الأطفال وزيادة وعيهم الثقافي للحفاظ على مجتمعهم، وأخيرا لقد تم فرض طابع حياه الطبقة المتوسطة على سكان المناطق العشوائية بالرغم من ضعف دخلهم المادي وضعف حالتهم الاقتصادية فلابد من اعادة النظر في تكاليف الحياة بتلك المناطق حتى تفي بالغرض، فيجب ان يكون هدف مثل تلك المشروعات هو الحد من الفقر في المجتمع وليس زيادته بارتفاع تكلفة الاستهلاك مع ثبات او انخفاض الدخل المادي.

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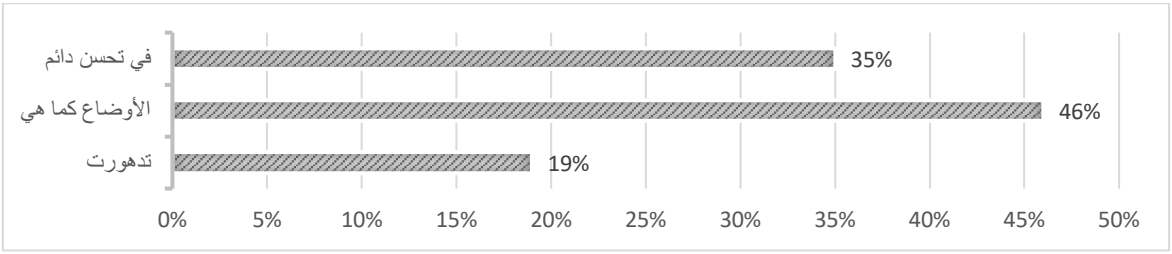
5.3. مدي تفاعل سكان الحي مع المجتمع الخارجي

اختلفت آراء السكان حول مدي احساسهم بالانعزال عن المجتمع المحيط فان عملية انتقال اغلب السكان من وسط القاهرة الى منطقة تبعد الى حد ما عن قلب القاهرة فهو امر ليس بهين فمنهم من يري ان ذلك الحي انقذهم من مصير الهلاك بمواطنهم القديمة وانهم لم يحلموا طيلة حياتهم بالمعيشة بوحدة سكنية آدمية، ومنهم من لا يره تلك المزايا ولا يشعر بالفارق بل يري الامر بمنظور سلبي يبعد كل البعد عن رؤية المزايا والاختلافات عن الموطن القديم، فمن خلال الاستبيان نجد ان عدد 45 أسرة بنسبة 87% تشعر تماما بالانعزال عن المجتمع الخارجي بينما نجد عدد سبعة أسر فقط بنسبة 13% تشعر بالاندماج مع المجتمع الخارجي ولا تري انعزالا (صورة 24)

صورة 24 مخطط يوضح مدي تفاعل الاسر مع المجتمع الخارجي

وهنا يأتي التساؤل كيف يمكن لأسر ان تشعر بالأمان وفى الوقت نفسه تشعر بالانعزال عن المجتمع؟ من اين يأتي الأمان بدون الحماية بالمجتمع؟ من الممكن ان يكون الإجابة على تلك التساؤلات ان ذلك الأمان يوفره العنصر البشري المتمثل في الحكومة وعربات الشرطة ونقطة الشرطة بالحي ومنه نصل لسؤالا آخر ماذا يمكن ان يحدث في ذلك الحي في حالة حدوث أي ظروف سياسية او تغييرات في سياسات الامن وتخلي الافراد الحكومية حماية ذلك المكان؟ هل سيظل الحي آمنا؟ هل سيستطيع الافراد حماية أنفسهم ام من الممكن ان يتم تهجيره؟

ووجد البحث انه منذ إعادة توطين هؤلاء السكان بالحي فلم تتغير أوضاعهم ولم تختلف جودة الحياة بالحي فنجد عدد 10 اسر بنسبة 19% تري ان الأوضاع في تدهور، كما نجد عدد 18 اسرة بنسبة 35% تري الأوضاع في تحسن بينما نجد 24 اسرة بنسبة 46% تري ان الأوضاع كما هي منذ إعادة توطينهم بالحي حتى الآن (صورة 25)

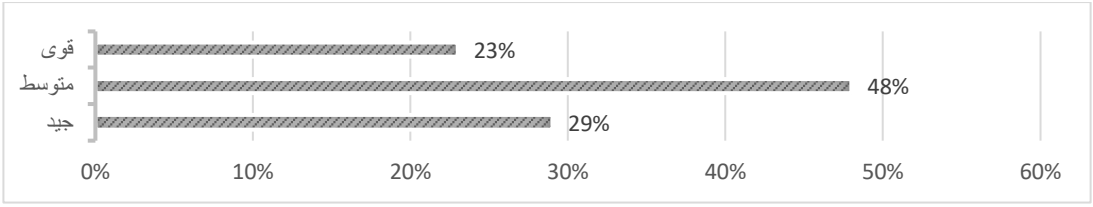


صورة 25 مخطط يوضح مدي التغيير في جودة الحياة بالحي منذ إعادة توطين السكان به حتى الآن

6. الاستنتاج

لقد اختلفت سياسات التعامل مع المناطق العشوائية على مر العصور السياسية، اما عن السياسة الحالية فنجد انها تجنبت بعض نقاط القصور في السياسات السابقة ولكن بها بعض القصور في السياسة الحالية ان لم تلق لها الدولة بالا ستحول تلك المجتمعات العمرانية الجديدة الى عشوائيات من جديد، أما عن الحالة الدراسية لحي الأسمرات، وان الطابع العمراني لحي الأسمرات عبارة عن شوارع بعروض كبيرة ومساحات فراغات واسعة غير مستغلة من قبل السكان، وما يمنع استغلالها هو رئاسة وإدارة الحي فهي تمنع أي تعديات من قبل السكان مع وجود عقوبات مشددة لاي تعديات تحدث منهم سواء داخل وحداتهم السكنية او خارجها في الفراغات العامة، ولكن نجد ان السكان انفسهم متضررون من تلك القرارات فيوجد عدد كبير من السكان كان يعمل بالأعمال الحرة في الشارع او داخل منزله في احيائهم القديمة وعند انتقاله الي حي الأسمرات تم منعه من ذلك بقرارات إدارية، فمن المحتمل اذا حدث أي تغييرات سياسية بالحي او تغيير في إدارة الحي البشرية او حدث أي تهاون اداري من قبل إدارة الحي سيتحول الى مجتمع عشوائي ونجد الباعة الجائلون في كل مكان وتنتشر المشروعات الصغيرة داخل وخارج الحي، فان التصميم العمراني للحي يساعد على ذلك لعدم استغلال الفراغات العامة بشكل جيد وشامل.

من الدراسات السابقة في البحث بدراسة الحالة الاجتماعية لسكان المناطق العشوائية وجد انه من اهم ما يميز سكان المناطق العشوائية هو التداخل اجتماعيا بين بعضهم البعض، فنجد ان أبواب بيوتهم مفتوحة دائما وغالبية الوقت يجلسون في الشوارع والطرقات امام منازلهم لتبادل الاحاديث او لعمل النساء سويا اشغال يدوية او ايه عمل تكسب منه مصدر رزق ويضعوا أحيانا مصاطب للجلوس عليها فتكون من بقايا الاخشاب القديمة او ربما أثاث قديم متهالك غير مستخدم بالمنزل فهي ثقافاتهم التي توارثوها عبر الزمن، لكن هنا وبعد ابتعاد الجيران عن بعضها البعض اصبح التفاعل اقل مما كانوا فيه بأحيائهم القديمة فبالسؤال عن مدي التفاعل الاجتماعي بين الاسر وبعضها وجد ان اغلب الاسر اصبح التفاعل بينهم وبين الجيران متوسط بعدد 25 اسرة بنسبة 48%، قوي بعدد 15 اسرة بنسبة 29%، تفاعل ضعيف لعدد 12 اسرة بنسبة 23% (صورة 21)

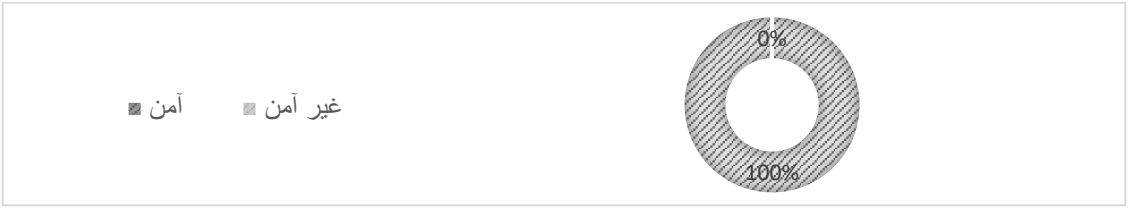


صورة 21 مدي التفاعل بين السكان وبعضهم بعد الانتقال

وعندما تدخل حي الأسمرات تجد أناسا تجلس على الأرصفة بالشوارع العامة نساء تتبادل الأحاديث وربما رجالا لكن بنسبة اقل في وقت النهار بل تظهر الرجال بالشوارع وعلى الأرصفة في وقت متأخر من النهار ربما بعد العودة من العمل وربما أيضا لارتفاع درجة الحرارة بالشوارع نهارا، نجد أيضا ان السكان تهجر أي عرائش او ما تسمي بالبرجولة Pergola طوال اليوم فهي غير مستغلة من قبل السكان ولا تناسب ثقافاتهم التي تنحصر في الجلوس امام المنزل ليس ابعد من ذلك وأيضا الارتياح للجلوس في الأرض أكثر من الجلوس على البرجولة المصنوعة من الخشب.

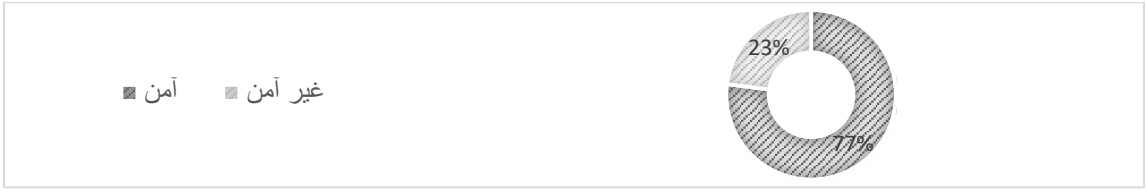
5.2. مدي شعور الاسر بالأمان داخل حي الأسمرات

لقد ساعد التخطيط العمراني لحي الأسمرات على توفر عنصر الأمان الى حد ما بالحي من حيث عدم وجود مناطق غير مرئية او شوارع ضيقة ولكن تكثر الساحات والتي تطل عليها الوحدات السكنية من اغلب الاتجاهات، كما يتوفر الأمان من العنصر البشري وهي متمثلة في الحكومة فبينما تسير داخل شوارع الحي تجد عربات الامن تتجول دائما طوال اليوم لحماية الامن العام بالحي، وبسؤال السكان عن شعورهم بالأمان لسير النساء لوقت متأخر من اليوم فأكد جميعهم بنسبة 100% انهم يستطيعوا النزول والتجول وقضاء حاجاتهم حتي الساعة التاسعة مساءا فهم يشعرون بالأمان بسبب وجود الحكومة بكل مكان (صورة 22)

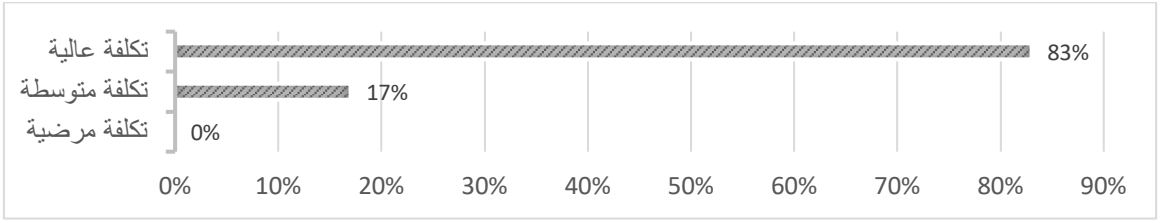


صورة 22 مخطط يوضح مدي شعور النساء بالأمان بالتجول داخل الحي الى وقت متأخر من اليوم

واختلفت آراء الأهالي حول مدي الشعور بالأمان للعب الأطفال بالشوارع فيري بعضهم ان تلك المنطقة بها خليط من الثقافات وسكان العشوائيات وان تلك الثقافات بعضها يختلف عن ثقافته وتربيته لأبنائه لذلك يشعر بالقلق من نزول أبناؤه للعب مع الأطفال في الشارع فيرفض تلك الفكرة نهائيا فنجد عدد 12 اسرة بنسبة 23% لا تري أمانا للعب الأطفال بالحي، بينما نجد عدد 40 اسرة بنسبة 77% تشعر بالأمان للعب أطفالهم ويتركوهم طوال الوقت بشوارع الحي بالساحات تحت المنزل (صورة 23)



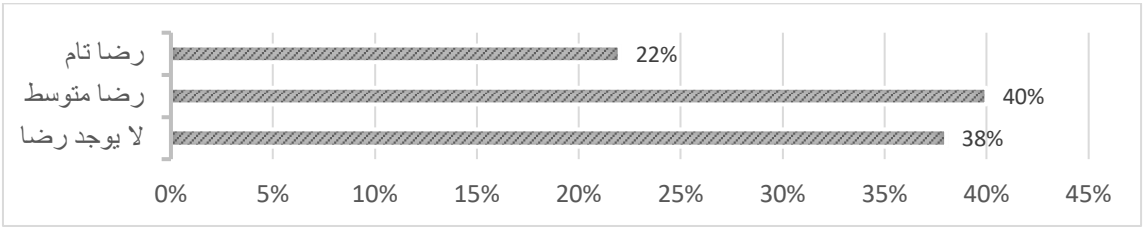
صورة 23 مخطط يوضح نسب شعور الاسر بالأمان لأطفالهم للعب والتجول بساحات وشوارع الحي



صورة 18 مدى رضا الأهالي عن تكلفة مواصلات الانتقال داخل الحي

4.4. تأثير التغيير في الحياة الاقتصادية للسكان على الشعور بالرضا من السكان بالحي

تنحصر أغلب مطالب السكان وشكواهم في الجوانب الاقتصادية فمنهم من يطالب بتخفيض الايجار ومنهم من يطالب بعمل أسواق قريبة لتوفير تكلفة الانتقال ومنهم من يطلب وظيفة فهو عائل الاسرة الوحيد والذي اصبح بدون عمل، ولقد شمل الاستبيان الاستفهام عن رضا الأهالي عن إعادة التوطين بالحي بعد التغيير في ظروفهم الاقتصادية العامة حتي الآن وكانت النتيجة ان هناك عدد 20 اسرة بنسبة 38% لا تشعر بالرضا، وعدد 21 اسرة بنسبة 40% تشعر بنسبة متوسطة من الرضا، بينما نجد عدد 11 اسرة بنسبة 22% من الاسر تشعر برضا تام عن الإقامة بالحي (صورة 19)



صورة 19 مدي شعور الاسر بالرضا عن الإقامة بالحي بعد التغيير في ظروفهم الاقتصادية منذ الانتقال للحي

5. الدراسات الاجتماعية لحي الأسمرات

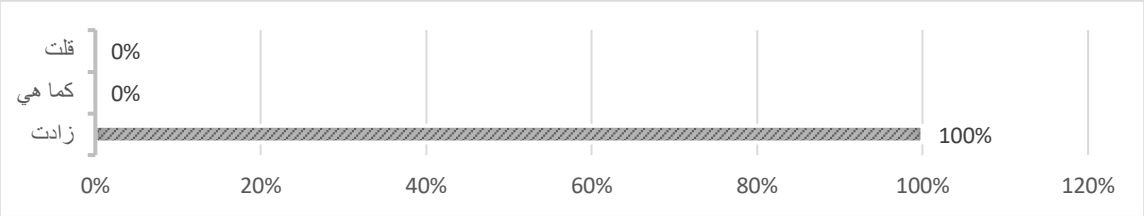
يعتبر العامل الاجتماعي جزأ لا يتجزأ من العامل الاقتصادي فكلاهما محوران لا يتفرقا، ولقد ظهر في الآونة الأخير مصطلح يسمي "اقتصادي اجتماعي" وفى مسمي آخر "Socioeconomic" وذلك بسبب التأكيد على عدم انفصالهم واخذهم في الاعتبار عند البدا في أي مشروع، لذلك تم دراسة التأثيرات الاجتماعية الناتجة عن إعادة توطين السكان الى حي الأسمرات وتركهم لمحل اقامتهم ونشأتهم فذلك له أثر كبير على حياتهم الاجتماعية، ومن هذه الدراسة يستنتج البحث بعض المعايير الاجتماعية التي يجب اخذها في الاعتبار في المشروعات المماثلة القادمة، وتم دراسة الآثار الاجتماعية من خلال مجموعة من الاسئلة التي وجهت للسكان للخروج منها بنتائج تستعرض الحالة الاجتماعية العامة للأهالي بالحي، وتم تلخيص تلك النقاط كالآتي:

5.1. تأثير عملية الانتقال على العلاقات الاجتماعية بين الجيران بعد الانتقل

لقد تمت عملية الانتقال والتسكين من قبل محافظة القاهرة ويتم ذلك على مراحل أي انه لا يتم انتقال سكان المنطقة دفعة واحدة بل يتم نقلهم على مراحل وفترات حتى يتم تسكينهم بالحي بشكل سريع، ونتيجة لذلك تم فقد عدد كبير من الاسر الجيرة القديمة فلم يتم تسكينهم بجانب بعضهم البعض في اغلب الحالات، ولقد اتضح من نتائج الاستبيان للفئة المستهدفة ان هناك عدد 35 أسرة بنسبة 67% قد فقدو جيرانهم القدامى ويسكنوا حاليا بجانب سكان جدد، اما بقية العدد وهم 17 اسرة بنسبة 33% لم تفقد جيرانهم وانتقلوا سويا بجانب بعضهم البعض (صورة 20)

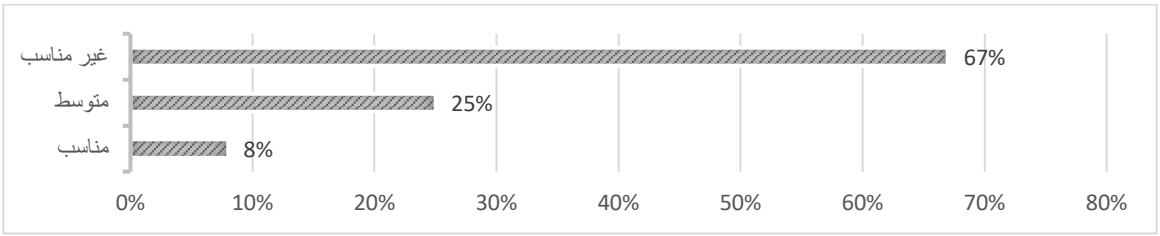
صورة 20 نسب فقد الجيرة بعد عملية الانتقال للحى

كما ازدادت المصروفات الشهرية للأسر بنسبة كبيرة ويرجع ذلك لعدة أسباب منها ان اغلبهم كانوا يعيشون بمنازل تم اخذها بطرق غير قانونية فلا يدفعون به ايجار شهري ثابت ولا يلتزم باي مصاريف كهرباء شهريا لأنها تدخل البيوت هناك بطرق غير مشروعة وبدون علم الحكومة وأيضا بعض البيوت لا يوجد بها وصلات مياه لذلك كانوا يعيشون بدون مسؤوليات حتي انهم كانوا يقومون بشراء السلع الغذائية من أماكن اقل سعرا بالمنطقة او بجوارها، اما هنا بالأسمرات فيقوم بدفع ايجار وفواتير للمياه والكهرباء شهريا دون انقطاع لذا من الطبيعي ان تكون النتائج بان عدد 52 اسرة من الفئة المستهدفة بالسكان وهي جميعهم اقرت بان المصروفات بالحي زادت بنسبة 100% ولم يقر أي اسرة ولا أي شخص بان نسبة الزيادة صفر% (صورة 16)



صورة 16 مدي زيادة المصروفات الشهرية للأسر بعد الانتقال الى حي الأسمرات

أما عن أمن الحيازة للأسر بالحي فيفتقد اغلبية الاسر تلك النقطة حيث ان وحداتهم السكنية بنظام الايجار الشهري مقابل مبلغ مالي قدره 300 جنيه شهريا، بينما فقط أهالي مثلث ماسبيرو هم من يمتلكون عقود تمليك لوحداتهم وذلك لقانونية امتلاكهم لوحداتهم بصورة رسمية بمثلث ماسبيرو، ومن المفترض ان يمتلك بقية السكان ذلك العقد الذي يضمن احقيتهم لوحداتهم السكنية ولكن اغلب السكان لا يستطيعون دفع ذلك الايجار شهريا ويتراكم عليهم الشهور تلو الأخرى في محاولات من إدارة الحي لعمل أنظمة تقسيط لدفع المتأخرات من الايجار، وفى الوقت نفسه من يلتزم بدفع الايجار الشهري يقوم الحي بتسليمه نسخة من العقد لضمان حقه بالوحدة ولكن لم تشمل الفئة المستهدفة أية حالات ممن لديهم عقد ايجار وامن حيازة بل جميعهم يشعرون بالقلق من ضياع امن الحيازة بمنازلهم، أيضا يجد اغلب السكان بعدد 35 اسرة بنسبة 67% من الفئة المستهدفة ان مبلغ الايجار هذا كبير جدا ولا يقتدرون على دفعه شهريا، بينما تجد 13 أسرة بنسبة 25% انه مبلغ متوسط والى حد ما يستطيعون دفعه، وفى الوقت ذاته يجد عدد أربعة أسر بنسبة 8% انه مبلغ ضئيل بالنسبة للإيجارات في وسط القاهرة ونواحيها (صورة 17)



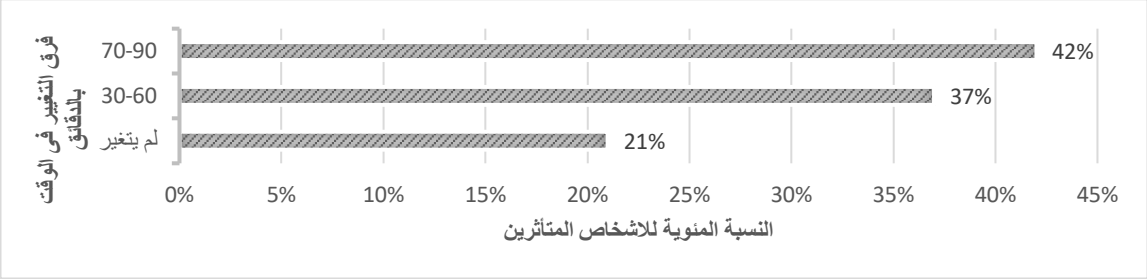
صورة 17 مدي رضا أهالي الحي عن تكلفة الايجار الشهري للوحدات السكنية

4.3. تأثير بعد الخدمات التجارية عن المساكن على الأسر اقتصاديا

من الدراسات السابقة يتضح بعد الخدمات وخصوصا أماكن الأسواق عن سكان الحي والتي يضطر اغلبهم لاستخدام وسائل النقل للذهاب للسوق لشراء احتياجاتهم اليومية والتي من الممكن ان تكون سلعة رخيصة الثمن فهي تستدعي منه ان يستقل اتوبيس السوق المتوفر بكثرة بالحي فلا يوجد قصور في ذلك ولكن يعاني اغلب السكان من تكلفة الانتقال به للسوق والتي تساوي ثلاث جنيهات للذهاب والعودة في الوقت الذي يكون فيه السكان في احتياج لذلك المبلغ فهو يعتبر مبلغ كبير بالنسبة لهم لإنفاقه يوميا لشراء احتياجات المنزل، فنجد عدد 43 اسرة من الفئة المستهدفة بنسبة 83% تجدها تكلفة عالية، عدد تسع أسر بنسبة 17% ترى تلك التكلفة متوسطة بالنسبة لهم، ولا يوجد أية اسر تشعر بانها تكلفة مرضية ومقبولة بالنسبة لهم (صورة 18)، كما أوضح بعض السكان قبولهم لفكرة الذهاب للسوق سيرا على الاقدام رغم بعد المسافة ولكن ذلك في حالة وجود مسارات مظللة ومريحة تجعله لا يشعر بالإرهاق حتى يصل الى جهته.

من المخطط السابق يتضح ان النسبة الأكبر من السكان بعدت أماكن عملهم ويرجع ذلك لسبب انتقالهم من أماكن تعتبر في قلب القاهرة ووسط البلد الي حي الأسمرات والذي يقع بحي المقطم خارج نطاق وسط البلد، واتضح من الدراسة ان فرق المسافة من مناطق الانتقال الى حي الأسمرات تنحصر بين 6: 12 كيلومتر وهي مسافة كبيرة الى حد ما تستغرق وقت ومجهود واموالا إضافية للتنقلات يوميا.

وشمل أيضا الاستبيان سؤالا موجها لهؤلاء الفئة الذين مازالوا يعملوا بنفس الوظيفة عن الوقت المستغرق للذهاب الى العمل قبل الانتقال وبعده لمعرفة فرق عدد الساعات المستغرقة في الذهاب للعمل حاليا وكانت النتائج ان النسبة الأكبر من السكان حدث لها تغيير بنسبة من 70: 90 دقيقة فرق توقيت للذهاب للعمل، اما عن النسبة التي لم يحدث لها تغيير في الوقت فهؤلاء يعملون بأماكن تبعد عن مواطن سكنهم من الأصل سواء كان توظيف حكومي او اعمال حرة ثابته مازالوا بها (صورة 13)

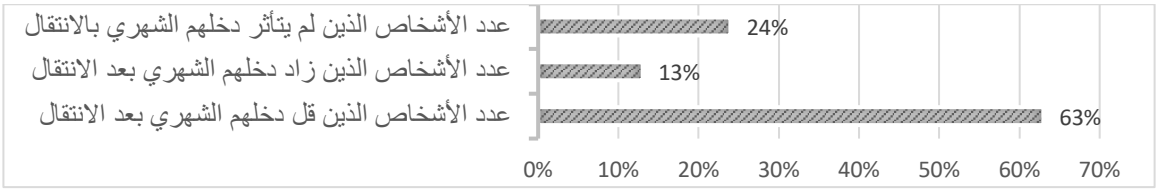


صورة 13 مخطط يوضح فرق الوقت المستغرق للعمل قبل وبعد إعادة التوطين بالحي

ومما سبق نجد ان إعادة التوطين له آثار هامة على وظائف السكان التي هي مصدر الدخل الأساسي للأسر، ولقد كان طلب اغلب الاسر بالفئة المستهدفة من الاستبيان هو ضرورة توفير فرص عمل مناسبة لهم منها يستطيعون المعيشة بداخل الحي وتكون عوضا لهم عن فقد وظائفهم القديمة.

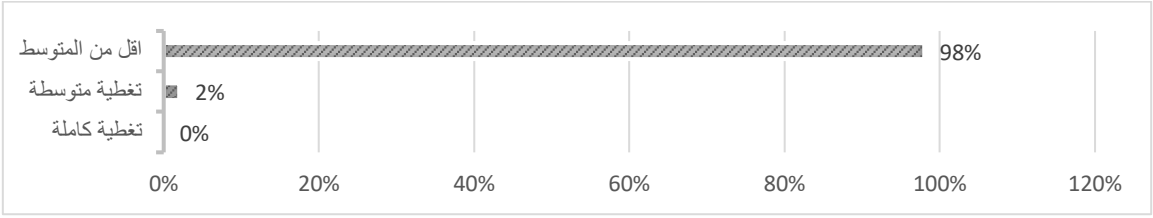
4.2. تأثير عملية الانتقال على الدخل الشهري للسكان

نتيجة لفقد اغلب السكان وظائفهم القديمة، أثر ذلك على الدخل الشهري لرب الاسرة سواء كان الام او الاب فشمل الاستبيان حصر للدخل الشهري لرب الاسرة قبل الانتقال للحي وبعد الانتقال للحي سواء بفقد الوظيفة وانعدام الدخل او استمرار الوظيفة وانفاق جزء كبير بالمواصلات يوميا او بتحسين الدخل بالحصول على وظيفة داخل الحي، فوجد ان اغلب السكان قد انخفض الدخل الشهري لهم بعد الانتقال (صورة 14)



صورة 14 أثر عملية الانتقال على الدخل الشهري للفئة المستهدفة من الاستبيان

نجد أيضا انه في ظل غلاء الأسعار حاليا فيبحث رب الاسرة عن وظيفة داخل الحي توفيرا لنفقة الانتقال، فنجد حالة عامة من عدم كفاية الدخل الحالي لرب الاسرة لمصاريفه اليومية، فلقد نتج من الاستبيان ان اغلب الاسر تجد ان دخلها الشهري اقل من المتوسط ولا يكفي تماما احتياجاتها اليومية (صورة 15)



صورة 15 أثر عملية الانتقال على مدي تغطية الدخل الشهري للاحتياجات اليومية

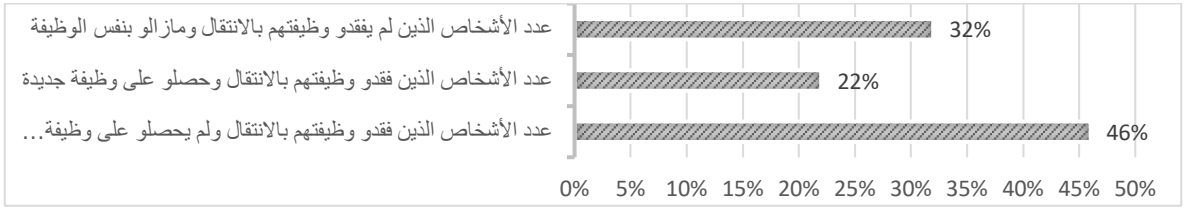
ونجد أن السكان يتطبعون بثقافاتهم القديمة بأحيائهم القديمة وهي المكوث بالشوارع امام البيوت مع الجيران للتسامر وتبادل الأحاديث مع الجيران وبعضها فنجد ان المخطط العمراني لحي الأسمرات لم يلقي بالا لهذا الطابع ولم يوفر لهم أماكن مظللة تسمح لهم بالمكوث فترات طويلة، فنجد انهم يجلسون على ارصفة الطرقات امام منازلهم مع جيرانهم في أوقات متأخرة من اليوم وبعد غروب الشمس، وسيتم دراسة ذلك تفصيليا في الدراسات الاجتماعية لأهالي الحي.

4. الدراسات الاقتصادية لحي الأسمرات

يعتبر العامل الاقتصادي هو أحد الجوانب الأساسية الضروري اخذها في الاعتبار لتخطيط أي مشروعات عمرانية، فهو أحد محاور الاستدامة والتنمية الشاملة فكيف يمكن ان نفكر في العمران وبناء المساكن دون الاخذ في الاعتبار باحتياجات من يسكن وكيفية معيشته في تلك المساكن فيما بعد؟ فإن دراسة تلك العامل تجنبنا ظهور أي آثار سلبية على المستفيدين بعد تنفيذ المشروع، ونستعرض فيما يلي الآثار الاقتصادية الناتجة عن إعادة توطين هؤلاء السكان الى حي الأسمرات من خلال مجموعة من النقاط والمعايير التي على أساسها يلخص البحث الحالة العامة للسكان بعد إعادة توطينهم بالحي وتم تلخيص تلك النقاط كما يلي:

4.1. تأثير عملية الانتقال على وظائف السكان قبل الانتقل

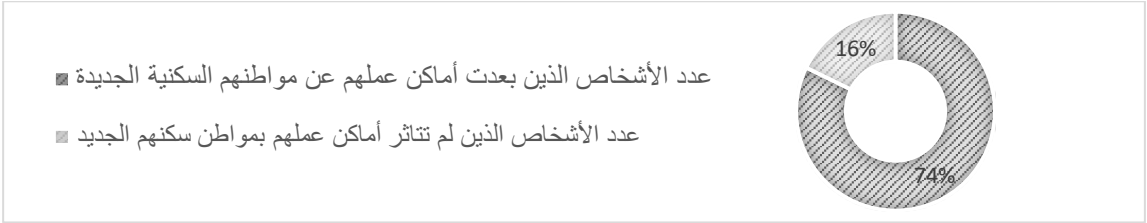
ان لعملية الانتقال بالغ الأثر على وظائف السكان بمواطنهم القديمة حيث ان اغلبهم كان يعتمد على العمل بموقع السكن او بالقرب منه او بعمل حر بالمنزل خصوصا السيدات أصحاب المشروعات الصغيرة بالمنازل، ولقد لخصت نتائج الاستبيان بان الفئة الاغلب من السكان قد فقدوا وظائفهم ولم يحصلوا على وظائف بديلة بالحي (صورة 11)



صورة 11 مخطط يوضح تأثير عملية إعادة التوطين الى حي الأسمرات على وظائف السكان

وعلى الأرجح يرجع ذلك الى انهم كانوا يقوموا بوظائف غير رسمية او وظائف بالقرب جدا من مواقع سكنهم او داخل موقع السكن نفسه أي تحت المنزل او بداخله فعند انتقالهم لحي الأسمرات نجد ان إدارة الحي تصدر قرارات صارمة بمنع إقامة أي عمل غير رسمي مثل البيع المتجول او افتراش الأرض بالبضائع مثل ما يحدث بالأسواق وأيضا يمنع الحي إقامة او بيع أي نشاط تجاري من المنزل لذلك نجد ان اغلب السيدات فقدت وظائفهم المنزلية، ومن يخالف تلك التعليمات من السكان يقوم الحي باتخاذ الإجراءات وغلق المشروع وسحب البضائع ومن ضمن أسباب فقد الوظيفة أيضا بعد مسافة العمل عن موقع سكنهم الجديد فاقر بعض السكان منهم انهم لو احتفظوا بوظائفهم سينفقون نسبة كبيرة جدا من دخلهم من العمل على المواصلات يوميا، اما عن الأشخاص الذين وجدو وظائف بديلة بالحي فتلك الاعمال تنحصر في عمال قمامة بالشوارع وهي وظيفة رسمية بإدارة الحي ويعمل بها النساء والرجال، ووظائف اخري مثل العمال بالجمعية الاستهلاكية او بفرن العيش او بالمدرسة والمركز الطبي ولكنها خدمات قليلة جدا حتى الآن التي تحتاج لتوظيف عمال او غيره من الوظائف، ومازالت النسبة التي فقدت عملها ولم تحصل على عمل تسعي لإيجاد وظيفة بالحي ولا يستطيعوا العمل بعيدا عنه لعدم القدرة على تكلفة المواصلات والانتقال يوميا.

وأخيرا فئة السكان التي لم تفقد وظائفها ومازالت بنفس عملها وعددهم 19 شخص وهي منقسمة الى فئتين: فئة اشخاص بعدت أماكن عملهم عن مواطنهم الجديدة أكثر مما كانت من قبل وعددهم 14 شخص بنسبة 74%، والفئة الأخرى اشخاص لم تتأثر أماكن عملهم بمواطن سكنهم الجديد وعددهم خمسة اشخاص بنسبة 16% (صورة 12)



صورة 12 مخطط يوضح تأثير عملية الانتقال على السكان الذين مازالوا بنفس أماكن عملهم بعد إعادة التوطين بالحي

3.3.4. إمكانية الوصول Accessibility

يعتبر المدخل الوحيد للحي حاليا هو الذي يقع بالناحية الغربية للحي وهو قادم من حي مدينة نصر مرورا ب "شارع 9" بحي المقطم ثم مرورا بالشريان الخدمي الذي يمتد بطول الحي من الناحية الغربية ثم نجد المدخل الرئيسي، ومن المفترض وجود مدخلان آخران للحي ولكن سيتم تفعيلهم عند اكتمال الشريان الخدمي للحي، ونجد أيضا ان خط سير اتوبيسات النقل العام المخصصة لنقل الاهالى من والى حي الاسمرات لها خط سير محدد من داخل الحي من المدخل الرئيسي للمرحلة الأولى مرورا بالمرحلة الثانية لتنتهي عند موقف الاتوبيسات العام على حدود حي الاسمرات من الناحية الشرقية وهو طريق موحد ذو اتجاهين للدخول والخروج من الحي، اما عن السيارات الخاصة فنجد أماكن مخصصة لانتظار السيارات بكثرة بكل الشوارع والطرق الرئيسية ويلاحظ زيادة عدد الأماكن المخصصة للسيارات مع قلة استخدامها من قبل الأهالي، ويرجع ذلك لضعف الحالة الاقتصادية للأهالي فيندر امتلاك الاسر هناك لسيارات خاصة.

3.3.5. المباني والفراغات Solid & Void

تكثر نسب الفراغات بحي الاسمرات بالنسبة لنسب الفراغات بالاحياء العشوائية، فنجد بالمناطق العشوائية المباني متلاصقة بعضها البعض ولا توجد فراغات بينية بينها مثل ما تم ذكره في الفصول السابقة، اما بحي الاسمرات فنجد فراغات واسعه وكبيرة بين كل مبني والآخر وبين كل مجموعة سكنية والاخري لتعطي الإحساس بالراحة النفسية لقاطني الحي من ناحية ومن ناحية أخري توفير التهوية الطبيعية للمباني من كل الاتجاهات كما انها تعطي خصوصية للسكان داخل وحداتهم السكنية، كما تكثر الفراغات العامة ومنها ما يستخدمها السكان في أغراض مختلفة ومنها الفراغات الغير مستغلة من قبل السكان حتى الآن، فنجد من تلك الفراغات ملاعب كرة القدم وهي مستغلة باستمرار للعب الكرة، وأيضا الساحات العامة مثل الميدان الذي يوجد في منتصف الحي ليفصل بين المراحل الثلاثة من الأسمرات فتم ملاحظة جلوس الاسر به انتظارا للخدمات المقدمة من الحي بالرغم من ان تصميمه غير مخصص للجلوس لكنه يقع في الجهة المقابلة للحي مباشرة، كما نجد أيضا الساحة الموجودة امام المسجد الرئيسي بالحي فهي ذات مساحة كبيرة تستوعب المصلين في أوقات الصلاة التي تحتاج لعدد كبير من المصلين مثل صلاة العيد او التراويح بشهر رمضان او في صلاة الجمعة في وقت لاحق عند اكمال تسكين الحي، ولكن نظرا لبعد هذا المسجد عن الكثير من السكان حيث ان موقعة غير متوسط للحي فنجد السكان تلجأ لفرش مصلي بساحات المجموعات السكنية الغير مستغلة (صورة 10)

ولكن لم يتم ملاحظة استغلال تلك الفراغات في أنشطة اخري للسكان ، فهناك نقطة يجب ذكرها بشأن تلك الفراغات الكبيرة المنتشرة بالحي، فان كل تلك الفراغات من الممكن ان تتحول وتستغل من قبل السكان كباعة جائلين ويتم استغلالها بوضع اليد من قبل السكان او أي محتلين ما لم يتم توعية السكان من قبل المنظمات الحكومية والغير حكومية وغرس روح الانتماء بهم للمكان والحفاظ عليه وعدم تحويله الى منطقة عشوائية بالمستقبل في حالة أي تغييرات سياسية او أي تغييرات في سياسة الحكم بالحي من قبل رئاسة الحي التي هي المانع الوحيد حاليا لهؤلاء السكان من تحول تلك المنطقة لعشوائيات.

كما ان الفراغات التي تقع على الطرق الرئيسية بالحي والتي بالأخص توجد بها صناديق القمامة المعلقة على أعمدة الانارة يتم استغلالها من قبل السكان في القاء القمامة على الأرصفة حيث انه لا يوجد صناديق قمامة مجمعة بالحي لإلقاء السكان القمامة بها فان الحي يتبع سياسة مختلفة في تجميع القمامة فتم التنسيق مع شركة نظافة لتكون هناك دوريات بصفة مستمرة كل ساعه تقوم عربات النظافة بالسير في الحي وتجميع القمامة من بؤر تكونها، ولكن ربما يكون لذلك أثر على تكون بؤر لآثار قمامة بصفة مستمرة بأماكن متفرقة من الحي، كما يقوم الحي بتشغيل بعض السكان من النساء والرجال كعمال نظافة بالشوارع لإبقائها دائما في صورة نظيفة.

صورة 10 مظاهر استعمالات الفراغات العامة سواء كانت مستغلة او غير مستغلة من قبل السكان

أما عن الخدمات الطبية يضم المشروع عدد أربعة وحدات طبية ومراكز صحية وسيارتان اسعاف، ويضم المشروع خدمات ترفيهية مثل حدائق ترفيهية ونادي ترفيهي وخمسة ملاعب لكرة القدم، أما عن الخدمات التجارية فنجد اغلب الخدمات في قلب الحي تقع في المرحلة الثانية مثل فرن العيش ومنفذ أمان للسلع الاستهلاكية اليومية وبعض الاحتياجات اليومية ومصرف السلع التموينية واللحوم ولكنها تعتبر من وجهة نظر السكان غير كافية لاحتياجاتهم اليومية وتبعد الى حد ما عن مواطن سكنهم، ولكن تري رئاسة الحي ان تلك المشكلات ستنتهي فور افتتاح المحلات الموجودة وتشغيلها حيث انها ستضم خدمات تجارية متنوعة موزعه على المراحل الثلاثة.

وهناك خدمات ثقافية كالمسرح المدرج المكشوف وقصر الثقافة لرعاية المواهب والاهتمام بالرعاية الثقافية للأطفال، وهناك أيضا خدمات إدارية للحي كمقر رئاسة الحي، نقطة الشرطة، الحماية المدنية، مكتب البريد، الشهر العقاري، كما يضم المشروع خدمات تعليمية مثل عدد سبعة حضانات ببعض الأدوار الأرضية من المباني السكنية موزعة على كامل الحي وعدد مدرستين للمرحلة الابتدائية والاعدادية، مركز للتدريب الحرفي تابع لوزارة الصناعة، ويضم أيضا مشغل لتصنيع السبح ومشغل للملابس، ونجد من الخدمات الدينية كنيسة ومسجد بالمرحلة الثالثة وأيضا مسجد كبير بالمرحلة الثانية بجانب منطقة الخدمات والمسرح الروماني، ولكن نجد ان مواقع تلك المساجد تستغل في صلاة الجمعة واوقات التجمعات بكثرة كما تستغل من قبل الساكنين حولها لقضاء الفروض الخمسة، اما بقية السكان ممن يقيم بعيد عن المسجد فلجأوا الى عمل زوايا صغيرة في ساحات البلوكات الغير مستغلة وفرشها بالحصر في اتجاه القبلة واستغلالها لإقامة الفروض الخمسة، ونجد أيضا على حدود الحي الجنوبي الشرقي موقف لأتوبيسات النقل العام وهي تتوفر بكثرة وتصل الى وسط البلد وأماكن متفرقة من القاهرة.

3.3.2. أسلوب التخطيط العمراني المستخدم بالحي

تم استخدام أسلوب التخطيط الشريطي وهنا نجد وحدة بتصميم واحد تتكرر بشكل ما مكونة مجموعة سكنية واحدة لتتكرر تلك المجموعة بشكل متوازي ويفصل بين كل مجموعة سكنية والأخرى طريق للسيارات والمشاة، ويختلف درجة ميل المبني وميل التخطيط الشريطي طبقا لشكل الأرض لتوفير فراغات عمرانية للأنشطة الترفيهية وأيضا توفير فراغات بين البلوكات وبعضها البعض مثل ما سبق دراسته في مستوي المجموعة السكنية Blocks (صورة 9)

صورة 9 مسقط افقي يوضح استخدام التخطيط الشريطي في التصميم العمراني لحي الأسمرات (جزء من تخطيط المرحلة الثالثة)

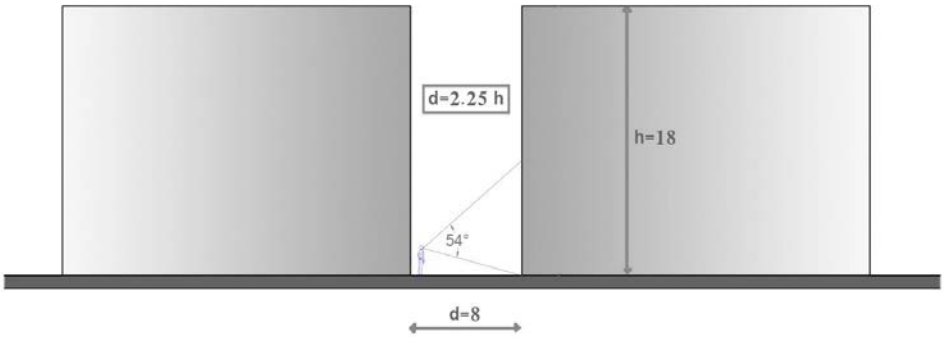
3.3.3. الطابع العمراني Urban Morphology

يعتمد تصميم حي الأسمرات في الأساس على وجود ميدان رئيسي في منتصف الحي يتفرع منه ثلاثة شاريين رئيسية تقسم الحي الى ثلاثة مراحل أولى وثانية وثالثة، ونجد بكل مرحلة تقسيم المجموعات السكنية مكونة تقاطعات فراغات عمرانية، ولا نجد اختلاف في الطابع العمراني من مرحلة لأخري او من مجموعة سكنية لأخري فنجد الطابع العام بالحي واحد ويتكرر بشكل نمطي واحد بدون أي اختلاف او تمييز لجزء عن الآخر.

المقابلة (صورة 7)، كما ان ارتفاع المباني الغير كبير ادي بدوره الى وصول التهوية الطبيعية دخول الشمس الى تلك الفراغات الواسعة الامر الذي يعتبر سلاح ذو حدين فالجانب الإيجابي لذلك هو جانب صحي وبيئي لدخول الشمس والهواء الى تلك الفراغات اما عن الجانب السلبي فان دخول هذه العوامل الجوية الى تلك الفراغات يمنع من استخدامها طوال النهار وتصبح بلا فائدة لارتفاع درجات الحرارة بها لفترات طويلة من اليوم.

صورة 7 مداخل العمارات السكنية بالحي

ويؤثر الفراغ بشكل كبير على الحالة النفسية للإنسان، فربما يثير في نفسه مشاعر الضيق اذا كان الفراغ صغيرا او انه يكون مريحا لنفسه اذا كان متوسطا او قد يشعر الانسان فيه بعدم الانتماء اذا كان كبيرا جدا، كما ان الفراغ يكون مقبولا نفسيا اذا كان عرض الفراغ يساوي نصف ارتفاع المبني او ان كان عرض الفراغ يساوي ضعف ارتفاع المبني او ان كان عرض الفراغ ثلاثة اضعاف ارتفاع المبني (الوكيل, 2007) وهنا نجد الفراغ الى حد ما مناسب حيث ان عرضه يساوي تقريبا نصف ارتفاع المباني وهي نسبة مقبولة وتعطي شعور طيب بالاحتواء (صورة 8)



صورة 8 دراسة الراحة النفسية للإنسان داخل فراغات الساحات بين المباني في البلوك الواحد

3.3. دراسة مستوي الحي السكني District Level

تشمل دراسة التقسيم العمراني للحي بأكمله ودراسة الجوانب التخطيطية والطابع العمراني للحي، كما تشمل دراسة نوع التخطيط المستخدم بالحي وحجم الأنشطة والخدمات الموجودة ودراسة استعمالات الاراضي land uses، وتشمل أيضا نسبة الفراغات الموجودة بالحي بأكمله، ونقاط تمركز السكان والتجمعات، ومن ثم نستطيع ان نشير الى المزايا العمرانية التي يتمتع بها هؤلاء السكان، وأيضا تحديد المشكلات العمرانية التي تواجه هؤلاء السكان بالحي لتجنب تكرارها في مخططات الدولة القادمة.

3.3.1. استعمالات الأراضي Land Uses

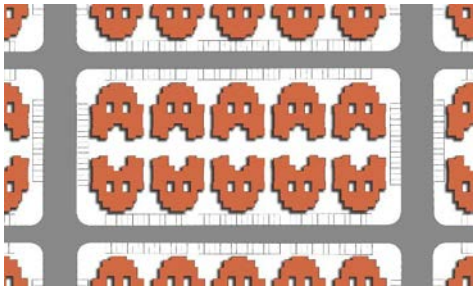
نجد ان اغلب استعمالات الأراضي بالحي هي أراضي سكنية، ويرجع ذلك الى انه مشروع إسكان اجتماعي الغرض الأساسي منه هو إعادة تسكين سكان المناطق العشوائية لذا تحتم توفير عدد 18300 وحدة سكنية بعدد 400 عمارة سكنية، كما يضم التخطيط مجموعة من المباني المتعددة الاستعمالات فنجد عدد 25 عمارة باستعمال سكني تجاري بإجمالي عدد 292 محل تجاري،

أما عن تصميم الواجهات الخارجية للمباني فجاءت جميعا نفس التصميم والشكل اختلفت فقط في اللون لبعض مجموعات المباني عن الأخرى فنجد مثلا مجموعة مساكن الصفا تمتاز باللون الأخضر، مجموعة مساكن الحياة باللون الأزرق، بينما نجد مجموعات مساكن الجوهرة والنسيم واغلب المجموعات الأخرى باللون البرتقالي، ونجد الإيقاع المتكرر في شكل الواجهات والذي ليس له أي مدلول عن هوية او ثقافة هؤلاء السكان والذي لا يعطي أي انطباع او مدلول عن المكان الذي يقطن به كل ساكن بل يستدل على كل عمارة برقم يكتب على مدخلها.

صورة 5 مداخل العمارات السكنية بالحي

3.2. دراسة مستوي المجموعة السكنية Block Level

هي مجموعة المباني المتجاورة على منسوب رصيف واحد مكونة البلوك السكني، عدد المباني السكنية في البلوك الواحد عشرة مباني سكنية وربما يزداد او يقل عددهم علي حسب اتجاه وطول البلوك (صورة 6) كما يربط جميع المباني بالبلوك الواحد ساحة ممتدة بطول البلوك يستغلها السكان في لعب الأطفال اغلب الأوقات ويستخدمها أيضا الأهالي في إقامة الاحتفالات الشعبية، وتنقسم هذه الساحة الى عدة مناسيب مختلفة تتصل بالسلالم والمنحدرات "Ramps"في بعض الأحيان، وفى بعض الأوقات من اليوم تكون بعض الأجزاء من تلك الساحات مظللة من انعكاس بعضها على الاخر، وفي الاتجاه الآخر بين كل عمارة والأخرى فتفصلهم ممرات بعرض 4م وغير مستغلة.

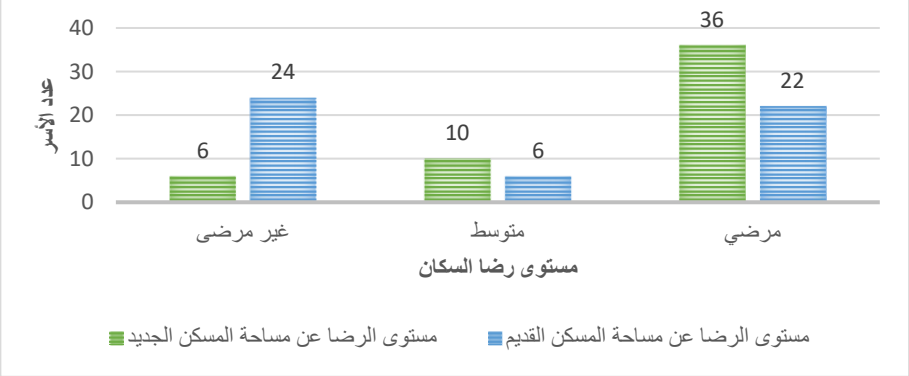


صورة 6 نموذج تصميم البلوك السكني في الحي

من الممكن ان نفترض ان تلك الفراغات صممت لجلوس السكان وتجمعهم سويا تأثرا بثقافاتهم القديمة في جلوس الجيران الدائم خارج المنزل وفى الساحات التي كانوا يستغلوها للعب الأطفال او تبادل الاحاديث او أحيانا لعمل النساء اعمال منزلية تجلب لها مصادر الرزق لتحسين دخولهم، ولكن اذا نظرنا الى هذه الساحات فنجد انها غير مستغله من السكان لذلك الغرض او تكاد تكون اغلبها غير مستغل وان كان استخدامها المتوسط هو لعب الأطفال فقط بالرغم من كونها فراغات واسعه وفارغة الا انها لا يوجد بها مقعد واحد لتبادل الاحاديث ولا يوجد بها أماكن مظللة للاستراحة بل نجد بعض السكان وبعض الأطفال من الممكن ان يجلسوا على سلم مداخل العمارات ان كان مظلل ولأنه المقعد الوحيد بالساحة، فان عدم وجود أماكن جلوس بالساحات البينية في البلوك، عدم وجود أماكن مظللة باستمرار بالإضافة الى عدم معرفة السكان ببعضهم البعض معرفة مسبقة بشكل كبير بسبب تجمعهم من مناطق مختلفة كل تلك العوامل كانت لها الأثر في ترك تلك الساحات دون استغلال او استفادة ملموسة لها من قبل السكان سوى لعب الأطفال الذين تأمن عليهم اهاليهم للعب اسفل العمارات فقط امام اعينهم.

اما عن طريقة تجميع المباني مع بعضها مكونة مجموعة سكنية فنجد المباني مجمعة بطريقة التجميع الشريطي " Linear Grouping" بطول البلوك الواحد مرآه لبعضها البعض "Mirror" مما ادي الى تكوين الفراغات الواسعة بشكل مميز بعرض حوالى ثمانية امتار من واجهة المدخل لواجهة المدخل المقابل، وبعرض أربعة امتار بين الواجهة الجانبية للمبني والواجهة الجانبية

وتضمن الاستبيان الذي تم اجراؤه مع سكان الحي السؤال عن مدي كفاية الوحدة لعدد افراد الاسرة مقارنة بمساحة مساكنهم القديمة بمناطق الانتقال الاصلية، وتضمن السؤال ثلاث درجات من الكفاءة سواء كانت مساحة مرضية او متوسطة او قليلة لكل من المسكن القديم والجديد فكانت النتائج كالآتي (صورة 3)، نجد ان اغلب السكان اتفقت على ان مساحة الوحدة السكنية الجديدة مرضية وكافية لمعيشتهم وحياتهم، كما نجد ان الاجماع أيضا على ان مساحة الوحدة السكنية القديمة كانت غير مرضية للسكان ولا لمعيشتهم وحياتهم.



صورة 3 مخطط يوضح نسبة رضا سكان بالحي عن مساحة الشقة الجديدة ومساحة الشقة القديمة بمناطق الانتقال

3.1.2. التصميم المعماري للمبني السكني بالحي

تم تنفيذ عدد 425 مبنى سكنى بكامل المراحل الثلاثة للمشروع (رئاسة حى الاسمرات, 2019)، وصممت المباني السكنية بتصميم معماري واحد داخليا وخارجيا فتختلف البلوكات عن بعضها فقط في الألوان فنجد التنوع في ألوان الواجهات لتشمل أربعة ألوان بكامل الحي ولكنها لا تعبر او تميز نوعية مباني عن الأخرى، فقط تختلف مباني "العشرات" وهي مباني المرحلة الثالثة عن المرحلة الأولى والثانية في كونها بارتفاع عشرة أدوار، فجاء تصميم العمارة السكنية في المرحلة الأولى والثانية من نوع الإسكان متوسط الارتفاع "Midrise Housing" عبارة عن دور ارضي وخمسة أدوار متكررة وهو الحد الأقصى لعدد الأدوار للمباني بدون مصعد في القانون المصري، بعدد ستة شقق بكل دور بمساحة حوالي 470 م2 للدور بالعمارة الواحدة، ونجد ان تصميم المبني هو تصميم بسيط تقليدي لكنه اتخذ هذا الشكل كما نري بالمسقط الافقي)صورة 4(ليسمح للست وحدات السكنية بكل دور بالإطلال على الشارع مباشرة او من خلال الساحات الداخلية المتصلة بين العمارات، وأيضا لمراعاة الاستفادة بالعوامل البيئية في دخول الإضاءة الطبيعية للوحدات السكنية مباشرة والاستفادة من التهوية الطبيعية، كما ساعد تصميم المبني في توحيد تقسيم الوحدة السكنية داخليا بنظام انعكاس كل شقة للأخرى أي ان كل شقتين متجاورتان كل منهما مرآه للأخرى.

صورة 4 مسقط أفقي للتقسيم الداخلي لتوزيع الوحدات السكنية بعمارات الحي – واجهة منظورية للعمارة السكنية

تم استخدام النمط المركزي "Core Type System" في تصميم العمارة السكنية حيث يقع عنصر الاتصال الراسي وهو السلم في المنتصف وتوزع الستة مداخل للوحدات من خلال ثلاثة اتجاهات ومدخل العمارة من الاتجاه الرابع، وتقع مداخل الوحدات السكنية في الغالب من داخل الساحات الداخلية الخاصة بالمارة وتوجد بعض مداخل العمارات على الشوارع الرئيسية التي تسير بها السيارات ويرتفع المدخل عن منسوب الشارع بمقدار حوالي من سبعة الي ثلاثة عشر درجة سلم أي ارتفاع يتراوح من 2:1 متر عن منسوب الشارع وذلك طبقا للتغير في منسوب الدور الأرضي بطول كل بلوك (صورة 5)

3. التصميم العمراني لحي الأسمرات

يقع حي الأسمرات بمحافظة القاهرة بحي المقطم بمنطقة الهضبة الوسطي ويحد بالحي شمالا حي مدينة نصر وهو الطريق الأقرب للوصول لحي الأسمرات من قلب القاهرة ووسط البلد، ويحده من الجنوب الطريق الدائري، اما من شرق حي الأسمرات فنجد منطقة صخرية ثم محور الشهيد ثم حي التجمع بأقصى الشرق، ومن الغرب مساكن المقطم ومنطقة الهضبة الوسطي، تم تخطيط المشروع على ثلاثة مراحل متتابعة يفصل بين كل مرحلة والأخرى طريق رئيسي فقط)صورة 1(، وتعتبر المراحل الثلاثة مشروعا واحدا يشمل كتل معمارية ذات طابعا معماريا واحد فقط تختلف في ألوان واجهاتها الخارجية لكنها نفس الشكل والطابع المعماري، كما انها نفس مساحة الوحدة والتي تمثل 65 م2 ونفس التصميم الداخلي لها، فقط تختلف المرحلة الثالثة في ارتفاع المباني السكنية حيث ان الارتفاعات في المرحلتين الأولى والثانية هي (أرضي وخمسة أدوار) أما الارتفاعات للمباني بالمرحلة الثالثة هي (أرضي وتسعة أدوار)

صورة 1 التقسيم العمراني لحي الأسمرات وهو ثلاثة مراحل تحيط بهم وتربط بين كل منهم الطرق الرئيسية للحي

3.1. دراسة مستوي المباني Building Level

تشمل دراسة المبني من حيث تصميم الوحدة السكنية من الداخل ومدي كفاءة التصميم لتلبية احتياجات السكان، وتشمل أيضا تصميم المبني من الخارج كطابع معماري او واجهات خارجية ومدي انعكاسها لثقافة المجتمع الذي يسكن حي الأسمرات.

3.1.1. التصميم الداخلي للوحدة السكنية

يختلف توجيه كل وحدة سكنية طبقا لموضعها في الحي ودرجة ميل المبني، فعلى سبيل المثال أحيانا تجد توجيه غرف النوم في الاتجاه الشمالي او الشرقي او الجنوبي او الغربي، كذلك الخدمات وصالة الاستقبال فيختلف توجيه كل منهم طبقا لتوجيه المبني ووضعه داخل الأرض، كما جاء تصميم الوحدة السكنية عبارة عن صالة مدخل بمساحة 3.7 م2 متفرع منها مدخل للمطبخ بمساحة 5.5 م2 ومدخل لفراغ المعيشة والاستقبال 20م2 وهو الجزء الشبه خاص بالوحدة ومنه نتفرع الى الجزء الخاص بالوحدة فنجد صالة توزيع صغيرة بمساحة 1.7م2 يتفرع منها غرفتين نوم بمساحة 13 م2، و10م2 وحمام بمساحة 3.5 م2)صورة 2(

صورة 2 مسقط أفقي لتوزيع الفراغات داخل الوحدة السكنية بحي الأسمرات

نحو مجتمعات عمرانية مرنة لإعادة توطين سكان المناطق العشوائية

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الملخص:
تركز تلك الورقة الحثية على تحقيق الاستدامة والمرونة للمجتمعات العمرانية الجديدة التي يتم بنائها من قبل الدولة لإعادة توطين سكان المناطق العشوائية الغير آمنة، وذلك بالقدرة على مواكبة التغييرات الطبيعية او البشرية التي يمكن ان تواجهها تلك المجتمعات حتى لا تتحول الي مناطق عشوائية لتلبية احتياجات السكان ومتطلباتهم المصاحبة للتغيير في الحياه السياسية والاقتصادية والاجتماعية، تمت تلك الدراسة من خلال دراسة التأثيرات الاقتصادية والاجتماعية المصاحبة لإعادة توطين سكان المناطق الغير آمنة الى حي الأسمرات بالقاهرة، ويصل البحث الى تحديد نقاط القوة ونقاط القصور لتلك المشروعات والوقوف على المشكلات المصاحبة لعمليات إعادة التوطين والمشكلات القائمة من بداية تصميم المشروع، حتي يصل الى مقترح تحسين جودة الحياة البشرية بتلك المجتمعات الجديدة من اجل تحقيق الاستدامة والمرونة بها باستخدام الموارد المتاحة.

الكلمات المفتاحية: المجتمعات المرنة - **Slum Relocation** – إعادة التوطين – **Informal Settlements - Resettlement**

1. المقدمة

تناولت الدولة في الآونة الأخيرة قضية هامة من أخطر القضايا التي تواجه مجتمعنا منذ زمن بعيد وهي قضية العشوائيات، ومنذ انهيار صخرة الدويقة عام 1994 تم انشاء صندوق تطوير العشوائيات ISDF والذي بدوره قام بتقسيم المناطق العشوائية الغير آمنة الى أربعة درجات من الخطورة، وكان التوجه الأهم من قبل الدولة هو الاهتمام بتنفيذ حلول المناطق ذات الخطورة من الدرجة الأولى والثانية وهي مناطق تمثل خطر جسيم على حياة سكانها، وتم تحديد أسلوب التعامل مع تلك المناطق بالإزالة وإعادة بنائها وإعادة تسكين السكان مرة أخري وامثلة تلك المشروعات مشروع إزالة وإعادة بناء حي زرزارة ببورسعيد، او بالإزالة وإعادة توطين سكانها في مشروعات عمرانية جديدة صممت خصيصا بقرار رئاسي لإعادة توطين سكان المناطق العشوائية الغير آمنة، ومن امثلة تلك المشروعات مشروعات الإسكان الاجتماعي علي أراضي الدولة مثل بشاير الخير بمحافظة الإسكندرية ومشروع الأسمرات بمحافظة القاهرة.
يركز البحث على مدي نجاح تلك التجربة في خلق مجتمع عمراني جديد يتسم بالمرونة والقدرة على التكيف مع أي متغيرات سياسية او اقتصادية او اجتماعية او بيئية قد تحدث فيما بعد، مجتمع يعطي فرصة جديدة لهؤلاء السكان للنجاة بأنفسهم وبأسرهم من ذلك الهلاك المتوقع حدوثه بالمناطق العشوائية، وتمت الدراسة من خلال عمل استبيان مباشر مع عينة عشوائية من الاسر التي تقيم بحي الأسمرات لأكثر من عام، وشمل الاستبيان الاستفسار عن حياة السكان الاجتماعية والاقتصادية بعد إعادة التوطين.

2. مراجعة الادبيات

تشير المرونة في علم الفيزياء وعلم النفس الى قدرة الجسم على العودة الى وضعه الأصلي بعد تلقيه الصدمات (Sharifi & Yamagata, 2014)، فيمكن الإشارة للمرونة هنا بانها قدرة النظام على التأقلم مع التغييرات التي قد تحدث للمجتمع على كل من المدي القصير والمدي الطويل، فيجب ان يكون المجتمع قادر على استيعاب تلك التأثيرات وقادرا على تنظيم نفسه وزيادة قدراته على كل من المدي الطويل والمدي البعيد (Chen & Graham, 2011)

اشارت حملة تمكين المدن من القدرة على الصمود التابعة لمكتب الأمم المتحدة للحد من مخاطر الكوارث UNISDR الى عدة نقاط يجب توفرها في المجتمع القادر على الصمود (UNISDR, 2010) ومن ضمن تلك النقاط تحديد القيادة القوية والتنسيق والمسؤوليات بوضوح، وضرورة تنبؤ المدينة المسبق بشأن الاخطار المتوقعة، وتوصي أيضا بدعم الارتباط الاجتماعي والمساعدة المتبادلة للمجتمع وضمان استمرارية الخدمات والقدرة على التعامل مع المتغيرات البشرية والطبيعية، ومن اجل تحقيق تلك الأهداف والوصول بالمدن الى القدرة على الصمود يجب الإشارة الى أهمية الاستثمار في الحد من مخاطر الكوارث والقدرة على الصمود الذي بدوره سيساعد في تحقيق مكاسب اجتماعية وبشرية، أيضا خلق مدن مترابطة بموارد وطنية ودولية، نمو اقتصادي مستدام مع توفير فرص للعمل، وأخيرا خلق مجتمعات أكثر توافق مع ظروف المعيشة والحياه.

إستمارة استبيان

الاسم : .....

الوظيفة : .....

مجال العمل : (1) التخطيط العمرانى .
(1) التنمية العقارية .
(2) التقييم العقارى .

تم تصميم هذا الاستبيان لاستطلاع أراء بعض السادة الخبراء في المجالات المختلفة التى تخص تطبيق القانون وهم : خبراء في التخطيط العمرانى والتنمية العقارية والتقييم العقارى وذلك بهدف قياس :

(1) مدى التوافق أو عدم التوافق في تطبيق مثل هذا القانون وتقنين المخالفات .
(2) رأى الخبراء في منهجية تحديد مقابل التصالح .
(3) التأثير المتوقع للقانون على العمران المصرى .
(4) أكثر العقبات التى تقف حائلا دون تنفيذ القانون .

لذا نرجو من سيادتكم التكرم بإفادتنا بخبراتكم الجليلة فى ملئ هذه الاستمارة .

---

(1) هل تم التطرق من قبل سيادتكم إلى قانون التصالح فى مخالفات البناء ؟
نعم ( ) لا ( )

(2) كيف ترون قانون التصالح وهل تتفق مع تطبيقه أم لا
.....

.....

(3) ما رأيكم فى المنهجية التى تم إتباعها لتحديد مقابل التصالح فى مدن وفرى المحافظات المختلفة
.....

.....

(4) ما رأى سيادتك فيما انتهت إليها المنهجية من أرقام مختلفة
....

....

(5) ما التأثير المتوقع من تطبيق القانون وما مدى قوه التأثير هل هو محدود ام متوسط أم قوى
....

....

(6) ما اكثر العقبات التى تقف حائلا لتحقيق أهداف القانون
....

....

(7) ما التوصيات التى تقترحوها سيادتكم للمساهمة فى الحد من مخالفات البناء
....

(9)الجهاز المركزي للتعبئة العامة والإحصاء, "دراسة المناطق العشوائية في مصر" 2008
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(12) قانون التصالح فى مخالفات البناء وتقنين الأوضاع رقم 17 لسنة 2019
(13) اللائحة التنفيذية لقانون التصالح فى مخالفات البناء وتقنين الأوضاع رقم 17 لسنة 2019
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السؤال السابع : التوصيات المقترحة للمساهمة فى الحد من مخالفات البناء مستقبلا

جاءت نتائج الإجابة على هذا السؤال كالتالى :

1. تدشين قاعدة بيانات قومية للأراضى والعقارات .
2. زيادة أعداد المهندسين في الوحدات المحلية لزيادة المراقبة والمتابعة .
3. متابعة البناء من قبل الوحدات المحلية بصورة دورية أثناء التنفيذ .
4. تبسيط إجراءات التنفيذ على العقارات المخالفة في المهد .
5. توفير وحدات سكنية تناسب كافة مستويات الدخول في المدن والقرى .

6. الخلاصة والتوصيات

حاولت الحكومة المصرية متمثلة في وزارة الإسكان والمرافق والمجتمعات العمرانية إيجاد منظومة تشريعية قانونية مؤقتة للتعامل مع الأوضاع الغير قانونية للعمران في المدن والقرى المصرية ، وقد جاء قانون التصالح في بعض مخالفات البناء من أجل تقنين الأوضاع . ويمكن تقييم القانون ووضع التوصيات من خلال النقاط الرئيسية التالية :

ضمان عدم التعارض مع المحددات والأهداف الرئيسية وهى : السلامة الإنشائية – التعدى على حقوق الغير- الحفاظ على الأراضى الزراعية خارج الأحوزة العمرانية – الحفاظ على المبانى التراثية وبالتالى استثنت هذه الحالات من التصالح . وهى نقاط لم يغفلها القانون .

طبيعة المخالفات : جاء قانون التصالح في بعض مخالفات البناء شاملا عدة منظومات –ومن وجهة نظر الباحثة قد يتطلب التفرقة بين التعامل مع المخالفات الفردية و المخالفات جماعية ، حيث تشكل المخالفات الفردية منظومة زيادة الاستفادة من المسطحات البنائية وهو ما يستلزم تحصيل مقابل مادى يتلاءم مع ذلك ، بينما تشكل المخالفات الجماعية التى نتج عنها اشتراك مجموعة من الأسر في مبنى سكنى واحد مناطق سكنية تكونت نتيجة عدم توافر وحدات سكنية .

تكلفة التصالح : ترى الباحثة أنه من الممكن قيام الدولة بتخفيض مقابل التصالح للوحدات السكنية التى بنيت كمناطق سكنية كاملة في المناطق غير المخططة ، حيث أن تكلفة التصالح لوحدة سكنية كاملة تعتبر عبئا على المواطنين .

المشكلات الإجرائية : والمتمثلة بشكل أساسى في إثبات تاريخ المخالفة و زيادة تكلفة التقارير الإنشائية . ترى الباحثة بأنه يمكن حل هذه المشكلات بتوفير كواد واليات بالوحدات المحلية المركزية للتعامل مع هاتين المشكلتين حيث يمكن إتاحة الصور الجوية مجمعة للوحدات المحلية وليس من قبل طالبى التصالح ، كما يمكن عمل تقارير السلامة الإنشائية بواسطة مهندسون مدربون في الوحدات المحلية وهو ما يسهم في تقليل تكلفة التقارير.

التكامل مع قانون البناء الموجد رقم (119) لسنة 2008 وقانون التعديات على أملاك الدولة رقم (144) لسنة 2017 : حيث يجب تقييم الأوضاع بعد انتهاء مدة قانون التصالح وتقنين التعديات على أملك الدولة وتعديل قانون البناء الموحد للسيطرة على الأوضاع العمرانية القائمة وتلافى التعديات مرة أخرى .

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(7) قرار محافظ القاهرة رقم 75 لسنة 1990
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2007, http://moee.gov.eg/test_new/report.aspx ص38

– تم تقدير الاستعمالات الأخرى من تجارى – إدارى – صناعى – غيرها) بأرقام مختلفة أو بنسب محددة من قيمة التصالح في الاستعمالات السكنية .

5. استطلاع أراء بعض المتخصصين فى قانون التصالح

تم تصميم استمارة استبيان لاستطلاع أراء بعض المتخصصين في المجالات المختلفة التى تخص تطبيق القانون وهم : خبراء في التخطيط العمرانى والتنمية العقارية والتقييم العقارى وذلك بهدف قياس :

(1) مدى التوافق أو عدم التوافق في تطبيق مثل هذا القانون وتقنين المخالفات.
(2) رأى الخبراء في منهجية ونتائج تحديد مقابل التصالح .
(3) التأثير المتوقع للقانون على العمران المصرى .
(4) أكثر العقبات التى تعوق تنفيذ القانون .

مرفق نموذج من استمارة الاستبيان في ملحقات البحث

1/5 نتائج الاستبيان

تم إجراء الاستبيان مع عدد من المتخصصين (24 خبير) في المجالات المختلفة بواقع 8 خبراء في كل تخصص (التخطيط العمرانى والتنمية العقارية والتقييم العقارى) ، وكانت النتائج كالتالى :

السؤال الأول : الذى يختص بمعرفه القانون او عدم معرفته

نسبة 80 % تقريبا من السادة الخبراء أطلع على القانون مع عدم إلمام نسبة 20 % منهم بتفاصيله.

السؤال الثانى : التوافق مع فكر القانون من عدمه

نسبة 70 % من السادة الخبراء مع تطبيق القانون ، والباقى مع عدم تطبيقه .

السؤال الثالث : الآراء فى المنهجية التى تم إتباعها لتحديد مقابل التصالح فى مدن وفرى المحافظات المختلفة

نسبة 80 % تقريبا يرون أنها منهجية مناسبة ، بينما يرى 20 % منهم أنه كان من الضرورة إدخال عامل عمر المبنى ، مع ضرورة حساب تكلفة إصلاح وتطوير المرافق في المناطق المفتقرة اليها أو تعانى من سوء الخدمة .

السؤال الرابع : الآراء فى النتائج التى تم التوصل إليها لتحديد مقابل التصالح فى مدن وفرى المحافظات المختلفة

نسبة 60 % تقريبا يرون أن نتائج تقدير مقابل المادى للتصالح مناسب ، بينما يرى نسبة 40 % ارتفاع الأرقام بشكل مبالغ فيه مما يؤثر على نسبة المتصالحين وانها سوف تنحصر في فئات معينة كالمطورين أو الذين يتصالحون في مساحات صغيرة ، بينما المخالفات الكاملة التى تتطلب التصالح مع كامل المبنى سوف تكون نسبتها قليلة.

السؤال الخامس : التأثير المتوقع من تطبيق القانون وما مدى قوه التأثير هل هو محدود ام متوسط أم قوى

نسبة 50 % يرون ان تأثير القانون محدود ، بينما يرى نسبة 50 % أن تأثيره متوسط .

السؤال السادس : اكثر العقبات التى تقف حائلا لتحقيق أهداف القانون .

جاءت نتائج الإجابة على هذا السؤال تنازليا كالتالى :

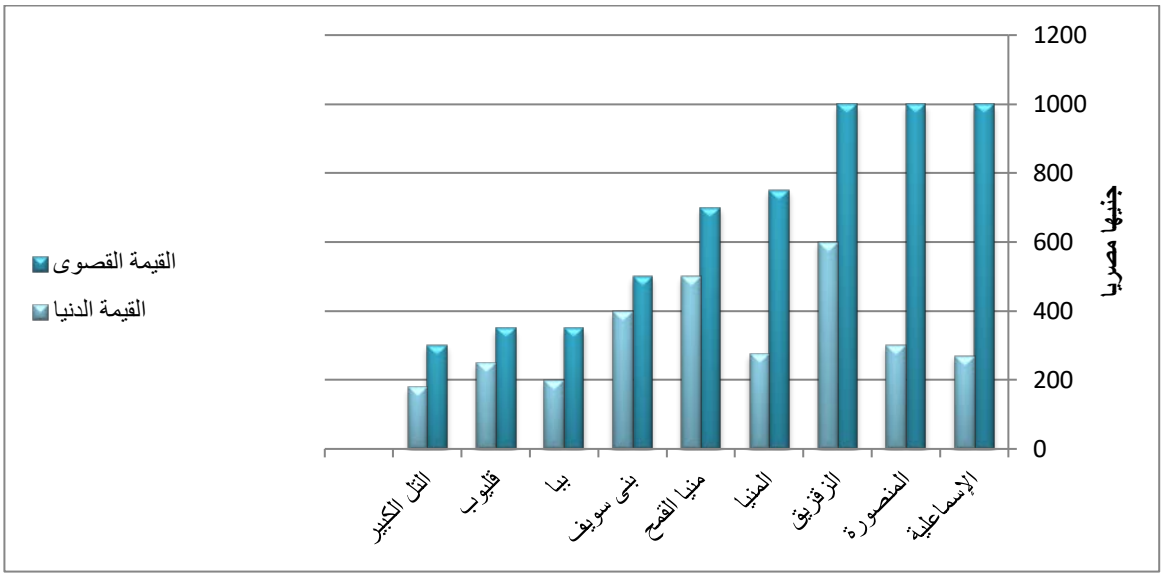
1. ارتفاع تكلفة التصالح في المساحات الكبيرة
2. ارتفاع تكلفة الحصول على تقرير السلامة الإنشائية
3. صعوبة إثبات تاريخ المخالفة و الحصول على الرصد الجوى
4. عدم معرفة الموطنين بقيمة مقابل التصالح
5. وجود حالات مختلفة يصعب البت فيها وتحديد هل يمكن التصالح عليها من عدمه
6. صعوبة إتفاق كل سكان العقار المخالف على التصالح وهو من شروط التصالح أن يكون التصالح على كامل المبنى .
7. قصر المدة

١- مدينة ميت غمر :

	الاستخدام	القيمة/م٢
شوارع مستوى أول		
الشوارع الرئيسية بعرض ١٢ م فأكثر	سكنى	٤٥٠
	صناعى	٤٥٠
	إدارى	٦٠٠
	تجارى	٧٥٠
	أخرى	٤٥٠
شوارع مستوى ثانى		
شوارع بعرض من ٦ م إلى أقل من ١٢ م .	سكنى	٣٥٠
	صناعى	٣٥٠
	إدارى	٥٠٠
	تجارى	٦٥٠
	أخرى	٣٥٠
شوارع مستوى ثالث		
شوارع عرض ٦ م .	سكنى	٢٥٠
	صناعى	٢٥٠
	إدارى	٤٠٠
	تجارى	٥٠٠
	أخرى	٢٥٠

شكل رقم (5) جزء من قرار محافظ الدقهلية لإقرار قيم التصالح بمدينة ميت غمر مقسمة طبقا لعروض الشوارع

ويوضح الشكل التالى رسم بيانى لقيم التصالح الصغرى والقصوى للاستعمالات السكنية لبعض المدن المصرية



شكل رقم (6) رسم بيانى لقيم التصالح الصغرى والقصوى للاستعمالات السكنية لبعض المدن المصرية
المصدر : قرارات المحافظين بشأن إقرار قيم التصالح

- تراوح مقابل التصالح للاستعمالات السكنية لبعض مدن عواصم المحافظات الجمهورية ما بين 1000 جنيها فى الدلتا ، بينما وصل فى مدن الصعيد الى ستمائة جنيها وهو ما يعكس الحالة العمرانية وتوافر الخدمات فى المدن .
- تراوح مقابل التصالح للمدن الأقل كفاءة عمرانية ما بين 500 جنيها و 200 جنيها .
- تراوح مقابل التصالح للقرى والعزب والنجوع ما بين خمسون جنيها إلى خمسمائة جنيها ، وذلك طبقا لعروض الطرق ومدى توافر الخدمات فى القرية .

بالتصالح طبقا للقانون رقم (17) ، ولكنها خطوة لاحقة وتتطلب تعديلات جذرية في قانون البناء الموحد رقم (119) لسنة 2008 .

4/ 7 منهجية تحديد قيمة مقابل التصالح

حدد قانون التصالح الحد الأقصى لقيمة التصالح في المخالفات بألفى جنيها مصريا ، والحد الأدنى خمسون جنيها مصريا ، ويتم تحديده بناءا على تقسيم كل محافظة إلى عده مناطق بحسب المستوى العمراني والحضاري وحاله توافر الخدمات ، وبالتالى ليتم تنفيذ القانون قامت المحافظات المختلفة بتحديد مقابل التصالح على ثلاثة مراحل :

المرحلة الاولى : إعطاء أوزان نسبية لمدن وقرى المحافظة

حيث تم رصد العوامل والمتغيرات المؤثرة على عملية تقسيم المحافظة إلى مستويات حضارية للمدن والقرى ، وتحليلها تحليل إحصائى كالتالى :

- موقع القرية / المدينة : تقع على (طريق إقليمى – طريق شريانى بين الحافظات – طريق يصل بين مراكز المحافظة)
- البيئة العمرانية و الهيكل العمرانى (حالات المبانى – ارتفاعات المبانى – نظم الإنشاء)
- رتبة المدينة على المستوى القومى .
- عدد السكان .
- قوة القاعدة الاقتصادية للمدينة / القرية
- توافر الخدمات المختلفة (تعليمى – صحى – دينى .....).
- توافر المرافق و كفاءتها .

المرحلة الثانية : إعطاء أوزان نسبية للمناطق داخل كل مدينة / قرية

تم دراسة الهيكل العمراني للمدن والقرى والوقوف على المستوى الحضاري للمناطق المختلفة داخل كل مدينة او قرية ومدى توافر الخدمات المختلفة بالقرى الرئيسية والتابعة ومقارنة النتائج بالقيمة السوقية لأسعار الأراضي والمباني بكل مدينة على حدا للوصول إلى قيم التصالح المطلوبة ، وبناءا عليه تم تقسيم كل مدينة الى عدة مناطق طبقا لمستوياتها الحضارية ، وتراوحت عدد المستويات طبقا لمساحة المدينة ، و تم تمييز المناطق ذات الطبيعة الخاصة (الواجهات الشاطئية على البحر او نهر النيل) .

المرحلة الثالثة : تحديد مقابل التصالح داخل كل منطقة حضارية

تم تقسيم المناطق المختلفة طبقا لعروض الطرق وإيجاد القيم المتناسبة مع كل فئة بالنسبة لكافة الاستعمالات (سكنى – تجارى – إدارى – صناعى – غيرها) .

ويوضح شكل رقم (5) جزء من قرار محافظ الدقهلية لإقرار قيم التصالح بأحد مناطق مدينة ميت غمر مقسمة طبقا لعروض الشوارع .

(سكنى – تجارى – إداري – صناعى ....) ، ويتناول البحث بالتفصيل في الجزء التالى منهجية ونتائج تحديد قيمة مقابل التصالح - حيث أنه يعتبر المحدد الرئيسى لمدى استجابة المواطنين للقانون وإجراء التصالح .

– دور القانون في التجديد الحضرى للمناطق المتهالكة

39 % من حصيلة المبالغ المحصلة لمشروعات البنية التحتية من مياه وصرف صحى .

التأكد من طلاء كامل الواجهات قبل إقرار التصالح.

5/4العلاقة بين قانون التصالح وتقنين التعديات على أراضى الدولة

يتزامن تطبيق قانون التصالح في بعض مخالفات البناء رقم (17) لسنة 2019 مع قانون 144 لسنة 2017 والخاص بتقنين أراضى وضع اليد من التعديات أو تغيير النشاط ، ويمكن إيضاح الفروق الجوهرية بين القانونين كالتالى من خلال الجدول التالى :

جدول رقم (1) الفروق الجوهرية بين قانون التصالح في بعض مخالفات البناء رقم (17) لسنة 2019 و قانون 144 لسنة 2017

قانون التصالح في بعض مخالفات البناء رقم (17) لسنة 2019	قانون 144 لسنة 2017
▪ التصالح على المبانى القائمة قبل يوليو 2017	▪ تقنين التعديات على الأراضى مهما زادت مدة التعدى
▪ يتم تطبيقه على المبانى الواقعة داخل حدود الكتلة العمرانية القائمة أو الكتل السكنية المتاخمة المتمتعة بالمرافق والمأهولة بالسكان .	▪ يتم تطبيقه على كافة الأراضى سواء داخل كردونات المدن أو خارجها ، ولكن أغلبها تقع خارج حدود الكتل العمرانية القائمة .
▪ تحديد مقابل التصالح على مستوى المدن القرى والأحياء طبقا للمستوى الحضارى والعمرانى ، وتحديد قيم ثابتة	▪ يتم دراسة كل حالة بشكل منفرد ، وحساب مدد التعديات
▪ لا يعتبر تقنينا للأراضى أو إثبات ملكيتها	▪ يعتبر تقنين للأراضى وما عليها من مبانى

6/4 تأثير قانون التصالح على أوضاع المناطق اللارسميه

تعامل قانون التصالح في بعض مخالفات البناء رقم (17) لسنة 2019، على مخالفات المبانى فقط في الكتل السكنية المأهولة بالسكان ، و بالتالى هو مجرد تقنين فردى لبعض المبانى وليس على مستوى المناطق الغير مخططة التى تم توصيفها في قانون البناء الموحد بانها المناطق التي نشأت بالمخالفة للقوانين واللوائح المنظمة للتخطيط والبناء ، ويتم تحديدها بالمخطط الاستراتيجي العام المعتمد للمدينة أو القرية ، ويمكن تقنين أوضاع المناطق الغير رسمية كاملة في حالة قيام كافة المخالفين

الرأى الثانى : تبنى أخرون أنه ليس من الحكمة غض النظر عن الأوضاع القائمة بالفعل ويجب تقنين أوضاع المخالفين كنوع من التكيف مع الوضع القائم بالفعل و الذى لا يمكن تغييره خاصة فى ظل وجود أحياء كاملة غير مقننة تستوعب ملايين من السكان ممن ليس لديهم القدرة على شراء وحدات سكنية مقننة ، وكنوع من المرونة الإدارية والسياسية استنادا إلى ان هذه الاوضاع كانت نتاج لأزمات اقتصادية بالبلاد عانى منها السكان لسنوات طويلة ، وأنه لابد من توفير الحيازة الامنه لهم .

القاهرة - شمس عين حى – رجيله أبو منطقة في ترخيص بدون المبانى بعض نماذج (3) رقم شكل

المصدر : الباحثةwww. Google Earth.com /

وبالتالى انتهج القانون القواعد الاساسية التالية :

– الحفاظ على الأرواح وحقوق الغير وحقوق الدولة والتراث المعمارى:

حدّد القانون الحالات التى لا يتم فيها التصالح وهى الأعمال التى تخلّ بالسلامة الإنشائية للبناء، والتعدى على خطوط التنظيم المعتمدة وحقوق الارتفاق المقررة قانونًا، فضلًا عن المخالفات الخاصة بالمنشآت ذات الطراز المعمارى المتميز.

– محدودية مدة القانون

حيث أن القانون استثنائي ومحدد المدة لا يتم تعميم عملية التصالح فى مخالفات البناء والتأكيد على أنه قانون مؤقت .

– تيسير السداد

طبقا للمادة (8) من القانون يمكن سداد مقابل التصالح على أقساط ربع سنوية متساوية لا تتجاوز مدتها 3 سنوات بعد سداد 25% على الأقل من القيمة الإجمالية لمقابل التصالح ، وتم تعديلها لاحقا على 5 سنوات .

– تطبيق مبدأ العدالة في تحديد قيمة مقابل التصالح

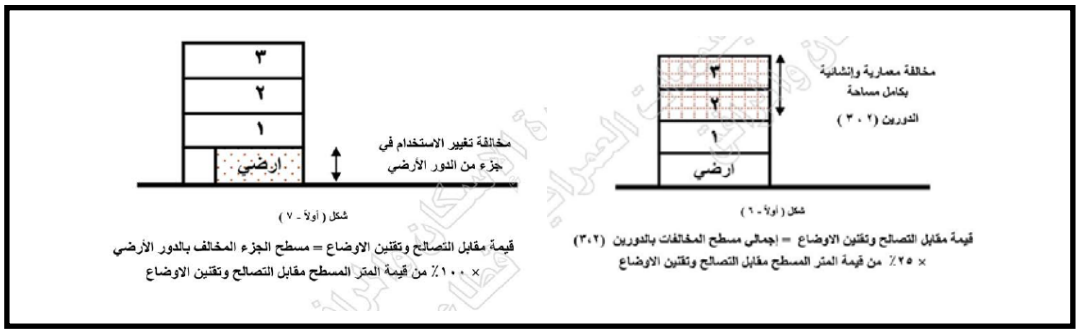
طبقا للمادة (8) من اللائحة التنفيذية للقانون رقم (17) لسنة 2019 فإنه يجب تقسيم كل محافظة إلى عده مناطق بحسب المستوى العمراني والحضاري وحاله توافر الخدمات وتقدير قيمة المتر المسطح مقابل التصالح وتقنين الاوضاع لكل استخدام

(2) تقدير قيمة المتر المسطح مقابل التصالح : طبقا للمادة (8) من اللائحة التنفيذية للقانون رقم (17) لسنة 2019 والتي نصت على تقوم اللجنة بتقسيم المحافظة إلى عده مناطق بحسب المستوى العمراني والحضاري وحاله توافر الخدمات وتقدير قيمة المتر المسطح مقابل التصالح وتقنين الاوضاع لكل استخدام (سكنى – تجارى – إداري – صناعى ....)

(3) أنواع المخالفات الرئيسية: (12)

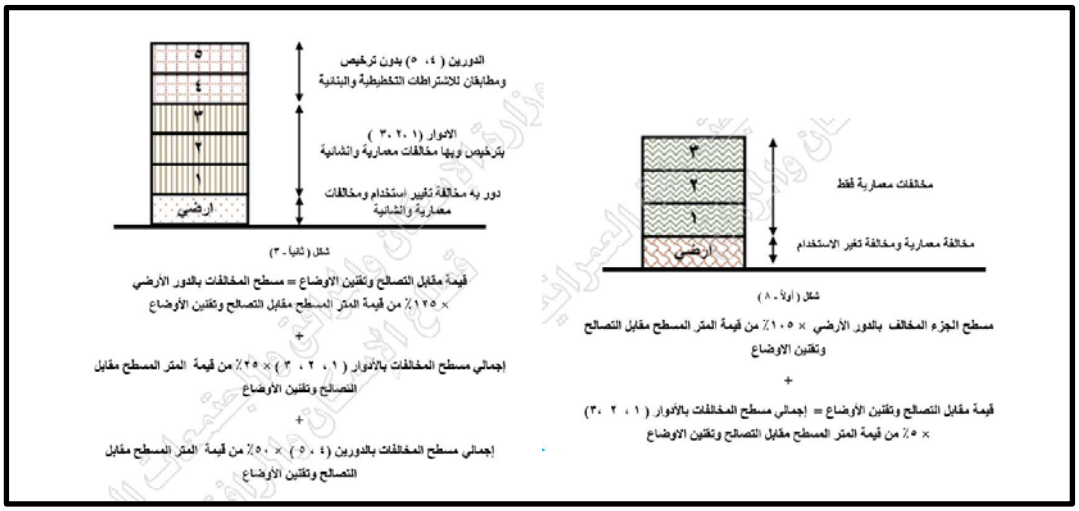
- حالة البناء دون ترخيص ومتعدى الاشتراطات التخطيطية والبنائية السارية : 100 % من قيمة المتر المسطح مقابل التصالح
- تغيير الاستخدام بالمناطق التى ليس لها مخططات تفصيلية : 100 % من قيمة المتر المسطح مقابل التصالح
- البناء دون ترخيص ومطابق للاشتراطات التخطيطية والبنائية السارية : 50 % من قيمة المتر المسطح.
- مخالفة الرسومات المعمارية والرسومات الإنشائية وبنفس المسطح وعدد الأدوار المرخص بها، : 25 % من قيمة المتر المسطح.
- مخالفة الرسومات الإنشائية للترخيص الصادر ومطابقة للرسومات المعمارية وبنفس المسطح وعدد الأدوار المرخص بها : 20 % من قيمة المتر المسطح.
- مخالفة الرسومات المعمارية للترخيص الصادر ومطابقة للرسومات الإنشائية وبنفس المسطح وعدد الأدوار المرخص بها، : 5% من قيمة المتر المسطح مقابل التصالح.
- الحد الأدنى لمقابل التصالح وتقنين الأوضاع 50 جنيهًا للمتر المسطح، والحد الأقصى 2000 جنيها .

ويوضح الشكلان رقم (1) و (2) نماذج استرشاديه حساب المخالفات في المبانى



المبانى بعض في واحدة مخالفة لحساب استرشاديه نماذج (1) رقم شكل

العمرانية والمجتمعات والمرافق الإسكان وزارة – 2019 لسنة (17) قانون استفسارات كتيب : المصدر



المبانى بعض في مخالفة من أكثر لحساب استرشاديه نماذج (2) رقم شكل

العمرانية والمجتمعات والمرافق الإسكان وزارة – 2019 لسنة (17) قانون استفسارات كتيب : المصدر

4/4 تطبيق القانون

واجه إرساء قانون التصالح فى بعض مخالفات البناء بعض التعارضات التى تتعلق فى فكرة القانون فى حد ذاته حيث الرأى الأول : يرى البعض أنه ليس فى صالح المدن المصرية - استنادا إلى أنه ليس من العداله مكافأه المخالف بالتصالح والتساوى مع غير المخالف كما ان مثل هذا القانون يثير المخاوف من تفاقم الأوضاع الغير قانونية .

- في 2016 : صدرت قرارات وزارية بتحديد قيم تركيب العدادات وضوابطها، كان أهمها أن العداد يتم تركيبه بصفة مؤقتة حتى تقنين وضع العقار .

توجد العديد من المخالفات الخاصة بعمليات البناء والعقارات، ولكل مجموعة من المخالفات القوانين الخاصة بها، وفي بعضها توجد آليات للتصالح وتقنين الوضع على النحو التالى :

- البناء على أراضي الدولة بوضع اليد أو البناء على أراضي خُصصت للزراعة والاستصلاح (تغيير نشاط) وصدر لها القانون رقم 144 لسنة 2017 لتقنين أوضاعها.
- البناء على أراضٍ زراعية قديمة، ويتعامل معها قانون الزراعة .
- ثم تم استحداث القانون رقم 17 لسنة 2019 للتصالح في بعض مخالفات البناء في حالات البناء على أراضٍ زراعية داخل الأحوزة العمرانية (كردونات) للقرى، أو البناء على أراضٍ خاصة داخل المدن بالمخالفة لقانون البناء الموحد رقم 119 لسنة 2008 ولائحته التنفيذية . حيث تشير إحصاءات وزارة الكهرباء في تقريرها السنوى 2018 / 2019 (10) إلى أن هناك نحو 8.2 مليون وحدة تم بناؤها بدون الحصول على ترخيص منذ سنة 2007.

4. قانون التصالح لمخالفات البناء طبقا للقانون رقم 17 لسنة 2019

1/4 فلسفة إصدار القانون واهدافه

حددت فلسفة إصدار قانون التصالح في بعض مخالفات البناء بأن وضع المبانى المخالفة بات يؤرق المجتمع المصرى بأسره، بسبب ما يسببه من مشكلات متعددة سواء بنائية أو اقتصادية أو قانونية أحدثتها. وجاءت الأهداف التفصيلية فى (1) الحفاظ على الثروة العقارية وتقنين الأوضاع المخالفة وفقًا لقواعد قانونية وهندسية. (2) إنهاء ووقف المنازعات القضائية المتعلقة بالمخالفات البنائية (3). الحفاظ على الشكل الحضارى والمعمارى. (4) إيجاد موارد يمكن من خلالها التغلب على مشكلات البنية التحتية التى أحدثتها هذه المخالفات البنائية.(5) الحفاظ على الرقعة الزراعية .

2/4 ملخص القانون

ورد نص قانون رقم 17 لسنة 2019 فى أثنى عشر مادة تناولت الهيكل الاساسى لفكر القانون

- وردت المادة الاولى ببيان ان هذا القانون يختص بالأعمال المخالفة لقانون رقم 119 لسنة 2008 ، ومع مراعاه قانون المحال العامة والمناطق التى لم يصدر بها مخططات تفصيلية .
- وردت المادة الثانية بتوضيح الحالات التى لا يجوز التصالح عليها كالتالى

1: الأعمال التى تخل بالسلامة الإنشائية للبناء. 2: التعدى على خطوط التنظيم المعتمدة المقررة قانونا.
3:المخالفات الخاصة بالمبانى والمنشآت ذات الطراز المعمارى المتميز.4: تجاوز قيود الارتفاع المقررة من سلطة الطيران المدنى أو تجاوز متطلبات شئون الدفاع عن الدولة.5: البناء على الأراضى المملوكة للدولة. 6: البناء على الأراضى الخاضعة لقانون حماية الآثار وحماية نهر النيل. 7: تغيير الاستخدام للمناطق التى صدر لها مخططات تفصيلية معتمدة من الجهة الإدارية. 8:البناء خارج الأحوزة العمرانية ويستثنى من البناء خارج الأحوزة العمرانية: الحالات الواردة فى المادة الثانية اصدار من مواد قانون البناء الصادر بالقانون رقم 119 لسنة 2008. و المشروعات الحكومية والخدمية والمشروعات ذات النفع العام و الكتل السكنية المتاخمة للأحوزة العمرانية للقرى والمدن ويقصد بها المبانى المكتملة والمتمتعة بالمرافق والمأهولة بالسكان.

ثم شرحت المواد من الثالثة إلى الثانية عشر طريقة عمل القانون وتشكيل اللجان والتعامل مع العقوبات وهو ما تناولته اللائحة التنفيذية تفصيلا وهو ما سوف يتناوله البحث فى الجزء التالى للوصول الى عقبات التى توجه كل مرحلة .

3/4 اللائحة التنفيذية وما تلاها من تعديلات

تكونت اللائحة التنفيذية من أربعة عشر مادة تناولت الاتي :

(1) إثبات تاريخ ارتكاب المخالفة بأى من الطرق المثبتة وذلك بإحدى الطرق الأتية :
. تاريخ الإجراءات القانونية المحررة حيال المخالفة. أو. تاريخ تركيب أى مرفق من مرافق العقار "كهرباء - مياه - غاز - تليفون - إنترنت – إلخ . أو مستحضر رسمى من الضرائب العقارية. . أو عقود البيع والإيجار المشمولة بإثبات تاريخ بالشهر العقارى. أو صورة ملتقطة من القمر الصناعى. أو تقديم تقرير يثبت تاريخ ارتكاب المخالفة من إحدى الجامعات المصرية أو المركز القومى لبحوث الإسكان والبناء او غير ذلك من الأدلة المثبتة لتاريخ القيام بالمخالفة.

(1) التقدم للتصالح : مستندات طلب التصالح ورسوم فحص الطلب التى تراوحت ما بين 125 جنيها للقرى و 500 جنيها للمدن إلى 5000 جنيها للمساحات اكثر من 4000 متر مربع .

القوانين الاستثنائية / المؤقته (محددة الفترة)

يراد بالقوانين محددة الفترة، او القوانين المؤقتة كما يسميها البعض، هي القوانين التي يحدد المشرع نفادها بأجل معين. فقد تستدعي ظروف خاصة كحالة الحرب مثلا، سن بعض القوانين وتنفيذها فترة معينة هي فترة الحرب (5)، كم أنها تعتبر قوانين استثنائية للتعامل مع ظاهرة أو خلل ما لمواجهته وتقنين أوضاعه .

2. منهجية البحث

اعتمدت الورقة البحثية على مجموعة من الخطوات الأساسية وهى:

- الخطوة الأولى (الدراسة النظرية): حيث تم استخدام المنهج الوصفى التحليلى للتعرف على الخلفية التاريخية لقوانين التعامل مع المبانى المخالفة .
- الخطوة الثانية (الدراسة التحليلية لقانون التصالح فى بعض مخالفات البناء) : تم استخدام المنهج الوصفى التحليلى وذلك للتعرف اولا على فلسفة وأهداف إصدار القانون ، ثانيا : المنهج التحليلى لعرض وإدراك مواد القانون والربط بينه وبين اللائحة التنفيذية وتعديلاتها .
- الخطوة الثالثة (دراسة تطبيق القانون) : تم استخدام المنهج الاستنباطي من خلال تصميم استبيان للمتخصصين فى مجالات تنفيذ القانون واستطلاع آرائهم حول المحددات الرئيسية للقانون.
- الخطوة الرابعه (بالخلاصة والتوصيات): من خلال تحليل أراء ومقترحات المتخصصين فى مجال تطبيق القانون .

3. الخلفية التاريخية لقوانين التعامل مع مخالفات البناء

سُنَّت العديد من التشريعات العمرانية لمواجهة النمو الحضرى العشوائى والتعدى على الأراضى الزراعية ، والتي رسمت موادها الأرض والعمران وعملية البناء بشكل مُفصَّل ، وكان للتعامل مع المبانى المخالفة عدة قوانين أهمها :

– القانون رقم 259 عام 1956: نصَّ على وقف جميع البلاغات وقرارات الإزالة الصادرة بحق جميع المباني المقامة على تقسيمات مخالفة، أي أراضٍ زراعية يملكها أصحابها، قاموا بتقسيمها إلى قطع أراضٍ أصغر دون الحصول على الترخيص بذلك، وبيعها أو البناء عليها ، و توصيل المرافق العامة إلى المناطق دون مقابل، وتحصيل قيمة توصيلها من الشارع إلى الأراضي فقط من أصحاب الأراضي.

– القوانين رقم 2 لسنة 1982 و30 لسنة 1983 : تعديلات قانون البناء، وقانون التخطيط العمراني رقم 3 لسنة 1982 قامت بتغليظ عقوبات المخالفين وإضفاء المزيد من التفاصيل على عمليات البناء والتخطيط.(6) ، ثم جاء قانون أخر يتيح تقنين أوضاع جميع المباني المخالفة القائمة حتى تاريخ إصداره، ثم نص على تطبيق القانون على كل ما يتم بناؤه من بعد إصداره.

– القانون رقم 99 لسنة 1986: عمل على تقنين أوضاع جميع المباني المخالفة القائمة حتى تاريخ إصداره، ثم نص على تطبيق القانون على كل ما يتم بناؤه من بعد إصداره.

– سنة 1990: بدأ إصدار سلسلة من التشريعات اكتفت فقط بتوصيل الكهرباء إلى المباني المخالفة دون تقنين عملية البناء نفسها. كما كان قرار محافظ القاهرة رقم 75 لسنة 1990 أول تشريع يستخدم مصطلحًا أصبح هو الوصف الرسمي والدارج لمثل هذه المباني: "العشوائيات". تلا هذا القرار بثلاث سنوات المشروع القومي لتطوير العشوائيات، والذي رصد 1221 منطقة على مستوى الجمهورية لإدخال الكهرباء ومياه الشرب والصرف الصحي لها بالإضافة إلى عدد من الخدمات الاجتماعية كالمدارس والوحدات الصحية، وإزالة 20 منطقة من بينها، تقرر أنها غير صالحة للتطوير. (7)

– منتصف العقد الأول من الألفية الثانية : ظهر تعريفان رسميان للبناء غير الرسمي. الأول هو ما قامت الحكومة بتعريفه بالعشوائيات: أي المباني المُقامة على الأراضي الزراعية، والتي عادةً يقوم الأهالي ببنائها _ ولذا يسمونها بنُا الأهالي_ ولكنها ضمت أخيرًا مبانيَ شُيدت بغرض الاستثمار العقاري. والثاني ما أسمته الحكومة بالبناء المخالف: أي الأبراج السكنية بالمناطق الحضرية داخل المدن، والتي عادةً كانت تُبنَى على أراضٍ مقسمة رسميًّا ولكنها خالفت قيود الارتفاع والمساحة المسموح بالبناء عليها.(8) هذا استنتاج مبني على تفرقة الحكومة بينهما بقرار رئاسة الوزراء رقم 129 بتاريخ 26 أكتوبر 2005 الذي سمح للشركة القابضة لكهرباء مصر بتوصيل التيار الكهربائي بشكل رسمي إلى العشوائيات، بالإضافة إلى قرار مجلس المحافظين بتاريخ 1 نوفمبر 2005 بتوصيل الكهرباء إلى المباني المخالفة . (9)

– بعد ثورة يناير 2011: استخدمت وزارة الكهرباء طريقة جديدة لم تستخدم من قبل. فبدلًا من العدادات الرسمية التي يربطها تعاقد يحمل اسم صاحب العقار، قامت الوزارة بتوصيل عدادات أخرى سُميت بالـ"كودية" نظرًا إلى حَمِلها فقط رقمًا كوديًّا للعقار دون اسم المالك لعدم ربطه بحيازة العقار، وتُرك الباب مفتوحًا للإزالة إذا رغبت الجهات الإدارية في ذلك.(10) و (11)

دراسة تحليلية لقانون التصالح فى بعض مخالفات البناء

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الملخص:
عانت المدن والقرى المصرية من الضغوط البشرية على هياكلها العمرانية و هويتها عبر الزمان ، فقد تعرضت لعمليات واسعة من النمو والتوسع الحضرى بالإضافة الى التكثيف العمرانى الشديد في الكثير من أرجائها وهو ما أوجد تشوهات بصرية ووظيفية تشكيلات مختلفة من مخالفات البناء والتى ، وتنوعت ما بين مجرد عدة أمتار زائدة إلى ان وصلت أحياء وأشباه مدن كاملة و أصبحت كتل سكنية مكدسة خارج المنظومة التشريعية والقانونية للعمران - تعانى أغلبها من ارتفاع شديد في الكثافات السكانية والبنائية وقصور في كفاءة المرافق والطرق والخدمات- مما يجعل من الصعب التعامل معها بأى أشكال من الارتقاء أو إعادة التخطيط الحضرى – ولكنها في ذات الوقت وفرت الأف من الوحدات السكنية لبعض الفئات و أصبحت جزء من الرصيد السكنى يصعب إهماله - وهو ما دفع الحكومة المصرية لسن قانون استثنائي للتصالح في بعض مخالفات البناء رقم (17) لسنة 2019 كنوع من محاولات التكيف مع الأزمات الاقتصادية وتقنين الأوضاع المخالفة و استيعاب العمران القائم بما له وما عليه والذى يخل بأغلب قوانين البناء والتخطيط العمرانى .

ويتناول البحث الدراسة في ثلاث نقاط رئيسية كالتالي:

- الدراسة النظرية للخلفية التاريخية لقوانين التعامل مع مخالفات المبانى .
- الدراسة التحليلية لقانون لتصالح مع بعض مخالفات المبانى كقانون استثنائي والمشكلات التى تواجه تطبيقه بوجه عام.
- منهجية تحديد مقابل التصالح للمدن والقرى .

استبيان لاستطلاع أراء المتخصصين حول القانون واليه تطبيقه واستنتاج الخلاصة والتوصيات.

الكلمات المفتاحيه: قانون التصالح – مخالفات المبانى – مقابل التصالح– التقنين .

1. المقدمة

تعتبر التشريعات العمرانية من أهم آليات تنظيم وإدارة العمران، فهي مجموعة من الضوابط والمعايير التي تسبق كافة عمليات التنمية العمرانية وتستمر حتى اكتمال البناء والتشييد والإدارة ، ويتم من خلالها التواصل بين وضع السياسات والمخططات بمختلف أنواعها وتوجهاتها وبين عملية التطبيق والتنفيذ . وتستخدم التشريعات والقوانين لتحقيق أهداف وسياسات الدول في التعامل مع المنظومات المختلفة ، ويجب أن تترابط مع بعضها البعض لتوفر بيئة عمرانية سليمة ملائمة للمستخدم من ناحية ولها فاعلية من خلال سلطة قانونية تراقبها وتشرف على تنفيذها من ناحية أخرى ، حيث أن أهداف التشريع الأساسية هي : التنظيم وحفظ حقوق المستخدمين (1)

- التنظيم : عن طريق وضع تصور واضح للعلاقات بين المشاركين لتسهيل تعاملهم .
- حفظ حقوق المستخدمين : كل المشاركين لضمان عدم التعدي على حقوق و منافع الغير

والقاعدة القانونية لها خصائص العمومية والتجريد وأنها تنظم سلوك الدولة و الأفراد وأنها تحتوى على جزاء يجبر الأفراد على الالتزام بها. هذا وقد أجتهد الباحثون والمفكرون في وضع العديد من التعريفات لمصطلح القانون و منها :
(1) " مجموعة القواعد القانونية المادية في بلد معين في زمن معين وهو ما يسمى بالقانون الوضعي (2)

(2) " مجموعة القواعد الملزمة التي تنظم علاقات الأشخاص في المجتمع تنظيما عادلا يكفل حريات الأفراد ويحقق الخير العام " (3)

(3) "مجموعة القواعد الجبرية التي تصدر عن إرادة الدولة وتنظم سلوك الأشخاص الخاضعين لهذه الدولة أو الداخلين في تكوينها" (4)

و تهدف التشريعات المنظمة للتعمير والبناء إلى تنظم حركة وأليات تصرفات الدولة والجماعات والأفراد فى عمليات التنمية العمرانية و صممت لتحمى وترفع مستوى الصحة العامة والأمن والنواحى الجمالية والمعنوية ومستوى المعيشة .

وتشمل المجالات العريضة لمنظومة التشريعات المجالات الاتية : إدارة منظومة الأراضى . التخطيط العمرانى . الأبعاد الفنية للتشييد والبناء . الأبعاد العقارية .

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- أهمية ربط مخرجات التعلم للمقررات الدراسية بمخرجات التعلم للبرنامج الدراسي لتوضيح كيفية تكامل كل المقررات معاً فى عملية دعم وتحقيق وتقييم كل مخرج من مخرجات التعلم المستهدفة للبرنامج ككل، ووضع تفاصيل ذلك الارتباط على المستوى الفردى لكل مقرر لتوضيح أهمية المقرر الدراسى فى دعم وتحقيق وتقييم أحد أو بعض مخرجات التعلم المستهدفة من البرنامج.

توصل الباحث إلى وضع مقترح آلية لتأكيد وقياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى، ويحقق استخدام وتطبيق هذه الآلية بالجامعات المصرية ما يلى :

- دعم وتحقيق وتقييم كل مخرج من مخرجات التعلم المستهدفة للمقرر الدراسى.
- قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى، مع توضيح مدى ملائمة كل طريقة من طرق التقييم المختلفة لقياس درجة تحقق كل مخرج تعليمى مستهدف للمقرر.
- الكشف عن جوانب القوة ونقاط الضعف في تدريس المقرر حتى يتم وضع خطط التحسين اللازمة .
- تعتبر مؤشر قوى على تحقق أهداف البرنامج الأكاديمي وكفاءة أداء أعضاء هيئة التدريس والهيئة المعاونة في تدريس المقرر وإكساب الطلاب لمخرجات التعلم المستهدفة بالمقرر.

14- التوصيات

يوصى الباحث بضرورة وضع مقترح آلية أخرى تقوم بعملية التقويم الذاتى للبرنامج الأكاديمى وقياس مدى تحقق أهدافه، ويتم فيها استخدام النتائج الخاصة بالآلية المقترحة فى هذا البحث على مستوى المقرر الدراسى ومن ثم القيام بعمل تجميع للنتائج على مستوى كل المقررات داخل البرنامج الدراسى، ثم استخدام تلك النتائج فى قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة للبرنامج الدراسى، وقياس مدى اكتساب الطلاب لمخرجات التعلم المستهدفة من البرنامج، والذى يعد من أحد الأهداف الرئيسية للبرنامج الأكاديمى ويؤثر فى عملية التقويم الذاتى والتقويم والاعتماد الخارجى للبرنامج.

كما يتقدم الباحث بمجوعة من التوصيات إلى الهيئة القومية لضمان جودة التعليم والاعتماد كما يلى:

- أن تقوم الهيئة القومية لضمان جودة التعليم والاعتماد بدورها في اعتماد وتعميم تطبيق الآلية المقترحة لتأكيد وقياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى كآلية من آليات التقويم الذاتي.
- تنظيم دورات تدريبية تختص بتوضيح كيفية عمل تلك الآلية يحضرها ممثلين من الجامعات المصرية وتقوم بها الهيئة القومية لضمان جودة التعليم والاعتماد.
- تعيين مندوبين من الهيئة للإشراف المباشر على كل مؤسسة من مؤسسات التعليم العالى لضمان سير العملية التعليمية بالمؤسسة وفق آليات وضوابط جودة الأداء الإدارى والتعليمى حتى حصولها على اعتماد الجودة، وتمكينها من الإدارة الذاتية لعملية التقويم بعد توصلها لمفاتيح جودة الأداء إدارياً وتعليمياً.

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5-12 تحديد متوسط الدرجة الفعلية التى حصل عليها الطلاب لكل طريقة تقييم داخل الجدول

بعد الانتهاء من إعداد الجدول السابق شرحه فى ملف Excel - جدول رقم (4)- يتم تحديد متوسط الدرجة الفعلية التى حصل عليها الطلاب لكل طريقة تقييم داخل الجدول لقياس كل مخرج تعليمى مستهدف للمقرر ILO على المستوى الأفقى.
كمثال افتراضى:
إذا كان عدد الطلبة المسجلين فى مقرر GSE 465 هو 100 طالب
لقياس المخرج التعليمى المستهدف ILO رقم A1 - يتم فيما يلى توضيح كيفية عمل الحسابات على ال Exercise الرابع وهو جزء من طرق التقييم المختلفة التى يمكن بواسطة حساب درجة تحقق كل طريقة منها ثم التجميع الأفقى على جدول رقم (4) للتوصل إلى قياس النسبة المئوية لتحقق المخرج التعليمى المستهدف ILO رقم A1

يتم حساب عدد الطلبة الذين قاموا بتسليم ال Exercise الرابع – وليكن 82 طالب من أصل 100 طالب مسجلين بالمقرر مع إسقاط عدد 18 طالب الذين لم يسلموا ال Exercise الرابع من الحسابات – ملحوظة إجمالى درجة هذا ال Exercise الرابع لكل طالب هى 1,667 كما هو موضح بالجدول السابق.
يتم جمع الدرجات التى حصل عليها هؤلاء الطلاب ال82 – بما فيهم من سلمه وحصل على صفر - (وليكن مجموع الدرجات 117,752 فيتم قسمته على 82 لتحديد متوسط الدرجة الفعلية التى حصل عليها الطلاب الذين قاموا بالتسليم وهى 1,436من 1,667).
يتم تكرار نفس الطريقة لبقية طرق التقييم التى تقيس ILO رقم A1 مع مراعاة اختلاف عدد الطلاب فى كل طريقة وفقاً لعدد الطلاب الذى قام بالتسليم الفعلى – عند حساب متوسط الدرجة الفعلية التى حصل عليها الطلاب.

6-12 حساب النسبة المئوية لتحقق المخرج التعليمى المستهدف بالمقرر الدراسى

يتم التجميع الأفقى لمتوسطات الدرجات الفعلية لكل طرق التقييم التى تقيس ILO رقم A1 وهى

ال Exercise الرابع
+ ال Exercise الخامس
+ ال Exercise السادس مقسوم على 2 لأنه يقيس 2 ILO's وهما A1 & C2 فيتم تقسيم درجته عليهما
+ Midterm Exam question 2-a (2 marks), question 3-a (1 mark)
+ Final Exam question 3-a (2 marks)

يكون المجموع الكلى لقياس تحقق المخرج التعليمى المستهدف ILO رقم A1 درجة من 9,1675 كما هو موضح فى خانات العمود الأخير على يسار الجدول كما هو موضح بجدول رقم (4)، وليكن المجموع = 7,834
يتم قسمة المجموع على الدرجة الإجمالية لحساب النسبة المئوية لتحقق المخرج التعليمى المستهدف ILO رقم A1
= (9,1675\7,834) x 100 = 0,8545 x 100 = % 85,45

يتم كتابة تقرير حول نتائج عملية تقويم المخرجات التعليمية المستهدفة ونسب تحققها بالمقرر الدراسى والتى تعبر عن مدى استيعاب وفهم الطلاب واكتسابهم للمخرج التعليمى المستهدف تحقيقه.

ملحوظة هامة : فى حالة تحقق أى مخرج تعليمى مستهدف ILO بنسبة أقل من 70 % يقوم أستاذ المقرر بعمل تغذية راجعة Feed back لنفسه ولباقى أعضاء هيئة المشاركين فى تدريس المقرر (فى حالة مشاركة أكثر من عضو هيئة تدريس فى تدريس أحد المقررات) لكي يتم مراعاة كيفية شرح المحتوى التعليمى المتعلق بالمخرج التعليمى المستهدف للمقرر ILO أو طريقة وضع الأسئلة عليه لضمان تحقيق استيعاب أكبر من 70 % للمخرج التعليمى المستهدف عند تدريس المقرر فى الفصل الدراسى التالى.

13- النتائج

توصلت الدراسة إلى مجموعة من النتائج المتعلقة بالتقويم الذاتى للبرامج والمقررات التعليمية كما يلى:

- أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى التقويم الذاتى للبرنامج الأكاديمى وتأثيرها المباشر على تحقيق أهداف البرنامج الأكاديمى.

2-12 التقسيم والتوزيع الإجمالى والتفصيلى للدرجة المخصصة لكل نوع من أنواع التقييم

لبدء عملية قياس ILO's مخرجات التعلم المستهدفة للمقرر يتم إعداد ملف Excel مأخوذ من خريطة ال Blue print للمقرر موضح به كيفية التقسيم والتوزيع الإجمالى والتفصيلى للدرجة المخصصة لكل نوع من أنواع التقييم - كما هو موضح بجدول رقم (4)- كمثال توضيحى يوجد عدد 6 Exercises بإجمالى 10 درجات مخصصة لهم فيكون نصيب كل واحد منهم = 10\6 =1,667 ، كما يلاحظ أن ال Exercise السادس يقيس 2 ILO's وهما A1 & C2 فيتم تقسيم درجته عليهما = 2\1,667 = 0,8335 كما هو موضح بجدول رقم (4).

جدول رقم (4) يوضح كيفية التقسيم والتوزيع الإجمالى والتفصيلى للدرجة المخصصة لكل نوع من أنواع التقييم .(عن الباحث)

TOTAL	Final Exam	Mid-Term Exam	Project	research	Exercises						Assignments		Quizzes		Assessment	
100	40	20	10	5	10						5		10		Weight (%)	
	Unseen Written Final Exam	Unseen Written Mid-Term	Term Project	Group Reports	Exercise 6	Exercise 5	Exercise 4	Exercise 3	Exercise 2	Exercise 1	Assignment 2	Assignment 1	Quiz 2	Quiz 1	Course Intended Learning Outcomes	
	Summative Assessment		Summative Assessment with Feedback												Technical Service Systems II	GSE465
9.1675	question 3-a (2 marks)	question 2-a (2 marks), question 3-a (1 mark)			1.667/2=0.8335	1.667	1.667								A1	A-Knowledge& Understanding
3.333			10/3=3.333												A2	
14.667	question 2-a (2 marks), question 3-b (4 marks)	question 1-b (3 marks), question 2-b (4 marks)						1.667							A3	
1	question 2-b (2 marks) (2/2=1 mark)														A4	
18	question 1-b (13 marks)												5		B1	B-Intellectual (Cognitive) Skills
2.5				5/2=2.5											B2	
2.5											2.5				B3	
16.833	question 1-a (3 marks)	question 1-a (3 marks)							1.667	1.667		2.5		5	B4	
16.333	question 3-c (6 marks)	question 3-b (7 marks)	10/3=3.333												C1	C-Practical/ Professional Skills
8.8335	question 2-c (8 marks)				1.667/2=0.8335										C2	
1	question 2-b (2 marks) (2/2=1 mark)														C3	
5.833			10/3=3.333	5/2=2.5											D1	D-General/ Transferable Skills
100	Total marks =40	Total marks = 20	10	5	1.667	1.667	1.667	1.667	1.667	1.667	2.5	2.5	5	5		

3-12 تحديد الأسئلة التى تقيس كل مخرج تعليمى مستهدف للمقرر فى الامتحانات

يتم تحديد الأسئلة التى تقيس كل مخرج تعليمى مستهدف للمقرر ILO فى امتحانى Midterm & Final ودرجة كل سؤال - كمثال المخرج التعليمى المستهدف للمقرر ILO رقم A1 يقاس فى Midterm Exam بالأسئلة التالية:

Question 2-a (2 marks), question 3-a (1 mark)

كما يقاس أيضاً فى Final Exam بالسؤال التالي:

Question 3-a (2 marks)

ملحوظة : فى حالة وجود سؤال يقيس أكثر من مخرج تعليمى مستهدف للمقرر ILO يتم تقسيم درجته على عدد ILO's المقاسة كما هو الحال فى Question 2-b (2 marks) –final exam الذى يقيس 2 ILO's وهما A4 & C3 فيتم تقسيم درجته عليهما = 2\2 = 1 كما هو موضح بجدول رقم (4).

4-12 تجميع الدرجات التى تقيس كل مخرج تعليمى مستهدف للمقرر أفقياً

يتم تجميع الدرجات التى تقيس كل مخرج تعليمى مستهدف للمقرر ILO أفقياً وتحديدها فى خانات العمود الأخير على يسار الجدول كما هو موضح بجدول رقم (4).

وللتأكد من صحة الأرقام والجمع يجب مراجعة التالى، كما هو موضح بجدول رقم (4).

يجب أن يكون المجموع الرأسى لكل خانات العمود الأخير مساوياً لمائة درجة

يجب أن يكون المجموع الرأسى لكل الخانات الخاصة ب Midterm Exam مساوياً عشرين درجة

يجب أن يكون المجموع الرأسى لكل الخانات الخاصة ب Final Exam مساوياً أربعين درجة

12- الآلية المقترحة لتأكيد وقياس نسبة تحقق مخرجات التعلم المستهدفة Intended Learning ILO's) Outcomes) بالمقرر الدراسى

12-1 إعداد خريطة توافق طرق التقييم المستخدمة بالمقرر مع مخرجات التعلم المستهدفة للمقررBlue print

يتم البدء فى الآلية المقترحة بإعداد خريطة Blue print للمقرر الخاصة بتوافق طرق التقييم المستخدمة بالمقرر مع مخرجات التعلم المستهدفة للمقرر والتى يتم فيها تحديد طرق التقييم المختلفة التى يمكن بواسطتها قياس كل مخرج تعليمى مستهدف للمقرر – مع مراعاة أن كل مخرج تعليمى مستهدف للمقرر يقاس على الأقل مرة واحدة بطريقة واحدة من طرق التقييم – كما يحدد فيها أيضاً إجمالى الدرجة المخصصة لكل نوع من أنواع التقييم. جدول رقم (3)

جدول رقم (3)خريطة Blue print لأحد المقررات الدراسية وتوضح توافق طرق التقييم مع مخرجات التعلم المستهدفة للمقرر.(عن الباحث)

Mapping of Course Intended Learning Outcomes with Teaching Assessment Methods (Blue print)

Course Title: Technical Service Systems II Course Code: GSE 465

Assessment	Quizzes (2)	Assign ments (2)	Exercises (6)	Group research	Term Project	Mid-Term Exam	Final Exam
Weight (%)	10	5	10	5	10	20	40
Time	Throughout Semester			After 5 weeks	After Mid-Term	After 6 weeks	Before Mid-Term

Assessment Methods																														
			Quizzes		Assignments		Exercises						Reports					Design			Examination					Project		
Course Intended Learning Outcomes			Desk-Crit	Review Pin-up	Quiz 1	Quiz 2	Assignment 1	Assignment 2	Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5	Exercise 6	Individual Term Paper	Group Reports	PowerPoint Presentations	Term Project	Computer-based Exercises	Architecture Design Project	Esquisse	Design Jury Oral Exam	Unseen Written Mid-Term	Unseen Written Final Exam	Design / Drawing Exams	Practical / Lab Exams	Computer Software Exams	Final Year Thesis Report	Final Year Design Project	Project Discussion (Jury)
GSE 465	Technical Service Systems II		Formative		Summative Assessment with Feedback																		Summative Assessment							
A- Knowledge & Understanding	A1											x	x	x									x	x						
	A2																	x												
	A3										x												x	x						
	A4																							x						
B- Intellectual (Cognitive) Skills	B1				x																			x						
	B2															x														
	B3						x																							
	B4			x		x		x	x														x	x						
C-Practical/ Professional Skills	C1																	x					x	x						
	C2													x										x						
	C3																							x						
D-General/ Transferable Skills	D1															x		x												

بعد أن أوضحت المصفوفة السابقة بجدول رقم (1) كيفية ارتباط المقررات الدراسية بالسنة الرابعة بقسم الهندسة المعمارية بمخرجات التعلم المستهدفة للبرنامج الدراسي، يتم عمل مصفوفة أكثر تفصيلاً لكل مقرر وتربط ما بين مخرجات التعلم المستهدفة لكل مقرر دراسى - الموجودة بتوصيف المقرر ضمن لائحة البرنامج الدراسى - ومخرجات التعلم المستهدفة للبرنامج الدراسي لتوضيح أهمية المقرر الدراسى فى دعم وتحقيق وتقييم أحد أو بعض مخرجات التعلم المستهدفة من البرنامج. كما يوضح جدول رقم (2) أهمية مخرجات التعلم المستهدفة من المقرر GSE465- Technical Service Systems II فى تحقيق بعض مخرجات التعلم المستهدفة من برنامج الهندسة المعمارية

جدول رقم (2) مصفوفة توضح ارتباط مخرجات التعلم لأحد المقررات الدراسية بالسنة الرابعة بقسم الهندسة المعمارية بمخرجات التعلم المستهدفة للبرنامج الدراسي بجامعة أكتوبر للعلوم الحديثة والآداب – MSA، (2019)،(وحدة الجودة بكلية الهندسة، جامعة MSA)

Course ILO's	**Program ILO's (Intended Learning Outcomes)**																										
GSE465- Technical Service Systems II	Knowledge and Understanding								Intellectual Skills					Practical Skills						Transferable Skills							
	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6	D7	D8	D9
A- Knowledge and Understanding																												
A1							x																					
A2	x																											
A3		x																										
A4							x																					
B- Intellectual Skills																												
B1									x																			
B2												x																
B3										x																		
B4									x																			
C- Practical Skills																												
C1														x														
C2														x														
C3															x													
D- Transferable Skills																												
D1																					x							

11- أهمية ربط مخرجات التعلم للمقررات الدراسية بمخرجات التعلم للبرنامج الدراسي

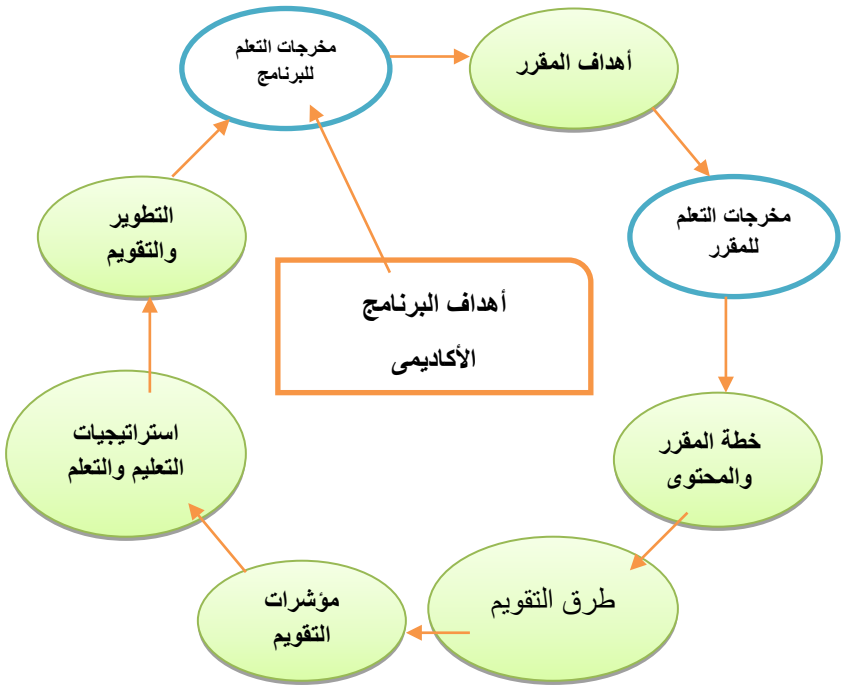
للتأكيد على التوافق ما بين مخرجات التعلم المستهدفة لكل مقرر دراسى مع مخرجات التعلم المستهدفة للبرنامج التعليمى يتم عمل مصفوفة لربط المقررات الدراسية بمخرجات التعلم للبرنامج الدراسي، حيث تعد هذه المصفوفة هى الوسيلة المناسبة لتوضيح أهمية كل مقرر فى دعم وتحقيق وتقييم أحد أو بعض مخرجات التعلم المستهدفة من البرنامج، وكيفية تكامل كل المقررات معاً فى عملية دعم وتحقيق وتقييم كل مخرج من مخرجات التعلم المستهدفة للبرنامج ككل، أي أن هذه المصفوفة توفر استراتيجية فعالة للتوضيح والموائمة وربط مخرجات التعلم للبرنامج بعدد متتابع من المقررات الدراسية. كما يوضح جدول رقم (1) مصفوفة لربط المقررات الدراسية بالسنة الرابعة بقسم الهندسة المعمارية بمخرجات التعلم المستهدفة للبرنامج الدراسي بجامعة أكتوبر للعلوم الحديثة والآداب – MSA (ماعدا المقررات الاختيارية لكونها فى جدول آخرمنفصل)، ويوضح ذلك الجدول تحقق معظم مخرجات التعلم المستهدفة للبرنامج الدراسي فى مقررات السنة الرابعة، بينما يتبقى بعض المخرجات والتى يتم تحقيقها فى بقية سنوات الدراسة.

جدول رقم (1) مصفوفة لربط المقررات الدراسية بالسنة الرابعة بقسم الهندسة المعمارية بمخرجات التعلم المستهدفة للبرنامج الدراسي بجامعة أكتوبر للعلوم الحديثة والآداب – MSA (ماعدا المقررات الاختيارية) ، (2019)،(وحدة الجودة بكلية الهندسة، جامعة MSA)

Program Learning outcomes		Knowledge and Understanding								Intellectual Skills					Practical Skills						Transferable Skills								
		A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6	D7	D8	D9
Course code	Course title																												
ASE451	Architectural Design V	x						x		x	x		x	x	x	x				x									
ASE452	Landscape Design	x						x		x					x														
ASE454	Working Drawing II		x										x				x								x	x			
CVL455	Steel Structures		x								x		x					x				x							
ASE461	Architectural Design VI	x						x		x			x	x	x	x				x									
ASE462	Housing Planning and Design	x					x			x				x	x														
ASE464	Working Drawing III		x														x								x	x			
GSE465	Technical Service Systems II	x	x					x		x	x		x		x	x						x							

9- أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى التقويم الذاتى للبرنامج الأكاديمى

عند إعداد اللوائح الخاصة بالبرامج الأكاديمية ومشتملاتها ومنها توصيف المقررات الدراسية يتم تحديد مخرجات التعلم المستهدفة لكل مقرر دراسى بالبرنامج التعليمى وكذلك مخرجات التعلم المستهدفة للبرنامج الدراسى، ولكن تحديدها فقط لا يكفي لضمان تحقيقها، حيث أنه يراعى فى تصميم البرامج التعليمية التخطيط لكيفية الانتقال بمخرجات التعلم المستهدفة من مستوى الاستهداف والتوقع " مخرجات التعلم المتوقعة " إلى مستوى التحقق الفعلي " مخرجات التعلم المحققة " ، ويتم الوصول إلى ذلك عن طريق البدء باختيار استراتيجيات التعليم والتعلم المناسبة والملائمة لتحقيق ما تم تحديده من مخرجات تعلم لكل مقرر دراسى بالبرنامج التعليمى، مع تحديد طرق التقويم والمؤشرات المستخدمة للتأكد من تحققها الفعلي، ثم دراسة التوافق ما بين مخرجات التعلم المستهدفة لكل مقرر دراسى مع مخرجات التعلم المستهدفة للبرنامج التعليمى للتأكد من ارتباط مخرجات التعلم المستهدفة لكل مقرر بأهداف البرنامج التعليمى والمتمثلة فى مخرجات التعلم المستهدفة للبرنامج الدراسى التى يكتسبها الطالب طوال سنوات الدراسة وحتى تخرجه من البرنامج التعليمى، ومن ثم تكمن أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى التقويم الذاتى للبرنامج الأكاديمى فى تأثيرها المباشر على تحقيق أهداف البرنامج الأكاديمى وضمان نجاح بقية العناصر المرتبطة به.كما يوضح شكل (1) الارتباط ما بين كل من مخرجات التعلم للبرنامج ومخرجات التعلم للمقرر ضمن عناصر تحقيق أهداف البرنامج الأكاديمى.



شكل (1) الارتباط ما بين كل من مخرجات التعلم للبرنامج ومخرجات التعلم للمقرر ضمن عناصر تحقيق أهداف البرنامج الأكاديمى (دليل قياس المخرجات التعليمية في الكلية الجامعية للأم والعلوم الأسرية،2018)

10- أهمية قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى

- توفير معلومات دقيقة ودورية عن اكتساب الطلاب لمخرجات التعلم المستهدفة بالمقرر الدراسى كمؤشر واضح على الشرح الوافى بشكل متكامل لمحتوى المقرر وملائمة أساليب التدريس المطبقة
- توضيح مدى ملائمة كل طريقة من طرق التقييم المختلفة لقياس درجة تحقق كل مخرج تعليمى مستهدف للمقرر.
- المساعدة فى عملية تقويم المقررات من حيث توضيح نقاط القوة والضعف فى تحقيق المخرجات المستهدفة بها ومن ثم إعداد خطط التطوير والتحسين والتعزيز للمقرر بناءاً على التغذية الراجعة لأستاذ كل مقرر.
- تعتبر مؤشر قوى على تحقق أهداف البرنامج الأكاديمي وكفاءة أداء أعضاء هيئة التدريس والهيئة المعاونة في تدريس المقرر وإكساب الطلاب لمخرجات التعلم المستهدفة بالمقرر.
- إن قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى من المتطلبات الأساسية في عملية مراجعة البرامج الدراسية للإعتماد الأكاديمي.

2-7 تحليل لجوانب الضعف في عملية إدارة التقويم الذاتي في الجامعات المصرية

يتم فيما يلى عرض للنقاط التى تحتاج إلى تحسين في أداء بعض مؤسسات التعليم الجامعي والتى تتعلق بشكل مباشر أو غير مباشر بعملية إدارة التقويم الذاتي في الكليات والجامعات المصرية والتى تم استخلاصها من تقارير الهيئة القومية لضمان جودة التعليم والاعتماد فى ضوء تقييم نتائج مؤسسات التعليم الجامعى التى تقدمت إلى الهيئة للحصول على الاعتماد (الكتاب السنوى 2016/2015 ، الهيئة القومية لضمان جودة التعليم والاعتماد) ويمكن إيجازها كما يلى:

- عدم قيام بعض المؤسسات بالمراجعة الدقيقة للوائح مراحل البكالوريوس والدراسات العليا لتحديد حجم الفجوة بين الوضع الحالى والوضع المطلوب في ضوء المعاييرالأكاديمية القومية وإجراء التعديلات المطلوبة.
- عدم الاهتمام بمجال تنمية البرامج التعليمية لمهارات ريادة الأعمال ونواتج التعلم المستهدف تحقيقها من إدراج ذلك المجال بالبرامج التعليمية.
- عدم اتخاذ إجراءات تصحيحية في بعض الجامعات بعد تحليل نتائج استطلاع الرأى عند قياس مستوي رضا (أعضاء هيئة التدريس/أعضاء الهيئة المعاونة / الطلاب/ الإداريون / العاملون).
- ضعف الدور الذى تقوم به وحدة ضمان الجودة في تطوير ومتابعة تنفيذ الخطط.
- عدم وضوح العلاقة ما بين إستراتيجية التعليم وبين ما يتم تطبيقه من أساليب للتعليم والتعلم علي مستوي المقررات الدراسية، إلي جانب وجود قصور نسبي في تنمية مفاهيم وأساليب التعلم الذاتي.
- قصور في إكساب الطلاب المهارات المهنية المستهدفة من خلال المقررات الدراسية.
- عدم وضوح الآليات التى تطبقها الكلية للتأكد من تحقق مخرجات التعلم المستهدفة بكل مقرر دراسى وقياس النسبة المئوية لدرجة تحقق هذه المخرجات باستخدام نظم التقويم لكل مقرر.
- عدم وضوح الآليات التي تطبقهاالكلية للتأكد من استيفاء الخريجين لمواصفات الخريج المستهدفة.
- عدم الاستفادة من نتائج البحث العلمى فى تطوير المقررات الدراسية.

8- التوصيات الخاصة بجودة إدارة التقويم الذاتي في الجامعات المصرية.

يتم فيما يلى عرض للتوصيات المطروحة من قبل الهيئة القومية لضمان جودة التعليم والاعتماد والتى تؤدى إلى التحسين في أداء مؤسسات التعليم الجامعي والتى تتعلق بشكل مباشر أو غير مباشر بعملية تحسين إدارة التقويم الذاتي في الكليات والجامعات المصرية والتى تم استخلاصها من تقارير الهيئة القومية لضمان جودة التعليم والاعتماد فى ضوء تقييم نتائج مؤسسات التعليم الجامعى التى تقدمت إلى الهيئة للحصول على الاعتماد (الكتاب السنوى 2016/2015 ، الهيئة القومية لضمان جودة التعليم والاعتماد) ويمكن إيجازها كما يلى:

- تطوير نظم وآليات عملية التعليم والتعلم في مؤسسات التعليم الجامعي (حكومي / خاص) وذلك بالتوجه نحو التعليم المبني علي إنتاج المعرفة ثم نشرها وتحويلها إلى مخرجات مستهدفة.
- الاهتمام بعملية التدريب لكل من(القيادات الجامعية / أعضاء هيئة التدريس/الإداريين /الفنيين)../، مع إيجاد آلية قياس حقيقي للاحتياجات التدريبية ونظم تقييم البرامج المنفذة.
- العمل علي إنشاء/استكمال المواقع الإلكترونية للكليات والجامعات، ومن ثم العمل علي تحديثها.
- الاهتمام بالتوزيع العادل للموارد (المادية /البشرية /الأكاديمية)علي مستوي(الجامعة /الكلية) والعمل علي الارتقاء بكفاءة استخدامها.
- الاهتمام بوجود إدارات أو وحدات متخصصة في أعمال الصيانة علي مستوي (الكلية / الجامعة) وكذا تفعيل خطط للصيانة الدورية سواء للأجهزة أو للمرافق والبنية الأساسية.
- إيجاد آلية لقياس مردود أنشطة مؤسسات التعليم العالي والجامعي (حكومي / خاص)على المجتمع، وكذا آلية قياس رضاء الأطراف المستفيدة من الخدمات التي تقدمها هذه المؤسسات، مع ضمان العمل على أن يكتسب خريجى الكلية المهارات اللازمة للوفاء بتلك الاحتياجات المجتمعية.
- القيام بعملية التطوير المستمر لكافة البرامج التعليمية، مع تضمينها إكساب الطلاب مهارات التوظف والتوجه نحوريادة الأعمال، مع وجود آلية التأكد من تقييم المخرجات التعليمية المستهدفة على مستوي البرامج والمقررات

6- خلاصة بعض الدراسات السابقة فى مجال الجودة الشاملة وتطوير الأداء الأكاديمى وتلبية احتياجات سوق العمل

لقد أشارت بعض الدراسات السابقة (العلوى ، 1998) إلى أسباب تعثر برنامج الجودة الشاملة فى مؤسسات التعليم العالى ، ومن أهمها مايلى:

- تأثير وسيطرة القطاع الإدارى من حيث الروتين والبطء فى دعم تنفيذ القرارات التى يتخذها القطاع الأكاديمي.
- الاعتماد على المركزية وإضعاف دور المجالس واللجان العلمية المتخصصة.
- ضعف كفاءة الجهاز الإدارى .
- اعتماد التعليم على التلقين والحفظ ، وعدم التركيز على المهارات المستهدف إكسابها للطلاب.
- عدم الاهتمام بالبحث العلمى لغرض تطوير المناهج التى يتم تدريسها للطلاب.

كما أشارت دراسة (آل زاهر، 2005) إلى أهمية تطوير الأداء الأكاديمى لأعضاء هيئة التدريس بمؤسسات التعليم العالى، حيث أن عضو هيئة التدريس يقوم بالعديد من المهام التى تتنوع وتتغير من مهام تدريسية وبحثية وإدارية بالإضافة إلى تغير احتياجات المستفيدين ومتطلبات العملية التعليمية ، ومجاراة ما يحدث من تطورات فى البيئة المحيطة داخلياً وخارجياً، لذا يجب على مؤسسات التعليم العالى الاعتناء بعضو هيئة التدريس والاهتمام بتمكينه من تطوير قدراته ومهاراته العلمية والمهنية.

بينما قام (التركستانى، 2005) بعمل تقييم لدور الجامعات فى تحقيق الأهداف الاستراتيجية للتعليم من خلال دراسة مدخلات التعليم ومخرجاته لتلبية احتياجات سوق العمل، وأظهرت نتائج الدراسة أهمية تعديل المناهج بما يتلائم مع متطلبات وطبيعة سوق العمل الذى بدأ يضع شروطاً معينة لتعيين الخريجين قد لا تتفق مع ما اكتسبه خريجى الجامعات من المناهج التعليمية الغير مواكبة لاحتياجات سوق العمل.

ويتضح من هذه الدراسات أهمية الدور الواجب على الجهاز الإدارى القيام به فى دعم تنفيذ قرارات القطاع الأكاديمي وقررات المجالس واللجان العلمية المتخصصة، لتحسين جودة إدارة عملية التقويم الذاتى لمؤسسات التعليم العالى، وكذلك أهمية الاعتناء بعضو هيئة التدريس والعمل على تمكينه من تطوير قدراته ومهاراته العلمية والمهنية ومواكبته للمتغيرات المحيطة واحتياجات سوق العمل فى الخريجين لكى يقوم بدوره فى تطوير المناهج وإكساب الطلاب المهارات المستهدفة من المناهج المطورة لكى يتسلح الطالب بالمهارت اللازمة التى ترفع من قدراته التنافسية فى سوق العمل.

7- تحليل لجوانب القوة ونقاط الضعف في إدارة التقويم الذاتي في الجامعات المصرية.

7-1 تحليل لجوانب القوة في إدارة التقويم الذاتي في الجامعات المصرية

يتم فيما يلى عرض للنقاط الإيجابية في أداء معظم مؤسسات التعليم الجامعي والتى تتعلق بشكل مباشر أو غير مباشر بعملية إدارة التقويم الذاتي في الكليات والجامعات المصرية والتى تم استخلاصها من تقارير الهيئة القومية لضمان جودة التعليم والاعتماد فى ضوء تقييم نتائج مؤسسات التعليم الجامعى التى تقدمت إلى الهيئة للحصول على الاعتماد (الكتاب السنوى 2016/2015 ، الهيئة القومية لضمان جودة التعليم والاعتماد) ويمكن إيجازها كما يلى:

- قيام الكليات بإعداد خطط إستراتيجية.
- إنشاء وحدة لضمان الجودة بكل كلية.
- وجود تجارب سابقة لمعظم الكليات في مجال الجودة، وإعداد دراسات ذاتية سابقة.
- وجود تعاون مشترك مع المجتمع المحيط لمعرفة احتياجاته والعمل على أن يكتسب خريجى الكلية المهارات اللازمة للوفاء بتلك الاحتياجات المجتمعية.
- وجود أنظمة لدعم الطالب مالياً واجتماعياً ببعض الجامعات، وتشجيع الطالب علي ممارسة الأنشطة الطلابية، ووضع سياسات تحفيزية للطلاب للمشاركة وآليات للتشجيع والتحفيز.
- الاهتمام بنظم الجودة في مجال الفاعلية التعليمية.
- قيام بعض الكليات بوضع المقررات فى صورة إلكترونية علي الموقع الإلكتروني الخاص بالكلية لمساعدة الطالب في الرجوع إليها عند الحاجة، كوسيلة مساعدة جنباً إلى جنب مع الأسلوب التقليدى فى التدريس والشرح.
- استيفاء معظم الكليات للنسب المرجعية بين أعضاء هيئة التدريس والطلاب.
- وجود نظم مطبقة لمتابعة الأداء الدراسى لطلاب الدراسات العليا.
- تفعيل نظام الجودة الداخلي بالكليات والذى يشمل ما يلى: (إعداد تقارير برامج ومقررات / عمل تقييم للمقررات ولأداء أعضاء هيئة التدريس وبعض القيادات)

4-3 أسلوب تقويم الأقارن

والمقصود به المشاركة والمساهمة من قبل أعضاء هيئة التدريس والباحثين في إصدار القرارات بشأن اقتراح برامج أكاديمية جديدة، أو الاستمرار فى القائم منها أو تعديلها، وهو يعد أحد أشكال التقويم الداخلى.

5-3 أسلوب الجودة الشاملة

ويقصد بها تقويم جودة المؤسسة كمنظومة متكاملة شاملة لكل المكونات والأبعاد والمجالات المرتبطة بالمؤسسة التعليمية، وهي عملية مراقبة مستمرة للمدخلات والعمليات والمخرجات التابعة للمؤسسة ومستوى الجودة الذى حققته أو تعمل على تحقيقه مقارنة بالمستويات الوطنية أو العربية أو الدولية، (مجلس ضمان الجودة والاعتماد للجامعات العربية، 2008).

4- أسس عملية تطبيق جودة إدارة التقويم الذاتى للجامعات المصرية

ترتكز عملية تطبيق جودة إدارة التقويم الذاتى للجامعات المصرية على مجموعة من المبادئ موضحة كالتالى (الحاج، 2009):

- التركيز على الاحتياجات الأساسية للأطراف ذات الصلة وجهات الاستفادة عند استطلاع رأى كل من الطالب، المجتمع، سوق العمل.
- العمل على توحيد الرؤى والأهداف والاستراتيجيات فى المجتمع التعليمي.
- تعزيز فرصة المشاركة الفعالة لجميع المرتبطين بالعملية التعليمية مع عدم التفرقة والمساواة فيما بينهم لتحقيق الموائمة بين أهداف البرامج التعليمية وبين احتياجات الطلاب والمجتمع وسوق العمل.
- الاهتمام بالأساليب المطبقة فى العملية التعليمية إلى جانب المنتج أو المخرجات المستهدفة منها.
- القيام بالتطوير والتحسين المستمر وفقاً لما توضحه خطط التحسين التى تعد بشكل دورى.
- الاستقلالية والبعد عن هيمنة الجهاز الإدارى.
- تحقيق المنافع المتبادلة ورضا المستفيد (اتباع مدخل لمختلف المشاركين من مراجعين وطلاب والمجتمع يكون الهدف منه هو تعميم الفائدة من تطوير ونقل المعرفة والمهارات).

5- الأساليب المستخدمة في عملية التقويم الذاتي في الجامعات المصرية

تتطلب عملية التقويم الذاتي في الجامعات المصرية استخدام أسلوبين من أساليب التقويم، الأسلوب الأول هو التقويم النوعي والثانى هوالتقويم الكمي.(مجلس ضمان الجودة والاعتماد للجامعات العربية، 2008):

1-5 أسلوب التقويم النوعى

وتستخدم فيه أدوات وأساليب عديدة منها المناقشات والمقابلات والملاحظات وفحص السجلات ودارسة الحالات والمقاييس والاستبيانات وغيرها، وعلى ضوء المعلومات والبيانات والأدلة التي تتجمع لدى أعضاء الفريق يقوم الفريق بتلخيص النتائج والأحكام التي توصل اليها بالإجابة على فقرات وعبارات المقاييس المكتوبة والتي تبين جودة أداء المؤسسة. وينصب التركيز هنا على جودة المدخلات والعمليات والمخرجات . ومعنى ذلك أنه لابد للمقوم عند إصدار الأحكام ، أن يستخدم خبرته وأن يستعين بالمعايير والأدوات المختلفة، وكيفية تأثير كل العوامل المختلفة في المؤسسة على مستوى الأداء العام للمؤسسة وعلى مستوى تحصيل الطلبة وجودة التعلم والتدريس وسلوك الطلبة واتجاهاتهم ونموهم الكلي،إذ تميل الأحكام هنا إلى الشمولية والتكامل.

2-5 أسلوب التقويم الكمى

يتم التركيز فى هذا الأسلوب على وضع الأحكام في صور رقمية، حيث يتيح التقويم الكمي النظر بدقة إلى كل عنصر من عناصر أداء المؤسسة من ناحية كمية على حدة وبالتالي التركيز على جودة المدخلات والعمليات والمخرجات من الناحية الكمية.

إن التكامل بين استخدام الاسلوبين النوعى والكمى واتباع المعايير الموضوعة واستخدام الأدلة والأدوات والمناقشات الجماعية يعطى صورة واضحة لشكل الأحكام النهائية عن المؤسسة من حيث جودة أدائها أوإمكانية حصولها على شهادة ضمان الجودة والاعتماد.

1- مقدمة

يعتبر تطبيق نظام إدارة الجودة الشاملة بأى مؤسسة من أهم المؤشرات الدالة على حرص تلك المؤسسة على أداء العمل بداخلها بإتقان ودقة، خاصة لتلك العاملة في مجال التعليم الجامعى وتهدف إلى تخريج أجيال جديدة لسوق العمل تتمتع بكافة المقومات اللازمة للمنافسة فى سوق العمل محلياً ودولياً، ولا شك أن من أهم الفروق بين مؤسسة تعليمية ناجحة وأخرى غير ناجحة هو طريقة إدارة تلك المؤسسة، ومدى اهتمامها بتحقق أهداف البرامج التعليمية التى يتم تدريسها مع اكتساب الطلاب بها لمهارات التعلم المستهدفة من كل من البرامج التعليمية والمقررات المدروسة بها، وتعتبر عملية التقويم الذاتى للجامعات من أهم العوامل المساعدة فى قياس مدى تحقق أهداف البرامج التعليمية والمقررات الدراسية.

2- أهداف إدارة الجودة الشاملة في التعليم الجامعي

إن اهتمام مؤسسات وجامعات التعليم العالى بتطبيق نظام الإدارة بالجودة الشاملة، لضمان وتحقيق خدمة تعليمية ناجحة ومتميزة، وانضباطا إدارياً يضمن خلق مناخ ملائم يساعد على التقدم والتميز في الوقت نفسه، ويمكن تلخيص فوائد تطبيق الجودة الشاملة وأهدافها في التعليم الجامعي على النحو التالي (حسين ، 2005):

- تحقيق أهداف البرامج التعليمية والموائمة بينها وبين احتياجات الطلاب وأولياء الأمور والمجتمع بناءاً على خطط التحسين الدورية للبرامج التعليمية.
- تنمية الوعي لدى الطلاب بأهمية عملية التعلم وأهدافها وتشجيع الطلاب على القيام بالتعلم الذاتي مع توفير السبل المطلوبة لتحقيق عملية التعلم الذاتى.
- مشاركة جميع العاملين في إدارة الجامعة فى عملية التقويم الذاتى ليكون كل فرد على علم ودراية واضحة بدوره ومسئولياته ومستوى مشاركته في التحسين والتطوير.
- تطبيق نظام إدارى موحد يقوم العمل بناءاً عليه فى كل أقسام المؤسسة الجامعية ، بدلاً من وجود نظام إداري منفرد لكل قسم أو إدارة، مما يحقق المزيد من الانضباط الإدارى.
- ضمان جودة الخدمات التعليمية المقدمة وتميزها.
- وجود نظام موثق لضمان الأداء لا يعتمد على الإدارة بنظام الفرد الواحد ولا يحدث به خلل في حالة تغيب أحد الأفراد أو تركه للخدمة.
- المعايشة اليومية لنظام الجودة الشاملة تعمل على رفع مستوى الوعي بجودة العمل و النظام لدى العاملين.
- خفض الهالك في إمكانات المؤسسة الجامعية من حيث الموارد والوقت وغيرها.
- تحسين كفاءة الإداريين والعاملين وأعضاء هيئة التدريس ورفع مستوى أدائهم، من خلال التدريب المستمر.
- زيادة الاحترام والتقدير المحلي، والاعتراف العلمي بالمؤسسة الجامعية، وحصولها على الاعتماد الأكاديمي محلياً ودولياً لما تقدمه من خدمات للطلاب وللمجتمع من خلال المساهمة في تنمية المجتمع المحلي.

3- الاساليب المتبعة في تطبيق جودة الأداء في مؤسسات التعليم العالي:

تتنوع الأساليب المتبعة فى تطبيق جودة الأداء بمؤسسات التعليم العالي كما يلى، (فاطمة ، 2013):

3-1 أسلوب التقويم الذاتي

وتقوم به وحدة ضمان الجودة والاعتماد التابعة للمؤسسة التعليمية ذاتها فى ضوء ضوابط ومعاييرمحددة، ويمكن أن يستخدم أسلوب التقويم الذاتي للمؤسسة، أو الوحدة، أو قسم دراسى، أو منهج دراسي معين.

3-2 أسلوب التقويم الخارجى

وهى عملية تقوم بها جهة خارجية يتم تكليفها من قبل وزارة التعليم العالى، أو أية جهة خارجية أخرى وتعمل على تقويم المؤسسة في ضوء ضوابط ومعايير تحددها الجهة الخارجية القائمة بعملية التقويم، ويمكن أن يكون التقويم الخارجي للمؤسسة، أو الوحدة، أو قسم دراسى، أو منهج دراسي معين.

3-3 أسلوب المقارنات المرجعية

وهي عملية مستمرة ومنتظمة تجرى لمقارنة نتائج أداء عمل المؤسسة مع نتائج العمل نفسه في مؤسسة أخرى من الاختصاص نفسه مع الأخذ فى الاعتباربالأنشطة والعمليات الداخلية والوظائف التي تقوم بها المؤسسة.

" المرونة فى تطويرآليات جودة إدارة التقويم الذاتي في الجامعات المصرية"

نحو آلية لتأكيد وقياس درجة تحقق مخرجات التعلم المستهدفة بالمقرر الدراسى

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الملخص:

توضح الورقة البحثية أهمية المرونة والاستمرارية في تطويرآليات جودة إدارة التقويم الذاتي في الجامعات المصرية، وتقدم مقترح آلية لتأكيد وقياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى، وتكمن أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى التقويم الذاتى للبرنامج الأكاديمى فى تأثيرها المباشر على تحقيق أحد أهداف البرنامج الأكاديمى وهو إكساب الطلاب مخرجات التعلم المستهدفة من البرنامج، حيث أصبح التقويم الذاتي من أهم العناصر الفاعلة والمؤثرة فى جودة التعليم ونجاح العملية التعليمية اللذان يعتمدان على العديد من المحاور الرئيسية المؤثرة مثل تطوير وزيادة فعالية التدريس والتعلم وتطوير عمليات اختيار أعضاء هيئة التدريس والباحثين والاهتمام بموضوعات البحث العلمي والتواصل مع سوق العمل لتلبية احتياجات المجتمع وأولوياته.

وتكمن أهمية المرونة فى تصميم وتطوير نظام إدارة التقويم الذاتي والجودة الشاملة في توفير آلية تمكن الجامعات المصرية من تحقيق الأداء المتميز في تقديم الخدمة التعليمية ، كما أن إدارة الجودة الشاملة من الأمور اللازمة والضرورية المؤثرة على استمرار المؤسسات التعليمية، وبقائها في عصر التقنيات.

وتتعرض الورقة البحثية للمبادئ التي ترتكز عليها عملية إدارة الجودة الشاملة والأساليب المتبعة في تطبيق جودة الأداء والتقويم الذاتى في الجامعات المصرية بهدف التوصل إلى وضع آلية تساعد فى عملية التقويم الذاتي للمقررات وتأثير ذلك على البرامج الأكاديمية، وكيفية تطبيق تلك الآلية في الجامعات المصرية.

أهداف البحث

الهدف الرئيسي من الورقة البحثية هووضع آلية تتسم بالمرونة لتطوير نظام الجودة الشاملة لادارة التقويم الذاتي من خلال تقديم مقترح آلية لتأكيد وقياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى ، هذه الآلية تتكامل مع دور الهيئة القومية لضمان جودة التعليم والاعتماد ودورالجامعات المصرية ، والهدف من استخدام وتطبيق هذه الآلية بالجامعات المصرية تحقيق ما يلى :

- دعم وتحقيق وتقييم كل مخرج من مخرجات التعلم المستهدفة للمقرر الدراسى.
- الكشف عن جوانب القوة ونقاط الضعف في البرنامج التعليمي حتى يتم وضع خطط التحسين اللازمة .
- قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى،مع توضيح مدى ملائمة كل طريقة من طرق التقييم المختلفة لقياس درجة تحقق كل مخرج تعليمى مستهدف للمقرر.
- تعتبر مؤشر قوى على تحقق أهداف البرنامج الأكاديمي وكفاءة أداء أعضاء هيئة التدريس والهيئة المعاونة في تدريس المقرر وإكساب الطلاب لمخرجات التعلم المستهدفة بالمقرر.
- تهيئة وإعداد الجامعات المصرية للتقويم الخارجي، ومن ثم للاعتماد على كافة المستويات.

توصل الباحث إلي مجموعة من النتائج من أهمها ما يلي :

- أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى التقويم الذاتى للبرنامج الأكاديمى وتأثيرها المباشر على تحقيق أهداف البرنامج الأكاديمى.
- أهمية قياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى كدليل على اكتساب الطلاب لمخرجات التعلم المستهدفة والمساعدة فى عملية تقويم المقررات من حيث توضيح نقاط القوة والضعف فى تحقيق المخرجات المستهدفة بها ومن ثم إعداد خطط التطوير والتحسين والتعزيز.
- أهمية ربط مخرجات التعلم للمقررات الدراسية بمخرجات التعلم للبرنامج الدراسي لتوضيح كيفية تكامل كل المقررات معاً فى عملية دعم وتحقيق وتقييم كل مخرج من مخرجات التعلم المستهدفة للبرنامج ككل، ووضع تفاصيل ذلك الارتباط على المستوى الفردى لكل مقرر لتوضيح أهمية المقرر الدراسى فى دعم وتحقيق وتقييم أحد أو بعض مخرجات التعلم المستهدفة من البرنامج.
- وضع مقترح آلية تتسم بالمرونة لتأكيد وقياس النسبة المئوية لدرجة تحقق كل مخرج من مخرجات التعلم المستهدفة بالمقرر الدراسى، وتكمن أهمية تحقق مخرجات التعلم المستهدفة بالمقرر فى عملية التقويم الذاتى للبرنامج الأكاديمى ومدى تحقق أهدافه، وعملية تقويم الذاتى للمقررات وإعداد خطط التطوير والتحسين والتعزيز.

كما يتقدم الباحث بمجموعة من التوصيات من أهمها ما يلى:

- يوصى الباحث بضرورة وضع مقترح آلية أخرى تقوم بعملية التقويم الذاتى للبرنامج الأكاديمى وقياس مدى تحقق أهدافه، وتحقق التكامل مع نتائج الآلية المقدمة بالبحث.
- قيام الهيئة القومية لضمان جودة التعليم والاعتماد بدورها في اعتماد وتعميم تطبيق الآلية المقترحة بالبحث كآلية من آليات التقويم الذاتي.
- قيام الهيئة القومية لضمان جودة التعليم والاعتماد بتنظيم دورات تدريبية تختص بتوضيح كيفية عمل تلك الآلية.
- الإشراف المباشر من قبل الهيئة على كل مؤسسة من مؤسسات التعليم العالى لضمان سير العملية التعليمية بها وفق آليات وضوابط جودة الأداء الإدارى والأكاديمى حتى حصولها على اعتماد الجودة، وتمكينها من الإدارة الذاتية لعملية التقويم بعد توصلها لمفاتيح جودة الأداء إدارياً وتعليمياً.

الكلمات المفتاحيه: التقويم الذاتى – مخرجات التعلم المستهدفة – تقويم المقررات –آليات القياس– الجودة الشاملة.

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- تكامل التقنيات، حيث أنه من التحديات الحيوية أن تكون التقنيات الذكية المستخدمة قابلة للتشغيل المتبادل بما يحقق تكامل التقنيات فى التواصل وتبادل البيانات.
- خطأ التفاوت والذى يشكل تحدياً حقيقياً حيث يجب أن يكون تنفيذ تقنيات الاتصال على نحو شديد المرونة فى التعامل مع إخفاقات النظام.

ح. الاستنتاج

يجسد توظيف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة النهج المتطور لنمذجة إدارة العمران. ونظراً لوجود بدائل متنوعة للمؤشرات فإن التحليل يجب أن يشتمل على تطوير واختبار سيناريوهات متعددة ويتم تمثيل كل منها بمجموعة محددة من السياسات والمعايير النموذجية. وينتج كل سيناريو مجموعات من المحاكاة الافتراضية لظروف مستقبلية لإستخدام وتنسيق المواقع مع الوسائل والفروق التى تتفق مع افتراضات كل سيناريو. ويسمى تحليل النتائج التى تشير إلى تعديل المدخلات بسيناريو التنمية التكرارى والذى يؤدى إلى التحليل الاستقرائى. وتؤدى هذه العملية التكرارية حاسوبياً إلى مجموعات متتالية من النتائج عن طريق تعديل مجموعات محددة من السياسات والتى تؤدى بدورها إلى اكتشاف أنماط هامة والتى تشير إلى المحددات المتوقعة على الآثار المستقبلية للسياسات التى تم تطبيقها أوالمقترحة للتطبيق المستقبلى. وتتمثل سمات النظام فى كفاءة وعمق التحليل بناءً على أنماط الزحف والتوسعات العمرانية السابقة وإستقراء الأنماط المستقبلية مع تقديم أفضل البدائل للنمو العمرانى والسبل المثلى لإدارته مع الأخذ فى الإعتبار الإستراتيجيات التنظيمية والمخططات الهيكلية والمقومات الإقتصادية والسمات والسلوكيات الإجتماعية للسكان.

خ. التوصيات

يجب على متخذى القرار والمسئولين عن إداراة العمران والتوسع العمرانى بمصر نظراً لما تعانيه من الزحف العمرانى وخاصة النموعلى أطراف المدن وبمحازاة الطرق السريعة، أن يتخذوا من السبل والوسائل ما يساعد على تحقيق الإستفادة القصوى من التقنيات المعاصرة والمتقدمة لتقنية المعلومات والإتصالات والتى تم تناول بعضها فى هذه الورقة البحثية ومنها توظيف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة. حيث تمثل هذه التقنيات الذكية النهج المتطور لنمذجة إدارة العمران والذى سيساهم بشكل كبير فى الإرتقاء بإدارة التوسع العمرانى فى المدينة وذلك من خلال تحديد أنماط التوسع وإستنباط المسببات التى تفرز وتشكل تلك الأنماط وتحديد أفضل السبل لمجابهتها، مع تفهم وعرض وتحليل نتائج تطبيق السياسات والتوسعات العمرانية بالمدينة. وتساهم التقنيات الحاسوبية الحديثة والمتمثلة فى الأنظمة الذكية لتحليل أنماط وخصائص النمو العمرانى فى آداء دور هام فى دعم المخططين ومتخذى القرارات الخاصة بالتنمية العمرانية للمدن وذلك من أجل تحقيق إدارة فعالة ومتفاعلة لمشكلة الزحف والتوسع العمرانى وإدارة العمران بالمدن.

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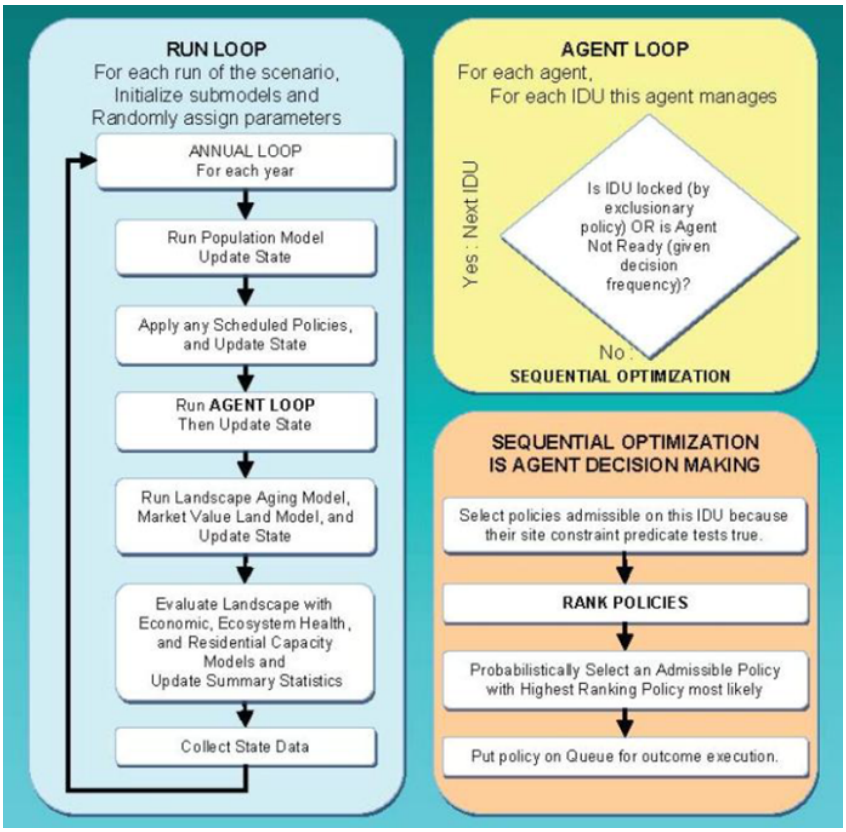
ج. المناقشة

يمثل التوسع العمرانى لإستيعاب الزيادة السكانية ظاهرة مستمرة فى مصر منذ عدة عقود، سواء كان هذا التوسع نتيجة مبادرات من الدولة بإنشاء تجمعات أو إمتدادات عمرانية أو مدن جديدة أو كانت تعديات عشوائية من المواطنين على ربوع أرض مصر بدءً من العاصمة وإلى جميع مدن وقرى مصر. وعلى الرغم من توفر المخططات الإستراتيجية والتفصيلية والتى غالباً ما تأتى متأخرة عن الواقع فى معظم الأحيان إلا أن ذلك لم يحد من ظاهرة الزحف على الأراضى الزراعية التى تضمحل يوماً تلو الآخر بل يتم للأسف تقنين تلك التعديات والتصالح عليها لاحقاً. وتعد إدارة العمران أحد أهم دعائم تحقيق التنمية العمرانية المستدامة. ولذلك نجد أن مشكلة إدارة العمران فى مصر تشمل الجهات المنوطة بها إحداث التنمية والعلاقات التى تنظم عملها والعلاقات البينية بين هذه الجهات، وكذلك الخطط العمرانية على المستوى المركزى والاقليمى والمحلى مع مراعاة العلاقات التكاملية والاشرافية بينهم. وبالنظر إلى التوسع العمرانى فى إنشاء المدن والتجمعات العمرانية الجديدة فى مصر نجد تبعثر فى التنمية العمرانية حيث لم ينتظم النمو الأفقى للعمران طبقاً للمراحل الزمنية المخططة هذا فضلاً عن إنتشار مبانى الخدمات بشكل عشوائى، بالإضافة إلى إختلال التوازن فى التنمية العمرانية والذى تمثل فى ضعف معدل الإنجاز فى الخدمات العامة والمجتمعية مع إختلاف فى خصائص العرض المتاح من الإسكان عن حقيقة الطلب الفعال عليه (فرحات، 2006). ولقد تم ذكر ذلك فقط كمثال لبيان أن عدم إختبار مدى الكفاءة المتوقعة من تطبيق سياسات التوسع العمرانى عند إقتراحها وقبل تطبيقها على أرض الواقع يعد أمراً جوهرياً وملحاً لأن النتائج السلبية الناجمة عن تطبيق سياسات تنمية عمرانية غير مدروسة بصورة كافية مع ضبابية الأثر المتوقع منها يعداً أمراً كارثياً وإهداراً لإمكانات ومقدارات الدولة والتى هى فى أمس الحاجة لتعظيم العائد من الإمكانات والقدرات المتاحة والمحدودة.

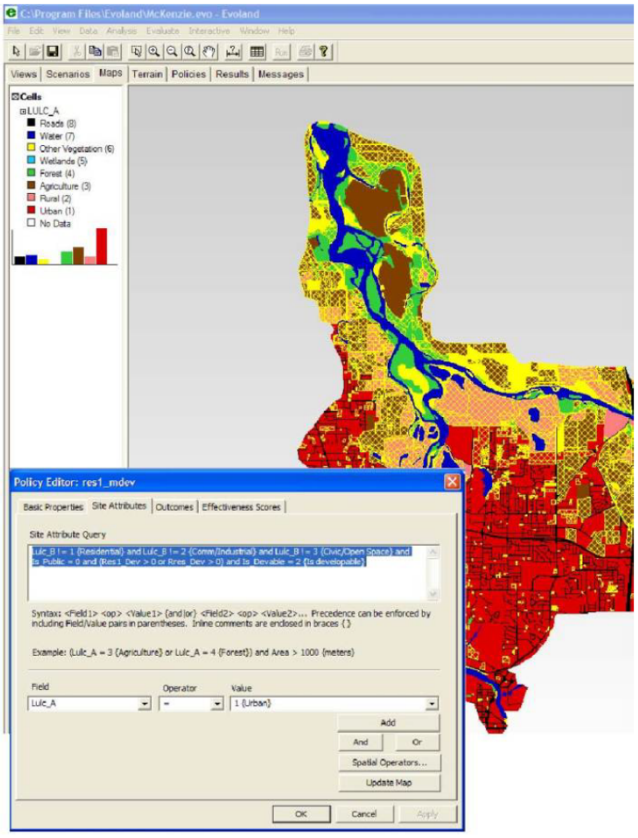
ولذلك فإن المرونة فى تحقيق متطلبات التنمية العمرانية تتحقق بقدرتوفر المعلومات الديموغرافية؛ التى تشمل السكان والأراضي، والنواحى المالية، وتعتمد على القدرة فى تصور الممكن تحقيقه باستخدام تلك المعلومات، وعلى القدرة فى تصور أنواع النتائج الفعلية التى يمكن أن تتحقق والمشاكل المحتملة أو المتوقعة عند تنفيذ خطة التنمية المرجوة. لذا فإن توظيف التقنيات الحاسوبية المتقدمة سيساعد فى صياغة تصورات للحلول المطلوبة لأى معوقات متوقعة أو أى سلبيات قد تنشأ بسبب الخطة المقترحة، هذا بالإضافة إلى تصحيح المسار للتأكيد على إيجابيات أى تعديلات فى تنفيذ خطة التنمية العمرانية وجداولها الزمنية على الطبيعة. ويتم ذلك بتحديد المؤثرات المحلية والخارجية المؤدية إلى تغير الأهداف، وبحث إمكانية تعديل الأهداف والتقليل من المؤثرات المحلية والخارجية، وبحث وتحديد ملاءمة التشريعات والنظم المالية والاستثمارية، وبحث توظيف الموارد المتاحة البشرية والمالية. ويعد إدخال التعديلات أسهل خلال مراحل الدراسة والمقارنة وأوفر ماليا عند مقارنته بتوقف أو تباطئ المشروعات بعد البدء بها أو خلال مراحل متقدمة أو فشل المخطط فى تنفيذ المرجو منه أو ظهورسلبيات تفوق ما كان متوقعا له من نجاح. وقبل الشروع فى تنفيذ خطة مشروع التنمية وفى خلال مراحل التنفيذ؛ يجب إعداد إطار واضح لعقد مقارنات بين التصور للمشروع الأصلى وبدائله المقترحة عند كل مرحلة وتحديد موازنات موضوعية تقدر الأهداف والوسائل والإنجاز واستخدامات الأراضى والنجاح المرحلى فى تحقيق خطة التنمية. هذا بالإضافة إلى استطلاعات الرأى لذوى العلاقة المباشرة بالمشروع من مخططين ومهندسين ومسؤلى المرافق والمرور وخبراء الاجتماع والقانون والصحة والتعليم والبيئة بحيث يدلى كل برأيه عن سلبيات وإيجابيات المشروع وعلى أن يكون استطلاع الرأى على فترات زمنية متتالية ويسهل الإطلاع عليه، لكل ذوى العلاقة من أصحاب الأراضي أوأعضاء مراكزالأحياء. وإن ضمان مرونة متطلبات التنمية يتوقف على فهم وتعاون المستفيدين والمعنيين فى تسهيل المرونة المطلوبة وتحقيقها (مدن المعرفة، 2007). ومن ناحية أخرى، فإن توظيف الوسائط الحاسوبية الذكية كأحد تطبيقات المتقدمة للذكاء الإصطناعى وتقنية المعلومات والإتصالات لا يوفر فقط إمكانات كبيرة لإدارة النظم العمرانية والاستدامة الحضرية للمدن بل يكون ميسراً وداعماً لتحويل المدن الحالية إلى مدن ذكية. وتوفر المدن الذكية خدمات حضرية أفضل للمناطق الحضرية بتوظيف التقنيات الذكية مما يعد تحولا نموذجياً جديداً فى التخطيط الحضرى وإدارة العمران (Min et al, 2019).

وعلى الجانب الآخر، توجد عدة تحديات فى توظيف الوسائط الذكية فى إدارة العمران بالمدن وخاصة فى الدول النامية ذات الموارد المحدودة والمشاكل العمرانية المتشابكة والمتراكمة، وتتمثل بعض هذه التحديات فى مايلى :(Ghosal & Halder, 2018)

- تكلفة التنفيذ، حيث أن العديد من المدن التى نفذت التقنيات الذكية فى إدارة العمران بهدف جعل المدينة ذكية استثمرت الكثير من المال .
- الخصوصية والأمان، حيث يمكن أن تتعرض الهواتف الذكية وأجهزة الكمبيوتر المتصلة عبر الشبكات للقرصنة وخاصة عند استخدام تطبيقات الاستشعار عن بعد والتى تجعل شبكات الاتصال معرضة بشدة للتهديدات ذات الصلة بالأمان والتخريب الإلكترونى. لذا، فإن التعامل مع مشاكل الأمان يشكل تحدياً حقيقياً يحتاج إلى أقصى قدر من الاهتمام.



شكل. 9 هيكل وتتابع العمليات فى نظام Evoland لتوظيف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة (Guzy et al, 2008) .

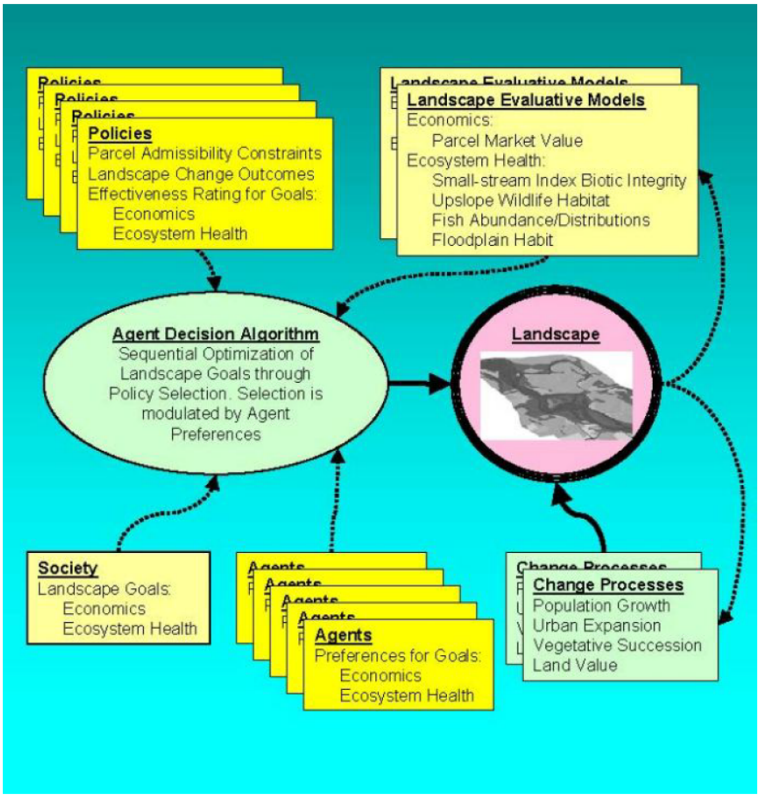


شكل. 10 إمكانية تعديل السياسات فى نظام Evoland حيث يتم دمج وظائف نظم المعلومات الجغرافية مع خاصية الاستعلام المكانى فى النظام (Guzy et al, 2008) .

ث. توظيف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة

إن إدارة التوسع العمرانى بالمدينة تتطلب تقييم الآثار البيئية المستقبلية للإمتداد إلى الأراضى الزراعية والصحراوية المحيطة. لذا تعد النماذج الصريحة المعتمدة على الوسائط المكانية الحاسوبية والذكية منطلقاً متميزاً لتمثيل التغير فى مستويات المرونة والخدمات الإيكولوجية التى تنتج عن سياسات استخدام الأراضى المختلفة. هذا بالإضافة إلى إمكانية استخدام مثل هذه النماذج كامتداد للتحليل الإستكشافى والذى قد ينتج عنه مجموعة من الخيارات التى تمثل بدائل مستقبلية متميزة. وتساهم خبرة المستخدم فى تحديد مستوى التفاعلية والتحليل الإستكشافى من خلال تبنى المنهج الاستقرائى حول التغيرات والخيارات المحتملة (Bankes, 2002; Parker et al , 2003; Evans & Kelley, 2004; Brown et al, 2005; Berger & Schreinemachers, 2006; Brown & Robinson, 2006; Guzy et al, 2008).

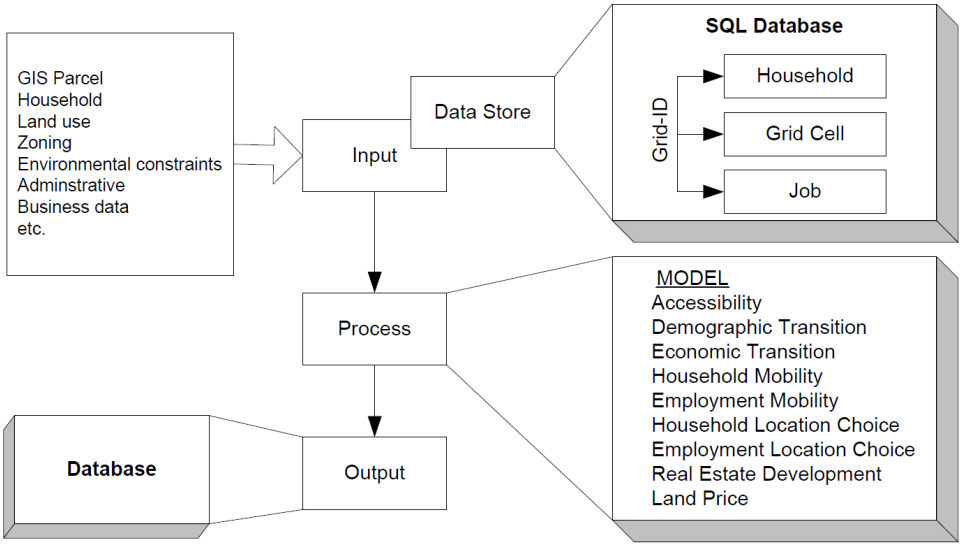
ويعد نظام Evoland من الأنظمة التى توظف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة. ولقد تم تصميم Evoland لتقييم بدائل مستقبلية للتوسع العمرانى والتى قد ينتج عنها تبنى سياسات إجتماعية وإقتصادية وأيكولوجية مختلفة. ويتميز هذا النظام بالديناميكية فى مستوى تناوله للتنوع الاجتماعى والاقتصادى وكذلك الموارد الطبيعية وتشابكات البيئة المبنية. ويقدم Evoland تقييم أنماط المحاكاة الناتجة عن تغيير السياسات المختلفة، وتحديد أكثر المواقع المتضررة، وكذلك تحديد المواقع التى يمكن فيها تحقيق أكبر الأثر والنفع من تطبيق السياسات التنموية والعمرانية المقترحة، ويقدم كذلك إستقراء تحليلى للبدائل المستقبلية. ويتمثل الإطار الهيكلى لنظام Evoland فى المكونات الرئيسية وعلاقات النظام الاجتماعى والإيكولوجى كما هو موضح بالشكل رقم (8)، حيث تشير الأسهم بالخط المتقطع إلى سيرتدفق المعلومات، أما الأسهم بالخط المستمر فتشير إلى تغييرات فى تنسيق المواقع الطبيعية. ويوضح شكل رقم (9) هيكل وتتابع العمليات فى نظام Evoland حيث يتم إعداد كل سيناريو عن طريق تحميل المعلومات وبدائل المؤشرات التى تميز كل سيناريو على حده. ويتم أخذ إختبار كل سيناريو بناءً على نسب توزيع قيم المؤشرات. ويتيح نظام Evoland إمكانية تعديل السياسات كما هو مبين بالشكل رقم (10) حيث يتم دمج وظائف نظم المعلومات الجغرافية مع خاصية الاستعلام المكانى فى نظام Evoland. ويوضح اللون الأصفر المظلل المواقع الى تعد فيها سياسة التوسع العمرانى والتنموى مقبولة أو مسموح بها. وتقدم خاصية إمكانية تعديل السياسات لمستخدمى النظام فى إضافة بدائل للسياسات فى خاصية الاستعلام المكانى (Guzy et al, 2008).



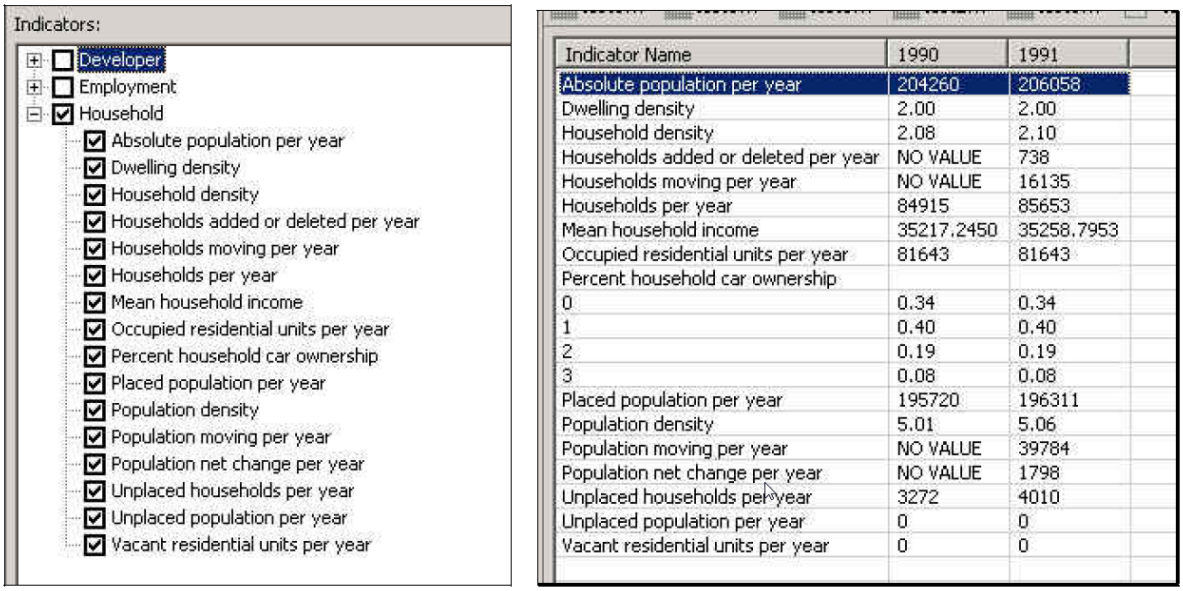
شكل. 8 الإطار الهيكلى لنظام Evoland لتوظيف الوسائط الحاسوبية الذكية فى دعم الإدارة الفعالة والتفاعلية لتخطيط عمليات التوسع العمرانى بالمدينة، تشير الأسهم بالخط المتقطع إلى سيرتدفق المعلومات، أما الأسهم بالخط المستمر فتشير إلى تغييرات على تنسيق المواقع الطبيعية (Guzy et al, 2008).

- محاكاة الخيارات لتحديد ما إذا كان الموظفون سينتقلوا أويبقوا فى أماكن عملهم الحالية.
- محاكاة الخيارات لأماكن الأسر الجديدة والإنتقال للأسر الحالية.
- محاكاة الخيارات لأماكن الوظائف الجديدة ونقل الوظائف.
- محاكاة الخيارات للمطور العقارى مع الإشارة إلى أنواع وأماكن البناء.
- محاكاة أسعار الأراضى فى كل شبكة من الأراضى على أساس خصائص الموقع.

ويوضح الشكل رقم (6) هيكل وتتابع العمليات فى نظام محاكاة النمو العمرانى UrbanSim. ويبين الشكل رقم (7) مثالاً لمخرجات النظام شاملاً المؤشرات والنتائج حيث يمكن ربط نظم المعلومات الجغرافية مع نظام UrbanSim فى جزئين رئيسيين وهما المدخلات والمخرجات. ومن أمثلة إدخال البيانات المطلوبة فى النموذج هو القاعدة المكانية (مثل الخرائط الطبوغرافية)، حيث تكون البيانات المكانية مستمدة من نظم المعلومات الجغرافية (على سبيل المثال قطعة أرض) وغيرها مستمد من مصادر البيانات غير المكانية (مثل بيانات التعداد) ويتم ربط هذه البيانات مع صفات العنصر المكانى.

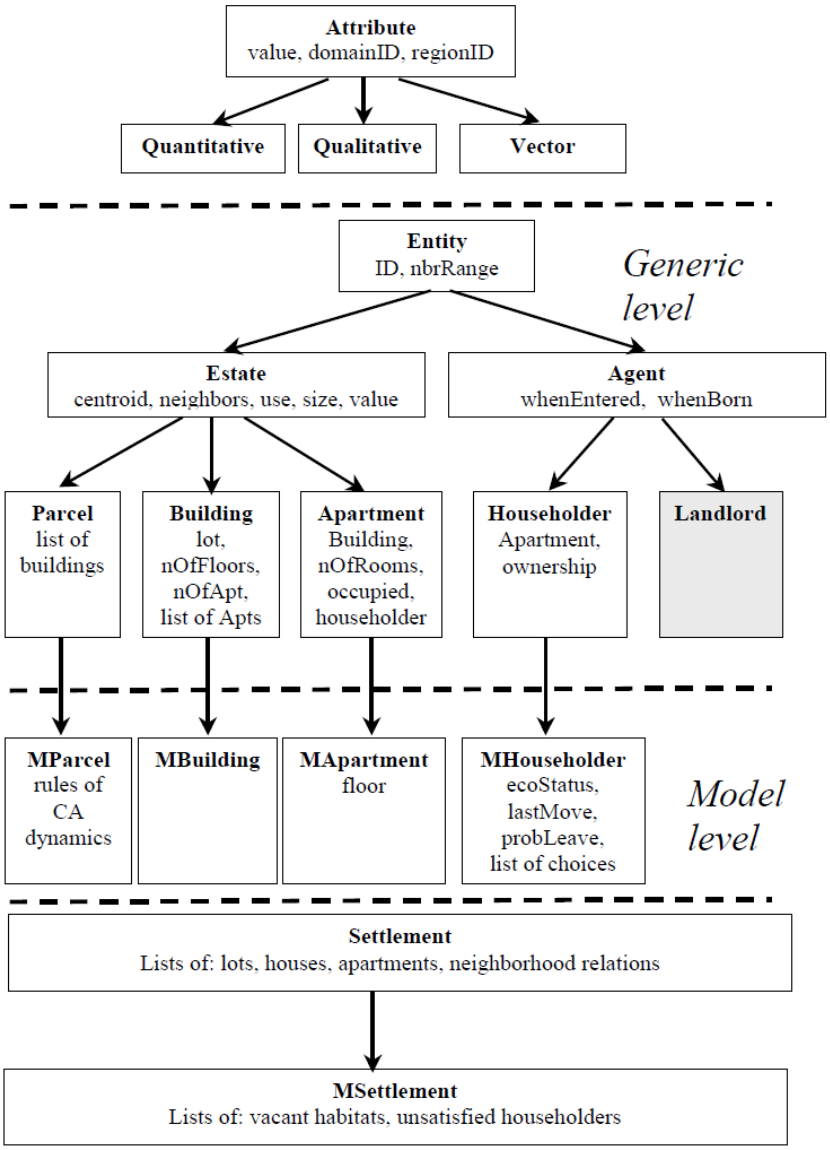


شكل. 6 هيكل وتتابع العمليات فى نظام محاكاة النمو العمرانى UrbanSim (Teerarojanarat et al, 2004).



Indicator Name	1990	1991
Absolute population per year	204260	206058
Dwelling density	2.00	2.00
Household density	2.08	2.10
Households added or deleted per year	NO VALUE	738
Households moving per year	NO VALUE	16135
Households per year	84915	85653
Mean household income	35217.2450	35258.7953
Occupied residential units per year	81643	81643
Percent household car ownership		
0	0.34	0.34
1	0.40	0.40
2	0.19	0.19
3	0.08	0.08
Placed population per year	195720	196311
Population density	5.01	5.06
Population moving per year	NO VALUE	39784
Population net change per year	NO VALUE	1798
Unplaced households per year	3272	4010
Unplaced population per year	0	0
Vacant residential units per year	0	0

شكل. 7 مثال لمخرجات نظام محاكاة النمو العمرانى UrbanSim موضحاً المؤشرات (على اليسار) والنتائج بعد إستخدام تلك المؤشرات (على اليمين) (Teerarojanarat et al, 2004).

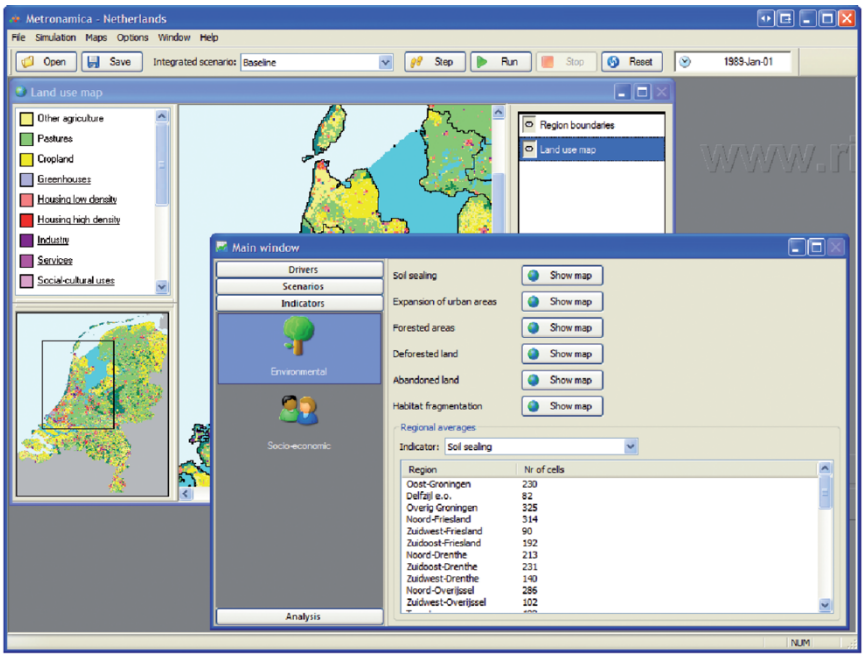


شكل. 5 الفئات الثلاثة الأساسية فى نظام OBEUS والمتمثلة فى المكونات والسمات والتجمعات (Benenson et al, 2005).

ت. نظام محاكاة النمو العمرانى

لقد تم صياغة نظام محاكاة النمو العمرانى Urban Growth Simulation (UrbanSim) بحيث تمثل قطع الأراضى أو السكان المكون الأساسى للنمذجة والمحاكاة. ويعد الهدف الأساسى من النظام هو محاكاة تنمية ونموالمناطق العمرانية بما فى ذلك استخدامات الأراضي، والنقل، والآثار البيئية على مدى فترات زمنية. ويتم ذلك عبر تحديد شامل لمختلف البيانات الاجتماعية والاقتصادية والأحداث المحددة من المستخدم والإجراءات (مثل السياسات والمحددات البيئية). ويمكن هذا النظام من إجراء محاكاة واقعية للنمو العمرانى مع صياغة سيناريوهات مختلفة. ويتيح للمستخدمين تقييم تأثير السياسات المتغيرة للنمو العمرانى وإدارته. ويتمثل الأساس النظرى لنظام محاكاة النمو على مفاهيم الاقتصاد القياسية، مع التركيز على إحتياجات السكان، وعمليات تطوير الأراضى ودور التخطيط فى تحديد استخدامات الأراضى، وقوانين الأراضى والمحددات البيئية. ويوفر نظام محاكاة النمو العمرانى UrbanSim وظائف عديدة للمساعدة فى محاكاة النمو العمرانى خلال أى فترة زمنية وذلك على النحو التالى (Teerarojanarat et al, 2004):

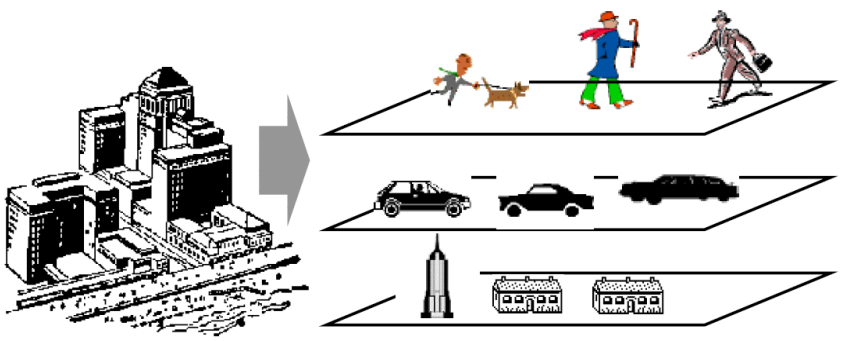
- توقع نمط إمكانية حركة السير والتنقل للسكان مع تحليل حركة السير.
- حساب المواليد والوفيات من السكان وفقا لنوع الأسرة.
- حساب توفير فرص العمل أو فقدان العمل وفقا لنوع العمل.
- محاكاة الخيارات لتحديد ما إذا كانت الأسر ستنتقل أو تبقى فى أماكن سكنهم الحالية.



شكل. 3 إستخدام Metronamica كآداة لتقييم الأثر البيئى بصورة متكاملة وتطبيقها على المناطق الساحلية فى هولندا كتوظيف لإمكانات النمذجة المكانية الديناميكية (Van Delden et al, 2010).

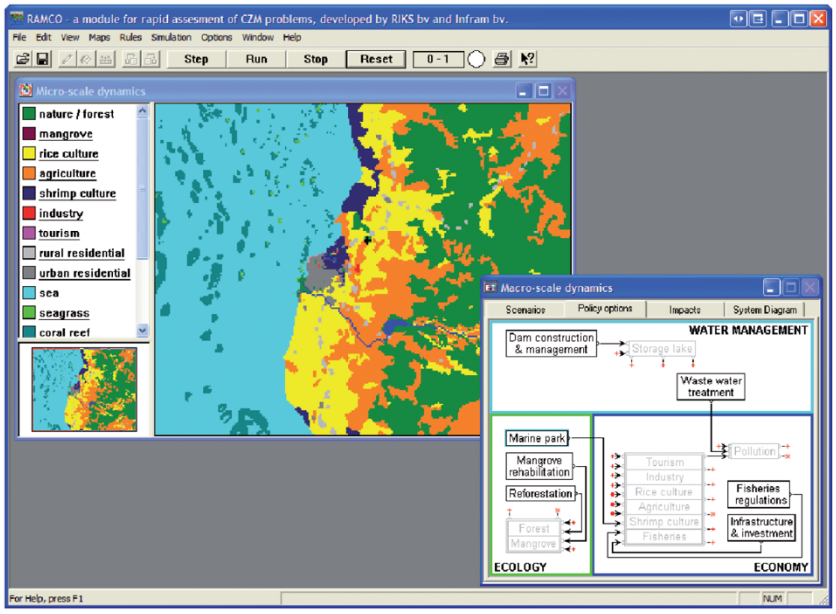
ب. نظام المحاكاة العمرانية إعتماداً على العناصر البيئية

إن ما يميز المدينة عن الأنظمة متعددة العناصر Multi-Objects Systems (MOS) هو العلاقات المكانية بين عناصر ومكونات المدينة. وعلى سبيل المثال، فإن عنصراً هاماً من عناصر تقدير ملاك الأراضى لقيمة العقارات هو إمكانية تطوير الحى السكنى. وبناء على ذلك، فإن قرار صاحب الأرض لتغيير استخدام قطعة أرض ما يعتمد بشدة طردياً مع استخدامات الأراضى المجاورة. وكذلك فإن رحيل السكان وقراراتهم لا تعتمد فقط على خصائص العقارات والقدرات الاقتصادية للأسرة، ولكن أيضا على خصائص البيئات المادية والبشرية فى المواقع الحالية والمحتملة. ويعد الهدف الأول لنظام المحاكاة العمرانية المعتمد على العناصر البيئية Object-Based Environment for Urban Simulations (OBEUS) هو الدمج المباشر للعلاقات المكانية فى مخطط النمذجة العمرانية مع توفير أدوات نمذجة تتيح التزامن بين الوسائط المتنقلة والثابتة (Mobile & Immobile Agents). ويقوم نظام OBEUS بدمج الخلايا الآلية (Cellular-Automata) والمحاكاة وأساليب الوسائط المتعددة (Multi-Agents). وتتمثل أهداف نظام OBEUS فيما يلى: إجراء عمليات متزامنة للعناصر العمرانية الثابتة والمتنقلة كما بالشكل رقم (4)؛ الأخذ فى الإعتبار العلاقات المكانية بين العناصر العمرانية على إختلاف أنواعها؛ توفير أدوات للتمثيل والنمذجة الحاسوبية لكل من: إنشاء وتغيير وحذف عناصر البنية الأساسية للعمران؛ الهجرة والتكيف للعناصر الإجتماعية؛ ظهور وإختفاء العناصر المكانية فى مستويات أعلى فى التسلسل الهرمى بالمناطق العمرانية والموضحة بالشكل رقم (5). وتتمثل الفئات الثلاثة الأساسية فى نظام OBEUS فى: المكونات (Entities) والتى تتمثل فى العناصر الأساسية؛ والسمات (Attributes) والتى تعبر عن صفات المكونات؛ والتجمعات (Settlements) والتى تمثل المدينة ككل كوحدة مفردة.

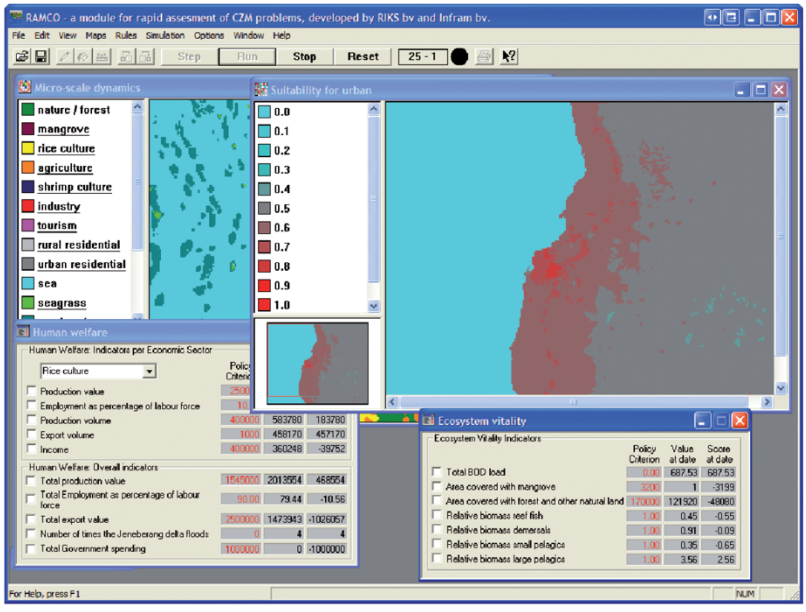


شكل. 4 إجراء عمليات متزامنة للعناصر العمرانية الثابتة والمتنقلة بالمدينة (Benenson et al, 2005).

يمكن التحكم فيها، مثل هطول الأمطار. وتسفرنتائج الحسابات فى نظام RamCo عن مخرجات فى أشكال مختلفة مثل الخرائط والرسوم البيانية والقيم العددية. ويتم عرض هذه المخرجات فى واجهة النظام نفسه، أو كتابتها فى ملفات لكى يتم تحليلها بإستخدام الأدوات المختلفة مثل جداول البيانات أو برامج نظم المعلومات الجغرافية. وتوضح الأشكال رقم (1) و رقم (2) بعض مخرجات تطبيقات نظام RamCo فى إدارة التوسع العمرانى، ويوضح الشكل رقم (3) مثال لإستخدام نظام Metronamica كأداة لتقييم الأثر البيئى بصورة متكاملة (Van Delden et al, 2010).



شكل. 1 استخدامات الأراضى وخريطة أولية لبدائل السياسات المتاحة فى المنطقة الساحلية لسولاويزي، اندونيسيا (Van Delden et al, 2010).



شكل. 2 بعض قيم المخرجات مع عدد من المؤشرات المتعلقة بسلامة الإنسان وحيوية النظام البيئى ومدى صلاحية الأراضى للتنمية والتوسع العمرانى، سولاويزي، اندونيسيا (Van Delden et al, 2010).

والمستنقعات والتى قد تعيق تواصل وتوظيف تقنية المعلومات والاتصالات. وتشمل المحددات المؤسسية السياسات الحكومية التى تؤثر على تكلفة الاتصالات والمرافق ذات الصلة. وتتمثل المحددات المادية فى بعض عناصر البيئة العمرانية مثل أسماء الشوارع، المناطق الخضراء والأسوار التى تم تصميمها لفصل المناطق المختلفة داخل التجمعات العمرانية. وتشمل هذه المجموعة الأخيرة من المحددات الهياكل الدائمة أو المؤقتة لإغلاق الطرق والشوارع، الطرق السريعة وغيرها من الشرايين التى تحد حركة السكان والمركبات (Njoh, 2012).

ولقد أتاح ظهور وإستخدام صور الأقمار الصناعية توفيرمصادر جديدة من المعلومات للمعنيين بإدارة العمران. وتوفر أجهزة الاستشعار عن بعد (Remote Sensing) صور بدقة عالية وخرائط بمقاييس رسم متنوعة ودقيقة بما يمكن من رصد التغيرات فى استخدامات الأراضى الحضرية والعمرانية فى جميع أنحاء العالم مع دقة ستتزايد على مدى السنوات القادمة. ولذلك فقد أصبحت ذات أهمية كبيرة بالنسبة للعديد من المناطق الحضرية التى تنمو بسرعة وخاصة فى البلدان الأقل نموا حيث تقل المصادر البديلة للمعلومات بسبب نقص الموارد. ومع ذلك يجب أن يوضع فى الاعتبار أنه على الرغم من هذه التطور، فإنه من المرجح أن تظل الصور الجوية التقليدية هى المصدر الرئيسى لمعلومات الاستشعارعن بعد فى المستقبل المنظور وذلك على نطاق قطع الأراضى بمقياس رسم 500:1والذى يمثل اللبنة الأساسية فى كتلة قواعد البيانات المستخدمة من قبل المستخدمين فى التخطيط الحضرى وإدارة الأراضي. هذا بالإضافة إلى التطورات التى حدثت فى التصوير الجوى بما يعظم من فائدته والتى شملت نوعية وجودة العدسات، واستخدام GPS لأغراض تحديد المواقع. وتوفر أدوات المسح الرقمى أيضا الصور المباشرة التى تتوافق مع المعلومات الجغرافية الرقمية.

وبالنسبة لإستخدام نظم المعلومات الجغرافية Geographic Information Systems (GIS) فإنه من الممكن من الناحية الفنية دمج كميات من البيانات التى تم جمعها لأغراض مختلفة بواسطة العديد من الأفراد. وهذا يجعل هذه الأداة مناسبة خاصة بالنسبة للتطبيقات فى مجال إدارة العمران والتوسع العمرانى. ويوفر GIS لمخططى المدن فرص متميزة للتعامل مع بيانات المدن بالعديد من الطرق التى تيسر إستكشاف الأنماط المختلفة عند تحليل البيانات المكانية والتى لم تكن ميسرة فى السابق وتتيح كذلك دمج البيانات التى تم جمعها من خلال الوسائل المختلفة وبالتالى تحقيق زيادة كبيرة فى قدرات التواصل وتبادل المعرفة بين العاملين فى إدارة العمران. ولكن، خلافا لنظم الاستشعار عن بعد والتى يمكن اعتبارها عملاً تقنياً بصورة أساسية، فإن التوظيف الفعال لنظم المعلومات الجغرافية يعتمد بصورة أساسية على عدد من العوامل التنظيمية، ومنها الإستعداد لتبادل البيانات والمعلومات مع المستخدمين المحتملين وهذا فضلاً عن تمكينهم من الحصول عليها بسهولة ويسر (Masser, 2001).

ت. تحليل لأنظمة توظيف تقنية المعلومات والإتصالات فى إدارة التوسع العمرانى

أ. نظام المعلومات للتقييم السريع والمتكامل لتقديم حلول مستدامة لمشاكل إدارة المناطق الساحلية

إن وحدة التقييم السريع للمناطق الساحلية RamCo (Rapid Assessment Module for Coastal Zones) هو نظام معلوماتى للتقييم السريع والمتكامل لتقديم حلول مستدامة لمشاكل إدارة المناطق الساحلية. ويساعد هذا النظام صناع السياسات ومتخذى القرارات فى إختبار البدائل ضمن السياق الأوسع للتغير المناخى، والنمو السكانى أو المتطلبات الاقتصادية المتغيرة. ويتم فى نظام RamCo وصف العمليات الطبيعية والبشرية فى المنطقة الساحلية مع الأخذ فى الإعتبار تأثير ديناميكية السلوك وتفاعل العوامل. وعلى سبيل المثال، عند التعامل مع سكان المنطقة الساحلية بشأن الثروة السمكية فإنه يتم ربطها بالأنشطة الاقتصادية والزراعة والصناعة والسياحة والتجارة. ويتميزنظام RamCo بطريقة ربط العمليات على المستويات المختلفة لتشكيل نظام واحد، واستخدام طبقات البيانات ودمجها فى نظام المعلومات الجغرافية (GIS) بما يمكن من صياغة بدائل للسياسات المقترحة أو القائمة وتقييم آثارها. وتستند العلاقات المحددة كمياً بين العناصر المختلفة من العمليات الطبيعية والاجتماعية والاقتصادية على الملاحظات الميدانية على نطاق واسع.

ولقد تم تطبيق نظام RamCo على منطقة ساحلية فى جنوب غرب سولاويزى (إندونيسيا) وذلك لدراسة النمو العمرانى المتوقع فى السنوات الخمس والعشرين المقبلة، مع الأخذ فى الإعتبار تأثير تزايد عدد السكان (النمو السنوى ± 3٪) وكذلك النمو الاقتصادى. وأسفرت النتائج المتوقعة من تطبيق نظام RamCo عن زيادة تلوث الأنهار والمياه الساحلية، وأن الطلب المتزايد على الغذاء سيؤدى إلى تدمير الغابات والذى سيؤدى بدوره إلى إزدياد تآكل التربة فى الجبال مما سيتسبب فى فيضانات الأنهار فى المنطقة الساحلية. وتمكن مثل هذه النتائج المتوقعة صناع السياسات ومتخذى القرارت من التدخل فى هذه العمليات الحيوية عن طريق إختيار وإختبار البدائل الأخرى مثل إعادة تأهيل أشجار المانجروف، ومعالجة النفايات ومياه الصرف، وإدارة السدود وإعادة تشجير الغابات، وتنظيم قواعد الصيد وتطوير المتنزهات البحرية. وبهذه الطريقة، يمكن إختبار بدائل سياسات التوسع العمرانى وإدارته قبل تطبيق تلك السياسات على أرض الواقع. ويفرق نظام RamCo بين التأثيرات التى يمكن السيطرة عليها من قبل صناع السياسات، وتلك التى لا

ومستوى الإدارة وسلوكيات الأفراد قد تشكل حالات بعيدة خارج عينة تجارب البلدان الصناعية التى تركز على البحوث التجريبية للتوسع العمرانى (Angel et al , 2005).

وقد تناولت النظريات والسياسات الدولية للتنمية الحضرية فى البلدان النامية عدد من المتغيرات التى حدثت فى العقود القليلة الماضية. وبنظرة عامة، خلال الستينات وحتى منتصف السبعينات من القرن الماضى حيث كان التركيز على الخطط والبرامج الكبرى والتى تشتمل على النطاق الواسع، التوحيد القياسى، وتوفير الخدمات الحضرية، وذلك إستناداً إلى مبادئ التخطيط الحديث. ومن بداية السبعينات إلى منتصف الثمانينات كان النهج يعتمد على المشروعات وذلك بالتدخلات التجريبية أو الصغيرة، والتى يمكن تكرارها فى أماكن أخرى، حيث كان هناك المزيد من الإهتمام على الظروف المحددة (بدلاً من النمط العام). وتم التركيز على قضايا مثل المساعدة الذاتية، المشاركة المجتمعية، ودعم المستوطنات أو التجمعات غير الرسمية بدلاً من البناء على نطاق واسع للعقارات النمطية. ومنذ منتصف الثمانينيات وحتى وقتنا الحاضر، تزايد الإهتمام للعمليات طويلة الأجل على نطاق المدينة، بدلاً من المشاريع المحددة أو التدخلات التجريبية. وقد تم التركيز على بناء القدرات المحلية وتعزيز المؤسسات لإدارة عملية التنمية الحضرية. ومن أسباب هذه التحولات فى النهج هى، بصفة عامة، فشل المنهجيات السابقة فى معالجة المشاكل الحضرية المتصاعدة. وتشمل المشاكل الرئيسية التى ورد ذكرها: سوء الإدارة الحضرية، الفقر، عدم الحصول على الخدمات الحضرية، التجمعات والإمتدادات السكنية العشوائية، والتدهور البيئى. ورغم واقعية هذه القضايا المحددة، فمن المهم تفهم التغييرات فى البنية السياسية والاقتصادية للمجتمع التى أدت إلى زيادة الاهتمام فى مجال إدارة العمران والتوسع العمرانى. ويجب كذلك ضرورة تحديد إرتباط إدارة العمران ببعض السياسات مثل الإعفاء من تطبيق بعض القوانين، أوالتمكين، أوالخصخصة أوالتصالح مع التعديات، أوما شابه ذلك. ولكن إذا حدثت تغييرات فى نمط العمران الحالى، وتطبيق إدارة التوسع العمرانى فإنه يجب تحليلها فى سياق السياسات الجديدة. ولذلك فإنه من المهم معرفة كيف يمكن ضبط الإدارة العمرانية للتغيرات فى سوق العقارات وأفكار مشروعات التنمية، بدلا من محاولة تجاهل هذه التغييرات (Werna, 1995).

ولمحلولة الإرتقاء بإدارة العمران وخاصة إدارة التوسع العمرانى فى مصر، فإن هذا البحث يهدف إلى تناول دور تقنية المعلومات والإتصالات بوجه عام، والوسائط الحاسوبية الذكية بوجه خاص فى توفير المعرفة اللازمة ودعم صناع ومتخذى القرار فى رفع كفاءة إدارة العمران، مع تحليل نماذج عملية لتوظيف الوسائط الحاسوبية الذكية وبيان دورها فى الإرتقاء بإدارة التوسع العمرانى بالمدينة.

ب. دور تقنية المعلومات والإتصالات فى إدارة العمران والتوسع العمرانى

تشمل تقنية المعلومات والاتصالات كافة الأجهزة والمرافق التى تمكن من جمع ومعالجة، تخزين ونشر المعلومات، والتى تنمو تطبيقاتها على نحو متزايد فى مجال التنمية والعمران. ويمكن أن تستفيد جهود التنمية والعمران فى البلدان النامية بشكل كبير من الاستثمارات فى مجال تقنية المعلومات والاتصالات. أما فيما يتعلق بإدارة التوسع العمرانى، فيمكن لتقنية المعلومات والاتصالات تعزيز مكاسب الكفاءة فى تقديم الخدمات العامة فى المناطق الحضرية وتيسيرالجهود الرامية إلى تعزيز التفاعل بين مجالس إدارة المدن وسكانها. وعلى الرغم من ذلك، فإن تقنية المعلومات والاتصالات كأداة فى إدارة المناطق الحضرية لا تزال فى حاجة الى كثير من الدراسات والتطوير. وتختلف تقنية المعلومات والاتصالات عن غيرها من الخدمات، ويمكن النظر إليها على أنها تقدم العناصر التى تسهل الكفاءة الاقتصادية والإنتاجية. ولذلك يمكن توظيف تقنية المعلومات والاتصالات فى القدرة على تعزيز أداء المناطق الحضرية أو المدن. وبصفة عامة، تكمن أهمية تقنية المعلومات والاتصالات فى قدرتها على تعزيز الناتج الاقتصادى للشركة أوالمكان أو القطاع. وعلى صعيد آخر، يمكن اعتبار تقنية المعلومات والاتصالات قطاعاً تنموياً فى حد ذاته. ولذلك يجب تنظيم هذا القطاع التنموى وفقا للسرعة العالية والمصداقية المجتمعية وقنوات التواصل والتفاعل المكانى. وبصفة خاصة، سرعة وكفاءة تدفق المعلومات لأن ذلك يعد هدفاً أساسياً من توظيف تقنية المعلومات والاتصالات.

ويشمل العنصر المعلوماتى فى إدارة التوسع العمرانى إنضمام مخططى المدن ومديرى ومستخدمى الحيز العمرانى، بالإضافة إلى تداخل مستويات أخرى متعددة والتى يمكن تصنيفها بالمدخلات، والمخرجات ، والدعم الإدارى. وعلى صعيد المدخلات، فإن مستخدم الحيز العمرانى يمكن أن يستخدم نظام تحديد المواقع العالمى Global Positioning System (GPS) والذى يوفر إرشادات جيدة للاتجاهات. ويمكن لمستخدمى الحيز العمرانى الحصول على أو إستخراج معلومات عن المرافق والخدمات فى المدينة. وهذه المعلومات قد تكون متاحة فى دليل المدينة المطبوع أو الرقمى أو دليل الهاتف. ويشمل مستوى الدعم الإدارى إشتراك المجالس المحلية فى جمع والحفاظ على البيانات اللازمة لآداء مسئوليات الإدارة العامة.

ويمكن تقدير المعوقات المكانية والمادية لتقنية المعلومات والاتصالات على مستويين: المستوى الأول ويشمل جميع المعوقات فى الطبيعة والبيئة المبنية التى تعيق حسن سير نظم المعلومات فى الفضاء الجغرافى. وفى المستوى الثانى، المحددات وتشمل العوامل التى تحد من قدرة أنظمة تقنية المعلومات والاتصالات فى تسهيل الأنشطة الأخرى فى الفضاء الجغرافى. ويمكن تصنيف هذه المحددات إلى أربع فئات رئيسية وفقا لأصولهم أوطبيعتهم على النحو التالى: الطبيعية، والمؤسسية، والمادية، والمعتقدات. وتشتمل المحددات الطبيعية على الجيولوجيا والجغرافيا والخصائص الطبوغرافية مثل صعوبة التعامل مع التربة أو الصخور والجبال والتلال

توظيف الوسائط الحاسوبية الذكية فى دعم إدارة العمران

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الملخص:
يعد الزحف العمرانى وخاصة النمو على أطراف المدن وبمحازاة الطرق السريعة من أبرز سمات التوسع العمرانى فى المدن المصرية. وتتمثل أهم سمات هذا الزحف العمرانى فى قصور التخطيط، وإختلال التوازن فى أنماط وخصائص النمو، وعدم كفاية الخدمات أو حسن توظيفها وكذلك القصور الشديد فى إدارة العمران وخاصة تخطيط عمليات التوسع العمرانى والتى تشمل تحديد أنماط التوسع ومسبباته وربط ذلك بسياسات التوسع العمرانى وسبل تنفيذها. ونظراً لأن عملية إدارة العمران تعتمد بشكل أساسى على حداثة وموثوقية البيانات المكانية وغير المكانية وكفاءة تحليلها والإستنتاج المفيد منها، فإنه يمكن توظيف التقنيات الحاسوبية المتقدمة وخاصة الوسائط الذكية فى التغلب على هذه الفجوة والمساهمة فى رفع كفاء إدارة العمران بالمدن المصرية.
ولمحلولة الإرتقاء بإدارة العمران وخاصة إدارة التوسع العمرانى فى مصر، فإن هذا البحث يهدف إلى تحليل دور تقنية المعلومات والإتصالات بوجه عام، والوسائط الحاسوبية الذكية بوجه خاص فى توفير المعرفة اللازمة ودعم صناع ومتخذى القرار فى رفع كفاءة إدارة العمران، مع تقديم نماذج عملية لتوظيف الوسائط الحاسوبية الذكية وبيان دورها فى الإرتقاء بإدارة التوسع العمرانى بالمدينة، ودعم الإدارة الفاعلة والتفاعلية لعمليات تخطيط التوسع العمرانى بالمدينة. وتتمثل سمات الوسائط الحاسوبية الذكية فى كفاءة وعمق التحليل بناءً على أنماط الزحف والتوسعات العمرانية السابقة وإستقراء الأنماط المستقبلية مع تقديم أفضل البدائل للنمو العمرانى والسبل المثلى لإدارته مع الأخذ فى الإعتبارات الإستراتيجيات التنظيمية والمخططات الهيكلية والمقومات الإقتصادية والسمات والسلوكيات الإجتماعية للسكان.
ويخلص البحث إلى أن توظيف الوسائط الحاسوبية الذكية سيساهم بشكل كبير فى الإرتقاء بإدارة التوسع العمرانى فى المدينة وذلك من خلال تحديد أنماط التوسع وإستنباط المسببات التى تفرز وتشكل تلك الأنماط وتحديد أفضل السبل لمجابهتها، مع تفهم وعرض وتحليل نتائج تطبيق السياسات والتوسعات العمرانية بالمدينة. وتساهم كذلك فى تحليل أنماط وخصائص النمو العمرانى مما سيدعم المخططين ومتخذى القرارات الخاصة بالتنمية والإدارة العمرانية للمدينة فى رفع كفاءة إدارة العمران.

الكلمات المفتاحيه: إدارة التوسع العمرانى، التقنيات الحاسوبية الحديثة، إدارة العمران، الوسائط الحاسوبية الذكية

أ. المقدمة

يتم تحديد التوسع فى المناطق العمرانية عن طريق التفاعل بين ثلاثة أنواع من العوامل: المحددات المادية للجغرافيا والبيئة، الطلب على الأراضى من قبل الأسر والشركات الذين يسكنون المدينة، والمحددات السياسية التى تنظم استخدام الأراضى والتفاعلات المكانية فى المدينة. وستكون أكثر النماذج إفادةً فى إدارة التوسع العمرانى تلك التى تتضمن كل هذه العوامل ، والتى تقيم نسبة مساهمة كل عامل فى التوسع العمرانى وإدارة العمران، وذلك لضرورة تحديد آثارها المترتبة على البيئات المادية والاقتصادية، وسياسات التوسع العمرانى. ويوجد قصور فى شمولية دراسة هذه العوامل على إدارة المدن وتوسعها العمرانى. وعلى الرغم من وجود بعض النماذج فلقد إقتصرت معظم التحليلات على تقييم الأثراللاحق لمدى نوع معين من السياسات وفعاليتها فى التأثير على هيكل العمران. ولا يزال هذا النوع من التحليل مفيداً لأنه يقدم معلومات مهمة لصناع السياسات حول عناصر النجاح والإخفاق التى حدثت بالفعل. ولكن الذى يمثل قيداً على الإستفادة من هذا التحليل هو مدى مناسبة السياق التحليلى، حيث ركزت تلك التحليلات التى أجريت عادة على كل مدينة على حدة، وبشكل كامل تقريبا على المدن الواقعة فى البلدان الصناعية. ولكن لكى يمكن تطبيق نتائج تلك التحليلات على البلدان النامية أو التى تمر بمرحلة انتقالية فإن الأمر يحتاج إلى مزيد من الدراسة والبحث (Angel et al , 2005).

ولذلك فإنه يجب تحديد القوى والعوامل التى تشكل التوسع العمرانى فى المدن، لأن ظاهرة التوسع العمرانى والعوامل المؤدية لها لا تزال غير مفهومة بصورة شمولية وبشكل متكامل. ولقد طرحت مجموعة متنوعة من العوامل على أنها تسهم فى التوسع الحضرى ومنها: تزايد عدد السكان من المناطق الحضرية؛ الهروب من مشاكل وسط المدينة؛ وإنجذاب سكان المدن إلى اطراف المدن نظراً لتوفر المساحات الخضراء والمفتوحة؛ فشل السياسة المتعلقة بقوانين إستخدامات الأراضى؛ قروض تمويل الإسكان؛ والضرائب العقارية؛ ازدحام وسائل النقل داخل المدينة؛ زيادة الدخل لنسبة معينة من الأسر؛ الاستثمار الأجنبى المباشر والهيكل الصناعي؛ وتزايد توفر السيارات ووسائل النقل الخاصة، وغيرها من العوامل. لذا فإنه من الأهمية بمكان بالنسبة لصناع السياسات ومتخذى القرارات فى إدارة التوسع العمرانى تفهم المساهمات النسبية للعوامل المختلفة للتوسع العمراني. ويعد هذا أمراً بالغ الأهمية ولا سيما فى سياق البلدان النامية، حيث أن التنوع الهائل من الظروف الاقتصادية، وتاريخها، ومستويات البنية التحتية، وأنماط

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مخرجات المنظومة

المنصة تحتوى على نموذج إلكترونى مقسم للقطاعات المختلفة (البيانات الاولية – المخطط القومى – المخططات الاستراتيجية – المخططات التفصيلية والاشتراطات – المخالفات – إصدار التراخيص – الإشغال والصيانة)

من قاعدة البيانات المكانية يتم التأكد من تكامل البيانات وتكويد كافة المبانى والأراضى على المنصة من حيث (الاستعمال – اشتراطات البناء- التبعية / الملكية – موقفه من المخالفات أو أ استبعاد قانونى أو تعاملات خاصة - الصيانة الدورية)

يتم تطبيق نتاج المخططات التفصيلية والكودات المختلفة على الأراضى والمبانى بشكل إلكترونى ، مع تسهيل حصول المواطنين على البيانات و تيسير عمل الإجراءات .

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عدم توفر الكفاءات والخبراء في مجال البنية المؤسسية التكنولوجية فى بعض القطاعات.	●	◍	○	◍	●
احتياج المنظومة العمرانية فى مصر إلى تحديثات مستمرة نتيجة نمو العمران المستمر.	●	◍	○	◍	●
حماية سرية المعلومات وتداولها	●	◍	○	◍	●

النتائج

يتضح من الجدول السابق أن كل البدائل المطروحة تدعم مواجهة مكامن الضعف و المخاطر ، وأن قاعدة البيانات المدمجة على مستوى الجمهورية جمعت أكبر عدد من النقاط ولكنها تحتاج إلى شبكات إنترنت فائقة السرعة كما انها ذات تكلفة مرتفعة وذلك يحتاج إلى دراسة تفصيلية من قبل متخصصى المعلومات والاتصالات .

التوصيات

يوصى البحث بالبدء فى اتخاذ الخطوات التنفيذية الفنية التالية لإعداد المنصة الإلكترونية لإدارة البيئة العمرانية فى المدن المصرية ،حتى يمكن الحد من المخاطر ، ودعم قدرة المدينة المصرية على التغير والاستجابة للتقدم العلمى والتكنولوجى وذلك من خلال الخطوات التنفيذية الأتية :

الخطوة الأولى : التهيئة الزمنية للقاعدة التشريعية

تتضمن وضع إطار زمنى لتعديلات القوانين واللوائح حيث يمكن تصنيف القاعدة التشريعية إلى

القوانين الوضعية يتم التغيير أو التعديل فيها كل عشر سنوات مثلا ، بينما يتم تغيير اللوائح الداخلية للجهات المختلفة على فترات ثابتة أقل ، مع إدراج القرارات الرئاسية والوزارية المتغيرة على المنظومة بشكل دورى وعلى فترات متباعدة مقننة .

الخطوة الثانية : التهيئة الزمنية لتتابع وتسلسل المخططات

تقنين تتابع زمنى لتحديث المخططات العمرانية على المستويات المختلفة على سبيل المثال :

تحديث المخطط القومى كل عشر سنوات ، يتبعه تحديث مخططات المدن والقرى فى حدود سنتين من تعديل المخطط القومى ، ثم تعديل المخططات التفصيلية فى حدود سنتين من تحديث المخططات الهيكلية . وذلك لضمان عدم التضارب فى الإجراءات التسلسلية للتنمية والبناء .

الخطوة الثالثة : تحويل القوانين واللوائح والكودات والادلة الاسترشادية إلى أدلة عمل الكترونية

يتم تحويل كافة التشريعات المعمول بها من (قوانين – لوائح داخلية – اشتراطات – قرارات جمهورية - قرارات ووزارية – كودات) إلى أدلة عمل إلكترونية .

تحويل المخططات بما تشمله من حصر مكانى على الصور والخرائط الجوية ونظم المعلومات الجغرافية إلى منصات إلكترونية .

ادخال الأبعاد الفنية للقوانين والكودات والمؤشرات الحضرية بشكل إلكترونى مما يتيح للمنظومة رفض التعامل في حالة عدم ملائمته للأبعاد الفنية .

تدعيم قاعدة البيانات المعدة لدى الهيئة العامة للتخطيط العمرانى بقاعدة بيانات المخططات التفصيلية واستخراج شهادات صلاحية الموقع للبناء من الناحية التخطيطية ثم تراخيص البناء بشكل إلكترونى دون تدخل بشرى .

2. تقديم الخدمات المختلفة للمواطنين والمطورين العقاريين وجميع ذوى الشأن من الأكاديميين والملاك والمستأجرين وأصحاب المصالح المختلفة ومحاربة الروتين.
3. تحقيق الانضباط ومواجهة الفساد وضمان تطبيق القانون والمخالفات على الجميع بشكل يضمن المساواه والعدل تحقيق الشفافية وتفعيل مبدأ المساءلة والمحاسبة.
4. توحيد المفاهيم والإجراءات وتحقيق الكفاءة والفعالية في استخدام الموارد الحكومية والحد من الآراء والأهواء البشرية.

ب .بدائل قواعد البيانات الخاصة بالمنظومة

يمكن إيضاح المتغيرات التى يمكن من خلالها اختيار قاعدة المعلومات الأكثر ملائمة عن طريق :

المتغير المكانى : استخدام قاعدة بيانات موحدة على مستوى الجمهورية / على مستوى المحافظات / على مستوى كل مدينة

المتغير الهيكلى : قاعدة بيانات خاصة بكل قطاع (التخطيط العمرانى – أعمال البناء – القطاع العقارى – قطاع تقنين الملكيات) / قاعدة بيانات مدمجة تشتمل كافة بيانات القطاعات الأربعة لكل قطعة أرض أو مبنى)

وفى ضوء الربط بين البدائل المتاحة لقواعد البيانات وتحليل مكامن (الضعف– المخاطر) لمنظومة إدارة البيئة العمرانية فى المدن المصرية يمكن الخروج بالجدول التالى

جدول رقم (3) : مقارنة البدائل المتاحة لقواعد البيانات ومدى قدرة كل بديل على التصدى لمكامن الضعف والمخاطر لمنظومة إدارة البيئة العمرانية فى المدن المصرية .

المصدر : تجميع الباحثة

مكامن الضعف والمخاطر	المتغير المكانى			المتغير الهيكلى	
	على مستوى الجمهورية	على مستوى المحافظات	على مستوى كل مدينة	قاعدة بيانات خاصة بكل قطاع	قاعدة بيانات مدمجة
ترابط قواعد البيانات بين الجهات المختلفة	◍	◍	●	◍	●
تدعيم خطط العمل بجدول زمنى يضمن نجاح المنظومة من حيث تتابع من المخطط الاقليمى الى مخططات المدن وانتهاء بمنظومة تراخيص المبانى	●	◍	◍	●	●
توائم المنظومة مع التعديلات المستمرة للقوانين .	◍	◍	●	●	◍
ملائمة المنظومة لبعض القطاعات التى ينظم عملها قرارات جمهورية أو وزارية متغيرة .	●	◍	●	●	◍
قدرة الشبكات الحالية على تحمل السرعات المطلوبة لتسهيل تبادل المعلومات بين مختلف الأنظمة الحكومية.	◍	◍	●	●	◍

القطاع العقارى	وزارة الإسكان والمرافق والمجتمعات العمرانية شركات إدارة الأصول الحكومية المحافظات	عقود تخصيص عقود بيع نهائية	لوائح داخلية - تقييم عقارى		
قطاع التصرفات العقارية	وزارة العدل – مكاتب الشهر العقارى	عقود ملكية نهائية	لوائح داخلية	لا يوجد	

خ. نحو وضع منهجية لتدشين منصة إلكترونية لإدارة البيئة العمرانية للمدن المصرية

أستعرض البحث فى الجزء السابق منظومة إدارة البيئة العمرانية فى مصر ، وركز البحث على رصد وتحليل الأبعاد الإلكترونية التكنولوجية التى صاحبت تلك المنظومات فى الآونة الأخيرة ، ويهدف البحث فى الجزء التالى إلى مناقشة المتغيرات المختلفة التى يمكن أن تؤثر فى طبيعة المنظومة وإستداماتها وقدرتها على أداء وظيفتها بشكل لائق ، ومن ثم يجب الوقوف على مكامن (القوة – الضعف – الفرص – المخاطر) لمنظومة إدارة البيئة العمرانية فى المدن المصرية عن طريق المنصات الإلكترونية والتى يوضحها التحليل الرباعى فى الجدول التالى :

جدول رقم (2) : التحليل الرباعى لاستخدام المنصات التكنولوجية فى إدارة البيئة العمرانية للمدن المصرية

القوه	الضعف
1. تبنى الدولة المصرية جهودا واضحا لحصر المنظومة العمرانية والعقارية. 2. وجود منظومة تشريعية متسلسلة بدءا بقانون البناء الموحد وإنتهاءا باللوائح الداخلية لكل هيئة . 3. وجود قاعدة عريضة من البيانات لدى كل جهة . 4. تم إعداد دلائل إرشادية تنظم وتقنن الأعمال المختلفة . 5. تم إعداد كودات فنية موثقة لكافة الأعمال المتعلقة بمنظومة التخطيط العمرانى والبناء.	1. عدم ترابط قواعد البيانات بين الجهات المختلفة . 2. خطط العمل غير مرتبطة بجدول زمنى يضمن نجاح المنظومة من حيث التتابع من المخطط الاقليمى الى مخططات المدن وانتهاء بمنظومة تراخيص المبانى . 3. التعديلات المستمرة للقوانين مما يؤثر على كفاءه المنظومة. 4. وجود بعض القطاعات لا ينظم عملها قوانين أو لوائح ثابتة وتنظم بقرارات جمهورية أو وزارية . 5. عدم تحمل الشبكات الحالية السرعات المطلوبة لتسهيل تبادل المعلومات بين مختلف الأنظمة الحكومية.
الفرص	**المخاطر**
1. تبنى الكثير من الهيئات للأنظمة التكنولوجية فى بعض قطاعاتها . 2. إطلاق القمريين المصريين طيبة و كيوب سات وما لهما من دور مهم فى رفع سرعات شبكة الإنترنت و رصد العمران بشكل دورى . 3. تفعيل منظومة التطبيقات الإلكترونية فى بعض الاعمال . 4. وجود هيكل مؤسسى قوى ومتزن . 5. توافر الخرائط وتكنولوجيا الرصد .	1. عدم توفر الكفاءات والخبراء في مجال البنية المؤسسية التكنولوجية فى بعض القطاعات. 2. لا يوجد قوانين تحمى سرية المعلومات وتداولها . **3.** احتياج المنظومة العمرانية فى مصر إلى تحديثات مستمرة نتيجة عدم القدرة على السيطرة على نمو العمران .

أ. الأهداف الرئيسية للمنظومة

تكمن الأهداف الرئيسية للمنظومة فى :

1. دعم منظومة إدارة البيئة العمرانية فى المدن المصرية المختلفة وتوجيه وتنظيم ومراقبة أعمال التخطيط العمرانى والبناء وزيادة القدرة على التخطيط السليم.

يوضح الجدول رقم (1) التالى تجميع لجميع القطاعات المسئولة عن إدارة وتشكيل البيئة العمرانية في مصر

جدول رقم (1) : تجميع القطاعات الرئيسية والثانوية لمنظومة الإدارة العمرانية في مصر. (المصدر : تجميع الباحثة)

القطاعات الرئيسية	الأجهزه المعنية	المخرجات	الأدوات	فترة التحديث	القطاعات المتداخلة التشابكية
قطاع جمع البيانات والمعلومات الجغرافية	الهيئة القومية للاستشعار عن بعد وعلوم الفضاء	صور الأقمار الصناعية خرائط مساحية للمدن والقرى	الأقمار الصناعية	لا يوجد فترات ثابتة	
	الجهاز المركزى للتعبئة العامة والإحصاء	إحصاءات عن أعداد المبانى وبعض خصائصها فى المدن والقري	التعداد العام الكارت الذكى	كل 10 سنوات	
قطاع التخطيط العمرانى	الجهاز الوطني لتخطيط استعمالات أراضي الدولة	خرائط استخدامات أراضي الدولة خارج الزمام	نظم المعلومات الجغرافية	لا يوجد فترات ثابتة	
	الهيئة العامة للتخطيط العمرانى	المخطط القومى المخططات الهيكلية للمدن والقرى	مؤشرات المرصد الحضرى دليل عمل مرجعى	ساري لعام 2052 يتم تحديثها كل خمس سنوات	- خريطة الاستثمار - لجنة استرداد أراضى الدولة - لجان التصالح بالمحافظات - هيئة استصلاح الأراضى
	هيئة المجتمعات العمرانية الجديدة	مخططات عمرانية للمدن الجديدة مخططات عمرانية لامتدادات المدن الجديدة	قانون البناء الموحد اشتراطات خاصة بكل مدينة قرارات وزارية	لا يوجد	- لجنة استرداد أراضى الدولة - لجان التصالح بالهيئة - هيئة استصلاح الأراض
قطاع أعمال البناء	المحافظات الأحياء مراكز المدن أجهزة المدن الجديدة	المخططات التفصيلية شهادة بيان بصلاحية الموقع للبناء من الناحية التخطيطية	قانون البناء الموحد اشتراطات خاصة بكل مدينة دلائل أعمال التخطيط التفصيلى	لا يوجد	
		شهادة صلاحية الأعمال للترخيص	قانون البناء الموحد الكودات الفنية	ثلاثون يوما	
		شهادة صلاحية المبنى للإشغال	قانون البناء الموحد	لا يوجد	

شكل رقم (7) : نماذج لبعض تطبيقات الخدمات العقارية على مواقع الجهات الإدارية الحكومية

خامسا : قطاع الحقوق والملكيات والتصرفات العقارية

في إطار مشروع التحول الرقمى الذى تشهده الدولة المصرية حاليا ، وفى ضوء أهمية منظومة الشهر العقارى في تسجيل العقارات وضمان الحفاظ على حقوق الملكية للأفراد ، فقد تم تدشين عدة مشروعات وخدمات لدعم المنظومة التكنولوجية في الحصول على بعض الخدمات للتيسير على المواطنين وشملت هذه الخدمات :

- تمكين المواطن من سداد رسوم الخدمات إلكتروني.
- توصيل الوثائق لطالبى الخدمات الإلكترونية إلى محال إقامتهم من خلال مكاتب البريد .
- تصميم وتطوير البرامج اللازمة للربط الإلكترونى مع قواعد بيانات الشهر العقارى .
- تحديث قاعدة بيانات الشهر العقارى أول بأول ببيانات المدفوعات ، ويوضح شكل رقم (8) : نماذج لبعض تطبيقات خدمات الشهر العقاري على مواقع الجهات الإدارية الحكومية

شكل رقم (8) : نماذج لبعض تطبيقات خدمات الشهر العقاري على مواقع الجهات الإدارية الحكومية

ويتولى المركز إعداد وتحليل المؤشرات الحضرية واستخدامها فى عمليات إعداد المخططات العمرانية ، كما يتولى متابعتها وتحديثها .

ت. التخطيط التفصيلى

التخطيط التفصيلى هوالعملية التى يتم من خلالها تحويل الأفكار والمقترحات التخطيطية الواردة فى المخططات الهيكلية إلى صورة تنفيذية ، ويحوى مشروعات محددة قابلة للتنفيذ مع تقديم المستندات والاشتراطات الخاصة بتنفيذ هذه المشروعات .

وتعتبر مرحلة التخطيط التفصيلى مرحلة انتقالية ما بين المخططات الهيكلية وإصدار تراخيص البناء ، وبالتالى فإنها تعتبر حلقة الوصل ما بين الهيئة العامة للتخطيط العمرانى ووزارة التنمية المحلية المتمثلة فى المحافظات .

وقد قامت الهيئة العامة للتخطيط العمرانى بإعداد دليل عمل المخططات التفصيلية بهدف تسهيل وتقنين عمل الجهات الإدارية المحلية و تيسير و تمكين المواطنين من التعامل على أراضيهم ، وقد تتضمن الدليل الضوابط والاشتراطات التخطيطية لكافة استخدامات الأراضى المناطق (السكنية – التجارية – الصناعية – الطرق – أماكن الانتظار ....) ، كما تتضمن الاشتراطات البنائية لكافة انواع المبانى بمختلف استعمالاتها من (سكنى – مدرسة – إدارى – بنوك – مسجد ....)

والمخرجات النهائية من التخطيط التفصيلى هى بيان معتمد من الجهة الإدارية بصلاحية الموقع للبناء من الناحية التخطيطية والاشتراطات البنائية .

ثالثا : قطاع أعمال البناء

هو أحد القطاعات الحيوية فى منظومة إدارة البيئة العمرانية ، حيث انه الخطوة الأخيرة والملموسة فى دخول المخططات حيز التنفيذ والبناء الفعلى على أرض الواقع ، ويتولاه إدارات الأحياء والمراكز المختلفة بالمدن القائمة ، و أجهزة المدن التابعة لهيئة المجتمعات العمرانية الجديدة . وهو قطاع يتميز بمحدودية مخرجاته النهائية مقارنة بقطاع التخطيط العمرانى والتى تتم على مرحلتين طبقا لقانون البناء الموحد ،. ويكون لكل مرحلة مخرج رسمى .

المرحلة الأولى الحصول على شهادة صلاحية الأعمال للترخيص

يقدم طلب الحصول على الترخيص من المهندس أو المكتب الهندسى المعتمد إلى الجهة الإدارية المختصة بشئون التخطيط والتنظيم مرفقا به المستندات اللازمة ، ثم تقوم الجهة الإدارية بالتأكد من مطابقتها للاشتراطات التخطيطية والبنائية للموقع والكودات والمواصفات الفنية المنظمة ، وتوفير الاماكن المخصصة لإيواء السيارات الذى يتناسب عددها والمساحة اللازمة لها وتصميمها مع الغرض من المبنى ، وذلك وفقا للاشتراطات التخطيطية للمنطقة وأحكام كود الجراجات فى الكود المصرى و اشتراطات الأمان للمنشآت متعددة الأغراض – وبعد استيفاء كافة الاشتراطات تقوم الجهة الإدارية بمنح شهادة صلاحية الأعمال للترخيص . (المواد من 40 إلى 44 قانون البناء الموحد 2008)

المرحلة الثانية :الحصول على شهادة صلاحية المبنى للإشغال

بعد إتمام تنفيذ الأعمال الصادر بها الترخيص يقوم المهندس المشرف على التنفيذ بإصدار شهادة صلاحية المبنى للإشغال تفيد أنه تم التنفيذ مطابقا للترخيص المنصرف والكودات المنظمة ولأحكام القانون ولائحته التنفيذية ، وتودع هذه الشهادة بالجهة الإدارية المختصة بشئون التخطيط والتنظيم مرفقا بها نسخة معتمدة من المهندس المشرف للرسومات المنفذة فعليا بالطبيعة. (المادة 62 قانون البناء الموحد 2008)

رابعا : القطاع العقارى

هو القطاع المسئول عن وضع الأليات والشروط العقارية المختلفة لتقييم و بيع وتأجير الأراضى والوحدات السكنية التى تقوم الجهات الحكومية بتنميتها والإشراف عليها ، وممثله بشكل أساسى فى هيئة المجتمعات العمرانية الجديدة ، المحافظات ، شركات إدارة الأصول العقارية المملوكة للدولة .

ويتولى بنك التعمير والإسكان بشكل أساسى مسئولية تحصيل مبالغ وأقساط الأراضى والوحدات السكنية التى تقوم هيئة المجتمعات العمرانية بطرحها على مستوى الدولة المصرية سواء طبقا للألية التى تطرحا الهيئات أو طبقا لقانون التمويل العقارى ، وذلك باستخدام الأليات البنكية المعتادة والمعتمدة من البنك المركزى المصرى .

ويوضح شكل رقم (7) نماذج لبعض التطبيقات التى تم تدشينها على المواقع الإلكترونية للجهات المختلفة.

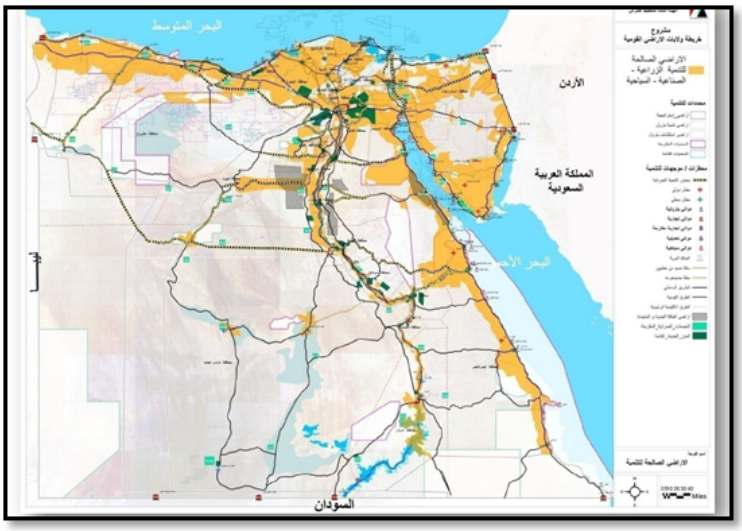
أ. إعداد المخطط الاستراتيجي القومى للتنمية العمرانية 2017

اعتمد فى إعداده على شقين من المعلومات

(1) خرائط مساحية وجوية عن صلاحية الأراضى لأوجه التنمية المختلفة .
(2) منظومة البيانات المتاحة لدى الهيئة العامة للتخطيط العمرانى .

وتكون المخطط من مخرجات عباره عن

- خرائط العوامل وبناء النماذج و خرائط مؤشرات الصلاحية.
- سيناريوهات لأنسب استخدام للأراضى لأوجه التنمية المختلفة.
- إعداد الخرائط الخاصة بالقطاعات المختلفة للتنمية الاساسية (الزراعة - الصناعة – السياحة – العمران) .
- إعداد الخرائط الموضحة لمؤشر درجات الصلاحية للأراضى المؤهلة لكل استخدام .



شكل رقم (6) : نموذج لإعداد خرائط رقمية لمؤشر درجات الصلاحية للأراضى المؤهلة لكل استخدام

المصدر : المخطط الاستراتيجي القومى 2017

ويوضح شكل رقم (6) : نموذج لإعداد خرائط رقمية لمؤشر درجات الصلاحية للأراضى المؤهلة لكل استخدام (المخطط الاستراتيجي القومى للتنمية العمرانية ، 2017)

ب. إعداد المخططات الاستراتيجية للمدن والقرى والعزب والنجوع

تم الانتهاء من اعتماد المخططات الاستراتيجية لعدد 84 مدينة ، كما تم الانتهاء من إعداد المخططات الاستراتيجية لعدد 42 مدينة وجارى اتخاذ إجراءات الاعتماد لها ، وجارى العمل في 47 مدينة بالإضافة لعدد 52 مدينة سيتم إعداد المخططات لها في الخطة المستقبلية من أصل 231 مدينة مصرية .

تم إعداد المخططات الاستراتيجية لعدد 4409 قرية من أصل 4673 قرية ، وذلك باستخدام نظم المعلومات الجغرافية على مستوى الجمهورية . (http://gopp.gov.eg/)

ويتم عرض صور المخططات الاستراتيجية والأحوزة العمرانية للمدن على الموقع الرسمى للهيئة على شبكة الإنترنت حتى يتمكن المواطن من الاستفادة بها .

وقد تم تدشين عدة مشروعات لدعم العمل بقواعد البيانات وأسس التخطيط السليمة فى الهيئة العامة للتخطيط العمرانى عن طريق :

مشروع تحديث بيئة العمل الإلكترونية بالهيئة ويهدف إلى :

- توفير بيئة وبرامج موحدة تتناسب وحاجة العمل وإدارة مركزية للخوادم وأجهزة المستخدمين .
- توفير الحماية لجميع مكونات الشبكة وما تحمله من بيانات ومعلومات .
- تدرج مستويات الاطلاع والتحكم .
- تحميل جميع البيانات على وحدة تحكم مركزية .

تدشين و إنشاء و المرصد الحضرى

عبارة عن كيان اعتباري تابع للهيئة يقوم بالتنسيق بين الجهات المعنية بعمليات التنمية العمرانية فى مصر على المستويين المركزى والمحلى من خلال جمع البيانات وتحليلها لإنتاج مؤشرات عمرانية ولإمداد راسمى سياسات التنمية ومتخذى القرار بالمعلومات مساهمةً فى إعداد وتطوير السياسات الوطنية العمرانية.
وقد تم استخدام نموذج رقمى موحد معد من قبل مركز الأمم المتحدة للمستوطنات البشرية لكل من المستويين الوطنى والمحلى ، وتم إعداد بعض المؤشرات والنتائج لكل من مدينتى الإسماعيلية وطنطا وقد تضمنها التقرير الوطنى لجمهورية مصر العربية المقدم لمؤتمر اسطنبول+5 عام 2001

ويوضح شكل رقم (5) : نموذج لحصر المبانى والأراضى بنطاق محافظة الإسماعيلية ضمن قاعدة بيانات تعداد 2017 (الجهاز المركزى للتعبئة العامة والإحصاء، 2019)

Distribution of Buildings by Type — توزيع المبانى طبقا لنوع المبنى

Table :1 — جدول : 1

Ismailia Governorate — محافظة الإسماعيلية

Kism / Markaz		أرض مسورة غير مستغلة Fenced and Unused Land	Building Type نوع المبنى: مبنى غير واضح المعالم Nondescript Building	المبانى الحوائزية Makeshift Buildings	**مبانى عادية للعمل **Regular Buildings for Work Purposes	*مبانى عادية للسكن * Regular Buildings for Housing Purposes	إجمالى المبانى Total Buildings	قسم / مركز	
Total Governorate	Urban	3,503	699	1,775	5,109	64,754	75,840	حضر	إجمالى المحافظة
	Rural	8,901	4,178	1,383	12,215	156,332	183,009	ريف	
	Total	12,404	4,877	3,158	17,324	221,086	258,849	جملة	
Kism Awal Ismailia	Urban	134	32	204	848	3,410	4,628	حضر	قسم أول الاسماعيلية
	Total	134	32	204	848	3,410	4,628	جملة	
Kism Thani Ismailia	Urban	585	93	606	759	19,264	21,307	حضر	قسم ثان الاسماعيلية
	Total	585	93	606	759	19,264	21,307	جملة	

شكل رقم (5) : نموذج لحصر المبانى والأراضى بنطاق محافظة الإسماعيلية ضمن قاعدة بيانات تعداد 2017

المصدر : الجهاز المركزى للتعبئة العامة والإحصاء ، 2019

ثانيا : قطاع التخطيط العمرانى

(1) الجهاز الوطني لتخطيط استعمالات أراضي الدولة

تم إنشاء الجهاز الوطني لتخطيط استعمالات أراضي الدولة بقرار جمهوري رقم 153 لسنة 2001 وذلك بهدف

(1) تخطيط استخدامات أراضي الدولة وضمان التنسيق الكامل بين أجهزة الدولة.

(3) متابعة تنمية هذه الأراضي وإحكام الرقابة عليها من التعديات .

(4) دراسة المشروعات القومية الكبرى ضمانا لتعظيم العائد ودفعا للاستثمار ووصولاً لمعدلات التنمية المرجوة من خلال السياسة العامة للدولة ، ومن أهم اختصاصات المركز فيما يتعلق بالسيطرة على الأراضي من التعديات :

1. حصر وتقويم أراضي الدولة خارج الزمام وإعداد التخطيط العام لتنميتها واستخداماتها في إطار السياسة العامة للدولة.
2. إعداد خرائط استخدامات أراضي الدولة خارج الزمام في جميع الأغراض بعد التنسيق مع وزارة الدفاع.
4. توثيق حدود كردونات المدن والقرى وأعداد الدراسات الخاصة بتوسيعاتها أو تعديلها سواء للمحافظات التي ليس لها ظهير صحراوي. (http://www.tadamun.co/)

(2) الهيئة العامة للتخطيط العمرانى

هى الجهة المسئولة عن رسم السياسة العامة للتخطيط والتنمية العمرانية المستدامة، وإعدادها مخططات وبرامج هذه التنمية على المستوى القومى والإقليمى والمحافظة، ومراجعة وإقرار المخططات العمرانية علي المستوى المحلى فى إطار الأهداف والسياسات القومية والإقليمية. وذلك من خلال الاعتماد على الخرائط المنتجة من جهاز استخدامات أراضى الدولة ومركز الاستشعار عن بعد ، ثم من خلال المسوحات العمرانية للهياكل العمرانية للمدن والقرى التى تقوم بها الهيئة عند إعداد المخططات المختلفة – تقوم بإنتاج الخرائط المنبثقة من نظم المعلومات الجغرافية ، والتى تسجل الإحداثيات المكانية لجميع قطع الأراضى والمبانى داخل نطاق القطاع الإدارى التى تقوم بتخطيطه ، ثم تقوم بتجميعها على مستوى الجمهورية في قاعدة بيانات موحدة ، وتقوم الهيئة بإعداد المخططات الاستراتيجية القومية والمخططات الهيكلية للمدن والقرى القائمة على النحو التالى :

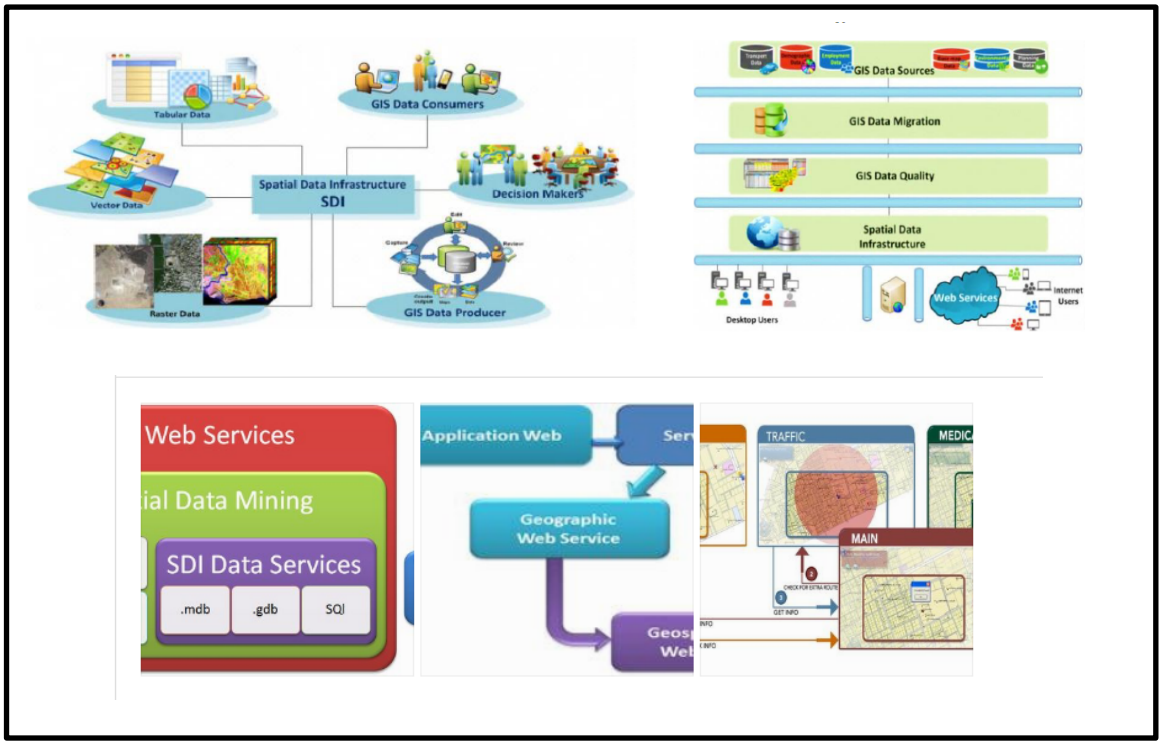
- استخدام نظم المعلومات الجغرافية لإنشاء شبكات المعلومات البيئية .
- إنتاج خرائط مساحية للمدن والقرى باستخدام التصوير الجوى والفضائى .

ويتزامن البحث بالتزامن مع إطلاق قمرين صناعيين مصريين جديدين فى نوفمبر 2019 هما :
طيبة ١ : من المقرر أن يسهم فى تطوير خدمات الاتصالات والإنترنت فى مصر ، ويضاعف من السرعات الحالية والتى تقف حائلا دون تبنى الأنظمة التكنولوجية المختلفة بشكل كامل .
كيوب سات : يختلف تماما عن القمر الصناعى طيبة 1، فهو من نوعية الأقمار صغيرة الحجم فى مدار على ارتفاع 400 كيلومتر فقط ، وهو على شكل مكعب يزن حوالى كيلو جرام، ويحتوى على كاميرا صغيرة يمكنها تصوير الأرضى والمبانى وتقدير ارتفاعاتها وإرسال الصور والبيانات إلى محطات الاستقبال فى القاهرة.

أ. **مشروع منصة البنية المعلوماتية المكانية** National Spatial Data Infrastructure in Egypt

تبنت وزارة التخطيط والمتابعة والإصلاح الإدارى بالتعاون مع الهيئة القومية للاستشعار عن بعد مشروع منصة البنية المعلوماتية المكانية الذى يهدف إلى توفير كافة البيانات والمعلومات المكانية والجغرافية و مشاركتها وتبادلها بين الجهات الحكومية و توحيد المواصفات المستخدمة فى إنشاء ونشر الخرائط مما يحقق إدارة أفضل للأصول والموارد الحكومية وتحقيق رؤية مصر 2030 وتفعيل التخطيط الشامل لأنشطة الدولة .

ويشمل المشروع فى مرحلته الأولى توفير تصوير فضائى محدث و استغلاله فى إنتاج خرائط مساحية جديدة لمساحة 49 ألف كيلو متر مربع ، ويوضح شكل رقم (4) مراحل تكوين نظم المعلومات المكانية Special Data Infrastructure (Amr Ali ، 2016)



شكل رقم (4) مراحل تكوين نظم المعلومات المكانية Special Data Infrastructure

المصدر : (Amr Ali ، 2016)

(2) الجهاز المركزى للتعبئة العامة والإحصاء

قام الجهاز المركزى للتعبئة العامة والإحصاء بإجراء **التعداد العام للسكان والمنشآت ضمن تعداد عام 2017 وقد تم تحديث البيانات عام2019** ، وقد أستحدث تجربة تدشين الكارت الذكى لكل وحدة تعداديه أثناء إجراء التعداد العام فى 2017 ، وشمل تكوين قاعدة بيانات عن جميع المنشآت وتبويبها وتصنيفها فى قاعدة بيانات .

ج. مخرجات النظام

حلت البوابة الإلكترونية للبنية المؤسسية الوطنية بشكل كامل لكافة الخدمات الحكومية السابقة . كما سمح للجهات الحكومية الاطلاع على المعلومات واستخدامها من خلال البوابة .

ح. الدروس المستفادة

قدمت التجربة الكورية الرائدة في البنية المؤسسية الوطنية والتي توجت بجائزة الأمم المتحدة للخدمة الحكومية مجموعة من الدروس والفوائد لتبني وتطبيق البنية المؤسسية في القطاع الحكومي. فيما يلي أهم الدروس المستفادة:

1. تم تكوين **ائتلاف من ثلاث جهات حكومية** تشمل وزارة المعلومات والاتصالات ووزارة الإدارة الحكومية والشئون الداخلية وكذلك المؤسسة الوطنية للمعلومات لإدارة تبني وتطبيق البنية المؤسسية لدى الجهات الحكومية. هذا الائتلاف كان له دور كبير وفعالية عالية في تحقيق النتائج
2. إطلاق مجموعة من **المشاريع التجريبية.** هذه المشاريع وإن كانت محدودة من حيث العدد إلا أنها أسهمت بشكل كبير في التعرف على التحديات والمخاطر والإشكالات الموجودة على أرض الواقع ومن ثم، تم إنتاج حلول استباقية وإدماجها في القانون قبل إصداره.
3. أهمية عامل **الوقت والاستمرارية** ودعم الحكومة كمفاتيح فعالة لتحقيق نتائج ملموسة.
4. تم استبدال التشريعات والسياسات التي كانت تدعم التبني بأخرى تدعم الاستخدام وهذا يبين **تفاعل مستمر بين منظومة السياسات وتطبيق البنية المؤسسية** في نجاح برنامج البنية الوطنية.
5. **التعديل المستمر والسريع** للسياسات كان محوري المؤسسية الوطنية.
6. **توزيع الأدوار** بهذا الشكل يؤدي إلى رفع مستوى الثقة والتعاون بين الجهات الحكومية ويخفف عبء المسؤولية على الجهة التي تدير وترعى البرنامج.
7. **بناء القدرات والكفاءات** له دور حيوي في تنفيذ البنية المؤسسية داخل الجهات الحكومية.
8. تبني منهجية عملية وواقعية **توازن بين الإمكانات والموارد المحدودة** والأهداف المرجوة.
9. ممارسات المشاركة والحوكمه وإدارة المخاطر المتوقعة في مسيرة البنية المؤسسية الوطنية لها أثر كبير في تحقيق النجاح.
10. **تقسيم البرنامج طويل المدى إلى مراحل صغيرة** والاستفادة من تجارب كل مرحلة قبل الانتقال إلى مرحلة أخرى له فوائد أكبر من صياغة برنامج ضخم وتنفيذه في مرحلة واحدة واستعجال النتائج. فيما يلي ملخص لأهم عوامل نجاح برنامج البنية المؤسسية الوطنية لكوريا الجنوبية.

ج. منظومة الإدارة العمرانية فى مصر

تتكون منظومة إدارة البيئة العمرانية فى مصر من بعض الهيئات و الوزارات التى يمكن تصنيفها كالتالى :

(1) المراكز الداعمة للمعلومات والخرائط والمتمثله بشكل أساسى فى : مركز الاستشعار عن بعد والجهاز المركزى للتعبئة العامة والإحصاء .
(2) مركز تخطيط استخدامات أراضى الدولة : هو الجهة العليا فى التحكم وإدارة الأراضى على مستوى الدولة ، ويقوم بتخصيص الأراضى للاستعمالات المختلفة (عمرانية – زراعية – صناعية – سياحية – تعدينية .....) وبالتالى يقوم بتخصيص تلك الأراضى للوزارات المختلفة .
(3) وزارة الإسكان والمرافق والمجتمعات العمرانية متمثلة بشكل أساسى فى الهيئة العامة للتخطيط العمرانى وهيئة المجتمعات العمرانية الجديدة .
(4) وزارة التنمية المحلية : متمثلة فى المحافظات وما يتبعها من أحياء ومراكز المدن .

ويعرض البحث فى الجزء التالى دور كل جهاز من الأجهزة السابقة فى المنظومة ومدى قدرة الجهاز على إعداد قاعدة بيانات إلكترونية يمكن تبويبها ودمجها فى منصة إلكترونية متكاملة لإدارة البيئة العمرانية ، ويمكن تصنيف عمل تلك الأجهزة فى خمسة قطاعات رئيسية .

أولا : قطاع جمع البيانات والمعلومات الجغرافية على المستوى القومى ويتمثل فى :

(1) الهيئة القومية للاستشعار عن بعد وعلوم الفضاء

أنشأ فى ضوء القرار الجمهورى رقم 489 لعام 1991 ، ويتبع وزارة الدولة للبحث العلمى ويتولى المهام التالية :

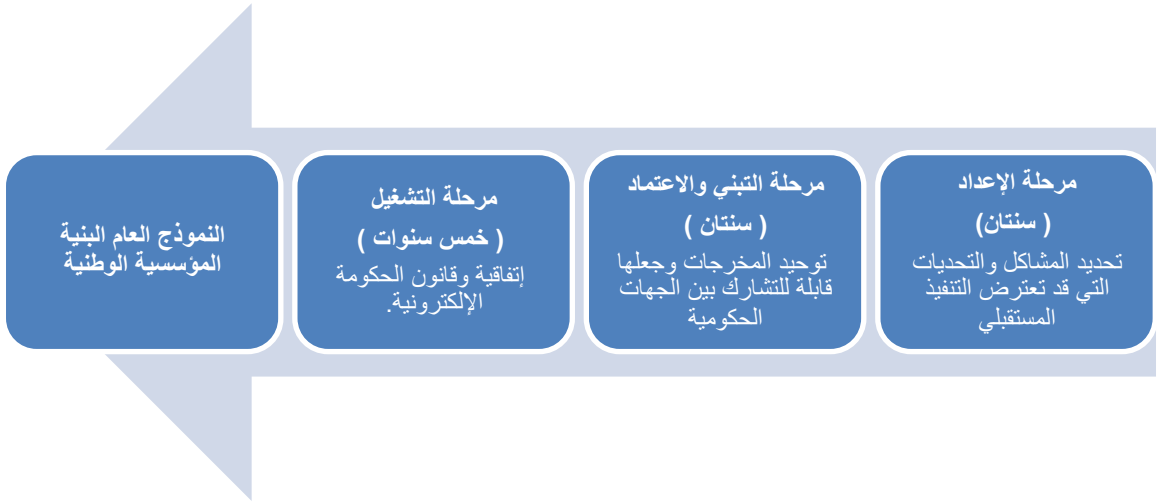
- إنتاج البيانات وصور الأقمار الصناعية بواسطة محطة استقبال الأقمار الصناعية بأسوان.
- استخدام صور الأقمار الصناعية فى إصدار الأطالس والوثائق الورقية والرقمية بالتعاون مع المنظمات المحلية والدولية .

ت. مرحلة التشغيل من (2009 إلى 2014)

تغطي مرحلة التشغيل الفترة التي امتدت من نهاية مرحلة التبني والاعتماد إلى عام 2014، وقد شهدت هذه المرحلة العديد من التحولات والتغيرات على مستوى نطاق عمل البنية المؤسسية الوطنية وتطبيقها ومفاهيمها الأساسية. خلال هذه المرحلة، تم :

1. دمج التشريعات الخاصة بالبنية المؤسسية الوطنية فيما عرف باتفاقية وقانون الحكومة الإلكترونية.
2. تحول التركيز من تبني وتطبيق البنية المؤسسية إلى التشغيل والإدارة.
3. تحول إدارة البنية المؤسسية الوطنية على مستوى الحكومة في ظل وجود منظور متكامل لإدارة الموارد.
4. تم توحيد الجهات المسئولة عن البنية المؤسسية الوطنية وإدماجها في جهة حكومية واحدة .

وكان من أهم التغيرات في الإعلان عن النموذج العام للبنية المؤسسية على المستوى الوطني أن المؤسسة الوطنية للمعلومات ووزارة الإدارة الحكومية والشئون الداخلية بدأت في إدارة مكونات ومخرجات البنية المؤسسية التي تحتاج فعلا المستوى الوطني، بينما أتيح لكل جهة حكومية بإدارة مخرجاتها الخاصة بها دون ارسال جميع مخرجاتها إلى نظام البنية المؤسسية الوطنية. (البنية المؤسسية فى القطاع الحكومى - تجارب دولية ومحلية ، 2018) ، ويوضح شكل رقم (3) ملخص تجربة دولة كوريا فى تدشين البنية المؤسسية الوطنية



شكل رقم (3) : ملخص تجربة دولة كوريا فى تدشين البنية المؤسسية الوطنية

المصدر : تجميع الباحثة

ث. التحديات

(1) **التركيز على المحور التقني في المشاريع التجريبية على حساب الجوانب الأخرى : لم تنجح البنية المؤسسية** الوطنية في اكتشاف وتحليل المشاكل المزمنة الموجودة في الجهات الحكومية .

(2) **عدم اكتمال مرحلة الإعداد لتطبيق البنية المؤسسية الوطنية :** لم تكن الحكومة الكورية مستعدة بالشكل الكافي للإطلاق الناجح للبنية المؤسسية الوطنية، حيث أن كافة النماذج ذات الصلة مثل النماذج المرجعية، ونموذج النضج، والنموذج العام لم تكن معدة بصورة تامة على المستوى الوطني؛ ما جعل تطبيق البنية المؤسسية في المشاريع التجريبية يستند إلى المنهجيات والمعايير والأدلة الاسترشاديه لدى كل جهة دون الاعتماد على دليل مرجعي موحد على المستوى الوطني.

(3) عدم توفر الكفاءات والخبراء في مجال البنية المؤسسية.

(4) **التداخل في توزيع المهام بين وزارة المعلومات والاتصالات ووزارة الإدارة الحكومية والشئون الداخلية** : واجهت مشاريع الحكومة الالكترونية صعوبات في التطبيق بشكل كامل، و كانت وزارة الإحصاء الكوري هى الجهة الوحيدة التي نجحت في التطبيق بشكل كامل .

(5) اقتصار استخدام البنية المؤسسية الوطنية في إدارة الأصول من إدارة موارد أنظمة تقنية المعلومات، مما خفض من الخدمات المتعلقة بتقنية المعلومات.

ب. تجربة دولة كوريا الجنوبية في إعداد البنية المؤسسية الوطنية

عملت دولة كوريا على حوسبة الخدمات في كل الدوائر الحكومية، فى الفترة من 1978 إلى 2000 ، وعمدت إلى إدخال الشبكات الفائقة السرعة لتسهيل تبادل المعلومات بين مختلف الأنظمة الحكومية. ، تم تدشين برنامج الحكومة الإلكترونية الكورية بإطلاق إحدى عشرة مبادرة كبرى في عام 2001. وخلال تنفيذ هذه المبادرات، ، عرقلت بشكل كبير تنفيذ برنامج الحكومة الإلكترونية. وأدت هذه التجربة إلى تبني مفهوم «بنية تقنية المعلومات»، التي أرستها الحكومة الكورية فى عام 2003 بإطلاق برنامج البنية المؤسسية الوطنية كأحد أهم البرامج الحكومية المبتكرة وذلك لمعالجة التحديات التي كانت تقف في طريق تحقيق الابتكار والفاعلية والكفاءة على الصعيد الحكومي.

و تبنى البحث دراسة تجربة دولة كوريا الجنوبية للأسباب التالية :

- يبلغ عدد سكان كوريا الجنوبية فى 2017 يبلغ إلى 51.736.224 موزعين على 17 مدينة ومقاطعة ، ويبلغ عدد سكان العاصمة سول 9.914.381، ثم تتدرج الأحجام السكانية لباقى المدن والمقاطعات ما بين 4 مليون نسمة و 500 ألف نسمة . (https://ar.wikipedia.org/)
- تبلغ مساحة كوريا الجنوبية 100032 كيلومترا مربعا ، ، وتبلغ الكثافة المتوسطة 487 نسمة في الكيلومتر المربع الواحد، أي أكثر من 10 مرات من المتوسط العالمي. (https://ar.wikipedia.org/)
- بدأت حكومة كوريا الجنوبية في حوسبة خدماتها في وقت مبكر ، أدركت حكومة كوريا الجنوبية أن الأنظمة المعلوماتية في الوزارات آلت إلى درجة عالية من التعقيد .

هو ما يتشابه كثيرا مع الوضع المصرى من حيث ارتفاع الكثافة وعدد سكان العاصمة .

تم تقسيم العمل إلى ثلاث مراحل رئيسية هى :

أ. مرحلة الإعداد من (2003 إلى 2005)

الهدف الأساسي من إطلاق هذه المرحلة تحديد المشاكل والتحديات التي قد تعترض التنفيذ المستقبلي الموسع للبنية المؤسسية الوطنية، وكذلك استخلاص الدروس والإرشادات لتوجيه المشاريع المستقبلية.

اقتصر الأمر خلال مرحلة الإعداد على تطبيق البنية المؤسسية الوطنية كمشاريع تجريبية وصياغة التشريعات والقوانين المتعلقة بالبنية المؤسسية، حيث تم التركيز على إدماج البنية المؤسسية الوطنية كعنصر أساسي في مشاريع الحكومة الإلكترونية بشكل عام. وانصب اهتمام الحكومة على إعداد الأرضية التشريعية والقانونية والأدلة الإسترشاديه كهدف مركزي لهذه المرحلة ، حيث تم إعداد إطار عمل البنية المؤسسية الوطنية وتطوير النموذج المرجعي التقني، وكذلك تدشين الإصدار الأول من «الدليل الفني لتنفيذ وتشغيل نظم المعلومات» لتسهيل تنفيذ التعاملات وتبادل البيانات بين مختلف أنظمة الجهات الحكومية. وحددت قيادة هذه المرحلة لثلاث مؤسسات حكومية، وكانت مهام كل جهه كالتالى :

- وزارة المعلومات والاتصالات: الإشراف على المشاريع التجريبية والنماذج
- المؤسسة الوطنية للمعلومات: تصميم وتنفيذ المهام التفصيلية المتعلقة بالبنية المؤسسية الوطنية.
- وزارة الإدارة الحكومية والشؤون الداخلية : كجهة داعمة.

ب. مرحلة التبني والاعتماد من (2006 إلى 2008)

الهدف من هذه المرحلة هو توحيد المخرجات وجعلها قابلة للتشارك بين الجهات الحكومية وتبادل المعلومات فى سهولة ويسر.

تم تفعيل قانون البنية المؤسسية الوطنية و سن أغلب القوانين والأدلة الإسترشاديه المتعلقة بالبنية المؤسسية الوطنية، كما تم فرض التدقيق على تقنية المعلومات كمحور أساسي في الحكومة الالكترونية كما تم إلزام الجهات الحكومية بتطبيق قانون " التنفيذ والتشغيل الفعال للأنظمة المعلوماتية " عند تبني البينة المؤسسية .

تم نشر معايير التقييم لضمان التشغيل البيني في عام 2006 ، ثم الزمت الجهات التي تبنت برنامج البنية المؤسسية باتباع الدليل الإسترشادي لـ " تطوير مخرجات بنية تقنية المعلومات" في كل مخرجاتها المتعلقة بالبنية المؤسسية.

وحققت وزارة الأراضي والنقل والشئون البحرية نجاحا مسبوقا في منع ازدواجية الأنظمة وإعادة استعمال موارد تقنية المعلومات.

وعرضها واستخدام مخرجاتها المختلفة في ضوء الأهداف المطلوبة من النظام ، وقد ساهمت نظم المعلومات الجغرافية في تطوير عمليات إعداد مخططات المدن و رفع كفاءتها .

وقد صاحب تطور نظم المعلومات واستخدامها نمو نظم الشبكات Networks التى تقوم بربط الأجهزة والحواسب ببعضها لتمكين مستخدميها من تبادل المعلومات ، وهو امر ذو أهمية كبيرة نتيجة زيادة كم المعلومات وزيادة مستخدميها وتتدرج الشبكات طبقا للنطاق الجغرافى لها من شبكات محلية : وهى شبكة فى مساحة جغرافية محدودة كمبنى واحد و شبكات متوسطة النطاق : ذات امتداد واتساع محلى تربط بين مجموعة حاسبات الية أو وحدات طرفية داخل نطاق مدينة وشبكات واسعة : تعتمد على الأقمار الصناعية والألياف البصرية (محمد غنيمى، 2006)

ونتيجة لهذا التطور التكنولوجى فقد قامت الحكومات المختلفة بانتهاج فكرة التحول الرقمى كأحد أركان التحول الذكى نحو التكنولوجيا ، ونتيجه لما شهدته المدن حول العالم من تزايد عدد السكان بشكل كبير في العقود الماضية ، حيث ستشهد المدن حول العالم تدفق 2.5 مليار ساكن بحلول عام 2050، وما يصاحب ذلك من توسع عمرانى ، اتجهت كافة الحكومات والبلديات حول العالم بالبحث عن رؤى جديدة لإدارة التنمية الحضرية ، ويوضح شكل رقم (1) خصائص المدن المستقبلية في ضوء التحول الرقمى . (البرنامج المتقدم للأداء الحكومى المتميز – إبريل 2018)

شكل رقم (1): خصائص المدن المستقبلية في ضوء التحول الرقمى .

المصدر : البرنامج المتقدم للأداء الحكومى المتميز – إبريل 2018

وبناءا على ذلك ظهر في العقدين السابقين

مصطلح المنصات الإلكترونية : وهى بيئة تفاعلية منظمة إلكترونيا تربط بين جميع الأجهزة العاملة في مجال ما، وتهدف إلى تقديم الخدمات المختلفة للمواطنين الكترونيا ، كما تساعد على توجيه وتنظيم ومراقبة المنظومات المختلفة من خلال سلسلة متتابعة من البيانات المكانية التى يربط بينها مدى زمنى مناسب

وتتميز المعلومات والتقنية الحديثة المرتبطة بالتنمية العمرانية بكثافة عالية في التغيير وسرعة في التطوير ولذلك فهي تحتاج لإدارة ذكية متطورة تستخدم كل التقنيات الحديثة لتواكب التحولات السريعة في التقدم العلمي والتقني. ويمكن من خلالها دعم اتخاذ القرارات وتحديد الأهداف والأولويات وتوزيع الأدوار والمهام وتنفيذ البرامج الزمنية لتحقيق استراتيجيات التنمية العمرانية. وتعد المعرفة هي حجر الزاوية لدعم أى نهضة تنموية لأى دولة في العالم ، كما انها تعد محور للتطور والتقدم والتفوق . ويوضح شكل رقم (2) المجالات الحضرية المتوقعة للتحول الرقمى . (البرنامج المتقدم للأداء الحكومى المتميز، إبريل 2018)

شكل رقم (2): المجالات الحضارية المتوقعة للتحول الرقمى

المصدر : البرنامج المتقدم للأداء الحكومى المتميز – إبريل 2018

نحو تدشين منصة معلومات عمرانية لإدارة المدن المصرية من خلال تحليل تجربة دولة كوريا الجنوبية

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الملخص:

ظهر مفهوم التحول الرقمى في الأونة الأخيرة كأحد الانظمة الأساسية التى تبنتها الحكومات المختلفة لتحسين جودة الحياة وتقديم الخدمات لمواطنيها بشكل ميسر ، وقد تم تعريف التحول الرقمى بأنه دمج التكنولوجيا الرقمية في جميع مجالات الأعمال والإدارة وتقديم الخدمات الحياتية ، وأصبح أحد اليات إدارة المدن وتسارعت الحكومات والبلديات في تدشين المنصات الإلكترونية كأحد الركائز الأساسية للمدن الذكية .

ويعد قطاع التنمية العمرانية والعقارية من أهم القطاعات المؤثرة لتحقيق التنمية الحضرية المستدامة ، وهو ما يحتم وجود سياسات واستراتيجيات و أنظمة تتيح الإدارة الفعالة للمدن .

وتمثل المدن المصرية منظومة عمرانية متسلسلة شهدت حضارات وتراث الأمم ومرت بكافة الثقافات والانظمة والأحداث المتعاقبة ، مما أنتج منظومة عمرانية متشابكة الأطراف و ميراث عقارى متعدد المعالم والخصائص . وقد أولت الحكومة المصرية كافة منظومات التنمية العمرانية والعقارية اهتماما كبيرا :

على مستوى التنمية العمرانية : تم سن وتعديل العديد من القوانين ثم الاهتمام بإعداد المخططات الهيكلية والتفصيلية للكثير من المدن والقرى وإعداد الكودات الفنية المختلفة فى كافة أوجه البناء الفنية.

على مستوى التنمية العقارية : تسعى الحكومة إلى إعادة هيكلة القطاع العقارى باختلاف مجالاته وصاحب ذلك الكثير من الجهود فى حصر الثروة العقارية بالتعداد المصرى 2017، وسن قانون الضرائب العقارية .

و قد أسهمت كافة الجهود السابقة فى تجميع قاعدة البيانات الخاصة بالثروة العمرانية والعقارية لكن دون تكامل وترابط .....وهو ما يحتم ضرورة استجابة المدن المصرية للتطور و الأنظمة التكنولوجية الحديثة للسيطرة على الهياكل العمرانية والعقارية للمدن - وهو ما حدد رؤية هذه الورقة البحثية فى اقتراح و صياغة منظومة تكنولوجيه متكاملة قادرة على استيعاب كافة المتغيرات بالاستعانة بتجربة دولة كوريا الجنوبية كأحد التجارب الرائدة فى مجال تدشين البنية المؤسسية الإلكترونية - وذلك استكمالا وتتويجا للجهود السابقة حتى تؤتى ثمارها ، وتعمل على إرساء السياسات والانظمة المبتكرة لتعزيز الاستدامة فى التخطيط الحضرى و التطوير العمرانى وتسهم فى زيادة كفاءة إدارة الأصول الحكومية و تيسير الخدمات العقارية.

الكلمات المفتاحيه: التحول الرقمى - التكنولوجيا - منصة معلومات عمرانية – إدارة المدن – تجربة كوريا الجنوبية

أ. المقدمة

التقنية " التكنولوجيا " : هى المجال التطبيقى للمعرفة على أرض الواقع ، وتتمثل فى الأفكار والادوات والآلات التى يبتكرها الإنسان لتحسن من مستوى حياته وبيئته ، ويمكن توصيف عملية التقنية " التكنولوجيا " فى ضوء الأدبيات المختلفة بأنها (1) عملية شاملة لجميع العمليات الخاصة بالتصميم والتطوير والإدارة . (2) عملية ديناميكية من خلال حالة من التفاعل النشط المستمر بين المكونات . (3). هادفة تهدف للوصول إلى حل المشكلات.(4) متطورة ذاتيًا تستمر دائمًا في عمليات المراجعة والتعديل والتحسين. (Ari-Veikko Anttiroiko,2013.)

ويتسم عالم المعرفة والتكنولوجيا بغزارة تدفق المعلومات بشكل يعجز العقل البشرى عن تمييزه و إدراكه و التعامل معه مما يتطلب اختصار المعلومات وجدولتها للاستفادة منها وهو ما أوجد فكرة اقتصاد الانتباه و التركيز Economy Attentional . ، وقد ظهرت هذه الفكرة نتيجة كثرة العلوم والمعارف التي لا يستطيع العقل البشرى تحملها في ظل الطرق والأساليب القديمة التي تعتمد عل الإسهاب والتطويل والتداخل بين المعلومات دون ربط دقيق ودون فائدة. (Floridi 2010)

وقد تم استخدام التكنولوجيا في كافة المجالات الحياتية و النظم الإدارية ، و تحولت نظم الإدارة من الإدارة البشرية التى تعتمد على مهارات البشر إلى نظم معلومات Information System موثقة لها مدخلات ومخرجات ثابتة (حريزى 2016)

ويعتبر نظم المعلومات الجغرافية Geographic Information System أحد أنظمة المعلومات الهامة فى التحليل المكانى والإحصائى التى ترتكز عليها كافة منظومات إدارة الأراضى و التخطيط العمرانى والتنمية العقارية ، حيث يتم الربط بين الصور الفضائية للأراضى والمبانى وإظهارها على خرائط جغرافية مرتبطة بقواعد بيانات يمكن استخراج المعلومات منها

وفيما يخص الاستدامة التكنولوجية، سيتم إختبار التكنولوجيا الرقمية متمثلة بعملياتها وآلياتها، اذ أمكن تشخيص من خلال ما تم عرضه من كيفية تصميم وإنتاج الشكل الرقمي ثلاث عمليات، اثنتان منها رئيسية، والثالثة ناتجة عن المزج بينهم ، حيث سيتم اعتمادها كتصنيف اساسي لعمليات التكنولوجيا الرقمية بهدف استكشاف المعرفة التطبيقية حولها.

النتائج

- تتحقق الحلول المعمارية من خلال تحقيق المرونة التصميمية بما يتيح اقصي استفادة من تلك المعالجات وتطويعها من اجل تلبية الاحتياجات الاجتماعية والمتطلبات الوظيفية ضمن هذه الحلول.
- تحقيق المرونة الداخلية والخارجية في التصميم مع إمكانات تعديل الحلول بحسب الاحتياجات الآنية للمستخدم بينما تعكس المرونة الخارجية إمكانيات التجميع والتوزيع والتشكيل التي تفتح مجالات الابتكار اللامحدود مع التأكيد على خصوصية المكان والملكية.
- تتميز بعض المعالجات التصميمية بالجمع والربط بين البيئة الفيزيائية والبيئة الاجتماعية والبيئة السيكولوجية والبيئة السلوكية، إن هذا التمييز يعود بالدرجة الأساسية إلى الفرق بين البيئة الواقعية وبين البيئة المدركة وهذه المحيطة بالإنسان حيث تاثير الثورة الرقمية على التصميم .
- الخامات الذكية قادرة على التجاوب مع البيئة المحيطة بها ، وذلك عن طريق أجهزة دقيقة جدا مثل المجسات والرقائق الإلكترونية حيث تتنوع الخامات الحديثة و تتميز بالعديد من الخصائص بما تتضمنه من قابلية التشكيل و سرعة الإستجابة للمؤثرات الخارجية مما يساعد المصمم على تحقيق رؤيته التصميمية .
- دراسة التاثيرات السيكولوجية والفسيولوجية علي تحديد نمط الفراغ وايجاد العلاقة بين الحيزات الداخلية ووسائل الادراك البصري والمعالجات التشكيلية.
- تشكيل حيزات فراغية تتفاعل مع العناصر التصميمية المختلفة من خلال التعرف علي الأساليب التكنولوجية الحديثة وكيفية استخدامها.

التوصيات

- ضرورة تحقيق الكفاءة والسهولة التصميمية من حيث نسبة عناصر الاتصال والخدمات والمعالجات الوظيفية والجمالية لتصميم الحيزات العامة.
- تحقيق مبدأ التوازن في العلاقة بين المساحات المغطاة والمكشوفة للنسيج العمراني واستخدام مواد بناء صديقة للبيئة وهي المواد المأخوذة من الطبيعة.
- دراسة الاتجاهات الحديثة في التصميم وتكنولوجيا تصنيع الخامات والتي تعكس بدورها على التصميم الداخلي والوصول الي تقنيات تنفيذية متطورة للخامات واعادة صياغاتها وتوظيفها .
- تطبيق تقنية ثلاثية الابعاد في التنفيذ من خلال التحليل والابداع والتطبيق التقنى المستحدث لتكنولوجيا الخامات المتقدمة .
- مراعاة أبعاد ومتغيرات جديدة أثناء عملية التصميم،فلا مجال للمحددات المتعلقة بصعوبة أو عدم القدرة علي تنفيذ الأفكار، ليفتح المجال إلى عالم جديد ونظريات جديدة في تغير وتطور متواصل.
- تطبيق نظريات ومناهج التصميم وأساليب وتقنيات التنفيذ المستحدثة حيث التطور السريع والمستمر في الإتجاهات الفكرية المعمارية وتنوعها لتواكب التطور التقنى الرقمي المتسارع.
- استخدام الطاقة من مصادر متجددة ويمكن الاعتماد عليها في إنتاج الطاقة الحرارية والكهربائية .
- اعتماد الفكر المستدام كنموذج لانطلاق مجموعة من المشاريع الصغري والكبري والتي تساعد علي ايجاد مجموعة من الحلول للمشاكل البيئية والعمرانية المستقبلية.

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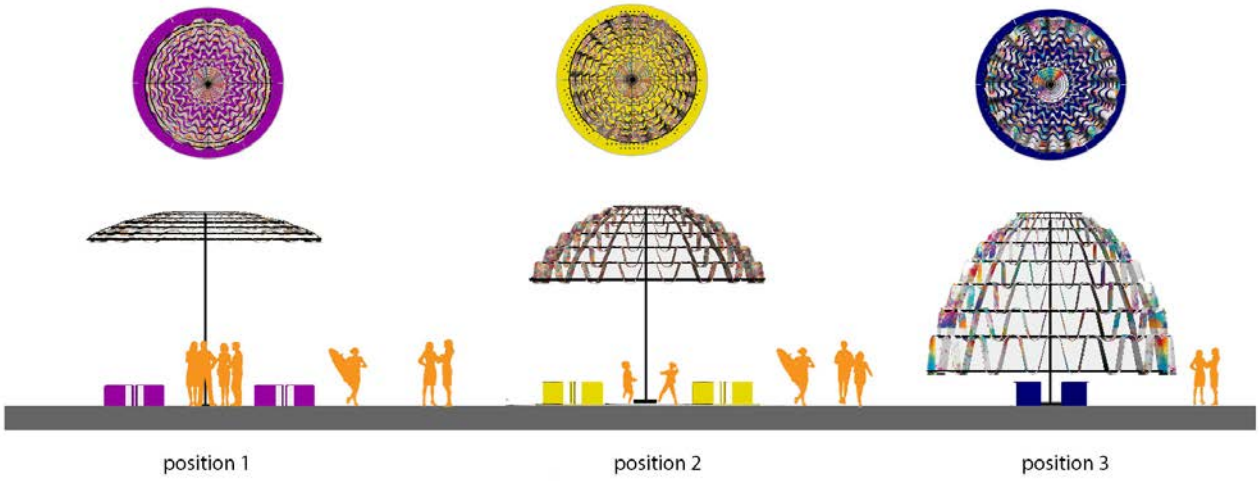
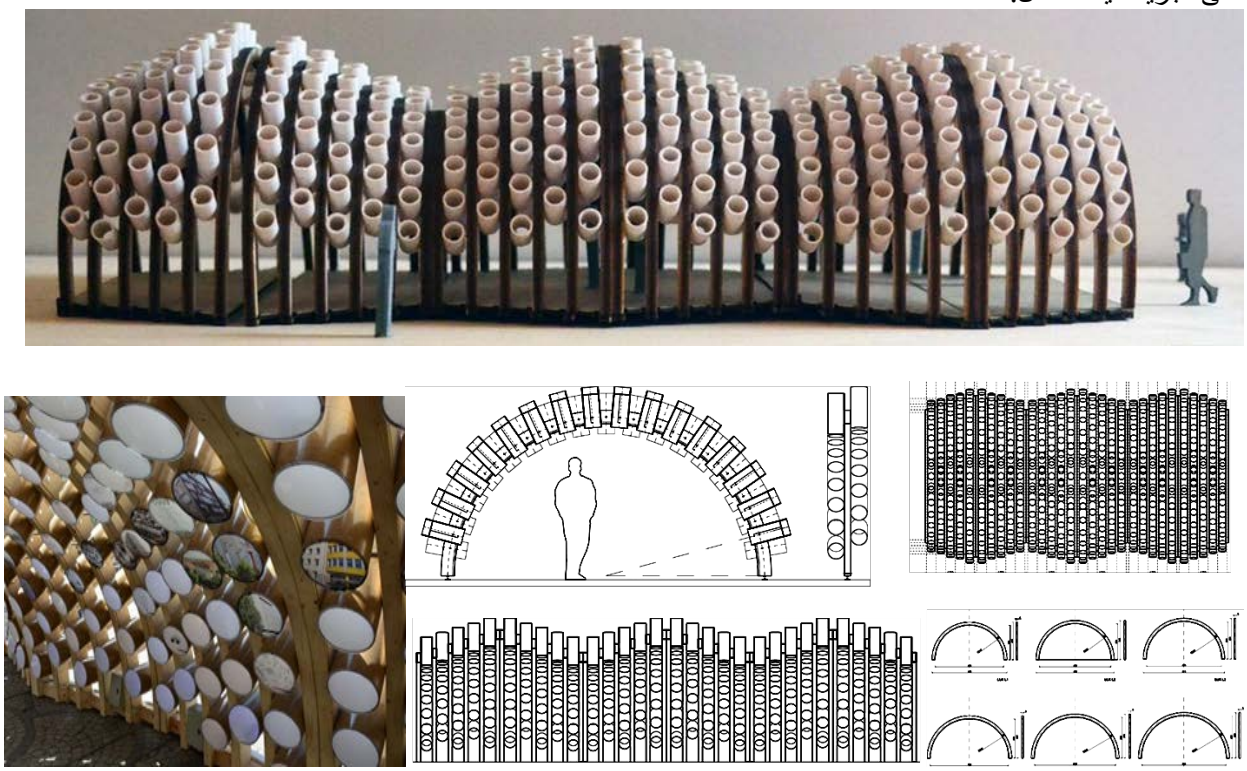


صورة 11 يوضح المساقط الافقية للثلاث اوضاع فى ألية الفتح والغلق

صورة 12 توضح كيف يمكن لأساليب التغطية الخارجية ذاتها من خلال حركتها في الأبعاد الثلاثة من تغيير درجة اتصالها أو انفصالها عن المحيط, فقد يتحول السقف المغلق العلوي إلى فتحة أو إلى سقف أو قد يختفي ويظهرصعوداً ونزولاً , ويمكن تغيير وضع التغطية العلوية نتيجة الانزلاق أو الدوران أو الانطباق وغيرها من العمليات الحركية في الفراغ.

حيث أظهرت الدراسات تصنيف الاستدامة إلى مفردات الأيكولوجيا :
ان مؤشرات للاستدامة الأيكولوجية متمثلة بالتشكل الأيكولوجي وأمكن تحديد أربعة نماذج للتشكلات هي:
نموذج التشكل الأيكولوجي : يمثل النموذج الشكل الاقرب للشكل الهندسي المستدام.
نموذج التشكل البايولوجي: يمثل انموذج الشكل الطبيعي العضوي
نموذج التشكل الايكو -بايولوجي : يمزج بين النموذجين يميل الي التشكيل الهندسي المستدام.
نموذج التشكل البايو-ايكولوجي : يمزج بين النوعين ويميل إلى التشكيل الطبيعي العضوي المستدام.

وبالتالي تتطور البيئة إلى كيان ايكومورفي,ويعد التشكل البايولوجي) الإحيائي (كأسلوب أو طراز تصميمي مستوحى من الطبيعة يعتمد على المنحنيات الناعمة للتذكير بها وإعطاء المصممين مجالا أوسع للفرص والاحتمالات فضلا عن مميزاتها المتمثلة بالمنحنيات، والانسيابية، والشفافية، والأشكال الطبيعية التي يمكن إظهارها وتطويرها خلال أنظمة نمذجة حاسوبية رقمية متقدمة، والاعتماد على الطبيعة كمصدر للالهام والتشكيل,أما التشكل الإحيائي فهو مؤشر للأشكال المولدة بشكل أساسي بالحاسوب اعتمادًا على تجريد هيئة الشكل.



صورة 9 تبين التصميم والذى يتكون من 36 قوس من الخشب الرقائقى و498 انبوبا ورقيا معاد تدويرهم
http://www.archi-tektura.eu

وتتلخص العملية التكاملية في التصميم المستدام للحيزات العامة مع تقنيات التفاعل الرقمي وتطبيقاتها

بان العلاقات الأفتراضية الرابطة بين نماذج التشكلات الأيكولوجية والبايولوجية وآليات وعمليات التكنولوجيا الرقمية للعمارة المحلية ، وطرح المؤشرات النهائية الفاعلية بعد ترميزها، واخيرًا تركيب وطرح النموذج الفكري.

يستعرض ***النموذج*** استلهام التصميم من الأشكال الطبيعية لنمو التفرعات الشجرية من حيث وجود الغطاء الشجري ودراسة نمو وتفرع الشكل وقدرته على التكيف في بيئته الطبيعية من حيث الدعم الهيكلي.

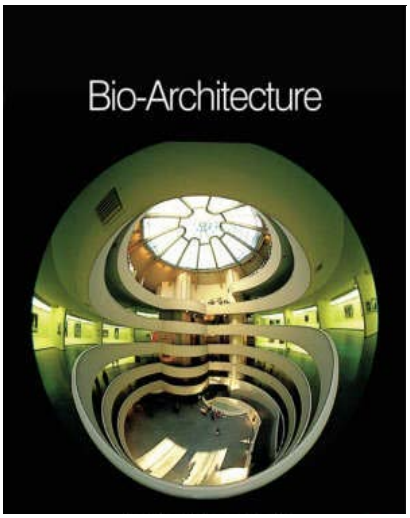
صورة 10 توضح تم استخدام التشكيلات الموجية في تصميم المظلة الخارجية لجعلها تتميز بثلاث مستويات للانفتاح والانغلاق لتوفير تجارب وانعكاسات ضوئية داخلية متنوعة حسب شدة الإضاءة الخارجية، والذي يجعل التصميم مرتبطا بقوة ببيئته المحيطة.

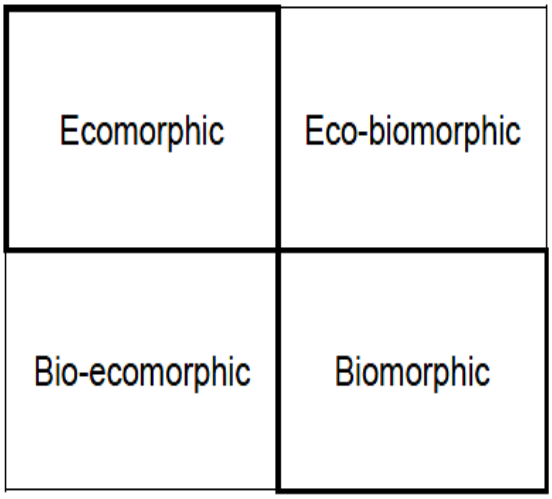
-النظام والتشكل الإيكولوجي والبيولوجي:

النظام الإيكولوجيEcosystem والعلاقة بين المبنى والبيئة الطبيعية، مشيرة إلى تشكيل وتخطيط النظام الإيكولوجي من خلال النظرة إلى المبنى وموقع المشروع كنظام ايكولوجي .إذ يأخذ التصميم الإيكولوجي بنظر الاعتبار الخصائص البيئية والمناخية والحدود الطبيعية لموقع المشروع ومدى تأثيرها على النظام المصمم وعمله، بدلا من التركيز على المبنى فقط بشكل كلي بمعزل عن المحيط الحيوي .
يهدف التصميم الإيكولوجي إلى تحقيق علاقة تعايشية بين النظام المصنع والنظام الإيكولوجي وجعل المنظرالطبيعي كنظام ايكولوجي يحيط بالنظام المصمم وكجزء طبيعي.
ترتبط إستراتيجيات التصميم بهرمية الأنظمة الإيكولوجية ومتطلبات الموقع وتتمثل تلك الإستراتيجيات بإستراتيجية الحماية، والحفاظ، والتطوير، وزيادة التنوع الحياتي، وإعادة تأهيل الكتلة العضوية.
إذ يزود تحليل النظام الإيكولوجي لموقع المشروع المصمم بأساسيات تحديد نوع استعمال الأرض ومناطق الحفاظ والتطوير والتشكيل الكتلي للمبنى والتأثيرات المحتملة أثناء دورة حياة النظام المصمم.
كما تناولت الدراسات مناهج محاكاة الطبيعة في التصميم وإمكانية عد الطبيعة كمنهج تصميمي من خلال محاور متعددة منها التعلم من الطبيعة، واستخدام النماذج الطبيعية للتشكيل، وجعل الطبيعة واضحة وصريحة، واستخدام الطبيعة للاعتبارات الإيكولوجية، وعمل كل الأصناف كمصمم .

و مكونات النظام الإيكولوجي ووظائفه مشيرة إلى المكونات الإحيائية والمكونات الطبيعية غير الحية، وموضحة فكرتين أساسيتين لعمليات الأنظمة الإيكولوجية والمتمثلة بتدفق الطاقة، ودورة المواد في الأنظمة الإيكولوجية محددة مميزات الأنظمة الإيكولوجية بأنها تحفظ الطاقة، وخزن المعلومات، كما انها أنظمة مفتوحة، وفي حالة نمو، ومقيدة، ومتميزة، ومتعددة التغذية العكسية، وقادرة على التوازن والقدرة على التكيف والتنظيم الذاتي والتماسك.

وفيما يخص التشكل، حددت نموذجين للأنظمة الإيكولوجية متمثلة بنظم التشكل الإيكولوجي) الايكومورفيك (اعتمادًا Biomorphicوالبايولوجي) البايومورفيك ،Eco morphic على طريقة تكوين التشكل، إذ تركز العمارة الايكومورفية على مبدأ:
"الشكل يتبع التدفق"، حيث يتم التفكير بالمبنى كتمثيل لنظام ايكولوجي طبيعي من خلال تتبع تدفق المواد والطاقة الداخلة الخارجة خلال الكائن العضوي أو النظام, ومشير إلى توليد الشكل المعماري من
متابعة منطق الأرض والمناخ والبيئة والتشكيل الطبيعي الناتج من تدفق المواد في الطبيعة، وإلى مفهوم التشكل الإيكولوجي بأنه:
التشكيل الهندسي أو العضوي الناتج من العوامل الإيكولوجية التي تربط بين الكائن الحي وبيئة سكنه .إذ يعتمد التصميم الايكومورفي على مفهوم فكرة إحيائية ترتبط بدراسة طريقة تشكل الكائن الحيبالعلاقة مع بيئة السكن، اذ يقوم الكائن الحي بتشكيل بيئته التي تقوم بدورها في تشكيله اعتمادًا على نظرية" الازدواج البنيوي التركيبي".





صورة 8 توضح نماذج التشكلات الايكولوجية والبايولوجية
/https://royalsocietypublishing.org/ Bio.architecture: bio inspired art and architecture-a perspective

كما يظهر دور التكنولوجيا الرقمية في السيطرة، والمراقبة، وعمليات التصميم، وتحييد الزمان والمكان، في حين يظهر دور استراتيجيات التصميم الإيكولوجي في إيجاد مباني وبيئات متكاملة مع الأنظمة الطبيعية من خلال مبدأ تتبع تدفق الطاقة والمواد الداخلة والخارجة خلال النظام، وبالتالي إنتاج أشكال و تشكلات ايكولوجية واحيائية متكيفة مع البيئة الطبيعية المحيطة بها, واخيرًا تعتمد الحلول التكنولوجية على تحديد المدخلات المتمثلة باختيار المواد، والطاقة خلال دورة حياة المبنى، فضلا عن تكامل التكنولوجيا مع الطاقات المتجددة لخلق نماذج معمارية مترابطة مع العوامل المحلية والمواردالطبيعية].

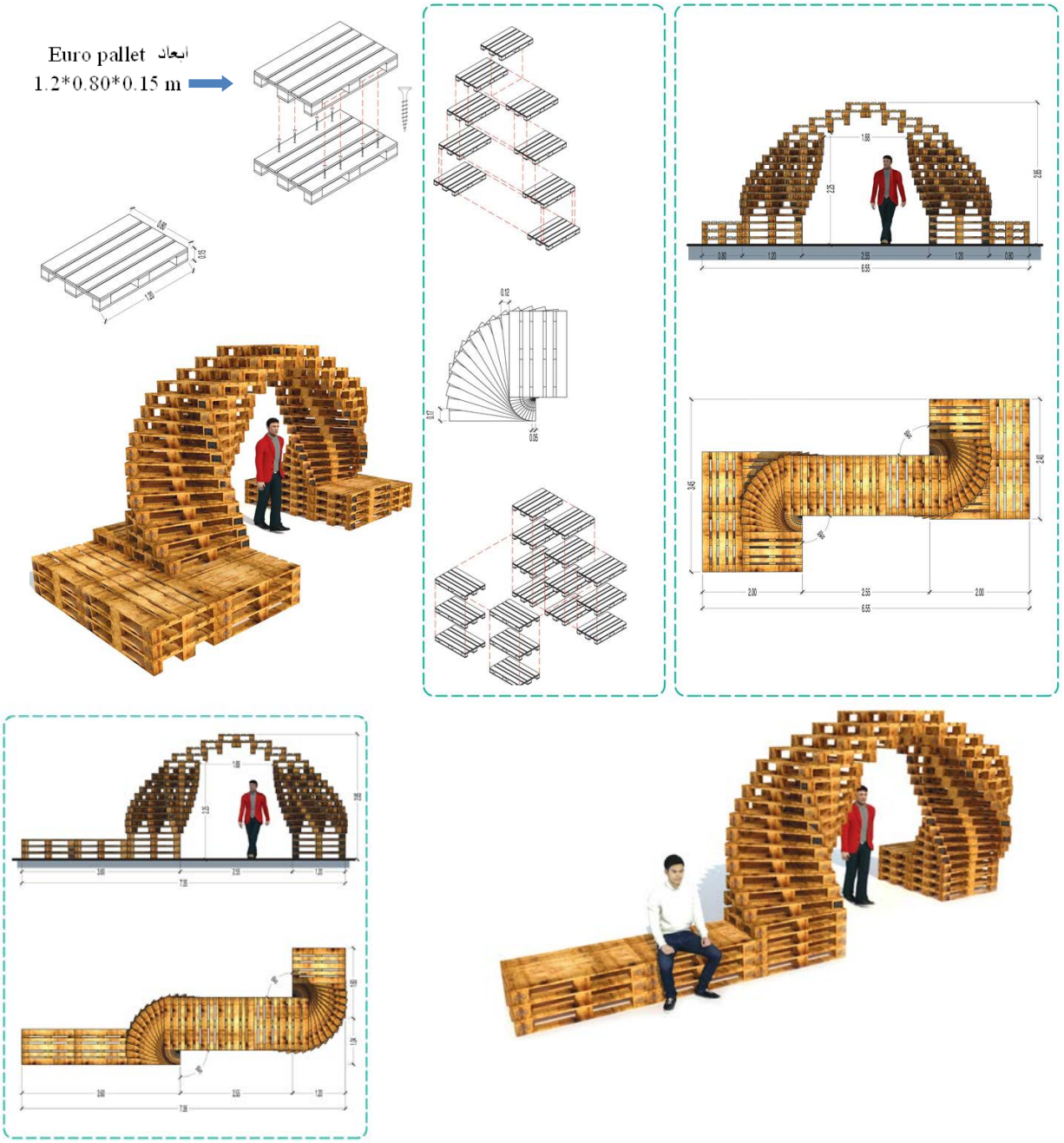
ويتضح لدينا الحاجة العلمية لمعرفة طبيعة تأثير التكنولوجيا الرقمية في التشكلات الإيكولوجية والبيولوجية في العمارة المحلية، مفترضة تأثر التشكلات الإيكولوجية والبيولوجية بالتكنولوجيا الرقمية في العمارة المحلية .يهدف البحث إلى الكشف عن طبيعة تأثير التكنولوجيا الرقمية في التشكلات الإيكولوجية والبيولوجية في العمارة المحلية .

ولتحقيق أهداف البحث سيتم اللجوء إلى الإجراءات الآتية:

1- تحديد مؤشرات التكنولوجيا الرقمية المتمثلة بالآليات والعمليات.

2- تحديد مؤشرات الأنظمة الإيكولوجية) التشكل الإيكولوجي والبايولوجي والعمارة المحلية.

3- ربط المؤشرات لتلك الانظمة داخل المبنى.



صوره. 7 توضح توفير مساحة للنقاش والوعي حول مواضيع مثل البيئة ، والتوازن بين التنمية والحفظ ، ومساحات للعب للاطفال ومساحات اخرى للشباب ومساحات للتجمعات الاسرية

https://www.plataformaarquitectura.com

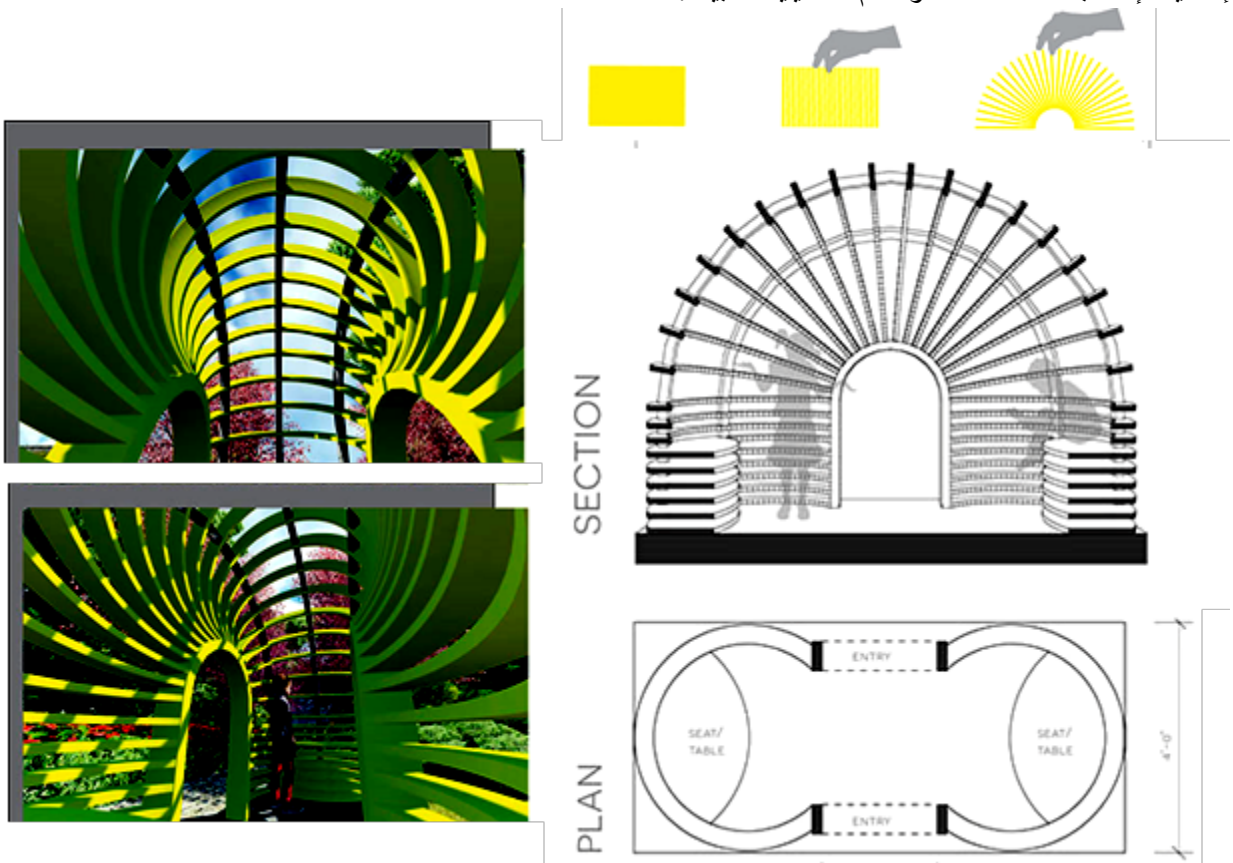
بعض النماذج لتصميمات يتم فيها تحويل حركة الافراد وذوى الاحتياجات الى طاقة بديلة

يعمل على تحويل الطاقة الحيوية bio-energy إلى طاقة لتشغيل interactive operate شاشة LED التفاعلية عن طريق تحريك يد داخل العجلة ويكتشف الطفل كيف يمكن تحويل جهده الى طاقة تعمل على تشغيل شاشة LED. وبالتالى يستطيع الطفل مشاهدة الشاشة ولعب اللعبة التفاعلية

صوره. 5 توضح كيفية تحويل الحركة لطاقة تشغيل لذوى الاحتياجات واشراكهم في انشطة المجتمع
www.parkplayer.com/hamster-wheel

أبرزت النماذج أهمية تداخل العلاقة بين مفردات التقنيات الحديثة والتكنولوجيا الرقمية مع المبادئ والأنظمة الإيكولوجية على الرغم من افتقار الحقل المعرفي للأسس العلمية المعتمدة على تحقيق التكامل فيما بينها، متناولة الأسس الإيكولوجية في العملية التصميمية للعمارة المحلية لمدينة الاسكندرية.

تعتمد الأنظمة الإيكولوجية على الأرض كمصدر للإلهام والتعبير في العملية التصميمية فضلا عن اعتماد المصادر والطاقات الطبيعية لتحقيق التصميم الإيكولوجي الأخضر وللحفاظ على تلك المصادر، موضحة فاعلية استخدام التكنولوجيا الرقمية في السيطرة على الأنظمة التشغيلية ، وأهمية النظم الذكية لتطوير أدائية الحيزات، فضلا عن التركيز على المزج بين التكنولوجيا والطبيعة الإحيائية لتحقيق عمارة متوافقة مع الطبيعة, إذ تعتمد نماذج العمارة الإيكولوجية والمتوافقة مع التكنولوجيا الحديثة على إمكانية الإفادة باعتماد الأشكال والنظم التشغيلية للطبيعة.



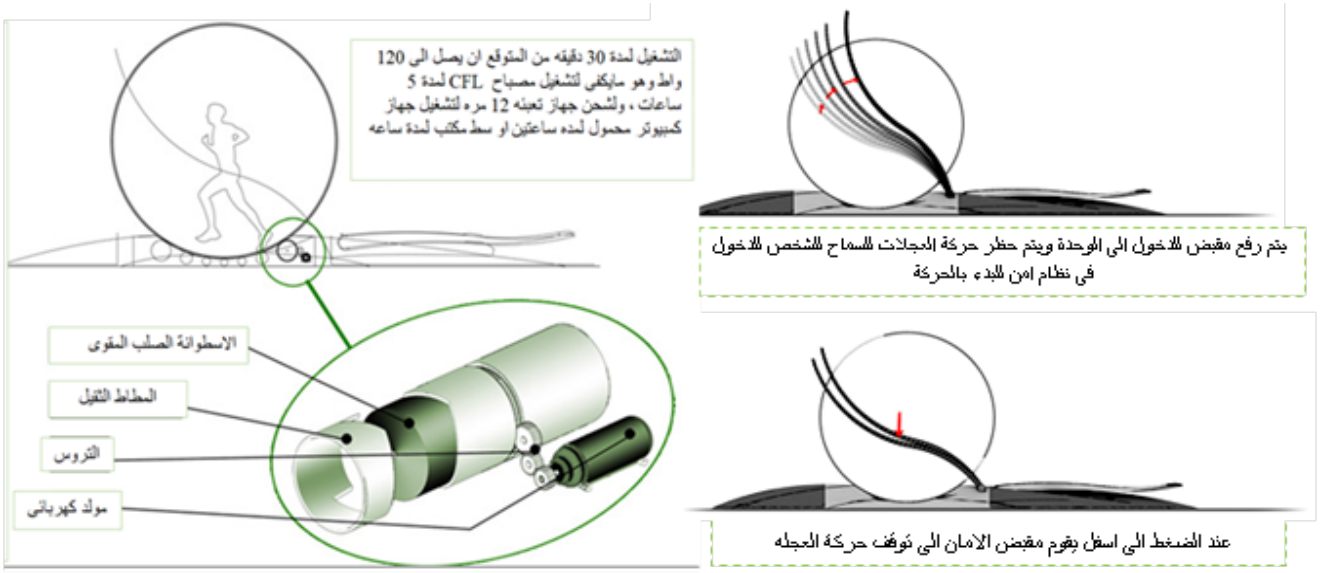
صوره. 6 توضح النموذج التالى تصميم وحدة خارجية للاطفال على شكل اقواس متتابعه مستمدة من التشكيل الحلقى للعبة الاطفال المطاطة وتمت محاكاه شكل اللعبة لانتاج تشكيل يربط الداخل بالخارج من خلال وجود فتحات تسمح بدخول الشمس للداخل وينتج عنها مجموعه من الظلال المتغيره التى تضيف على التصميم روح المتعه والاثارة للطفل
https://www.plataformaarquitectura.com

نماذج مقترح تطبيقه لاستراتيجيات الاستدامة في الحيزات العامة في الأسكندرية

تصميم (Nadim Inaty) ، "العجلة الخضراء" – وهى هي آلة تمرين تعمل على تحويل الطاقة الحركية التي ينتجها جسم الإنسان إلى كهرباء و تتألف العجلة الخضراء من وحدة واحدة كاملة مع مقعد ، وبقع من العشب الحقيقي ، وتتميز بثلاثة مستويات مختلفة ذوي القوة المتنوعة وتنتج طاقة تكفي تقريبًا في 30 دقيقة لشحن 12 هاتفًا محمولًا.
تشجع "العجلة الخضراء" على زيادة الصحة ونهج مستدام للتصميم فحسب ، بل إنها تشجع أيضًا علي زيادة التواصل في المجتمع.

صوره. 3 توضح لتصميم العجلة الخضراء وهى هي آلة تمرين تعمل على تحويل الطاقة الحركية التي ينتجها جسم الإنسان إلى كهرباء

يخطو المستخدمون إلى الجهاز مع وجود قضبان الأمان في الوضع العمودي ، والتي تغلق العجلة في مكانها حتى يصبح العداء آمنًا ومستعدًا للتحرك و بمجرد استبدال مقابض الأمان ، هناك ثلاثة مستويات لتناسب مستويات اللياقة المختلفة.
تقوم سلسلة من القضبان الفولاذية المغطاة بطبقة من المطاط السميك بنقل الطاقة الحركية التي ينتجها الطفل إلى الدينامو من خلال الترس.يمكن عندئذ توصيل هذه الوحدة بمرفق تخزين الطاقة المركزي لاستخدامها في مصابيح الشوارع وغيرها من احتياجات الطاقة الحضرية .
يمكن أن تؤدي عدة وحدات مجتمعة إلى توليد طاقة كبير لا يؤدي فقط إلى تخفيف الضغط على الشبكة التي تم إجهادها بالفعل ، ولكن أيضًا يقلل من انبعاثات الكربون أيضًا.



صوره. 4 توضح تصميم حركة العجلة الخضراء واوضاع نقل الحركة لتوليد الطاقة
https://www.greenprophet.com/2012/07/green-wheel-nadim-inaty

التوجه الثاني يلجأ الى توظيف التقنية العالية مع مراعاة الظروف المناخية وتوفيروتوظيف الطاقات المتجددة إيجابياً التوجه الثالث Reuse أو إعادة الإستخدام Recycling إمكانيات التدوير فيتبنى الدمج بين مبادىء كلا التوجهين تبعاً لطبيعة الموقع الذي يبنى فيه وطبيعة المشروع .

كل من التوجهات الثلاث يتبنى عدة مبادىء تهدف إلى إنشاء فراغ حضرى مستدام صديق للبيئة يستخدم أقل قدر من الطاقة ويحافظ على مصادرها الطبيعية ويسبب أقل قدر من التلوث للبيئة الطبيعية وأهم هذه المبادىء:

تفهم المكان (Understanding Place)

يبدأ التصميم المستدام بتفهم طبيعة المكان و معاملة البيئة بحذر شديد حتى يمكن العيش فيها دون تدميرها. كما يساعد تفهم المكان على اتخاذ الاجراءات والممارسات مثل كفاءة إستخدام مصادر الطاقة في التبريد أوالتدفئة أو الإضاءة وغيرها من الإستخدامات وذلك من خلال استعمال حلول تصميمية تحقق راحة الإنسان باسلوب طبيعي مع إستخدام أقل قدر من الطاقة.

التواصل مع الطبيعة (Connecting with Nature)

حيث يستفيد التصميم من البيئة الطبيعية المحيطة بالموقع و يستلهم أفكاره التصميمية منها ، حتى يكون متكاملاً معها لأنه يعتبر جزءاً منها .

تفهم العمليات الطبيعية (Understanding Natural Processes)

لا توجد في الطبيعة نفايات؛ حيث مخرجات كائن حي تعتبر مدخلات لكائن آخر- حيث النظم الطبيعية مصنوعة من الحلقات المغلقة- و هذا يجعل البيئة نظاماً متكاملا و محاولة تطبيق ذلك على التصميم الحضرى يعتبر نظاما مصغرا للنظام البيئي.

تفهم الأثر البيئي (Understanding Environmental Impact)

عن طريق تقييم الموقع، و سمة المواد، كفاءة الطاقة، تقنية البناء، المواد، والطاقة و يمكن تخفيث الأثر السلبي على البيئة عن طريق "استخدام المواد المستدامة في التصميم، و مواد بناء لا ينبعث منها ما يضر الإنسان أو البيئة المحلية ، وإعادة تدوير مواد البناء أكثر من مرة.

المشاركة في عمليات التصميم (Embracing Co-creative Design Processes)

يرى مصممي الاستدامة أهمية الاستماع الى أي صوت في العملية التصميمية، سواء على نفس مستوى المهنة أو ابناء البيئة المحلية أو المستخدمين .

تفهم الأشخاص (Understanding People)

يجب أن يأخذ التصميم المستدام في الاعتبار مجموعة كبيرة من الثقافات والأديان وعادات الناس مستخدمي البيئة المبنية، (تفهم البيئة الاجتماعية و الاقتصادية)، لتتحقق ملائمة التشكيل الحضرى للبيئة المحلية، و تلبية احتياجات المستخدمين.

أما على المستوي التفصيلى تقاس الاستدامة بحجم ترشيد الطاقة والحفاظ عل الموارد، أما استدامة الفراغات الحضرية فبعض المراجع تناولتها من تنسيق الموقع بها حيث التنوع والمرونة والبساطة والتفرد لعناصرتنسيق الموقع، بمعنى أنه كلما حققت عناصر التنسيق من الأشجار والبيئة المشيدة التشابه مع البيئة الطبيعية وبأقل ضغط بيئى ممكن، كلما حقق ذلك الاستدامة.
تعتمد الحضارة البشرية على عمليات الإنشاء والبناء والتعمير المتواصل للحفاظ على بقائها، ولكن قدرة الكوكب والطبيعة على دعم هذه العمليات آخذة ف التراجع بسبب الزحف الشديد على الأراض والتدمير المتواصل للبيئة الطبيعية والاستنزاف الحاد للموارد والاستهلاك المتزايد لمصادر الطاقة المختلفة، ومن هنا تنبع اهمية تحقيق التخطيط والتصميم الحضرى لمبادئ الاستدامة كحل بديل لتصميم وتخطيط التجمعات الحضرية.
وذكر(ماثيو كارمونا) Matthew Carmona ف كتابه بعنوان Public Places Urban Spaces: The Dimension of Urban design)
ان مفهوم التصميم الحضرى هو فن خلق الأماكن للناس حيث يشمل طريقة تصميم هذه الأماكن وتحقيق الأمان للمجتمع فضلاً عن الناحية الجمالية، هذا إلى جانب بعض الأمور الأخري والمتعلقة بالربط بين الاجتماع والحركة والشكل الحضري والفراغات الطبيعية والمعالجات التى تضمن نجاح المدن.
كما أشارت دراسة RFQ: Requester for architecture Qualifications) بان التصميم الحضرى المستدام ليس أسلوب أو نمط لبناء جديد بل يمثل ثورة في كيفية التفكير بتصميم وبناء وتشغيل الفراغ بشكل عفوي وركزت هذه الدراسة على فلسفة التصميم المستدام من خلال التنسيق بين الفضاءات المفتوحة والمشاهد الطبيعية والبيئة المحيطة عن طريق:

استهلاك اقل للطاقة وتزويد أعلى نوعية من الإنارة الطبيعية والاصطناعية .
حفظ المواد والمصادر الطبيعية وتحسين نوعية البيئية الداخلية.
وقاية مصادر المياه الداخلية والخارجية .

الحيزات العامة و التصميم المستدام

التصميم الحضرى للحيزات العامة المستدامة ليس أسلوب أو نمط لبناء جديد بل يمثل ثورة في كيفية التفكير بتصميم وبناء وتشغيل الأبنية بشكل عفوي وركزت هذه الدراسة على فلسفة التصميم المستدام من خلال التنسيق بين الفضاءات المفتوحة والمشاهد الطبيعية والبيئة المحيطة عن طريق:

1- استهلاك اقل للطاقة وتزويد أعلى نوعية من الإنارة الطبيعية والاصطناعية. .
2- حفظ المواد والمصادر الطبيعية وتحسين نوعية البيئية الداخلية. .
3- وقاية مصادر المياه الداخلية والخارجية. .

إن الهدف النهائي من التصميم المستدام هو استعمال نهج الأبنية القديمة في تركيب منطقي بأفضل التقنيات الحديثة.

التوصل إلى التعريف الإجرائي لمفهوم الاستدامة في الفراغ الحضرى

هو الحفاظ على الأنظمة الايكولوجية والاقتصادية والاجتماعية المشكلة للبيئة الحضرية وهي عملية تتضمن التعامل مع الموارد والتوجه التقني للتطوير بصورة متناغمة ومتوافقة مع الاحتياجات الحالية والمستقبلية للإنسانية.

توجد ثلاثة مبادئ أساسية للعمارة المستدامة والتصميم المعماري المستدام والمتمثلة باقتصادية الموارد، وتصميم دورة الحياة والتصميم الإنساني.

اولا حفظ الطاقة والمياه:

ويشمل قرار حفظ الطاقة بالتخطيط الواعي لها ، أي تحديد ظروف المناخ المحددة لاتجاهية البناء وسمك الجدران والتخطيط الواعي للموقع والطاقة من خلال الاستفادة من شكل وموارد كل النباتات والأشجار.

ثانيا دورة حياة المبنى:

يمر المبنى بثلاث مراحل ما قبل البناء ويشمل المواد المعادة في البناء والمواد ذات العمر الطويل والصيانة القليلة والوجه البنائي المرتبط بالمرحلة السابقة والذي يشمل عدم استخدام مواد عضوية و ما بعد البناء ويشمل إعادة استخدام المبنى والبنية التحتية الموجودة.

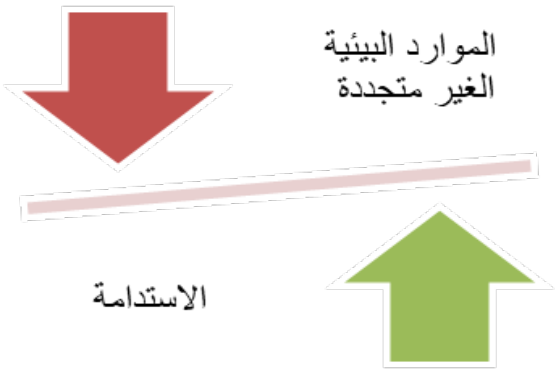
ثالثا التصميم الإنساني:

والذي يشمل حفظ كل المصادر الطبيعية الطبوغرافية الموجودة والتصميم الحضري وتخطيط المواقع ،أي الاستفادة من المخططات لتقليل طلبات الطاقة والماء وتحقيق الراحة الإنسانية من خلال إدامة الصحة.

قياس الاستدامة

هو مصطلح يدل على القياسات الكمية التي تستخدم أساسا لادارة الاستدامة. و تشمل القياسات المستخدمة للاستدامة -و التي تشمل الاستدامة البيئية والاجتماعية والاقتصادية ، سواء على الصعيد الفردي أو في أشكال تجميعات مختلفة .

يمكن اعتبار قياس الاستدامة من المنظور البيئي هو مقارنة أو موازنة الهيئة الكمية لادارة الموارد بالطلب على النظم الايكولوجية. فكلما زاد الطلب الكمى على الموارد البيئية – خاصة الغير متجددة و التي تحدث خللاً في النظم البيئية – قلت نسبة الاستدامة، أي أن العلاقة بين استخدام الموارد البيئية الغير ممتجددة و الاستدامة علاقة عكسية .



صوره. 2 يوضح العلاقة العكسية بين الاستدامة والموارد البيئية الغير متجدده

مراحل التصميم الحضرى المستدام

يتوجه المصممون الذين يهتمون بالبيئة والحفاظ عليها في تصميماتهم إلى إستخدام أحد ثلاثة توجهات للتعامل مع البيئة الطبيعية في تصميم الفراغ الحضرى الملائم لمستخدميه:

التوجه الأول يلجأ الى إستخدام خامات ومواد بناء من الطبيعية في إنشاء الفراغ الحضرى مثل الطين والتربة والأخشاب وغيرها

لذلك فإن التحدي الذي واجه القطاعات العمرانية فى هذا الوقت إنما تمثل فى مقدرتها على الإيفاء بالتزاماتها وأداء دورها التنموى تجاه تحقيق مفاهيم التنمية المستدامة الشاملة (اقتصاديا –اجتماعيا – عمرانيا – بيئيا) وهذه المفاهيم تعكس الاهتمام لدى القطاعات العمرانية بقضايا التنمية الاقتصادية فى ظل حماية البيئة وخفض استهلاك الطاقة والاستغلال الأمثل للموارد الطبيعية، والاعتماد بشكل أكبر على مصادر الطاقة المتجددة، فى إطار متكامل للتنمية الاجتماعية لفئات المجتمع المختلفة تضمن مستوي معيشى افضل.

يعتبر منهج التنمية المستدامة من المناهج الحديثة ويكاد يرتبط بكل العلوم الإنسانية، ومنها علم التصميم الحضرى الذي يهدف إلى إيجاد صلة الوصل الفنية والوظيفية ما بين العمارة والتخطيط - وارتباط التنمية المستدامة بالتصميم يهدف الوصول إلى تصميم حضرى مستدام لا يزال في أفكاره وتطبيقاته في التمهيديات الأولية .

التنمية المستدامة

يمكن تحديد مفرداتها ومفهومها بأنها التنمية التي تلبي الاحتياجات للأجيال الحالية بدون المساومة على إمكانيات الأجيال القادمة في تلبية حاجاتهم وهذا التعريف يحتوي على ثلاثة أفكار رئيسية هي:

التنمية : يجب أن لا تخلط مع النمو، حيث النمو هو اتساع مادي كمي لنظام اقتصادي ، بينما التنمية هي مفهوم نوعي يرتبط مع التحسين والتقدم في الأبعاد الثقافية والاجتماعية والاقتصادية

الإحتياجات : تقديم أفكار في توزيع الموارد ومواجهة الإحتياجات الأساسية الانسانية المتزايدة لإرضاء طموحاتهم بحياه افضل

الأجيال القادمة : مفهوم العدالة للأجيال العالمية وأن علينا واجب أخلاقي للعناية بكوكبنا وليكون في نظام جيد مقبول للأجيال القادمة

ماهية الاستدامة

ان أصل كلمة استدامة (sustainer) يعود اصول لاتينية من مصطلح to hold up أي الإسناد من الأسفل فالمجتمع يشيد من الأسفل عن طريق ساكنيه في الوقت الحالي والمستقبل حسب المفهوم الإغريقي .

إن مفهوم الاستدامة هو الاستغلال الأمثل للموارد والإمكانات المتاحة سواء كانت بشرية أو مادية أو طبيعية بشكل فعال ومتوازن بيئيا وعمرانيا لضمان استمرارية الإدامة دون إهدار مكتسبات الأجيال القادمة.

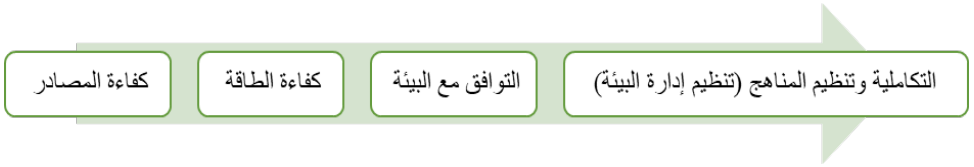
كما ان الاستدامة -بالمعنى الواسع - هي المقدرة في الحفاظ على عملية أو حالة معينة وهي الآن تعتبر أكثر استخداما فيما يتعلق بالنظم البيولوجية و البشرية في الحفاظ على العمليات Ecosystem و في سياق الايكولوجي يمكن تعريفها بأنها قدرة النظام الإيكولوجي فى الحفاظ على الايكولوجيه Ecosystem ،والوظائف ، والتنوع البيولوجي والإنتاجية في الحاضر و المستقبل.

لقد تم الإشارة إلى مفهوم الاستدامة في المؤتمر العالمي للتنمية والبيئة و قد تم صياغة الاستدامة (بأنها سد حاجات الناس في الحاضر دون التأثيرعلى الأجيال القادمة لسد احتياجاتهم في المستقبل) وخلال المؤتمر تم الموافقة على بعض التعاريف الخاصة بالاستدامة بأنها :

Sustain	Sustenance	Sustainable
دعم يمد بالحياة، يواصل أو يبقي	هي عملية إعطاء الحياة أو القوت، الغذاء أو التغذية	هي صفة تصف شيئا قد تم إعطاؤه دعما وراحة وغذاء أو زود بالعون وبهذا بقي ذلك الشيء على قيد الحياة وبشكل مستمر أو قد تم إطالة عمره

جدول . 1 يوضح التعاريف المرتبطة بالاستدامة وماهية أصل كلمة استدامة

قدم هذا التعريف لأول مرة ١٩٨٧ ويعني تحقيق حاجة الحاضر من دون التأثير في الأجيال القادمة هو تحسين نوعية حياة الإنسان في ظل محدودية سعة مصادر النظام البيئي وقد تم تحديد أربعة أهداف للاستدامة بموجب منظمة التعاون الاقتصادي والتنمية كما هو موضح بالصورة 1.



صوره.1 توضح عناصر ومفردات التنمية المستدامة والاهداف الرئيسية من الاستدامة

تكامل التصميم المستدام للحيزات العامة مع تقنيات التفاعل الرقمي وتطبيقاتها بمدينة الأسكندرية

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[ا] مدرس بكلية الفنون والتصميم جامعة فاروس بالاسكندرية , مصر
دكتوراه في الفنون الجميلة تخصص العمارة الداخلية

[ب] مدرس بكلية الفنون الجميلة جامعة الاسكندرية , مصر
دكتوراه في الفنون الجميلة تخصص العمارة الداخلية

الملخص:

ان التوجهات التصميمية الحديثة اصبحت بلورة للاطار النظرى التفصيلى للإبداع وتمثلت في التقدم في تقنيات الانظمة التفاعلية لتواكب المتطلبات والإحتياجات البيئية فى ظل الثورة الرقمية، ولقد شكل هذا الاساس الاحتياج السعي لدراسة تصميم الاماكن العامة وما تتضمنه من تصميم حيزات الاستراحات الخارجية باعتماد علاقة جانبين اساسيين هما الجانب الابداعي فى التصميم والجانب التطبيقى المعتمد على التكنولوجيا الرقمية التفاعلية للوصول الى تصاميم اكثر ابداعا".

و يهدف هذا البحث الى تعريف الاسس العامة للتصميم التفاعلي الذكي الابداعى وعلاقته بتحقيق الاستدامة البيئية و كيفية توظيف التكنولوجيا و فاعليتها فى تحقيق التكامل بين التصميم و مستخدميه بشكل يتسم بالمرونة و القابلية التفاعلية لخلق فراغ ديناميكى تفاعلى .

بالاضافة الى دمج آليات النظام الحركى التفاعلى لخلق تكوينات تصميمية ابداعية متطورة مغيرة بذلك النمط التقليدى في التصميم واستخدام تكنولوجيا الخامات الحديثة و تنفيذها باستخدام الحاسب الالى و التقنيات التكنولوجية الرقمية ، و تتعرض الدراسة لمجموعة من النماذج التوضيحية كتطبيقات لهذه التكنولوجيا الرقمية التفاعلية فى التصميم الحضرى لمدينة الاسكندرية ويختتم البحث بالاجراءات التطبيقية وصولا" الى استخلاص و عرض النتائج و التوصيات النهائية .

ويتم تناول مشكلة البحث حيث القاء الضوء علي مشكلات التصميم في الحيزات العامة حيث تحدث الكثير من التغييرات فى الفراغات و البنية الهيكلية المعمارية و نظم اتصالها مع المتلقى. انعكست تلك التطورات فى ظل النظم التكنولوجية المتقدمة فى التصميم و التنفيذ على تغيير تصميم الحيزات العامة مثل محطات الانتظار وبالتالى كانت المشكله الرئيسيه هى الرتابة والجمود التى تظهر بشكل ثابت من الناحية التصميمية والوظيفية .

يعد أهمية البحث خطوة نحو دراسة تطبيقات التكنولوجيا الرقمية التفاعلية فى تصميم حيزات عامة مستدامة لانتاج انماط شكلية وظيفية و التعبير عن هوية الفراغ باستخدام التكنولوجيا الرقمية و الفكر التفاعلى و توظيفها لتقديم حلول ابداعية لحل المشاكل التصميمية المختلفة و التنوع فى الخامات و النظم التكنولوجيا الذى يتناسب مع احتياجات الفراغ

يعتمد البحث بشكل اساسى على تقديم حلول ابتكارية والاتجاهات تصميمية و وظيفية لحيزات العامة و لذلك فهو يهدف للتعرف على النظم التكنولوجية المتقدمة فى التصميم و آليات التنفيذ الرقمي التفاعلية و دراسة مدى فاعليتها فى تحقيق التكامل بين آليات الفراغ و مستخدميه بشكل يتسم بالمرونة و القابلية التفاعلية لخلق تصميمات ابتكارية ذكية.

الكلمات المفتاحيه: الاستدامة , التصميم الحضرى , التكنولوجيا الرقمية , التفاعلية , النظام الحركى التفاعلى

المقدمة

ان الهدف الرئيسي من وراء مفهوم الاستدامة هو العمل على ايجاد توازن فى كافة المصالح التى تخدم جميع المستويات الاقتصادية والاجتماعية والبيئيه فى اطار المجتمع الواحد ومع ظهور العديد من النداءات فى بداية الستينات نحو حماية البيئة والطبيعة والتوجه نحو تفعيل اليات تكفل التوافق والتكامل فيما بين البيئة العمرانية والنظام البيئى الاكبر ، دفع ذلك العديد من المؤسسات الى العمل فى مجال التصميم الحضرى من خلال فكر الاستدامة ، الامر الذى جعل العالم يدرك مدى الارتباط الوثيق بين التنمية الاقتصادية والبيئية وانعكاس ذلك مباشرة على النشاط الانسانى داخل الفراغات الحضرية دون استنزاف للمصادر الطبيعية

وهكذا فإن بواعث تبني مفهوم الاستدامة في القطاع الحضرى لا تختلف عن البواعث التي أدت إلى ظهور وتبني مفهوم التنمية المستدامة (Sustainable Development) بأبعادها البيئية والاقتصادية والاجتماعية المتداخلة.

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المحاور الرئيسية للمؤتمر

١. المرونة الحضرية:

كيفية تكيف البيئة الحضرية مع المخاطر والكوارث المحتملة عن طريق حلول مبتكرة وديناميكية بحيث تكون مجتمعات صحية ومرنة

٢. التخطيط المرن:

وجود نهج تكاملى على المستوى التخطيطي يضع في الاعتبار التطورات الاقتصادية والاجتماعية والبيئية المستقبلية

٣. المرونة والتراث:

الحضري والطبيعي ودوره في تعزيز الهوية

٤. المرونة البيئية:

ومواجهة المخاطر الناتجة عن التغيرات المناخية

٥. مرونة تنسيق الموقع:

وقدرته على الحفاظ على الوظائف الإيكولوجية والتنوع البيولوجي

٦. مرونة البنية الأساسية:

مدى قدرة وكفاءة شبكات البنية الأساسية على التكيف مع الازمات والمخاطر

٧. المرونة في الأنظمة:

وقدرتها على القيام بتقنيات وحلول منهجية مبتكرة لمواجهة تحديات المرونة

٨. استخدام التكنولوجيا الحديثة والابتكارات:

في تحقيق مرونة المدن

٩. المرونة في أنظمة التعليم:

وقدرتها على تخطي العقبات

١٠. السياسات العامة المرتبطة بالمرونة:

لضمان اتباع نهج متماسك ومتكامل نحو المرونة

مقدمة

أصبحت الأزمات صفة طبيعية للمدن خلال القرن الحادي والعشرين. وذلك لان معظم المدن عرضة للعديد من التأثيرات الناتجة عن التعرض للضغوط والمخاطر الطبيعية أو البشرية مثل التغيرات المناخية والتوسع الحضري وعدم الاستقرار الاقتصادي. ومن هنا نشأت فكزة المدن المرنة والتي يقصد بها قدرة النظم الحضرية على الحفاظ على الاستمرارية عند التعرض لأي ضغوط أو مخاطر مع قدرتها على التكيف الإيجابي والتحول نحو الاستدامة. فى المدينة المرنة يتم تقييم جميع الخطط والمخططات والاستراتيجيات وذلك عن طريق الاستعداد لاستيعاب جميع المخاطر والاستجابة لها وسبل التعافي منها؛ سواء بشكل فجائى أو متدرج. متوقع أو غير متوقع مع الحفاظ على وظائفهاً وهياكلها وهويتها الأساسية والتكيف مع التغييرات المستمرة.

اللجنة المنظمة

رئيس اللجنة

زينب فيصل عبد القادر	**أستاذ مساعد**	**جامعة أكتوبر للعلوم الحديثة والآداب**

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جامعة أكتوبر للعلوم الحديثة والآداب

كلية الهندسة

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تقاطع محور 26 يوليو مع طريق الواحات

مدينة 6 أكتوبر – الجيزة – مصر

تليفون: ٣٨٣٧١١١٣ – ٣٨٣٧١١١٥ – ٣٨٣٧١٥١٦

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المؤتمر الدولي

" نحو مدن مرنة "

مـــارس 2020