

A Study on the Spatial Design Strategies of Human Settlements in the Context of Circular Economy and Future Landscape Regeneration

Wang Yuxin Zhang Pingping (Corresponding Author) Li Shijiao Liu Xu

School of Art and Design, Heilongjiang Institute of Technology

ABSTRACT

With the rapid development of urbanization, the problem of spatial environment is becoming increasingly severe, and the sustainable development of human settlements has become the focus of global attention. In the future, the construction of human settlements should not only take into account ecological balance, sustainable development and green ecological development, but also take into account social, cultural and economic development. Nowadays, as a new design concept, circular economy and landscape regenerative space have received extensive attention and practice around the world. Based on the theoretical framework of circular economy and future landscape regeneration, this study deeply studies the life cycle of materials and renewable and recyclable materials, and builds a circular community. The purpose of this paper is to deeply discuss the influence of "circular economy" and "future landscape regeneration" on the spatial design of future human settlements and the construction of development strategies, so as to meet the diverse living needs of urban residents while maintaining the natural ecological balance and efficiently utilizing resources.

Keywords: circular economy; future landscape regeneration; human settlements; sustainable development;

Introduction:

In the context of global resource shortage and increasingly severe environmental problems, population growth, accelerated urbanization and climate diversity are intertwined, which makes the spatial design of human settlements face unprecedented challenges. The Ministry of Housing and Urban-Rural Development issued the "Guiding Opinions on Carrying out Co-creation Activities for a Better Environment and a Happy Life in the Construction and Improvement of Urban and Rural Human Settlements", which proposes to take urban and rural communities as the basic spatial units, improve community infrastructure and public service facilities, and create a livable community space environment. The guidance also emphasizes the dominant position of the masses, and promotes the construction and improvement of human settlements by the government

and the participation of multiple parties in society through decision-making conspiracy, development and co-management, construction co-management, effect co-evaluation, and achievement sharing. And under the transformation of a variety of economic elements, the traditional linear economic development model has been unsustainable, and the concept of circular economy has come into being. In the design of human settlements, the efficient utilization and recycling of resources are emphasized to achieve the coordinated development of economy and resources, society and environment, and to provide new ideas for resources to take the road of sustainable development.

1. Overview of Research on Human Settlements Space

(1) Research background

In recent years, the overall human settlements space in Chinese cities has shown a gradual improvement trend. The evaluation of urban human settlements space mainly focuses on natural environment, social environment, economic environment, and infrastructure. Research shows that in the context of global resource scarcity and environmental issues, the spatial design of urban human settlements in China still faces many challenges. With the continuous increase in global population and rapid economic development, global resource use has shown a continuous upward trend since 2019, and is expected to continue to increase in the coming decades. This will exacerbate resource depletion and significantly increase greenhouse gas emissions. The problem of resource shortage is not only reflected in the energy sector, but also positively correlated with agriculture, forestry, fisheries, animal husbandry, fossil fuel energy consumption, greenhouse gas emissions, etc. This also means that in countries and regions with severe resource shortages, future economic development will rely more on high energy consumption and high emissions industrial models, leading to more serious damage to the environment. And in the design of human settlements space, not only should attention be paid to infrastructure, green design, social and cultural issues, but also ecological environment, living conditions, residents' needs, and the harmonious coexistence between humans and nature should be emphasized.

In response to these issues, the State Council has issued policies such as the "Guiding Opinions of the Ministry of Housing and Urban Rural Development on Carrying out Co-creation Activities for a Better Environment and a Happy Life in the Construction and Improvement of Urban and Rural Human Settlements", the "14th Five Year Plan for the Development of Circular Economy", and the "Opinions on Promoting Green Development of Urban and Rural Construction" in the design of human settlements space, aiming to promote the sustainable development of human settlements, alleviate and solve current resource and environmental problems, and provide theoretical and practical support for achieving sustainable development.

(2) Purpose and significance

The relevant policies issued by the state cover multiple aspects, from urban planning to rural construction, from ecological protection to resource utilization. The implementation of these policies not only provides clear directions and guidelines for improving the design of human settlements spaces, but also lays a solid foundation for achieving urban-rural integrated development and ecological civilization construction. Through the guidance and support of these policies, the space design of human settlements in China will be significantly improved, and the space design of human settlements will plan more comfortable, healthy and sustainable programs. This study is based on relevant national policies to explore the spatial design strategies of human human settlements for circular economy and future landscape regeneration. The concept of circular economy has become a key force in promoting the green transformation of the construction industry. The application of circular economy concept in the construction field is mainly reflected in the recycling of building materials, energy recovery and reuse, and the conservation and recycling of water resources. It also provides scientific basis and practical guidance for future landscape regeneration theory, promoting the harmonious coexistence between humans and nature^[1].

The design of human settlements space environment is a science that focuses on the study of human settlements space, including rural areas, towns, cities, etc., and emphasizes the exploration of the mutual relationship between people and the environment. It emphasizes treating human settlements as a whole, taking into account various factors such as nature, society, and culture, as well as local characteristics and urban culture, to create a comfortable, healthy, and sustainable human settlements^[2]. This study will deepen the interdisciplinary integration of human settlements science with circular economy, future landscape regeneration, and enrich the theoretical system of related disciplines. Through systematic research on the application of circular economy concept in human settlements space design and future landscape regeneration design strategies,

new perspectives and ideas are provided for subsequent academic development and related research, effectively improving resource utilization efficiency, reducing environmental pollution, enhancing human settlements quality, and promoting sustainable development of human settlements construction.

The emerging design and planning concepts of circular economy and future landscape regeneration are gradually becoming the main directions of human settlements space design. They emphasize the restoration and reconstruction of damaged or degraded landscapes, the efficient utilization and regeneration of resources, and the construction of a complete resource use chain to ensure that the system can gradually self repair, thereby achieving a sustainable development path.

2. Case Study on Circular Economy and Future Landscape Regeneration

(1) International case analysis

It is understood that there are cases of circular economy and future landscape regeneration theory being applied to the design of human settlements spaces both domestically and internationally. For example, the Hammarby Eco City project in Sweden, Hammarby Lake City, is one of the most ambitious urban development projects in Sweden since 1990. The project aims to transform the previously small industrial and storage land into a new city that can accommodate 20000 people. At the launch of this project, a specialized environmental task book was formulated with the goal of reducing the local ecological footprint to half of the average construction area in the early 1990s, and achieving high-quality development of local ecology priority, conservation and intensification, and green low-carbon through comprehensive green transformation. This project has successfully achieved the combination of circular economy and future landscape regeneration through scientific and reasonable planning and design, becoming a classic example of urban sustainable development.

Similar cases have also been found in other countries, such as the Donald West Water Park in Portland, USA, which constructed a new environment

of "artificial nature" by imitating natural features and borrowing natural elements, reconstructing wetland characteristics, and using water and wetland habitats as the main body of the new park; The Topinpuiston Circular Economy Innovation Park in Turku, Finland, houses three waste treatment companies, two biomass power plants, and a sludge treatment plant. In addition, the park also has multiple universities, chemical companies, and landscaping material factories, which mainly achieve circular economy and carbon neutrality goals through cross departmental and multi-level collaboration; Howard from the UK proposed the concept of "rural cities" in 1898, advocating for the relocation of residential spaces from densely populated urban areas to suburban areas. This concept laid a solid foundation for the development of "urban-rural integration"^[3].

(2) Domestic case analysis

There are also some cases in the design of human settlements spaces in China that integrate circular economy and future landscape regeneration theory. The most important case is the industrial site regeneration case in Yangpu Binjiang, Shanghai. This case is located in Yangpu District, Shanghai, which was once one of the important birthplaces of modern industry in China, gathering numerous factories and docks. But with the transformation of cities and the adjustment of industrial structure, these industrial facilities gradually became idle, forming a large number of industrial sites. This case involves the re planning and design of this industrial zone, transforming the former industrial zone into an urban creative industry belt. Through detailed research and planning, the scope of industrial heritage preservation and transformation has been determined, and an overall transformation plan has been formulated. The plan inherits the historical and cultural memory of industrial heritage, creating an urban public space that integrates cultural, creative, leisure, and ecological functions.

A similar case in China is Nanning Garden Expo's Quarry Garden. The site used to be a quarry with complex geological conditions, sparse vegetation, and degraded ecological functions. The design team adapted the site to make a suitable plan, transforming the disadvantages of

abandoned land into the advantages of borrowing scenery, in order to demonstrate the combination of ecological restoration and landscape art; Nanjing's Tangshan Mine Park was also designed based on abandoned mines. The design team selected landscape entrances from the fragmented natural environment for the design, allowing visitors to stroll through wetland meadows and flower streams; There is also the Hangzhou Iron and Steel Park on the Grand Canal located in Hangzhou, Zhejiang. Its predecessor was the Hangzhou Iron and Steel Plant, which was designed and transformed into an urban park with cultural, artistic, and leisure functions. While preserving industrial relics, it also fully promotes the characteristics of the site, echoing the cultural features of the Jiangnan region.

(3)Comparative analysis of cases

These relevant cases both domestically and internationally emphasize the preservation of architectural cultural heritage, pay attention to ecological restoration of the site, and improve the quality of the spatial environment by preserving the original architectural structure and site relationships, implementing measures such as vegetation planting and water system management, and endowing the space with new functions and values. There are different points in each of these cases, such as industrial culture, local culture, or digital display, which are in line with the characteristics of each space.

By analyzing domestic and foreign cases, it can be understood that cultural inheritance and innovation, ecological restoration and sustainable development of resources, multi-functional integration and public participation, as well as the application and innovation of technology should be emphasized in the design of human settlements spaces. These domestic and foreign cases have important reference value for the design of human settlements in other cities.

3.Design Strategy for Human Settlements Space

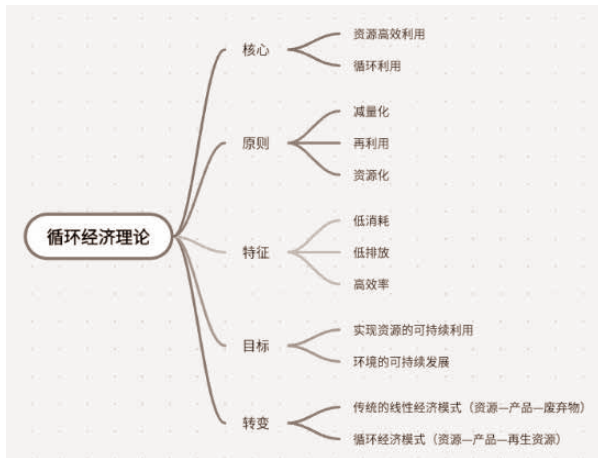
In the design of human settlements space, the integration of circular economy and future landscape

regeneration concepts also requires designers to consider various elements such as ecological prospects, economic development, and social harmony from macro regional planning to micro architectural design. Exploring a new path of sustainable development in the face of the dual challenges of global resource depletion and worsening environmental problems.

The design of human settlements space under the concept of circular economy requires us to fully consider the reduction of resources at the source and the recycling and utilization at the end of the design process, emphasizing the efficient utilization and recycling of resources, and continuously implementing the concept of sustainable development throughout the life cycle of resources. At the same time, the concept of future landscape regeneration, as an emerging design concept, is gradually becoming an important direction in the design of human settlements spaces. The focus is on emphasizing the restoration and reconstruction of damaged or degraded landscapes, as well as the protection and restoration of natural ecosystems. These two concepts not only focus on the health status of ecosystems, but also promote economic circular development and emphasize the positive role of humans in it. This plan combines these two design concepts to create a human settlements that can meet the needs of contemporary people without harming the resources of future generations, allowing them to meet their own development needs.

(1)Design strategy based on circular economy

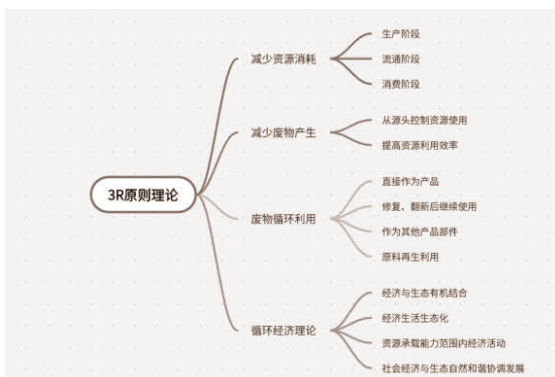
The circular economy theory is an economic growth model that focuses on efficient resource utilization and recycling, with the principles of "reduction, reuse, and resource utilization", and the basic characteristics of low consumption, low emissions, and high efficiency, are in line with the national concept of sustainable development. Its core concept is to transform the traditional linear economic model (resources-products-waste) into a circular economic model (resource-products-renewable resources), in order to achieve sustainable utilization of resources and sustainable development of the environment. (As shown in Figure 3-1)



Analysis of Circular Economy Theory 3-1 (Image source: self-made)

Its theoretical basis is ecological economics, which is based on the principle of "3R", which refers to the three aspects of reduction, reuse, and recycling[4]. It mainly refers to reducing the consumption of resources and waste generated in the process of production, circulation, and consumption, controlling the use of resources from the source, and directly using the waste generated in the process as products or continuing to use it after repair and renovation, or using it as other product components. Waste can also be recycled as raw materials. The theory of circular economy emphasizes the organic combination of economy and ecology, focuses on the ecologicalization of economic life, and requires economic activities to be carried out within the capacity of resources to achieve harmonious and coordinated development of social economy, ecology and nature. (As shown in Figure 3-2)

The concept of circular economy is integrated into



Theoretical analysis of the "3R" principle 3-2 (Image source: self-made)

the design of human settlements space. Resource conservation during construction mainly includes energy conservation, land conservation, water conservation, material conservation, etc. Energy conservation refers to effectively improving the thermal insulation performance of the external enclosure structure by controlling the window to wall ratio of the building, using energy-efficient air conditioning and heating equipment, and planning and designing the building layout and plane structure in a reasonable and scientific manner; Water conservation refers to the rational recycling and utilization of water and rainwater, the installation of water-saving sanitary appliances and equipment, and the improvement of residents' daily water habits in accordance with relevant laws and regulations, in order to achieve maximum water-saving benefits; Material conservation refers to minimizing the use of materials in construction, especially non renewable materials, and strengthening the reuse of existing structural materials. It also emphasizes the recycling of waste materials and the use of renewable and local materials during the construction process. New building materials should be used as much as possible, and the awareness of material conservation among designers, managers, and construction personnel should be raised to increase the utilization rate of building materials and reduce the waste of material resources. We should increase the utilization rate of renewable resources, fully consider the application and planning of renewable energy in the process of building design and construction, combine the positioning of each project, compare and analyze renewable energy utilization schemes from the aspects of technical feasibility, economic rationality, and operational management convenience, and comprehensively determine suitable schemes.

There is a wealth of ecological wisdom embedded in some traditional environmental techniques, including the cyclic use of materials, the ecological nature of the manufacturing process, and the high adaptability of structural design, which correspond to the sustainable development ecological concept advocated by the

country at present. In green landscape design, attention can be paid to adapting to the local geographical and climatic characteristics, planning and using local materials reasonably, utilizing structurally sound processes, and designing ecological plans that reflect environmental friendliness and resource conservation. Compared with traditional design, the integration of circular economy theory has made design more focused on material selection, functional improvement, and other aspects, from the past "usable and easy to use" to the current "reusable and recyclable" resources. This has maximizes the satisfaction of human psychological and physiological needs, and meet the needs of niche populations on the basis of meeting sustainable development.

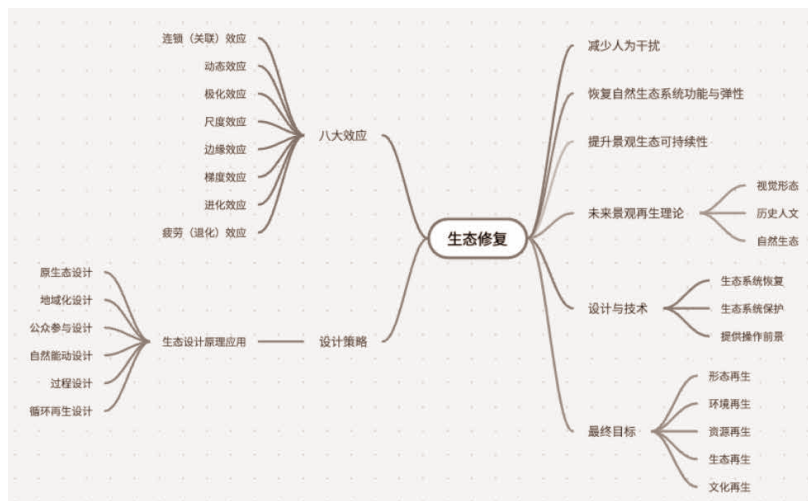
(2)Design strategy based on future landscape regeneration

The future landscape regeneration strategy is an important means to address degradation and environmental issues in the process of urbanization. The future landscape regeneration strategy is to create a healthier and more comfortable human settlements for residents through rational and scientific planning and design, while restoring and enhancing the ecological functions of the landscape.

One of the core contents of future landscape regeneration is ecological restoration, which restores the function and resilience of natural ecosystems by

reducing human interference, effectively enhancing the sustainability of landscape ecology. The theory of future landscape regeneration emphasizes systematic research from three levels: visual form, historical humanities, and natural ecology. The ultimate goal is to achieve the regeneration of landscape form, environment, resources, ecology, and culture. The theory proposes eight effects of landscape regeneration: linkage (correlation) effect, dynamic effect, polarization effect, scale effect, edge effect, gradient effect, evolutionary effect, and fatigue (degradation) effect. In the future landscape regeneration design strategy, the application of ecological design principles is also emphasized, which includes original ecological design, regional design, public participation design, natural active design, process design, and circular regeneration design. These designs and technologies not only focus on the restoration and protection of ecosystems, but also provide operational prospects for landscape regeneration. (As shown in Figure 3-3)

Against the backdrop of rapid urbanization, the integration of public spaces and ecosystems with sustainable development concepts has become an important issue in urban planning and design. In the process of landscape regeneration, the recycling of resources is the key to achieving sustainable development. Through scientific and rational planning and design, public spaces can not only improve the quality of life of urban residents, but also promote the



Future Landscape Regeneration Concept 3-3 (Image source: self-made)

restoration of ecosystems, thereby achieving sustainable development of cities. For example, through innovative design, the energy consumed in daily activities is converted into usable power energy and returned to the user, achieving energy recycling; The theory of garbage recycling and resource reuse can also be combined to improve the urban environment, while creating reliable and sustainable resource cycles in some public spaces. By creating multi-scale and heterogeneous habitats, more stable natural communities with strong structures, functional maps, low intervention, low investment, high landscape value, and matching with different habitat types can be constructed. This not only carries regional culture and historical memory, but also integrates natural vegetation landscapes more comfortably.

The future landscape regeneration strategy should not be limited to traditional methods such as land reclamation and mining area recycling, but should introduce models and methods such as urban double repair, land art aesthetics, and industrial heritage under the premise of building an ecological civilization and a beautiful China. The transformation of the subject, the intersection of image and imagery, and the diversification of practical methods can effectively achieve the coordinated development of cultural heritage protection and future landscape regeneration. While helping to protect and inherit cultural heritage, it also enhances the ecological functionality and cultural value of the landscape, ensuring the quality of cultural heritage and promoting the formation and development of distinctive local cultures.

(3)Comprehensive design strategy

Under the guidance of circular economy theory and future landscape regeneration theory, constructing a comprehensive design strategy system is the key to achieving sustainable development of human settlements space design. This system starts from multiple dimensions and comprehensively considers ecological, economic, social, cultural and other factors to achieve efficient resource recycling and sustainable and harmonious development of the ecosystem.

In the overall design, with the support of national

policies, ecological restoration and multi-scale heterogeneous habitat creation are utilized as one of the core elements of future landscape regeneration, supplemented by a focus on sustainable material and energy use, community participation and public education as public behaviors, and the protection of historical and cultural heritage, to construct a scene of harmonious coexistence between humans and nature, historical culture, society, economy, etc. The construction of a strategy system that combines circular economy with future landscape regeneration should take into account the above aspects. Through the implementation of these strategies, the landscape can be effectively enhanced, creating a more comfortable and healthy human settlements for residents, carrying regional culture, and having higher resource recycling capabilities.

4.Conclusion

The concept of circular economy and future landscape regeneration is deeply integrated, and a systematic strategy system for human settlements space design is proposed. It emphasizes the perspective of the entire life cycle, multi-scale, and interdisciplinary approach, combined with community participation and public education, in order to improve public awareness of circular economy and future landscape regeneration, alleviate resource shortages, achieve efficient resource recycling and sustainable development of ecosystems and social economy.

References

- [1] Guo Lin. Application of Circular Economy Concept in Green Housing Construction [J]. *Jushe*, 2025,(03):63-66.
- [2] Li Huimin. Research on Planning and Design Methods of Historical Human Settlements in Ancient Villages [D]. Xi'an University of Architecture and Technology, 2009.
- [3] Shi Mengmeng. Study on the Landscape Regeneration Design of Ruins Park under the Concept of Organic Renewal [D]. Lu Xun Academy of Fine Arts, 2023.DOI:10.27217/d.cnki.glxmc.2023.000262.
- [4] Li Guangzhi, Li Tongsheng, Yang Haimei, et al. Analysis of Ecological Mode Selection of Science and Technology Parks-Taking Xi'an High-tech Zone as an Example [J]. *Science and Technology Management Research*, 2008,(06):488-491.