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## **Green Architecture & sustainability**

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### **Abstract:**

Green architecture is a contemporary direction in the architectural design, which seeks balance with the surrounding environment through employing the skills used by the architect in a better way. This study investigates the main concepts that directly related to the green architecture & sustainability norms. A descriptive method was used in this study through investigating several literatures on the study topic. The study concluded that there is a lack of understanding of the phenomenon of sustainability among the local architects and caring for the direct literal meaning of sustainability and green architecture, looking at it through the eyes of climatic considerations and traditional social values concepts. The study recommended enhancing the environmental awareness in general and planting awareness towards sustainability culture in particular, Studying the local traditional architecture and knowing what could be aspired and developed from it to support the foundations and culture of sustainability.

**Keywords:** Green architecture, sustainability, environment, environmental awareness



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## **1. Introduction:**

Green architecture is considered as a contemporary direction in the architectural design, which seeks balance with the surrounding environment through employing the skills used by the architect in a better way. Recognizing Green architecture gives the architect a chance to know the best ways to treat nature through introducing designs that takes in its account the prolonged environmental effect.

The varied environmental issues such as pollution and using up energy and resources- pushed the sustainability phenomenon to occupy a considerable part of the contemporary global directions, and at the level of theoretical and practical applications levels, as a way to discover solutions of the impacts and subsequences of environmental stress on a global level. Sustainability aims to establish a balanced and inclusive analysis of the available potentials in a specific environment and directing them through certain strategies that work in the environmental system to preserve the balance of the natural resources through the principle of warranting and efficient usage of the resources in the different applications along the sustainable designing process.

This research has been found to simulate this concept by studying the possibility of applying sustainability principles in the architecture of the local environment. As the main problem that could be recognized in previous studies in this field is the lack of a certain mechanism which revitalizes the patterns of sustainable architecture locally, and to find sustained methods and mechanisms in the local contemporary and future architecture.

## **2. Sustainability Phenomenon and the Correlated Systems:**



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Sustainability as a phenomenon involves many scopes and various levels of eco-systems. Once we see it through the lexicon of the ecological system, another through the economical system, and sometimes through the lexicon of the social systems that related to culture, awareness and human conduct, taking different tools in the state of action like technological, economical and environmental tools (Rogers, 1997, p. 7, 8). Its entries are classified on various systems, such as; the environmental systems, the ecological systems, power systems and options, the systems of culture and awareness of the environmental issues, technological systems, social systems and the nature-respecting technological concept and the organizing policies and its importance in achieving the economical balance (Adams, 2003, p. 10, 13). These levels interrelate with each other in light of the fact that they do not work separately, and its effectiveness is linked to the surrounding conditions (economical, social, environmental, cultural...etc) of the environment in case. Most of the known studies in the subjects of architectural sustainability showed the nature of the relation between sustainability phenomenon and the local environment in general, the local architecture in specific, and clears out the fact that principles of sustainability are already there in the historical dimension of the traditional communities life, and that these principles contributed in the making of these traditional communities and its cities and architecture ( Fathi, Hasan, 1988, p. 9).

Other studies have evinced that the Islamic teachings assured the principles of sustainability and determined the human conduct towards the environment that surrounds him (Jamil, Akbar, 1996, p.22).

The studies have also assured the importance of implementing the modern technologies in what suits the traditional values and the specialty of the local environment to invest the local potentials in producing a sustainable, modern local architecture.

### **3. Sustainability in Architecture- Elements and Relations.**



#### a. Sustainable Development:

The first definition of sustainability was first taken into consideration as it was talked through the world conference for environment and development known as (WCED) in 1987 as fulfilling the needs of the society at present without affecting the future generations in fulfilling their future needs. This means using the multi natural resources without minimizes them or their renewable benefits for the coming generations, this protect the stock of consumable natural resources such as: water, power, and living things (SABD, 2002, p. 2) and (kharofah, 2006, p. 11).

#### b. Sustainable Development Dimensions:

We can refer here to three determining and interacted dimensions, which are the economical, social and environmental dimensions. This is a sustainability framework based a content that is interrelated with the economical schemes. John Elkington, who is an economist, specialized in ecology, introduced in 1997 the term of the TBL Triple Bottom Line to describe how far the economical, social and environmental dimensions are interrelated. Elkington was able through this term to assure that the environmental, social or economical sustainability can never be achieved separately. On the contrary, the three sides should be taken into consideration at the same time to enhance the quality of the environment and the economical welfare and social justice (The Economist, Website).

#### 4. Sustainable Architecture:

The building process uses huge quantities of materials, produces tons of debris and sets out gases and pollutants of the environment. It also requires a huge power during operating and along the lifetime of the building. So, if architecture in the past sought the Vitruvius trilogy: strength, function and beauty, nowadays it is seeking to have an effective role to develop the environment level not only in the site, but also on the regional and global levels (Earth Pledge Organization, a website).

James Steel showed that sustainable architecture is the architecture which aims to fulfill the requirements of the society at the present time in a way that saves the



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potentials for the upcoming generation's needs (Steel, 1997, p. 3). Another definition recognized by the Organization of Economical Cooperation and Development) OECD; where it defined sustainable architecture as the architecture with the least negative impacts on the natural and the constructed environment whether on the level of the local environment or the regional and the global levels. Also, it is the one that involves the quality integration of the economical, environmental and social performance (OECD, Websites). The goals of the sustainable architecture are to enhance the effectiveness of Resources, Energy efficiency and nature compatibility (Ibraheem, Mohsen, 2006, p. 5).

#### **4.1 Sustainable Architecture Principles and Entries:**

Fisher identifies five basic principles of the sustainable environmental architecture:

- The healthy inner environment.
- Energy efficiency.
- Good structural materials.
- The environmental shape; clarifying the relation between the shape and the designing process with the location.
- Good design. (SABD 2002, p. 7).

The entries for sustainable architecture are represented by the cultural and social factors, in addition to health and environmental considerations. Some of these factors are linked to the environment and some others are linked to the human being as an effective element in the motion of the environment and in its continuity (Kunszt, 2003, p. 7).

In order to achieve the concept of sustainability in the scope of architectural work, two basic points should be concentrated on: 1- working on re-qualifies old architectural productions and raising its performing efficiency for certain purposes. 2- producing new models that are considered successful in the standards of modern time,



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but their main goal remains directed to the future, and establishing what could be called ( sustainable future) ( Corcoran, 2001, p. 1,2).

The steps of the designing process depend on three basic levels, coming subsequently from top to bottom like this: Principles, Strategies and Means.

#### **4.2 Sustainable Design:**

It is identified as the mental integration between architecture and each of the integral engineering specializations ( electrical, mechanical, constructional) in addition to the beauty concepts and proportionality, assemblage, light, shade and the integral studies like the future cost of different aspects ( environmental, economical, human) (Ibraheem, Mohsen, 2006, p. 6).

Sustainable design is the one that harmonize with the surrounding environment by applying the principles of sustainability, strength, longitude and the construction materials plus a sense of the place.

This design dealing with resources in an inclusive way because sustainability is a principle that includes many components like energy, environment, the ecological system and the society in a system of interrelated and grading relationships which can all enroll under the shade of sustainability. (Edwards, 2005, p. 52).

The basic principles of the sustainable design that should be rooted in the sustainable designing process have been set as follows:

- Studying the location.
- Connecting to nature.
- Realizing the natural processes.
- Studying the environmental impact.
- Integration of the designing climate and supporting the processes.
- Studying the human nature. ( Ibraheem, Mohsen, 2006, p. 6-7).

Researchers have classified two types of buildings according to how far they meet the terms of sustainable design. The name (Healthy Buildings) is given to those buildings whose interior climate fits the considerations of human comfort ( Knuszt, 2003, p. 7).



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There is also an inclusive term for those buildings which suffer from lack in these standards or in which the previous principles have not been taken into consideration in the designing process. These buildings are called (Sick Buildings) which described as depending on unsustainable sources of power (non-renewable), and its dependence on natural ventilation and lighting is so little compared to the artificial methods of lighting and ventilation. (Smith, Peter, 2005, p. 197).

So many names have been given to the healthy buildings, which were designed according to the principles of sustainable design like the solar buildings, green buildings, ecological buildings and smart buildings. All these are sustainable buildings but are different in the method of interpreting the sustainable principles or technology in their construction. (Waziri, 2003, p. 55).

## 5. Green Architecture Concepts:

To understand green architecture better, we must recall some of the basic concepts of green architecture as follow [Edwards, 2005]:

- **Ken Yeang** discussed green architecture from an environmental perspective; he identified green architecture as a designing process where the designer massively reduces the negative impact of the materials used in the design so that it won't affect the eco-system or disrupt the system.
- **William G. Reed** identified green buildings as structures that are designed, constructed and operated in an environmentally compatible way, through reducing the contrast between the buildings and the surrounding environment, and minimizing the production and construction costs.
- **Deborah K. Dietsh** sees that the real green architecture is an entry to a design that cares for the interrelation between the buildings and the used materials with what surrounds them, plus its administrative systems. However, in order



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to achieve a perfect idea like this, architects have to consider some factors like the fronting of the site and consuming the energy generated from the materials.

- **Douglas Pollard** mentioned that the green design in architecture should be working on finding solutions that lead to cutting down on energy consumption, and working at the same time on raising the efficiency of the buildings and the inner systems inside them.
- (**Brenda and Robert Vale**) also identified the green entry of the constructed as an inclusive entry for designing buildings where all the resources whether materials or energy should be taken into consideration [ Waziri, 2003].

Through the previous concepts, it becomes clear that green architecture is a multi-faced theme, but they all agree that the green architecture is a highly efficient system that adapts to its vital environment with the least collateral damages. The call for (Green Architecture) is a call for a better nature treatment.

### 5.1 Green Assessment Foundations of Architecture:

Cheryl Walker and Gail Lindsey mentioned that the green design is (balanced, healthy, and environmental, of an architectural spirit); in a way that every project should respect 6 main determinants as follow (Ryhan, Ryman and Ghada, 2006):

1. Respecting the features of the site.
2. Minimizing energy consumption.
3. Adapting with the climatic environment.
4. Economizing the use of resources.
5. Reducing garbage and pollutants.
6. Using local building materials.

The following is a description of some these determinants;

- **Respecting the features of the site:**



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This principle aims at non-disturbing of the land on which the building is going to be built; Consequently, if it was removed or moved from its location, the location would come back the way it used to be before the construction; i.e. this principle focuses on not making essential changes to the features of the location and never disrupting with the natural land physically, ecologically and socially.

**- Minimizing energy consumption:**

This principle points at minimizing the use of energy or even do away with it, replacing it with natural resources for energy, and some processes could be done about that, such as:

- A tight thermo design to reduce the use of air conditioning appliances.
- Economizing on fitting buildings with luxury appliances like fridges, heaters and stoves and replacing them with natural means.
- Fitting the building with devices that can absorb the natural power and turn it into electricity.

**- Adapting with climatic environment:**

Adapting with the climatic environment of the location plays a big role in the work of the green design through the constructed environment design, where the building's effect on nature is reduced.

**- Economizing the use of resources:**

Economical resources represent all what can be extracted of natural resources and the wind and water power. In term of the intellectual development in dealing with the environment, there has been a tendency to preserve the vital surrounding of the natural environment; where most resources are dealt with in a more economical way through reusing them by the different processes of recycling; water, for example, a purifying grid for the used water could be done to reuse it once for the purposes of washing, watering plants and other similar activities (Nursk, 1966, p. 4)

**- Minimizing waste and pollutants:**



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Trying to cut down on the different types of garbage (organic, garden waste and trash, sewage water, etc) by eliminating them or reusing them.

## **6. Sustainability Structure and Mechanism:**

As for Doumar's Vicious circles of poverty, the structure shape of the relations inside it depends on the continuation of the negative phenomenon (like poverty in the circles of underdevelopment phenomenon) and consume up the power repeatedly. The characteristics of variety, inclusiveness, continuation, and balance apply on these circles but lack the characteristics of renewability and non-consuming of the power, so they are back warding the ecological circle as it is a (sustainable or non-sustainable) circle.

In this way, the phenomena that include a similar circular system could be explained and from a sustainable point of view as a (sustainable circle) if they were positive, and (non-sustainable circle) if they were negative. The principle of cause and effect in the first circle depends on terms like (keeping, warranting, transforming, renewability, investment, existence, etc), while the second circle has got terms like (consumption, draining, wasting, reducing, non-existence...etc) as they are in the samples of the vicious circles of poverty.

If the elements sustainability like (Environment, Energy, Economy, and Human) were compared to each other we see that the same relation is applied to them. The environment, for example, is the milieu that contains the sustainability process, and it is the source of the materials from which the design process has its raw materials to start with the steps of the designing process then construction and operating which must not have negative outcomes on the environment itself like (draining, random consumption of the resources, minimizing pollution and waste, keeping the healthy environment). This is how the environment can be a method for sustainable designing



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and an end at the same time; the same thing applies to all the other sides. Figure 1-1 clarifies this concept.

All the previous models show the existence of a case of sustainability (sustainable circle). The opposite case comes in the case of negating (the non-existence). However, the basic elements still form a means and an end. The state of negation applies to the mechanisms and strategies and not on the basic elements. The environment, for instance, is already there, and it is the source of the materials, but if the design is not sustainable, this will lead to the non-keeping and non-warranting in the natural resources and elements. The thing which leads to an unhealthy environment and draining the resources and an environmental misbalancing, when the circle, is repeating as time passes. And the circle is directed to another path, which is the path of non-stability. As shown clearly in figure 1-1 a and b. We can note from the figure that the negation case has not happened to the environment, or on the resources of the environment, but it did on the designing process; the thing which led to back warding the possibilities that followed to reach in the end to consuming the environment up and draining its resources and the appearance of pollution problems and the like.

Because the environment along with its resources and natural powers, it formed a mutual point between the two circles. Then it is possible for them to be put together as it appears in figure 1-1 a and b, which shows the synchronization case between a sustainable design and another non-sustainable one and the effect of each one of them within the circle. This is because the application of sustainability in a building or an environment will be timely graded and synchronized with the non-sustainable design as it was assured by the previous studies.

It has become clear that the negation elements (the non-existence) lead to the increase of another positive element gradually because human nature always seeks replacements. Due to the environmental problems and the economical stress represented in the high cost of energy resources, construction and the deterioration of



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the infrastructure, which leads to a raise in the costs of sustainability, because of the negative usage of the natural resources and powers, all these lead to forming a motive in the society towards finding solutions and changing to other non-experimented methods which can lead to a gradual constructing of the awareness of troubles and the level of the needed solutions, in addition to a simple understanding of the human relationship with surrounding environment and the impact of his activities on it ( The Concept of Sustainable Education, Mouran, 1995, p. 6).

Depending on the same notion, we see that this level of knowledge needs nutrition of the society with a better knowledge about solutions levels and the abilities of sustainability to make a change. If there was no nutrition, the previous environmental circle comes back to the point of unsustainable designing (the traditional designing) which turns the circle path to a (non-sustainable path). On the other hand, by feeding with additional knowledge, the path will move from the awareness point to understanding the change process to sustainability, meaning understanding the sustainability enablement requirements. And here, enablement requires an awareness of sustainability plus an economical support. The circle here also has two paths to go on. The path of a society, which does not hold the foundations of enablement, and the path that can lead to building the foundations of sustainability culture from which the initiation of an implementation program of sustainability (sustainable designing) can result, and which returns with good benefits on the environment as well. Figure 1-1 a, b, c, d clarifies the details of these sections.

### **6.1 Mechanism for Activating Sustainability Circle Locally:**

It has been referred to previously that the suggested sustainability circle involves effective variables that guarantee the continuation of the sustainable designing process. The research points that the first step to determine these variables is to look into the general circle of sustainability in a general way without separating the two



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circles (sustainability and non-sustainability). Generally, there are two points (nodes) which form two movable joints to reverse the path of the circle, which are:

- 1- Looking for new styles represented by new directions and modern technologies.
- 2- Enabling sustainability represented by economic support and social behavior activation to make use of the data and potentials after figuring out problems. The first needs an environmental awareness, as it has been mentioned before, the past attempts and directions (innovated in the local environment) without awareness nutrition to understand its strategies will lead to the inability to benefit from these directions so that they can be effective in the designing process. That is why the methodology used here is unsustainable.

The second needs at first an awareness process of all the problems and solutions , which resulted from comprehending the experiences, and the local attempts toward sustainability; this is where the role of the assessment process comes to determine the negative and positive sides and to identify the problems). Second, it needs a financial support to provide the tools (techniques and technology) needed to start the change towards the methodologies of the sustainable design. This is called a positive attitude.

### **Summary of the conclusions:**

The most important indicators and results concluded from this study could be summarised as follow;

1. Lack of understanding of the phenomenon of sustainability among the local architects, and caring for the direct literal meaning of sustainability and green architecture, looking at it through the eyes of climatic considerations and traditional social values concepts.
2. The unclear vision of the local architect and its contradiction in the field of the changes related to the environmental issues from which the local environment and architecture are suffering, especially when taken in the perspective of sustainability.



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3. Applying sustainability principles on the local architecture will affect the ideologies (thoughts and practices) of the modern local architecture, by affecting the design considerations, the way of dealing with building materials and the data of the surrounding environment.
4. Sustainability culture represented in (awareness and knowledge) formed an important factor towards applying sustainability, and its absence showed a big effect in the unclearness of many of the indicators. It has also been shown that raising knowledge of the visibility of the costs effectiveness and distributing them (initial, operational and sustainability costs) has got a great influence on understanding the relationship between the energy variable and the economical factor within the framework of sustainability.
5. Assuring the principle of the need to find solutions for the reality of the modern local architecture. And the need of the right and inclusive cognitive nutrition to enrich the local architect's vision of the nature of the problems and the horizons of possible solutions within the framework of sustainability.
6. Because the issues of architectural sustainability repeat itself accumulatively, every variable is the cause and effect of a case as it is in the concept of the circle of non-sustainability in the local environment previously mentioned.
7. Absence of planning for studying the visibility for such housing projects, which are characterized by the high costs that do not solve the problem of the housing need.
8. Limiting the design and treatments of the environmental considerations on temperatures and thermo comfort (though not efficient for the sustainability standards), which were applied through the upper surface of the building and the artificial ventilation and air-conditioning systems that are non-sustainable. The same thing appears in the issue of rain and rainfall by using diagonal roofs without taking into consideration the effectiveness of directing the falling water for example.



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If the previous indicators were compared to the characteristics of the local environment through the potentials and determinants; they refer to no crossing over of the environmental determinants and not finding effective solutions for the environmental and economical issues in particular, not mentioning their being insufficient ways to reach good levels of sustainability...and they could not make an effective use of the potentials available in the local environment that is dedicated to the environmental features.

### **Recommendations:**

Basing on what has been mentioned and concluded of the previous studies, this research puts a set of steps and procedural recommendations as a methodology towards preparing the right ground to apply the principles of sustainability in the local architecture. These steps are:

1. Increasing environmental awareness in general and planting awareness towards sustainability culture in particular.
2. Studying the natural environment and identifying its components with its two side's potentials and determinants.
3. Studying the local traditional architecture and knowing what could be aspired and developed from it to support the foundations and culture of sustainability.
4. Setting environmental standards for the architectural projects; this thing that depends on the second and third terms.
5. Distributing the application of the assessment process of sustainability in the private and public projects and determining the offices responsible for that.
6. Economical support of the sustainable applications in all the levels of development and the economical and architectural development is part of it.



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7. Supporting innovations (economically and culturally) and directing them to enter within the steps of the designing process which depend on using the potentials and determinants of the local environment.

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