



URBAN LANDSCAPE POTENTIAL TO SUSTAIN ARCHITECTURAL DEVELOPMENT, CASE-STUDY: MOHARAM- PASHA COMPOUND, ALEXANDRIA, EGYPT

Pakinam Nabil Barakat

*Architectural engineering department, Pharos University in Alexandria, Alexandria, Egypt.
 E mail address: pakinam.nabil@pua.edu.eg*

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ABSTRACT

Sustainability is considered a leading term through various world aspects like architecture, transportation, manufacturing and business. It guaranteed the continuity of many fields by protecting the natural environment from harmful human interferences for their own comfort, without recognizing that most of their energy consuming solutions are in fact leading to many universal changes that threaten the ecological equilibrium of the world. Furthermore, urban landscape Architecture allows the architect to create green cities where the built and the natural environments are interwoven. Therefore, by combining the previous terms together, sustainable landscape architecture will be formed and will achieve balance between buildings and their inhabitants that in return will lead to sustainable development in cities and the whole world.

The paper analyzes sustainability from an environmental point of view and then a focus is undertaken on landscape planning, environmental impact design and sustainable development. Furthermore, there will be a review for keywords' definitions, landscape elements and the route to sustainable cities. Finally, the researcher combines together the principles of sustainable urban landscape and those for sustainable development, leading to a new methodology that will not only enhance the landscape ecological performance in urban spaces, but will also protect habitats and strengthen their sense of belonging and identity. Finally, this new vision will be applied on a case-study, Moharam Pasha Compound in Alexandria, showing how it will enhance inhabitants' life and achieve environmental, economic, aesthetic, social and psychological Benefits.

Keywords: Urban Landscape; Landscape Architecture; Sustainable development.

1. Introduction

Governments and decision makers are now directing designers and investors to create sustainable clean solutions and new cities. This will be obtained by using several means like sustainable development, urban environmental solutions and using landscape elements. But, implementing them in the designing phase of new cities only is not enough therefore; new agenda is needed to apply them on the already existing cities converting them into clean ones that are protected from toxic environments, biodiversity loss, climate

change, global warming or pollution. This will not only rescue the world's natural resources but will also enhance the inhabitants' life and health.

2. Methodology

This paper aims to present key issues on urban landscape and sustainable development, showing their vital role in architecture and organizing the relation between human activities and natural environment. The first part of the paper is a descriptive methodology that explains:

- Sustainable development and means to achieve it with its goals.
- The concept of sustainable landscape elements in architecture.
- Urban landscape ecology and its benefits.

Afterwards, the researcher has grabbed together and analyzed all principles for achieving Sustainable Urban Landscape and sustainable development. Moreover a new principles agenda is developed to sustain architectural development through the proper use of sustainable urban landscape.

The second part of this paper examines the previous principles by applying them on a case study: Moharam-Pasha compound, a mixed-use (residential and commercial) present in Moharam-Beik, Alexandria, Egypt. Furthermore, a conclusion will be presented to review the positive impacts that have been gained by the owners, inhabitants and visitors of this compound when transformed through urban landscape into a sustainable environmentally friendly compound, leading to sustainable architectural development.

3 Sustainable developments

3.1. Sustainable development and means to achieve it

Sustainable development has been announced by World Commission on Environment and Development as "A development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" [1]

Architects have agreed that there is a triangular conflict among economy ecology and equity as a key for sustainable development. A balance between development, property and resource discourses is required to achieve an integrated sustainability in an urban context (fig.1). Moreover, by achieving this triangular equation, sustainable landscape will lead to sustainable development through achieving sustainable cities and they all will be able to finally achieve the holistic scope of sustainability (fig.2) [2]



Fig. 1. Means to achieve Sustainable Development [2]



Fig. 2. Hierarchy of Sustainability [3]

3.2. Goals of sustainable development

United Nations has set up seventeen sustainable development goals (SDG) in 2016 that are also called “Global Goals” (fig.3) and they are considered a mean for wealth, protect the planet and achieve peace. They are achieved by the partnership of governments, private sector, civil society and citizens alike to preserve the rights for future generations ^[4]



Fig. 3. Seventeen Sustainable Development Goals up by United Nations^[4]

4. Sustainable urban landscape

4.1. Sustainable landscape in architecture

Sustainable landscape architecture is a subtitle for sustainable design that performs on three levels which are; design, planning and management in order to achieve harmony between people and the surrounding natural and built environment ^[5].

4.2. Landscape elements

Hardscape and softscape are considered elements of landscape which work together perfectly to achieve the goals and function of landscape architecture. Furthermore, hardscape is named on all hard and non-living elements, while softscape is every soft living growing object like. Table 1 shows a comparison between the two previous and ways to differentiate their characteristics ^[6].

Table1.

Features of hardscape and Softscape, aselemens of landscape architecture

Hardscape	Softscape
<ul style="list-style-type: none"> • Hardscape can be "hard" like gravel, paving and stones (whether natural or manmade) • They are solid and unchanging • They also can be retaining walls, pavers for paths or patios, outdoor kitchens, water features, gazebos, decks, and driveways. 	<ul style="list-style-type: none"> • Softscape are living and growing like flowers, trees, shrubs, groundcovers. • They change and evolve constantly, as they grow and adapt to climate and other conditions. • Plants are available in a variety of colors, shapes, textures, and sizes.

Source: Researcher, 2019

4.3. Urban landscape spaces ecology

“Urban landscape spaces” is a term used to describe every public and private open space in urban areas and should also be covered by softscape, soil, trees or shrubs, which are

available by visitors to use and enjoy. Furthermore, Architects and designers should put in considerations the rules to achieve green urban spaces correctly in a city, which are (fig.4) ^[7]

- The percentage of the area of green spaces to the city.
- Activities and experiences should be present to increase the quality of urban green spaces, like; play areas, seating and vegetation.
- The functionality of green spaces, which is influenced by the location and distribution (accessibility) in the whole city
- They should be designed to promote public transportation, whether bicycles, cars or buses. Also, they should plan the required parking spaces.

4.4. Sustainable urban landscape benefits

It is the most convenient method with many benefits (fig.5) to achieve ecological designs for the outdoor and urban environment. In addition, it is the strategy of achieving function, cost, energy efficiency, aesthetic and environmental objectives of sustainable development. Architects now focus more on two main features; function and aesthetic to attain sustainable landscape ^[5].



Fig. 4. Principles to achieve green urban spaces^[3]

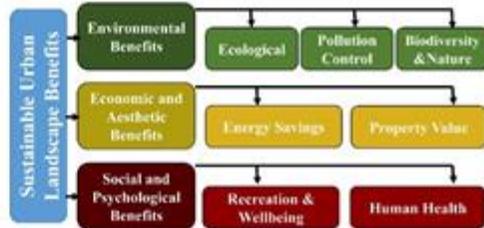


Fig. 5. Sustainable Urban Landscape Benefits^[3]

5. Principles to sustain architectural urban landscape development

A new agenda is designed by combining principles of sustainable landscaping with principles of sustainable urban city and sustainable development ^[8]. Thus, by applying them, a greater sense of community and safe will be present due the 24-hour activity. Therefore, a new perspective is introduced through applying the following guidelines:

- Preserve the percentage of green area to the city's area
- Spread the implementation of green ground and water plant
- Provide softscape that purify air quality and Water wise usage.
- Minimize pesticides and harmful chemicals
- Minimize usage of non-renewable energy especially for lighting systems
- Provide hardscape that increase people comfort.
- The preservation of open and public spaces for activities and gatherings
- Provide easy accessibility of all active areas.
- Provide "Shades" for protection from severe weather condition, energy saving and temperature control.
- Provide "Signs" in streets and parks for guiding.
- Use suitable durable "Pavements" for different activities.
- Use "Waste Conveyance System" for street garbage containers and buildings to reduce pollution and sustain people health.

- Management of “Water Bodies” to regulate air temperature and increase aesthetic and property value.
- Use of locally and sustainably materials and products
- Eliminate sources of pollution like air, water, solar, thermal and light.
- Encourage people on clean transportation systems.

6. Application of the new principles agenda on a mixed-use compound.

6.1. Case study: Moharam-Pasha compound, Alexandria.

Compound Moharam Pasha is a residential commercial compound that occupies an area of 24000 m². It is located in the heart of Alexandria city on Suez canal street, one of Alexandria’s main roads, connecting the city’s entrance to its seaside. It is located near the commercial, entertainment, educational and medical centers of Alexandria ^[9] (fig.6). After studying the compound, it consists of fourteen residential building of fifteen floors height and consists of many commercial divided on ground and first floors only, to be in a specific zone apart from residence flats and to provide them with their daily needs (fig.7).



Fig. 6. Location and surrounding of Moharam-Pasha compound, Alexandria, Egypt ^[3].



Fig. 7. Moharam-Pasha Compound ^[9]

This residential compound is considered a luxury one according to the GOPP, General organization for physical planning ^[10], (GOPP, 2009) because the area of residential units varies from 103 m², consists of two bedrooms with an area more than 90m², to 248 m² (4 bedrooms). The compound consists of total 1,274 residential units with average of 5,096 inhabitants; this is calculated by multiplying the average population per unit (4 inhabitants) in total number of residential units (1,274).

6.2. Strategy followed to achieve sustainable urban landscape development

A questionnaire has been proposed by the researcher with twenty people living inside the compound and visitors. Therefore, all their opinions, problems and suggestions will be reviewed, beside the researcher’s proposed solutions. Furthermore, other solutions will be suggested towards sustainable living (fig.8).

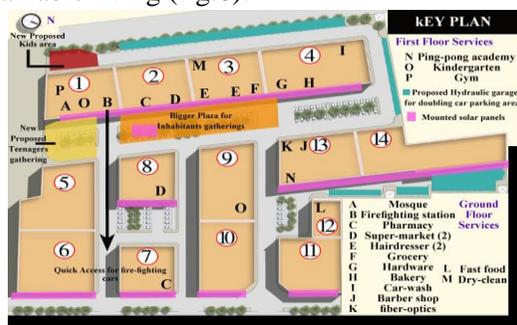


Fig. 8. Moharam Pasha site with existing services and proposed solutions ^[4].

6.2.1. Find solutions for existing problems

Parking Problems: The compound is designed with 5000 m² for ground floors garages that keeps 500 cars and 300 outdoors parking slots. This solves the parking problem of 800 units out of 1274 unit while the rest of inhabitants face a huge problem in parking their cars due to the limited parking slots corresponding to cars available (fig.9). Therefore, the hydraulic garage parking is the best solution for limited parking spaces with convenient height of 6 m (fig.10). It is powered by an electronic hydraulic system which lifts and lowers a platform till 3 tons car, allowing cars to be parked over each other ^[11]

Although the GOPP has assigned that in luxury compounds, each unit should have one parking space for a car, but when asking the inhabitants, it was discovered that 90% of the questionnaire samples had more than one car for the each residential unit. Therefore, by doubling all parking slots using the hydraulic system, 1600 parking slot will be available for inhabitants.



Fig. 9. Parking Problems in



Fig. 10. The condition before and after the parking

Pollution control: There are many forms of pollution like sound, noise, water, visual and many other types. By asking the inhabitants, they complained from the garbage whether in the floors inside buildings or in the compound itself (fig. 11). Therefore, the researcher suggested implementing smart pneumatic waste conveyance system (PWCS) (fig.12), an automated waste collection system that uses a vacuum-type underground pipe network to collect household waste, which is then transported through underground pipes to a sealed container ^[12].



Fig. 11. Garbage in compound as a source of pollution ^[4].

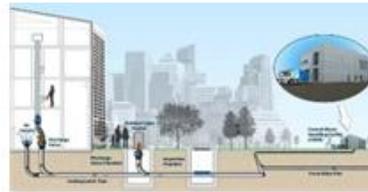


Fig. 12. Smart pneumatic conveyance system as a gravity vacuum waste conveying ^[12].

6.2.2. Using softscape towards sustainable development

Public and active areas: They are very limited inside the compound which prevents its inhabitants from gathering and communicating due to the very small plaza that has only three benches for the whole 14 buildings. Furthermore, this forces people to stand in street roads and kids to play between cars which increase the level of danger and accidents.

Therefore, there are three decisions that must be taken to provide all inhabitants with their active areas, which are (fig.13):

- 1- Children face a huge danger due to playing in streets and riding bicycles between cars. Therefore, a new kid's play area will be proposed to allow a safer playing zone and healthy fun childhood for inhabitants (fig.14). This area will apply all

safety standards as it is present inside the compound and surrounded by walls from three sides leaving the only access controlled from one side.

By considering 15% of inhabitants (5096) are children with age from 3-9 years therefore there is an average of 750 children that will have an area of 650m² to play and enhance their physical and mental health.

- 2- According to GOPP, a small football playground should be present, therefore it will be proposed with dimension 40m*25m for older children who play football and will be very close to the main plaza where parents can sit together and watch their children playing (fig.15).
- 3- The existing plaza present in front of most services and is considered nowadays the gathering point for all inhabitants. But due to its small area, this allows more accidents as it forces people to stand in streets with their children playing around. Therefore, it will be doubled and extended to reach these services (fig.16). Also, for safety the vehicles street that was present between plaza and services will not exist anymore as the plaza extension will take place.

The new proposed main plaza will extend to reach 25m *80m with area of 2,000 m² by calculating the sum of all green areas in compound they will reach 4,000 m² which is efficient for the 5,000 inhabitants as each person according to GOPP needs a green area from 0.65m² to 4.75 m²



Fig. 13. Proposed solutions for public and active areas in Moharam-basha compound [4].



Fig. 15. The new proposed area for playground [4].



Fig. 14. New proposed kids' play area [4].



Fig. 16. Extending the present plaza to reach services [4].

Green Rooftop on buildings and softscape in site : The presence of green roof, green ground cover, trees and bushes have a great role in increasing property aesthetic values and gain many benefits to public, private, economic, social sectors, local and global environments. In addition to, green roof allow the building to harmonize and integrate with the natural green environment (fig.17).

Therefore, it is vital to increase the usage of softscape in site, public parks, active spaces and parking areas. In addition to, making use of the connected roof of most buildings in Moharam-Pasha site, by applying green roofs will achieve many goals like [13]:

- Air filtration
- Green roof will reduce heat gain and decrease the use of air conditioners.
- Temperature insulation.
- Environmentally friendly with high aesthetic features.

- Urban agriculture and fresh food production.

Water recycling for irrigation and cleaning: On-site wastewater reuse can reduce water use in both urban and rural households. Grey-water is wastewater from non-toilet plumbing fixtures such as showers, basins and taps. It is ideal for garden watering and can be reused indoors for toilet flushing and clothes washing (fig. 18) [14].



Fig. 17. Green Roof building in harmony with natural environment [15].

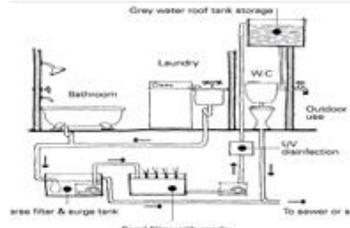


Fig. 18. A waste water reuse system [14].

6.2.3. Using hardscape towards sustainable development.

Use Natural resources for energy generation: Electricity generation in the compound depends on non-renewable energy, which means that the more the electricity is used; the more our natural resources will be wasted. Therefore, it is vital to search for natural renewable resources for a healthier life.

The Research proposes solar panels to be used in three forms to convert solar energy into electricity without causing any harm to environment, which are:

- The one floor building, shown in figure 19, present inside the compound as an electrical room is the best place for mounting solar panels on its inclined roof and connected to batteries inside the room.
- In addition to, wall mounting them in south-east elevations shown previously in figure 7 to supply services shops with electricity and act as shades.
- Finally, they will be mounted on all buildings' roofs (fig.20) to capture sun rays and produce electricity.



Fig. 19. Electricity room where solar panels will be roof-mounted [4].



Fig. 20. Wall mounted solar panels, used as shades [16].

It is important to reduce the usage of electricity in street lights by using the perfect combination of photovoltaic, high-efficiency LED brings very well economic and environment benefits with the clear renewable solar energy (fig. 21) [17].

Solar Bench: The construction is made of durable materials like steel, wood and tempered glass. The smart benches will encourage people to spend more time in natural environment (fig.22) [18].



Fig. 21. Photovoltaic panels that can be mounted to existing street lights [17].



Fig. 22. Solar bench with solar panels that empowers USB ports and built-in lighting [18].

Solar Tree Shades: The solar tree (fig.23) looks like a normal tree with of glass photo-voltaic panels in the form of branches and tiers that can be placed to provide shade. The more the shaded areas increase in the compound, the more it reduces exposure to harmful Ultra-Violet rays, extend outdoors time and increase comfort ^[19].

Sustainable Recycle containers: A set of four recycling metal containers (fig.24) are proposed to encourage inhabitants for garbage recycling, also connected to the proposed central pneumatic waste conveyance system ^[20].



Fig.23. Solar Tree proposed for clean energy & shading systems ^[19].



Fig. 24. Sustainable Recycle Garbage containers ^[20].

Sustainable bicycle parking: To encourage the inhabitants on using bicycles for a better health and cleaner environment, the researcher proposed two bicycles parking stations beside the two main gates of the compound. The Parking unit idea offers a place for cyclists to safely park (fig. 25), while facilitating greenery, benches and advertising plane that could help support care of the unit ^[21].



Fig. 25. Bicycles parking unit proposal at Moharam-Pasha Compound ^[21].

6.3. Benefits of applying strategy on case-study

- **Safety:** The vehicles routes will be apart from playing, riding bicycles or gathering areas.
- **Better health:** Green Rooftop and softscape will reduce and filter air particles.
- **Garbage and pollution control** due to the usage of PWCS system, **Increase of property value:** Active areas proposals will increase the sense of belonging
- **Recreation and Wellbeing:** Plaza and playing areas provide people with a source of relaxation, self-satisfaction and emotional warmth
- Using **renewable sources of energy** that enhance human health and protect the right of future generations in natural resources.
- **Green roofs** can be useful in urban agriculture to produce fresh food.
- **Water reuse:** It reduce water bills, use fewer water resources, irrigate the garden during drought or water restrictions

7. Conclusion

Sustainability plays a vital role in the entire organization starting from local neighborhood and individuals to the whole planet. Therefore, it is important to allow the inhabitants and civic to participate in all sustainable implementations decisions.

The study supports the proposal of a new framework that provides a move towards a typology of sustainable landscape development design that in turn can help architects develop and refine

their approaches to sustainable architectural development. Furthermore, the result is a common grouping of strategies for achieving sustainable landscape and sustainable development.

Afterwards, the concluded framework was applied on a mixed-use residential compound due to the great belief that when promoting an ethic of sustainability and development in a small scale, this will encourage and empower people to take actions that improve environmental quality. Moreover, this will be applied on bigger scale like city then the whole world will call for sustainable landscape development, strengthen the bondage between built and natural environment and allow a better quality for life.

The research will finally encourage designers and architects to use this futuristic framework and achieve sustainable development through sustainable urban landscape.

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قدرة التصميم الحضري والاندسكيب على استدامة التطور والتنمية المعمارية دراسة الحالة: حي محرم باشا السكني، الاسكندرية، مصر

الملخص العربي

يتجه العالم الان الى تحقيق الاستدامة في مختلف المجالات كالعمارة ، النقل، الصناعة و التصنيع، فهي المفتاح الى استمرار الحياة وحماية البيئة الطبيعية من تدخلات الانسان المؤدية للتلوث و حدوث خلل في التوازن البيئي.

لذلك يعد التصميم الحضري والاندسكيب هم وسيلة الدولة والمعماريين لخلق مجتمعات ومدن خضراء ونظيفة حيث تندمج فيها المباني مع الطبيعة دون التسبب في اي ضرر لها.

يهدف البحث الى تحليل قواعد التنمية المستدامة من جهة وقواعد التصميم الحضري والاندسكيب من جهة اخرى و العمل على دمجهم للخروج برؤية جديدة و مستدامة. هذه الرؤية ستكون قادرة على تحسين الاداء البيئي للفراغات الحضرية ثم تطبيق هذه الاستراتيجية على تجمع سكني مثل حي محرم باشا في منطقة محرم بيك بالاسكندرية، مصر. سيتم دراسة كل ما يتعلق بالحي السكني بدايتنا من التصميم للمساحات واعداد السكان والمشاكل التي يواجهها، كما سيتم البحث عن حلول لتقليل نسبة التلوث به وتحويله الى حي سكني مستدام باتباع مجموعة من الخطوات وبحث المشاكل مثل:

- 1-مشاكل السكان في قلة اماكن انتظار السيارات وابتكار حل لمضاعفة عدد الاماكن.
- 2-حل مشكلة التلوث و القمامة عن طريق تطبيق نظام مواسير الضغط في مناور الخدمة والى خارج الحي مباشرة دون تدخل اي قوى عاملة
- 3-حل مشاكل المناطق العامة ومناطق الانشطة المختلفة وجعلها اكثر امانا وبعيدة عن السيارات، وقد ادي ذلك الى حل مشاكل كثيرة تتعلق بصحة الاطفال والشباب الجسدية والنفسية والعضلية.
- 4-استغلال اسطح المباني وتحويلها الى مناطق خضراء بالاضافة الى زيادة المناطق الخضراء في الموقع وما ترتب على ذلك من فوائد كثيرة مثل تنقية الجو.
- 5-استخدام مصادر طبيعية للطاقة المتجددة و استغلالها في ائارة المباني و الموقع.
- 6-استخدام ائاث للشوارع مستدام ومعتمد على الطاقة المتجددة لتشجيع السكان على الخروج في الهواء الطلق وممارسة أنشطة مختلفة.
- 7-استخدام حاويات قمامة تشجع على اعادة التصنيع والتدوير.
- 8-وضع محطات للعجل في الموقع العام لتشجيع الناس على استخدام وسائل النقل النظيفة والغير ملوثة للبيئة عوضا عن السيارات ووسائل النقل العام.

بتطبيق هذه النقاط تم تحويل التجمع السكني هذا الى تجمع نظيف ومستدام وبتطبيق هذه القوانين بنطاق اكبر سيحول المدينة الى مدينة مستدامة وتقل معدلات التلوث وتحسن عليها بيئيا واقتصاديا واجتماعيا وجماليا وفسولوجيا.