

Healthy Residential Buildings (Reality and Hope)

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Abstract

Indicators of the external environment have lately altered because of the modern features created by individuals, which may negatively affect their health inside their residential, causing to obstruct the role of healthy buildings in performing its tasks and leading to drifting far from its intended goals, which include providing residents comfort and stability.

The circumstances also differed in terms of establishing the purposes of the healthy buildings, since individuals overlooked the demands of their health and their internal environment in the construction of his dwelling.

Therefore, designing the correct healthy residential building has an effective role on human health by preparing these buildings to achieve visual and physical comfort. So in order to be labeled as a healthy residential building, it must contain features that are compatible with the health of its occupants.

Keywords: Healthy Design, Healthy Buildings, Architectural, Residential, Well-being.

Introduction

The concept of architectural harmony with health is not a new concept, especially that the interaction between nature, humankind, and the environment is represented through architectural philosophy (Halleran & Peters, 2020). Thus, it is a well-known harmony regardless of cultural or civilizational differences.

Healthy designs focus primarily on energy, resource conservation and motivating people to avoid environmental damage. On the other hand, healthy designs failed to identify the characteristics that affect human health and well-being in the living and working environment, as well as the basic needs of humans to communicate with nature, which contains physical, emotional, mental, and spiritual health. Which leads us to the architect role in designing healthy buildings for living, working and leisure spaces, especially that housing quality is a critical urban intervention in decreasing health risks and boosting climate resilience, which is a key development goal (Capolongo, 2014).

Beyond the design characteristics and criteria of healthy buildings, the relationship between architecture and health has received more attention lately; primarily because of the consequences of environmental features

such as overcrowding, noise, air quality, and light on people's health (Carmichael et al., 2020). Therefore, quality of the built environment that enables such positive behavior is a critical subject of discussion here.

Since each individual deserves an opportunity to improve their standards of healthy living, the primary objective of this study is to focus on the broad principles of healthy housing. As well as the interaction between the ecosystem, and the built environment, in the extent to which it might be reflected on urbanization in general.

Study Problem & Questions

The current global interest in conserving the environment and the lives of human cultures on earth forms the main scientific, philosophical, and technical trends that most studies and research are leaning toward.

It is worth noting that the world's rapid and steady population growth, in addition to the energy crisis and pollution problems resulting from large energy consumption and their negative effects on the environment, have attracted the interest of various countries around the world, whether they are energy exporters or importers (Senitkova, 2019).

Simultaneously, the need for a more balanced approach to the environment continues, particularly among planners, architects, and designers, in order

to seek out planning and design choices for modern cities and new residential buildings that utilize renewable natural energy sources.

Hence, this study aims to answer the following questions:

- 1- What does "healthy residential building" mean?
- 2- How has the concept of healthy residential building evolved over time?
- 3- How does healthy buildings' influence the environment?
- 4- What are the most important fundamentals and requirements for developing healthy residential buildings?

Methodology

The study's methodology is based on studying the dimensions of the healthy residential building concept, defining its details, and moving towards obtaining conclusions and recommendations that may benefit in exploiting the environment to preserve urbanization and human requirements in it using the inductive method.

Background Review

Approaches to healthy buildings, healthy buildings evolution over time and their impact on the environment, healthy building standards and requirements are discussed in the background of this research.

Healthy residential buildings

There have been numerous studies for healthy designed buildings based on scientific theories, and it has been given several labels, the most prominent of which are ecological design and green design. Eco-design has become a synonym for healthy design, derived from ecological theories that view nature as an integrated system of "eco systems", as well as the concept of "green," which represents durability and growth (Hale, 2020).

A "healthy building" is one that is neither damaging to its occupants nor to the surrounding environment. In actuality, this is a deficient definition, relying solely on one criterion: the absence of unhealthy conditions or influences. However, there must be a suitable environment both functional and aesthetically conducive to achieve healthy living (Hzmi, 2013).

A healthy residential building helps its residents to perform all physical, technical and social functions in a normal way through the interrelationship between man, environment and society. In terms of functionality, it must

meet the occupants' basic needs in a healthy and supportive manner. It must be appealing, tranquil, and harmonious from an aesthetic standpoint (Mashhour, 2005).

Environmental quality has emerged as a critical problem in the pursuit for healthy structures. An insufficiently cleaned or maintained environment, insufficient ventilation, pollutants produced from sources and activities inside the building, and contamination from outside sources are four major causes of indoor environmental concerns, and more than one may be active at any given moment. These factors can worsen or add to the stress that occupants experience as a result of insufficient temperature or air flow (Hao et al., 2022).

Household health and the health of the cities in which they exist are inextricably linked. The quality and healthfulness of the air, water, light, and sound that enter a house, as well as the general atmosphere of any house, are all affected by the immediate surroundings. If the air, water, sound, garbage, or radiation that leaves a residence is unhealthy, it pollutes the city. As a result, if one of the two is "unhealthy," neither the house nor the city can be healthy. If the air outside is contaminated, a low-energy-consuming, daylight-illuminated, naturally ventilated, and thermally-

conditioned structure will nonetheless be unhealthy (Brown, 2015). Figure (1) shows an example of a healthy building environment.



Figure (1). Healthy Residential Building example.

The evolution of healthy residential buildings over time

Healthy residential buildings have developed from the simple and basic residential to the modern designs of healthy residential buildings nowadays. This development includes all areas of design, from branch distribution to executive development, all of which are accomplished by using natural, manufactured, and semi-manufactured materials. Healthy residential began with a simple design that corresponded to the primitive humankind's precautions, and set aside a solitary space to be protected from the external environment (Mashhour, 2005). Wood, dirt, stones, and animal skins were employed in the construction of residential. Which made these

residential suited for the environment, conducive to comfort, peace, and serenity, yet vulnerable to some critters.

Thereafter, residential buildings evolved and took on new roles because of the variety in activities that are carried out within it. As a result, the interior areas were multiplied, and the activities were separated into inside and outside activities. It has also grown more tolerant of environmental influences, particularly climatic ones, as well as the utilization of locally sourced raw materials that are consistent with the local ecosystem (Brown, 2015).

Ancient world civilizations followed, which vary in content due to various religions and cultures. Rather, it was introduced inside the dwelling's internal spaces. Which influenced the diversity of interior spaces and expanded their specialization to meet all human needs at home and therefore eliminate the need to practice activities abroad, as well as improved building tolerance to environmental impacts and the use of environmentally friendly materials (Mashhour, 2005).

Environmental pollution and overcrowding in the world had a huge impact on modern buildings recently. It was mostly small in size, with few spaces, and not suitable for activities, especially since the individuals started to carry out most of their activities inside their homes and completely drift far

from natural environment. All of this progress had an increasing impact on individuals' activities, which began to decline to only meet the basic needs and ignore some of the activities that are considered extremely important for their health, which negatively affected human health in return (Alolwan & Baik, 2017). Figure (2) shows the evolution in residential buildings over time.



Figure (2). Evolution in residential buildings over time (Simon, 2018).

Healthy buildings' impacts on the environment

In both developing and developed countries, buildings in general are accountable for a large portion of the consumed resources and pollution released. They are also responsible for more than 40% of national and global energy consumption and air pollution. While water and material usage are roughly 25 and 30 percent of total consumption, respectively (Levin, 2001). Figure (3) is an expressive image of buildings' impact on the environment as a whole.



Figure (3). Expressive image of the impact on environment.

Transportation is another significant contributor to overall human environmental loads, particularly in automobile-dependent cultures such as the United States, Western European countries, and Japan. Due to the

massive material and energy requirements for the infrastructure and fuels required to maintain healthy buildings far from city centers (Senitkova, 2019). Because of the severity of these effects, buildings present both a challenge and an opportunity to improve cities' sustainability.

Basic fundamentals for the construction of healthy residential buildings

- 1) Preserving the population's, the ocean's, and the world's overall health.
- 2) Energy, water, and other natural resources should all be conserved and protected.
- 3) Attaining the concept of long-term sustainability in designing and constructing healthy buildings.
- 4) Using materials that do not harm the environment in any way, whether during manufacturing, use, maintenance, or disposal. Such as applying glass panels directly on concrete without enough insulation (glass wool), which leads to doubling the heat load inside the building, requiring the use of higher-energy air conditioning (Hzmi, 2013).
- 5) Disposing waste in a way that does not have a negative impact on the environment, instead using recyclable waste to serve the ecosystem.

Factors for healthy building criteria

In order to design healthy residential buildings, some factors must be stated and the process has to be clear. Some factors for healthy building criteria are listed down in Table (1).

Table (1). Factors for healthy building criteria (Senitkova, 2019).

Environmental focus	Criteria focus
Indoor environmental quality	Thermal comfort Indoor air quality illumination Security Privacy Functional support
General environmental quality	Energy consumption Natural resource consumption Mineral resource consumption Land use Air pollution Water pollution

It can be seen from the table above that the list is quite long, despite the fact that it only covers a few broad categories of indoor environmental conditions. When all of these issues are considered, it becomes evident that designing healthy buildings is a challenging task. While there is data and regulations to aid designers when it comes to the individual components,

there is little advice for designers when it comes to the complicated interactions among these elements and the cumulative impact of various environmental exposures on occupants of the building (Mashhour, 2005).

In more details, the human body combines its response to environmental influences as communicated by numerous sensors (visual, tactile, aural, thermal, and postural) in the interior environment. Majority of the research studies focuses on each of these sensors and the human responses they induce, and only a little amount of research has been done on the relationships between the various components. As a result, designers are faced with a challenging task of determining the interrelationships between the numerous components as well as the impacts of interactions between environmental factors and human responses to them. Not to forget that designers have limited guidance on how to successfully address the underlying issues (Senitkova, 2019).

To summarize, the fundamental concerns of healthy building design include creating a healthy indoor air environment with proper airflow and material selections that reduce outgassing within the building. In addition to selecting building materials and resources that are environmentally friendly, low in embodied energy, and have a minimal upstream environmental impact. Lastly, healthy building design should include the

utilization of renewable energy sources and renewable power like wind and geothermal.

Requirements for human health in healthy residential buildings

The internal environment of every human needs to be both comfortable and safe in order to achieve safety, as the person is exposed to various diseases in the event that his residence does not comply with the requirements of his health inside. Some of these requirements include:

1- Achieving human comfort, through achieving the following:

- Visual comfort.

Visual comfort requires protection of the eye from stress and from the pollution of the moral and material environment (Mashhour, 2005).

- Hearing comfort.

This is mainly achieved by managing sounds, whether they originate from outside the residential or from within it, so that they do not exceed allowed boundaries and become undesirable noises, causing individuals to lose their ability to think and focus (Mashhour, 2005).

- Physical comfort.

It expresses itself in physiological comfort, as well as the comfort that comes from exercising organ functions, thermal comfort, and functional comfort (Header, 2021).

- Social comfort.

It is the consequence of meeting social, cultural, and urban needs, in order to meet the human desire for internal and exterior privacy, acoustic and visual (Adan et al., 2007).

- Economic comfort.

A residential building should be suitable with the material capacities of its resident, by lowering maintenance labor and conserving energy.

2- Providing safety from external influences, through providing the following (Adan at al., 2007):

- Protection from the socio-psychological environment.
- Protection from the effects of natural environment.
- Protection from the effects of urban environment.

Conclusion

- 1- The significance of connecting healthy residential buildings' design with the external environment in order for a person to have a healthy, enjoyable, and secure existence life in his residential building.
- 2- The importance of the interaction among the numerous sciences that specialize in the study of healthy residential buildings in order to establish compatibility between residential buildings and the environment in a way that is safe for human health in general.
- 3- The essence of compatibility of the residential in its design characteristics with the physical and moral nature of the human being.

Recommendations

- 1- When constructing healthy residential buildings for human health, it is suggested that comfort levels for individuals should be taken into consideration.
- 2- Various environmental elements must be considered while designing and constructing healthy buildings and its surroundings, such as isolating industrial and airport zones from residential neighborhoods for example.

- 3- It is recommended that residents and the government work together to improve the built environment and manage pollution issues.
- 4- The usage of building materials that minimize global environmental destruction should be considered. Other materials are considered based on the non-toxicity of the elements that make them, and wood can be chosen if it does not destroy forests.
- 5- All precautions must be taken to guarantee that no harmful gases are emitted from the building's materials or construction systems, as well as avoiding their spread into the building's internal environment's atmosphere.

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