Landscape Design of Industrial Heritage Based on Low Impact Development Concept

Yongjin Liu
Shanghai Art and Design Academy, Shanghai, 201808, China
857664845@qq.com

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Abstract. The industrial heritage in the city is a historical witness of urban development and an indispensable component of the city. The transformation of complex industrial heritage blocks requires systematic planning. The low-impact development concept has injected new ideas into the transformation of industrial heritage blocks. This paper analyzes LID technology's technical measures, application value and transformation principles in industrial heritage blocks, and puts forward the follow-up research direction.

The Concept of Low Impact Development (LID) Mode

Low Impact Development (LID) mode
LID is a new concept of rainwater management proposed by Maryland in the mid-1990s. The basic principle is to minimize the impact and damage to natural ecosystems during the development and construction of artificial systems. The LID concept control the runoff and rainfall pollution through decentralized, small-scale source control facilities. After the development and construction of the area, it should be as close as possible to the natural hydrological state before the development.

Progress and examples of foreign research on low impact development
The development of the concept of low-impact development can be roughly divided into the following stages: In the late 1990s, the US Environmental Protection Agency (EPA) compiled the first comprehensive LID design technical standard; 2000-2009: EPA officially recognizes the LID design concept of rainwater management and non-point source pollution control design. In 2009, EPA began to promote the concept of green infrastructure. The green infrastructure concept is basically the same as the low-impact development design concept, and its purpose is simply to extend the concept of low-impact development of municipal drainage to all aspects of municipal infrastructure.

Typical LID Design Principles
Water permeable paving. Effectively reduce the light flow of rainwater and reduce the burden on urban drainage systems.

Rain garden. Rainwater Garden is a rainwater management technology that planted vegetation in a naturally formed or artificially constructed shallow concave green pool, collecting rainwater collection and purification, and realizing source purification.
hallow trenches of vegetation. A network system consisting of shallow ditch vegetation is set up in the city. The road is usually a single slope of the road that can be used to introduce rainwater into the shallow trenches of the vegetation.

**Industrial heritage landscape**

*Urban Industrial Heritage Concept*

Urban industrial heritage refers to historically valuable architectural or industrial sites left over from the industrialization process of the city. These buildings and sites have been abandoned and no longer have productive capacity or administrative capacity. However, it is a historical witness of urban development and an indispensable component of the city.

*Treatment of urban industrial heritage*

More and more people advocate that urban industrial heritage cannot be simply dismantled. But through the new ideas of cultural creativity, we should make them into a city industrial heritage landscape, restore its vitality, continue its important role as a city with its new look and new value. As the role elements of the city, they should continue to shoulder the heavy responsibility of the modern development of the city.

The treatment of urban industrial heritage is generally divided into two types, namely protection and development. How these two treatments are applied depends on the nature of the urban industrial heritage.

*The value of urban industrial heritage*

The value of urban industrial heritage mainly includes three aspects: First, humanistic value. Urban industrial heritage is a typical feature of a city which represents the early functions of the city and. The second is economic value. Compared with waste disposal and destruction treatment, transforming it into urban industrial heritage landscape is more sustainable and economical activity. The third is environmental value. Waste utilization is one of the important environmental protection concepts. The concept of sustainable development is implemented in the protection and development of urban industrial heritage, which can maximized the value of industrial heritage.

*LID technology’s application in the industrial heritage block*

The industrial heritage block is composed of buildings, roads, green spaces and other elements. The Dilapidated architecture in the block area Poor road traffic, Lack of green space, and the rainwater problem have become the important factor hindering the transformation and development of industrial heritage blocks. The transformation of complex industrial heritage blocks requires systematic planning. The LID concept has injected new ideas into the transformation of industrial heritage blocks. Applying LID technology to the renovation of the block will not only effectively improve the rainwater problem in the region, but also have important significance for improving the environmental quality of the region.
Technical measures for LID technology in industrial heritage blocks.

Infiltration: Increase the ground infiltration rate
There are a large number of impervious concrete underlay surfaces in urban blocks, which change the natural ecological characteristics and hydrological nature. Therefore, it is particularly important to strengthen the natural infiltration of rainwater.

stagnation : Slow down the concentration speed of water flow
Vegetation has a certain blocking effect on rainwater, which can effectively delay the generation of rainwater runoff, reduce the flow rate of rainwater runoff, and avoid the occurrence of internal disasters to some extent.

Storage: store rainwater
It is far from enough to clean the rainwater through a simple permeable paving, sinking green space and other stagnation facilities. It is necessary to have a storage and purification facility to re-purify the rainwater.

Net: increase the ability of rainwater decontamination
A large amount of pollutants are attached to the surface of the city. When it rains, these pollutants are washed away by rainwater. The rainwater should be purified by means of physical or biological purification.

Use: make full use of rainwater resources
Establish a complete rainwater reuse system to achieve rainwater resource utilization. Commonly used water facilities mainly refer to rainwater storage and purification facilities that can be used directly.

Drainage: initial rainwater and excess rainwater discharged
At the beginning of the rainfall, a large amount of suspended matter will be trapped in the rainwater, and the infiltration channel is easily blocked by it. Therefore, rainwater discharge measures at the beginning of rainfall are indispensable, such as setting an overflow port and a drain pipe.

Application value of LID technology in industrial heritage blocks

Ecological value
The use of LID technology can significantly improve the drainage capacity of existing rainwater systems in industrial heritage blocks, reduce the losses caused by internal disasters, and more importantly, LID can maximize the recovery of damaged water ecosystems. And the restoration of aquatic ecosystems is bound to affect the structure and function of the entire neighborhood ecosystem, and then bring significant ecological benefits.

Social value
LID technology especially reflects the value of public services in the process of transforming industrial heritage blocks into urban landscape parks: the first is to enrich urban public space and serve all kinds of people in cities; the second is to build urban green ecological environment and improve city quality and image; the third is that improved the living environment and eased the contradiction between supply and demand of urban water resources.

Economic value
At present, the economic growth situation has shifted from configuration-based growth to regenerative growth, and resource intensive efficiency utilization will gradually replace extensive operations. The transformation of industrial heritage blocks is the product of the new normal of economy. LID technology provides intensive development measures for urban parks for urban renewal, and results in huge comprehensive economic benefits.
Artistic value
In the construction of the landscape of industrial heritage blocks, LID technology not only pays attention to the ornamental nature of ecological transformation, but also takes into account its technical measures to achieve both art and function. The artistic value of industrial heritage block landscape is not only reflected in the innovative and effective landscape design, but also gives people a brand-new landscape perception and visual perception through the construction method born in nature and integrated in nature.

Renovation and update design principles
Principle of integrity
The ecological environment refers to the environment composed of ecological relationships. It is the sum of various natural environments closely related to the survival and development of human beings. In the renovation of the block based on the LID concept, it is necessary to carry out an overall planning of the block and rationally arrange the catchment zone on the basis of reasonable functional layout, and then create a good living and ecological environment for people.

Ecological principles
The ecological principle is based on the principle of ecological design, based on the theory of landscape ecology, and creates a landscape space by simulating natural ecological methods. The LID concept itself is a concept that respects the laws of nature and respects the natural ecosystem, reducing the damage to the environment caused by human activities.

Regional principles
As an era product of the locality, the industrial heritage block has obvious regional characteristics and rich historical context. The principle of regionality is to adapt to local conditions, and to respect the characteristics of the site from the topography, climatic conditions and soil conditions of the block, so that the degree of intervention on the site during the transformation process is minimized.

Artistic principles
The architecture, equipment and landscape of the Industrial Heritage District itself have an industrial aesthetic. In the transformation, the artistic value of the industrial heritage should be highlighted while paying attention to shaping the artistic beauty of the landscape. Through the rational arrangement of industrial heritage and landscape, the fusion and opposite methods are adopted to highlight the artistic beauty of industrial heritage.

Conclusions
Industrial heritage blocks are the product of the rapid development of the city. The buildings, landscapes and municipal facilities in the area pay special attention to functional efficiency. The research in this paper puts forward the measures, values and principles of the renovation of industrial heritage blocks under the LID concept. The following conclusions and subsequent research directions are presented.

The renovation of industrial heritage blocks under the LID concept should be based on the respect for water, topsoil, topography and vegetation. Through the overall planning and the utilization of low-impact technical measures, the ecological rainwater utilization landscape system of the block is constructed.
In the transformation of industrial heritage blocks based on the LID concept, designers are required to comprehensively consider various types of low-impact development facilities, and select reasonable types according to specific needs so that they can be subtly integrated with the landscape.

In the process of continuous development of urban construction, the abandoned old industrial factory have further deteriorated the landscape environment due to the large-scale rainwater and water pollution. The design under the LID concept can not only make the rainwater comprehensively utilized, but also reduce the pollution caused by waste pollutants, and also use the rainwater as a landscape component to beautify the environment and improve the hydrological situation of the site before and after the reconstruction.

References


