# Analysis on Green Building and Sustainable Development of Urban Economy

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**Abstract.** Worldwide, with the acceleration of urbanization and the increasing pressure on resources and environment, the waste of resources and the destruction of environment caused by the traditional building mode have become an important problem faced by urban development. Therefore, as a resource-saving and environment-friendly new building form, green building has been highly concerned by the government, enterprises and all sectors of society. Green building, with its environmental protection, resource saving and energy efficient characteristics, has a positive impact on the sustainable growth of urban economy. This paper will discuss the close relationship between green building and urban economy, and analyze the mechanism of their mutual promotion. The advantages of green buildings in reducing energy consumption, reducing carbon emissions and improving indoor air quality not only help to improve the quality of life of residents, but also minimize the impact on the ecological environment. This paper aims to discuss the relationship between green building and sustainable development of urban economy and its significance to urban development by analyzing the way and ability of green building to save energy and resources.

**Keywords:** Green building; sustainable development; urban economy.

## 1. Introduction

Green building is an important development direction in the global construction industry, which aims to achieve efficient use of resources, reduce environmental impact and improve the quality of living and working environments. With the enhancement of people's awareness of sustainable development and environmental protection, green buildings have achieved remarkable results in economic, social and environmental aspects [1].

Green buildings can be described in a variety of ways, but its fundamental meaning is to depict the harmonious coexistence of people, structures, and the environment. To be considered green, a building must conserve energy and resources during both its construction and use as well as minimise environmental contamination. People should control and minimise the excessive use and destruction of the natural environment as much as possible while using natural conditions and technological means to create a good and healthy living environment. They should also maintain the dynamic equilibrium between the ecological environment and human demands and returns from nature [2].

In modern society, construction activities are one of the activities that have the greatest impact on the natural ecological environment, using 40% of the natural resources used by human beings, 40% of the total energy, and the waste created also accounts for 40% of the total [3]. As a result, the creation of green buildings will be crucial to attaining sustainable growth. Sustainable development of the building economy is to make buildings follow the concept of green economy and realize efficient utilization and sustainable development of building resources in the two dimensions of time and space. The time dimension requires that the building should not sacrifice the future interests and resources, and the space dimension requires that the building economy of a place should not be developed at the expense of the interests of other regions. In addition, it is also necessary to optimize the allocation of resources in the building to maximize the output per unit of resources [4]. In order to balance environmental improvement and economic development, green building economy has emerged. This economic model has greatly promoted the sustainable development of the construction industry [5]. The development of green buildings is of great significance to the sustainable development of urban economy, rational utilization of resources and ecological balance.

In this paper, the financial advantages of green construction are examined and assessed. By gaining a deeper understanding of the economic potential of green buildings, it can make more informed decisions for a sustainable construction industry and drive broader green building practices.

## 2. Definition of Green Building

A building is considered to be "green" if it maximizes resource conservation (energy, land, water, and material savings), protects the environment and reduces pollution, offers occupants a healthy, useful, and efficient use of space, and coexists peacefully with the natural world throughout the building's entire life cycle. According to Agenda 21, sustainable development should take into account the environment, society, and the economy. Low-energy and zero-energy buildings can therefore be seen as belonging to the initial stage of the development of sustainable buildings when taken together with the definition of sustainable building. The second level includes ecologically friendly and energy-efficient structures. The third stage of the development of sustainable buildings is where green and ecological buildings belong. The terms "green building" and "ecological building" are not interchangeable. The former is primarily concerned with environmental elements produced by the building and is intimately tied to the residents' health and living conditions. This last one emphasizes ecological harmony and ecosystem, and it primarily takes ecological considerations in design into account [6].

## 3. Economic Benefits of Green Buildings

### 3.1. Energy Efficiency

The accelerated pace of urbanization in China has effectively driven the rapid development of urban construction industry, and has also intensified the use and consumption of building raw materials and various energy sources. From the perspective of harmonious development of human society and ecological environment, the concept of green energy saving and ecological environmental protection should be clearly reflected in the design scheme of construction projects [7-8]. Design units and designers should uphold a high degree of professional ethics, enhance professional ability, optimize the electrical green energy saving design scheme of building projects, on the one hand to ensure the safety and comfort of the building living environment, and provide convenient conditions for residents to use. On the other hand, the energy-saving efficiency of engineering design should be improved to reduce the improper loss of electrical resources [9]. In China's national energy consumption, building energy consumption accounts for nearly 50 percent. Building energy conservation has been given a lot of attention recently in response to the problem of a global energy shortage. As a crucial component of national energy conservation efforts, building energy conservation is one of the key ways to advance environmental protection, lower greenhouse gas emissions, and improve building energy conservation.

Masdar City, one of the most ambitious sustainability projects in the world in 2010, is an example of energy-efficient design and technology. It aspires to be among the world's greenest cities, as shown in Fig. 1 [10].



**Fig. 1.** Masdar city [6].

Life cycle analyses were performed on all major component materials, machinery, and systems required to create or run Masdar City in order to reduce the carbon footprint of both its operation and maintenance. By doing this, it is ensured that the city was constructed using the most environmentally friendly materials possible and that the technology, apparatus, and systems utilised to run the city are also as environmentally friendly as possible. Energy-efficient buildings will go a long way towards assisting the city reach energy savings of 70% when compared to cities of comparable size in the region, as buildings account for a significant amount of the city's carbon footprint. In comparison to the UAE average, the water-saving requirements will lower drinking water use by 70%.

### 3.2. Water resources management and conservation

Water is one of the most important human needs, and many countries face many problems in terms of water and energy supply. Some current methods of using water resources increase greenhouse gas emissions. In view of the high water consumption and energy consumption of buildings, as well as the high energy consumption, water loss and CO2 emission of centralized water treatment, it is necessary to propose a combined system that considers the optimization of water and energy utilization and the reduction of greenhouse gas emissions [11]. Considering the economic benefits of green buildings in urban development, while paying attention to water consumption, energy consumption and emission reduction, it is also necessary to pay attention to the construction cost and maintenance cost of buildings should not be too high.

#### 3.2.1. Water-saving Devices

Water-saving appliances are an important part of building water supply and drainage system, and their water-saving performance directly affects the effect of building water-saving [12]. The use of water-saving devices can greatly reduce the consumption and waste of water resources in urban buildings. The waste caused by the water supply network is also a large proportion of urban water resources waste, which is mainly caused by three aspects:

First, the material and quality of the pipes and fittings are not up to standard, resulting in leakage of the pipe network.

Second, the pipes of the local hot water supply system are too long, resulting in the cold water left in a part of the pipe must be abandoned before obtaining the needed hot water, resulting in water waste.

Third, the water waste caused by the phenomenon of overpressure flow of the pipe network.

To solve the above problems, qualified products should be selected and the construction quality also should be ensured during the construction process. In addition to considering the indoor layout and function, the pipeline length should be reduced as far as possible in residential buildings, and the most important thing is to effectively control the indoor overpressure discharge [12].

### 3.2.2. Rainwater collection

Rainwater recycling is an important part of water conservation in green buildings. In urban areas where population density is concentrated, rainwater recycling is more meaningful for water resource management. Take Suzhou Industrial Park as an example, and its process is shown in Fig. 2. First, rainwater falls on the roof and is piped into a regulating sedimentation tank. Then, precipitation is carried out under the action of flocculant. After the precipitation, the water is sterilized in the clear pool. The sterilized water can be used for air conditioning replenishment, greening and garage cleaning.

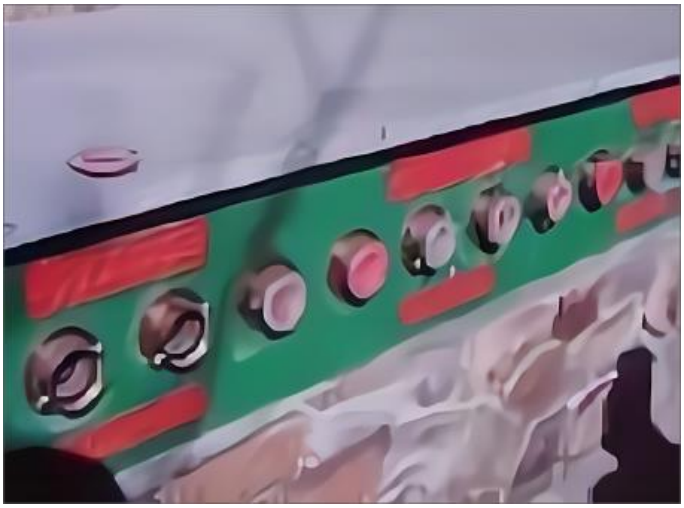


**Fig. 2.** Water pressure control box in Korea [12].

Urban water resource scarcity and the degradation of the natural environment have emerged as significant barriers to the growth of contemporary cities. Utilising rainwater resources to the fullest extent will substantially ease the stress on water resources and lower the strain of water demand in urban areas. Urban rainwater utilisation aims to maximise the use of rainwater resources by regulating surface runoff and infiltration, which will allow the hydrological cycle to progress in a way that is beneficial to urban life and conserve limited water supplies. Urban rainwater utilisation is also a crucial technical safeguard measure to safeguard the environment, prevent and control water pollution, and create a harmonious society. Utilising rainwater will have significant positive social, environmental, and economic effects [13].

The 21st century has seen a rise in concern over water resources. Water is a resource that has its own inherent qualities. It is not only unique and irreplaceable, but also reusable and regenerative. Not only does the development of industry and agriculture depend on water resources, but water resources are also essential to urban development. The sustainable growth of the urban economy greatly depends on the circulation of water resources.

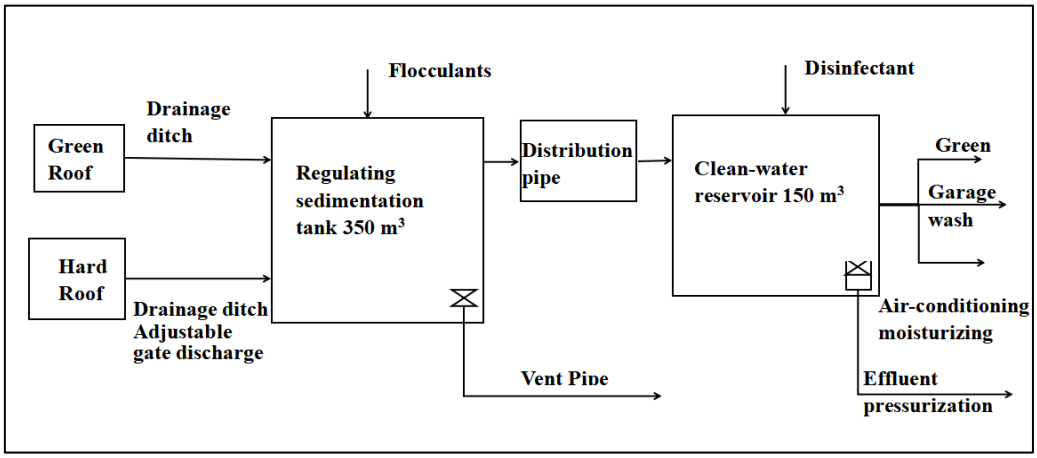



**Fig. 3.** Rainwater recycling process [13].

## 4. Materials and Resource Efficiency

With the construction, renovation, demolition and reconstruction of buildings, the amount of concrete materials is huge, which not only causes a large amount of resources and energy consumption, but also causes environmental pollution, which directly affects human production and life and sustainable development. Recycled concrete is a green building material that not only solves the issue of disposing of waste concrete at the source but also conserves natural aggregate resources, reduces the supply and demand imbalance, greatly satisfies the criteria for sustainable development, and has substantial social, economic, and environmental advantages [14]. Recycled concrete can address the issue of waste concrete treatment at its source, conserve resources, and satisfy societal demands for sustainable development from the standpoint of long-term development.

The new wall material refers to the wall material which is characterized by energy saving, waste benefit, soil saving, light weight and multi-function, and generally refers to all the wall materials outside the clay solid red brick. It mainly uses silicate materials such as concrete, cement and sand, and some are mixed with industrial or construction wastes such as fly ash, coal gangue and slag, and are made of non-clay bricks, building blocks and building boards by pressing, sintering and steam [15]. Compared with traditional wall materials, the characteristics of new wall materials are reflected in the following aspects:

### 4.1. Saving resources

Instead of a considerable amount of industrial waste produced throughout the course of industrial production, new wall materials typically do not use any or just a tiny amount of natural raw materials, particularly non-renewable resources. A significant portion of the varieties of new wall materials are green building materials, with light weight, heat insulation, sound insulation, heat preservation, and other qualities. They can also effectively reduce environmental pollution, save a lot of money on production, increase the use of housing space, and provide a number of other benefits. Even some materials are able to guard against fire. Utilising natural heat and light as much as possible can conserve fossil fuels, lessen pollution, and cut waste emissions. Some of these materials have already entered the application stage.

### 4.2. Adopting clean production technologies

The new wall materials save energy as much as possible in the production process, including coal, electricity, natural gas, oil and so on. At the same time in the production process will be as much as possible to control the harmful waste residue, waste gas, waste water and so on discharge. That is, no new pollutants are produced while using waste residue. In addition, the product efficiency of new wall materials is also better than that of traditional wall materials. Generally, it has the advantages of high quality, strong versatility, long service life, good construction, low labor intensity, mature construction technology, complete construction equipment, good construction quality, etc., which can effectively reduce the energy consumption of building construction process and later building use.

## 5. Conclusions

This paper mainly analyzes the relationship between green building and sustainable urban economic growth. The meaning and characteristics of green buildings are expounded, and the significance of green buildings to the sustainable growth of urban economy is discussed. In urban development, sustainable development and rapid economic development are often opposite, however, good green buildings can solve this contradiction. Because in the long run, the benefits of green building far outweigh the costs. According to the analysis of energy, water resources and materials, the development of green buildings is not only a necessary part of the sustainable development of urban economy, but also a good green building can greatly promote the sustainable development of urban economy. Although green buildings require a higher initial investment than traditional buildings, the advantages they offer far outweigh this in both environmental and economic terms. In

summary, through in-depth research, this paper explores the potential of green buildings and sustainable development of urban economy, and provides new perspectives and suggestions for promoting sustainable development of urban economy.

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