

Article One : Critical Review Article

(Critically analyze the process of innovation in others and be able to negotiate complex partnerships)

Critically Analyze and Review CES (Cultural Ecosystem Services) Research

1 Introduction

CES, short for Cultural Ecosystem Services, is non-material advantages humans derive from environment. It has gained lots of attentions by scholars, because of its beneficial impact on human wellbeing (Milcu et al., 2013), and many scholars have studied CES and their evaluation methods for decades (Katz-Gerro and Orenstein, 2015; Milcu et al., 2013).

However, it still exists research gap and imperfect, especially in the CES evaluation method, that is collaboration between researchers and participants. This paper will carry out critical analysis and review of CES articles from recent years in categories, CES evaluation method (from perspective of partnerships between researchers and participants), and CES research area.

Through literature review and critically analyze, I have identified gaps and imperfections in this research area, which provide suggestions for my future CES evaluation research.

2 Critical analyse of CES evaluation research

2.1 Introduction to CES (include concept and the importance of CES assessment)

The concept of Cultural Ecosystem Services (CES), which is defined by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2023), includes non-material advantages humans derive from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience. CES include spirit, aesthetics, leisure tourism, artistic inspiration, local identity, cultural heritage, education, social relations and negative values, it is normally considered to represent non-material links between people and ecosystems (MEA, 2005; Cheng et al., 2019; Haines-Young and Potschin, 2018;). Among them, cultural services such as aesthetics, recreation, education, culture, and sense of place identity are important indicators demanded by the public (Wallace, 2007; Chan et al., 2012), and they are also an important part of the characterization and vitality of urban green spaces.

Enhancing the CES of urban spaces is not only a crucial element of human well-being, but also plays an significant role in enhancing the quality of urban life (Depietri et al., 2021). CES has been studied in over 30 nations, which confirms their scientific value and suggests that they are positively associated with human well-being (Sharma et al., 2022). Despite the assessment for CES have methodological difficulties, It serves as a link between the natural world, cultural norms, physical and mental health, and group decision-making, all of which have an impact on the ecosystem and the well-being of humans (Hirons et al., 2016). Therefore, research on the CES assessment have academical value and practical significance.

2.2 CES categories

2.2.1 Classification of CES categories

The classification of categories for cultural ecosystem service (CES) originated with Daily and Costanza (1997), and later dozens of scholars, such as De Groot, Brown, Plieninger, and others, had studied the system of CES indicators (Dai et al., 2019).

The most scientific classification of CES currently available is from the MEA 2005 and TEEB 2010. According to which, the classification of CES categories include Aesthetic values, Recreation and ecotourism, Sense of place, Educational value, Cultural heritage, Exercise value, Inspiration, Spiritual and religious values, and Social relations. Their definitions are shown in Table 1.

Among the CES indicators, aesthetic value is the most easily perceived, especially in lakes, forests, parks and mountain landscapes. Aesthetic value, which is often quantitatively assessed through perceptual survey methods based on landscape characteristics, such as preference scales, beauty models, and choice experiments (You et al., 2017). Similar techniques are used to measure spiritual and religious values,

inspiration, social relation, and sense of place(Vaz et al.,2018;Ko & Son,2018).Currently, questionnaires are usually used for assessing recreation and ecotourism values,and with the support of GIS, recreational mapping studies have also been developed, taking into account participant preferences(Dai et al.,2019) .

Table 1 Classification and definition for CES categories
(adopted from MEA 2005 and TEEB 2010)

CES categories	Definition
Aesthetic values	People are attracted to the area's environment, which allows them to feel nature's beauty and enjoy a pleasant visual experience.
Recreation and ecotourism	People usually choose where to spend their relaxation time based on the characteristics of the natural or cultivated landscapes in a particular area.
Sense of place	The public has a sense of affection and identification with a particular scene.Many people cherish the sense of place' associated with recognised qualities of their area.
Educational value	The area offers knowledge and educational opportunities to the general public.
Cultural heritage	The area has historical and cultural significance due to the existence of culturally valuable species or historically significant landscapes.
Exercise value	The area might offer space for individuals to enjoy sports and exercise.
Inspiration	Places can stimulate people's artistic creativity and inspiration,deliver a rich source of inspiration for art,folklore,architecture,and advertising etc.
Spiritual and religious values	Places can provide spiritual, religious and other activity-related values.
Social relations	Areas provide places for social interaction between people.

2.2.2 CES categories in current studies

According to Sharma et al., (2022), current research is highly irregular in the evaluation of CES categories. Most of the articles assessed recreational and ecotourism and aesthetic value services. Which is followed by educational values, spiritual and religious values and cultural heritage. Inspiration, culture, sense of place, and social relations received the least attention, and few articles focused on the multidimensional category of CES .

Similarly, Romanazzi et al.,(2023) combed and reviewed the last 5 years (2019-2023) of CES evaluation articles,and reported the evaluation of CES categories in the review studies. They pointed out , the evaluation of CES categories was highly irregular, with most publications concentrating on Recreation and ecotourism, and aesthetic value services,with limited comprehensive and holistic assessments of CES (Romanazzi et al.,2023).This limitation makes it difficult to derive design guidelines from evaluation results to guide practice.

2.3 Critical analyse of CES evaluation methods (from perspective of partnerships between researchers and participates)

The current CES assessment methods can be summarised as follows: Monetary evaluation methods , Non-monetary evaluation methods (including quantitative, qualitative and social learning methods).Among them, monetary method has become less popular among academics in recent years,because of its evident shortcomings.The following describes these methods and analyses their benefits and drawbacks.

2.3.1 Monetary evaluation method

Seven monetary evaluation methods were identified by scholars (Cheng et al., 2019; Romanazzi et al., 2023), including market price, travel cost, hedonic pricing, value transfer, deliberative evaluation, contingent evaluation and choice experiment.

Though this approach was formerly thought to be one of the primary methods for CES assessment (Hirons et al., 2016), only a few of recent CES research used it to evaluate the value of cultural services (Yang & Cao, 2022). This is mainly because it has obvious drawbacks: on the one hand, the Monetary methods have a much narrower research scope and fewer services can be evaluated. In contrast, non-monetary evaluation methods, such as participant mapping, interviews, and questionnaires, are extensive and effective in evaluating nearly all CES (Márquez et al., 2023); On the other hand, Monetary methods are unable to evaluate the preferences and emotional attitudes of participants to CES, and also difficult to reflect their demand.

However, This gap can be filled with non-monetary evaluation methods (Sharma et al., 2022). Specifically, some qualitative methods can facilitate communication between the researcher and the participants and make it easier to understand their viewpoints.

2.3.2 Non-monetary evaluation method

Non-monetary approaches have gained more attention recently, due to the drawbacks and challenges of monetary approaches, especially when the situation is complex and not all CES can be evaluated in monetary method (Cristetal., 2012). This article will present 10 CES evaluation methods combined with their innovations and drawbacks.

(1) Observation, this method is used for researchers to examine human action and behaviour to reflect CES social value. For example, Xin et al., (2020) proposed a triangulation method to assess social relations in Chinese urban parks through observation, questionnaires and interviews.

Although observation is a common research method in the social sciences, which allows the researcher to directly observe behaviour of research subject in natural environment. It has obvious drawbacks such as subjectivity, inability to infer causality, time and resource consumption, difficulty in replicating the same environment and other disadvantages. It has not been discovered that any article uses only observational method for CES measurement; instead, they typically combine it with other approaches. Therefore, CES evaluation studies should be conducted in conjunction with other methods to complement and validate the observed data.

(2) Social media-based method, This method is a relatively new method via web platforms (Czembrowski et al., 2016). CES are assessed using social media data. Grzyb and Kulczyk (2023), for instance, used social media crowdsourcing data to evaluate factors affecting recreation and ecotourism along the urban river. Mouttaki et al. (2022) classified and mapped cultural ecosystem services using artificial intelligence and social media data from Flickr images.

With the usage of Social media-based method, CES research has gained a new source of data and has also contributed to the rapid growth of research in the field in recent years (Richards & Friess, 2015). Crowdsourcing has innovations and advantages of being fast, large-scale, low-cost, and efficient compared to traditional surveys. However, Social media-based method still face lots of challenges in methodological and theoretical issues, for instance, sample representation, data availability and ethical issue. Meanwhile, Many recent research are restricted to certain issues of unrelated case sites or data processing approaches (Zhang et al., 2022). Therefore, Future studies on CES need to incorporate additional theoretical viewpoints and a variety of data sources.

(3) The 'document method' estimates CES values from certain individuals or groups by analyzing texts, images, or other forms of materials (Scholte et al., 2015). For instance, Zhang et al., (2022) explored the relationship between CES perceived by youth and older adults and the spatial context of urban park ecosystem landscapes using the document method based on value-labelled photographs fed back after a self-drive tour of the Runflower Creek Urban Forest Park in Chengdu, China.

While the documentation method in CES assessment research has several benefits, including low cost, extensive data time range, and rich data diversity, it also has drawbacks, including potential bias, delayed data updating, and challenges with data interpretation.

(4) Questionnaire, researchers used the questionnaire method to set up a set of questions about each of the CES services, which was used to collect information from the participants about their CES evaluation. For example, a Likert scale can be used to evaluate the aesthetic value of CES. For instance, Gai et al., (2023) studied public perceptions of CES in urban parks through importance-performance analysis based on a

questionnaire survey, in order to provide guidance for the construction and optimisation of parks in high-density urban centres.

Cheng et al., (2022) combined questionnaire, participatory mapping, and interviews to assess the CES of an urban park in China, including recreational, ecotourism, and aesthetic values. They pointed out that participants found it challenging to understand the meaning of CES if only the questionnaire was used, but that when interviews and participatory mapping were combined, participants found it will be easier to understand. Furthermore, the use of pre-formulated questions in surveys may distort participants' perception.

The questionnaire method's benefits include its effectiveness, low cost, and capacity to gather information rapidly from a large number of participants. This approach makes data uniform and standardised and makes statistical analysis easier. However, because the standardised questions restrict participants' freedom to express their individual thoughts, it might fail to produce comprehensive qualitative data. Therefore, CES evaluation studies should be conducted in conjunction with other methods to complement the questionnaire data.

(5) Interview, In the interview method, the researcher will learn more directly and in-depth about the participants' evaluation of the various services of CES through face-to-face interaction with them, and the interviewees are allowed to talk freely about their feelings and thoughts. For example, Cheng et al. (2021) conducted a CES assessment in Los Angeles to examine the relationship between landscape character and CES, aiming to apply CES assessment to landscape design practice. Teff-Seker and Orenstein DE (2019) evaluated CES in dryland ecosystems using a novel method called the Walking Focused Interview. During these interviews, the researcher focuses on specific aspects of the participants' physical, psychological, and cognitive experiences while they are encouraged to wander in a natural desert landscape. They pointed out that this approach is more useful than a single interview for gathering data about people's general experiences to nature.

Compared to other data collection approaches in CES research, interviews offer distinct advantages, including interactivity, detailed recording, flexibility, and in-depth information exploitation. Interviews might have disadvantages, just like any other research methods, for instance, time-consuming, small scale study and subjective bias (Alshenqeeti et al., 2014). Therefore, researchers might use the interview method combined with other methods to make up for its drawbacks, such as the fact that participant subjectivity affects interview data.

(6) Focus groups, the method offers participants the chance to learn more and provides time for group reactions and discussion (Cheng et al., 2019). The purpose of the focus group is to observe how people interact and how a group develops conversation on the topic of CES, rather than to collect individual ideas or thoughts. For instance, Ki'ci'c et al. (2022) used focusing group combining participatory mapping to study public perceptions of CES provided by green infrastructure in cities, the CES categories involved in this research including sense of place, aesthetic, cultural diversity, recreation and ecotourism, educational.

Focus groups have both advantages and shortcomings in CES research. On one hand, focus groups are an excellent way for CES research. It offers a method of gaining access to individual and group perspectives, meanings, and values—all of which are very important when researching CES. On the other hand, focus groups research on CES is potentially impacted by its inadequate research methodology and reporting (Slovák et al., 2023).

(7) Expert-based method, This method assesses CES indications and offers professional recommendations by applying the knowledge and experience of specialists. For example, Gosal et al. (2019) used social media and expert-based methods from a cultural ecosystem services (CES) perspective, assessed the relationship between the use of the Camargue delta and the presence of natural elements by consulting local managers.

The expert-based method, often employed in specialized fields of study or industries, carries both significant advantages, like in-depth expertise, efficiency, flexibility and some limitations, for instance, subjectivity and bias, money-cost, potential for over-reliance.

(8) Narrative, Narrative method is a way in which the researcher captures CES information through participants' storytelling and scene descriptions. Narratives can be analysed to evaluate the sense of place. Kim and Son (2021) assessed and mapped cultural ecosystem services of an urban forest from blog posts, is an example based on narrative method.

The use of narrative method in CES evaluation study has both important benefits and drawbacks. On the one hand, it may capture in-depth narratives and personal experiences, which helps to fully comprehend the significance of data. On the other hand, it may be subjectively biased, because of its depending entirely on individual telling stories (Bell, 2002).

(9) Participatory mapping, Maps of CES are created by combining participatory techniques with contemporary cartography tools. For instance, participants may be asked to show their perception of the CES on a map. Cheng et al. (2022) studied how park renovations affect CES by developing a participatory mapping combined with interview methods, in which participants were required to assess CES on both current and historical maps. According to Cheng, it is appropriate to combine participatory mapping with other techniques like interviews and questionnaires in CES assessment research.

(10) Participatory GIS (PGIS), Participatory mapping methods are combined with geographic information systems (GIS). Santarém et al. (2021) used GIS technique to assess and prioritize of cultural ecosystem services in the Sahara-Sahelian region, in order to provide recommendations for upgrading cultural ecosystem services in these countries.

In CES evaluation studies, Participatory mapping and the PGIS method have similar innovations and drawbacks. While it can encourage public involvement in the geographical decision-making process, it requires significant resources in personnel, time, and finance, and participant skill and the technology used would have an impact on the data's accuracy.

In conclusion, the literature review revealed that quantitative studies account for a significantly greater percentage of current measures of CES than qualitative studies. Nevertheless, a major drawback of quantitative approaches is that they are unable to accurately capture users' true emotions and perceptions of the surroundings, as well as the true outcomes of evaluations; qualitative approaches can compensate for this shortcoming. Furthermore, there are certain limitations to using a single method to evaluate CES, instead, a variety of method combinations should be used, together with multi-party data validation, to improve the reliability of the results.

2.4 Research area of CES

In terms of research area, the study area of the CES assessment mostly were coastal area, historic garden, urban parks, natural reserve, forest, urban green space, villages and national parks, with few study targeting on urban waterfront spaces, rural, wetland and desert (Romanazzi et al., 2023).

3 Conclusion

In conclusion, through the literature review and critical analysis of the CES articles, we found that there exist a number of issues relating to current CES evaluation research.

Firstly, current research is highly irregular in the evaluation of CES categories. Most of the articles assessed recreational and ecotourism and aesthetic value services. Inspiration, culture, sense of place, and social relations received the least attention. So future studies should focus more on other CES subcategories, especially those that are significantly less evaluated.

Secondly, few current articles focused on the multidimensional category of CES. Some researchers use one category to represent CES as a whole and ignore all other categories. However, because categories are interrelated, a comprehensive evaluation of CES must consider multidimensional categories to determine its total value.

Thirdly, more combination of methods should be used in the evaluation process, especially in the urban green space. The use of a single method for assessing the CES has certain drawbacks, to make up for these, a combination of methods and multiple data validation should be used, with the aim of making the study's conclusions more scientific.

Therefore, in my future research, I will carry out a comprehensive evaluation of CES in urban waterfront spaces, combining multiple measurement methods (semi-structured interview combined with questionnaire as main data collection methods) and exploring the relationship between environmental factors and the CES evaluation results, and finally construct a CES evaluation theoretical model for urban waterfront space.

Reference

- Márquez, L. A. M., Rezende, E. C. N., Machado, K. B., do Nascimento, E. L. M., Castro, J. D. A. B., & Nabout, J. C. (2023). Trends in valuation approaches for cultural ecosystem services: A systematic literature review. *Ecosystem Services*, 64, 101572.
- Yang, L., & Cao, K. (2022). Cultural ecosystem services research progress and future prospects: A review. *Sustainability*, 14(19), 11845.
- Hirons, M.; Combetti, C.; Dunford, R. (2016). Valuing Cultural Ecosystem Services. *Annu. Rev. Environ. Resour.* 41, 545–574.

- Sharma, S., Hussain, S., & Singh, A. N. (2022). Evaluation methods for cultural ecosystem services: A systematic. *Proceedings of the International Academy of Ecology and Environmental Sciences*, 12(3), 194-210.
- Scholte, S.S.K., van Teeffelen, A.J.A., Verburg, P.H., (2015). Integrating socio-cultural perspectives into ecosystem service valuation: a review of concepts and methods. *Ecol. Econ.* 114, 67–78.
- Cheng, X., Van Damme, S., Li, L., & Uyttenhove, P. (2019). Evaluation of cultural ecosystem services: A review of methods. *Ecosystem services*, 37, 100925.
- Czembrowski, P., Kronenberg, J., Czepkiewicz, M. (2016). Integrating non-monetary and monetary valuation methods – SoftGIS and hedonic pricing. *Ecol. Econ.* 130, 166–175.
- Xin, C., Luyuan, L., & Pieter, U. (2020). Taking “social relations” as a cultural ecosystem service: A triangulation approach. *Urban forestry & urban greening*, 55, 126790.
- Mouttaki, I., Bagdanavičiūtė, I., Maanan, M., Erraiss, M., Rhinane, H., & Maanan, M. (2022). Classifying and mapping cultural ecosystem services using artificial intelligence and social media data. *Wetlands*, 42(7), 86.
- Grzyb, T., & Kulczyk, S. (2023). How do ephemeral factors shape recreation along the urban river? A social media perspective. *Landscape and Urban Planning*, 230, 104638.
- Zhang, K., Tang, X., Zhao, Y., Huang, B., Huang, L., Liu, M., ... & Wan, J. (2022). Differing perceptions of the youth and the elderly regarding cultural ecosystem services in urban parks: An exploration of the tour experience. *Science of The Total Environment*, 821, 153388.
- Gai, S., Fu, J., Rong, X., & Dai, L. (2023). Importance–performance analysis and improvement of an urban park’s cultural ecosystem services based on users’ perspectives: A Beijing case study. *Journal of Asian Architecture and Building Engineering*, 22(2), 726-739.
- Cheng, X., Van Damme, S., Li, L., Uyttenhove, P.(2022). Cultural ecosystem services in an urban park: understanding bundles, trade-offs, and synergies. *Landsc. Ecol.* 37, 1693–1705.
<https://doi.org/10.1007/s10980-022-01434-8>.
- Teff-Seker Y, Orenstein DE. (2019) . The 'desert experience': Evaluating the cultural ecosystem services of drylands through walking and focusing. *People and Nature*, 1(2): 234-248?
- Cheng, X., Van Damme, S., & Uyttenhove, P. (2021). Applying the evaluation of cultural ecosystem services in landscape architecture design: Challenges and opportunities. *Land*, 10(7), 665.
- Kičić, M., Haase, D., Marin, A. M., Vuletić, D., & Ostoić, S. K. (2022). Perceptions of cultural ecosystem services of tree-based green infrastructure: A focus group participatory mapping in Zagreb, Croatia. *Urban Forestry & Urban Greening*, 78, 127767.
- Gosal, A. S., Geijzendorffer, I. R., Václavík, T., Poulin, B., & Ziv, G. (2019). Using social media, machine learning and natural language processing to map multiple recreational beneficiaries. *Ecosystem Services*, 38, 100958.
- Romanazzi, G. R., Koto, R., De Boni, A., Palmisano, G. O., Cioffi, M., & Roma, R. (2023). Cultural ecosystem services: A review of methods and tools for economic evaluation. *Environmental and Sustainability Indicators*, 100304
- Kim, J., & Son, Y. (2021). Assessing and mapping cultural ecosystem services of an urban forest based on narratives from blog posts. *Ecological Indicators*, 129, 107983.
- Cheng, X., Van Damme, S., & Uyttenhove, P. (2022). Assessing the Impact of Park Renovations on Cultural Ecosystem Services. *Land*, 11(5), 610.
- Santarem, F., Saarinen, J., & Brito, J. C. (2021). Assessment and prioritization of cultural ecosystem services in the Sahara-Sahelian region. *Science of The Total Environment*, 777, 146053.
- Sharma, S., Hussain, S., & Singh, A. N. (2022). Evaluation methods for cultural ecosystem services: A systematic. *Proceedings of the International Academy of Ecology and Environmental Sciences*, 12(3), 194-210.
- Hirons M, Comberty C, Dunford R. 2016. Valuing cultural ecosystem services. *Annual Review of Environment and Resources*, 41: 545-574
- Vaz, A. S., Castro-Díez, P., Godoy, O., Alonso, Á., Vilà, M., Saldaña, A., ... & Honrado, J. P. (2018). An indicator-based approach to analyse the effects of non-native tree species on multiple cultural ecosystem services. *Ecological Indicators*, 85, 48-56.
- Ko, H., & Son, Y. (2018). Perceptions of cultural ecosystem services in urban green spaces: A case study in Gwacheon, Republic of Korea. *Ecological indicators*, 91, 299-306.
- You, W., Ji, Z., Wu, L., Deng, X., Huang, D., Chen, B., & He, D. (2017). Modeling changes in land use patterns and ecosystem services to explore a potential solution for meeting the management needs of a heritage site at the landscape level. *Ecological indicators*, 73, 68-78.
- MEA. 2005. Millennium Ecosystem Assessment: Ecosystems and Human Well-being Synthesis. Island Press, Washington DC, USA
- TEEB. 2010. The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB. London, UK
- Cheng, X., Van Damme, S., Li, L., Uyttenhove, P.(2019). Evaluation of cultural ecosystem

- services: A review of methods. *Ecosyst. Serv.* 37, 100925. <https://doi.org/10.1016/j.ecoser.2019.100925>.
- Haines-Young, R., Potschin, M. (2018). Common International Classification of Ecosystem Services (CICES) V5.1. Guidance on the Application of the Revised Structure. Fabis Consulting Ltd., Nottingham, UK.
- Chan, K. M. A., Satterfield, T., & Goldstein J. (2012). Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics*, (74), 8- 18. <https://doi.org/10.1016/j.ecolecon.2011.11.011>
- Wallace, K. J. (2007). Classification of ecosystem services: Problems and solutions. *Biological Conservation*, 139(3), 235- 246. <https://doi.org/10.1016/j.biocon.2007.07.015>
- Katz-Gerro, T., & Orenstein, D. E. (2015). Environmental tastes, opinions and behaviors: social sciences in the service of cultural ecosystem service assessment. *Ecology and Society*, 20(3).
- Milcu, A. I., Hanspach, J., Abson, D., & Fischer, J. (2013). Cultural ecosystem services: a literature review and prospects for future research. *Ecology and society*, 18(3).
- Slovák, Ľ., Daněk, J., & Daněk, T. (2023). The use of focus groups in cultural ecosystem services research: a systematic review. *Humanities and Social Sciences Communications*, 10(1), 1-13.
- Zhang, H., Huang, R., Zhang, Y., & Buhalis, D. (2022). Cultural ecosystem services evaluation using geolocated social media data: A review. *Tourism Geographies*, 24(4-5), 646-668.
- Richards, D. R., & Friess, D. A. (2015). A rapid indicator of cultural ecosystem service usage at a fine spatial scale: Content analysis of social media photographs. *Ecological Indicators*, 53, 187-195.
- Alshenqeti, H. (2014). Interviewing as a data collection method: A critical review. *English linguistics research*, 3(1), 39-45.
- Bell, J. S. (2002). Narrative inquiry: More than just telling stories. *TESOL quarterly*, 36(2), 207-213.
- Dai, P.C., Zhang, Z.L., Liu, R., & Yang, Y.J. (2019). Advances in Ecosystem Cultural Services Research - Based on Web of Science Analyses. *Acta Ecologica sinica*, 2019, 39(5) : 1863-1875.

For this part , I combine Article Two with Article Three into one article.

Article Two :Public Engagement Article

(Take responsibility for planning and developing an innovative approach within a partnership or collaborative team environment.)

What Influences the Recreational Attractiveness of Urban Mountain Parks?

Abstract: Although urban mountain parks are vital for public green leisure and recreational resources, their recreational value is underdeveloped, affecting the public's recreational experience. This study aims to explore what factors influence the recreational attractiveness of urban mountain parks, and provide enhancement recommendations and narrow research gap for recreational attraction. This study was carried out empirical study and establishes structural equation modelling based on a tourist survey. We found that seven factors—tourism transport, excursion services, tourism safety, integrated management, environmental resource protection, landscape resource value, and market impact—all contribute positively to enhancing the recreational attractiveness of urban mountain parks. In the overall influence of the seven factors on recreational attractiveness, environmental resource protection was the highest, followed by landscape resource value. Furthermore, these seven influence factors were interrelated, among which the impact coefficients of environmental resource protection on market influence and landscape resource value are relatively high.

Keywords: China's national A-class scenic spot assessment standards; urban mountain parks; recreational attractiveness; structural equation modelling

1. Introduction

Urban mountain parks are becoming important places for green leisure and recreation for residents in numerous Chinese cities (Zhang et al., 2020). Compared with traditional urban parks, mountain parks have unique features, such as rich terrain variations, varied spatial forms, unique ecological resources, rich landscape elements, and microclimatic variations, which make them rich in ecological services, such as aesthetics, ecology, science, education, and recreational value. Nevertheless, compared with urban green spaces located in flat areas, current Chinese park construction norms are incomplete in terms of construction guidance and indicators for mountain parks. In many urban mountain spaces, problems exist such as unclear leisure service management functions, underutilisation of landscape resources, and unreasonable provision of leisure space, which restrict the recreational value of mountain parks, and fail to satisfy the public's recreational demand for mountainous green spaces (Zhang et al., 2020).

Recreational attractiveness refers to an invisible factor that allows recreationists to choose recreational areas and modes based on the richness of the recreational resources (Mao, 2017); it is also an important indicator of the quality of destination recreation. The greater a place's recreational attractiveness, the more it can attract the interest of tourists.

Different aspects of leisure attraction have been considered by researchers, for instance, research models, objects, and perspectives, but the innovation aspect of this research is to assess the factors affecting urban mountain parks using structural equation modelling and to offer management recommendations, which have been less studied, especially based on China's national A-class scenic spot assessment standards. Firstly, in terms of research models, most scholars explain the components of recreational attractiveness and conduct evaluation studies by constructing a 'push-pull resistance' model (Yousefi & Marzuki, 2015; Kresic & Prebezac, 2011; Li & Cao, 2022; Yun, 2021; Gary & Nina, 2003). Although the 'push-pull resistance' model has different levels of indicators, it is unable to take into account the connections between these indications. However, structural equation modelling (SEM) not only obtains the weights of the indicators at each level and evaluates the object of study, but also analyses the relationship between the indicators, which is a more comprehensive research method than push-pull resistance modelling. In addition, SEM, as opposed to general regression and factor analysis, is better able to control measurement error, deal with multiple variables simultaneously, and construct complex multivariate models (Wang et al., 2020; Cheng, 2022). This study examines both the factors influencing recreational attractiveness and the relationship between the factors; therefore, SEM is chosen to conduct the analysis. Secondly, in terms of the research object of leisure attractiveness, scholars mainly focus on the evaluation of rural attractiveness (Hakuć-Błażowska & Kupren, 2022; Lo, 2019), tourism attractiveness of forest landscapes (Alessandro, 2022; Sapozhnikov, 1985; Kirshbaum et al., ; Khamitov et al., 2021), tourism attractiveness of cultural landscapes (Asadov et al., 2022), recreational value assessment of waterfront landscapes (Ozgeldinova et al., 2022; Rzetala, 2016; Mukayev et al., 2020), and universal urban parks (Mao et al., 2022; Voigt et al., 2014; Zhang & Zhou, 2018; Yang et al., 2021; Li et al., 2021). There is little research on the influence mechanisms of recreational attractiveness in mountain parks, although they have great recreational value and potential for research. Compared with urban parks with flat terrain, urban mountain parks have large terrain undulations and special ecological resources. Research on the effect of the recreational attractiveness of ordinary urban parks is not fully applicable to urban mountain parks. Thirdly, there are various research perspectives on recreational attractiveness, such as the perspective of local attachment (Cheng et al., 2013; Lam & Ryan, 2021; Sulkaishi & Siska, 2021), tourism experience (Raimkulov et al., 2021), and tourist perceptions (Petrosillo et al., 2007; Kim et al., 2020; Yin, 2020). However, there is a lack of research considering recreational attractiveness in relation to China's national A-class scenic spot assessment standards to examine the influencing mechanisms of recreational attractiveness.

China's national A-class scenic spot assessment standard is a criterion used by China's cultural and tourism sectors to judge the recreational attraction of scenic spots. It focuses on elements of service, landscape quality, and visitor experience. In recent years, many urban parks in China have declared and successfully created national A-class tourist attractions. In urban mountain parks, bridging national A-grade tourist spots play a significant role in enhancing recreational attractions.

What factors affect the recreational attractiveness of urban mountain parks under the guidelines of China's national A-class scenic spot assessment standard, and is there any interaction between these factors? All these factors need to be confirmed through empirical research.

Therefore, this study relies on the resource background of the mountain environment in Fuzhou Fudao Park, under the guidance of the national A-class scenic spot assessment standard, develops an SEM of leisure attraction and scientifically assesses the ability of mountain parks to provide leisure services to the public, and explores the factors that affect the attractiveness of leisure to provide theoretical support for the optimisation and management of urban mountain parks.

2. Materials and Methods

2.1. Study Sites

The site of this study, Fudao Park, is located in the main urbanised area of Fuzhou City, China, that is, the western area of Gulou District, Fuzhou City, on the east bank of the Minjiang River, with the highest elevation at 169.7 m above sea level. The park contains three areas, namely Jinniu Mountain Sports Park, Jinniu Mountain Park, and Meifeng Mountain Park, with a total area of about 1.34 square kilometers. Figure 1 shows its location. Fudao Park is the first mountain sponge park in Fuzhou, with China's first suspended steel-framed urban forest trestle — Fudao. The total length of Fudao is about 19 kilometres, connecting Xihu Park's lakeside trestle in the east and Minjiang Park (Guoguang section) in the west. It is a civic fitness and leisure corridor connecting 'City-Lake-Mountain-River' in the centre of the city, linking the landscape pattern of Fuzhou city.

Fudao Park is an urban mountain park integrating natural and humanistic landscapes, mountain recreation, ecological conservation, and forest recreation. It meets the public's demand for recreation in mountainous green spaces. Therefore, it is typical and representative research.

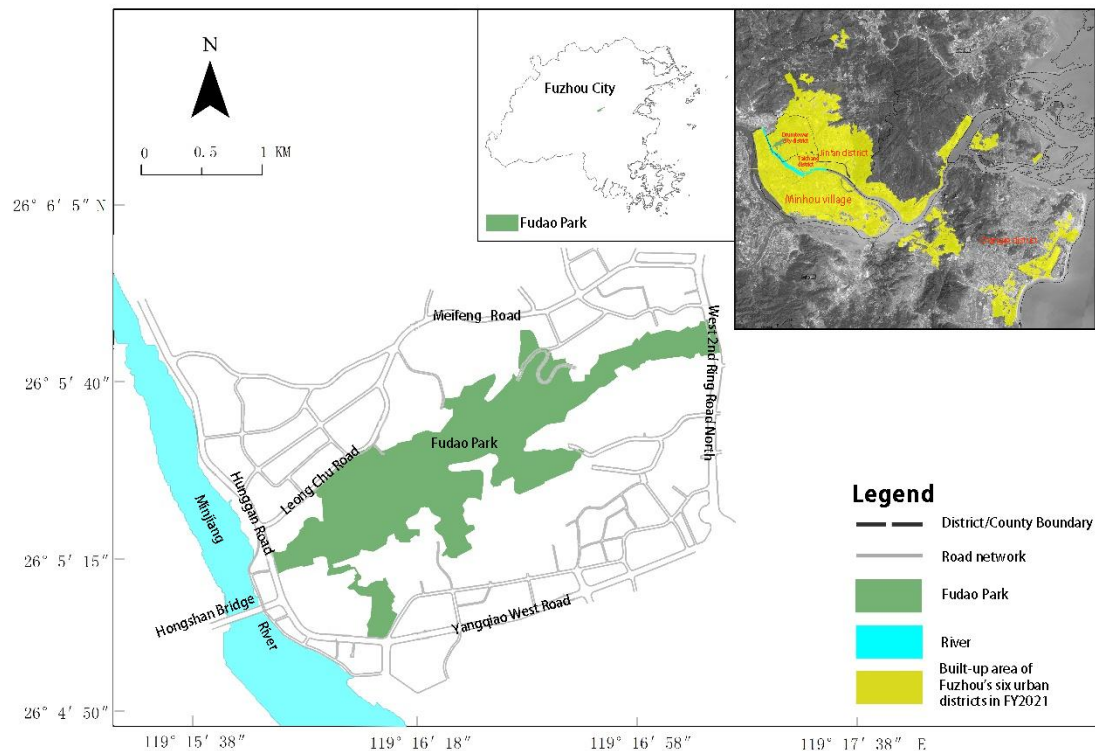


Figure 1. Location Map of Fudao Park

2.2. Methods

This study uses SEM to investigate the factors influencing recreational attractiveness. SEM is a multivariate statistical method for analysing relationships between variables and testing the consistency of theoretical models with research data. It not only obtains the weight of indicators at each level for the research object but also analyses the relationship between indicators at each level. In addition, it is capable

of controlling measurement errors and handling multiple variables simultaneously, and constructing complex multivariate models (Wang et al., 2020; Cheng, 2022).

2.2.1. Study Questionnaire Design

The research questionnaire that we developed is divided into two parts. The first part consists of questions on demographic characteristics, including gender, occupation, the visitors' current residence, and the number of times they have visited Fudao. The second part includes structured questions and semi-structured subjective questions.

The sections of structured questions contain eight modules, namely, tourism transport, excursion services, tourism safety, integrated management, environmental resource protection, landscape resource value, market influence, and recreational attractiveness, with a total of 31 items (as shown in Table 1). In order to acquire participants' personal subjective suggestions and feelings regarding Fudao Park as well as supplement the structured question items. There is a qualitative section in the questionnaire— a subjective and semi-structured question —that is, 'What recommendations do you have to raise visitors' experiences at Fudao Park?'

The content of the second part of this questionnaire was established through a series of processes, including taking the current China's national standard assessment rules of 'Quality Rating and Classification of Tourist Scenic Spots' as the main framework and reviewing a large amount of literature related to leisure attraction (Kanwal et al., 2020; Cong et al., 2023; Neffi et al., 2021; Ding & Wu, 2022; Al-Ababneh, 2013; Cheng, 2021; Mao et al., 2022; Grigaliunaite & Pileliene, 2019; Rajesh, 2013), combined with the physical situation of the sample site, Fudao Park. Furthermore, this research also invited six experts specialising in tourism and landscape architecture and conducted focus groups to discuss and compile the questionnaire.

The questionnaire was scored on a 7-point Likert scale for all 31 items, except for tourists' personal information and one subjective item, and the level of agreement was expressed on a scale of 1 to 7. A score of 1 represents strongly disagreeing, 2 is somewhat disagreeing, and so on, with 7 being strongly agreeing. The score for each module is the average of the scores for each question in that module.

2.2.2. Data Collection

The questionnaire survey team consisted of four people, and the research participants were tourists visiting Fudao Park. The time chosen for the survey was March–April, in the spring season with a pleasant climate in Fuzhou, which can prevent interference from thermal comfort factors. For this survey, 609 questionnaires were distributed and returned, with a recovery rate of 100%. After screening, 55 invalid questionnaires were excluded and 554 valid questionnaires were used, with a validity rate of 91%.

2.2.3. Research Hypotheses

This study proposes seven factors affecting recreational attractiveness based on China's national A-class scenic area rating rules, namely, the 'Quality Rating and Classification of Tourist Scenic Spots', which are tourism transport, excursion services, tourism safety, integrated management, environmental resource protection, landscape resource value, and market impact. Simultaneously, research hypotheses on the relationship between these factors are proposed.

Improvements in transport conditions affect tourists' perception of the environment and satisfaction with tourism destinations (Kanwal et al., 2020). Cong et al. (2023) pointed out that the traffic accessibility of mountain tourist attractions is an important factor that affects recreational attractiveness. Based on the above, the following hypothesis was proposed:

H1: Tourism traffic has a significant positive effect on recreational attractiveness.

Excursion services refer to the services and facilities provided by scenic spots for the convenience of tourists, including hygiene and guided tours. Empirical research by Neffi et al. (2021) indicates that the service quality of a tourist destination has a direct effect on travellers' satisfaction and tourism loyalty. In addition, Al-Ababneh (2013) pointed out that tourists' satisfaction with various services provided by a destination affects their overall evaluation of the destination's attractiveness. Based on this, the following

hypotheses are proposed:

H2: Excursion services have a significant positive effect on market influence.

H3: Excursion services have a significant positive effect on recreational attractiveness.

According to Maslow's Hierarchy of Needs theory, safety is a basic human need; therefore, tourism safety is the most basic need of tourists and the primary factor that influences their tourism decisions. Hence, tourists' perceptions of safety influence their tourism behaviour and satisfaction. George et al. (2003) considered that tourists' perceptions of safety affect their satisfaction with and the image of a tourist destination. Ding and Wu (2022) indicated that tourists' perceptions of safety at tourist destinations affected their image of the destination. Based on this, we propose the following hypotheses:

H4: Tourism safety has a significant positive effect on market influence

H5: Tourism safety has a significant positive effect on recreational attractiveness.

Comprehensive management includes management systems, staffing, service attitudes, and implementation effects, which reflect the management level of the scenic spot. Cheng (2021) pointed out that upgrading the comprehensive level of tourism managers and establishing a customized tourism management pattern would be conducive to improving the quality of tourism services. Coghlan (2012) suggests that operators in scenic areas can improve their management services to generate higher visitor satisfaction. Based on this research, the following hypotheses are proposed:

H6: Integrated management has a significant positive effect on excursion services.

H7: Integrated management has a significant positive effect on recreational attractiveness.

Environmental resource protection includes both tourism resource protection and environmental resource protection, emphasising the contents, measures, and effects of protection. Mao et al. (2022) proposed through empirical research that the quality of urban park landscape resources and recreational facilities have a direct effect on their recreational attractiveness. Ma et al. (2002) pointed out that the comprehensive evaluation of tourism resources by tourists mainly includes natural landscape resources, such as vegetation, animal resources, forest environment, density of attractions, and unique features. Accordingly, the following hypotheses are proposed:

H8: Environmental resource protection has a significant positive effect on landscape resource values.

H9: Environmental resource protection has a significant positive impact on market influence.

H10: Recreational attractiveness is significantly enhanced by environmental resource protection.

Landscape resource value includes ornamental recreational value, historical and cultural value, and scientific research value, as well as its own uniqueness, scale, and integrity. Kingchan (1997) believes that only when the landscape quality of a tourist destination meets tourists' expectations and the landscape resources are sufficiently attractive can tourist satisfaction be maximised and tourists be more likely to revisit the destination. Grigaliunaite and Pileliene (2019) concluded that the aesthetic and ornamental values of tourist destinations affect tourist satisfaction significantly. Accordingly, the following hypotheses are proposed:

H11: Landscape resource value has a significant positive effect on market influence.

H12: Landscape resource value has a significant positive effect on recreational attractiveness.

Market influence mainly encompasses popularity, reputation, marketability, and theme clarity. Rajesh (2013) developed a theoretical model of destination image and tourist loyalty and found that the destination image perceived by tourists affects their satisfaction and willingness to revisit. Park and Njite's (2010) study of tourism influences on Jeju Island found that destination image influences tourist satisfaction and future behaviors. Based on this, the following hypothesis is proposed:

H13: Recreational attractiveness is significantly positively affected by market influence.

Thus, this study proposes a hypothetical model for the recreational attractiveness of urban mountain parks, as shown in Figure 2.

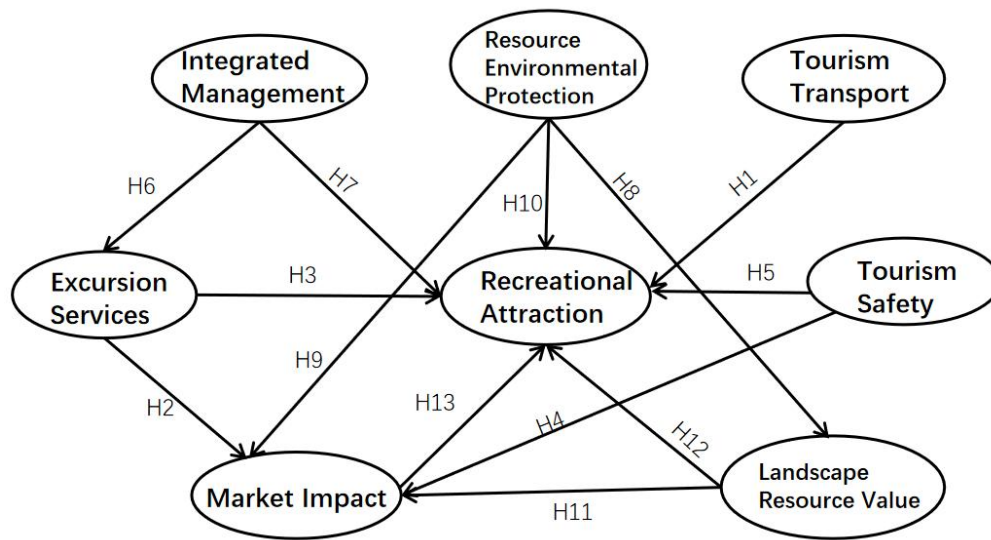


Figure. 2. Hypothetical model of recreational attractiveness

2.2.4 Quantitative Data Analysis

According to the study purpose and requirements of data analysis, data processing and analysis were conducted in two steps. The first is confirmatory factor analysis (CFA) of the measurement model, which includes reliability, validity, and goodness-of-fit tests of the measurement model. The second step was a goodness-of-fit test and path analysis of the structural model.

2.2.4.1 Confirmatory Factor Analysis (CFA)

(1) Reliability analyses are used to test whether a test-taker's responses are true and reliable (Lu, 2018). As shown in Table 1, the values of the reliability coefficient Cronbach's α are above 0.8, which is greater than the standard value of 0.7, indicating that the scales of the questionnaire have good reliability.

(2) Questionnaire validity test is an essential measure of the validity of a questionnaire and was measured via content and convergent validity in this study (Hua, 2017). The content validity of the questionnaire is reflected by the correlation of individual items with the whole, as shown in Table 1; The correlation of each item with the whole was significant at the 0.01 level. Convergent validity relies on three items: standardised factor loadings, combined reliability, and average variance extracted (AVE) to test the analysis (Liu, 2019). As shown in Table 1, the standardised factor loading of each question item was above 0.74, which is greater than the standard value of 0.6. The AVE value of each dimension was above 0.67, which is greater than the standard value of 0.5. The combined reliability of each dimension was above 0.86, which is greater than the standard value of 0.7. Therefore, this questionnaire was deemed to have good validity.

Table. 1. Reliability and validity analysis of the measurement model

Latent Variable	Observed Variable	Observed Variable	Standardised	Whole Correlation (At the	AVE (Standard	Combined Reliability	Reliability Coefficient Cronbach's
-----------------	-------------------	-------------------	--------------	---------------------------	---------------	----------------------	------------------------------------

			Factor Loading (Standard Value>0.6)	0.01 level)	ard Value>0.5)	y (Standard Value>0.7)	α (Standard Value>0.7)
Tourism Transport	External transport	A1:My access to Fudao park is convenient.	0.884	Significant	0.7015	0.9036	0.899
	Entrance signs	A2:I can easily find the entrance to Fudao park.	0.877	Significant			
	Parking facilities	A3:Fudao park is equipped with a car park for easy parking.	0.771	Significant			
	Tourist Route Setting	A4:Fudao park tour route is set up well and smooth.	0.813	Significant			
Excursion Services	Visitor Centre	B1:The Visitor Centre is able to provide the tourist services I need.	0.877	Significant	0.6873	0.9293	0.927
	Guided tour system	B2: I am satisfied with the guide system in Fudao Park.	0.835	Significant			
	Tour Guide Service	B3: I am satisfied with the tour guide and interpretation service in Fudao Park.	0.877	Significant			
	Environmental Hygiene	B4: The overall environment of Fudao Park is clean and tidy.	0.749	Significant			
	Toilet facilities	B5: I am satisfied with the toilets in Fudao Park(number, facilities, hygiene, cleanliness, etc.)	0.856	Significant			
	Tourism Shopping	B6: I am satisfied with the convenient service points(tea, commodities, food and beverage, etc.) set up in Fudao Park.	0.771	Significant			
Tourism Safety	Security personnel	C1: I feel protected by the security staff in Fudao Park.	0.803	Significant	0.7378	0.8937	0.886
	Security Facilities	C2: I think the tourist facilities(walkways, platforms, etc.) in Fudao Park are safe.	0.840	Significant			
	Safety Tips	C3: The safety reminders in Fudao Park are well set up	0.929	Significant			
Integrated Management	Management Services	D1: The staff of Fudao Park has good service attitude and well management.	0.841	Significant	0.7016	0.8757	0.870
	Convenience	D2: Visitors can easily learn about the complaint channels of Fudao Park.	0.874	Significant			
	Great publicity	D3: I am usually able to read reports about	0.796	Significant			

Environmental Resource Protection	Air Quality	Fudao Park. E1: When I visit Fudao Park, I feel the air is fresh and refreshing.	0.828	Significant	0.7243	0.9291	0.926
	Noise control	E2: The environment of Fudao Park is quiet with little noise.	0.837	Significant			
	Water Quality	E3: Water seen in Fudao Park is clean and the water surface is free of debris.	0.797	Significant			
	Building Facilities	E4: The buildings and facilities in Fudao Park are in harmony with the surrounding landscape.	0.898	Significant			
	Vegetation Landscape	E5: I am satisfied with the overall landscape of Fudao Park.	0.891	Significant			
Landscape Resource Value	ornamental and recreational value	F1: I think Fudao Park has a high ornamental recreational value.	0.869	Significant	0.7901	0.9377	0.937
	Specificity	F2: The landscape of Fudao Park is special and different from other scenic spots.	0.906	Significant			
	Scale and abundance	F3: There are abundant Tourism resources in Fudao Park, and the attractions are sparsely distributed.	0.878	Significant			
	Completeness	F4: The ecological and tourism resources of Fudao Park are well-maintained and relatively complete.	0.902	Significant			
Market Impact	Attractiveness	G1: I think Fudao Park is of high reputation, at least nationally well-known.	0.794	Significant	0.74	0.8949	0.886
	Distinctive theme	G2: Excursions in Fudao Park are themed and unique.	0.897	Significant			
	Reputation	G3: I was generally impressed with Fudao Park and it was praised by those around me.	0.886	Significant			
Recreational Attraction	Attractiveness	Y1: Fudao Park is attractive to me.	0.817	Significant	0.6732	0.8607	0.829
	Willingness to revisit	Y2: I would like to visit Fudao Park again in future.	0.840	Significant			
	Satisfaction	Y3: I feel satisfied with this visit to Fudao Park.	0.804	Significant			

(3) This study used goodness-of-fit tests for measurement models, the following fitness index values were obtained for the measurement model: $\chi^2/df = 2.209$, Root Mean Square Error of Approximation

(RMSEA) = 0.047, Goodness of Fit Index (GFI) = 0.907, Adjusted Goodness of Fit Index (AGFI) = 0.886, Incremental Fit Index (IFI) = 0.961, Comparative Fit Index (CFI) = 0.961, Parsimony-Adjusted Measures Index (PNFI) = 0.814, Parsimony Goodness of Fit Index (PGFI) = 0.742. Each indicator is within the range of standard values, and the fit index of the measurement model is excellent, as shown in Table 2.

2.2.4.2. Structural Model Inspection and Analysis(Goodness-of-fit Tests for the Structural Model)

Parameter estimation of the structural model through maximum likelihood estimation (MLE) was used to determine whether the hypothesised model is valid or not, resulting in: $\chi^2/df = 2.552$, RMSEA = 0.053, GFI = 0.889, AGFI = 0.868, IFI = 0.949, CFI = 0.949, PNFI = 0.828, and PGFI = 0.751. As shown in Table 2, each indicator is within the range of standard values, indicating a good degree of fitness of the structural model and credible results.

Table. 2. Fitness analysis of measurement model, structural model

Index Category	Index name and standards	Measurement model	Evaluation of index	fitStructural model	Evaluation of fit index
Absolute Fit Indices	$1 < \chi^2/df < 3$	2.209	Excellent	2.552	Excellent
	$RMSEA < 0.100$	0.047	Excellent	0.053	Excellent
Relative Fit Index	$GFI \geq 0.900$	0.907	Excellent	0.889	Good
	$AGFI > 0.8$	0.886	Excellent	0.868	Excellent
	$IFI > 0.9$	0.961	Excellent	0.949	Excellent
	$CFI \geq 0.900$	0.961	Excellent	0.949	Excellent
Parsimony Index	$FitPNFI > 0.5$	0.814	Excellent	0.828	Excellent
	$PGFI > 0.5$	0.742	Excellent	0.751	Excellent

2.2.5. Qualitative Data Analysis

This study used text analysis method to exporing and interpreting the qualitative section of the questionnaire. Textual analysis is a method of studying and interpreting text data, it is usually used to extract themes, emotions, opinions or insights from a large amount of textual data, and to grasp the deeper meaning of the text from the surface to the inside.

Frequent word statistical analysis is an essential element of text analysis. Frequent word statistical analysis is the process of measuring and statistically analysing the frequency of occurrence of each term in a text in order to identify common words, keywords as well as themes in the textual data. The first step is text segmentation, which is the process of dividing text into a sequence of words according to certain rules. This study used text segmentation tools, GooSeeker, to filter out high-frequency words by filtering out meaningless words and screening lexical properties. After which, this study visualised the high-frequency word statistics results based on Weiciyun textual analysis software (<https://fenci.weiciyun.com/>) to generate word cloud diagrams. This analytical method can help to appeal the greatest concern and highest perceived frequency of factors in Fudao Park among the general population.

Article Three :Communicate Research Conclusion Article

(systematically and creatively evolve a concept through each stage of a project and effectively communicate the conclusions of this process to specialist and non- specialist audiences)

3. Results

3.1. Influence Coefficients Between Potential Variables in the Model

The final structural model of recreational attractiveness obtained in this study is shown in Figure 3, and the influence paths and coefficients between the potential variables in this model are derived as shown in Table 3. The results show that: (1) Hypothesis H1 holds, as tourism transport has a significant positive effect on recreational attractiveness, and its impact coefficient is 0.17, which indicates that enhancement of transport facilities in tourist destinations is beneficial to their recreational attractiveness; (2) H2 and H3 are confirmed, and excursion services have a significant positive effect on market influence and recreational attractiveness, with coefficients of 0.1 and 0.15, respectively; (3) H5 is valid, as there is a significant positive effect of the exogenous latent variable tourism safety on recreational attractiveness with an impact coefficient of 0.12; (4) H6 and H7 are confirmed, and the exogenous latent variable comprehensive management has a significant positive effect on the attractiveness of excursion service and recreation, with influence coefficients of 0.23 and 0.11, respectively, indicating that upgrading the comprehensive management of scenic spots also has a positive effect on their excursion services and recreational attractiveness; (5) H8, H9, and H10 are confirmed, indicating that environmental resource protection has a significant positive effect on landscape resource value, market impact, and recreational attractiveness, with impact coefficients of 0.3, 0.32, and 0.17, respectively; (6) H11 and H12 are confirmed, as landscape resource value has a significant positive effect on market impact and recreational attractiveness, with influence coefficients of 0.25 and 0.17, respectively; and (7) H13 is valid, indicating that market impact has a significant positive effect on recreational attractiveness, with an influence coefficient of 0.19.

3.2. Overall Impact Coefficients of Each Factor on Recreational Attractiveness

As shown in Table 4, environmental resource protection had the highest influence coefficient on recreational attractiveness, at 0.28. This was followed by landscape resource value (0.22), market influence (0.19), and tourism transport (0.19), whereas the influence of tourism safety (0.12) on recreational attractiveness was the lowest relative to the former. This suggests that the intrinsic condition of tourism resources attracts tourists the most, in contrast to extrinsic conditions such as market influence and transport.

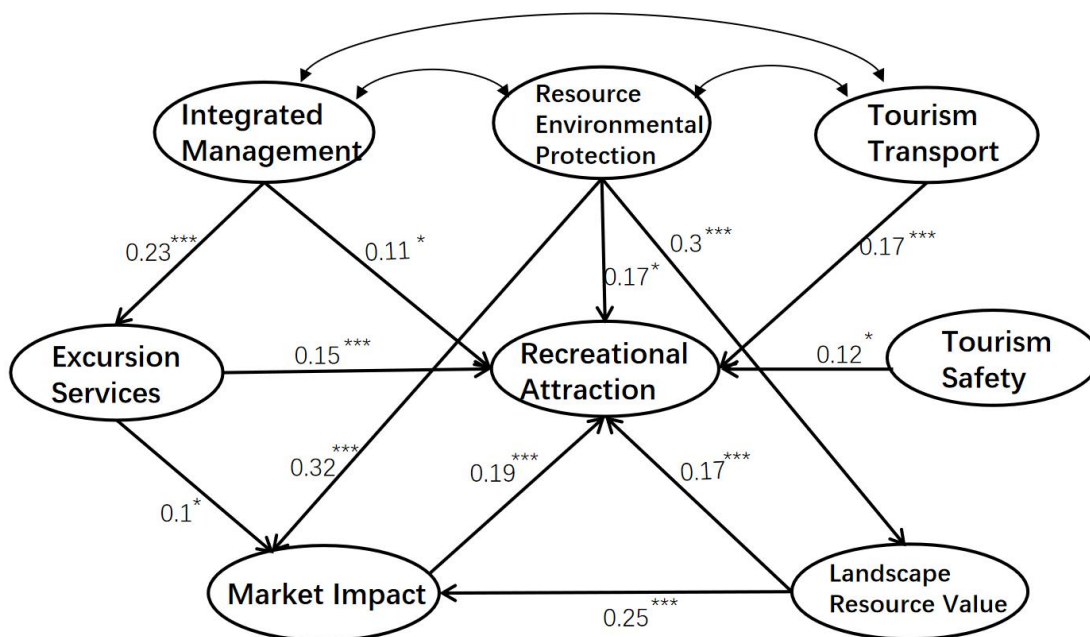


Figure. 3.Final structural model of recreational attractiveness

Note: *** denotes significant correlation at the 0.001 level (bilateral), and * denotes significant correlation at the 0.05 level (bilateral).

Table. 3. Fitted path coefficients between potential variables

Hypothesis proposed	Fitted paths between latent variables			Coefficient t
H1	Tourism Transport	→	Recreational Attraction	0.17
H2	Excursion Services	→	Market Impact	0.1
H3	Excursion Services	→	Recreational Attraction	0.15
H5	Tourism Safety	→	Recreational Attraction	0.12
H6	Integrated Management	→	Excursion Services	0.23
H7	Integrated Management	→	Recreational Attraction	0.11
H8	Environmental Resource	→	Landscape Resource Value	0.3
H9	Protection Environmental Resource	→	Market Impact	0.32
H10	Protection Environmental Resource Protection	→	Recreational Attraction	0.17
H11	Landscape Resource	→	Market Impact	0.25
H12	Value Landscape Resource	→	Recreational Attraction	0.17
H13	Value Market Impact	→	Recreational Attraction	0.19

Table. 4. Overall impact coefficients of each influence factor on recreational attraction

Impact Factor	Direct impact	Indirect impact	Overall impact effect
Tourism	0.17	0	0.19
Transport			
Excursion	0.15	0.02	0.17
Services			
Tourism Safety	0.12	0	0.12
Integrated	0.11	0.04	0.15
Management			
Environmental	0.17	0.11	0.28
Resource			
Protection			
Landscape	0.17	0.05	0.22
Resource Value			
Market Impact	0.19	0	0.19

3.3 Textual analysis of the qualitative section of the questionnaire

The last question of our questionnaire is a semi-structured subjective question, which is informative, unrestricted, and informativeness. It reflects participants' subjective enhancement recommendations and feelings regarding Fudao Park.

After cleaning, segmenting, and carrying out frequent word statistical analysis on them, We found that the most frequent keywords, as shown in Table 5, are Parking, Facility, Service, Landscape, Transport and Promotional activities et al. In addition, it can also be seen that Landscape, parking, facility, Service are the most frequent words from the visual word cloud (Figure 4). We collation, generalisation, classification and coding the top 20 high-frequency terms into several dimensions; the top 4 dimensions, in order of frequency of occurrence, were tourism transport, excursion services, landscape resource value and market impact, as shown in Table 6. In conclusion, it implies that the factors that have the greatest influence on visitors' tourism experiences and recreational sentiments are these four dimensions.

Table. 5. High frequency word list for public recommendations of Fudao Park (top 20)

Term	Frequency	Term	Frequency
Parking	26	Water(Water landscape)	14
Facility	25	Vegetation(plant)	12
Service	24	Entrance	13
Landscape	23	Car	13
Transport(traffic)	19	Shade place	10

4. Discussions

4.1. Invalid assumptions in the SEM

Among the hypotheses proposed in this study, only H4 was not confirmed; that is, tourism safety does not have a significant positive effect on market influence, whereas in previous studies (George et al., 2003; Ding & Wu, 2022), tourism safety affected tourists' overall impression of a destination. The main reason for the deviation may be that Fudao Park, the subject of this study, is located in the centre of Fuzhou City, where law and order are well managed, which makes tourists less concerned about tourism safety, leading to a discrepancy with the results of some established studies.

4.2. The qualitative section of the questionnaire

In the qualitative section of the study, what the participants focus on is similar to the quantitative findings—that is, the conclusions drawn from structural equation modelling. The last question of our questionnaire is a semi-structured subjective question, which reflects participants' subjective enhancement recommendations and feelings regarding Fudao Park.

According to this study results, we found that the most frequent dimension were tourism transport, followed by excursion services, and then landscape resource and market impact; 1) First, the public's primary issue is tourism transport. Participants proposed that Fudao Park should increase the number of entrances and parks, optimise the guiding system, and enhance accessibility; 2) The second is to upgrade the park's service facilities. Participants pointed out that the park should provide visitors with convenient facilities such as direct drinking water, self-service shopping machines, and leisure pavilions; 3) Thirdly, enhancement of cultural and natural landscape resources. Participants considered that Fudao Park lacks a distinctive and cultural landscape, and they recommend that, in order to enhance the park's cultural atmosphere, landscapes with distinctive regional features be added. Meanwhile, the diversity of plants and the richness of the landscape should be increased; and 4) On a final note, promotional activities for the park should be increased. Participants suggested that Fudao Park should conduct more public activities to promote its image.

The opinions obtained from the semi-structured subjective questions indicate that tourists are most concerned about the park's tourism transport, excursion services, landscape resource and market impact, which align with the factors affecting the recreational attractiveness of urban mountain parks proposed in this study.

4.3. Limitations of this study

This study explores the mechanisms influencing the recreational attractiveness of urban mountain parks through empirical research to provide a reference for the improvement of the recreational attractiveness of other urban mountain parks. However, there are still some limitations to this study. For instance, the research object, Fudao Park, is an urban mountain park, which belongs to one type of urban park, and it remains to be verified whether the research conclusions are applicable to other types of urban parks. In the future, other types of parks can also be studied, making the research conclusions more comprehensive and scientific.

5. Conclusion

This study takes China's national A-class scenic spot assessment standards as a guideline, establishes a structural equation model of leisure attraction, and explores the influencing factors, influencing coefficients, and relations between the factors of leisure attraction through empirical research. The results can offer direction for improving urban mountain parks' recreational attractiveness. The following are the primary conclusions.

5.1. Influence Factors of Recreational Attractiveness on the Urban Mountain Parks

This study proposes seven factors that affect recreational attractiveness: tourism transport, excursion services, tourism safety, integrated management, environmental resource protection, landscape resource value, and market impact. The confidence, validity, and degree of fitness of the recreational attractiveness structural model are all excellent, indicating that these seven influencing factors have significant positive effects on the enhancement of the recreational attractiveness of mountain parks, which provides a reference value for the study of the leisure attractiveness of other urban mountain parks.

5.2 Overall Effect of Influencing Factors on Recreational Attractiveness

In terms of the overall influence of the seven influencing factors on recreational attractiveness, the influence coefficient of environmental resource protection was the highest, followed by landscape resource value, with the following rankings: environmental resource protection (0.28) > landscape resource value (0.22) > market influence (0.19) = tourism transport (0.19) > excursion services (0.17) > comprehensive management (0.15) > tourism safety (0.12). This indicates that:

(1) The primary draws to the parks for visitors are the preservation of the resource environment, which includes things like air quality, noise level, vegetation, and scenery, as well as the value of the landscape resources, which include things like ornamental recreational value and exotic degree. The finding offers critical guidance for mountain park planning and design. The appropriate use of tourism resources by park planners and designers should be based on the preservation of the natural resource background, together with the enhancement of plant species diversity and strengthening of the landscape's abundance and characteristics.

(2) Tourism transport is also an important factor affecting recreational attractiveness in mountain parks, and the parks should simultaneously enhance internal and external traffic to strengthen the accessibility and smoothness of excursions. By upgrading the external traffic conditions of parks, self-driving and public transport go hand in hand to ensure that the scenic spot has good accessibility, linking the 'last kilometre', so that tourists can achieve a seamless connection with the scenic spot. Simultaneously, it is necessary to work towards enhancing the park's internal transportation system, making the trip more comfortable, and making the tour route more selective.

(3) Market influence is as important as tourist transport in its effect on park recreational attractiveness. To draw visitors and boost their visibility, Park managers should set up excursions with distinctive features and themes, as well as conduct public activities.

(4) The park's degree of management, security, and service has an impact on how

appealing it is to tourists. To provide a pleasant and safe visiting environment for guests, park administrators should provide drinking water, restrooms, guide systems, and other convenient service locations; put up safety facilities and safety warnings; and fairly distribute security personnel.

5.3. Relationships of Potential Variables

There are also interactions between potential variables, among which the coefficients of environmental resource protection on market influence and landscape resource value are high, being 0.32 and 0.3, respectively. This demonstrates how improving the background resource protection of urban mountain parks—that is, improving the quality of the water and air, managing noise, and enhancing the protection of vegetation and buildings—will greatly increase the parks' landscape value and market influence. Furthermore, the influence coefficient of landscape resource value on market influence is 0.25, showing that the ornamental value and landscape features of mountain parks are directly related to enhancing their market influence, such as popularity and repute.

References

- Al-Ababneh, M.M. Service quality and its impact on tourist satisfaction. Institute of Interdisciplinary Business Research. 2013, 164. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3633075
- Alessandro, P. Demand Analysis on Forest-based Recreational Activities. *Journal of Environmental Accounting and Management*. 2022, 10(03): 219-236. DOI:10.5890/JEAM.2022.09.002
- Asadov, B.; Baranov, A.; Baranova, S.; Philippova, I. Ecological and Humanitarian Approach to Assessing the Tourist and Recreational Attractiveness of Cultural Landscapes Drawing on the Example of the UNESCO World Heritage Site «Curonian Spit» . In *National Conference on Sustainable Development (ESG)* . Cham: Springer Nature Switzerland. 2022, October, pp. 181-189. <https://doi.org/10.1007/978-3-031-30498-9>
- Cheng, C.L. Research on Tourist Satisfaction of Ice and Snow Tourism in Heilongjiang Province Based on Structural Equation Model. Harbin University of Commerce. 2022.
- Cheng, J. Tourism Management Optimisation Suggestions and Service Quality Improvement Strategies. *Western Tourism*. 2021, (01): 59-61.
- Cheng, T. M.; C. Wu, H.; Huang, L. M. The influence of place attachment on the relationship between destination attractiveness and environmentally responsible behavior for island tourism in Penghu, Taiwan. *Journal of Sustainable tourism*. 2013, 21(8), 1166-1187. DOI:10.1080/09669582.2012.750329
- Coghlan, A. Linking natural resource management to tourist satisfaction: a study of Australia's Great Barrier Reef. *Journal of Sustainable Tourism*. 2012, 20(1): 41-58. DOI : 10.1080/09669582.2011.614351
- Ding, G.; Wu, J. Influence of tourism safety perception on destination image: A case study of Xinjiang, China. *Sustainability*. 2022, 14(3): 1663. DOI:10.3390/su14031663
- Gary, M.C.; Nina, M.R. Legacy tourism: the Search For Personal Meaning In Heritage Travel. *Tourism Management*. 2003, 24(6):713-717. DOI:10.1016/S0261-5177(03)00048-7

- George, R. Tourist's perceptions of safety and security while visiting Cape Town. *Tourism Management*. 2003, 24(5): 575-585. [https://doi.org/10.1016/S0261-5177\(03\)00003-7](https://doi.org/10.1016/S0261-5177(03)00003-7)
- Gong, Q.; Li, J.; Wu, L.; Zhu, M.; Luo, M.; Sun, J.; ... & Liang, X. Exploring Accessibility and Its Impact in the Mountain City: A Typical Case Study of Nyingchi City, Tibet Autonomous Region, China. *Land*. 2023, 12(2), 361. DOI:10.3390/land12020361
- Grigaliunaite, V.; Pileliene, L. Local Tourist Satisfaction with Their Holiday in Lithuania//Paper presented at the 20th International Scientific Conference called Economic Science for Rural Development. Jelgava: LLU,2019. DOI:[10.22616/ESRD.2019.095](https://doi.org/10.22616/ESRD.2019.095)
- Hakuć-Błażowska, A.; Kupren, K. Tourist Attractiveness of Rural Communes in the Functional Urban Area of Olsztyn—a Voivodship City. *Acta Scientiarum Polonorum Administratio Locorum*. 2022, 21(3): 335-353. DOI:10.31648/aspal.7246
- Hua, W.J. XY pharmaceutical drug quality management construction research based on the perspective of customer satisfaction. Xi'an polytechnic university. 2017.
- Kanwal, S.; Rasheed, M.I.; Pitafi, A.H, et al. Road and transport infrastructure development and community support for tourism: The role of perceived benefits, and community satisfaction. *Tourism Management*. 2020, 77: 104014. DOI: 10.1016/j.tourman.2019.104014
- Khamitov, R. S.; Zarubina, L. V.; Platonova, J. A.; Zaytseva, V. A.; Osokina, A. V.; Fomicheva, M. V. Recreational Potential of the Pine Forests in the Vologda Region Drawing on the Example of Kradikhino Forest. In *IOP Conference Series: Earth and Environmental Science*. 2021, October.(Vol. 875, No. 1, p. 012087). IOP Publishing. DOI: 10.1088/1755- 1315/875/1/012087
- Kim, G.; Duffy, L. N.; Moore, D. Tourist attractiveness: Measuring residents' perception of tourists. *Journal of Sustainable Tourism*. 2020, 28(6): 898-916. DOI:10.1080/09669582.2019.1708919
- Kingchan K. Tourist satisfaction in relation to a holiday in Thailand. *The Development and Evaluation of Activity Schedules for Tourists on One-Day Commercial Reef*, 1997.
- Kirshbaum, A., Masterkova, G., Papulov, E. Application of Assessment Method of Prospect for Recreational Use of Municipal Forest named after Foresters of Russia. *АЕСА РОССИИ*, 60.
- Kresic, D.; Prebezac, D. Index of Destination Attractiveness as a Tool for Destination Attractiveness Assessment. *Tourism: an International Interdisciplinary Journal*. 2011, 59(04):497-517. <https://www.webofscience.com/wos/woscc/full-record/WOS:000213662600006>
- Lam, I.K.V.; Ryan, C. Destination attractiveness and place attachment: A multi-group analysis of visitors from the Greater China Region. *Tourism Recreation Research*. 2021: 1-22. DOI:1080/02508281.2021.1983716
- Li, F.; Yao, N.; Liu, D. et al. Explore the recreational service of large urban parks and its influential factors in city clusters—Experiments from 11 cities in the Beijing-Tianjin-Hebei region. *Journal of Cleaner Production*. 2021, 314: 128261. DOI:10.1016/j.jclepro.2021.128261
- Li, J.; Cao, B. Study on Tourism Consumer Behavior and Countermeasures Based on Big Data. *Computational Intelligence and Neuroscience*. 2022. <https://doi.org/10.1155/2022/6120511>
- Lo, C.H. An Empirical Study on the Effect of Attractiveness of Ecotourism Destination on Experiential Value and Revisit Intention. *International Journal of Performance Measurement*. 2019, 9(2). DOI:10.15666/aeer/1502_043053
- Lu, J. Study on the public participation of water resources in the Qian Tang River Basin. Northwest University. 2018.
- Ma, J.Y.; Sun, X.G; Jia, R. Research on Design and Application of AHP Models of Synthetic Assessment on Forest Tourism Resources . *Arid Land Geography*.2002(04): 372-376.

DOI:10.13826/j.cnki.cn65-1103/x.2002.04.017

- Mao, Z.; Wang, W.; Ren, Z. et al. Recreational Attractiveness of Urban Parks and Implications for Their Management: A Case Study in Changchun, China. *Chinese Geographical Science*. 2022, 32(3): 456-466. DOI:10.1007/s11769-022-1273-5.
- Mao, Z.X. Recreational attraction analysis of urban park — — A case study in Changchun. University of Chinese Academy of Sciences, 2017.
- Mukayev, Z.T.; O zgeldinova, Z.O.; Janaleyeva, K.M.; et al. Assessment of the tourist recreation capacity of Lake Alakol basin. *Geo Journal of Tourism and Geosites*. 2020, 30: 875-879. DOI:10.30892/gtg.302spl13-517
- Neffi, S.; Idris; Felia, S. et al. The Effect of Services Quality on Tourist Satisfaction and Tourist Loyalty//Paper presented at the 5th Asia-Pacific Conference on Economic Research and Management Innovation. Online: 2021. DOI:[10.2991/aebmr.k.210218.001](https://doi.org/10.2991/aebmr.k.210218.001)
- O zgeldinova, Z.; Bektemirova, A.; Mukayev, Z. et al. Natural and recreational potential of landscapes of the Tobol river basin within the Kostanay region. *GeoJournal of Tourism and Geosites*. 2022, 43(3): 907-911. DOI:10.30892/gtg.43309-903
- Park, Y.; Njite, D. Relationship between destination image and tourists' future behavior: Observations from Jeju island, Korea. *Asia Pacific journal of tourism Research*. 2010, 15(1): 1-20. DOI:10.1080/10941660903510024
- Petrosillo, I.; Zurlini, G.; Corliano, M.E. et al. Tourist perception of recreational environment and management in a marine protected area. *Landscape and urban planning*. 2007, 79(1): 29- 37. DOI:10.1016/j.landurbplan.2006.02.017
- Raimkulov, M.; Juraturgunov, H.; Ahn, Y. Destination attractiveness and memorable travel experiences in silk road tourism in Uzbekistan. *Sustainability*. 2021, 13(4): 2252. DOI:10.3390/su13042252
- Rajesh, R. Impact of tourist perceptions, destination image and tourist satisfaction on destination loyalty: A conceptual model. *PASOS. Revistade Turismoy Patrimonio Cultural*. 2013,11(3): 67-78.
- Rzetala, M. The new evaluation proposal of tourist-recreational attractiveness of water reservoirs. In *Proceedings of the 3rd International Multidisciplinary Scientific Conferences on Social Sciences & Arts SGEM*. 2016, pp. 773-780.
- <https://www.researchgate.net/publication/308778304>
- Sapozhnikov, A.P. The Recreational Attractiveness of Relatively Undeveloped Forest Territories. *Lesnoe Khozyaistvo*. 1985 (7):37-39.
- Soliman, M.; Gulvady, S.; Elbaz, A.M. et al. Robot-delivered tourism and hospitality services: How to evaluate the impact of health and safety considerations on visitors' satisfaction and loyalty? *Tourism and Hospitality Research*. 2023: 14673584231153367. DOI:10.1177/14673584231153367
- Sulkaisi, N.; Siska, F. The Effect of Services Quality on Tourist Satisfaction and Tourist Loyalty. In *5th Asia-Pacific Conference on Economic Research and Management Innovation*. Atlantis Press. 2021, pp. 1-7. DOI:[10.2991/aebmr.k.210218.001](https://doi.org/10.2991/aebmr.k.210218.001)
- Voigt, A.; Kabisch, N.; Wurster, D. et al. Structural diversity: a multi-dimensional approach to assess recreational services in urban parks. *Ambio*. 2014, 43: 480-491. DOI:10.1007/s13280- 014-0508-9
- Wang, Y.; Wen, Z.L.; Fu, Y.Z. Equivalence testing: A new perspective on structural equation model evaluation and measurement invariance analysis .*Advances in Psychological Science*, 2020, 28(11):1961-1969. DOI:10.3724/SP.J.1042.2020.01961

- Yang, Y.; Wang, Z.; Lin, G. Performance assessment indicators for comparing recreational services of urban parks. *International Journal of Environmental Research and Public Health*. 2021, 18(7): 3337. DOI:10.3390/ijerph18073337
- Yin, J.; Cheng, Y.; Bi, Y. et al. Tourists perceived crowding and destination attractiveness: The moderating effects of perceived risk and experience quality. *Journal of Destination Marketing & Management*. 2020, 18: 100489. DOI:10.1016/j.jdmm.2020.100489
- Yousefi, M.; Marzuki, A. An Analysis of Push and Pull Motivational Factors of International Tourists to Penang, Malaysia. *International Journal of Hospitality & Tourism Administration*. 2015, 16(1):40-56 DOI:10.1080/15256480.2015.991987
- Yun, X. Factors Influencing Consumers' Choice of Cruise Tourism--Based on Push-pull Relationships. *Scientific Journal of Economics and Management Research Volume*. 2021, 3(11).
- Zhang, S.; Zhou, W. Recreational visits to urban parks and factors affecting park visits: Evidence from geotagged social media data. *Landscape and urban planning*. 2018, 180: 27-35. DOI:10.1016/j.landurbplan.2018.08.004
- Zhang, Y.L.; Xu, S.J.; Han, R.N.; Ma, J.; Li, X. Evaluation and Optimization of the Recreation Service Capability of Urban Mountain Parks Based on the Mountain Characteristics —A Case of Chengde City. *Chinese Landscape Architecture*. 2020,36(12):19-23.DOI:10.19775/j.cla.2020.12.0019
- Liu,Q.Y.;Wu,Y.;Xiao,Y.H.et al.The Inherent Psychological Mechanism of Perceived Restoration of Urban Parks —An Perspective from Environmental Preference and Place Attachment Theory. *Chinese Landscape Architecture*. 2019, 35(6): 39-44. DOI: 10.19775/j.cla.2019.06.0039