

Evaluation of urban river landscape design rationality based on AHP

Qiao Lifang, Zhang Yichuan*, Cao Wei

School of Horticulture and Landscape Architecture, Henan Institute of Science and Technology, Xinxiang 453003, P. R. China

Abstract: An evaluation model for the rationality of the landscape design of urban rivers was established with the analytic hierarchy process (AHP) method so as to provide a foundation for updating the landscape design of urban rivers. The evaluation system was divided into four layers, including the target layer, the comprehensive layer, the element layer, and the index layer. Each layer was made of different indices. The evaluation standards for each index were also given in this paper. This evaluation model was proved tenable through its application to the landscape design rationality evaluation of the Weihe River in Xinxiang City of Henan Province. The results show that the water quality, space, activity, facility, community, width of vegetation, sense of beauty and water content are among the most influential factors and should be considered the main basis for evaluating the rationality of the landscape design of urban rivers.

Key words: *urban river; river landscape design; evaluation model; analytic hierarchy process*

DOI: 10.3882/j.issn.1674-2370.2008.04.008

1 Introduction

Rivers flowing through cities provide ecological benefits, including water supply, pollution control and biological protection (Chen et al. 2007); social benefits, including places for leisure, recreation and popular science education (Zhang et al. 2008); and economic benefits, including tourism and the increase of the valuation of neighboring land. Because of the public's preference for the river landscape (Wang 2007), rivers are the most attractive zones as well as the most active zones in cities (Zhang 2002). In recent years, most cities have begun to pay attention to the landscape design of urban rivers and tried not only to protect the ecological environment but also provide a place of recreation for the public. However, some problems have appeared during the landscape design, of which the most common is the damage to river ecosystems. Evaluating the rationality of the landscape design of urban rivers has become a burning issue.

Quantitative methods have the advantages of accuracy and ease of comparison. Therefore, it will be important to apply quantitative methods to the evaluation of the rationality of the landscape design of urban rivers. At present, most landscape planning and design methods rely on the experiences and subjective opinions of landscape architects, with low measurability. Many landscape characteristics of urban rivers have been highlighted, but many important

This work was supported by the Foundation for Excellent Young Teachers of Henan Institute of Science and Technology (Grant No. 200713) and the Scientific Research Foundation for Masters of the Henan Institute of Science and Technology (Grant No. 040132).

*Corresponding author (e-mail: zhangyichuan2002@163.com)

Received Jul. 17, 2008; accepted Nov. 28, 2008

elements have been neglected. For example, the cultural features have been highlighted, but the ecology has been neglected; or the ecology has been highlighted, while the amusement and leisure features have been neglected (Wang and Li 2003; Wang et al. 2008). Therefore, a unified standard should be established.

AHP, developed by Professor Saaty (1980, 1986, 1994) of Pittsburgh University in the 1980s, is a method by which a complicated problem may be resolved into some components in an orderly and relative hierarchy in order to determine the relative importance of each component through one-to-one calculation. It has the advantage of solving problems qualitatively and quantitatively, combining the experience and judgment of deciders into the model with quantitative treatment. AHP has already been applied in many fields, such as industrial controlling, engineering, economics, medicine and mining (Karadogan et al. 2001; Gershon et al. 1993; Bascetin 2004; Bascetin and Kesimal 1999a, 1999b; Toren 2002). Yamashita (2002) explored the visual evaluation of water landscapes with the photo-projective method (PPM), but the results were possibly erroneous when the photos were different, and this study paid more attention to the visual quality. Corresponding methods for river health evaluation have been put forward. These methods have conformed to the urban river's functional characteristics by considering the social indicators, but the indicators have still not been comprehensive, and the evaluation methods have not reflected the real situation when all indicators were considered equally important (Cai and Hu 2008). However, no report on the application of AHP to the establishment of an evaluation model for landscape design of urban rivers has been made. Based on the uniform standard, a landscape comparison can be made between different rivers and between different works on the same river.

2 Method

Index weight values of modification factors were determined using AHP. This method is a systematic and hierarchical combination of qualitative and quantitative analysis. People often use it to find the weights of multiple targets within the overall goal or the weights of multiple factors linked to multiple goals. When band structure forms among multiple targets and multiple factors, we use AHP to calculate the weight of one goal or factor in one layer to those of superior layer. Thus, we can find the weights of the overall goal (Zhang et al. 2005). Twenty questionnaires were handed out (17 recalled) to experts on landscape planning of Henan Agriculture University, Henan University of Science & Technology, Henan Institute of Science & Technology, and Zhengzhou University to determine the relative importance of each criterion. These experts, all between the ages of 40 to 60 years old, have long-term and rich experience in teaching, research and practice of water landscape planning and design, and all of them have managed large-scale river landscape planning and design directly. In case study, this method was applied to the landscape design rationality evaluation of the Weihe River in Xinxiang City of Henan Province, and the rational proposals for the Weihe River's landscape renewal were put forward based on the evaluation results.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات