

Article

Are We on the Same Page? Chinese General Visitors' Perception of the Role of Museums in Sustainable Development

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Abstract: The issue of sustainability has emerged as a focal point within the museum sector. This article aims to investigate the perceptions and attitudes of Chinese general visitors towards museums and sustainability. To achieve this, we employed a visitor evaluation approach, with inhabitants of the Chinese mainland serving as the target population. We conducted a survey using an online questionnaire, yielding a total of 1260 valid samples. The study finds that most museum visitors in mainland China see a strong link between museums and sustainable development, with factors like age, gender, education, familiarity with sustainable development, and museum interaction shaping these perceptions. The results indicate that large segments of the Chinese visitors hold a favourable perception of the significance of museums in terms of environmental, social, economic, and cultural sustainability. However, the visitor generally does not wish to sacrifice their own visiting experience to enhance museums' sustainable development capacities. The article examines the relationship between museums and sustainability and offers recommendations for museum practice and policymaking in China and beyond.

Keywords: museum; sustainability; Chinese museums; Chinese mainland; visitor perception; visitor evaluation



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1. Introduction

In 1987, the World Commission on Environment and Development (WCED) proposed a definition of sustainability in the Brundtland Report: meeting the needs of the present without compromising the ability of future generations to meet their own needs [1]. The report, authored by Gro Harlem Brundtland, explicitly identifies the economy, society, and environment as the three fundamental components of sustainability. Since the 2000s, culture has emerged as an additional significant component shaping the fundamental framework of contemporary sustainable development [2]. Museums occupy a paramount position as the primary establishment responsible for the acquisition, safeguarding and scholarly investigation of both tangible and intangible cultural heritage. Consequently, museums are crucial actors in advancing the cause of sustainable development [3].

In recent years, the topic of sustainable development has gained increasing attention and relevance in the museum sector. Several initiatives and publications have highlighted the contribution of museums to sustainable development. For instance, the *Culture and Local Development* report, released in 2019 by the International Council of Museums (ICOM) and the Organization for Economic Co-operation and Development (OECD), presents a comprehensive analysis of the role of museums in promoting sustainability. The report highlights that sustainability is a dynamic process based on the recognition and preservation of tangible and intangible heritage, with museums responding to the needs of communities [4]. Moreover, the 26th ICOM General Conference, held in Prague in August 2022,

marked the formal adoption of a revised museum definition, in which the concepts of inclusion, community engagement, and sustainability were introduced for the first time [5]. ICOM also designated 'Museums, Sustainability, and Wellbeing' as the topic for International Museum Day in 2023, highlighting the role of museums as key contributors to the well-being and sustainable development of communities.

Over the past two decades, sustainability has become a key driver of change in China's institutions, with museums playing a crucial role in this shift. Former President Jintao Hu's emphasis on sustainable development as a cornerstone of China's economic strategy has led to significant growth in the museum sector [6–8]. In 2000, China had only 1392 museums, but by 2008, this number had increased to 1893. Since the introduction of free admission for state-owned museums, the numbers of both museums and their visitors have soared. As of 18 May 2023, China had 6565 museums, drawing over 500 million visitors in 2022, despite the challenges posed by the COVID-19 pandemic. This remarkable growth reflects China's achievements in cultural sustainability and highlights the potential of its museum sector to promote sustainable development. While museum professionals are optimistic about museums' role in fostering sustainability, it remains uncertain whether the general visitor shares this view. As a primary stakeholder, does the visitor recognize and support museums as key players in building a sustainable society? If not, does this challenge the perceived relationship between museums and sustainability?

This article examines the attitudes and perceptions of members of museum visitors in the Chinese mainland on the role of museums in promoting sustainable development. We argue that understanding general visitors' perspective on these issues is essential for enhancing our comprehension of the relationship between museums and sustainable development. Although sustainability has been integrated into the mission and vision of museums, it is uncertain whether the general visitor has a similar understanding of this concept. Previous research has rarely addressed visitors' perception on this topic. Therefore, this article attempts to fill this gap by exploring how select segments of Chinese general visitors perceive and evaluate the impact of museums on various aspects of sustainability. If the visitor does not recognise the role of museums in sustainable development, does this imply that museums are unable to achieve true sustainability? If there is a bias in the visitors' recognition of museums as important in only a limited number of aspects, what factors contribute to this bias? This study posits that a comprehensive examination of these matters necessitates a foundation rooted in the comprehension of the general visitor sentiments surrounding the interplay between museums and sustainable development. From the perspective of theoretical contributions, the discussion of the concept of the sustainable development of museums from the perspective of the visitor will help us understand the social role of public cultural institutions in sustainable development.

2. Literature Review

The prevailing consensus among scholars is that sustainable development is underpinned by four fundamental dimensions: environmental, social, economic, and cultural [9–14]. In the present context, the existing body of research concerning museums and sustainable development encompasses an exploration of the multifaceted function that museums play within these four dimensions.

Firstly, researchers endeavoured to investigate the potential influence that museums may exert on the promotion of environmental sustainability. This dimension mainly concerns the environmental impact of museum architecture and operations, as well as the awareness and education around environmental issues that museums can provide to the public. Aboulnaga et al. assessed the energy use and heat island phenomenon of museum architecture through an energy audit, using the National Museum of Egyptian Civilization as a case study [9]. Gustafsson and Ijla underscored the significance of museums in promoting environmental sustainability within the context of urban development, examining both the environmental and social consequences that museums have on the surrounding region [15]. Lucchi devised a framework for evaluating the energy efficiency and environ-

mental sustainability of museums, which has been applied by over 50 European museums to facilitate comparisons and identify deficiencies in environmental matters [16].

Secondly, the influence of museums on the sustainable development of society mostly manifests in its effects on audiences, encompassing community well-being and engagement, as well as museums' influence on education, awareness, and values [9]. From an alternative standpoint, this dimension fundamentally embodies the social value of museums as cultural institutions, a topic that has been extensively examined by numerous scholars in the field of museology [5]. In light of this premise, certain scholars continue to undertake a re-evaluation of the societal significance of museums through the lens of sustainable development. Ekinil and Kazmina discovered that the development of interactive programs and events within museums resulted in increased visitor numbers within the local region [17]. Abounnaga et al., meanwhile, conducted a study in which they analysed data from Internet users' comments to assess the sustainability impact of the National Museum of Egyptian Civilization on social media [9].

Thirdly, museums have a significant role in fostering sustainable economic growth, primarily through the revenue generated from tourist visits and the economic value created by museums. This dimension mainly focuses on the economic value of museums as cultural attractions that can generate revenue from tourist visits and create economic benefits for the local community. One method used to evaluate the economic viability of museums is the calculation of yearly revenue, as demonstrated by Abounnaga et al. [9]. Plaza and Haarich conducted a study in which they proposed a distinct category of global museums [18]. The objective of their research was to examine the potential of these museums in revitalising the economic vibrancy of urban areas. Westervelt analyses three museums in Massachusetts to examine the extent to which these institutions contribute to the economic and social revitalisation of the city [19]. Museums exert influence on the economy through their contribution to employment creation, GDP generation, and tax revenue generation for the local community. In 2016, the American Alliance of Museums conducted a statistical analysis revealing that museums produced a substantial annual contribution of USD 50 billion to the GDP of the United States. Additionally, these cultural institutions supported a significant number of employment opportunities, amounting to 726,200 positions in 2016. Moreover, over the same year, the fiscal revenue created by museums amounted to USD 12 billion [20].

Finally, it is well acknowledged in the academic literature that museums, as quintessential cultural institutions, have a significant impact on the sustainable development of local culture [15,21]. This dimension mainly relates to the recognition and preservation of cultural heritage, both tangible and intangible, as well as the promotion of cultural diversity and creativity. Museums play a crucial role in the preservation of local culture through the collection of objects [22,23]. Additionally, they contribute to the dissemination and influence of culture through educational programmes [24]. Yung et al. examined the influence of societal factors on the preservation of heritage from a comprehensive perspective, including five distinct dimensions [25]. The significance of the advancement of digital technology in recent years cannot be overlooked, as it has significantly enhanced the function of museums in fostering sustainable cultural growth. There is a consensus among a significant body of scholars that the process of digitising heritage significantly advances cultural sustainability [3,26,27]. This is particularly true for the digital preservation of museum collections and their subsequent exhibition [28].

In recent years, Chinese researchers have also participated in debates on these four dimensions, which collectively demonstrates the strong connection between modern Chinese museums and efforts to advance sustainable development goals [29–31]. For instance, the connection between ecological museums and rural tourism has been extensively examined in terms of economic sustainability [32]. Additionally, the creation of cultural creative products is recognised as a significant opportunity for the sustainable growth of cultural industries [33]. In the context of cultural sustainability, museums are assigned the roles of *actors* and *centres*. The term *actors* highlights the beneficial contribution of museums

in safeguarding local culture, while the term *centres* underscores the potential influence that museums can exert on the public cultural consciousness [34]. Furthermore, scholars have suggested the concept of the museum–volunteer–society interaction, emphasising the role of volunteers in connecting museums with societal sustainability [35]. Meanwhile, the energy consumption of Chinese museums, particularly with the rise of new and expansive museum architecture, necessitates heightened consideration of environmental burdens [36].

These findings, while offering valuable perspectives from museums or professionals analysing museums and sustainability, nevertheless, do not provide us with insights into public attitudes and opinions. Scholars and museum professionals have widely acknowledged the importance and worth of museums in promoting sustainable development across environmental, social, economic, and cultural dimensions. In this particular setting, do members of the museum visitors living in the Chinese mainland also acknowledge the significance of museums as a component in the four pillars of sustainable development? Are their perceptions affected by inherent structural disparities? For example, do visitors with varying levels of museum visitation experience hold similar attitudes toward the contributions museums make to sustainable development? If this is the case, in what manner do these disparities contribute to their comprehension of the correlation between museums and sustainable development?

3. Methods

While there is a dearth of research experience in directly investigating museum visitor's perceptions around sustainability, the current methodologies for assessing the efficacy of museums in promoting sustainable practices can nevertheless serve as valuable resources for informing the research method employed in this study. We found that some studies focused on the actions exhibited by museums within a singular dimension. Orea-Giner et al. conducted a study examining the economic and socio-cultural significance of museums [11]. The authors assert that through the use of mixed research methods, an assessment may be conducted to evaluate the sustainability performance of museums. Pop et al. introduced a comprehensive scale consisting of six variables that assess the significance of museums in the context of cultural sustainability [3]. However, these methods lacked comprehensiveness in addressing the four pillars of sustainable development and did not directly measure visitor's perceptions.

Other studies opted to adopt a comprehensive methodology in assessing the overall performance of museums across the four dimensions of sustainable development. The sustainability of cultural heritage and historic building restoration was evaluated by Aboul-naga et al. across four dimensions: environmental, cultural, economic, and social [37]. ICOM and OECD offer a self-assessment framework encompassing five key themes to enhance the social impact of museums [4]. These themes include economic development and innovation, urban design and community development, cultural and educational development, inclusion, health and well-being, and managing the relationship between local government and museums to maximise the impact on local development. In terms of substance, these themes encompass the four pillars of sustainable development as well. Pop and Borza released a comprehensive collection of 33 indicators that can be used to assess museum sustainability [38]. However, these methods also showed some limitations in effectively gauging visitors' opinion. The indicators created for these approaches were designed for museum professionals, or for people who are very familiar with the work of museums, but were not suitable for the visitors who only use museums as leisure destinations.

Therefore, we decided to adopt a different approach that was more suitable for our research objectives, choosing the questionnaire method as the data-gathering method for this study. Moreover, based on our past experiences conducting visitor evaluation, we chose the theoretical framework developed by Stylianou-Lambert et al. (2014), which was designed to measure the visitors' perceptions of museums' contributions to sustainable de-

velopment [39]. One notable attribute of the framework lies in its compact and comprehensible design of indicators, which effectively encompasses all four dimensions of sustainable development. Based on this premise, we formulated relevant statements that are tailored to specific conditions common in museums in the Chinese mainland, and that serve to measure the general visitor's perception of museums. The statements we formulated are presented in Table 1.

Table 1. Dependent variables and scale design.

Dimensions	Indicators	Statement?	Code
Environmental	Urban Planning and Regeneration Landscape Planning	I worry a new museum will harm the environment.	Q1.1
	Eco-buildings/Energy Efficiency	Museums should minimise lighting to save energy, even if it compromises the exhibition's visuals.	Q1.2
		Museums should limit air conditioning to save energy, even if it makes exhibition halls uncomfortable.	Q1.3
	Environmental Education	Museums should educate the public about environmental protection, even if it is not their primary theme.	Q1.4
	Eco-events/Exhibitions		
Social	Wellbeing	Museum visits won't make me happy.	Q2.1
	Sense of Place	Museum visits won't make me feel comfortable and at home	Q2.2
	Social Responsibility	Museum visits won't boost my social responsibility.	Q2.3
	Active Citizenship/Participation Engagement	Museum visits won't inspire me to care about societal concerns.	Q2.4
Economic	Fundraising	I will still attend the museum if it starts charging for entry again.	Q3.1
	Cultural Tourism	I think a new museum can promote local tourism.	Q3.2
	Cultural Employment	I think a new museum can create local jobs.	Q3.3
	Economic Revitalisation of Local Community	I think a new museum will improve the local economy.	Q3.4
Cultural	Heritage Preservation	Museums can't preserve local culture.	Q4.1
	Cultural Skills and Knowledge	Museums won't help me learn about culture.	Q4.2
	Memory/Identity	Museums can't help us remember the past.	Q4.3
	New Audiences/Inclusion	Museums can't make society more inclusive.	Q4.4
	Cultural Diversity/Intercultural Dialogue	Museums can preserve cultural variety.	Q4.5
	Creativity and Innovation Artistic Vitality	Museums can boost social innovation.	Q4.6
Overall		The relationship between museums and sustainability	Q5

In the process of designing the dependent variables, we gathered the issues outlined in Table 1 utilising a Likert scale consisting of five points. To enhance the questionnaire's quality, it was necessary to address inconsistencies between the scale's scores and visitors' attitudes. While higher scores generally indicate a more favourable opinion, some of our queries were *negative* statements—and, thus, in these instances, a lower score indicates a *favourable* opinion. The design of independent variables primarily encompasses demographic variables and cognitive variables. Demographic variables primarily encompass the characteristics of the sample population, including age, gender, educational background, occupation, and geographic location. The cognitive variable primarily encompasses two inquiries. The first aspect to consider is the level of the audience's familiarity with the term 'sustainable development'. Possible answers were the following statements: 'I don't know anything about sustainability', 'I know something about sustainability', and 'I am familiar with sustainability'. The second aspect pertains to the audience's familiarity

with the museum, which can be categorised into four groups: non-visitors (individuals who have never visited museums before), occasional visitors (average museum visit is less than one per year), frequent visitors (average museum visit is twice or more per year), and museum professionals.

Moreover, the term “museum”, as used in the questionnaire, often broadly refers to museums focused on history and archaeology within the Chinese context. Although, theoretically, Chinese museums also support the definition provided by the International Council of Museums, there are corresponding terms in Chinese for specific types of institutions such as science museums (科技馆), natural history museums (自然馆), and art museums (美术馆). Therefore, although the survey employed a museum concept without any restrictions, in practice, it reflects the understanding of the Chinese museum visitors regarding the relationship between such institutions, particularly those centred on history and archaeology and sustainable development.

To verify whether the Chinese visitor’s understanding of the scale aligns with our expectations, we distributed 100 questionnaires for a pilot survey prior to the formal investigation, simultaneously recording participants’ evaluations of the questionnaire’s readability and comprehensibility. Based on the feedback from the pilot survey, we made targeted adjustments to the Chinese expressions in the questionnaire.

The dissemination and retrieval of questionnaires was carried out via online platforms. Online questionnaires can reach a broader demographic, enabling the inclusion of both actual and potential museum visitors, who both constitute focal populations of interest in this research. To enhance the quality of the responses, we implemented a minimum time requirement for questionnaire completion. Respondents were required to spend a minimum of 90 s on finishing the questionnaire. Failure to meet this time threshold resulted in participants not being allowed to submit the questionnaire. Participants were provided information about these limitations before completing the task and were allowed to decline participation at any point during the procedure. The questionnaire was active from 1 May 2023 through 1 June 2023, for a total of 31 days. A total of 1260 valid samples were collected. The data were collected and analysed using a statistical analysis software programme called SPSS 29.0, which is a commonly used statistical tool that helps users to explore relationships within data.

4. Results

We will now turn to analyse the results from our questionnaire, drawing on 1260 samples collected from individuals in the Chinese mainland. Figure 1 depicts the demographic features of the sample population. In terms of gender composition, 716 participants were women, constituting almost 56 per cent of the total cohort. In terms of age distribution, the demographic segment comprising individuals aged 18 to 35 was predominant (968), while adolescents and seniors represented a very small percentage of our total pool of participants.

Regarding the educational background of participants, a very high number possessed an undergraduate degree (850), while a considerable number had attained graduate degrees or higher (180). In relation to occupational composition, there was a greater prevalence of managers (205), followed by students (175) and administrative employees (110). From a geographical standpoint, the participants in this study represented a significant number of the provinces within the Chinese mainland, with a predominant concentration in the eastern coastline regions. These areas exhibit high population density in China and are also characterised by a dense distribution of Chinese museums.

Sample Demographic

Sample Gender



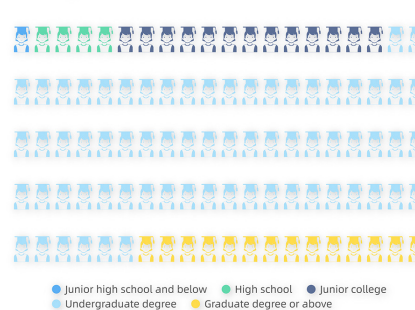
Sample Age



Sample Occupation



Sample Education



Sample distribution

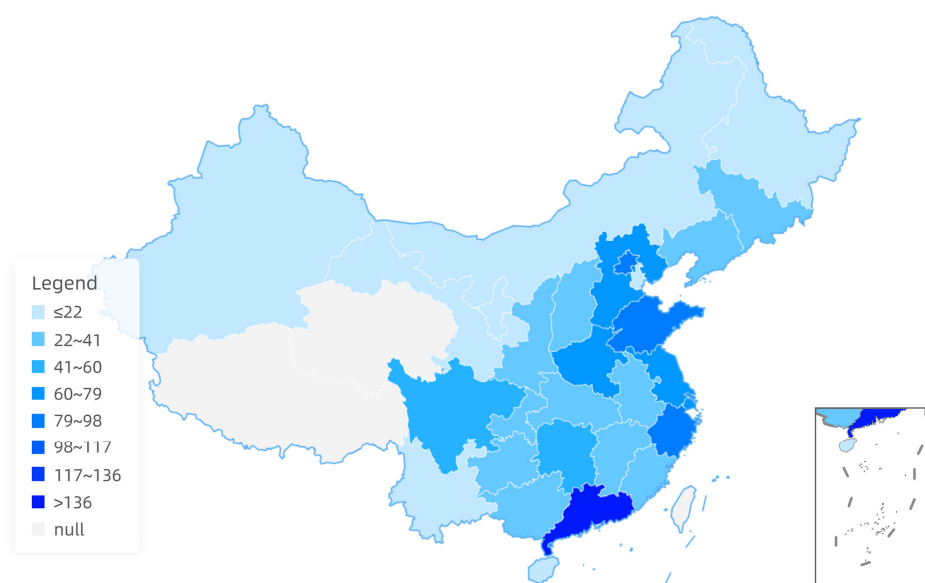


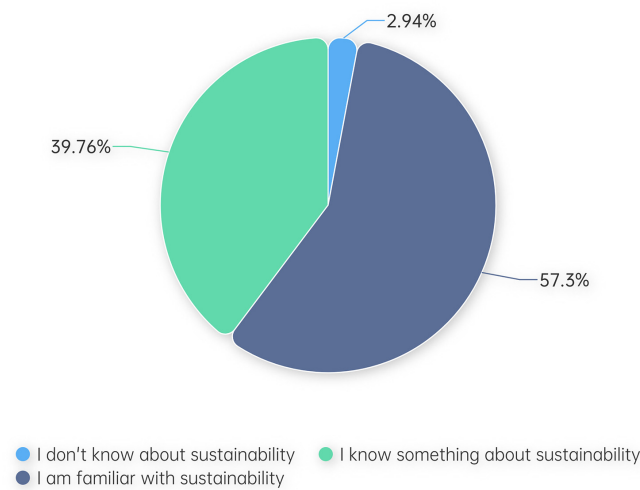
Figure 1. Sample Demographic.

In order to gain a deeper comprehension of the structural disparities within the general population, we conducted a survey to assess participants' level of familiarity with sustainability concepts and museums. The results of the survey are depicted in Figure 2. In relation to their level of acquaintance with the notion of sustainable development, a majority of the respondents, over 50 percent, indicated that they possessed a high level of

familiarity with the term ‘sustainable development’ (722), whereas a minority, less than three percent, claimed to have no prior knowledge of it. In terms of familiarity with museums, the proportion of occasional visitors who came less than once per year was 490, while the number of frequent visitors who visited museums twice or more per year was the largest in our cohort (630). A minority of survey respondents, less than two per cent, reported that they had never been to a museum. It is important to note that around 10 per cent of those we surveyed were museum professionals. Our rationale behind not excluding these professionals from the survey is that these individuals are not tasked with evaluating the sustainability performance of their institutions. To summarise, the majority of respondents in this study possessed a fundamental comprehension of the principles underlying sustainable development and exhibited familiarity with museums.

Public Knowledge

About Sustainability



About Museum

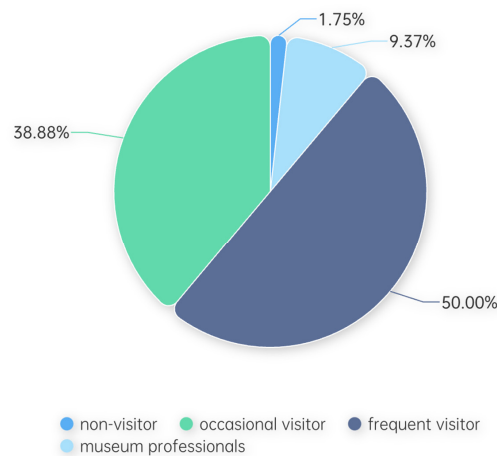


Figure 2. Public knowledge.

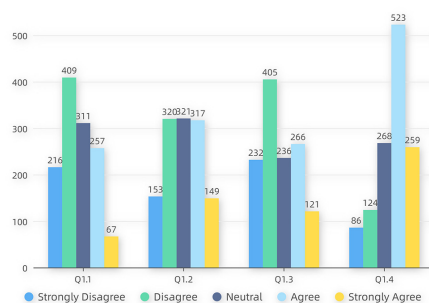
The primary focus of this study centres on the four pillars of sustainable development, which serve as the dependent variables in our questionnaire (Figure 3). In general, a significant majority of participants hold the belief that there is a correlation between museums and sustainability, since about 40 percent of general visitors state that they perceive a strong connection. In contrast, less than one percent of the surveyed population saw no correlation between museums and sustainable development.

Public Perception

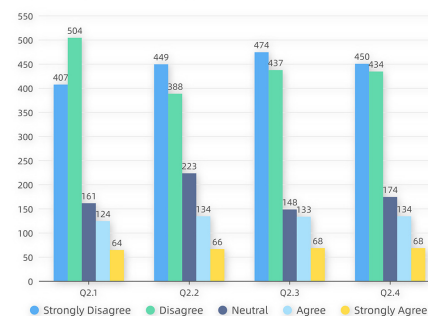
the Relationship between Museums and Sustainability



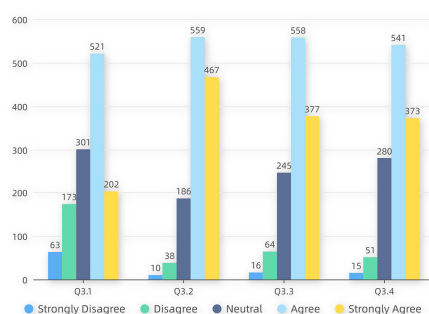
Environmental Dimension



Social Dimension



Economic Dimension



Cultural Dimension

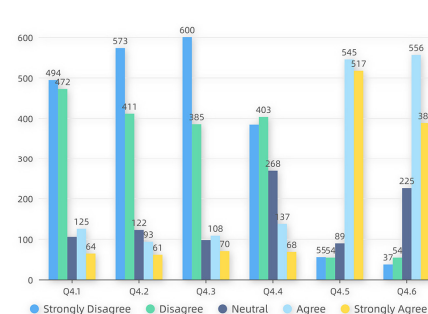


Figure 3. Public perception on Museums and Sustainability.

Most indicators show that the individuals who participated in our survey hold a positive view of the four dimensions of sustainable development. The distribution properties of these indicators are very clear (Figure 3). The survey question presupposes a negative

trend for the social dimension, whereby a lower score implies a higher level of agreement with the assertion that museums and social sustainability are tightly connected. For example, in the item Q2.1 “Museum visits won’t make me happy”, 407 participants chose 1 point, 504 participants chose 2 points, and the average score was 2.15 points. This indicates that the vast majority of participants do not agree with this statement. In other words, most participants believe that visiting museums can bring happiness (Figure 3). Questions related to the economic dimension are presented positively, with higher scores indicating a more positive attitude. In the item Q3.2 “I think a new museum can promote local tourism”, the average score reached 4.14, indicating that more participants agreed with this viewpoint. In the cultural dimension, the first four indicators are negative, while the last two are positive. Environmental indicators have a much more complex expression, with the first indicator having a negative trend, while the fourth has a positive one. Additionally, the second and third indicators examine visitors’ readiness to sacrifice the quality of museum visits to improve institutional sustainability. In Q1.2 “Museums should minimise lighting to save energy, even if it compromises the exhibition’s visuals”, the average score is 2.99, which means participants are almost evenly split on this issue. In 1.3 “Museums should limit the use of air conditioning”, the average score is 2.71, with opponents slightly more prevalent.

5. Discussion

Before we begin delving into the data analysis for the survey, we need to draw attention to the limitations presented by our sample selection. Examining the demographic characteristics of the sample population discussed in the previous section, we can easily see that a large proportion of the group participating in this survey are well-educated, and most participants have visited museums. This underlines an important question: To what extent can this cohort of respondents be said to represent the whole of China? Obviously, the limited sample of individuals who participated in our survey does not mirror the structural characteristics of Chinese society as a whole. While our wider, longer-term objective is to understand how the general Chinese visitor views museums as actors of sustainable development, the inherent limitations of our survey methods (with its small sample size) means that this question cannot meaningfully be answered in the present paper. However, the data drawn from our survey do allow us to better understand how China-based individuals who have been influenced by museums in the past perceive the relationship between museums and sustainability. And, just to be clear, this is not meant to discriminate against those who do not visit museums; it is merely a reflection of our ability to more easily reach certain segments of the population with our current research methods.

Based on the findings of our research, we can observe that a majority of survey participants perceive museums as contributing meaningfully to the advancement of sustainable development. Concerning the social dimension of sustainability, it is widely believed that museums have the potential to contribute positively to several aspects of individuals’ lives, such as their overall well-being, sense of belonging, social responsibility, and social engagement. The economic dimension acknowledges the significant positive influence of museums on the local economy. Similarly, the cultural dimension highlights widespread recognition among respondents of the importance of museums in preserving local cultural heritage and promoting diversity.

However, it is the environmental dimension of sustainability that offers the most intriguing findings. First, there was a noteworthy level of inconsistency in opinion surrounding the potential environmental consequences associated with the construction of new museums, which distinguishes this item from other statements. Although a majority of survey respondents denied the detrimental impact of museums, a significant proportion of participants—over 25 percent—expressed the view that the potential environmental harm caused by museums should not be disregarded. Furthermore, when we asked participants about their willingness to compromise the experience of their museum visits to enhance

institutional efforts towards environmental conservation, they responded in markedly negative ways.

To gain a deeper comprehension of variances in attitudes between survey respondents, we employed inferential statistical techniques, specifically, the T-test and one-way ANOVA. These methods were executed using the SPSS29.0 software to investigate the associations between five distinct independent variables (gender, age, education, familiarity with the concept of sustainability, and familiarity with museums) and their corresponding dependent variables.

5.1. Gender Differences

The results indicate that gender differences can be observed in respondent perceptions relating to all four dimensions of sustainable development, albeit to varying degrees. Regarding general attitudes surrounding sustainability, female participants had a higher tendency than male counterparts to acknowledge the interconnectedness between museums and sustainable development. Gender differences in the environmental domain mainly manifested in divergent perspectives around the use of lighting and air conditioning in museums; specifically, female participants did not believe that museums could be made more sustainable by cutting back on air conditioning and lighting. Gender differences were also observed for all four indicators within the social dimension, with women being more likely than men to recognise the significance of museums in fostering well-being, a sense of belonging, social responsibility, and social engagement. In the economic domain, gender differences only appeared when asking how museums affect local employment: In this instance, women were more likely than men to agree that museums play a beneficial role in creating local jobs. Although most participants believe that museums can enhance cultural understanding, preserve historical memory, and promote social inclusion, compared to male participants, female counterparts generally expressed more positive attitudes with respect to these questions.

In summary, notable divergences emerged in museum visitors' sentiments when analysed through the lens of gender, and this disparity showed a strong and persistent pattern. Overall, women were more likely to say that museums have a favourable impact on sustainable development. However, they also concurrently displayed a heightened sensitivity towards factors that have the potential to influence the quality of their individual museum experiences. It is imperative to underscore that gender serves as merely one lens through which to comprehend the fundamental structural disparities in perceptions, rather than being the root cause of this phenomenon.

5.2. Age Differences

This research categorises participants into four age groups: adolescents (under 18), young adults (18–35), middle-aged (36–55), and seniors (over 55). However, upon examining the demographic characteristics of survey participants, we noticed that the majority were aged between 18 and 55; representation of adolescents and senior individuals in the study was, thus, notably low. We examined attitudes across four age groups using a one-way analysis of variance (ANOVA). The results indicate important differences between younger and middle-aged groups of participants, and across all four dimensions of sustainable development. Nevertheless, the extent of this influence is comparatively smaller than that of gender.

Of particular note is the fact that young adults were more inclined to draw a correlation between museums and sustainable development, compared to individuals in the middle-aged demographic. For the environmental dimension, individuals in the younger demographic were more willing than middle-aged individuals to support the practice of reducing air conditioning usage in museums for environmental conservation. As regards the social dimension, young adults were more likely than middle-aged individuals to recognise the importance of museums in enhancing their sense of belonging. For the economic dimension, the younger demographic did not exhibit a higher degree of optimism com-

pared to the middle-aged demographic concerning museums and their capacity to create employment. When considering the cultural dimension, we observed that younger individuals were more inclined to acknowledge the capacity of museums to improve individual cultural knowledge.

In summary, it can be inferred from the data that well-educated young adults from the Chinese mainland had a more positive view than middle-aged individuals toward the contribution of museums to sustainable development. Furthermore, the former group demonstrates a heightened willingness to compromise the quality of their museum visits in the name of greater sustainability. Nevertheless, young adults participating in our survey exhibited a certain level of scepticism when it came to advocating for the importance of museums as a source of employment.

5.3. Educational Differences

The categorisation of education levels in this study aligns with the prevailing classification system in the Chinese mainland. We grouped participants' educational background and attainment into five distinct categories, namely, junior high school and below, high school, junior college, undergraduate degree, and graduate degree or above. Participants with postgraduate degrees or above show a greater propensity to acknowledge the strong correlation between museums and sustainable development than individuals with other educational backgrounds. The postgraduate group exhibited noteworthy disparities across three variables within the environmental component as compared to the other groups. To begin with, undergraduates exhibit a greater propensity to refute the notion that the construction of museums results in ecological damage. Furthermore, with respect to the question of whether museums should limit lighting and air conditioning for ecological reasons, graduate degree-holders tend to hold the belief that museums should not restrict the utilisation of such resources for the sake of environmental conservation.

Within the social dimension, we also observed important disparities between respondents of different educational backgrounds. In comparison to other demographic groups, our data shows that graduate students exhibit a higher propensity to acknowledge the significance of museums in fostering sentiments of well-being, a sense of belonging, social responsibility, and social engagement. The economic dimension, meanwhile, evidenced the impact of educational background on the perception of the interplay between museums and local tourism. We observed that graduates and undergraduates had a higher propensity than respondents who did not pursue education beyond junior and senior high school to acknowledge the significance of museums in fostering the growth of local tourism. The dimension of culture encompasses various indices that represent disparities in educational backgrounds. We can, notably, observe that graduates exhibit a higher propensity to acknowledge the significance of museums in the preservation of local cultural history, fostering individual cultural cognition, safeguarding local cultural memory, and facilitating social inclusivity.

Based on the results drawn from our analysis, it can be reasonably inferred that individuals with higher levels of education are more inclined than other groups to acknowledge the significance of museums with respect to all aspects of sustainable development. Interestingly, however, more highly educated individuals are less inclined to compromise the quality of in-person visits to facilitate museums' attainment of sustainability objectives.

Our discussion of educational background and attainment shows a noteworthy limitation: Among the participants we surveyed, the percentage of those who have attained graduate and postgraduate degrees is relatively high. Although, over the past 20 years, enrolment in higher education programmes has developed rapidly in China, the viewpoints of those who have not experienced higher education should not be ignored. In future studies, we will focus on this group.

5.4. Knowledge About Sustainability

The study's findings revealed that a significant majority of participants exhibited various levels of comprehension regarding the concept of sustainable development. The outcomes of the ANOVA indicate that this variable exhibit statistically significant variations across nearly all measures within the four dimensions.

Generally, individuals that had a greater level of familiarity with sustainable development exhibited a higher propensity to acknowledge the correlation between museums and sustainable development, in contrast to those who were less familiar with it. With regard to the environmental dimension, it is noteworthy that the group possessing a greater level of familiarity with the notion of sustainability exhibited a higher propensity to refute the negative effects of museum activities on the environment, when compared to other groups. Furthermore, the demographic segments that possessed the least familiarity with the concept of sustainable development exhibited the most pronounced resistance toward embracing measures aimed at curtailing the use of lighting and improving energy efficiency within museums. However, this trend was completely reversed when it came to the issue of using air conditioning: Respondents who were more familiar with the concept of sustainability tended to oppose any restrictions on the use of air conditioning in museums.

Within the social dimension, we found that groups possessing different levels of familiarity with the concept of sustainability held significantly different attitudes around the four indicators in this dimension. Individuals who possessed a greater understanding of sustainable development tended to have more favourable attitudes towards museums' efforts to promote well-being, foster a sense of belonging, encourage social responsibility, and facilitate social engagement. In terms of the economic aspect of sustainability, individuals who were less acquainted with the notion of sustainability more enthusiastically endorsed the idea that visitors should financially contribute towards museum visits. Nevertheless, we observed that individuals who were less acquainted with the principles of sustainable development tended to exhibit greater support for museums that contribute to local economic development. Within the cultural dimension, individuals who possess knowledge about sustainable development tended to exhibit a greater propensity for acknowledging the significance of museums in safeguarding cultural heritage, fostering cultural comprehension, preserving cultural memory, fostering social inclusivity, and safeguarding cultural diversity.

5.5. Knowledge About Museums

The general visitor in China has different levels of familiarity with museums. For this study, we employed Marilyn G. Hood's research methods and conducted a series of visitor evaluation practices from 2017 to 2023 in the Chinese mainland. As a result, we categorised the level of familiarity with museums among survey respondents into four distinct groups: non-visitors, occasional visitors, frequent visitors [40], and museum professionals. Our findings indicated that there were notable variations in nearly all indicators based on the level of familiarity with museums among respondents.

Based on the analysis of our survey, individuals working in the museums field (10 percent of respondents) exhibited a higher propensity, compared to non-professionals, to see a correlation between museums and sustainable development. Among non-professionals, individuals who visit museums frequently exhibited a higher propensity to view interconnections between museums and the concept of sustainable development, compared to those who only visit museums occasionally. With regard to the environmental aspect, there were notable distinctions between museum professionals and non-professionals across three indicators. Specifically, professionals exhibited a higher tendency to refute the notion that museums contribute to environmental degradation. However, they also displayed a greater inclination compared to non-professionals to resist environmental conservation measures such as the restriction of lighting and air conditioning.

In terms of the social aspect, employed individuals exhibited a higher propensity compared to unemployed counterparts to acknowledge the significance of museums across all four dimensions. Meanwhile, among non-museum professionals, those who regularly visit museums showed more pronounced support for initiatives across multiple dimensions of sustainability compared to those who do not visit museums regularly. In the realm of economics, employed individuals exhibited a greater propensity to allocate financial resources towards museum visits. Simultaneously, within the non-professional demographic, individuals who visit museums regularly exhibited a higher propensity to financially contribute towards their visits compared to casual visitors and those who never visit museums.

The perception of the importance of museums in the context of tourism was found to be more favourable among professionals compared to non-professionals. Regular visitors were more inclined than casual visitors to acknowledge the importance of museums in fostering local employment. The differences in familiarity with museums also reflect varying degrees of attitudinal differences across all six indicators for the cultural dimension. Among these, museum professionals exhibited more positive attitudes towards heritage preservation, cultural skills and knowledge, memory/identity, and new audiences/inclusion compared to the non-professional group. In general, those who possess a greater level of familiarity with museums tended to draw stronger correlations between museums and sustainability. Simultaneously, these individuals were less inclined to endorse museums that compromise the quality of individual visits to achieve greater environmental sustainability.

5.6. Are We on the Same Page?

Based on the results discussed above, we found that the differences had some common features. We considered five independent variables in our analysis: gender, age, education, familiarity with sustainability, and familiarity with museums. We focused on investigating the relationship between museums and sustainable development, especially with regard to its environmental, social, economic, and cultural dimensions. Despite variations in perception, clear and consistent patterns emerged among survey responses in relation to our proposed statements. One key data point that should be underlined is the positive perception among a majority of our survey respondents regarding the correlation between museums and sustainable development. Due to the biased distribution characteristics of the population sample, we cannot generalise these results to the entire Chinese public. However, for those groups who have prior experiences and familiarity with museums, the reliability of this conclusion remains valuable. We also noted that young individuals, who had a better understanding of sustainable development, visited museums more frequently, and also had higher levels of education, tended to perceive stronger connections between museums and sustainable development.

However, although there was a prevailing belief among a majority of survey respondents that museums could contribute to sustainable development, there was also a reluctance to sacrifice the quality of individual museum visits. Our findings indicate that those with higher levels of education and greater acquaintance with the museum sector were more strongly opposed to limiting the comfort of their own visiting experience in the name of environmental protection or efficiency (Figures 4 and 5). The Sankey diagram can be used to visually represent the relationship between multiple variables. In this paper, we place the two dependent variables Q1.2 and Q1.3 in the middle, and the independent variables 'Education' and 'Familiarity with museums' on the two sides. On one hand, this can reflect the distribution of the independent variables on the dependent variables; on the other hand, it can also reflect the approximate proportion of the dependent variables on the corresponding independent variables. This raised a new question: What was the underlying reason for individuals who had a higher tendency to acknowledge the role of museums in promoting sustainability, but showed a lower willingness to compromise the quality of their personal museum experiences in the name of sustainability?

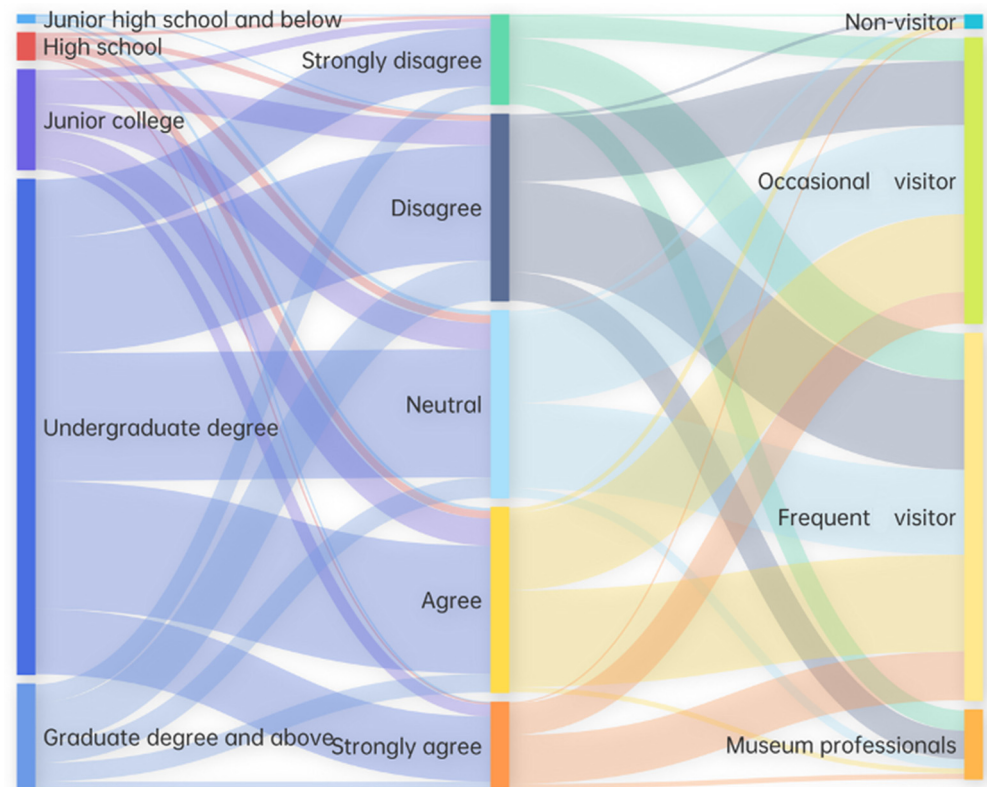


Figure 4. Sankey diagram of education (left), familiarity with museums (right), and attitude toward minimising lighting for energy efficiency (middle).

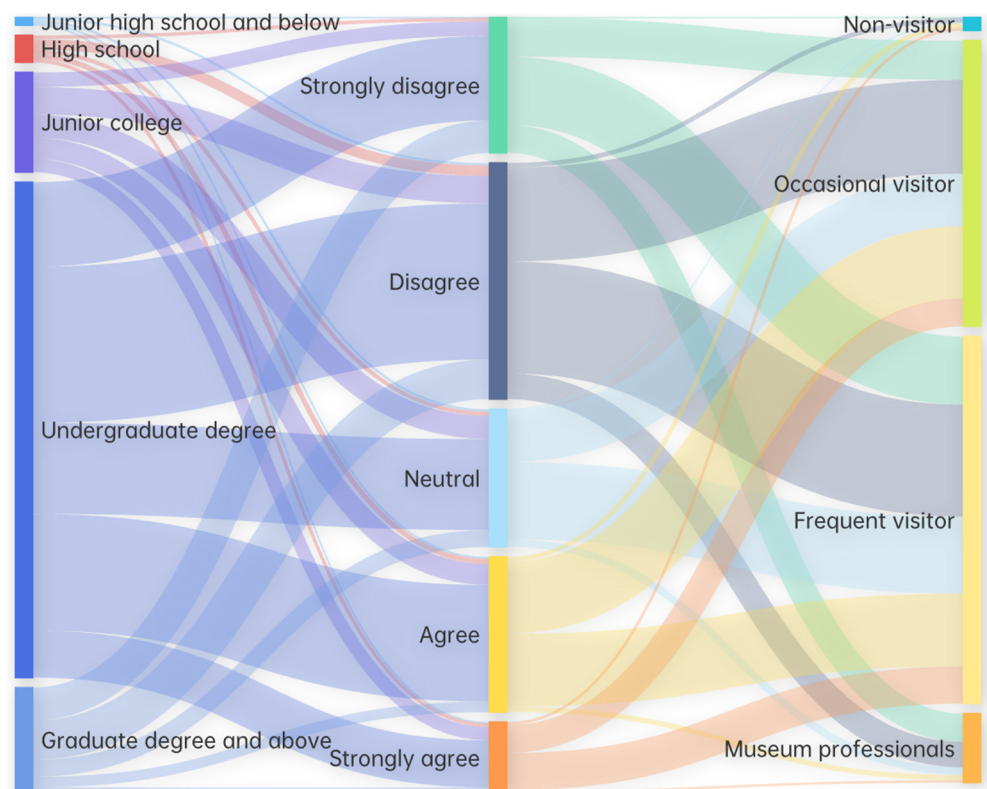


Figure 5. Sankey diagram of education (left), familiarity with the museum (right), and attitude toward limiting air conditioning (middle).

Our initial supposition was that museum professionals would be more likely to actively advocate for the adoption of sustainable practices within museums. However, the results of this study suggest that, at least among our survey respondents, professionals were more reluctant than non-professionals to compromise the quality of their museum visits in the pursuit of sustainability goals. Our findings, thus, raise further questions as to whether museum workers may at times have incongruent attitudes about sustainable development when compared to the institutions they work for.

The expression of scepticism towards certain sustainability initiatives among museum workers is a phenomenon that deserves our attention, but in highlighting it, we do not wish to suggest that museum professionals are selfish. The rationale behind this phenomenon, we postulate, stems from the tendency to inadvertently separate environmental sustainability from all four pillars of sustainable development. Indeed, the four dimensions of sustainable development are both interdependent and mutually influential. According to Loach et al., the assessment of museums' contribution to cultural sustainability may be determined by evaluating their parallel efforts to address economic, social, and ecological sustainability [41]. Pop et al. conducted a comprehensive literature analysis and survey involving 86 museums to investigate the diverse impacts of culture, society, economy, and the environment on the attainment of cultural stability within Romanian museums [3]. The findings of this study indicate that the social and economic performance of museums significantly influences their capacity to achieve cultural sustainability. In this particular context, while Chinese museum professionals in our survey expressed reservations about compromising the quality of individual visits to prioritise museums' contribution to environmental sustainability, it is important to note that this stance does not contradict their favourable attitudes towards museums implementing other aspects of sustainability. Experienced individuals can discern that any decision made by the museum to diminish the quality of visitors' experiences would inevitably have a significant impact on the museum's sustainable development efforts across social, economic, and cultural dimensions. Here is one illustrative example: If a museum chooses to limit or even stop the use of air conditioning for the purpose of energy conservation, imagine the impact this might have on the visitor experience—in turn, leading to a decrease in visitor numbers. Accordingly, while reducing air-conditioning use might accord with a museum's objective to operate more sustainably from an environmental standpoint, the impact of such a measure on sustainable development from cultural and economic standpoints would be grave. Although this is an extreme example, as Worts posits, the sustainable development of museums is contingent upon achieving equilibrium among the four dimensions [42].

6. Conclusions

This study employed online questionnaires as a method to investigate the perspectives of people living in the Chinese mainland. As we emphasised in the previous section, the sample is heavily represented by museum visitors, rather than representing a general cross-section of the Chinese population. Accordingly, it is difficult for us to use the survey results to represent the attitudes of the general Chinese public; it nevertheless accurately reflects the attitudes of typical museum visitors in the Chinese mainland. The primary objective was to gain insights into the visitor's perceptions around the correlation between museums and sustainable development. How aware is the visitor of the multiple contributions of museums to environmental, social, economic, and cultural sustainability, which are widely considered the four pillars of sustainable development? The study's findings confirmed that a majority of museum visitors in the Chinese mainland believe that museums can make significant contributions to sustainable development.

From a cross-cultural standpoint, it is important to focus on an extra data point in this survey: the level of familiarity that the Chinese population has with sustainable development. Based on the findings presented in Figure 2, only 2.9 per cent of participants expressed a lack of familiarity with the idea of sustainability. There are two key explanations for this phenomenon: First, it is clear that the majority of the survey respondents

involved in the study have attained high levels of education; secondly, as previously mentioned, sustainability is mostly regarded as a political notion in mainland China. Over the past two decades, the Chinese government has seen sustainable development as a crucial objective for national development, which has led to more widespread public awareness of the concept. Despite lacking a thorough understanding of the four dimensions of sustainability, the majority of our survey participants comprehend the fundamental concept of sustainable development, which entails exercising restraint for the benefit of future generations.

In addition, the museum sector in China is also facing some new and unique challenges as it undergoes a period of rapid growth. In recent months, some prominent museums in China have struggled to address a large gap between visitor demand and their operational capacities. Although most museums in China offer free admission to the public, visitors often face difficulties in obtaining tickets, which require both financial and time investments. Although this phenomenon only occurs in some museums and there is still a large number of museums lacking sufficient visitor footfall, such imbalances between institutions also present new challenges to the sustainable development of Chinese museums. Given these circumstances, what strategies could Chinese museums adopt to effectively address this issue? Or should they meet the public demand for museums by expanding or building new facilities? This research assigns renewed significance to the sustainable development of museums within this particular setting; while enhancing the social and economic impact of museums, it also poses a threat to their environmental and cultural sustainability.

For museums in China, this appears to be a fortunate dilemma. On one hand, a large number of visitors choose to visit museums during their leisure time, which is a direct result of China's cultural policies over the past two decades. On the other hand, the excessive pressure placed on a few leading museums has, objectively, diminished the quality of the visitor experience. Implementing limits on visitor numbers might have an impact on the social and cultural components of museums, perhaps hindering their sustainable development. Conversely, the expansion or creation of a new museum has the potential to create negative environmental impacts and positive economic impacts. In an interview, Laishun An, former vice president of ICOM, stated that annual energy usage in Chinese museums might be as high as 20 billion kilowatts [36]. Therefore, the issue of energy consumption in Chinese museums can no longer be ignored, and questions around how to maintain a balance between environmental sustainability and cultural sustainability in the process of opening to the public has become a pressing issue that museums must face.

The Chinese central government also faces challenges in establishing a consistent standard for managing museums in a sustainable manner due to the presence of cultural, social, economic, and environmental tensions and pressures, as well as considerable variations in the type, geography, and size of museums. In other words, museum-based sustainable development goals often conflict with the local government's own sustainable development goals, especially when the local government prioritises economic development. Hence, while local governments will likely face significant obstacles in incorporating museums' sustainable development goals into their own sustainability planning, such integration would serve as a crucial benchmark for assessing the administrative capacities of local government in the future. Although this contradictory phenomenon goes beyond the scope of this paper, it highlights the importance of this study from another perspective.

The research in this paper has certain limitations. From a methodological point of view, although we have tried to compensate for the lack of sample distribution with a relatively large sample size, we have not completely avoided this problem. This makes the extent to which our findings are representative of public attitudes in Chinese mainland is controversial. In addition, although the use of the four dimensions to reflect the relationship between museums and sustainable development has proven to be an effective way, the particularity of the museum's own meaning-making and representation may have a more complex relationship with sustainability. For instance, is the significance of sustain-

ability consistent across different cultures? Could sustainability be perceived as a product of a Western-centric perspective? In the context of museums representing other cultural backgrounds, what approach should be taken to present the relationship between indigenous cultures and sustainability? These limitations will shed light on future research.

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