

A case of public landscape design for a small city - Dali Erhai Ecological Corridor manhole covers beautification project

Tao Rulin^{1*}, Li Liping²

¹College of Art, Dali University, 671003 Yunnan Province, P.R. China

²College of Art, Dali University, 671003 Yunnan Province, P.R. China

Abstract. Manhole covers are one of the most important public facilities in cities. They are the first choice for public landscape renovation in many small and medium-sized cities because of their low cost of renovation and quick results. Many cities around the world have manhole cover cultures, with more widely used and successful cases in Japan. At present, there is no systematic manhole cover culture in China. This study explores the practicality of manhole covers as a public landscape design for small cities from design, art form and material techniques of the Dali Erhai Ecological Corridor manhole covers landscaping project, which has the value of being widely used and promoted.

1 Introduction

The Dali Erhai Ecological Corridor project was successfully awarded the 2022 Landezine International Landscape Award. The project covers a landscape area of approximately 400,000 square meters and 30 kilometers of sewerage network, including more than 8,000 manhole covers. The Dali Erhai Ecological Corridor manhole covers beautification project has beautified 200 quadripartite manhole covers and 845 electric and sewage manhole covers. These manhole covers are on both sides of the pedestrian corridor and the visible part of the pedestrian path in the green area. The design is based on the characteristics of the environment, and the corresponding cultural content is selected. By combining spray-painting and aluminum painting to improve the ground landscape of the Dali Erhai Ecological Corridor, the project created a public art space that integrates with nature. Unlike other municipal constructions, the Erhai Ecological Corridor emphasizes the integration of ecology, cultural landscape and nature.

2 Methods and Materials

This study used the field survey method to research and investigate the area around the Erhai Lake, which was divided into two parts: firstly, to determine the number and type of manhole covers that need to be beautified; and secondly, to go deeper into the Erhai area to understand the local culture and environment. In addition, we combined practical research and design to explore the materials that need to be used for manhole covers to ensure their functionality, including wear-resistant features and warning features, as well as specific methods for beautification design. There are two main

methods, one is the production of cast bronze relief manhole covers and the other is the production of painted manhole covers.

3 Design content of the Dali Erhai Ecological Corridor manhole covers beautification project

Dali is a national historical and cultural city, and an important city in the development of tourism in Yunnan. In 2018, the Yunnan Provincial People's Government issued the policy of "to gradually build Dali into a central city in western Yunnan that drives regional development, an ecologically pleasant city with beautiful mountains and clear water, an international first-class tourist resort city, and a civilized and harmonious model city of ethnic unity" [1]. In 2022, the Dali Prefecture Government announced the developmental concept of "highlighting the overall value of Dali's history and culture and shaping the city's appearance and ethnic characteristics" [2]. In accordance with the policy and the concept, the cultural content of the Dali Erhai Ecological Corridor Project's manhole covers beautification was chosen to incorporate elements of the regional culture into the local culture and its connotations. For example, for the manhole covers adjacent to the sea, birds and fish from the Erhai region are chosen as the main themes; the selection of themes on both sides of the main road and green areas within the village area is based on regional ethnic culture, such as Bai Zharan patterns, embroidery patterns of the hereditary ethnic groups of Dali Prefecture, etc.; the Erhai introduction QR-codes are displayed in sections throughout the corridor. The details are as follows:

* Corresponding author: 765784698@qq.com

3.1 Ethnic cultural elements, traditional motifs of various ethnic groups in the Erhai region

Traditional ethnic motifs are an accumulation of ethnic and folk cultural beauty, with rich and heavy human emotions and intuitive culture. They express the aspirations for beauty and a celebration of life. In this section, the design creates ethnic illustrations in a modern painting language based on the habits of the hereditary ethnic groups living in villages in different areas around the Erhai Sea. The designers also use traditional cultural motifs from regional cultures such as the Bai culture on architecture, clothing and handicrafts as design sources. For example, the paper-cutting patterns come from the handicrafts of villagers living in villages in the Erhai region, the Bai ethnic people. They are good at cutting out the animals and plants according to their imagination, representing their aspiration for a better life. At the same time, this is also a reflection of the love of life and beautiful things about the people living in the Erhai area (Fig. 1).



Fig. 1. Application of Bai paper-cutting patterns in the Erhai region

3.2 Fauna and flora, birds and fishes of the Erhai region.

In recent years, Dali has continued to promote the protection of the Erhai lake and implement of ecological restoration projects (Fig. 2) [3]. The effective restoration of mudflats, wetlands and other areas of aquatic vegetation in the Erhai lake has provided a good habitat for waterfowl, while becoming an important wintering ground for migratory birds [4]. According to statistics, there are 18 orders, 42 families and 263 species of birds in Erhai area; 4 orders, 9 families and 28 species of amphibian reptiles; 4 orders, 7 families and 30 species of fishes [5], and 23 families, 38 genera and 52 species of aquatic vascular plants [6]. In order to better showcase the rich flora and fauna of the Erhai region, the design of these manhole covers includes the theme of the flora and fauna of the Erhai region.

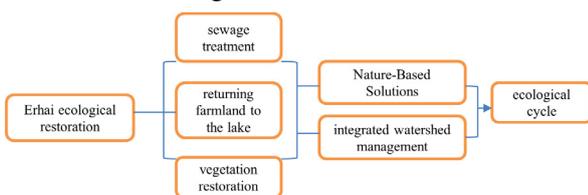


Fig. 2. Erhai Ecological restoration



Fig. 3. Application of flora and fauna motifs in the Erhai region

3.3 Eco-protection symbols from around the world;

The document *The 14th Five-Year Plan for Ecological and Environmental Protection in Dali Prefecture* shows that the environmental management of the Erhai lake has achieved good results, but will remain as an important work to continue to promote. In order to further implement the protection of the Erhai lake and to mobilize public awareness of protection, the ecological and environmental protection symbols of various countries around the world have been added to our design.

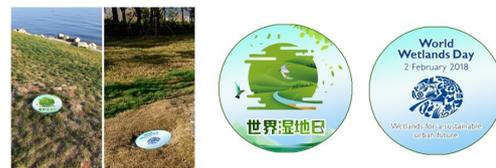


Fig. 4. Application of Eco-protection symbols from around the world

3.4 Erhai Ecological Corridor logo

The logo for the 'Erhai Ecological Corridor' incorporates the Three Pagodas, a landmark of Dali, and incorporates the geography and landscape of Dali in the design, which is a very representative design. As a result, the logo of the Erhai Ecological Corridor was also incorporated into the design of the manhole covers in shallow relief.



Fig. 5. Application of Erhai Ecological Corridor logo

3.5 Others

To enrich its design, the manhole covers also use other motifs with traditional Chinese cultural characteristics, including the 12 zodiac signs and the 24 solar terms. To further emphasize the inclusive and international nature of Dali's culture, we have also used iconic architectural and cultural motifs from around the world.



Fig. 6. Application of the patterns from 24 solar terms

4 Art forms for the Dali Erhai Ecological Corridor manhole covers beautification project

The main art forms used in the design of the Dali Erhai Ecological Corridor manhole covers include spray painting and light relief sculpture. The advantages of these two art forms are their functionality and aesthetics. Functionality means that the finished manhole covers produced in this way are resistant to abrasion and sunlight, as the manhole covers are placed on outdoor surfaces and need to be highly resistant. For aesthetics, because manhole covers are a form of public art, they are often designed for the general public and need to conform to their aesthetic inclinations. Therefore, the art form is realistic, beautiful and decorative. A rich artistic form is used to emphasize the diverse artistic language, and different artistic forms are used depending on the content of the design, these include the following.

Table 1. The art forms for the design of the Dali Erhai Ecological Corridor

S/N	Theme	Art Form	Style
1	ethnic motifs	spray painting	elegant
2	eco-signs from around the world	spray painting	decorative
3	patterns of Chinese festivals	spray painting	decorative
4	flora, fauna, birds and fish of the Erhai region	3D painting	realistic
5	the 24 solar terms	illustrations	elegant
6	logo of the Erhai Ecological Corridor	light relief	decorative
7	Dali landmark landscape and architecture	light relief	elegant
8	the twelve Chinese zodiac signs	bronze casting	realistic

5 The materials and craft of Dali Erhai Ecological Corridor manhole covers beautification project

At present, there are two types of manhole covers for the completed ecological corridor, namely cast iron manhole covers and concrete manhole covers. Electricity manhole covers, mobile manhole covers, inspection manhole covers and camera manhole covers are all distributed in the main road, pedestrian roads and the green areas on both sides, and there is no regular distribution of manhole covers. The manhole covers are mainly square and round in shape, with the diameter of round manhole

covers being 89cm, 84cm and 39.5cm respectively, and the size of square manhole covers being 49cm x 49cm, 60cm x 60cm and 80cm x 80cm respectively. Numerous scattered and protruding manhole covers are exposed to the ecological corridor environment in a disorderly manner, which has a negative impact on the overall appearance and aesthetics of the ecological corridor. Therefore, in the choice of craft, we used both cast bronze relief and colorful spray-painting. In addition to the highlights of the design patterns, the more aesthetic and wear-resistant copper and aluminum manhole covers were used in terms of material.

5.1 The craft of cast bronze relief manhole covers

The art of cast bronze relief sculpture is characterized by the ability to better express the artistic approach and aesthetic value through relative three-dimensional patterns, which are highly textured and have a long serve life. Cast bronze relief manhole covers and other cast sculptures are first shaped in clay, and then turned into a negative mould, which is then turned into a positive mould. This is actually a material conversion process, i.e. from plastic clay products to plaster and glass steel for shaping [7], and finally sent to a professional foundry for the final casting process. Each piece of bronze artwork is produced through a minimum of 11 complex and rigorous processes. These processes are a mixture of traditional craftsmanship and the modern technology in precision casting.

5.2 The craft of painted manhole covers

The main material used for the painting manhole covers is aluminum, fluorocarbon paint in rich colors and protective varnish, and the painting process is a combination of spraying and drawing [8]. Aluminum is light, rigid and strong, with good weather resistance and corrosion resistance. Fluorocarbon paint has excellent weather resistance, good corrosion resistance and hard paint film. It also has maintenance-free and self-cleaning properties. Its carbon coating has extremely low surface energy, so surface dust can be self-cleaned by rainwater [9]. It also has excellent hydrophobicity (maximum water absorption rate less than 5%) and extremely small friction coefficient (0.15-0.17) [10]. It does not stick to dust and stain and has good anti-fouling properties.

6 Conclusions

In China, many small cities lack planning in the early stages of construction. Most places do not have independently designed public spaces, or these spaces are designed earlier with functionality in mind and no consideration for aesthetics. Moreover, the design of public landscapes in small cities is faced with economic constraints and design difficulties. Therefore, optimisation and beautification are good solutions. The ultimate aim of public landscaping in small cities is to

create comfortable living spaces and to integrate nature and the environment into the city and people's lives, giving them a sense of beauty and driving the city's vitality. As one of the most livable cities in China, Dali's beautiful natural environment is already well recognized. The manhole covers beautification brings an artistic effect to the green landscape of the ecological corridor. The manhole covers beautification project for the Dali Erhai Ecological Corridor is therefore of relevance as a case study in the design of public landscapes in small cities. In terms of economic investment and public acceptance by the city, it has a wide application and promotion value.

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