Analysis of Greening Ecology in Landscape Reconstruction of Construction Waste Dump in Wind-sand Area

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Abstract. In order to solve the problem of increasing urban construction waste, taking QiuLing Park in Hohhot as an example, the green space park after the landscape transformation of urban building was investigated. In this paper, the characteristics of green planting in the fragile ecological areas were analyzed, based on the relationship between ecological environment factors, the method of configuring vegetation in the landscape of construction waste in the park was discussed. Meanwhile, combined with the climatic and meteorological conditions of the region, the function and ecological benefits of the urban green space after the transformation were evaluated. It can provide experience for landscape construction and ecological restoration of construction waste dump.

1. Introduction
In recent years, China has gradually entered the era of urbanization 2.0, that is, the era of big urbanization, urban agglomeration and urban circle. This means that there will be more people and more infrastructure projects inclined to the city, resulting in more and more construction waste. As a result, the impact on the environment and the city will be increasingly prominent. Therefore, the reconstruction of the urban construction waste landfill is indispensable, which can not only improve the local land use rate, but also improve the ecological environment of the area.

Different levels of research on the disposal of garbage dump are carried out at home and abroad. Research on construction waste has been carried out earlier abroad, especially in ecological restoration and landscape construction. For example, Charles Waldheim and James Corner put forward the concept of Landscape Urbanism and ecological planning at the end of last century. They attached great importance to the research of ecological transformation and management of waste land, among which waste dump, as a typical representative of waste land, was listed [2]. The investment in the ecological transformation of the waste dump has been gradually increased and the transformation efforts have been gradually deepened. In the field of landscape design, a large number of waste land transformation research departments and projects such as Creative Land Use Center have been developed to solve the polluted and damaged waste land. Fread. A. sидит put forward the idea and method of building muck pile design, and put forward the experimental design method and the specific research content of urban management [3,4]. Referring to the above theoretical research and combined with the actual situation, there are many domestic related studies and cases in recent years [5-7], but few of them involve the windy and sandy areas that have fragile ecological environment. As the central and western regions of China are in the acceleration stage of urbanization for now, the research on the landscape transformation of construction waste has a practical significance for
improving the urban living environment and promoting the urban ecological balance.

2. Overview of the research area

In this paper, Qiuling Park in Hohhot is regarded as the research area. This park is a typical mountain park for the landscape transformation of muck heaps[1]. The location and function division of the park are shown in Figure 1-B. In addition, Hohhot is a typical temperate continental climate city, with less precipitation and more sandstorms.

![Figure 1. Park location and block planning](image)

3. Analysis of plant configuration

Plant community is the basis of green space ecosystem. Selecting suitable plant species can prevent soil erosion, help to repair the ecosystem and improve the landscape value of the park. At present, Qiuling park is planted with a large number of stress resistant trees, which are in the early and middle stage of vegetation recovery. It is necessary to continue to improve the soil and enrich the trees to achieve the overall ecological design.

The park is transformed from construction waste and the site conditions are relatively complex. The planting of plants should be combined with the particularity of the site. Ornamental plants should be planted in the activity or rest space to form a seasonal landscape for sightseeing. According to the arid and windy climate characteristics of Hohhot, as well as the citizens’ cultural hobbies, the reasonable layout of vegetation can be carried out.

As shown in Figure 1-A above, from high to low, a variety of windbreak and resistant plants are planted in strips. According to the plant planting situation, the park is divided into different functional areas (Fig.1). The plants in the windbreak and sand fixation area should have the characteristics of wind erosion and sand burial resistance, drought resistance, rapid root development and propagation. Therefore, Pinus tabuliformis is mainly planted on the top of the slope. The trunk of the Pinus tabuliformis is straight and vigorous. It is evergreen and does not fear the wind, snow and cold. The trunk of Pinus tabuliformis is straight, branches are crooked and colorful. Planting Pinus tabuliformis at high place can have certain windproof effect. The tree species planted next to Pinus tabuliformis is mainly Chinese pagoda tree, which likes light and is slightly shade resistant. It can adapt to dry and cold climate and is suitable for Hohhot weather. It has deep, developed root system, strong wind resistance, strong germination ability and long life. It has resistance to sulfur dioxide, hydrogen fluoride, chlorine and other toxic gases and smoke and can resist the toxic substances of vehicle exhaust nearby. A large area of Prunus davidiana is planted near the bottom of the slope, which is drought and cold resistant, salt and alkali resistant. Due to the decomposition of various wastes, the residual soil has become salt and alkaline. Prunus davidiana meets this requirement exactly and the
survival rate of transplantation is high. Planting ornamental shrubs around the hillside, such as Syzygium aromaticum and Ligustrum lucidum. Syzygium aromaticum has a certain cold resistance and strong drought resistance, the requirements to soil are not strict. Ligustrum lucidum is resistant to a variety of toxic gases and it is a good anti pollution tree species.

Combining with figure 1, it can be seen that plants in the isolation and protection zone are various, include Acer mono and Pinus tabulaeformis, which can not only block the noise of road vehicles, absorb harmful gases in the air to avoid affecting the growth of other plants in the park, but also block the vision of pedestrians, which is conducive to the formation of a sense of privacy in the park. In the tree belt isolation area, trees and shrubs are planted in strips. On the side close to the park, mainly Pinus tabulaeformis and Prunus davidiana are planted. Among them, colorful tree species such as Prunus cerasifera are planted. Wax and lilac are planted near the residential area. When viewed from the residential building to the Park (Fig.1), the rich colors and obvious layers can be obtained by the viewer. The tall trees on the top of the slope add a lot of beauty.

Beyond that, in the process of landscape reconstruction of urban building muck pile, not only the influence of wind but also the topographic factors should be considered in the design. The trees and shrubs should be planted on the surface of the slope and distribute in zonal arrangement for the purpose of protecting and greening. According to the growth conditions in the field, the planting strategy should be made by stages. So, in the early stage, local plants with strong resistance can be selected for covering, such as Elymus, Pennisetum and legumes. With the improvement of the soil quality of the overburden layer, the pioneer trees such as shrubs or trees with strong tolerance are gradually introduced to form a stable environmental ecosystem.

Therefore, it is necessary to plant partly according to the slope and landscape effect. The slope is planted with arbor and shrub in forestry planting, distributed in strips, dedicated to form the protection forest. The viewing area on the upper part of the mountain is the highest point of the park. Panoramic and beautiful scenery below the slope can be appreciated in the wooden houses built at the top of the mountain. The mountain where the wooden houses are located is mostly planted with shrubs and small trees, so as to avoid blocking the sight line and create a hidden atmosphere of the wooden houses. The path leading to the wooden houses plants Euonymus maackii opposite, among which the colorful leaf trees are planted, which enrich the visual senses. Acer mono and Pinus tabulaeformis are planted on the slopes, enrich the image of trees. On the other hand, in order to avoid water and soil loss, we should plant more trees such as Acer mono and Sabina vulgaris Ant to strengthen the stability of the soil. We can also plant ground cover plants such as Parthenocissus quinquefolia to cover the soil, prevent water and soil loss, conserve water, purify the air and absorb dust. Soil and water conservation can also be carried out through the protective forest, such as the main forest belt and wind break belt. The main forest belt is located in the windward direction, perpendicular to the dominant wind direction. The windbreak forest belt is located at the edge of park road and drainage and irrigation system, which plays an auxiliary role in windbreak. It can be seen that the garden is dominated by wind and sand resistant and drought resistant plants, which possess the remarkable climatic characteristics and abundant plant diversity. The type is "arbor shrub ground cover", with obvious layers, which can adjust the spatial color and beautify the environment.

4. The analysis of the elements of the ecological environment

The restoration of ecological environment and the virtuous cycle of ecological system is the core foundation of the landscape transformation of the construction waste. That is to say, the basis of ecological benefits is ecological balance and the virtuous and efficient cycle of ecosystem [9]. As far as the whole ecosystem is concerned, the park and its surrounding environment belong to the whole urban ecosystem. The reconstruction of construction waste landfill is bound to have a certain impact on the surrounding environment, society and other aspects. As a result, we can take some measurements and analyze the changes of Qiuling Park and its surroundings in landscape pattern and ecosystem, then evaluate the ecological correlation of environmental landscape. The portable gas detector (BOSEAN BH-90) and ambient air quality detector (XIMA ST-8312) were used to measure
this area and the results were shown in the figure.3&4.

Combined with the above plant planting distribution (Fig. 1-A), there are following plant species like Silk wadding wood, Pewter, Picea asperata, Ulmus pumila, peach, Eupatorium aromaticum, Forsythia suspensa, etc. in the park. From the perspective of arbors, Silk wadding wood not only bears cold and drought, but also has deep and developed root system, which can resist wind. It also has a certain resistance to sulfur dioxide. Pewter is resistant to cold, drought and grow fast. It is also resistant to smoke and harmful gases. Picea asperata is resistant to cold and drought. Although it grows slowly, it has strong wind resistance. Ulmus pumila cvyi likes light and be tolerant to cold and drought, be resistant to barren and saline soil, wind, smoke and toxic gases. Picea asperata is resistant to cold and drought. Although it grows slowly, it has strong wind resistance. Ulmus pumila cvyi likes light and be tolerant to cold and drought, be resistant to barren and saline soil, wind, smoke and toxic gases. Peach trees have strong cold tolerance and can endure - 22 °C low temperature in dormancy period. From shrub analysis, Eupatorium aromaticum is a plant with strong cold and drought resistance and likes light. As a whole, the local trees are selected, which are cold and drought resistant and some plants have strong wind resistance. They also have certain resistance to smoke, sulfur dioxide and toxic gases in the air. These tree species can not only increase the richness of natural landscape, but also relieve the pressure of urban environment and ecology to some extent.

From the analysis of air qualified days [8] (Fig. 2). (Note: the concentration limit of air quality index (AQI) is in accordance with national regulations (GB3095-2012), AQI ≤ 50 is excellent; 50 < AQI ≤ 100 is good; 100 < AQI ≤ 200 is light pollution; 200 < AQI is medium pollution; 300 < AQI is serious pollution.) Compared with 2018, the change in 2019 is relatively small. The number of excellent air days in 2018 is 310 days and that in 2019 is 292 days. Although the number of excellent days in 2019 is less than that in 2018, the overall fluctuation is small, indicating that it has a certain effect on the improvement of air quality at ordinary times and it is unlikely to be too good or too bad. In addition, according to the air pollutant concentration (Fig. 3) [8], the change patterns of sulfur dioxide, nitrogen dioxide, fine particles, inhalable particles and carbon monoxide are almost the same, which are basically higher from January to April in 2018, from October in 2018 to April in 2019 and from October to December in 2019, almost unchanged in other months. Considering the cold weather in Hohhot in winter, the above situation may be caused by the heating in winter and the continuous increase of air pollutants caused by a large number of coal combustion. However, compared with the pollutants in two years, the peak value in 2019 is smaller than that in 2018, so it is judged that the landscape transformation has a certain positive impact on the urban environment.
Therefore, from the aspect of ecological and environmental factors (meteorology). Although the temperature has reached a new high and a new low in recent years, the highest temperature can be kept within a range and the lowest temperature also rises. Although the precipitation does not keep rising continuously, the lowest precipitation can be kept at about twice of the previous lowest value. It can be seen that the ecological benefits in meteorology after reconstruction is obvious. In terms of natural landscape, the special properties of these plants, such as wind resistance and smoke absorption, have already played a positive role in the ecology. In the meantime, those characteristic create a better living environment for residents. From the aspect of ecological benefit criticism index (air quality improvement index). Although the number of qualified days of air quality fluctuates little in 2019, the overall number of qualified days is still less than that in 2018. In the aspect of air or due to the heating in winter, the concentration of some substances in a certain months of the year is still in a high range, but the peak is lower than before. Therefore, there are some positive effects of ecological benefits in improving air quality indicators.

5. Conclusion
At present, in the urbanization construction of our country, the park construction with the function of ecological restoration is more and more perfect. In ecological design, it is pointed out that in order to meet the needs of modern people for landscape design, attention should be paid to the treatment of terrain, vegetation and other factors in the design. Especially, in arid and windy areas, the living environment of plants is poor and the ecology is fragile, so the allocation of greening is very important to the ecological environment of this area. Plants are the main body of ecosystem restoration and ecosystem reconstruction. The successful experience of ecosystem restoration and reconstruction at home and abroad lies in the plants’ select and plants’ match. The greening planning should adhere to the principles of respecting nature, conforming to nature and sustainable development. On top of that, it should also adjust strategies according to the current environmental problems of the site and the natural succession law of the ecosystem, that is, measures to plant different types of plants year by year to continuously improve the environment. From the perspective of ecological restoration, the topographic relief has the auxiliary role of ecological restoration [9,10]. Therefore, the mountain park after the reconstruction of the construction waste dump is one of the effective ways for solid waste treatment. It is exactly the response to the development of low-carbon environmental and green protection when using the surrounding resources reasonably according to local conditions, transforming and utilizing the urban construction waste pile and constructing the economical landscape.
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