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The impact of sustainable interior design on cultural cities (Global Environmental Trend 2030)

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Summary:

This research paper aims to provide a comprehensive vision about the role of sustainable design in the design of architectural buildings and interior spaces and the extent of its contribution to achieving sustainable development through some applications that help achieve sustainable and modern trends to control temperature change and energy conservation through the application of sustainable strategies to keep pace with the global trend 2030 Agenda, especially in achieving environmental quality within the interior spaces in cultural cities, by addressing what is sustainability and its objectives, and how to prepare the building for the application of sustainable design to achieve the required internal environmental quality points within the interior space, such as alternative energies, water recycling, natural ventilation, material efficiency and many more.

Keywords:

Sustainability - Sustainable design - Bio cell - Cultural cities.

Introduction:

Culture is a line of communication between man and the environment, through which its roots are strengthened in nature and society. Hence the interest in the cities of spreading culture with their various cultural centers as a platform for preserving the environment through their sustainable designs, such as a platform for spreading culture.

Cultural cities are the capital of the nation, which includes its literature and arts. The interior architecture reflects the exterior architecture. It is a real tool for assessing the nation's culture; every building is a cultural sign.

Sustainable design is the global movement's response to environmental crises. Hence, the focus began on sustainable interior design and overcoming a large part of interior design problems such as temperatures in the interior space, energy consumption, the use of sustainable environmentally friendly materials, in addition to rationalizing the consumption of used resources. Especially reaching the minimum amount of harmful emissions to maintain human health in the internal vacuum and thus maintain the health of society through applied Bio cell sustainable strategies.

Bio cell Sustainability provides many environmental treatments for cultural buildings to achieve present and future comfort in the internal branch. Hence, future trends need an interior designer who employs and develops sustainable design principles to overcome environmental problems to keep pace with the global trend. Through the research study, we will learn about the nature of sustainable design, its characteristics, and cultural cities, and we will address some examples of cultural centers that follow Bio cell sustainable strategies.

The importance:

The importance of the research study lies in identifying sustainable design through the design of cultural cities and modern trends of design to conserve energy through the application of sustainable-bio cell strategies.

The target:

- Identify the nature of sustainable design and how to use through bio cell building's strategy.
- Addressing the analysis of some cultural centers and their using of bio cell building's strategy.

The methodology:

- **The descriptive approach** by studying the nature of sustainability and Bio cell sustainable design to reach the points of application of bio cell sustainable interior design.
- **The analytical approach** through the analytical study of one of the cultural buildings.

The sustainable design system is generally considered a tool for preserving the indoor environment with its activities and interaction with the environment and the users of the space, and it is a tendency to continue to improve the quality of the required indoor environment. (1)

Unbalanced development of cities causing serious environmental issues such as excessive carbon emissions, pollutions, heat islands, destroying natural ecosystems. In order to meet the needs of the increasing population of cities, future development is inevitable and continuing this kind of development will be followed by environmental crises such as climate change and global warming. Building industry has an important factor in engender and intensification of these crises. Biological Urban Cell (Bio Cell) is the solution for simultaneously achieving human and environmental needs, sustainable urban developments and restoring and strengthening the urban natural ecosystems.

1. The sustainable

1.1 The Sustainability concept

Sustainability is the ability to maintain a certain state and has become the most used, as the World Commission on Environment and Development states that it is meeting the needs of the present without compromising the ability of future generations to meet their needs. (6)

1.2 Sustainable Construction

It is the building in which integrated quality is achieved in terms of efficient environmental performance and compliance with social and economic requirements in order to reduce the impact on the environment.

The sustainable building features :(6)

- Energy efficiency
- Efficient use of natural resources.
- Achieving indoor air quality and noise reduction, in addition to preventing pollution.
- Using integrated systems to achieve environmental suitability.
- Using environmentally friendly building materials with the possibility of using them more than once.

2. The sustainable- Bio Cell

Bio Cell are designed to be a part of urban ecological network and helping to restore urban natural ecosystem. The use of native vegetation, will provide all aspect of sustainability.
In order to achieve the quality of the indoor environment, which is the most important element influencing sustainable interior design, we will discuss the study of bio cells to achieve them in cultural cities.

3. The Bio Cell

3.1 The concept

Biological Urban Parcel (Bio Cell) is "a sustainable and productive structure with high ecological services aligned with human needs to reduce building ecological footprint and to create or restore natural ecosystems in a way that will create value for both humans and environment". These building will be an independent building from external food, energy and water sources, consider material life cycles and using nature friendly materials. (23) It has been planned to reduce building ecological footprint. They store and collect water and use treated sewage for irrigation. By using new technologies with collaboration of green surfaces they try to provide ecological services as equal as natural ecosystem services. They are designed to be a part of urban ecological network and urban natural ecosystem. They are economical buildings to expand through cities. (4)

3.2 Bio cell building Goals

- They are designed to be a part of urban ecological network and helping to restore urban natural ecosystem. They are using native vegetation. It will provide all aspects of sustainability.

- Bio Cell buildings are Independent building in energy and food needs by producing it themselves. Providing their water needs by harvesting moisture from air, terrestrial elements; reusing waste waters and storing rain water.
- Material life cycles are considered in constructions. By becoming a producer structure and Zero-emission building it will reduce the building's ecological footprint and will help the environment to restore itself.
- Ecological services: Bio Cells is providing ecological services as equal as natural landscapes per specified areas. So green surfaces of Bio Cell are depending on how much it can serve the ecosystem, by combining Technology and the use of right vegetation, Bio Cell can provide equal ecosystem services and absorb pollution.

3.3 Bio cell system application standards

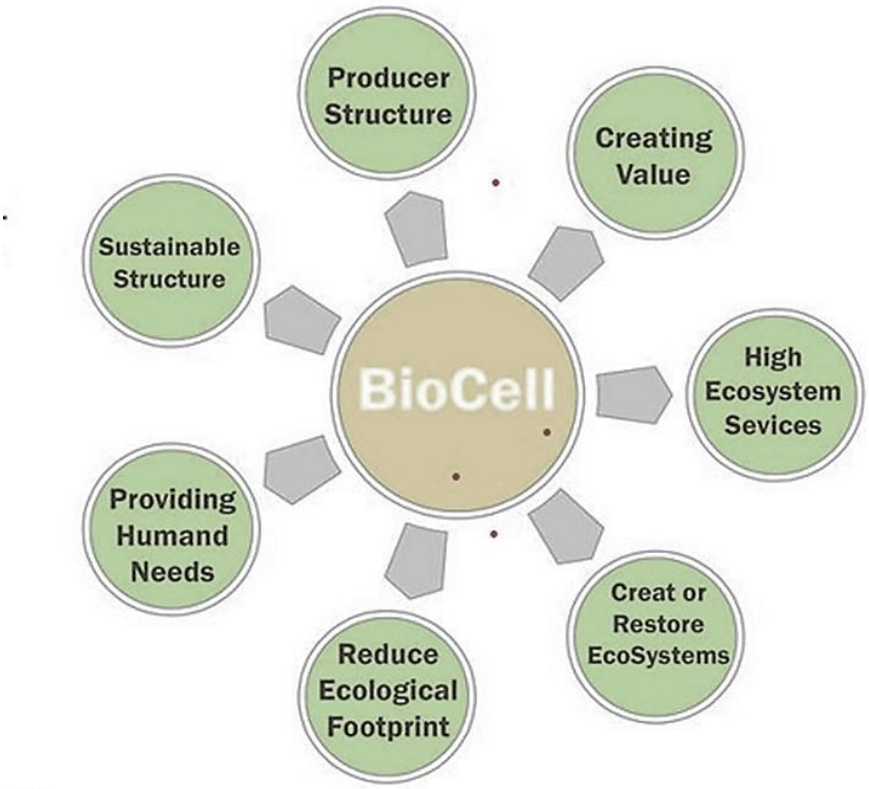

Figure (1): Bio cell system application standards (18)

We will look at examples of these:

4. Bio cell system in building

4.1 Bio cell - skyscraper

- Architect: NDA Studio
- Project Year: 2017

Figure (2): Bio cell skyscraper (16)

4.1.1 Bio cell work

Bio cell buildings are independent building in energy and food needs by producing them themselves. Providing their water needs by harvesting moisture form air, terrestrial elements, reusing waste waters and storing rain water, they are designed to be a part of urban ecological network and helping to restore urban natural ecosystem. They are using native vegetation, which will provide all aspect of sustainability. Material life cycles are considered within constructions. By becoming a producer structure and zero-emission building it will reduce the building's ecological footprint and will help the environment to restore itself. (17)

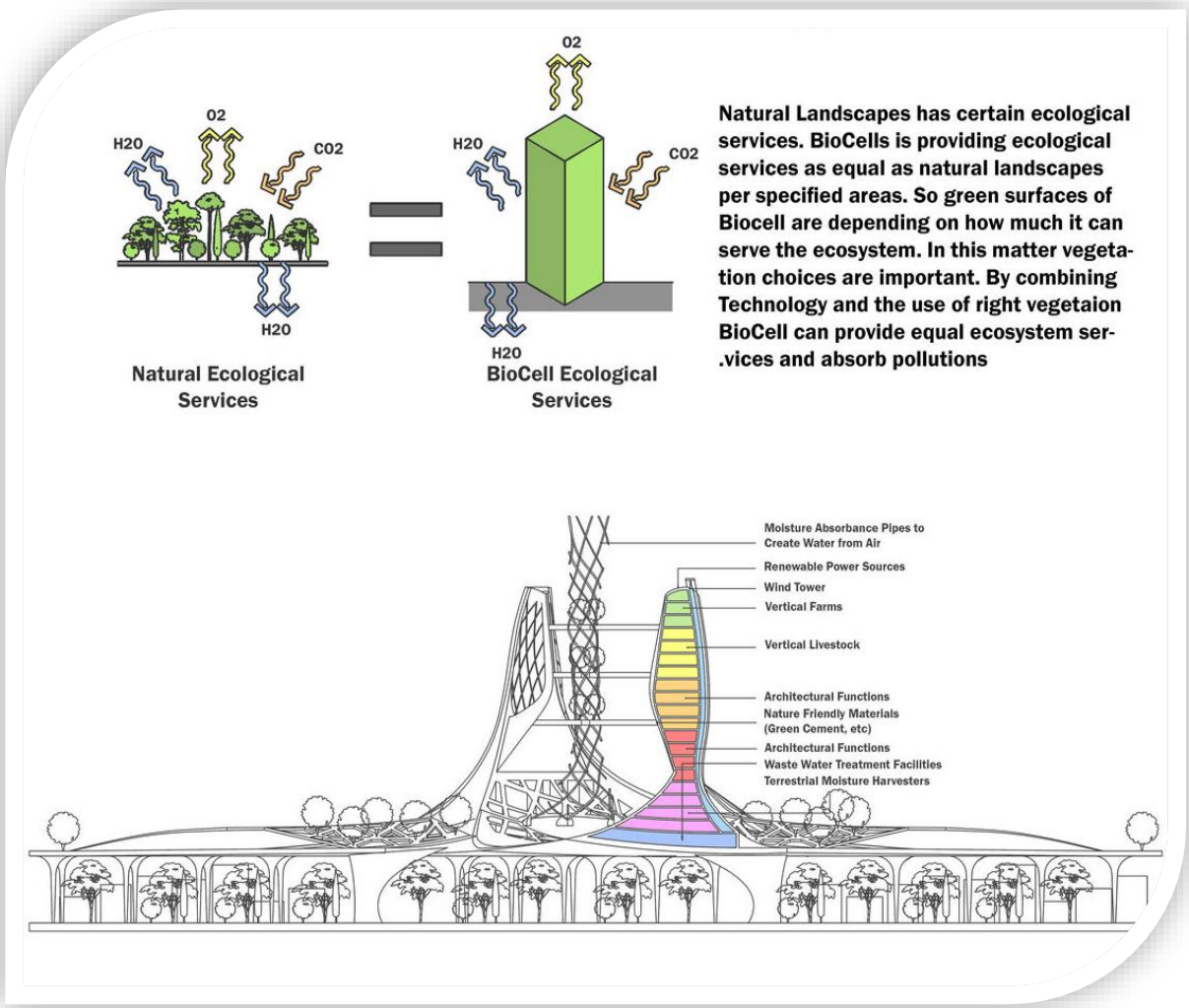

Figure (3): How the Bio cell works (17)

Bio cell can make new values in urban high rise perceptions. Otherwise, by using traditional spatial concepts and local heritage, it creates new and familiar architectural values. This structure by finding dual functions for green surfaces will give benefit for both man and environment.

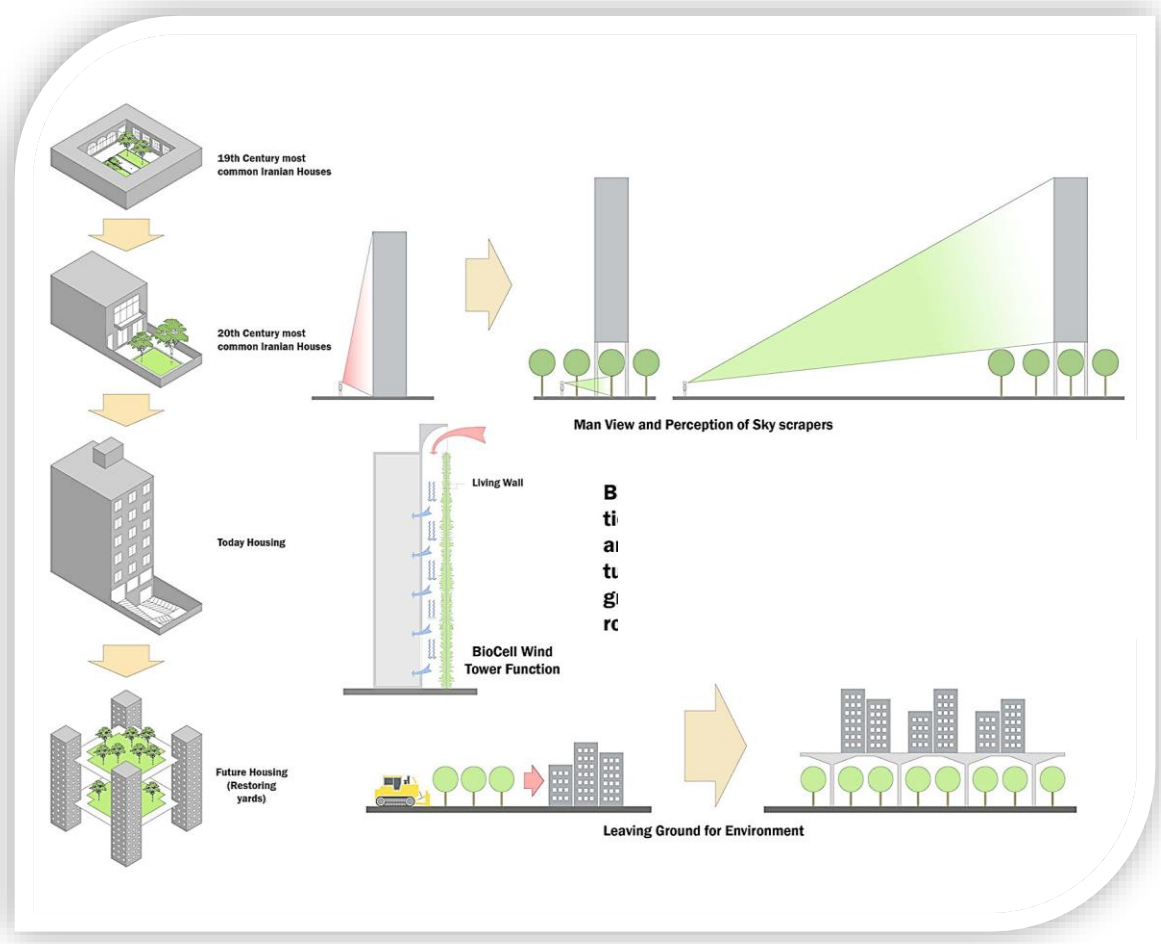

Figure (4): Future Housing (restoring yards) (18)

4.2 Amadai Cultural Center

4.2.1 Cultural Center analysis

A practice through Bio Cell buildings to reach sustainable Interaction between built environments and natural ecosystems. (4)

This project is an exercise through the Bio Cell design concept. It is a sustainable building in line with human needs that focuses on reducing the ecological footprint and creating environmental services to be part of the urban green network and to add value to the natural ecosystem and the built environment." These buildings will focus on having environmental services almost similar to the landscape.

4.2.2 Project information

- Architect: Notash Dadjoo - environmental designer (21)
- Place: Hamadan province, Hamadan, Iran.
- Designed year: 2019
- Awards: Candidate for winning in 2A Continental Architectural Award 2019.
- Bronze A' Design Winner in Architecture, Building, and Structure Design Category, 2019 – 2020.

1. Cultural building
2. Commercial, educational & sport building
3. Office building.
4. Public parking
5. Thematic landscape (kid's garden).
6. Playground.
7. Collaborative landscape
8. Thematic landscape (rock garden)
9. Thematic landscape (tranquility garden)
10. Thematic landscape (health &sport garden)
11. Entrance landscape
12. Parking entrance road

Figure (5): Amadai Cultural Center (21)

4.2.3 Concept

- Inspired by Avicenna monument – Iran

Figure (6): Avicenna monument (22)

- Design idea: The idea has been taken from the birth process, the first thing that appears is the head, so visually half of the building is buried and then the other half appears to have come out of the ground. The sustainable, cool and heritage-oriented design is distinguished by its introversion, buried form, low height, canopy, few openings with little space in the facades and the use of rough and dark materials in the facades.

Figure (7): Amadai Cultural Center

4.2.4 Sustainable Design of Amadai Cultural Center

Introverted and sustainable design synchronized with local architectural heritage and climate conditions, have been featured by centralized and buried form, low height, few openings with small area in façades, canopy for sunlight control and the use of rough and dark material in façades.

a) Use of Bio cell

Bio cell has an important role in urban natural ecosystem which is a key factor for these buildings. Because of the shortage of water resources in Iran, the building must first be able to solve its water needs. Therefore, by taking advantage of rain water storage systems, water crafting systems from air humidity and soil moisture and re-use of treated sewage, it will resolve this need. Based on the amount of available water sources and also to provide ecological services equal to natural landscapes, expansion of green areas will be considered in building's design. The use of new technologies such as carbon absorbent devices, pollution absorbent materials will take place and work with green areas if all the green surfaces can't provide services as equal as natural ecosystem services. The result of adding all these feathers in one sky scraper building, it will be transformed into a built natural patch and will be connected to urban ecological network and helps to create or restore urban natural ecosystems.

b) Use of light facilities

The use of light structures to shade open spaces to reduce the Earth's heat and thus achieve the approval of the Sustainability Assessment (LEED) in reducing the Earth's heat.

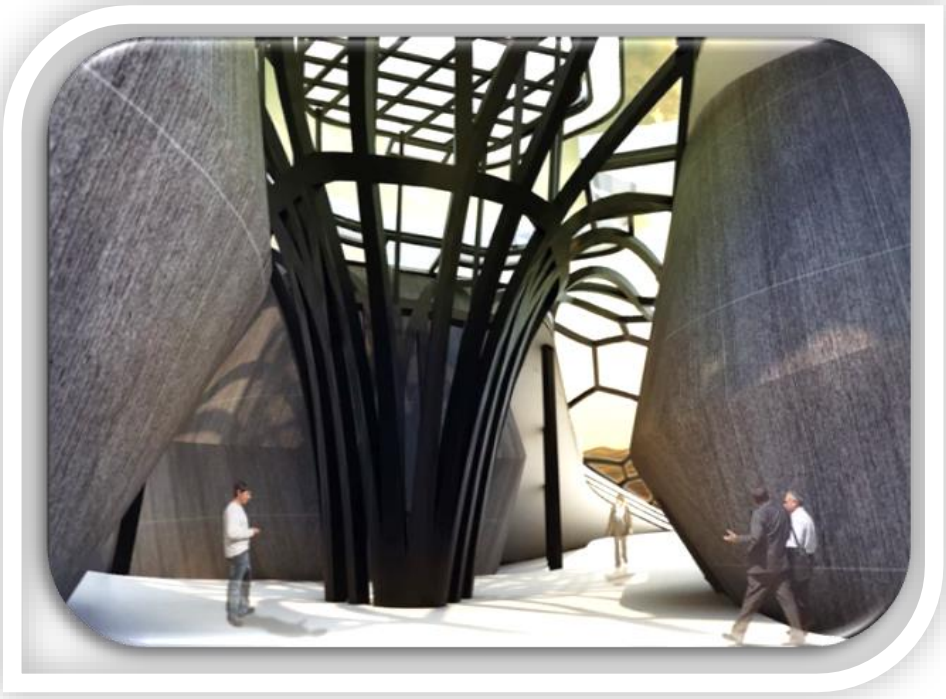

Figure (8): Outdoor of Amadai Cultural Center (20)

c) Natural lighting

Figure (9): Internal space of Amadai Cultural Center

The picture shows the dependence on natural lighting during the day through the glass facades to achieve visual comfort during the day, which is one of the LEDs' dependence on the quality of the interior environment.
It also shows the large architectural openings facing each other, thus achieving the required ventilation inside the void while creating air movement in the internal void, one of the LEDs' appropriations for the quality of the internal environment.

4.3 Bio cell Campus

In the middle of Guangzhou's Bio-Tech Island, HENN is the building of the new Bio Cell Research and Development Centre. (23)

Figure (10): Design of Bio cell Campus (23)

4.3.1 The concept

The design of the project is directly derived from the principle of cell division and fusion. The design has been inspired by the aesthetics and formal language of merging cells, resulting in a three-part main building that appears to be a coherent ensemble as viewed through a membrane.(24)

This is supplemented by two further buildings of similar organic design. The round facade is contrasted by an efficient grid on the inside, which provides clear orientation and functional division.

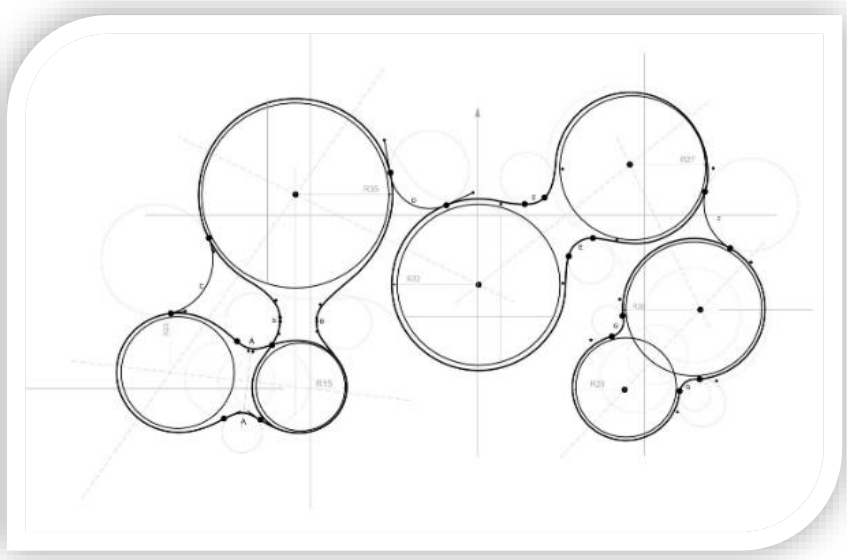

Figure (11): Plan of the Bio cell Campus (23)

Figure (12): Bio cell Campus

The building consists of three separate entities in a united building hosting a music space, a dance space, and a media library. These three elements are articulated around a space serving all the elements of the program. The exceptional location of the Cultural Center guided the organization of the project and its orientation.

Figure (13): Internal space of Bio cell Campus

4.3.2 The use of bio cell designing

- The picture shows the building's design as if it were part of the green network and its compatibility with the natural environmental system with its flowing lines in the design. The spaces open to the outside in order to generate permeability and take advantage of natural light. (1)
- Green inner courtyards and outdoor areas function as recreational and meeting spaces and enable a high natural-light incidence.
- The picture shows the reliance on large architectural openings, which achieve the required thermal comfort with air movement in the internal space.
- Relying on natural lighting for the maximum possible period while avoiding direct rays. This is achieved by protruding surfaces, entering architectural openings, and also using light refractors.
- Emphasizing the quality of the indoor environment by using green plants to purify the air and using opposing architectural openings to achieve renewal of indoor air.
- The design uses vegetation to achieve sustainability aspects for a building free of harmful emissions, thus reducing the negative environmental impact. (1)

5. Conclusion

We conclude from the research study the importance of the role of sustainable& bio cell design for the comprehensive internal drawn vision in the design of internal spaces and then air production, airy, permeable, and then back to the surrounding environment, good ergonomics, also environmental conservation and ocean control.

6. The Results

1. Sustainability is all the methods and techniques that make raw and manufactured materials and unsustainable elements sustainable, through sustainable development of the environment and internal space to meet the needs of the present and the future.
2. Sustainability aims to reduce negative impacts on the environment and humans.
3. There are long-term negative changes in temperature and energy consumption, which must be studied and try to reduce the negative impact of preserving the environment for future generations and preserving human connection.

4. Sustainable design is a continuum between people, the environment and the design followed, so both of them must be considered when designing as they affect each other.

5. To achieve sustainability; we follow the applications of the elements of sustainability& bio cell strategies.

6. The sustainable interior design of the interior space follows the achievement of the quality of the interior environment, such as indoor air quality, control of emissions from the materials used, and thermal, visual and acoustic comfort.

7. Biological Urban Cell (Bio Cell) is the solution for simultaneously achieving human and environmental needs.

8. Unbalanced design of cities causing serious environmental issues as destroying natural ecosystems.

7. The Recommendations

1. Continuing to update sustainable design strategies and merging them with the interior design.
2. Re-evaluating the requirements of the sustainable interior space according to the activity and the human needs inside it, in an attempt to improve the defects that occur in it as a sustainable design.
3. Emphasis on the use of sustainable alternatives.
4. Care to build a generation of sustainable designers with skills, experience and knowledge of modern technologies and employ them to implement sustainable interior design with all its requirements.
5. Paying attention to scientific research, modernization and design strategies for the internal space to keep pace with the global environmental trend.

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