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Sustainability In Commercial Buildings To Achieve A Healthy Environment For Humans. Case Study Taikoo Hui Mall

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Abstract

The research works to highlight the importance of sustainability and its role in raising the efficiency of commercial centers and upgrading them to achieve optimal performance in terms of environmental, functional, economic and construction terms to achieve the desired goals and help in attracting the largest number of users and achieving the largest possible percentage of profits, as commercial buildings are an important element of attraction Which, in turn, is reflected in contributing to raising the national economy, by explaining the concepts related to sustainability, starting from identifying sustainable development strategies, leading to sustainability in the commercial environment, to extract the standards that must be met in commercial buildings to achieve sustainability, a case study of the Guangzhou Taiko Building in China and analyzed through sustainability criteria.

Keywords Sustainability, commercial buildings, sustainable development, sustainability criteria.

1. Introduction

The environment suffers from the impact of the wasteful exploitation of its natural resources, and the loss of its strategic energies (which if lost will not be compensated), and this large consumption of those resources increases with the increase in population numbers in the world on the one hand, and with the increasing human needs of buildings and technologies on the other hand without attention. The idea of sustainability was not a goal or an intellectual trend in architecture that was born of the moment. Since the seventies of the last century, (green architecture - ecological architecture, sustainable buildings, environmental architecture) appeared as different intellectual trends under the umbrella of sustainability, just as the act of sustainability and its applications in architecture has preceded that. Environmental architecture appeared in ancient civilizations in the form of man's attempt to adapt and coexist with his environment, and the forms of this adaptation varied from the use of materials available in the local environment through the ways of using them and ending with the methods he used to deal with the elements of the environment (wind, sun…..etc.).

Previous studies: The thesis adopted access to a methodology for the application of green architecture and economic sustainability in low-cost housing buildings in Egypt by

studying the concepts and principles of green architecture, concepts of economic sustainable development, green evaluation systems and methods of raising economic efficiency, and matching this theoretical study on a set of global models of low-cost housing.[21]

The study dealt with the concepts of sustainability and analyzed the dialectic of the mutual impact between man and the environment by recognizing the impact of the social dimension on environmental sustainability, by studying methods that mask social impacts on the environmental environment in application to nature reserves. [22]

The research examines methods of reducing energy consumption and using renewable energy to reduce the use of fossil energy that is prone to depletion, as a key pillar for sustainability. [23]

The study examines the issue of measuring the effectiveness of sustainability assessment systems on campus in Egypt, as an issue related to urban and environmental problems that threaten the future of Egypt, including energy limitations and crisis, water poverty and severe environmental pollution, which increases the importance of having an urban regulatory framework that stimulates construction processes and adopts the latest methods of energy conservation.[24]

2. Research methodology

The research is based on a theoretical study that deals with sustainable development and its role in achieving sustainability in commercial buildings, and commercial building evaluation systems, followed by an analytical study of the Taiko Guangzhou building in China and its analysis through sustainability criteria, then the results obtained from the study.

3. Sustainability

There are many and varied concepts related to sustainability, and they are as follows:

- "It is defined as the optimal exploitation of material, natural and human resources and capabilities in a balanced and appropriate manner with the natural environment so that they are benefited in a balanced and appropriate manner with the natural environment so that they are utilized without harming or neglecting the capabilities of future generations while ensuring the continuity of life in an effective and appropriate manner"[1].

Meeting the needs of the current generation without wasting the rights of future generations to life at a level no less than the level in which we live." This means that there should be a comprehensive view when preparing sustainable development strategies that carefully consider the three dimensions. The French thinker **Jack Attali** participated in the International City Forum in Abu Dhabi and said that a sustainable city is a city that can live and prosper in the long term. This requires the availability of the necessary financial means to achieve growth and development, and the necessary natural resources[1].

From the foregoing, we conclude that sustainability is meeting the present's economic needs and achieving social justice, through the optimal use of available resources and capabilities in proportion to the surrounding natural environment, without wasting the rights of future generations.

3.1. Sustainable development

Sustainable development goes beyond the concept of the environment to include all sectors and their interaction among them and their impact on the quality of life. Which is generally known as: "Achieving the needs of the present without compromising the ability of the future to meet its needs"[2], and the following is a presentation of the most important definitions of sustainable development:

- A conscious will of the available resources, environmental and natural capabilities, and the rehabilitation of the natural environment that has been subjected to deterioration and misuse [3].

- That development that considers justice in society, respects nature and supports economic aspects, that is, it is based on the integration of needs - and sustainable development does not reflect a fixed situation, but rather is a process of change as this change must be managed in a good way to meet our future needs as it faces our needs current [4].

3.1.1. sustainable development strategy

The environment is the general framework that is affected by and affects economic activities. The environment is also affected by the behavior of community members and affects their health conditions and various activities. Therefore, any successful program for sustainable development must achieve compatibility and harmony between these three elements (environment, economy, society), and link local performance and behavior with global concerns. Thus, the sustainable development strategy moves under three main objectives (environmental development - economic development - social development) (Figure 1)[5].

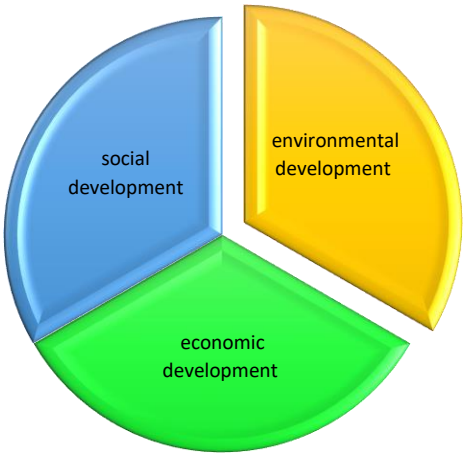

Figure 1 sustainable development strategy

A. environmental development

- Use of renewable energies and environmental protection: in the sense of protecting the components of the local ecosystem as a basis for maintaining the balance of the global ecosystem using renewable energies and limiting ecological damage such as desertification and climate change and protecting the valuable components of the natural field such as wildlife, nature reserves, and historical areas.
- Preserving natural resources: in the sense of providing the current needs of resources and taking them from their natural sources, but at rates commensurate with the ability of these resources to renew and continue.

B. economic development

By achieving a stable level of economic growth rates, enhancing efficiency and economic capacity, which contributes to providing job opportunities and increasing production and services. It is understood as the need to generate the highest production of economic welfare while preserving the property stock of resources, including environmental properties.

C. social development

By considering the importance of social and cultural dimensions of development, which includes all social and ideological systems, and neglecting these aspects may lead to the failure of many development programs and projects.

Based on the foregoing, sustainable urban development in its comprehensive concept is a saturated and multidimensional process. It is a strategy that aims to achieve current and future needs. It also touches all aspects of life, including political systems, economic and urban conditions, scientific and technical progress, values, habits, and behaviors.[5]

3.1.2. Sustainable Development Goals

It can be said that the most important sustainable development goals are:

The framework for sustainable development in Egypt, which was developed by the working group of the German United Nations Program, relied on a balance between [6]:

- Material management to conserve human and natural resources.
- Environmental protection to avoid environmental degradation.
- Economic and social development to satisfy human needs and achieve the common good.

- Conscious management of the available resources, especially the historical areas, and an attempt to restore balance to the areas that have been subjected to deterioration.
- Relying on renewable and local resources mainly in historical areas.
- Optimal use of resources in the long run.
- Work to activate the role of local communities in the different stages of sustainable development processes.
- Implementation of projects where population centers are in historical areas and where the needs for them increase.
- Relying on a balance between three axes, namely protection - preservation - socio-economic development with its various elements.
- Protecting and developing the biological diversity of the local ecosystem and increasing its production.
- Adopting the environmental planning methods and approach to achieve the foundations of the sustainable development goals.
- Work within the carrying capacity of the ecosystem in the sense that it takes place on the system that allows diversity, flexibility, and the ability to absorb negative influences.

3.2. Sustainability in the commercial environment

Modern trends in commercial building design seek to achieve design sustainability by providing a sustainable commercial environment.

Sustainability in the commercial environment is related to both human beings, the economy, and environmental responsibility, and access to them is through achieving the three requirements together, and the following will be addressed to each of them.

3.2.1. The human aspect

A person desires to provide an attractive, interesting and comfortable space while in the commercial building, whether it is for shopping or to meet with his friends and social acquaintances, which requires good design and there is strong evidence that the design of public spaces in sustainable commercial buildings is more attractive to users and thus more economically successful.[7].

Sustainable design focuses on indoor environmental quality (IEQ), which includes indoor air quality (IAQ), which is achieved by providing good lighting, thermal comfort, humidity control, and acoustics And odor control, for example, it was found that providing natural lighting in the spaces of the commercial building led to an increase in sales to 40%, and it also consumed less electricity needed for lighting during daylight hours, thus reducing the economic cost of operation, which made lighting Naturalness is a hallmark of good design for public spaces in commercial buildings.[8].

3.2.2. The economic aspect

The main indicator of the success of the commercial environment is the sales volume per square meter which is often affected by the difference in the quality of the indoor environment, on the other hand controlling the cost of construction, operation, and maintenance.

The traditional view was that the focus was on making the cost of construction as low as possible, and with the growth of awareness and the emergence of the concept of sustainability, the conviction began that sustainable design could save in operating cost and compensate for what was paid over construction to achieve sustainable design.[9]

3.2.3. The environment aspect

There are no longer dividing lines between the environment and the economy since the emergence and spread of the concept of sustainable development, which affirmed beyond any doubt that ensuring the continuity of economic growth cannot be achieved considering the threat to the environment with pollutants and waste, the destruction of its vital systems and the depletion of its natural resources.

Waste of building materials during the implementation of commercial buildings causes additional costs and leads at the same time to pollute the environment with these wastes that contain significant proportions of toxic and harmful chemicals. Thus, the environmental solutions and treatments provided by sustainable architecture lead at the same time to achieve economic benefits that It is limited to the individual and society level.

The high cost of energy, environmental concerns, and public concern about the phenomenon of "sick buildings" associated with closed box buildings in the seventies, all helped to make a leap in the movement of sustainable architecture, but at the present time, "economy" is the main driver of transformation and orientation towards more designs and green buildings.

The integration of green design techniques and smart technologies in the commercial building not only reduces energy consumption and reduces environmental impact, but also reduces construction and maintenance costs, creates a positive and comfortable environment for the user, improves his health and increases their productivity, and increases the building ownership value and rental income.[9]

3.3. Sustainable Buildings Evaluation System

3.3.1. (LEED) (The Leadership in Energy and Environmental Design)

This system was developed by the US Green Building Council USGBC, a voluntary, non-governmental body that aims to develop standardization systems and standards for sustainable building efficiency. The LEED rating system provides a complete approach to assessing the efficiency of buildings that achieve sustainability goals, and some international standards where the assessment includes strategies for site planning and rationalization of consumption Water, energy efficiency, material selection and indoor environmental quality[10]. (Figure 2)

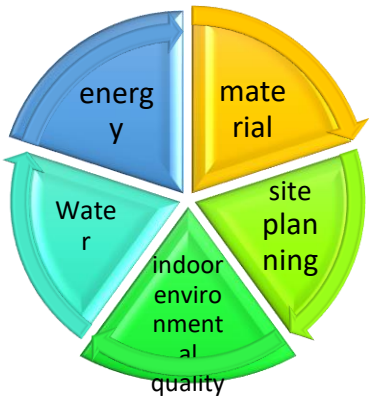

Figure 2 assessment strategies of leed

selector elements:

- Through the elements of the determinants mentioned above, the following becomes clear:

- Paying attention to the elements of the site and responding to its vocabulary as it affects the building.
- Paying attention to energy performance by relying on renewable energy and analyzing energy use systems.
- Attention to the need to reuse water and rationalize its use.
- Attention to recycling materials and waste management.
- To improve the indoor environment, it depends on the performance of ventilation and thermal comfort with control.
- Interest in evaluating the building according to the design vocabulary.

Table 1 Rating parameters of leed

Rating parameters	points
sustainable site	14
water use efficiency	5
Energy and Atmosphere	23
materials and resources	16
indoor environment quality	22
Creativity in rehabilitation, operation, and maintenance	5
Total points	85

3.3.2. BRE Environmental Assessment Method

It is the first system that was published in 1990 in the United Kingdom. It is a program of (BRE) The Building Research Establishment, a program for assessing the environmental performance of new and existing buildings[11].

he trends towards achieving an evaluation system is the result of increased energy demand, which reaches 50% in buildings and 40% of raw materials. It sets standards for best practices in sustainable development and the stringent quality assurance framework that has received ISO 9001 certification and is accredited under the UKAS system[12].

Rating parameters

The BREEAM system includes several determinants within the framework of sustainability, which include inside and outside the building, so it is also called a sustainable evaluation system, namely:

- Management: Attention to control the performance of individuals during the operation of the building.
- Energy use: 2co emission in addition to building energy use.
- Health and Well-being: health and well-being.
- Pollution: includes the pollution of water and outside air.
- Transportation: It includes the relationship of public transportation to the building and dealing with it.
- Land use: This includes the type of site and the urban layout.
- Ecology: includes the value of the ecological site and its preservation.
- Materials: includes the effect of material consumption on the environment and the relationship to the life cycle of the building.
- Water: Included use and preservation inside and outside the building [12]

3.3.3. The Egyptian green building council Green Pyramid Rating System [13]

The Green Pyramid is a national system for environmental assessment of buildings in Egypt. It provides specific criteria by which the environmental credentials of buildings can be

assessed, and these buildings themselves can be assessed. Additionally, the system should help designers, manufacturers and developers make choices commensurate with the environmental impact of their decisions.

Scope of the Green Pyramid Rating System and Eligibility for Evaluation The Green Pyramid Rating System is designed for use in new construction.

The objectives of green buildings can be summarized as follows:

- To provide a benchmark for good practice that enables buildings in Egypt to be assessed for their adherence to environmental standards through a credible, transparent environmental rating system.
- To enable building designers, constructors, and developers to make reasoned choices based on the environmental impact of their decisions.
- To stimulate awareness and demand for sustainable green buildings.
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- To stimulate awareness and demand for sustainable green buildings.
- Allowing informed dialogue with stakeholders and contributing to broadening the debate on green buildings in Egypt over the coming years.

Main areas

The Egyptian Council for Green Architecture is a complete building approach to sustainability through Perceive performance in seven key areas:

1. Sustainable development sites.
2. Rationalization of water consumption.
3. Energy efficiency and the environment.
4. Selection of building systems and materials.
5. Indoor environmental quality.
6. Process design and innovation.
7. Solid waste recycling.

The evaluation of this system consists of three levels

To earn the Green Pyramid certification a project must meet all the stated mandatory minimum requirements, obtaining an accreditation point by meeting certain criteria. Projects will be evaluated, based on the accumulated credit points, according to the following rating system:

- GPRS certified➔ 49-40 credits.
- silver pyramid ➔50-59.
- credits gold pyramid ➔60-79.
- credits Green Pyramid ➔80 credit hours and above.

The highest level in the evaluation is green and not platinum as in other systems because it is the ultimate and required goal.

4. Case Study Guangzhou Taikoo Hui Mall

The analysis dealt with the commercial building chosen from a set of determinants derived from the elements of the sustainability assessment (LEED).

1. Planning sustainable sites.
2. Creativity and management
3. Energy efficiency and renewable energy.
4. Building materials and resources.
5. Indoor environment quality
6. Water efficiency

About the project

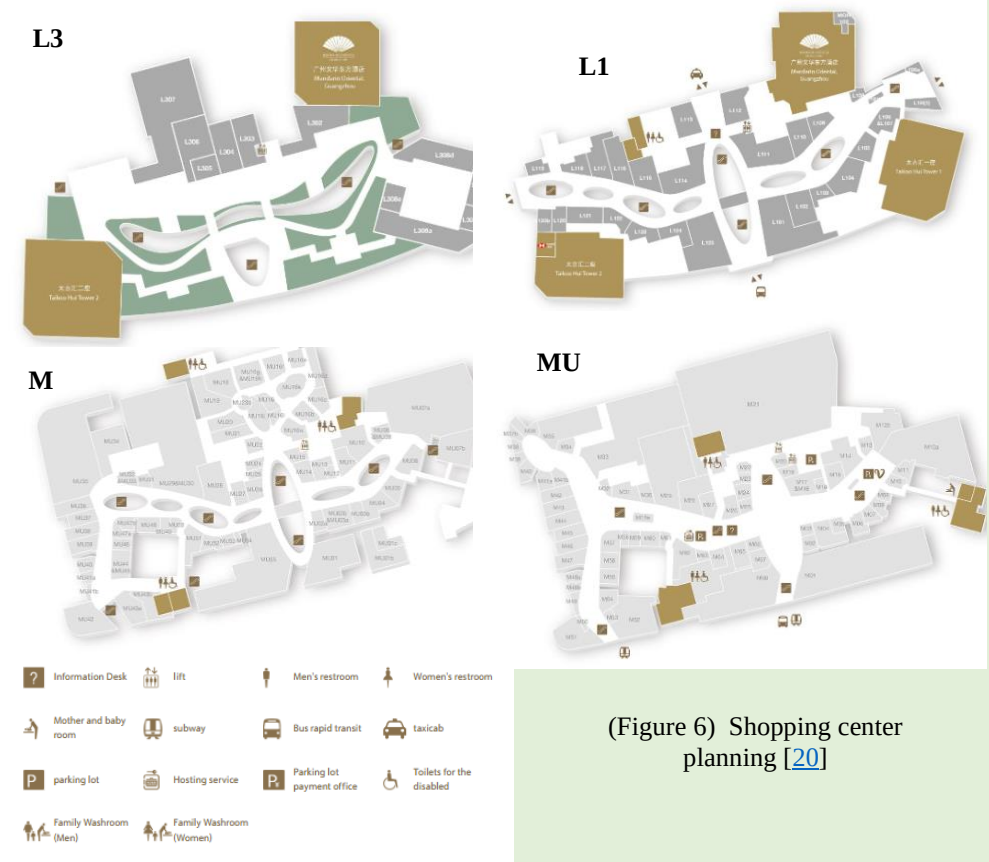
This project is in TaiKoo Hui, 383 Tianhe Road Tianhe District, Guangzhou, opened in 2011, Guangzhou is the capital and largest city in southern China. It is located on the Pearl River about 120 km (75 mi) northwest of Hong Kong. The total floor area is approximately 1,291,830 square feet (excluding the parking area) and is used as an indoor mall. At the time of certification, in February 2017, it was the first indoor mall in the world to receive the current LEED certification for buildings: Operation and Maintenance. [14]

Table 2 Analyzing the project through the established determinants

Determinants	Project analysis
1.Planning sustainable sites	The site contains several buildings connected to the shopping center (two administrative buildings, a hotel building and a cultural center), and all the buildings have been linked through communication elements (pedestrian paths) on the site or from the inside with the floors. (**Error! Reference source not found.**)  Figure 3 Scheme showing the shopping center and its connection with the surrounding buildings[15] ➢ The site provides many convenient transportation sources for the convenience of users, which are as follows: • Dozens of bus lines are available to pass • The shopping center is connected to the metro station of Line 1 and Line 3 through the m basement. ➢ The general site harmonizes with nature through site coordination elements to create an integrated environment.**Error! Reference source not found.**) ➢ Providing private parking spaces for users who use taxis or their own service vehicles to not impede the movement of private cars and facilitate external traffic.**Error! Reference source not found.**)  (Figure 5) Demonstrates the harmony of the site with nature and the coordination of the site [16]  (Figure 5) Explain taxi service [16] Storage Rain collection up to 100,000 liters, and this rainwater can be used for cooling towers, also used as toilet water.
2.Creativity and manage	➢ The shopping center consists of five floors with a total area of 138000 m2, the two basement floors are dedicated to services, waiting areas and a retail part, the first and second floors are all brands (more than 180 brands), the third floor is

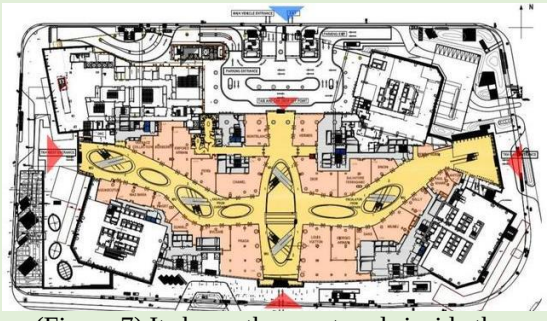
restaurants overlooking 8000 m2 rooftop garden.**Error! Reference source not found.**)

- Escalators are distributed in line of sight throughout the mall, and users can naturally see the shops in front of them as they walk, which effectively encourages the flow of people to all parts of the commercial building.



(Figure 6) Shopping center planning [20]

- The per capita share is 9 m2.
- Reliance in the design on the use of "two intersecting axes", and you can move around them directly during the shopping process, which facilitates the movement of shopping.**Error! Reference source not found.**)



(Figure 7) It shows the courtyards inside the center and the movement paths, entrances, and exits [15]

- The designer succeeded in using multiple courtyards in the commercial building, and each courtyard is mainly equipped with an elevator and stairs, making it easy to go up and down and connect between floors.**Error! Reference source not found.**)
- The designer succeeded in merging the internal environment in the center with the external environment, where the external movement path (main streets) was linked to the roof garden through a path containing a staircase in order to attract

the largest possible number of pedestrians outside to the shopping center. **Error! Reference source not found.**)

(Figure 8) Connecting the roof garden to the street and the glass box to the entrance [16]

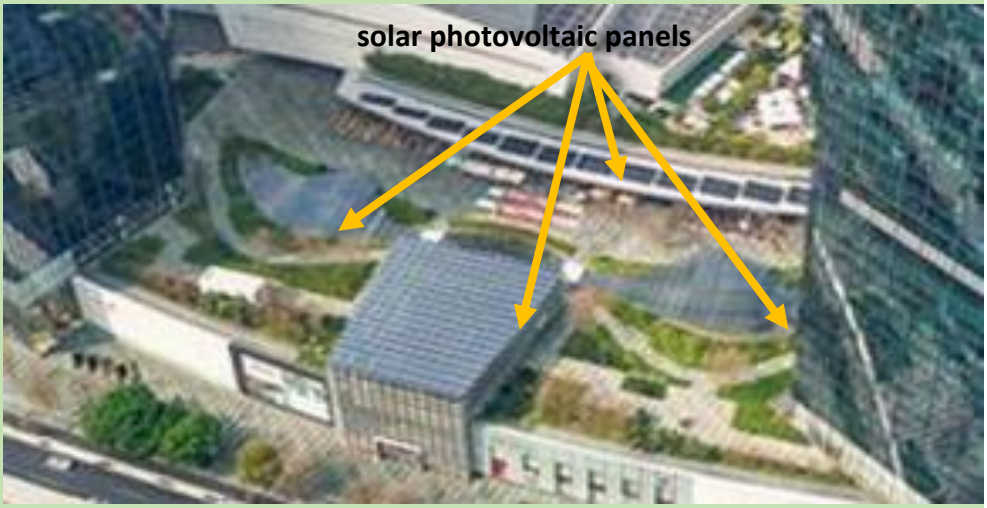
- The designer used attractions at the entrances and exits, which are characterized by a giant glass box that allows the light to pass smoothly and open and expand the view without limits, to connect between the interior and the exterior, where pedestrians on the street can clearly see the interior to attract the largest possible number.**Error! Reference source not found.**)
- Separation of movement paths, as the center has allocated places for trucks to load and unload goods and transport waste.

The use of electronic guiding panels that enable users to know the available parking spaces and how to go to them, to avoid any congestion that may occur.**Error! Reference source not found.**)

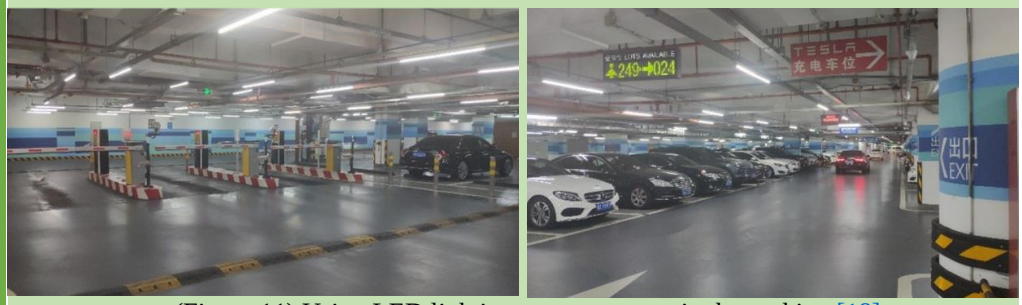
(Figure 9) Electronic guiding panels to guide the movement of cars [17]

3.Energy efficiency and renewable energy

- To make full use of the high-quality primary energy, Guangzhou Taikoo Hui company adopted Hanergy's most advanced solar thin-film technology and installed 405 thin-film solar photovoltaic panels on the roof of the shopping mall. This could generate approximately 76,000 kWh of clean electricity each year, which could reduce carbon emissions by about 60 tons. So far, TaiKoo Hui is the only commercial project in Guangzhou that uses solar panels to generate renewable energy. **Error! Reference source not found.**)



(Figure 10) Using solar panels to generate energy [18]

	➢ The double-layered glass curtain wall ensures the penetration of natural light to reduce energy consumption, aid in thermal insulation and sound insulation. ➢ Adjustable indirect lighting system reduces internal glare and power consumption. ➢ Compared to 2017, the annual electricity consumption of Taikoo Hui in 2018 decreased by 1.5 million kWh. ➢ All lights inside the center are energy-saving LEDs.**Error! Reference source not found.**)  (Figure 11) Using LED lighting to save energy in the parking [18] The CO2 sensor regulates the supply of moderate fresh air to ensure fresh and pleasant air without wasting energy.
4.Building materials and resources	➢ Using high quality local environmental finishing materials that are durable, biodegradable, and recyclable, and beautiful in appearance.**Error! Reference source not found.**)  (Figure 12) Efficient quality of finishing materials inside the center [16] ➢ The sensor powered trash can is not only wonderful, but healthy too**Error! Reference source not found.**) ➢ Efficiency of the materials used in the water tools.**Error! Reference source not found.**) ➢ "GOMIC" sanitary waste storage system is placed in a centrally controlled treatment room for waste recycling, the system can effectively reduce odor pollution caused by waste to the surrounding environment, thus reducing air purification load and saving energy, especially for wet waste treatment The entire system is fully enclosed, which increases the safety factor and provides maximum protection for the machine operator.

- In terms of reuse, kitchen waste machine by cooperating with catering tenants, kitchen waste can be used as compost to fertilize green plants in the building.

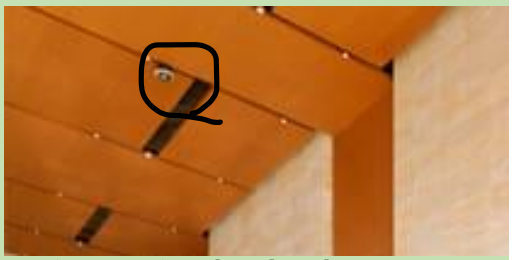
Due to the use of electronic payments, electronic invoices, and electronic vouchers,

(Figure 13) Efficient quality of materials used in toilets and smart trash [19]

2 million paper consumption is saved annually, which is equivalent to reducing the cutting of 200 trees each year.

5. Quality of the internal environment

- CO2 sensors regulate indoor air quality and a 24-hour central control room, providing advanced monitoring and a customer hotline to always monitor entire property**Error! Reference source not found.**).
- Use advanced photocatalytic technology/nano photon purification system to improve indoor air quality.



(Figure 14) Carbon dioxide sensors to adjust the quality of the indoor environment [16]

- Use the air conditioning machine control system to adjust loads and distribute them to refrigeration equipment.
- The rooftop gardens of more than 8,000 square meters provide a comfortable and enjoyable green space, ideal places for cultural and recreational activities.**Error! Reference source not found.**)

(Figure 15) Various shots of the roof garden add charm and bring a measure of comfort and enjoyment to users [19]

- Community participation and full support. In 2018, TaiKoo Hui organized a series of community and cultural activities to make this comprehensive business

district thrive with endless vitality and improve the community and surroundings.

- Compared to manual charging mode, self-service electronic payment can save 10 minutes per car owner, speed up the flow of cars in and out of the field, improve the efficiency of parking spaces with carbon dioxide sensors, always monitor the air quality in the parking lot and charge the cars electricity and this feature is not available in any other center.**Error! Reference source not found.**)
- There are also light sensors to adjust the quality of lighting and coordinate between

(Figure 16) An application for paying bills, electric car charging, and lighting efficiency inside the parking lot [16]

natural and artificial lighting to create a vacuum that achieves the greatest comfort for users.

- Multiple elliptical hollow "courtyards" allow natural light to fall directly on each floor, making natural light reach hard-to-reach places so that the general lighting of the mall is natural and comfortable during the day.**Error! Reference source not found.**)

(Figure 17) It shows the different courtyards in the center and their connection across the floors to achieve the greatest amount of natural lighting [19]

- Use glass to connect the inner space with the outer space and make the internal environment more open to the outside.**Error! Reference source not found.**)

(Figure 18) Transparency and communication inside and outside [16]

- LED industrial lighting is used and is dim to be soft and elegant at night.

	The diversity of industrial light sources and their consistency with each other to create a combination of sophistication within the center.**Error! Reference source not found.**)  (Figure 19) Natural lighting harmonizes with artificial lighting [16]
6. Water Efficiency	➢ Bathrooms have high quality and highly efficient sanitary equipment. ➢ Devices in restrooms operate with sensors, hand dryers use air to provide water, and urinals without water. **Error! Reference source not found.**)  (Figure 20) Efficiency of the quality of materials used in toilets[19] ➢ The water treatment system saves the use of recycled water as rinsing water and garden irrigation, the center saves more than 140 million liters of water equivalent to the consumption of 56 swimming pools. Storage capacity of rain collection is up to 100,000 liters, and this rainwater can be used for cooling towers, and it is also used as toilet water.

Through the analysis of the previous building, it achieves the most comprehensive performance of sustainability, which is included in the evaluation systems, and this confirms the importance of realizing sustainable evaluation systems, so the achievement of the determinants in an integrated manner ensures the achievement of sustainable commercial buildings and this is the main objective of the research.

5. research results

An indicative list has been reached for a sustainable commercial building. The purpose of this list is to achieve sustainability to enhance sustainability in commercial buildings. The list is divided into six elements to achieve sustainability (sustainable site - energy efficiency - water efficiency - materials and resources - indoor environmental quality - design and creativity).

Strategies to achieve sustainability in commercial buildings	
Sustainability Criteria	
1. Sustainable site	
The objectives of this category are: ➢ **Site Selection:** To encourage development in desert areas, redevelop informal areas in projects and avoid areas that negatively affect archaeological, historical, and protected areas.	**Items required:** ➢ Site selection. ➢ Alternative transportation and use of public transportation. ➢ Rainwater management.

➢ **Accessibility:** To reduce pollution and traffic congestion from the use of cars and to conserve non-renewable energy by encouraging public and alternative transport. ➢ **Environmental balance:** to reduce the environmental impact of the project on the site and surrounding areas| By them, protect existing natural systems, such as animals and plants including pathways for wildlife, seasonal uses, soil, groundwater, and hydrology from damage and promote biodiversity**.**	➢ Project design and exploitation of the project land.
2. Quality of the internal environment	
The objectives of this category are: ➢ Provide a building and its systems that support the well-being and comfort of users by providing adequate ventilation and outdoor air quality indoor air quality. ➢ To eliminate the exposure of the occupants of the building to the harmful effects of smoke and the risk of bacteria and other pathogens. ➢ To encourage the use of low-emission adhesives, sealants, paints, paints, floors, ceiling, and systems to mitigate the health risks associated with formaldehyde in the construction of products ➢ To enhance the thermal, visual, and acoustic comfort of passengers (including providing comfort individual controls, where appropriate to improve the well-being, energy production efficiency, and flexibility of the future**.**	**Items required:** ➢ Monitoring and control of air conditioning systems. ➢ Carbon dioxide monitoring. ➢ The extent of achieving natural lighting and ventilation. ➢ The quality of industrial lighting. ➢ Attention to internal coordination. ➢ The environmental quality and sustainability of furniture and paints.
3. Materials and Resources	
The objectives of this category are: ➢ Material Selection: Encourage the selection of materials with low environmental impact and costs over the entire life cycle of the building. ➢ Regional and local materials (to reduce the environmental impacts caused by transport). ➢ Renewable materials. ➢ Recycled materials. ➢ High efficiency materials (to reduce the need for construction maintenance energy, or skill. ➢ Or can be easily disassembled for reuse). ➢ Reuse of materials: To promote the reuse of previously used materials and avoid waste. **Note:** The determination of environmental impact and the cost of the life cycle of materials can be based on the publication of international guidelines until the production of the national or regional guideline material set.	**Items required:** ➢ Selection of high-efficiency materials. ➢ Choose materials with high resistance to erosion and less maintenance. ➢ Waste management in the stages of construction, demolition, and renovation. ➢ Storage and collection of recycled materials ➢ Use materials from the surrounding environment. ➢ Use of recyclable and reusable materials.
4 – Energy efficiency	
The objectives of this category are: ➢ Reduce energy consumption and carbon emissions by integrating passive design strategies.	**Items required:** ➢ Rationalization of energy consumption.

➢ Optimize the selection of electrical and mechanical equipment, evaluate the stock of energy and carbon for each growing MEP system, and reduce its impact on the environment. ➢ Reduce energy demand to meet peak load needs use by building efficiency, design services and location, where possible, on renewable energy generation. ➢ Encourage the provision of measurement facilities that allow recorded energy performance in buildings and monitored to allow future improvement and proof of validity. ➢ Reduce energy consumed by commonly used building devices. ➢ Use of clean and renewable energy sources.	➢ Use of new and renewable energy. ➢ Monitor building systems. ➢ Adaptation of the design of air conditioning to the functional need, technically and economically. ➢ Considering the division of the cooling and heating load. ➢ Consider the climatic conditions.
5 - Water Efficiency	
The objectives of this category are: ➢ Help professionals across the country to improve the quality of our buildings and their impact on the environment. ➢ Develop and implement a comprehensive water strategy. ➢ To reduce the use of safe drinking water by encouraging the use or reuse of greywater and avoiding the use of clean potable water, where possible. ➢ Irrigation water efficiency. ➢ Reduce wastewater generation.	**Items required:** ➢ Use the lowest rate of water consumption. ➢ Quality of fixtures and sanitary works in the building. ➢ Quality of sanitary works for rain drainage works. ➢ Reuse of gray water. ➢ Water treatment rates.
6. Innovation and Design	
The objectives of this category are: ➢ Cultural Heritage: Designs that reflect excellence in national and regional cultural heritage, while contributing to the environmental performance of the building.	**Items required:** ➢ Creativity in design. ➢ Application of patents in design and implementation. ➢ Innovation and renewal. ➢ Adopt successful project management methods
Access to (TRIPLE ZERO) 1- ZERO ENERGY 2- ZERO CARBON 3- ZERO WASTE	

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(Note): AR➔ it is the meaning Arabic reference

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