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Exploring the importance of sustainability in the construction industry

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Abstract. This article focuses on sustainable development in the construction industry and analyses the environmental, economic and social impacts of sustainable construction. The environmental aspects mainly include energy consumption and new energy use, garbage recycling. Sustainable construction also has a mitigating effect on some problems in urban development, such as the heat island effect. In terms of economy, sustainable construction can improve the economic efficiency of the construction industry and drive the comprehensive development of all aspects of the construction industry. On the social side, sustainable architecture reduces the pressure on the city and contributes to the long-term stability of society. Through multi-faceted assessments and analysis from different perspectives, the importance of sustainability for the current and future construction industry is illustrated. Nowadays, high energy consumption and high pollution in the building industry are harmful to humans. In order to change the status quo and meet the requirements of development, it is necessary to integrate the concept of sustainable construction into the design, construction, and energy consumption of construction in the future. The article also makes recommendations on how sustainable buildings can be well-known or recognized in the future and contribute to the sustainability of the future construction industry.

Keywords: sustainable construction, low carbon, environmental protection, sustainable innovation.

1. Introduction

As the hometown of mankind, the earth suffers some consequences of various human activities. With the progress of the industrial revolution, the production efficiency and scientific and technological level of human beings have been continuously improved. However, this comes with massive resource consumption and pollutant emissions. The Earth's ability to purify itself has fallen short of the rate at which humans are destroying the Earth's environment. Therefore, human beings need to plan for the future how to ensure that they can live on the earth as long as possible. Achieving sustainability is one of the most important ways to secure the future of humankind.

For humans, sustainable development is a necessary condition for maintaining long-term human reproduction, and at the same time, it is also to ensure that the earth's ecology and resources can be recycled for a long time. In 1987, the point is raised in a book named Our Common Future. Its main content is to meet the current human production and living needs without affecting the ability of future generations to meet the needs [1]. Sustainable development has three pillars which are environment,

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economic aspect and social aspects. The specific impacts of these three aspects should be carefully considered in any industry in its journey towards sustainable development [2]. Sustainability presumes that resources are finite, Human overuse of resources will have a negative impact on the future. Humanity must not only focus on the long-term priorities and consequences of how resources are used, but also consume gently and systematically to maintain sustainability. For nature systems, sustainability is that the study of how natural systems function. Although nature has the power to repair itself, natural resources and the environmental carrying capacity of an ecosystem are limited. Therefore, the key to natural sustainability is to achieve development while ensuring biodiversity and ecological balance. It is a long process for economic and social development. In order to make this process more stable and sustainable, it is important to incorporate the concept of sustainability.

In recent years, with various environmental and energy problems causing great trouble to mankind, the concept of sustainability is increasingly being valued by architects and civil engineers. Introduce this development concept into civil engineering and building construction. The introduction of this development concept into civil engineering and architectural construction is valued by architects. Sustainable construction is an environmentally friendly building. It is an innovation that creates a healthy, eco-friendly living experience based on ecological principles. The Environmental Protection Agency detailed definition of sustainable architecture. Throughout the life cycle of the building, environmentally responsible, pollutant emission reduction and resource conservation practices are used to complete each phase of the project. It includes siting, design, construction, operation and maintenance of buildings, even demolition of buildings [3]. The goal of sustainable construction is to reduce the environmental impact of the construction industry through the use of environmentally friendly building materials, efficient energy consumption patterns and green construction technologies [4]. Six sustainability principles are clarified. They are saving building materials, reusing intact materials, use of recyclable and renewable materials, protecting nature, the use of new materials is guaranteed to be non-toxic and harmless, the use of new materials is guaranteed to be non-toxic and harmless, Improving quality of life [4]. Sustainable construction has become a very new and important part of civil engineering. Therefore, in the context of the increasing emphasis on sustainable development, sustainable construction will become one of the most important directions for the future development of the construction industry and will be valued by the world.

By analysing the positive impact of the widespread use of sustainable construction on all aspects of development, it is clearer that the concept of sustainability is important for the future development of the construction industry. This has a guiding significance for determining the development direction of future civil engineering.

2. Case description

Sustainable design concepts are widely used in the design and construction of modern buildings. One of the most well-known sustainable design concepts is “vertical forests”. Vertical forests have long been seen as models for sustainable architecture and a prototype building for new forms of architectural biodiversity. The unique design concept of the vertical forest is concerned with human needs and the relationship between humans and other living species [5].

For cities, space is a valuable commodity and therefore city builders prefer to use urban land to create economic value. In this case, the planning of the natural environment of the city will be drastically reduced [6]. Vertical forests try to return the ecological environment to the city and solve some environmental problems in urban development. The concept of a vertical forest was first proposed by Designer Stefano Boeri. The main purpose of vertical forests is to leave suitable space for vegetation to grow in the architecture of the city, and it enables residents to communicate with nature.

Nowadays, the architecture of vertical forests is gradually becoming known, and more and more vertical forest-type buildings are widely used in cities around the world. The first example of a vertical forest in the world was the two residential towers in Milan. The two buildings not only provide a living environment for people, but also for more than nine hundred trees and other plants. Because a large number of plants help produce humidity, absorb carbon dioxide and produce oxygen, and even absorb

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dust. Therefore, the project will have a positive effect on the city's air quality and natural environment [7]. Similar buildings have become a way to pursue green environmental protection and sustainable development and are gradually being valued by governments.

In the future, as the urban population continues to increase, the ecosystem of cities will be under great pressure and the interaction between humans and nature will become less and less. In this case, it can be predicted that the construction of buildings similar to vertical forests is a solution to the problem. With the increasing number of vertical forests, a more sustainable and environmentally friendly city, the forest city, will definitely emerge in the future urban development. In China's Guangxi Province, Stefano Boeri Architetti designed and planned to build a new top-down plant-covered environmentally friendly and efficient city named Liuzhou Forest City. It meets all the needs of citizens for the city and makes the city a part of nature. More importantly, the city can achieve energy self-sufficiency (such as renewable energy, water and heat recycling systems) [8]. Liuzhou Forest City will definitely become an important attempt and reference for the development of sustainable architecture in the future.

3. The importance of sustainability in construction

With the continuous expansion of cities, the impact of many developing problems on human production and life will become more and more obvious. In order to solve a series of problems in development and prevent some irreversible damage in the construction process, sustainable construction methods are proposed.

The study found that the construction industry is considered to be the industry with the world's largest energy consumption and greenhouse gas emissions. According to statistics, buildings consumed 36% of the total energy in 2018. Also, it accounts for 39% of energy and process-related CO_2 emissions [9].

In this context, sustainable construction is important in order to complete the requirements of low carbon and sustainable development. The importance of sustainability in building construction is reflected in three main aspects, which are environmental and energy consumption, economic, and social.

3.1. In terms of the environment and energy consumption

The biggest impact of traditional construction is on the environment. Problems such as environmental damage, emissions of greenhouse gases and harmful substances, and serious depletion of non-renewable resources which caused by construction increase the burden on the earth. Therefore, in order to alleviate the environmental and energy crisis, the application of a new construction method continues to be widely used, which is sustainable construction. Sustainable construction is not only about using more environmentally friendly or green materials. It also includes the vegetation around the building, the construction of facilities, energy consumption after use, and building maintenance considerations.

The importance of sustainable construction for the environment and energy is reflected in many ways. The first is using some building materials that are environmentally friendly and with have a smaller carbon footprint or use recyclable materials. This can reduce the pollution of construction waste to the environment, reduce carbon emissions and the use of natural resources [10]. In other ways, the energy consumption of water, electricity and other energy caused during the period when the building is in use is enormous. Sustainable buildings consider how to achieve energy self-sufficiency, such as solar and wind energy, and water circulation systems. It greatly reduces the use of traditional energy, and the introduction of new energy can make buildings greener and more sustainable. The third point is that sustainable construction pays more attention to the introduction of complete ecosystems in urban construction, and the city is closer to nature. The most common measure is the construction of a large amount of vegetation. More greenery can absorb carbon dioxide and dust and produce oxygen. Vegetation has other roles in sustainable construction. Citizens can get a healthier living environment in a city with large areas of greenery. Nowadays, due to a series of human activities such as heat emission from artificial heat sources and urban greening occupied by buildings, more and more large cities in the world are facing a serious heat island effect crisis. Compared to these cities, Singapore's construction is an example of how to solve problems. Singapore which is known as the “Garden City” has about three million trees which can alleviate urban problems like the heat island effect [11]. Government of

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Singapore has set an example of urban environmental sustainability through using greenery to balance the impact of human activities on the environment. In summary, sustainable construction plays a crucial role in alleviating today's switching and energy consumption problems.

3.2. In terms of economy

Although the use of new building materials to achieve sustainable construction can incur higher costs. Longer-term thinking can prove that sustainable construction yields higher economic value. It includes reducing capital investment in environmental governance and energy production, potentially reducing users' utility bills and others [10].

The data studies show that sustainable buildings increase their value by 7% compared to some traditional buildings [10]. Sustainable construction technology's continuous development and gradual maturity can drive economic development. First of all, sustainable construction can lead to the development of many related industries, including the development of new building materials, new architectural design thinking or the experimentation of new construction methods. They will all bring higher economic benefits to the construction industry. Secondly, Sustainable buildings can save money by reducing the building's carbon emissions, processing inputs and operating costs. This is good news for users [12]. Sustainable construction can be found to have positive economic implications, so its importance should be recognized.

3.3. In terms of society

The importance of sustainable construction in society is mainly reflected in the service of residents. Sustainable construction means more consideration in design and the use of materials. A good design can make the occupants have a more comfortable and natural living experience. Materials used in sustainable construction tend to be more environmentally friendly and harmless, and occupants are protected from harmful substances such as formaldehyde. In short, sustainable architecture can make occupants healthier and happier in better working environment and less noise will become its advantages. Wo if their workplace is a sustainable building less noise will become its advantages. Working in such an environment can greatly improve the productivity of employees. Therefore, the universal use of sustainable buildings is conducive to increasing social productivity [10]. Sustainable architecture is a sustainable and green city that provides a healthy living environment for human beings. Such a living environment helps people be healthier and can reduce government investment in health care. This reduces the pressure caused by residents on the city and is conducive to maintaining long-term social stability.

4. The impact of sustainable concepts on the development of future building design and construction

As countries around the world pay attention to how to solve the problem of damage caused by human activities to the earth, the future direction of the construction industry will be very different from the past. The traditional construction aimed at solving the problems of human production and life has gradually been eliminated. Civil engineering is gradually beginning to consider issues such as energy saving, green and low emissions. Therefore, sustainability will become one of the most important directions on the development path of the construction industry in the future. All parts of the building will continue to strive for sustainability.

4.1. Architectural design

Because the designer's ultimate goal is to make the world a sustainable circular whole, not a single building. Therefore, in the design process, designers should consider more other aspects when designing the building itself. It includes considerations such as the relationship to surrounding buildings, the impact on the local natural environment, and how to achieve low carbon sustainability during construction and use.

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The impact on the design around the design target is that the buildings of the future will not have traffic, foot traffic, and where in the city will be the main considerations. More important design consideration is whether the completion of the building will cause damage to the original ecological environment of the area, or whether it will negatively affect the normal operation of other surrounding buildings. Some designers will even reduce the footprint of the building to create a small ecological system around the building. For the interior design of a building, the concept of sustainability will make the design focus on health and comfort. In order to achieve this goal, lighting, ventilation, air quality optimization and other aspects need to be considered [13].

4.2. Use of materials and energy

Sustainable building materials are becoming increasingly important as humanity moves towards a greener future. The heavy use of building materials is considered to be one of the largest segments of energy consumption and carbon emissions in the construction industry. In the future, to achieve the sustainable development goals, traditional reinforced concrete, steel and other materials will not appear in the future building. The sustainable impact on building materials is that the selection of more, non-toxic and healthy materials will be prioritized. Or engineers will prefer to use materials that are easy to recycle and reuse. The common characteristics of these materials are environmental protection and renewability.

In the future, the energy used by buildings will also change greatly. The sustainable change affects the proportion of traditional energy use, especially non-renewable energy use. The wide application of traditional energy sources such as oil, natural gas, and thermal power generation makes the future of mankind full of crisis and uncertainty. Therefore, in the future, the energy used in sustainable buildings must be low-carbon, zero-pollution and renewable. Energy consumption should also be controlled in sustainable buildings to avoid overuse and waste of energy. The ideal model for future sustainable buildings in terms of energy consumption is to achieve recycling and self-sufficiency. Examples include the use of water and thermal energy circulation systems, the use of solar or wind energy to generate electricity and so on.

4.3. Building construction stage

In order to achieve a sustainable building, consideration should be taken from the design stage of the building to its final demolition. Therefore, in the future, the concept of sustainability will also influence the construction phase of the building. A large number of studies have shown that the traditional construction mode will produce a large amount of construction waste and dust that pollutes the environment and causes harm to the surrounding environment and the normal life of residents. Sustainable and green construction concepts will influence the construction team's construction methods, including focusing on environmental preservation at the construction site, the use of a range of smart construction technologies, and the exploration of new construction models.

5. Suggestion of sustainable construction

5.1. Ways to develop sustainable construction in the future.

Until now, it has been difficult to build the ideal sustainable building. Therefore, there is still a lot of rooms for sustainable construction. The importance of sustainability to construction determines the necessity of building sustainable buildings, and some methods are needed to achieve this requirement.

The first step is to enhance architects' design concepts. So that they can better understand the importance of sustainability and integrate this concept into their own design work.

Designers or engineers can also use augmented reality for building design and construction options. The use of augmented reality technology brings a more immersive experience to engineering design and construction. With AR, designers can see a 3D model of the design work. Electronic models allow for better visualization of the final product, providing designers with more accurate feedback on how their plans will look in real-life scenarios. Second, building materials need to be innovative. Innovation is not

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limited to building materials such as cement or steel. It also includes intelligent building materials or the continuous optimization of the entire system for the production of building materials.

The example is that the construction industry is moving closer to using smart materials and technologies to create a sustainable and efficient whole. Smart materials such as shape-memory alloys, superhydrophobic coatings self-healing concrete are more widely used, addressing the shortcomings of traditional building materials. Smart technologies such as automated production systems, 3D printing technology and artificial intelligence applications are also expected to revolutionize the production of building materials. This change increases productivity while reducing labour and scrap costs.

The progressive methods in construction technology are mainly the combination of architecture and intelligence. One practice is the use of intelligent construction systems. Smart building technology utilizes advanced data collection tools such as sensors or drones to collect real-time information about a given project site. Engineers can then use this data to make reasonable arrangements and division of labour throughout the project cycle. At the same time, the system can also be used to monitor the air quality and noise of the construction site. The purpose is to facilitate engineers to take some measures to reduce the local hazards of construction.

5.2. Ways to promote sustainable building development and popularization in the future.

Sustainable buildings are important for the future of urban development. But not many sustainable buildings are being built because of expensive design costs and costs, low area efficiency or other reasons. In order to make sustainable construction universal and progressively a sustainable urban agglomeration, some efforts are needed. First of all, the state and the government should strengthen the promotion of green and low-carbon and the introduction of sustainable buildings. Citizens should understand that sustainable buildings make more sense in the long run, both in terms of economic value and future development. Second, investment in relevant education should be strengthened to provide technical personnel for sustainable construction. This can drive continuous progress and innovation in the construction industry.

6. Conclusion

Research and analysis have shown that if the construction of buildings can achieve sustainable results, then it will benefit environmental purification and protection, economic development, and social progress. Therefore, in the future development of the construction industry, factors such as green, healthy and recyclable will be considered. These considerations will directly affect architectural design and urban planning. And the construction method, energy use, and selection of building materials must be based on whether it contributes to the sustainable development of construction. In short, the government will pay more and more attention to low-carbon and pollution-free development in the future. The proposition of sustainability and environmental friendliness will gradually become the main development direction of the construction industry and civil engineering in the future. In order to better achieve sustainable building development, specific measures need to be taken in each part of the industry. Architects or design firms need to start thinking about how to be sustainable in the construction of buildings at the design stage of a project. For example, the design of energy recycling systems and the use of renewable resources in the operation phase of buildings, as well as the consideration of adding more green areas. For governments, they should develop policies to encourage the development of sustainable buildings and minimize the construction and development of energy-intensive industries and the use of highly polluting materials.

The future development of the construction industry will definitely move in the direction of sustainability. After a long period of development, the concept of sustainable construction will be more mature, and the sustainable construction technology will be more advanced. Finally, sustainable cities will be built, and low-carbon and environmentally friendly living will become the daily life of more residents. Humanity will eventually live in a healthy, harmonious, happy and sustainable world.

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