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IMPROVEMENT OF THE URBAN ENVIRONMENT

الهندسة المعمارية

ARCHITECTURAL ENGINEERING

Towards Achieving Environmental Sustainability of Landscape
"Case Study: Fayoum University Campus, Egypt"

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Abstract:
Landscape has been recognized as a major tool in the achievement of environmental Sustainability. The paper objective is bringing out the interrelationships between landscape design and sustainable development. It begins by looking at the theoretical and conceptual issues in landscaping, sustainability and environmental impact design. It then goes on to assess the intensity and scale of environmental impacts from landscape design. It argued that landscaping is a pre-requisite to environmental sustainability. Hence the paper asserted that unsustainable use of landscape elements leads to environmental problems like biodiversity loss, climate change, global warming, soil and coastal erosion, and pollution. The paper identifies the negative and positive impacts from landscape planning. Findings from the study show that the positive impacts outweigh the negative impacts, by analyzing some successful global programs in unique projects to quantify benefits and produce landscape performance through environmental sustainability Then summarized some strategies for applying in the practical frame work. the paper methodology is:
 1- Theoretical approach: explaining the relationship between landscape, environment and sustainability then analyzing chosen projects and concluding strategies for applying in the practical study.
2- Practical approach: analyzing the existing case study of fayoum university campus and applying strategies which environmental sustainability and evaluating the outputs.

Are derived from the theoretical study towards The paper concludes that landscape have fundamental role to achieve environmental sustainability on the highest level.
Keywords: landscape , Environmental sustainability , landscape impacts , environmental landscape.

Introduction :
Landscape architecture is one of the preconditions for environmental Sustainability. Sustainable landscape architecture creates ecological designs for the outdoor and urban environment. It begins with appropriate systems which address function, cost, energy efficiency, beauty, and environment. Sustainable development means the use of environmental resources in perpetuation of existence (see Wright, 2008) Singh, 2009; to help protect habitat, contribute to storm water management, conserve water, among other objectives. The current trend in the practice of landscape architecture is to find the balance of "aesthetics and function" required for Successful environmental Sustainable design. The paper summarized some strategies to applying in landscape projects to achieve Environmental sustainability of landscape using and relying the global projects and experiences. The paper introduces a practical framework to enhance landscape through environmental sustainability , with important reference and application in one of the Egyptian high education institutions; Fayoum University Campus.
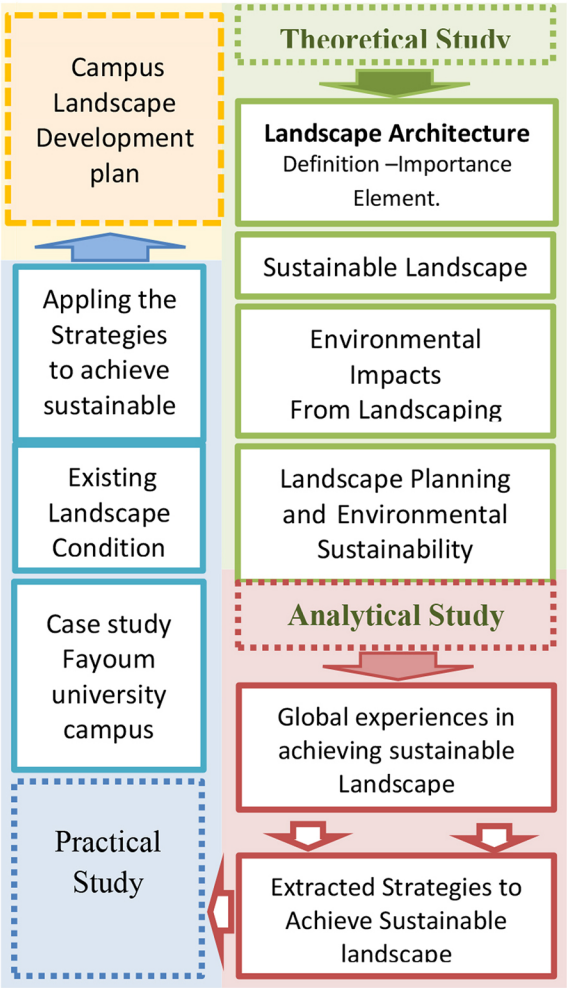
Structure of the Paper:

Fig. 1.chart structure of the paper.
Source: The author

1- Landscape Architecture:

1. 1-Landscape definitions:

Landscaping means the creation of an environment that is enabling, convenient and comfortable for living, working and circulation. Landscape Architecture is an appropriate way of conserving the biodiversity and other components of the landscape. From this point of view, Kanagabsabai (2010) perceived landscaping as a means of maintaining a healthy, clean and pure environment. Also, from ecological point of view. Jay and

Scott (2011) declared that the landscape structure affects the abundance, distribution, and interaction of organisms.

1. 2 -The importance of landscape:

Landscape architecture is rooted in an understanding of how the environment works and what makes each place unique. It is a blend of science and art, vision and thought. It is a creative profession skilled in strategic planning, delivery and management. Landscape architects bring knowledge of natural sciences, environmental law and planning policy. They lead teams, engage stakeholders and manage conflicting demands. They also create delight with beautiful designs, protecting and enhancing our most cherished landscapes and townscapes. Landscape Architecture has great benefit in economic, health and Psycho-social and environment aspects.

1.3 -Landscape Architecture Elements:

There are two main components in landscape design. These two parts are Softscape and Hardscape. Hardscape is designing elements that are solid and unchanging as the years go by such as (signboards, sidewalks, furniture elements…, Etc). Softscape are elements that are fluid and changing as they mature like (Grass, trees shrubs, flowers soil and water element ..Etc.). The ideal landscape is a balance of both hardscape and softscape.

Hardscape Element		
Sidewalks		

- Sidewalk and walkway materials must be slip resistant and easy to maintain.
- Locate obstacles such as signs, street furniture, and newspaper stands to the side of the travel way.
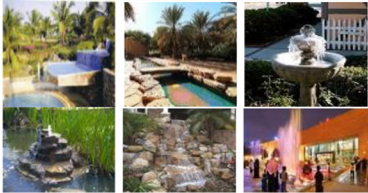
Street Corner and curb Extension	

- Street corners provide space for place-making elements such as landscaping, benches, bicycle racks, and improved lighting.
Street corner amenities can be associated with small plazas to enhance the public landscape.

Furniture Elements Trash, seating, lighting and signboards	

–Should be conveniently located for pedestrian traffic near benches, bus stops, and other activity nodes.
Pedestrian-scale lighting can be integrated into bollards, walls / seat walls, buildings, and Pavement.

Softscape Element	
Grass, Trees Shrubs Flowers and Soils.	

Using low-profile shrubs and upward branching trees to maintain visibility and sight distance at intersections, driveways, crossing, and other Critical areas.

Water elements Fountains, Water Pools, Canals	

Table 1. landscape elements Source; (Streetscape Handbook, adopted by author.)

2 - Sustainable Landscape:

Sustainable architecture is architecture that seeks to minimize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development space. Sustainable architecture uses a conscious approach to energy and ecological conservation in the design of the built environment. The idea of sustainability, or ecological design, is to ensure that our actions and decisions today do not inhibit the opportunities of future generations .

Fig. 2.The basic dimensions of sustainability
Source: Hasna, Abdallah M. "Dimensions of sustainability." Journal of Engineering for Sustainable Community Development 1.2 (2006)
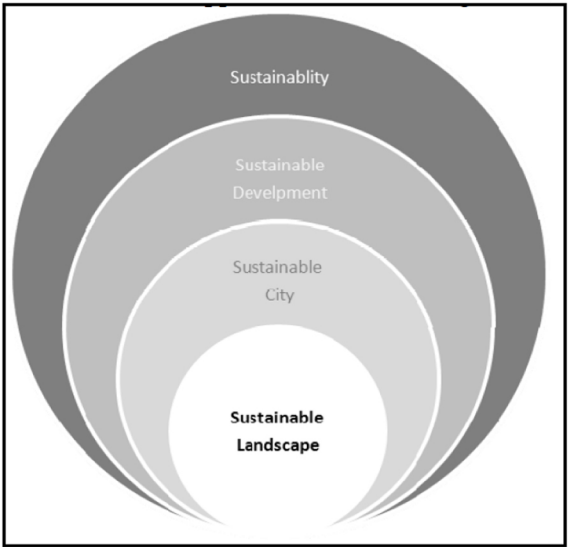

Fig. 3.Hierarchy of sustainability
Source: Importance of Humane Design for Sustainable Landscape S. Toofan (2014)

A change of lifestyles and attitudes toward the local and global environments is important, the development of scientific knowledge-bases that provide skills, techniques, and methods of implementing specific environmental design goals is urgent. To enhance environmental sustainability, a landscape must holistically balance and integrate all three principles - Sustainable Design, Economy of Resources, and Life Cycle Design - in design, construction, operation and maintenance, and recycling and reuse of architectural resources, These principles comprise a conceptual framework for sustainable landscape
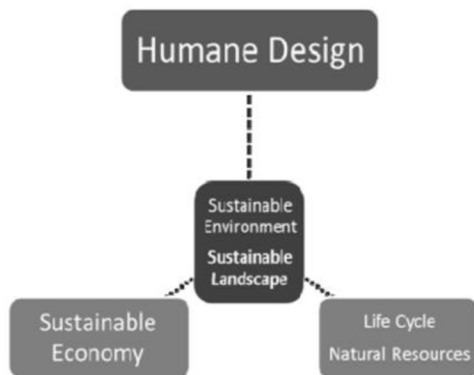Architectural design.

Fig. 4. Humane Design for creation sustainable landscape.
Source: Importance of Humane Design for Sustainable Landscape S. Toofan (2014)

3- Environmental Impacts From Landscaping:

- The positive impacts of landscaping include the socio-economic effects, as well as the provision of contact with culture and nature.
- Other positive impacts are environmental conservation, initiatives for waste management, improved concern for urban appearance, improvement of environmental condition, as well as making the most of professionals like landscape architects, planners, curators, sculptors, estate managers, horticulturists, artists, and environmentalists.
- Moreover, some unquantifiable impacts are made on the environment
Through landscaping. For example, social welfare improvement,
Amenities, cultural heritage, and environmental change. Harris (2006)
Established that there is a significant relationship between landscape planning and environmental impact design. He opined further that landscape protection is a possible way of combating the changing perspectives on the earth, as well as the associated problems like pollution, depletion of earth's protective ozone layer, deforestation, species extinction, global warming and climate change. Landscape planning is very important in order to cushion the effects of environmental hazards and risks.

4- Landscape Architecture and Environmental Sustainability:

- Landscape architecture is a strategy for achieving the social, economic and environmental objectives of sustainable development. The social objectives include participation in Environmental monitoring and management, promotion of cultural identity, institutional development, as well as empowerment. Also, the economic objectives include growth equality and efficiency, while the ecological objectives include biodiversity conservation, retention of ecosystem integrity, as well as management of global resources.
- Landscape architecture could be viewed as an environmental approach to the attainment of sustainable development. For instance, from landscape ecological approach, many landscape planners have perceived the conservation of plants as a means of enhancing the quality of the environment, (Given 1995; Bell et a;,

1994; Haines – Young, 2000; and Clouston, 1979).

- Sustainable development requires an understanding of the interaction between human activities and natural processes (Joseph, 2009).

Rising rate of urbanization has inflicted several problems on the Environment, while there will always be a need for general Environmental awareness-raising, today there is even more urgent priority– namely to demonstrate how the concept of sustainable use can be applied to real life situation (Christafferson, 1998).

5 - Experiences Achieved Environmental Sustainability of land scape.

California Academy of Sciences San Francisco, California, U.S.A

The living roof's 3,500 square-foot observation deck is one of the museum's most popular exhibits. the green roof reduces storm water runoff by more than 90 percent, lowers energy needs for air conditioning,

The living roof was planted with 1.7 million native California plants. that adapted to the local ecosystem, this landscape requires little irrigation and attracts numerous species of birds, butterflies, and insects.

Create1.5-acres of new landscape space around the museum. Flexible outdoor rooms supply opportunities

The roof opens to allow cool night air to flow into the building below. By using natural

for sculpture, exhibits, cafes, receptions, and informal gatherings. A large building overhang and strategic planting design.

ventilation instead of air conditioning to regulate interior temperature, the building becomes more energy efficient.

HtO Park Toronto, Ontario, Canada :

This unique urban public space offers a sand beach, grass-covered green space amid paved pathways, and a planked boardwalk along the Waterfront.

The project creates a sense of community, offering relaxing gathering spaces for mental restoration and social interaction in a working utility.

The lush green grass and trees are irrigated with lake water rather than drinkable city water. This water conservation strategy saves the city thousands of dollars each year in avoided water treatment costs.

The paths are made of porous materials, allowing rainwater to infiltrate the soil beneath. This effective stormwater management technique helps alleviate the problems Associated with rapid runoff, such as water pollution and flooding .

Burbank Water and Power Eco-Campus Burbank, California, U.S.A

The structure was saved from the junkyard and acts as a giant trellis, creating an interesting juxtaposition of industry and nature.	The project creates a sense of community, offering relaxing gathering spaces for mental restoration and social interaction in a working utility.

Table 2. Experiences and global projects (achieved Environmental sustainability,OECD 2015, adopted by author.)

6- Summarized Strategies for achieving Environmental Sustainability of Landscape:

Reducing of Energy, Carbon, Water and Waste – Promote of Healthy and Safety life.

- Reducing of air , water and land pollution.

- Creating or maintain a functioning soil ecosystem and utilize strategies to promote infiltration and maintain water future integrity of the watershed

- Developing of plant communities that serve as a foundation for a healthy ecosystem.

- Utilizing of strategies to promote and change the climate to be more suitable and comfortable for users

- Energy conservation which Refers to reducing energy through using less of an energy service

- Using the landscape to reconnect people to nature and to apply the aim of the place.

7- Managing resources and materials efficiently by reducing material needs, reusing materials generated onsite, and recycling materials as much as possible.

Figure 5. Summarized Strategies for achieving Environmental Sustainability of Landscape, (adopted by author.)

7- Case Study Fayoum University Campus:

Fayoum is a city in Middle Egypt. Located 100 kilometers (62 miles) southwest of Cairo, as shown in figure 6. The city located today at a height of 22 meters above sea level on the banks of the Bahr Youssef canal which penetrates the Fayoum depression of its southeastern part and is divided into eight distributary canals which provide the Fayoum with water necessary for cultivation and drinking. The total population of the city of Fayoum is 851,125 inhabitants (Census 2014).

Figure 6. Fayoum location .
(Surce: Google earth)

Fayoum University is a governmental university located in the Egyptian city of Al Fayoum in northern Egypt. From 1976 to 2005, Fayoum University was a public institution within the University of Cairo. In August 2005, it was established as an independent campus with 2,000 faculty members and enrollment of about 25. 000 students.
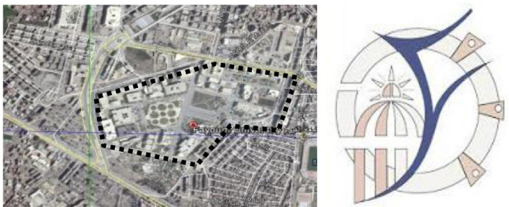

Figure 7. location of Fayoum University
(Surce: Google Earth)

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The evaluation of the existing conditions of the Fayoum University landscape was primarily achieved through site observations, and allowed for a site condition inventory, a functional analysis, and an aesthetic appraisal of the campus environment. Identification of primary landscape organizing elements and features that contribute to the existing physical character has been noted, and relevant problems and issues described. An inventory map was developed to describe the various landscape features, and a photographic data bank was compiled to illustrate in detail the conditions of the Fayoum Universty Campus . The map and inventory photos are included as a frame of reference.

Fig.8. Map, Google earth , adopted by author

7.1.1 Key plan of existing landscape condition :

Campus lawns:

Campus Features: Building:

Fig. 9. Key plan of existing landscape condition
Source: The author.

7.1.2 Campus Zoning:
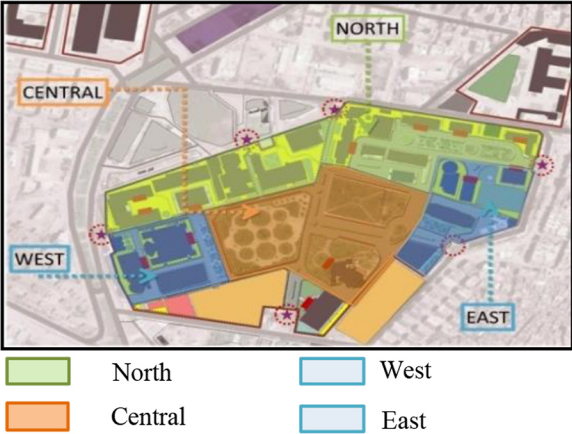
Fig. 10. Campus Zoning , Source: The author.

7.1.3 Overall Campus;

- Weak campus landscape image and character.
- Lack of visual consistency of campus landscape design.
- Incoherent organization of landscape components.
- Absence of a clearly organized and functional pedestrian-bicycle pathway system.
- Lack of built features that promote social gathering and interaction.

Fig. 11. Overall campus pictures, source: Author.

7.1.4 Central Campus;

- Lack of edging to control access and storm water.
- Absence of pedestrian improvements at roadway intersections.
- Weak relationship between campus passive spaces, special use lawns, and athletic fields.
- Undefined parking area.
- Inconsistent use of furnishing and lighting styles.
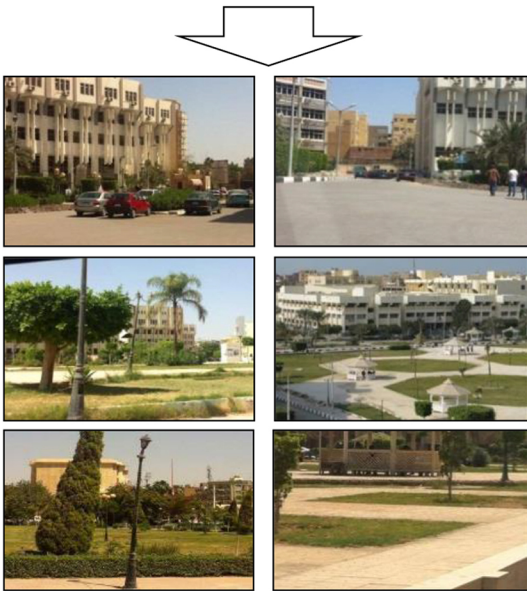
Fig. 12. Central campus pictures, source: Author.

7.1.5 North Campus;

- Lack of traditional-style built landscape features and structures.
- Lack of memorable outdoor spaces that maintain a comfortable pedestrian scale.
- Weak relationship between campus building spaces.
- Weak relationship of the Campus precinct to neighboring land uses.

Fig. 13. North campus pictures, source: The author.

7.1.6 West & East Campus;

- Weak attractive landscape of Main campus gates.
- Undefined parking area.

Fig. 14. West & East campus pictures, source: The author.

7.2 Existing Features:

Pedestrian Path – Pavers

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Trash Receptacles :

Benches :

Lighting:

Pergolas

Table 3. Existing features:
Source: The author)

7.3 Summary of Key Issues:

Existing landscape components and site features have generally been designed as a response to individual building architecture, the relationship between the landscape, furnishings theme, signage, circulation system, lawn spaces, and special features is indistinct. Additionally, the general absence of unified design in terms of site furnishings, landscaping, lighting, outdoor spaces, circulation, and edges has resulted in a somewhat illegible campus environment.

8- Applying Strategies for achieving environmental sustainability of landscape in Fayoum University Campus, Introduction :

The Campus landscape development plan, has been developed to achieve the strategies of environmental sustainability of landscape which summarized form theoretical study to conclude and review practical results in achieving environmental sustainability throw landscape. Campus landscape development plan has been divided into several parts, which allow for the implementation of the strategies as shown in the analysis below.

8.1 Campus Landscape Development Plan:

Fig. 15. Campus Landscape Development Plan
Source: Author.

Program:
1. Entrance water feature.
2. Active lawn area (1).
3. Active lawn area (2).
4. Main plaza.
5. Active lawn area (3) .
6. Building courtyards.
7. Theater.
8. Parking area.
9. Athletic field.

Fig. 16. Section A-A   (Source: Author)
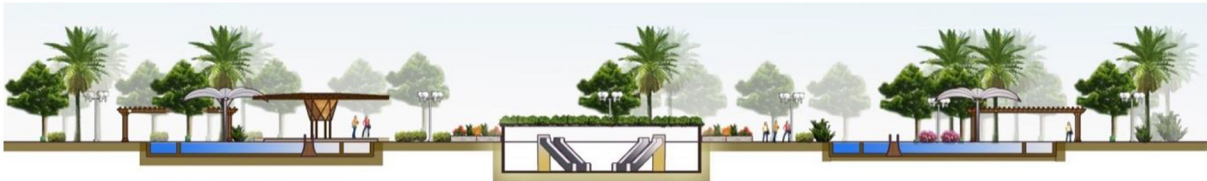
Fig. 17. Section B-B   (Source: Author)

8.2 Campus Landscape Development Framework:

8.2.1 Development Issues:
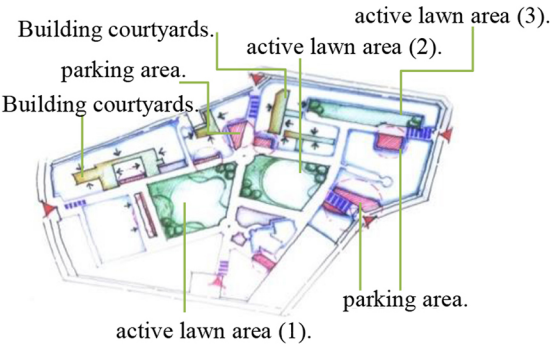
Fig. 18. Development Issues, Source: Author

8.2.2 Circulation study:
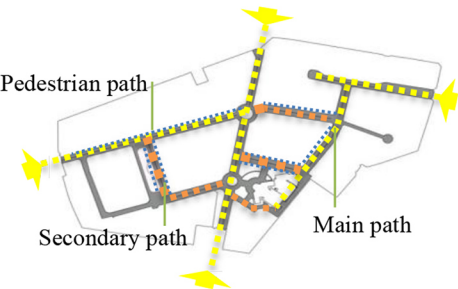
Fig. 19. Circulation study , Source: Author

8.2.3 Development Zoning:

- North
- West & east
- Central
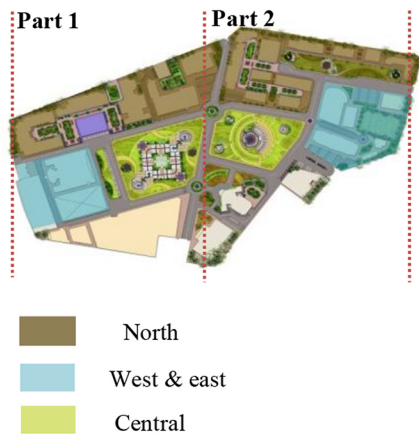
Fig. 20. Development Zoning , Source: Author

8.2.3 Softscape Study:
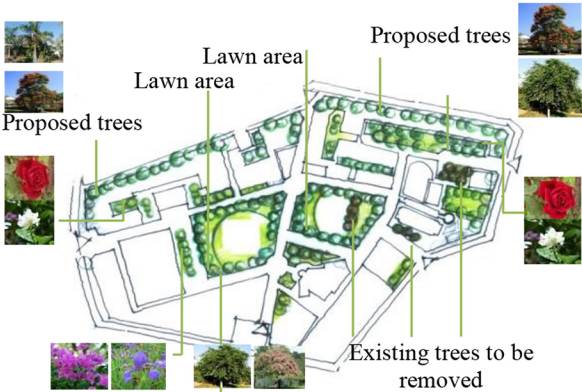
Fig. 21. Softscape Study, Source: Author

Cassia java	**Ficus**
Cassia javanica is a small to medium-sized tree up to(25-40) m tall.	Ficus sycamorus, a large, evergreen tree reaching a height of twenty metres, grows throughout Egypt.
Roystonia	**Spathodea**
It is a very large palm up to 20m, with a white marble column-like trunk and beautiful thick crown of leaves.	Spathodea campanulata is medium sized, reaching a height of 10-35 m, deciduous, with a round, heavy crown of dense, dark foliage.
Glycosides Bougainvillea Damascena Jasminum	

Table 4. Softscape Study source: curve landscape adopted by author)

8.3 Analysis of development plan according to selected Strategies:

8.3.1 North campus part-1
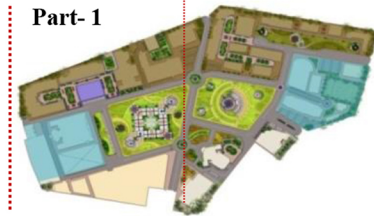
Part- 1

Fig. 22. North campus Development zoning, Key plan

After:

Before:

Fig. 23. North campus development plan , part1,source: Author

Applying Selected strategies.
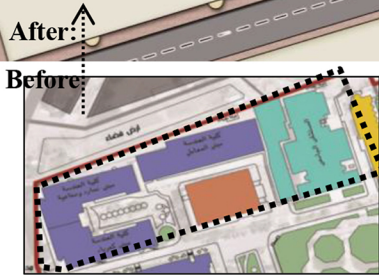
Fig24. North campus part 1(Existing condition) Google earth

Applying Selected strategies.

1 -Reducing of air, water and land pollution, through Reducing of automobile dependence between campus buildings to reduce air pollution (carbon emissions) and promote social gathering and interaction.

2 –Using the landscape to reconnect people to nature and to applying the aim of the place, through Provide relationship between campus building spaces which features, shaded setting and water feature that maintain a comfortable pedestrian scale and Develop a distinct and structured landscape pattern that addresses existing and new campus development while also including a common landscape furnishings palette for the whole campus (the Design Vocabulary).

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8.3.2 North campus part-2

Fig. 25. North campus development plan , part2,source: Author

Part- 2
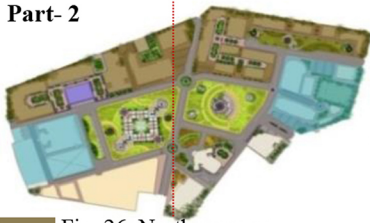
Fig. 26. North campus
Development zoning, Key plan

After:

Before:

Fig27. North campus part 2(Existing condition)
Google earth

Applying Selected strategies.

1-Reducing of air , water and land pollution.

2-Using the landscape to apply the aim of the place. These two strategies have been achieved by , create a hierarchy of circulation that effectively buffer pedestrians.

- development of automobiles and parking lots, such as establish an identifiable distinctive campus edge and transition to surrounding area neighborhoods.

- Develop comprehensive circulation, drainage and landscape improvements in perimeter .

-Increase the scale of details and complexity of planting at intersections, pedestrian entry areas, and points of interest .

3- Managing resources and materials efficiently by reducing material needs,

Through Plant native materials as part of the campus landscape design to help reduce maintenance and need for supplemental irrigation.

- Irrigation systems shall irrigate each area per the plant selected.

- low water plant zones should be irrigated less frequently to conserve water.

8.3.3 Central Campus Part-1:

Main Restaurant

After:

Fig. 28. Central campus development plan , part1,source: Author

Fig. 29.Section A-A, source: Author.

Applying Selected strategies.

1-Create a functioning soil ecosystem.
2-Developing plant communities that serve as a foundation for a healthy ecosystem.

By incorporating plants that are well-adapted to the local ecosystem, this landscape requires little irrigation and attracts numerous species of birds and butterflies. The green roof of main restaurant reduces storm water runoff.

Before:
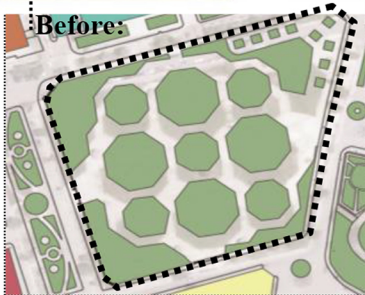
Fig.30. Central campus part 1(Existing condition) Google earth

Part- 1

Fig.31. Central campus Development zoning: Key plan

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8.3.4 Central Campus Part-2:

Open theater

After:
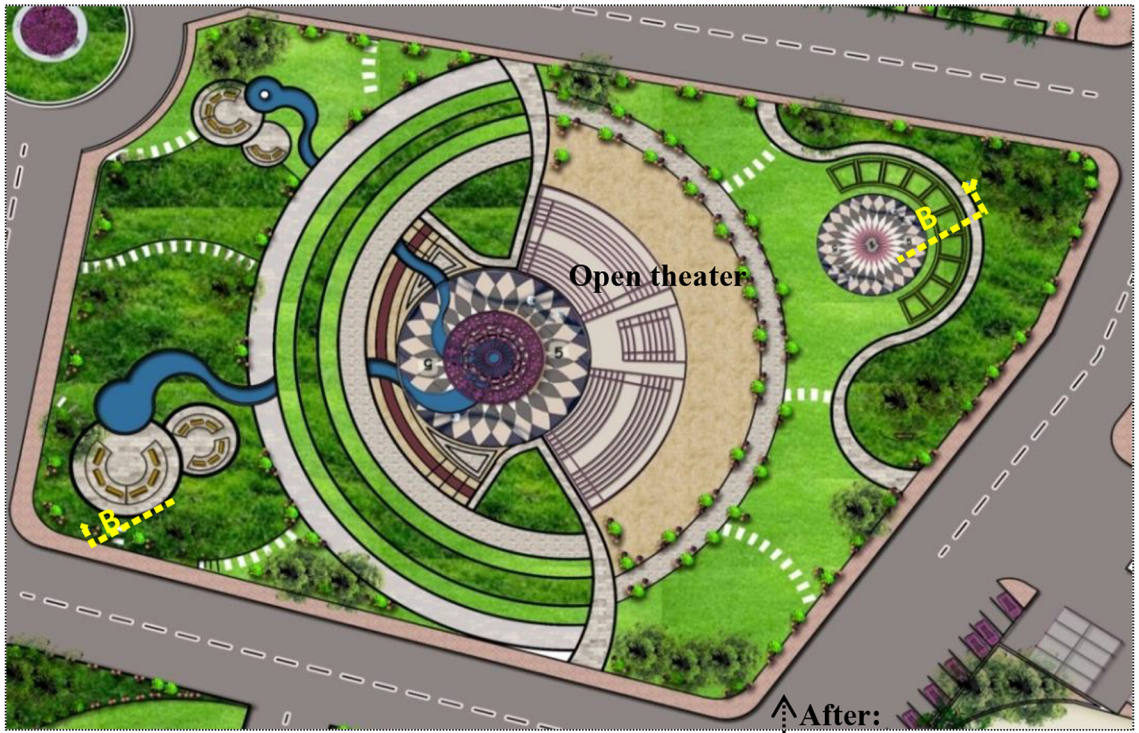
Fig. 32. Central campus development plan , part2,source: Author

Fig. 33. Section B-B, source: Author.

Applying Selected Strategies.

1- Utilizing strategies to promote and change the climate to be more suitable and comfortable for users by use, Water and green spaces contribute to cooling the air as it moves upward to replace the warmer air in the center of the sanctuary.

2- Using the landscape to reconnect people to nature and to apply the aim of the place.
The design features of the entire campus efforts to show leadership in the environmental field through the sustainable use of air, soil, stones and water.

- Community members can benefit from the green campus, which features large balconies, palms and shaded gardens, and can also attend specials and cultural events to be held in the open theater.

Before:

Fig.34. Central campus part 2(Existing condition) Google earth

Part- 2
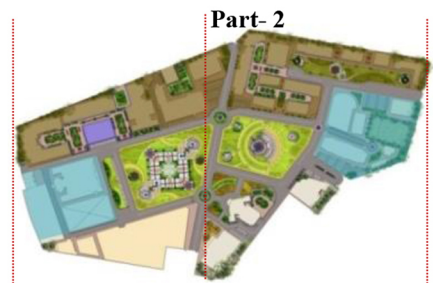
Fig.35. Central campus Development zoning, Key plan

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8.3.5 West & East Campus:

After:
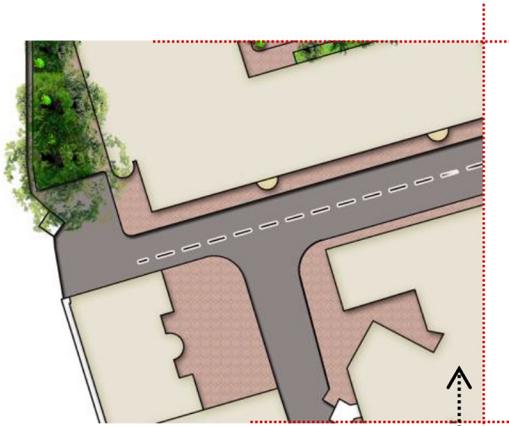
Fig. 36. West campus development plan
Source: Author
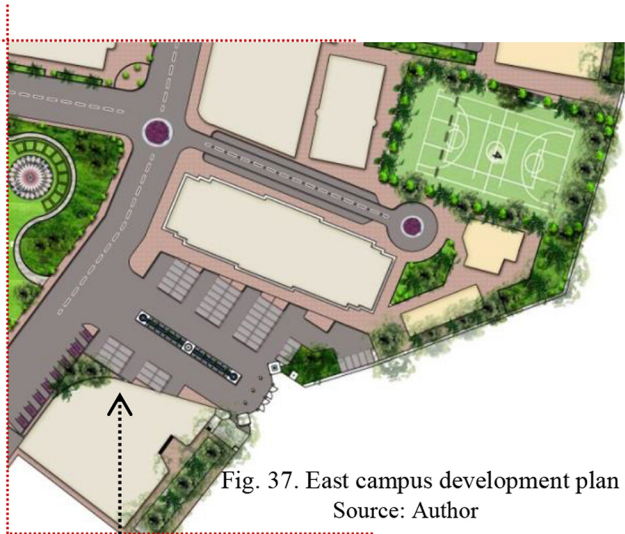
Fig. 37. East campus development plan
Source: Author

Applying Selected Strategies.

1-Reduce of air , water and land pollution, by, Defined parking area to avoid randomly parking while Attractive land scape of main & secondary gate.

2-Manage resources and materials efficiently by reducing material needs, reusing materials generated on site, and recycling materials as much as possible, Materials used in the campus are summarized up to: asphalt, concrete and stone in addition to other materials such as wood which are environmentally friendly attributes, including an enduring life-cycle.

- Accommodate redevelopment of the East Campus in a manner that is similar to the scale, structure, and qualities of the Central Campus.

After:

Before:
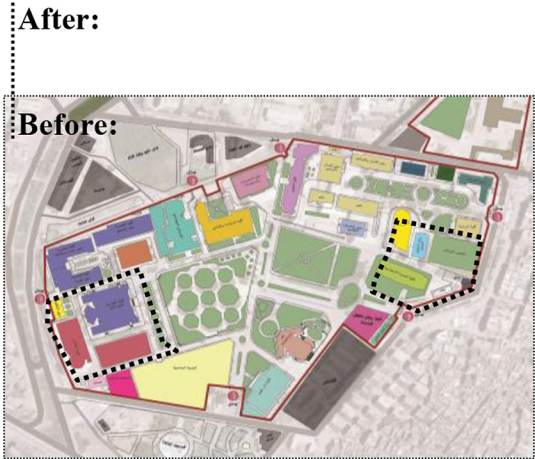
Fig.38.West &East campus (Existing condition)
Google earth

Part- 1   **Part- 2**
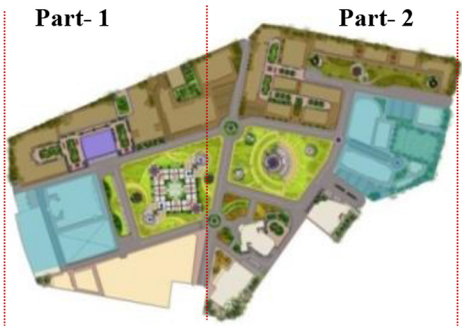
Fig.39. West and East Campus
Development zoning, Key plan

Discussion and Results:

This paper examines the key issues on landscape architecture and environmental sustainability. Landscape architecture is the aspect of physical planning which deals with the improvement of the aesthetic environment. Sustainable landscape architecture takes into account environmental aspects of landscapes. There are many different approaches to landscape sustainability. It is not just about creating green spaces, but are about implementing design that can benefit both humans and ecosystems simultaneously; the paper summarized some strategies from theoretical and analytical study for applying in fayoum university campus, it has been developed in a logical sequence that leads from an examination of campus landscape and site development concerns to design concepts and solutions. This paper commences with an inventory and description of campus landscape components, and summary of key issues and opportunities for the long-term future development of the Campus environment . Next it proposes a master plan framework for future campus development.

The applied strategies have been achieved the environmental sustainability of landscape in Fayoum university campus and resulted the following :

- Improve active campus gathering spaces with site design and landscape improvements.
- Maintain and enhance larger passive courtyards, campus greens and quads with site and landscape improvements.
- Establish new larger scale multipurpose pedestrian plazas and gathering places.
- Reinforce circulation patterns and campus spaces with the development of distinct landscaped edges.
- Establish simple and direct circulation patterns.
- Defined and improve the character and appearance of parking lots interior islands.
- Reduce the number of duplicate paths and increase the efficiency of existing pathways.
- Establish a more unified palette of materials for lighting, site furnishings, and landscape and hardscape elements.
- Improve the visual quality of the, North, Central ,West and East campus landscape.

Conclusion:

The landscape is a prerequisite to a sustainable environment. Landscape architecture is a necessary tool for environmental protection. It preserves the environment from the fierce assaults of human on the environment. It is useful for the enhancement of the aesthetic value of the environment. Accordingly, for the achievement of sustainable development through landscape architecture, environmental resources should be used in such a way as to meet the need of the present without compromising the ability

of future generations to meet their own needs.

One of the widely recognized approaches for ensuring sustainable development is landscape architecture. Sustainable development cannot be attained without due consideration to the quality and preservation of the environment. Landscape architecture has a significant role to play in the protection of the rich variety of natural biological and physical resources that are available in the environment. For the attainment of sustainable landscape architecture therefore, it is necessary to promote landscape that encourages the meaningful and purposeful use of environmental resources.

References:

1. Wright, R. T. (2008) Environmental Science: Toward a Sustainable Future. New Delhi, PHI Learning.

2. Singh, H. R. (2009) Environmental Biology. New Delhi, S. Chand and Company Ltd.

3. Jay, W. and Scott, B. (2011) Essential Environmental. Pearson, Glenview.

4. Kanagasabai, S. (2010) Textbook on Environmental Studies. New Delhi, PHI Learning Private Limited.

5. myanmar census 2013, in - January 10, 2014.

6. Ibimilua Adewale Festus ,Key Issues on landscape Planning in the Context of Environmental Sustainability , European Scientific Journal January 20,2014.

7. Riham Rasheed Ibrahim Mohamed , Towards Maximizing the role of Materials to achieve Sustainability on gardens Hardscape level, giza, Egypt, 2015.

8. Ahern, J. (1995) Greenways as a Planning Strategy. Landscape and Urban Planning, 33, (1) 131-135.

9. Ashana, D. K. and Asthana, M. (2010) A Textbook of Environmental Studies. New Delhi, S. Chand.

10. Borrini-Feyerbend, G. and Buchan, D. (eds.) (2007) Beyond Fences: Seeking Social Sustainability in Conservation. Vol. 1. Switzerland and Cambridge, UK, IUCN.

11. Countryside Agency (2002) Recent Practice and the Evolution of Landscape Character Assessment. Countryside Agency.

12. Cranz, G. and Boland, M. (2005) Defining the Sustainable Park. A Fifth Model for Urban Parks. Landscape Journal 23 (2-04) 102-120

13. D. Satterthwaite, "The Role of Cities in Sustainable Development," Sustainable

Development Insights, Boston University, pp. 3-8, May 2010.

14. A. Soltani and E. Sharifi, "A case study of sustainable urban planning principles in Curitiba (Brazil) and their applicability in Shiraz (Iran)," International Journal of Development and Sustainability, vol. 1, pp. 120-134, Feb 2012.

15. Joseph, B. (2009) Environmental Studies. New Delhi, Tata, Mc Graw Hill. Kanagasabai, S. (2010) Textbook on Environmental Studies. New Delhi, PHI Learning Private Limited.

16. Magnus, O. O. (2005) Elements of Landscape Design. Benin, Easy Way. Nassauer, J. (1995) Culture and Changing Landscape Structure. Landscape Ecology 10 (4) 229-237.

17. William, M. A. (2009) sustainability. In Paul, C. Philip, C.; and Mark, G. (eds.) Introducing Human Geographies. London, Hodder Arnold

18. S. Toofan, Importance of Humane Design for Sustainable Landscape, IACSIT International Journal of Engineering and Technology, Vol. 6, No. 6, December 2014.

19. S. Romaya and C. Rakodi, Building Sustainable Urban Settlements: Approaches and Case Studies in the Developing World, London: ITDG, 2002.

20. C. Pugh, Sustainability, the Environment and Urbanisation, London: Earthscan, 1996.

21. R. Stren, R. White, and J. Whitey, Sustainable Cities: Urbanization and the Environment in International Perspective, Boulder CO, Westview Press, 1992.

22. B. Mollison, Permaculture – A Designer's Manual, Sisters' Creek, Australia: Tagari Publications, 1988, p. 127.

23. G. Haughton and C. Hunter, Sustainable Cities, London: Routledge, 1994.

24. Hasna, Abdallah M. "Dimensions of sustainability." Journal of Engineering for Sustainable Community Development 1.2 (2006)

الملخص :

الاستدامة البيئية هي القدرة على الحفاظ على جودة البيئة المادية الحالية مع الحفاظ على جودة البيئة في المستقبل، ويعتبر تنسيق المواقع من الأدوات الرئيسية في تحقيق الإستدامة البيئية ، وقد لوحظ أنه في المجتمعات العمرانية المعاصرة تم تهميش دور تنسيق المواقع واستخدامه بشكل محدود في مجال تجميل البيئة وإخفاء الدور الحقيقي وقيمته كأداه فعالة في الاستدامة البيئية.

من هذا المنطلق تهدف الورقة البحثية الى إبراز العلاقات المتبادلة بين تنسيق المواقع والإستدامة البيئية، من خلال التعرف على الدراسات النظرية لتنسيق المواقع ثم تقييم حجم الآثار البيئية الناجمة عنه . وقد اظهرت الورقة البحثية أن تنسيق المواقع شرط مسبق للإستدامة البيئية،

وأن الاستخدام غير المستدام لعناصر تنسيق المواقع يؤدي إلى العديد من المشاكل البيئية مثل فقدان التنوع البيولوجي ، تغير المناخ ، الاحتباس الحراري .... والتلوث ، كذلك تحدد الورقة البحثية الآثار الإيجابية والسلبية الناجمة عن مدى جودة تنسيق المواقع وقد تبين أن التأثيرات الإيجابية تفوق التأثيرات السلبية، من خلال تحليل بعض البرامج العالمية الناجحة في مشاريع متميزة ودراسة مدى تأثير تنسيق المواقع في تحقيق الإستدامة البيئية لها، ومن ثم الخروج ببعض الإستراتيجيات لتطبيقها في الدراسة التطبيقية.

منهجية البحث هي:-

المنهج النظري :- دراسة العلاقة بين تنسيق المواقع ، البيئة والإستدامة وتحليل المشاريع المختارة وصولا الي إستراتيجيات يمكن تطبيقها.

المنهج التطبيقي:- تحليل الوضع القائم لحرم جامعة الفيوم وتطبيق الإستراتيجيات المستخلصة من الدراسة النظرية مع تقييم النتائج.

وخلاصة الورقة البحثية أن تنسيق المواقع له دور هام ورئيسي في تحقيق التنمية البيئية المستدامة .

الكلمات المفتاحية : تنسيق المواقع ، الاستدامة البيئية ، تأثير تنسيق المواقع ، التنسيق العمراني المستدام.

Criminogenic Urbanism
How can Urban Fabric Stimulates or Deters Crimes?

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ABSTRACT:

Crimes rates reflect the security situation of the country. In addition to having mutual effect on many fields and aspects; such as, social, economic, humanitarian, and urban Design aspect. The crime indicator of Egypt is average in comparison to the other countries. Yet, the increasing rate of this indicator in the last years is very high. The last report of the public security, which was published in 2013, reported a huge increase in crimes rates compared to the preceding year. Urban design could be a controlling factor to deter certain types of crimes, as the physical environment represents the place (the situation) where crimes take place. This paper will deal with the compact urban fabric which forms most of the old parts of Egyptian cites and most of informal areas. This compact fabric is the most claimed to be a breeding place for criminals. First the theoretical part will contain the characteristics of compact urban fabric. In addition to defining the selected study areas from the old parts in Fayoum city characterized by this Fabric and their demographic composition. Second, the case study areas will be analyzed on the scope of crimes' types and rate. In addition to running GIS and integration analyses to define the controlling factors that can make the same urban fabric either stimulates or deters crimes. Third, this paper will list set of these controlling factors resulting from analyses.

KEYWORDS:

1. INTRODUCTION

All countries seek to ensure safety and security through developing crime prevention and criminal justice. Nowadays there are international crime indicators that reflect the security situation of countries which subsequently affect other vital aspects such as economy, investment, tourism, etc. one of the most important of these indicators is "the crime rate index" which is an international indicator that is produced by the known data base Numbeo. It includes 117 countries which are ordered from the countries of the highest rates of crimes to those of the lowest ones. The indicator is half-yearly produced. The work on the report is being made throughout the year in order to rate the crimes in the countries and sometimes the capitals. In addition, the report shows the indicator rates of crime of each country separately depending on what are considered as crimes in each country's law. In another word, the cases which are considered as crimes according to each country's laws are the only cases that are taken into consideration while making the report.

The occurrence of crimes depends on various dimensions; social, economic, political and physical. Many criminologists and sociologists argued the role and the effect of each dimension in crime occurrence. Some of them ended up their researches concluding that the physical urban environment is the dominant dimension behind crime occurrence describing certain regions and cities as criminogenic cities. Could it be true? If so, this means that understanding and controlling the relation between urban design elements and crime occurrence would better deter crime.

1.1 History of the Relation between Urban Environment and Crime

During the 1920s and 1930s criminologists' attention focused on the "criminogenic city" and the criminology of urban places, however, by the end of the twentieth century researchers had moved away from the notion that the city is itself criminogenic. Subsequently the researches on urban crime has become more detailed and comprehensive concerning mainly with explaining why urban crime rates vary, why some social, economic, and spatial characteristics are correlated with variations in urban crime rates, and how certain crime characteristics of urban places affect individual criminality[1].

The beginning of assuming that the city might have a crime-causing effect was by the European sociologists such as Émile Durkheim (1897)[2], Max Weber (1958)[3], Ferdinand Tonnies (1887)[4], who wrote about the changes resulted from the transition of societies from agrarian and village-based forms to industrial and urban-based ones. They assumed that rapid social change, growing and expanding cities would turn these urban communities into criminogenic cities. Yet, regardless this assumption related to migrations and social change, most of eighteenth-and nineteenth-century philosophers and social scientists believed that city life itself would be criminogenic even without any changes or transition of societies[5]. Their motive behind such belief was that London and other major European cities at that time were difficult places to live, "to go out at night before the advent of gaslights meant moving about with a large group of men carrying weapons and torches. To

do otherwise was to invite nearly certain mayhem and robbery" (Stark)[6].

Another experience was that of American sociologists associated with the University of Chicago in the period between 1920 and the World War II. They mainly concerned with why cities might have higher crime rates than the hinterland, In addition to their interest in documenting and explaining variations in crime levels within cities (Park, Burgess, and McKenzie; Shaw and McKay)[7].

At that time, when there were many variation between criminologists and socialists about do cities could be criminogenic by itself, OR crime in the city was caused by the influx of immigrants and social changes. Researchers from the Chicago School observed in their studies that some sections of cities consistently had higher crime rates than others, regardless of who populated those areas. They argued and demonstrated with data that crime rates can be explained more accurately by focusing on the ecology of areas in the city, rather than on the ethnic composition of the population inhabiting those areas[8].

They observed the immigration process within certain cities in the United States. They noticed that new immigrants typically moved into the poor and deteriorated neighborhoods for economic reasons. Crime rate in these areas was high due to poor living conditions, as these neighborhoods experienced great levels of poverty, racial heterogeneity, transience, and family disruption. However, as generations of these immigrant families improved their living conditions they moved to better neighborhoods, and as a result, their ethnic groups' crime rate declined. Meanwhile, new immigrants from different ethnic groups repopulated the neighborhoods that the earlier arrivals had vacated. Despite the near complete change in population composition, crime levels in these

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[1] Robert D.Crutchfield, Charis E.Kubrin (2002)
[2] French sociologist. He formally established the academic discipline and—with Karl Marx and Max Weber—is commonly cited as the principal architect of modern social science.
[3] German sociologist, philosopher, jurist, political economist
[4] German sociologist and philosopher. He was a major contributor to sociological theory
[5] Robert D.Crutchfield, Charis E.Kubrin (2002)

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[6] Stark, Rodney. Sociology. New York: Wadsworth, 1998.
[7] Park, Robert; Burgess, Ernest; and McKenzie, Roderick. *The City.* Chicago: University of Chicago Press, 1925.
[8] Robert D.Crutchfield, Charis E.Kubrin (2002)

transitory areas remained high[9]. Chicago School criminologists thus concluded that it was not criminogenic characteristics of ethnic groups that led to elevated rates of crime, but the nature of the urban ecology in which they lived.

Some of the most important theories during this era was the argument of Jacobs (1961)[10] that the circulation of people and appreciation of public space are crucial elements to the urban vitality and indicated that informal (natural) surveillance ("eye on the street") is a good deterrent to criminal activity[11]. Other study was that study examined empirically by Oscar Newman (Newman, 1972) in New York on crime prevention and neighborhood safety to elaborate the idea of defensible space and natural surveillance. He observed that hat higher crime rate existed in high-rise apartment buildings than in lower housing projects. Newman focused on explaining his ideas on social control, crime prevention, and public health in relation to community design. He defined defensible space as "a residential environment whose physical characteristics—building layout and site plan—function to allow inhabitants themselves to become key agents in ensuring their security." His theory depends on monitoring the urban space arguing that crime and delinquency can be controlled and mitigated through environmental design. And he numbered five factors that make a space defensible:

1. Territoriality: the idea that one's home is sacred
2. Natural surveillance: the link between an area's physical characteristics and the residents' ability to see what is happening
3. Image: the capacity of the physical design to impart a sense of security

4. Milieu: other features that may affect security, such as proximity to a police substation or busy commercial area
5. Safe Adjoining Areas: for better security, residents obtain higher ability of surveillance of adjoining area through designing the adjoining area

Thus, we can conclude that the dominant belief at this period of time related to the relation between cities and crime was that cities could be criminogenic because of their urban ecology, regardless the inhabitants and the social changes. This conclusion expresses the belief of most of Europeans and Americans criminologists and socialists during this era.

Later on, the concept of defensible spaces and its factors provided the theoretical base for the development of another important approach in urban crime prevention which is Crime Prevention through Environmental Design (CPTED). The noticeable limitation of this approach was in its scope. It deals with micro-level design and physical changes while marginalizing the macro-level (city, neighborhood)[12].

More recently, urban design researchers that uses Space Syntax techniques to analyze geographic distribution of crimes, started to pay more attention to other factors that could influence crime occurrence such as spatial and socio-demographic factors.

At the beginning of the twenty-first century, many theories that address urban crime (modern criminology) developed through using new analytic techniques, new research tools, and modified explanations relying on the earlier findings from the Chicago School. Many design researches was based on validating the relation between spatial configuration and crime occurrence using space syntax techniques such as, (Baran et al 2006, Nubani & Wineman 2005, Shu 1999, Hillier 1998).

The Space Syntax theory of Hillier depended on two measures which are integration and connectivity to measure the level of accessibility of street segments within a spatial

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[9] Robert D.Crutchfield, Charis E.Kubrin (2002)
[10] An American-Canadian journalist, author, and activist best known for her influence on urban studies, sociology, and economics.
[11] Baran, Smith, Toker; The Space Syntax and Crime: Evidence from a Suburban Community

[12] Brantingham 1981

system. The theory proposed that built environment with high integration and connectivity values will tends to attract higher densities of movement (pedestrian and car users). Moreover, most of space syntax researches showed that crimes, in particular property crime occurred in segregated areas.

1.2 Crime Rates in Urban Areas V.S Rural areas

Are crimes' levels higher in urban areas versus rural areas? According to international crime's statistics, community size does make a difference, as there is a massive variation in crimes rates between cities and rural areas. The Mega cities come first in the list of crimes rates. Violent and property crime rates in the largest cities (Metropolitan Statistical Areas, or MSAs) are three to four times as high as the rates in rural communities (Barkan), and then come the surrounding cities; however, the areas with the rural pattern have the lowest crimes rates.

A statistics hold for nearly all types of crime in U.S. metropolitan areas showed that homicide claims 11 victims per 100,000 inhabitants and more than 25 per 100,000 in some of the largest cities. In small cities and in rural counties, homicide claims only 5 victims per 100,000, and fewer than 2 per 100,000 in most rural states[13] (Federal Bureau of Investigation). This pattern also occurs for robbery and assault; they are much more common in large urban areas than elsewhere. Like violent crime, property crime is lowest in rural areas (Barkan). Further, this urban-rural difference has been found in Canada, England, Australia, and the Netherlands[14]. Same conclusion is proved by a recent statistics in England and wales for all types of crimes through different areas ranging from mainly rural style to mainly urban environment.
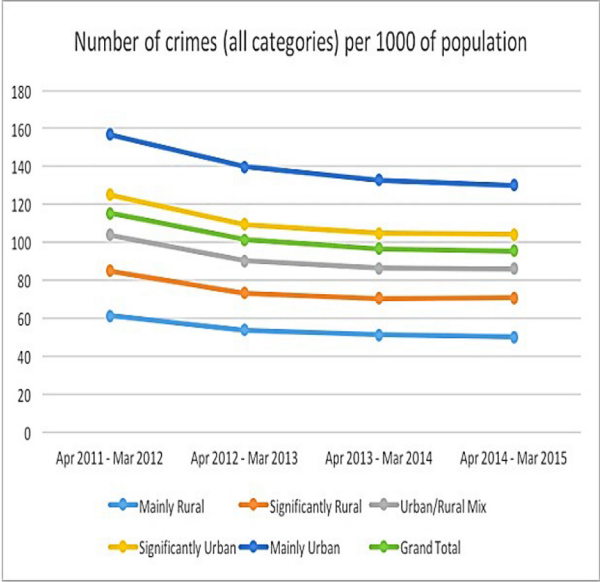
Figure 1:Urbancrime rates vs Rural Crime rates - (England & Wales)
Source: locationcounts.co.uk

Thus the belief of most of eighteenth-and nineteenth-century philosophers and social scientists that city life itself would be criminogenic might be true to great extent, subsequently cities becomes more challengeable for urban designers and criminologists to understand and examine the relation between urban design and crime.

1.3 URBAN CRIME

Mainly the research literature on urban crime is generally of two types. The first type compares the crime rates between cities, while the second type concerns with explaining the variation in crime rates within the same city. Both types depend on the primary social theories to understand their observation[15].

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[13] statistics from the Uniform Crime Reports (1995)
[14] Shover, Neil. "Burglary." In *Crime and Justice*, Chicago 1991

[15] Robert D.Crutchfield, Charis E.Kubrin (2002)
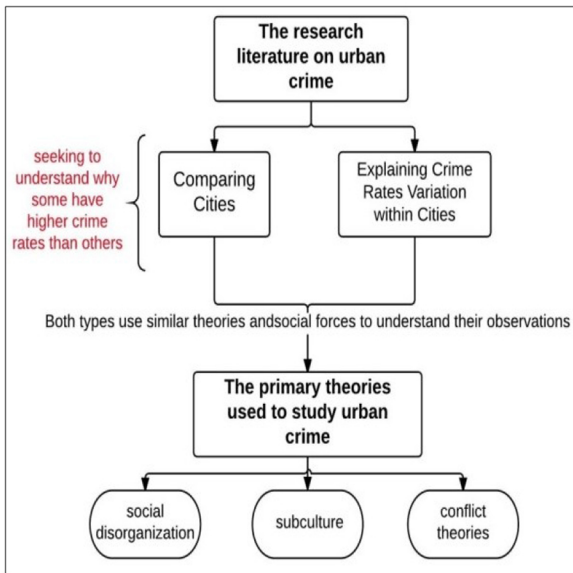
Figure 2: Research literature on Urban Crime
Source: By Author

This paper deals with urban crime of the second type and focuses on the urban crime prevention within the same city through analyzing one dimension of the physical environment which is the urban fabric. As it is one of the essential factors affecting the type and the rate of crimes, with respect to other aspects (social, economic and demographic).

2. Hypothesis of the Research

The previous literature review for the history of the relation between urban environment and crime shows that not only urban design researchers, but also criminologists and socialists paid great attention to this relation since the 18th century. This brief history ended up that although there were many varying views related to this relation; most of them agreed that cities could be criminogenic because of their urban ecology with complementary attention to primary social theories. Matching with these views, the paper's hypothesis is that urban design elements can either stimulate or deter crime depending on other factors. This paper focuses on a certain urban design element which is the compact urban fabric. In addition to proposing an approach to better understand and control crime occurrence through urban design.

3. The Proposed Approach

There are various international theories and hypnosis depended on integrated approaches of urban crime prevention to ensure safety and security. For example, "Jacobs 1916" and "Hillier's hypothesis "eyes on the street" deterring crime". However, locally instead of direct intervention in the criminogenic communities, the most common urban crime prevention strategy (UCPS) offered is creating new satellite communities, and cutting off the citizens and their public life behind gates using private security and surveillance systems. On the local scope, Egypt has the third rank of crime rate in the Middle East area and the 28th rank globally[16], the increasing rate of crime index of Egypt becomes very noticeable. The last report of the public security, which was published in 2013, reported a huge increase in crimes rates compared to the preceding year. The report showed an increase in robbery (350%), kidnapping (145%), cars burglary (500%), shoplifting (125%) housebreaking (130%), and finally homicide (130%).

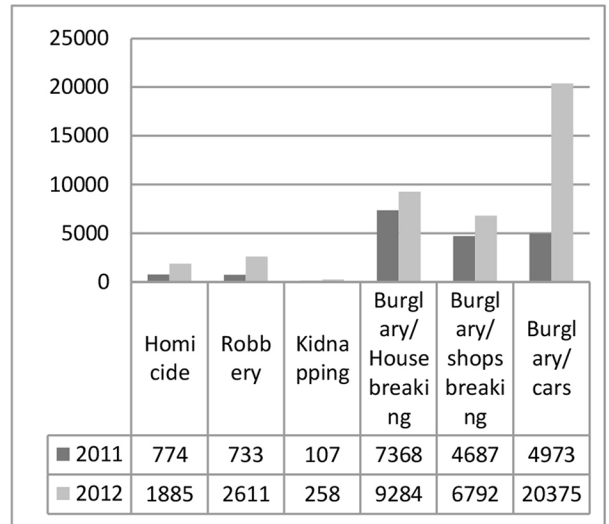|	Homi cide	Robb ery	Kidna pping	Burgl ary/ House breaki ng	Burgl ary/ shops breaki ng	Burgl ary/ cars
2011	774	733	107	7368	4687	4973
2012	1885	2611	258	9284	6792	20375

Figure 3: Crime Rate, Egypt (2011-2012)
Source: Public Crime Report, Ministry of interior, 2013

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[16] International Crime Index, 2017,
https://www.numbeo.com

Accordingly, this paper offers an approach to reach effective urban crime prevention, through developing Hillier's hypothesis of deterring crime by spatial configurations depending on integration values.

Various hypotheses argue the correlation between crime occurrence and monitoring the urban space through integration values. Some deduced that it is a negative correlation as the high integration values means much circulation of people and traffic leading to higher perception of public space and urban vitality. Thus high integration values leads to better surveillance ("eye on the street") on the urban space which is a good deterrent to criminal activity (Hillier's hypothesis). On the other hand, other hypothesis and application on case studies deduced results and conclusion that totally contradict with Hillier's hypothesis[17].

In order to verify this relation, the most common places for robbery and pickpocketing in Fayoum city were sited on roads network map. It was deduced that these places are located in areas with very high integration values. Although vital urban spaces and massive traffic (surveillance) makes sense to deter crime, pickpockets and robbers exploit the same circumstances to commit their crimes.
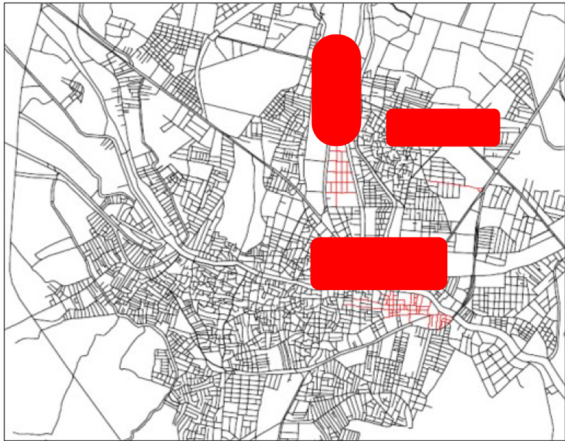
Figure 4: Common Places for Robbery & pickpocketing in Fayoum city
Source: Ahram Online (OCT.2014)

Thus the proposed approach aims to control and monitor the urban space to deter crimes but with different ways matching with each situation and respecting the varying demographic composition from one area to another.

In order to understand the actual relation between crime occuerance rate and integration values, the concept of monitoring the urban space "Eyes on Street" needs to be classified into three categories. The first category "A" refers to the technical surveillance systems such as CCTV systems[18]. This category would be very useful in deterring traffic crimes, yet it could be less efficient in burglary cases as offenders to some extent know how to escape these surveillance systems. The second category "B" refers to areas with high integration values which are characterized by commercial activities, mixes-use land, well accessibility and massive traffic. Finally category "C" refers to the local residents' surveillance (natural surveillance).

Figure 5: Proposed Approach to Deduce the correlation between Crimes and Integration Vales

Source: By Author

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[17] Perver K. Baran, William R. Smith, Umut Toker (2006)

[18] Closed Circuit Television Systems

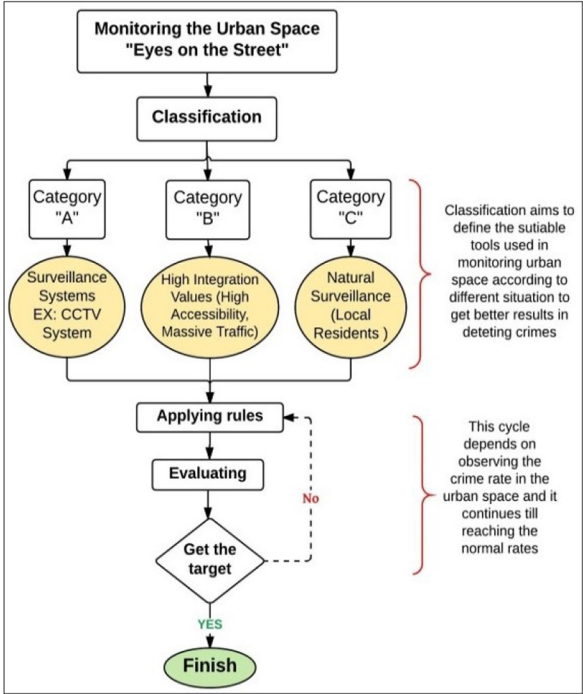| Monitoring the Urban Space			
Category	"A"	"B"	"C"
Description	Technical Surveillance Systems	High Integration values	Natural Surveillance (Local Residents)
Most Found in	New Gated compounds, Vital Buildings	Commercial and mixed-use areas	Rural areas, old parts of the city
Pros & Cons	· Very useful in deterring traffic crimes, yet it could be less efficient in burglary cases. · High Initial costs.(Con) · Surveillance Systems are easily damaged. (con)	· The massive traffic hinders accruing certain crimes.(burglary, homicide) · Suitable environment for some crimes (Pickpocketing & Robbery)	· More efficient in deterring crimes · Limited to definite areas depending on the demographic composition and the level of local residents in distinguishing foreigners
(Rules) Needed Complementary factors	· Vital movement and traffic · Mixed-used lands · Commercial activity	· Wide side-walks · Perfect lighting · Nearby security services · Vital Buildings	· Perfect lighting · Nearby security services

Table 1: Categories for monitoring the Urban Space
Source: By Author

This methodology will be applied to two case study areas in Fayoum city characterized by compact urban fabric (quite similar spatial configuration) but with contradictory crimes rates in order to deduce the controlling factors that can make the same urban type either stimulates or deter crimes. The two study areas are Dar-El-Ramad and Al-Sofy.

4. Case Study

This paper will compare between two case study areas in Fayoum city characterized by compact urban fabric (quite similar spatial configuration) but with contradictory crimes rates in order to deduce the controlling factors that can make the same urban type either stimulates or deter crimes. The two study areas are Dar-El-Ramad and Al-Sofy. First the demographic composition of the two areas will

be mentioned. Then a group of comparative analysis will be shown (Urban Fabrics, Roads Hierarchy, Services, Land use and Infrastructure) in order to show the Similarities and differences between the two areas Using GIS. In addition to other analyses depends on using Depthmap Platform, to compare between the integration values of the roads network in the two areas, show the 10 % core of integration in Fayoum city and deduce the correlation between these integration values and the security index.

4.1 Physical characteristics & demographic composition

The first case study area is Dar-el-Ramad which is classified as an informal area (unplanned) according to the strategic plan of Fayoum city with area nearly about 53 acres. The core of Dar el Ramad was formed since before 1800, while the whole area sprawled and originated till the 1960s as a compact urban fabric unplanned area. The estimated population is about 10,977 (2011) with negative growth rate (-1.548) and its population density is 208 p/acres.
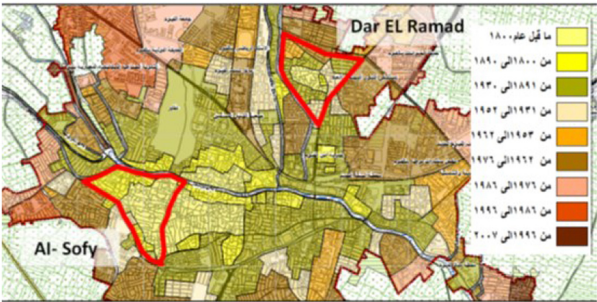
Figure 6:Urban Development of Fayoum city over TIME
Source: Strategic Plan of Fayoum city

The second study area is AL-Sofy; one of the oldest areas of Fayoum city, as it was formed since before 1800 till 1890.this area is classified as a part of downtown Fayoum according to the strategic plan of Fayoum city, yet it characterized by a compact urban fabric and suffers from multi urban and social problems with great shortage in services and infrastructure. This situation made the Informal Settlements Development Fund (ISDF) started

to upgrade Al-Sofy area and determine it as unsafe area of the third degree in 2013.

In addition to its urban deterioration, Al-Sofy area unlike Dar-el-Ramad is characterized by critical security status. Al-Sofy was known to be one of the most dangerous areas breeding criminals in Fayoum city. Its crime rate is of the highest in the city. The official statistics for 2016 showed 28 homicide case, 111 attempted murders, 39 burglary and 139 robbery cases all in Al-Sofy only during 2016[19].

4.2 Comparative Analysis for the two case study areas

Geographic information system (GIS) and Space Syntax are used to execute numerous comparative analysis between the two case study areas.
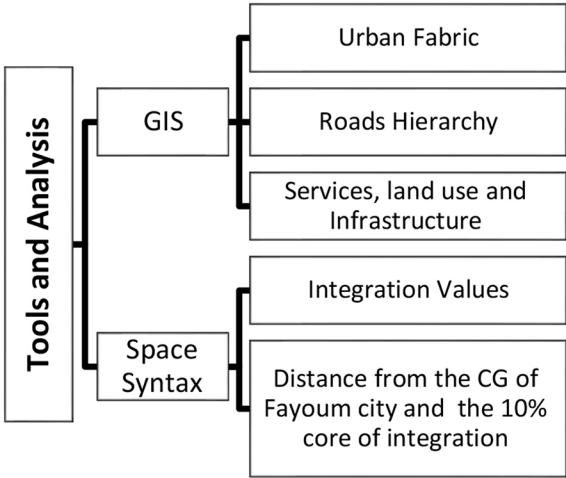
Figure 7: Tools &Analysis
Source: By Author

4.2.1 Urban fabric

Dar-El-Ramad is one of the oldest areas in Fayoum city, its core was formed before 1800 and sprawled in a random way forming unplanned informal area with compact urban fabrics especially in the core which is characterized by numerous dead end-streets, while the north and the east parts of the area have linear urban fabrics as they were formed on agricultural land. The different urban fabric of Dar-El-Ramad is due to its urban

development that took place over long period of time since 1800 till 1976.

Al-Sofy area is actually the oldest part of Fayoum city, it is considered as a part of down town of the city. It was formed and developed over a limited period of time in comparison to the urban development of Dar-El-Ramad. The west part of Al-Sofy has more regular Fabric compared to the whole area which is characterized by compact urban fabric. The number of dead end-streets is clearly less than Dar-el-Ramad, yet the whole street network of Al-Sofy is more segregated.

Figure 6: Urban Fabric Dar-El-Ramad
Source: By Author

Figure 8: Urban Fabric of Al-Sofy
Source: By Author

From comparing the urban fabric of the two study areas, it is clear that although they have

[19] Fayoum Police Station "Thani Police Station"

the same type of urban fabric and both started originating nearly at the same era, there are obvious differences between their urban fabrics as a result of the nature of each area that greatly affected the way of urban gr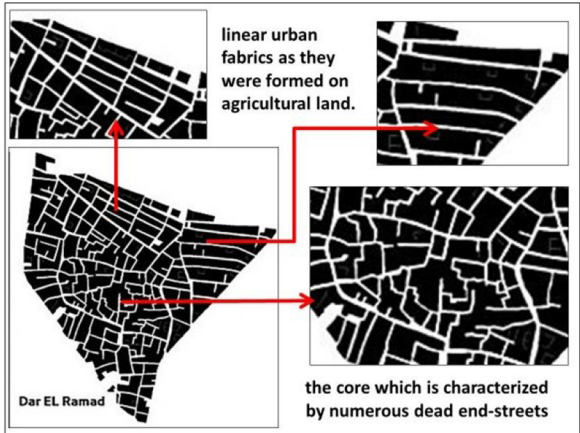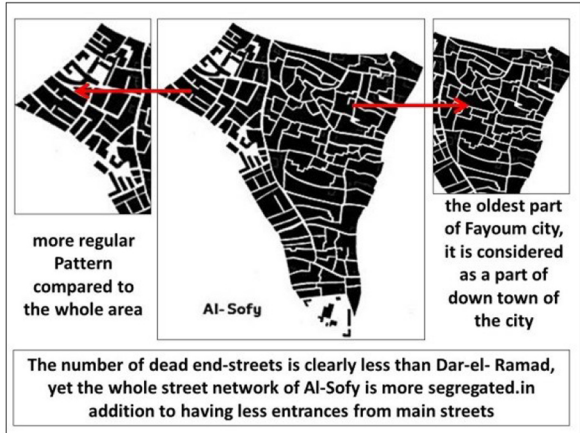owth. Dar-El-Ramad area started from its core as a rural style (Daier Nahia) with numerous alleyways, while the urban fabric of Al-Sofy area which is located near "Bahr Youssef" was affected by the small canals and the segmentation of agricultural lands during developing.

4.2.2 Roads Hierarchy

The roads network of Fayoum city contains a set of main roads links the various districts of Fayoum city within the ring road, yet it shows poor hierarchy on the scope of individual districts.

Dar-El-Ramad area has poor roads hierarchy represented in a set of minor unpaved secondary roads connected directly to vital and major roads. Although all roads of Dar-El-Ramad area are considered as secondary roads with numerous dead end-streets (50% of Dar-El-Ramad roads are unpaved and < 6m width), this area is surrounded by three vital main roads; one of them is considered as a regional road (Saad Zaglool road, 20 m width) which leads direct to the ring road and the Fayoum-Cairo desert highway. On the other hand Al-Sofy area has a segregated secondary roads network, but unlike Dar-El-Ramad the surrounding roads around Al-Sofy are minor secondary streets except for the main road (EL-Horeia road, 10 m width) located north the area.
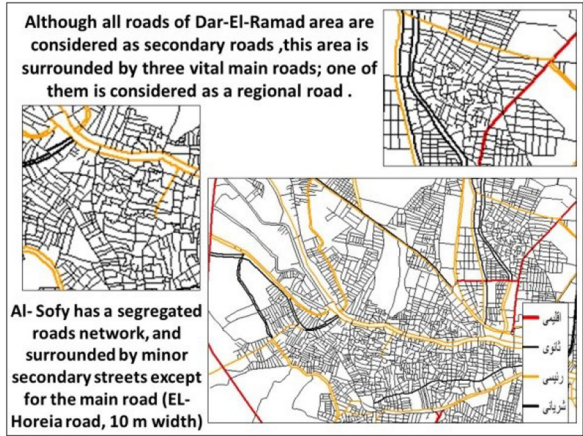

Figure 9: Roads Hierarchy
Source: By Author

From comparing the roads hierarchy of the two study areas, it is clear that, both have a deteriorated street network (nearly alleyways), unpaved and segregated. Yet Dar-el-Ramad area has the advantage of its borders which are considered as vital roads. These borders positivity affect the crime rate of the area, as the width and the hierarchy of the roads network greatly affect the crime occurrence, and this will be better proved by executing the integration analysis to the roads network of Fayoum city.

4.2.3 Services, Land use and Infrastructure

Dar el Ramad suffers from a severe shortage in public services as the land use of the whole area is residential with few scattered religious building, however Dar-El-Ramad is surrounded by multi vital services institutions; such as the general hospital of Fayoum city, the Security Directorate, primary and secondary schools, Directorate of Veterinary Medicine, directorate of agriculture, and nearby the Fayoum governorate is located. These vital services meet the needs of the residents to some extent, yet the real problem remains in the poor accessibility that prevent ambulances or firefighting service from accessing the area in emergency cases.

Like Dar-el-Ramad, the land use of Al-Sofy is mostly residential with few scattered religious building. In addition to an industrial area in the south part of Al-Sofy, medical center, preparatory and secondary schools and a small security service building on the eastern borders of the area. The services surrounding the area are much less than those around Dar-el-Ramad. Both areas are connected to the infrastructure networks (electricity, water and drainage), but the infrastructure of Al-Sofy is deteriorated, which made the ISDF started in developing the area in 2013.
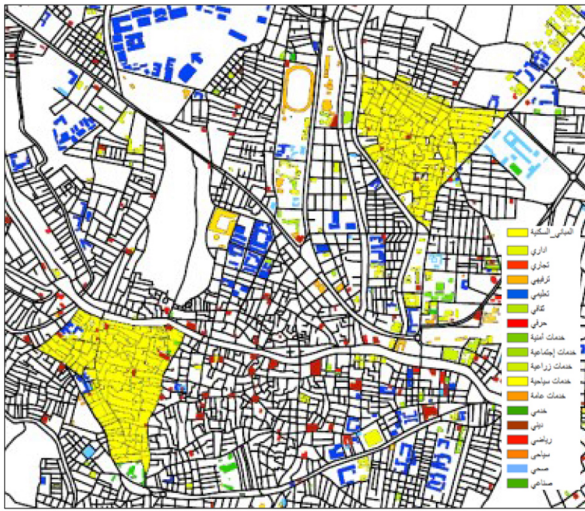
Figure 10: Land use , Non-Residential building (Services)
Source: Strategic Plan of Fayoum city

Figure 11: Integration Analysis of Fayoum city
Source: By Author

The comparison between the land use and the services of the two study areas shows that both areas suffer from a severe shortage in public services with a dominant residential land use. Yet the vital building surrounding Dar-el-Ramad area act as surveillance on the near urban spaces and positively affect the crime rate (especially the security directorate building).

4.2.4 Space Synatax

Integration analysis is excuted to the axial map of Fayoum city within the ring road using DepthMap platform to analyze the spatial configuratoin of the two case study areas (Al-Sofy, Dar-El-Ramad) with respect to the whole city as a comprehensive buffer in order to get better results.

Integration: Is one of the most popular Space Syntax analysis methods of a street network. It measures how many turns one has to make from a street segment to reach all other street segments in the network, using the shortest paths. The street segments that require the least amount of turns to reach all other streets are called 'most integrate' and are usually represented with warmer colors, such as red or yellow, while the "most segregated" are usually represented in green and blue. If an integration radius is identified; it could be in local scale or at a certain radius.

Integration analysis of Fayoum city shows a huge difference in integration values between Al-Sofy and Dar-el-Ramad. However the core of Dar-el-Ramad is segregated with low integration values,the borders of the area have very high values (of the highest 10% integrated roads in Fayoum city). This acts as a strong potential to the area. Unlike Dar-el-Ramd, the whole area of Al-Sofy has a very segregated streets network with low integration values. The core of Al-Sofe can be considered as one of the most segregated parts in Fayoum. Moreover, the borders of Al-Sofy and the surrounding areas almost from all directions are segregated too.

4.2.5 Core of Integration Analysis (10%)

This analysis is executed to define the highest 10% integrated roads in Fayoum city and their allocation among the whole city. In addition to defining the distance between the core of integration and the case study areas. The analysis showed that the core of integration is located in the center of the city and extended to the south, plus some main roads that are directly connected to the ring road. The borders of Dar-el-Ramad area are among the core of integration as well as the surrounding south areas. In addition to the distance between the center of Dar-el-Ramad and the center of Fayoum city which is located in the core of integration (L1) is shorter than that of Al-Sofy area (L2) which is quite far from the core of integration.
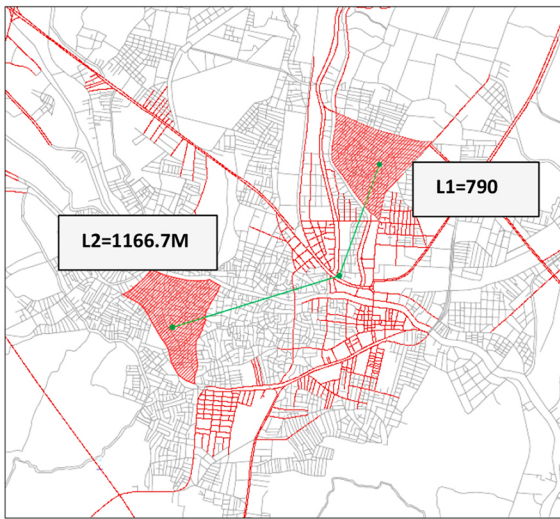
Figure 7: 10% ore of Integration, Fayoum City
Source: By Author

5. Results

The "compact urban fabric" is the most urban fabric type claimed to be a breeding place for crimilans that stimulates crimes occuerance due to its bad accessibility and its segregated streets network. Yet this paper presented two case study areas charecterised by this type of urban fabric. one of them has a critical security status with high crime rate, while the other is much safer like the normal residential parts in Fayoum city. Varios comparetive analysis are executed to deduce the reasons behind this contradictory security status of the two study areas, although they are charecterised by the same type of urban fabric. The analysis showed that both areas were of the oldest parts in Fayoum city, with deteriorated urban environment, miserable streets network and severe shortage in public services with a dominant residential land ues. The difference between the two areas was obvious in the areas surrounding Dar-el-Ramad with their major roads and vital buildings. In addition to the integration analysis that showed discrepant results between the two areas, thus could it be the reason behind the contradictory security status?

6. Conclusion and Recommendations………

- The contradicting security index of the two study areas proves that "the claim that compact urban fabric is a criminogenic urban type stimulating crimes occurrence is not right at all". It can provide ideal natural surveillance for the urban space in some cases; on the other hand it could be a dangerous criminal hotbed depending on the characteristics of the area and the dwellers.

- The analytical and the applied parts of the paper showed that security index is quite correlated to monitoring the urban spaces, yet the concept of urban spaces surveillance needs to be classified rather than to be generalized.

- Each category of monitoring the urban spaces needs some complementary factors of urban design to effectively deter crime.

- Urban crime occurrence cannot be generalized. The type of crime depends on the situation. Some crimes exploit the crowd and the vital roads such as pickpocketing, while others need segregated and un-monitored urban spaces such as homicide and burglary.

- Dar-el-Ramad area has better security index because its urban spaces are better monitored and controlled by different ways. For example, although the core of the area is very segregated, it has a rural style and the dwellers to some extent can distinguish any foreigner. Thus the core and the backstreets are well monitored by natural surveillance (category "c"). In addition to the vital borders of the area that are characterized by high integration values, massive traffic, vital buildings and various services, all these factors monitor the borders from crime (Category "B").

- On the other hand, Al-Sofy area has a critical security index because it lacked any category of monitoring its urban spaces. In addition to the segregated informal areas surrounding it.

- Vital main roads with high integration values which are characterized by mixed

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land use, commercial activities and massive traffic, need some complementary urban design elements to deter certain types of crimes (pickpocketing and robbery) such as perfect illumination, suitable sidewalks matching the activity and nearby security services.

- There is no correlation between urban type (spatial configuration) and crime occurrence unless taking into consideration some other factors such as the integration values, the surrounding areas and the demographic composition that can provide natural surveillance for the urban space.

- Monitoring the urban space will not benefit in deterring crime unless realizing and understanding that it comprises different tools, each can benefit in definite situation.

- When planning or developing residential areas, it is recommended to make a hierarchy in the integration values matching the hierarchy of the streets network, starting from high integration values for the main streets.

References

1. Abdelbaseer A Mohamed& Akkelies Van Nes &Mohamed A Salheen. (2015) "Space and Protest: A tale of two Egyptian squares", the 10th international Space Syntax Symposium, London, UK.

2. Abdelhalim, K. & Shehayeb, D. (2010, April)." Crime Prevention and Urban Development – The Case of Greater Cairo". In the Workshop No. 3: Practical Approaches to Urban Crime Prevention organized by ICPC, Canada as part of the 12th UN Congress on Crime Prevention & Criminal Justice held in , Salvador, Brazil, April 12th-19th, 2010

3. Hillier,B. (September 2009) "The Genetic Code for Cities – is it simpler than we think? " Keynote paper for conference " Complexity Theories of Cities have Come of Age"

4. Hillier,B. & Sahbaz,O.(2008) "An evidence based approach to crime and urban design Or, can we have vitality, sustainability and security all at once?

5. International Center for the Prevention of Crime (2010), "Practical Approaches to Urban Crime Prevention", 12th UN Congress on Crime Prevention and Criminal Justice. Salvador, Brazil.

6. Lee and Seo (2013), "Compining Space Syntax with GIS-based built Environment Measures in Pedestrian Walking Activity ", 9th International Space Syntax Symposium, Seoul.

7. Mahmoud, (2010), Ph.D. thesis "Methods of action plans for upgrading deteriorated residential areas: Evaluation of action plans using computer simulation models as a case study", Faculty of Engineering , Cairo University

8. Mi Min, K. et al (2007) "The Effect of Spatial Configuration on Land Use and Land Value in Seoul ", 6th International Space Syntax Symposium, Istanbul.

9. Narvaez, L. et al (2012) " Space Syntax Economics: decoding accessibility using property value and housing price in Cardiff, Wales", Eighth International Space Syntax Symposium, Santiago de Chile.

10. Perver K. Baran , William R. Smith, and Umut Toker (2007) "The Space Syntax and Crime: evidence from a suburban community". 6th International Space Syntax Symposium, İstanbul.

11. Perver K. Baran , William R. Smith, and Umut Toker, (May 2006) "Conflict between Space and Crime: Exploring the Relationship between Spatial Configuration and Crime Location" Paper presented at EDRA37, Atlanta.

12. Robert D.Crutchfield, Charis E.Kubrin "Urban Crime", Encyclopedia of Crime and Justice (2002)

13. Shehayeb, D. (2007, November). Safety and Public Space: The relation between people and public space. Presentation conducted at the International Seminar "Safety and Security and Public Space", 18-19 November, 2007, Bogotá D.C., Colombia

14. UNhabitat, 2003. "The use of GIS in informal settlement upgrading: its role and impact on the community and on local government"

15. United Nations Office on Drugs and Crime, August 2010." Handbook on the Crime Prevention Guidelines - Making them work – Criminal Justice Handbook Series"

16. United Nations Office on Drugs and Crime, 2009." Crime Prevention Assessment Tools". New York.

17. United Nations Office on Drugs and Crime, Dec (2016)." Governing Safer Cities: Strategies for a Globalized World- A Framework to guide Urban Policy- Makers and Practitioners"

18. UNHABITAT, 2010. "Egyptian Experience Strategy for Intervention in Informal areas".

19. UNHABITAT, 2010. "Using GIS in constructing area-based physical deprivation index in Cairo Governorate, Egypt".

20. UN-HABITAT (2012) Vaggione, Pablo, "Urban planning for city leaders".

21. UN-HABITAT (2012), " Streets as Tools for Urban Transformation in Slums: A Street-Led Approach to Citywide Slum Upgrading". Vaggione, Pablo (2012). "Eight Opportiunities for Urban Planning Innovation"

Arabic References

1. تقرير الامن العام الصادر عن قطاع مصلحة الامن العام, وزارة الداخلية عام 2013

2. د.شــــــفق الوكيــــــل (2007) "التخطــــــيط العمرانى(الاسكان– الخجمات– الحركة)"

3. د. نســمات عبــد القــادر, د.ســيد التــونى (1997) "اشكالية النسيج والطابع"

4. تقرير مجلس الوزراء ودعم اتخاذ القرار(2008) , "العشــوائيات داخــل محافظــات جمهوريــة مصــر العربية ".

Online References:

1. https://www.numbeo.com
2. http://www.isdf.gov.eg/
3. http://www.ahram.org.eg/
4. http://www.spacesyntax.net/
5. http://www.arcgis.com/
6. http://www.esri.com/
7. http://fromto.hig.se/~bjg/Axwoman.htm

TOWARDS A MECHANISM FOR CONCLUDING THE MOST RELEVANT URBAN PATTERN FOR THE MIDDLE-INCOME RESIDENTIAL PROJECTS IN EGYPT

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Abstract:

The urban pattern unit is considered the milestone for the design of the various types of housing projects. It is the main unit of measuring and achieving the urban requirements of a certain urban environment. In this paper, the middle-income class residential projects was intentionally selected as the research subject since it represents a key segment of societies in general and of the Egyptian society specifically; as it is a living example of culture, traditions, customs and economic stance of the society, in addition to the increase of the number and the size of the middle-income class residential projects whether it is built by government or privet sector.

This research paper aims at concluding clear criteria for designing a convenient urban pattern unit for the middle-income class residential projects. These criteria should take into consideration people's physical needs, space, landscape, culture, social relationships and economic stance.

The research methodology consists of three parts. The first part is the theoretical review, which covers various urban pattern components to conclude a scheme plan for urban patterns that are used in the second part which is the analytical study. Throughout this part, two international case studies were deeply analyzed. Meanwhile, the third part sheds light on a local field study of two local case studies in Cairo governorate; the first is Ebad el Rahman residential compound, Qattameya and the second is the Egypt aviation company corporate housing project, El-Nozha. Throughout these study parts, the research provides a mechanism of concluding the most relevant urban pattern layouts for the middle-income residential projects.

1. Theoretical Review:
1.1. Urban patterns.
1.1.1 Definition of patterns

Patterns can be defined as a plan, a diagram, or a guide for arrangement of repeated or corresponding parts, decorative motifs etc..., and using them to design materials, products, buildings and landscape.

Patterns are also defined as a style, a standard way of moving or acting and a representative sample or a model worth of imitation. [1]

1.1.2 Urban pattern classification due to their nature of formation [1]:

The source of these patterns can be determined by several factors, however there are two key factors related to its design:

- **Nature inspiration**: For example, inspired by tree leaves, water streams, bee hives etc…
- **Human creativity:** Patterns based on geometric shapes or an artistic design with which the designer aims for certain concepts.

1.1.3 Characteristics of patterns:

| Rhythm | Repetition | Mobility | Scale |

Figure (1.1) Characteristics of pattern

Each pattern design has its own characteristics that makes it distinctive, and defines how it deals with buildings and spaces. These characteristics include scale, flexibility, mobility, variety, hierarchy, repetition, rhythm and harmony.

1.1.4 Factors affecting the formation of patterns:

Examples of such factors include:

1. Natural circumstances: causing the pattern to take a certain form, such as around a mountain, or down natural branches of river streams, or along sea coasts.
2. Political factors: implementing particular pattern of city planning for political purposes.
3. Socioeconomic circumstances: urban patterns are affected by the social and economic state of the residents, and the formation of slums and illegal housing types relative to poor economic abilities and urban ignorance is an evident of that.

1.1.5 Urban pattern context:

Urban design consists of two parts; physical components (can be measured, analyzed and designed by urban design tools), such as streets, buildings and the spaces within them. The second part is the society of users using this urban community.

1.1.5.1 Physical urban pattern context:

Urban context determines the physical features and components of the urban environment that it forms; moreover it is the physical language of city and community building. [2]

A-Movement network (streets): Movement network are divided into two types; regular and irregular networks. Each urban pattern needs its specified movement grid that suits the type of motion, the number of meeting points, the visual axis and the location of the densest areas. [3]

B- Urban blocks (Buildings):

The unit of the urban pattern structure is the urban block while the block geometric shape is the main factor of defining the urban form. [4] Recognizing urban pattern features can be achieved through the following: [3]

❖ Qualitative analysis of urban fabric: This type of analysis studies the relationship between the building, its surroundings and the intermediate spaces.
Types of physical urban tissue are classified by Richard R. as follows: [5]

- Point fabric: where the building is placed inside its land completely surrounded by spaces.
- Linear fabric: the buildings are connected from both sides forming a continuous urban wall.
- Compact fabric: the buildings are connected from two or more sides.
- ❖ Quantitative analysis of urban fabric: The quantitative study of a certain urban fabric depends on the resulting digital readings from analyzing the urban fabric features. The most vital aspects of setting a quantitative study are floor coverage, floor area ratio, housing densities and average floors number.

C- Urban spaces [6]: Urban spaces can be distinguished through different characteristics, whether they are publicity, shape, scale, type or degree of closure.

D-Landscape pattern: Landscape elements are divided into two categories; soft-scape (greenery and water elements), and hardscape (seats, built structures, fences, lighting elements, etc…)

1.1.5.2   Non-Physical   Urban pattern context:

It is the result of inserting the social and the economic structure unit through a certain pattern.

This chapter ends by concluding the main urban pattern components.

1.2.   Middle-income class
1.2.1 Definition of the middle-income class:

It is the broad group of people in contemporary society who fall socio-economically between the working class and the upper class. A sizable and healthy middle-class can be viewed as a characteristic of a healthy society. [7]

1.2.2   Components of the middle-income community

Types of middle-class families can be classified according to financial differences:

Upper middle-class: Highly-educated professionals and managers.

Lower middle-class: Semi-professionals and craftsmen with some work autonomy.

1.2.3   General   Characteristics   of middle-class families: [8]

- Home ownership and at least one private transportation vehicle.
- Achievement of tertiary education (post high school education).
- Holding professional qualifications; including academics, lawyers, engineers, politicians and doctors, regardless of wealth.
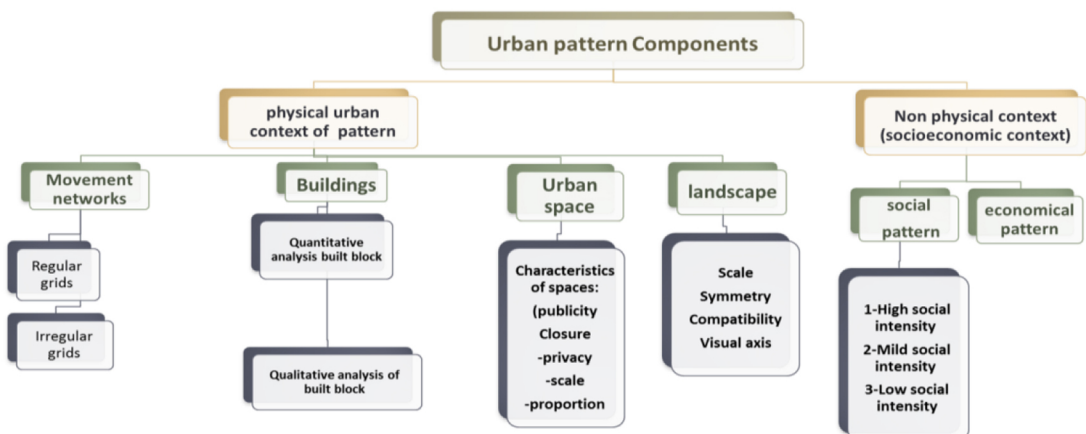

Figure (1.2) Urban pattern components

- Cultural identification and a clear identity.
- The middle-class is the most eager participant in cultural, social and political events therefore they need places to pursuit such activities.

1.2.4 The needs of the middle-income families:

- **Basic needs:** middle-class requires quality in the basic life needs, such as owning a private apartment in an adequate location, food, clothing and a clean healthy indoor and outdoor environment.
- **Urban needs:** middle-class requires a good medium quality urban community with enough landscape elements around recreational areas and neighborhood parks for both children and youth.
- **Cultural and social needs** middle-class is characterized by post high school education; therefore there is a need for cultural buildings, libraries and social buildings or spaces for socializing, not to mention their own residential area expresses their cultural backgrounds.

1.2.5 Factors affecting middle-income families

The life of the middle-income family is affected economically by several factors such as income, wealth, consumption and ambition.

1.2.6 Middle-class in Egypt:

- **The history and evolution of the middle-class in Egypt:**

According to the World Bank, the middle-class has expanded in the majority of the Middle Eastern countries, however at the same time it has shrunk in Egypt. The middle-class has witnessed its most flourishing era after the revolution of the 23rd of July, 1952. The free education system and the guaranteed employment system in the public sector helped this class to grow more. The government was controlling all aspects of the economic system and the majority of Egyptians during Nasser's era belonged to the middle class. Following Nasser's era, the Egyptian government has begun to move on to adopt the capitalistic approach, which resulted in the deterioration of the middle-income class, and hence this class has been shrinking. [9]

- **The size and significance of the middle class in Egypt:**

The middle-class is the most sensitive social class to all the problems and crises of Egyptian society. The problems of unemployment and inequality were felt the most by the middle-class due to the fact that people in this class usually enjoy higher levels of education [9]. It is worthy to note that while the middle-class represented about 43% of population by (2001), it currently represents 39% of population (2015).

Figure (1.4) some middle income class residential projects in Egypt

1.3 Urban patterns for the middle-income class:

This chapter discusses the most relevant characteristics of each urban pattern component to the middle-income class.

1.3.1 The physical Urban Components needed for the middle-income class:

The physical analysis of any community is studied through its main urban components as follows:

1.3.1.1 Movement network and street fabric:

The middle-income compounds are enclosed by its buildings within a uniform network grid of vehicles roads; this grid is preferred in this particular class to have easy access from the main roads to public spaces.

Pedestrians have paved sidewalks around the buildings connected within clear paths for walking, observing or even practicing simple social activities. The intersections and number of blocks per square kilometer are both indicators of connectivity and pedestrian accessibility.

Figure (1.5) Middle income spaces

Image source: (WordPress.com)

1.3.1.2 Buildings (Residential blocks):
- **Building heights:** for middle-income class, it is more affordable in the developing countries if the buildings never exceed four or five floors however even if it exceeds this limit they can afford

having elevators installed and maintained in their dwellings if necessary.
- **Blocks Geometric shape:** repetitive blocks with a geometric shape that supports both affordability and aesthetics by providing in between spaces.
- **Block fabric type:** depending on the height of buildings in the design there are two types of block fabric used in middle-income residential blocks, which are:
  - **Point fabric:** used when there is enough land specified for residential use.
  - **Linear fabric:** used when the design integrates building blocks together to form intermediate spaces used for recreation and different social activities.

1.3.1.3 Spaces between buildings:

The research will elaborate on some of the characteristics that specially affect this class, such as:
- **Closure:** In a middle-income compound, it is of high necessity to create open and semi-open spaces to be perceived as transition spaces for social communication and interaction which makes semi-open spaces as important as public space. Meanwhile, closed spaces like the inner courtyards and setbacks provide lighting and oxygenation as well as being highly intimate social spaces.
- **Ratio and scale:** Similar to all residential urban communities, well-designed spaces always considers the relationship between height, lengths and widths of the space from one side and human scale from another side. The height/width ratio also influences the levels of shading.

The space left between buildings has to be either human scale or intimate scale.

- **Connectivity:** Middle-income dwellings have adequate amount of connectivity of their areas to others represented in the directness of links and the density of connections in a transport network.

2. Analytical study:
2.1. Analytical study objectives:

The analytical study's objective is to present the best affordable urban patterns for the middle-income class through analyzing the case studies, in addition to clarifying the effect of each pattern on the urban environment as well as the degree to which each pattern fulfills the middle-income needs.

Figure (1.6) Middle income dwellings (Source: www.dreamstime.com)

1.3.1.4 Landscaping:

The middle-income class is able to afford the construction and maintenance landscaping and the following are the two components of landscape the middle-income needs:

Soft scape: the middle-income community needs sufficient amount of greenery as a breath around their dwellings, including grass areas around each block and grass covered parks.

Hard scape: hardscape is essential to middle-income community, and its elements are as follows:

- Elements for practicing social activities: youth playgrounds, children play zones, pergolas and shadings.
- Elements for pedestrians: bicycle routes, parking lots and sidewalks.
- Elements for site completion and aesthetic purposes: flower boxes, lighting elements, statues and wall paintings, etc…

2.2. Tools of data and information gathering:

Observation is one of the analytical study tools in the information gathering phase. The observation process is divided into: [10]

- **Simple observation:** mostly used in researches where the researcher neither has enough information nor realizes the type of information he needs for observing this case study.
- **Systematic information:** where the researcher specifies the type of information he needs to gather by observation of such behaviors.

The study also resolves to other tools of analysis, such as:

- Mapping
- Sketches and diagrams
- Photos

- Outline sketching with the aid of photographs

2.3. Analytical study cases choosing criteria:

The criteria of case study sample choosing are based on finding cases with a group of characteristics which are:

- Sufficiency of both literature and visual data for analysis.
- The presence of a clear urban pattern and most of the analysis elements.
- Choosing a wide variety of patterns across a widely various set of countries.

2.4. Analytical study cases:

2.4.1 Queensbridge Houses

Queensbridge Houses is owned by The New York City Housing Authority and it is the largest social housing project in North America. It is located in Long Island City in Queens and opened in 1939 and still in use today. It is owned by the New York City Housing Authority, the 3142-unit complex accommodates approximately 6907 people within two separate complexes (North and South Houses). Each complex accommodates about 3450 residents.

The Y-shaped floor plan of the residential towers and their location in a park-like setting demonstrates how much the accommodation of poor city dwellers improved over the course of one and a half centuries.
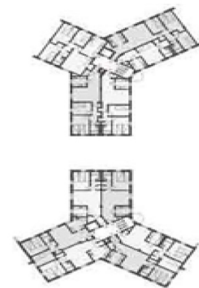

Figure (2.1) Queensbridge housing

Figure (2.2) Unit plan showing apartments within one floor

Figure (2.3) Building unit

The project consists of -Y- Shaped building units grouped around a wide central court yard space

Figure (2.4) Urban character

- Analyzing urban context:

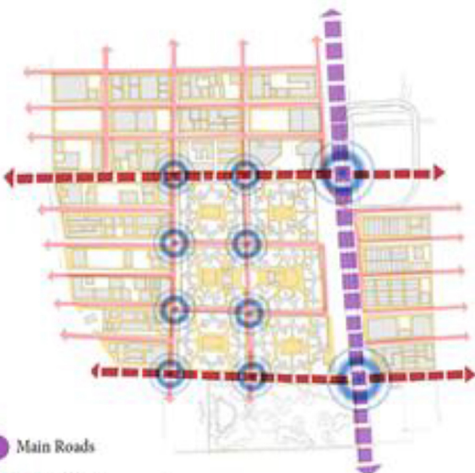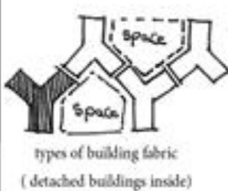**Table (2.1) Queensbridge urban context (movement network and buildings)**

Physical Context

1- Movment Network analysis	2-Building Analysis

Main Roads
Inner Streets
Pedestrian Only
Meeting Points (Nodes)

Towers & Skyscrapers
More than 6 stories
6 stories
Less than 6 stories

Buildings heights

types of building fabric
(detached buildings inside)

Building Pattern	Geometry of the unit

Elements of reading urban context and urban influences

Street Fabric			Street Pattern								Building Fabric			Urban Block				
regular		Irregular	Grid	Radial	Contour	Linear	Diagonal	Curvilinear	Oraganic	Combine	Point Fabric	Linear Fabric	Compact Fabric	Rectangular	Square	Triangle	Topographic	Organic
Square	Rectangular	Branched																

Table (2.2) Queensberg urban context (urban space and non-physical context)

	Physical Context		Non Physical Context
	3- Urban Space Analysis	4- Landscape Analysis	5- Socio economical State Analysis

Inner Space Zones — A Inner space A

Hardscape / Softscape — site shots for landscape

Economical State — Low Income / Mid Income / High Income

Unit's Inner Court — Complex's inner court / Social Interaction inside the Complex / Inner building court yard

Social hierarchy of space — Intense Social Interaction areas / Mild Social Interaction areas / Areas for quiet observation

Elements of reading urban context and urban influences

Urban Space Fetures — Shape (Dynamic, Static), Closure (Opened, Semi Closed, Closed), Ratio (Wide, Deep, Corridor), Scale (Intimate, Human, Monumental), Degree of Privacy (Public, Semi Public, Private)

Hard scape — Availability, Service structures, Lighting Elements, Benches and seats, structural Elemnts (Arcs, Fencen,etc..), pedestrian Paving, Parkings

Softscape — Water Elements (Lakes, Pools, Fountains &Faucets), Green Elements (Trees, Shrubs, Grass Coverd Areas)

social space — Area for calm Vewing, Mild social interaction areas, Intense social interaction areas

Economical State — high income, mid-income, low income

Present / Mild / Absent

2.4.2 Ruy Ohtake Housing Project 2011.

- **Project description:**

The project is an evidence on the perfect pattern for middle and low-income mass housing projects completed in 2011. The project plans to improve urban living, leisure spaces, educational and health facilities, and provide housing for about 70000 people in 18080 households.

The Residential buildings have eleven 5-storey cylindrical buildings grouped around a central space that holds all social activity. Each building has 18 apartments with access via a central stair. The area of every apartment is 49 m^2 with 2 bedrooms with a curved external width of 6.50 m. Moreover, there are 2 apartments on the ground floor for the disabled and there is an open recreation area for the residents.

Figure (2.5) The project of Ruy Ohtake

Figure (2.6) Spaces between buildings

Figure (2.7) Apartments from inside