

Discussion on Reformation Design and Reuse of Industrial Wastelands

Take the Landschaftspark Duisburg Nord Designed by Peter Latz as an Example

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Abstract—Located in north of Duisburg, the Landschaftspark Duisburg Nord is a post-industrial landscape park situated in Ruhr Industrial Base of Germany. So to speak, it sets a good example for other old industrial areas throughout the world. With novel and unique design idea, it most skillfully transforms abandoned factory into public amenity and furthest utilizes the original abandoned materials in the factory as well as endows the old industrial base with new vitality. Landscape transformation and reuse of industrial wasteland is discussed and researched through taking the Landschaftspark Duisburg Nord as an example.

Keywords—*Landschaftspark Duisburg Nord; industrial wasteland; transformation; reuse*

I. INTRODUCTION

Iron and steel industrial areas, coal mining factories and coking factories closely linked to cities and towns have gradually quitted the historical stage. These memorials in the period of heavy industry leave deep impression on people. Most industrial wastelands become recreation and tourist centers through transformation and reuse, attracting people's attention as the monument that witnesses the past history and the current revival of economic society as if the rebirth from the past industrial age. Industrial wastelands refer to the sites that carry out industrial production or relate to industrial production in the past but now haven't been used for production with change of time.

Landschaftspark Duisburg Nord is the transformation and reuse of industrial wastelands. The transformation and utilization of the original industrial materials, landscape restoration, skillful and novel conception solve difficulties in industrial wastelands and newly add a scenery spot in this area. The close connection of design with use of parks, industrial wastes with ecology, unique reuse contribute to the new image and landscape of Ruhr. The transformation and reuse of buildings and materials reminds people of the industrial age. Meanwhile, it makes the area unique and creates new vitality.

The transformation and reuse of Landschaftspark Duisburg Nord is analyzed and researched in this paper, in order to provide theoretical basis and research reference for the transformation of industrial wastelands in the future.

II. INTRODUCTION TO LANDSCHAFTSPARK DUISBURG NORD

In the 1990s, Ruhr was the most important industrial base of Germany. After the Second World War, with the arrival of information era, most factories close down, leaving industrial wastelands. Landschaftspark Duisburg Nord is the transformation and reuse of industrial area. Steel works, coal mine and iron and steel industry with history of centuries pollute the surrounding environment and close down in 1985 with the industrial decline. Countless old factory buildings and structures are covered by weeds with the passage of time. Whether tear down or reserve the sites becomes a problem. Finally, German government reserves the industrial wastelands in order to let people understand the industrial development history in the past instead of forgetting. Designers transform and reuse it through combination of science with art. In 1994, the Park opened to the outside world and received favorable reviews. The successful transformation of Landschaftspark Duisburg Nord means the transformation and reuse of urban industrial wastelands is mature. At the meantime, Landschaftspark Duisburg Nord becomes the model for design and research in transformation and reuse of industrial wastelands throughout the world.

III. VALUE EMBODIMENT OF INDUSTRIAL WASTELANDS

A. Historical Value

With the upsurge of information technology, industrial civilization quits the stage. With the closedown and remove of old industrial area, structures and industrial facilities stay in industrial wastelands. They witness the economic prosperity and development and historical changes in specific area of the city and symbolize the historical value owned in the period of machine production, referring to the epitome of city in industrial age and one of the effective ways for future generations to understand historical value of the city. The design of Landschaftspark Duisburg Nord is transformation of industrial wastelands. It once was the steelworks with history of centuries with the value of reflecting the society in this period. Obviously, we should not completely repudiate and bury industrial wastelands but transform and reuse it as well as respect the historical value in industrial age.

B. Social Value

Industrial production can increasingly improve social mechanism. In industrial age, most people rush into the city because of the good employment situation and better economic development of cities. With the upgrade of economic structure and the development of tertiary industry, factories in city center move to suburbs to where people migrate. Numerous industrial wastelands appear in city center, which restrict urban development, sharpen social contradictions, make cities decline and impede urban economic development. The design of Landschaftspark Duisburg Nord with environmental and ecological renovation solves problems in employment, residence and economic development caused by industrial decline. The industrial wastelands after transformation with unique charm can meet people's ever-increasing material and spiritual requirements and relieve social contradictions.

C. Economic Value

In the industrial revolution, most factories choose prime location in cities. The transformation and reuse of industrial wastelands can maximize the economic benefits. We can transform industrial wastelands through various forms to greatly reduce the cost in demolition and reconstruction. Designers make the best of steel wastes like large machines stored before transformation of Landschaftspark Duisburg Nord instead of tearing down them.

D. Aesthetic Value

In the opinion of the men in the street, industrial buildings and facilities left on industrial wastelands are ugly and should be dismantled. Nowadays, people gradually research industrial buildings and think it embodies the beauty of art. They are no longer the ugly wastes but sceneries for people to appreciate. The structures left have complex technology, solid and rigorous structure and reflect geometric beauty of buildings with combination of industrial technology and machine structure. The reservation of original appearance and structures can provide reference for later generations. They reflect the aesthetic value in industrial age and real scenery in society of certain historical period.

IV. ANALYSIS ON PROBLEMS IN TRANSFORMATION AND REUSE OF INDUSTRIAL WASTELANDS

A. Problems before Transformation:

1) *Waste of land resources:* After the 1960s to 1970s, numerous industrial wastelands appeared in cities. Because factories have large floor area and architectural scale, the closedown and remove of factories causes the embezzlement of large area of land, leading to land shortage and waste of land resources. The area of the original industrial base of Landschaftspark Duisburg Nord reaches 230 hectares. Improper handling of it will consumer plenty of material and financial resources. Wastelands waste a large number of land resources. The Landschaftspark

Duisburg Nord after transformation and reconstruction changes into another scenery in the city.

2) *Ecological imbalance. Industrial development cannot do without exploitation of materials:* German Ruhr Industrial Region takes coal mine and steel as the leading industry. Meanwhile, the science and technology was backward at that time. People blindly pursue economic prosperity and growth and excessively exploit resources and deal with pollution discharge improperly, so many environmental pollution problems appear such as the reduction of air quality, destruction of cultivated land, salting of soil, reduction of species, leading to imbalance of ecological system.

3) *Social problems:* Landschaftspark Duisburg Nord locates in Ruhr Industrial Base which is the most backward space of Germany. It focused on heavy industry like coal mining and steel in the mid- 19th century so the economy of surrounding cities developed rapidly. In the 1960s, the slowdown of industrialization process, the fast migration of population and the decline of heavy industry in Ruhr caused plenty of surplus labors. Data researches show the average unemployment rate in this area reaches up to 12 percent and the expansion of unemployed population reaches the highest.

B. Problems in Transformation

1) *Plenty of abandoned wastes:* Landschaftspark Duisburg Nord once was coking and steel plant. Abandoned factories, water towers, pools, blast furnaces and corrosive machines are left in the abandoned industrial land with an area of 230 hectares. It wastes capitals and funds to tear down them. We should consider the destination of these wastes and safety measures during the transportation.

2) *Industrial pollution:* Located in the most important industrial base of Ruhr, Landschaftspark Duisburg Nord before transformation has numerous industrial facilities and wastes used in industrial age. Therefore, it will inevitably cause industrial pollution such as air pollution, soil pollution and water pollution.

3) *Other problems:* Side issues exist in transformation, such as economic problems in manpower and material resources required and influences on the surrounding environment such as noise and traffic. In order to solve the problems we should formulate plans through scientific demonstration and management. We also need to solve the problem about how to transform the old industrial area into a landscape park.

V. MEASURES AND ACHIEVEMENTS IN TRANSFORMATION OF INDUSTRIAL WASTELANDS

Above-mentioned problems exist in transformation of industrial wastelands. We should take the following proper measures:

A. Transform and Reuse Industrial Residuals

1) *Transform structures:* As mentioned above, industrial areas have waste iron and steel and machines. It will spend

lots of funds and may cause safety problems if we clear it away such as transport it to dumping ground. Therefore, we can reserve structures in factories through following the principle of minimum destruction and endow some of them with new functions. For example, it can be transformed into overlook platforms for visitors to climb and overlook the distant view safely. We follow the historical principle in transformation. Many rails of material transport exist in the industrial area. We reserve the route of rails, plant grass or flowers and trees on both sides of it and transform it into path for people to shuttle.

2) *Utilize the abandoned industrial materials:* The abandoned materials refer to the abandoned industrial materials and industrial raw materials and residual tiles left by industrial structures even the waste residues caused by industrial production. The large-scale production activities in industrial age cause abandoned materials such as large steel plate, steel, red brick and coke. Cokes, coal cinders and mineral waste residues can serve as media for plant growth or materials for ground pavement; abandoned red bricks can be ground to serve as materials of red concrete; we can polish large steel plate and draw on it to make it full of sense of art and make it into rain sheds of different shapes. These measures make us clearly understand the utilization of abandoned materials and the function of art and realize “change waste material into things of value”, which follow the principle of sustainable development.

B. Soil Improvement

The abandoned coal cinders and heavy metals in Ruhr Industrial Base slowly erode soil and influence the self-purification of it. According to the reconnaissance before transformation, the soil in the industrial base suffers from serious destruction. Some soils are poisonous and the pollution has reached more than ten meters under the ground. The seriously polluted soil leads to the survival of no plants. In order to restore the land, we use other medium like pitch to control the expansion of polluted soil and pave new soil on it. Meanwhile, we establish new water transportation system to prevent the surface water from polluting the soil below. For soil with light pollution, we excavate the surface soil on the ground and replace it with new soil and apply organic fertilizer to achieve good effects. We can remove the hazardous substances through biological activities. The metabolic activity of earthworm can restore the soil. Furthermore, we can resolve the hazardous substances through microorganism and regularly convey nutrient solution and plant some plants with strong vitality to accelerate the self-regulation of soil.

C. Recycling of Water

In the industrial age, rivers were polluted because no effective measures were taken to deal with waste water produced in the large-scale industrial manufacture in Ruhr. The measures are as follows: ① Use roter to excavate and clear away sludge with pollution of heavy metal; ② Construct slope on both sides of rivers to bring rainwater in

the river; ③ Put plants with resistance to contamination in the river to promote the self-purification of waste water, and resolve contaminated particles; ④ Dredge the river to form running water, so that the water source will not suffer from secondary pollution, and divide the main drainage line into branches in the Landschaftspark Duisburg Nord to meet requirements of people; ⑤ Plant mulberries and willows alternately on both sides of the river in order to let the worms on mulberries become the best food of fishes and form ecological balance; The excreta of fishes and residuals in rivers can be nutrient of plants. In this way, it forms beautiful scenery, realizes recycling and protects the ecological balance.

D. Adjust Measures to Local Conditions and Protect Vegetation Growth

The discharge of industrial waste gas in industrial manufacture causes the sharp reduction of air quality in local areas. We can see the growth of plants in many industrial areas abandoned for many years without human intervention. The plants can be reborn through living in harmony with the surrounding environment and forming biotic population. Therefore, we can do experiment on these nameless plants and transplant it in other places to resolve hazardous substances in soil. The transformation of Landschaftspark Duisburg Nord follows the ecological principle. The designer Peter Latz refers to the technology, reserving the vegetation instead of dealing with them. For example, the luxuriant silver birches and willows grow around the railway.

VI. CONCLUSION

In the 1990s, as the most important industrial base of Germany, Ruhr became the world-famous Landschaftspark Duisburg Nord for public entertainment after transformation and reuse. It skillfully reserves the original industrial facilities and creates unique industrial landscape. The environmental and ecological renovation project solves problems in employment, residence and economic development caused by industrial decline and endows the old industrial base with new vitality. The practice with profound significance sets a good example for transformation of other old industrial areas around the world.

With historical changes, the decline of factories leads to plentiful industrial wastelands. We cannot totally repudiate or tear down or destroy it, but transform and reuse it more reasonably. Industrial area leaves deep impression on people because it is symbol of a period and representative of social image. Therefore, when dealing with industrial wastelands, we should consider the close relationship between it and development history of city. The reasonable transformation and reuse should base on its unique conditions to furthest embody the historical, social, economic and aesthetic values of industrial wastelands, and then better solve surrounding environmental problems and promote local economic development.

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