

Comparative Analysis of Landscape Greening Development in the Context of Sustainable Development

–Taking Shanghai and Nanjing as an Example

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Abstract: The cause of urban landscaping and greening is in a stage of development and is being explored in various cities. Most people are gradually realizing and accepting the value of landscaping as a way to maintain and improve the urban ecological environment, as well as to promote social well-being and sustainable economic development, as the idea of sustainable urban development continues to gain traction. Therefore, exploring how to continue to develop landscaping in the context of sustainable development and the significance of planning and development of landscaping has become a topic of urgent concern. This paper will take Shanghai and Nanjing, two cities of similar size and distance, as the basis for a comparative study of the ecological benefits and economic value of landscaping, and analyze and give suggestions for the future development of landscaping in the context of sustainable development. It is found that the ecological and economic benefits of landscaping in the two cities are significantly different under different planning policies. The ecological and economic advantages of Nanjing's landscaping are more noticeable than those of Shanghai, and an analysis of its landscaping practices is important for directing the future development of urban landscaping.

Keywords: Landscaping, sustainable development, ecological benefits, economic value.

1. Introduction

In recent years, the cause of urban landscaping and greening has been in the development stage, and all cities are in the process of exploration. With the growing prominence of global warming and the increasing awareness of environmental protection, controlling carbon dioxide emissions and mitigating the greenhouse effect have become a global consensus, and the concept of low-carbon economy has emerged and is widely recognized. Landscaping is increasingly recognized and accepted by the general public due to its vital role in enhancing the ecological environment, preserving urban ecosystems, and fostering social well-being and sustainable economic development[1]. As a result, the concept of urban sustainable development is gaining greater attention[2]. This paper centers on the development characteristics of different urban landscaping under the background of sustainable development, planning strategies and the different impacts and values they bring, selects two cities with similar geographic location and area size, Shanghai and Nanjing, for a case study, and compares

and studies the differences between gardens under the background of sustainable development in terms of ecological benefits, economic value, etc., which helps to understand the impacts of sustainable urban development on the ecological environment, as well as how to further improve the urban ecological environment and promote sustainable urban development through gardening. Differences in the characteristics of gardening and greening in different cities reflect the differences in the history and culture of the city, the social structure and the needs of the residents, based on which the study can provide new ideas and methods for urban planning and design.

2. Basic Situation of Shanghai's Landscape Greening

Shanghai is located at the mouth of the Yangtze River, in the alluvial plain of the Yangtze River Delta, bordering Jiangsu and Zhejiang to the west, and as of the end of 2021, Shanghai's administrative division covered an area of 6,340.5 square kilometers.

Shanghai's landscaping situation has made remarkable development and progress in recent years. By the end of 2023, the total number of various types of parks in Shanghai will reach 832. Historical data shows that the number of parks in Shanghai has grown rapidly in the past few years. By the end of 2021, the total number of parks in Shanghai will be 532, which is 3.5 times more than that in 2011. In terms of green space, by the end of 2021, the total green space in Shanghai reached 171,200 hectares, with a per capita park green space of 8.8 square meters. This data shows that Shanghai has reached a high level of green space per capita and continues to push for more green space construction and renovation, but there is still high room for improvement [3].

3. Nanjing Garden Greening Basic Situation

Nanjing is located in the middle and lower reaches of the Yangtze River, in the southwestern part of Jiangsu Province in the low hills, with a total area of about 6,587.4 square kilometers.

Nanjing's landscaping situation has made remarkable progress in recent years, with the green coverage rate of the built-up area of Nanjing reaching 45.04% and the green space rate at 40.86% by the end of 2023. This data indicates that Nanjing has taken a leading position among similar cities in the country. Since 2013, Nanjing has initiated the construction of greenways in the city, and after ten years of efforts, a network of 1,582 kilometers of greenways has been built by the end of 2021 [4]. These greenways connect pleasant ecological landscapes, integrate cultural and historical resources, and carry a wealth of civic activities, initially constructing a green network that integrates multiple functions such as ecological protection and recreation.

4. The Difference Analysis of Urban Landscaping Value

Shanghai and Nanjing, as two cities in the Yangtze River Delta region with similar distances and sizes, place slightly different emphasis on landscaping. In recent years, the Nanjing municipal government has increased its efforts in landscaping and greening, and has also been named a national garden city. And Shanghai in recent years because of limited land resources and other reasons, pay more attention to economic construction, for gardening and greening without too much investment. Therefore, comparing the ecological benefits and economic values brought by landscaping in two cities can not only explore the development direction of improving the comprehensive competitiveness of cities under the background of sustainable development but also better guide the development of landscaping in other cities in China based on these two cities.

4.1. Ecological Benefits

4.1.1. The Main Performance of Ecological Benefits

Generally speaking, there are three aspects in the construction of ecological benefits: first, build more urban parks and green space, adjust the urban micro-climate. Specifically, through vegetation coverage, water and other elements, combined with air cooling humidification, reduce wind speed, effective regulation of urban micro-climate. Second, increase the green area of the city, adjust the humidity of the surrounding air and the temperature of the top building, thus affecting the indoor environment, ease the urban heat island effect, play a role in energy conservation and emission reduction [5]. Finally, landscaping is very important to improve air quality. Through photosynthesis, plants absorb both particulate matter and harmful gases, such as nitrogen dioxide and sulfur dioxide, effectively purifying the air, reducing the concentration of harmful substances in the air and improving air quality.

4.1.2. Comparison of Differences in Ecological Benefit

First of all, Nanjing is much stronger than Shanghai in terms of improving air quality. Specifically, most of the ecological benefits provided by Shanghai's landscaping remain at the theoretical level, and the actual ecological benefits are not satisfactory. Nanjing makes extensive use of vertical greening plants, including climbing plants, Yunnan yellow heart, and wild roses. In their natural state, these plants effectively absorb atmospheric SO₂. Data show that the carbon sequestration per unit area of campus green space in Nanjing is 59.27 g/d, and the oxygen release per unit area is 43.47 g/d [6]. These data provide specific quantitative indicators of eco-efficiency and show that landscaping plays an important role in mitigating global warming and improving urban air quality [7-8]. This is also the reason why the air quality in Nanjing is better than that in Shanghai.

In terms of green space construction planning, Shanghai's urban greening faces the challenge of narrow land and dense population, making parks and green spaces precious[9]. At the same time, Shanghai's urban expansion has led to the improvement of green infrastructure in the city center, but the rapid urbanization of the suburbs, the overall area of green infrastructure is not a large proportion, and it is difficult to obtain better ecological benefits. While Nanjing's main urban garden green space plant green volume and ecological benefit survey research shows that the green space plant carbon sequestration per unit area and oxygen release per unit area and other indicators are more ideal [6].

In terms of specific implementation measures, from the perspective of Nanjing, according to the description of "A Study on The Urban Greening System Combined with Nature Conservation--A Case Study of Nanjing City", Nanjing adopts a combination of landscape greening and nature conservation in the urban greening system, emphasizing the concept of ecological infrastructure [10]. For Shanghai, according to the analysis of "Strengthening Research on Shanghai's Greening System Sublimating the Scientific and Technological Connotation of Garden Cities", Shanghai has put forward research objectives and directions such as plant community configuration, soil remediation and recycling economy in the development of gardening and greening [11], and planned a number of country parks in the suburbs, which are helpful in enhancing the ecological benefits of the city. However, it is obvious that most of the effective greening measures in Shanghai are at the planning level, lacking the specific ecological greening design and construction adopted in Nanjing, and thus the ecological benefits brought about mostly remain at the theoretical level, with less benefits and lack of research.

4.2. Economic Value

4.2.1. Shared Economic Value

In common, the economic value of landscaping is mostly shown in the real estate and tourism industries. First of all, landscaping can significantly improve the quality of life and living environment in residential areas. It can not only meet people's pursuit of quality of life, but also affect the market value of real estate to a certain extent. In addition, with the acceleration of urbanization, people's demand for leisure and entertainment is growing, and urban green space provides a good open space for the tourism industry. The green belt around the city of Shanghai has a greater potential for recreational transformation, and more tourists can be attracted to come for sightseeing and tourism through the establishment of theme parks, city parks and community parks. There is a significant correlation between the size of urban green space and the level of economic development in Nanjing. The old city of Nanjing, the southeast of Zijinshan Mountain and the central area of Hexi New Town form a "three-core" pattern of high prices, and the residential prices in these areas are significantly affected by the proximity of parks and green spaces [12]. From the perspective of Jiangsu Province, the mean value of the contribution of greening resource elements to urban tourism development is 0.29%, and the mean value of the contribution rate is 13.26% [13], which indicates that greening plays an important role in enhancing the attractiveness of urban tourism.

4.2.2. Comparison of Economic Value Differences

First of all, in general, Shanghai and Nanjing have their own focus on landscaping and greening, with Shanghai focusing more on improving the ecological environment and enhancing the city's image through the construction of green spaces, while Nanjing pays more attention to the construction of urban forests and the use of green spaces to enhance the quality of life of residents and economic value. Both places' landscaping and greening have promoted sustainable urban development to different degrees, but the specific forms of expression and focus are different.

Secondly, Nanjing has established the concept of green development and promoted the practice of scientific development by developing a green economy, in order to enhance the city's image and attract investment. This not only enhances the overall image of the city, but also attracts more foreign investment and promotes the high-end transformation of the industrial structure. Shanghai, on the other hand, through large-scale landscaping projects, such as the construction of the Disneyland scenic spot and the landscaping of the Huangpu River on both sides of the riverfront[14], has not only improved the urban environment, but also upgraded the city's international image and attracted more domestic and foreign tourists and investments.

Once again, in terms of the economic benefits of ecological services, Nanjing's "Green Nanjing" forestry construction project shows that the new forest land has a significant role in purifying the air and improving the microclimate, and the total value of its ecological services reaches about 2.9 billion RMB per year [15]. Shanghai, on the other hand, relatively lacks specific measures and relevant data on ecological services.

At last, comparison can be found that Nanjing's landscaping not only beautifies the urban environment and improves the quality of life of the residents, but also brings significant economic value to the city by attracting investment, promoting tourism and increasing the value of ecological services in various ways. Although Shanghai's landscaping has also brought economic value in the real estate industry and tourism, it lacks specificity and is more concerned with the establishment of the city's image at the general level, and the planning and construction lacks consideration of the economic value and practical significance of landscaping.

5. Suggestions

In the context of sustainable development, the importance of landscaping is reflected in a number of aspects: improving the ecological environment, enhancing the quality of life of residents, protecting biodiversity, promoting social and economic development. Therefore, promoting the high-quality development of landscaping is one of the key paths to achieving sustainable urban development. By comparing the different impacts of landscaping in Shanghai and Nanjing, several suggestions can be drawn for the future development of landscaping in the city.

(1) Strengthen the concept of sustainable development: the need to integrate the concept of sustainable development into the landscape design and ecological planning, to ensure the coordinability and consistency between the two.

(2) Adhere to the principle of ecology: in the process of urban landscape greening, the principle of ecology should be adhered to [16].

(3) Learn from experience, according to local conditions: cities such as Shanghai can learn from the successful experience of other countries in urban landscaping, out of a new road of sustainable development of landscaping suitable for local conditions.

(4) The establishment of long-term mechanism of urban landscaping: through scientific planning and design, rational management and effective implementation, the ecological benefits, social benefits, economic benefits organically combined, so that the construction of urban landscaping on the road to sustainable development.

6. Conclusion

This paper firstly analyzes the basic situation of Shanghai and Nanjing in terms of gardening and greening, and compares and discusses the differences between the two cities in terms of ecological benefits and economic value measures in the context of sustainable development, analyzes the different impacts brought about by them, and summarizes the appropriate measures and improvement points of gardening and greening in the construction of sustainable development of the city. The shortcomings are that firstly, there is less data, and Shanghai lacks of targeted research, which may cause some bias to the conclusion of the analysis. Secondly, the analysis of the impacts of landscaping is only focused on the ecological and economic levels, and further research should consider more social and cultural aspects to explore the development and impacts of landscaping in different cities under different planning policies.

References

- [1] Fang, Du. "Considerations on the Landscape Construction of Environmentally Friendly Community." *Northern Horticulture* (2010): n. pag.
- [2] M R Nugraha1 and O C Dewi1, "Maintaining Environmental Sustainability through Existing Environment's Vegetations," *IOP* (2021)
- [3] Chen Haifeng, Shanghai parks number over 830, Diversified development makes parks beautiful in their own way, 2023.12.26, <https://www.chinanews.com.cn/sh/2023/12-26/10135552.shtml>
- [4] Nanjing Daily, Greening coverage rate of built-up areas in the city reaches 45.04%, 2024.8.15, https://sw.nanjing.gov.cn/ywdd/yqjj/202408/t20240815_4739799.html
- [5] P. Phelan, K. Kaloush et al. "Urban Heat Island: Mechanisms, Implications, and Possible Remedies." (2015). 285-307.
- [6] Meng Xi. *Research on the investigation of plant green volume and ecological benefits of garden green space in the main urban area of Nanjing [D]*. Jiangsu: Nanjing Agricultural University, 2016.
- [7] N. Humaida, M. H. Saputra et al. "Urban gardening for mitigating heat island effect." *IOP Conference Series: Earth and Environment* (2023).
- [8] D. Leung, J. K. Tsui et al. "Effects of Urban Vegetation on Urban Air Quality." (2011). 173 - 188.

- [9] Xiao Li. *Introduction to Urban Greening and Landscaping in Shanghai [J]. Journal of Shanghai University (Social Science Edition)*,1994(5):38-40.
- [10] Xue-zhon, Jiang. "A Study on The Urban Greening System Combined with Nature Conservation--A Case Study of Nanjing City. " *Journal of Chinese Landscape Architecture* (2003): n. pag.
- [11] Zhang Deshun. *Strengthening Research on Greening System in Shanghai to Sublimate the Scientific and Technological Connotation of Garden City[J]. China Garden*,2007,23(3):49-52. DOI:10.3969/j.issn.1000-6664.2007.03.012.
- [12] Shao Liting,Shao Dawei,Wu Dengming. *Influence of park green space on residential price and its scale difference law[J]. China Urban Forestry*,2022,20(06):112-118.DOI:10.12169/zgcsly.2021.09.15.0002.
- [13] Long Zukun,Li Xumao. *The contribution of greening and its efficiency analysis in urban tourism development--Taking Jiangsu Province as an example[J]. Journal of Huaqiao University (Philosophy and Social Science Edition)*,2016(6):130-140. DOI:10.3969/j.issn.1006-1398.2016.06.013.
- [14] Shen Yolei. *New trend of garden beautification in Shanghai[J]. China Flowering and Horticulture*,2019,(02):49-51.
- [15] CHEN Yongzhong, JIAO Jiaguo, LU Xinjuan, et al. *Evaluation of ecological benefits of "Green Nanjing" forestry project construction[J]. Forestry Economy*,2012(9):97-101.
- [16] Kong Xiangke. *Discussion on the sustainable development of urban landscape greening[J]. Southern Agriculture*,2019,13(30):51-52. DOI:10.19415/j.cnki.1673-890x.2019.30.028.