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Auditory Experience Identification Through Soundscape Approach in Borobudur Temple

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ABSTRACT

Borobudur Temple, a UNESCO World Heritage site located in Central Java, Indonesia, is famous for its architectural splendor and spiritual significance. However, the auditory experience of visitors, as part of the cultural landscape, has been minimally researched. This research aims to identify and explore the soundscape at Borobudur Temple and examine visitors' auditory perceptions. Soundscape, introduced by R. Murray Schafer, encompasses the acoustic environment understood and experienced by individuals or communities, which influences their perception and experience of a location. Using a quantitative descriptive approach, this study collected data by field measurement of sound intensity and characteristics as a physical form of the acoustic environment, and visitor perceptions collected by adapting a questionnaire based on Method B of ISO/TS 12913-2. Data analysis included descriptive statistics, soundscape analysis of perceptual attributes, and word cloud to examine respondent's feedback. This research not only expands knowledge on acoustic evaluation of cultural heritage sites but also provides a basis for soundscape management strategies that can enhance visitor experience and preserve acoustic heritage.

Keywords: Soundscape, Auditory Experience, Cultural Heritage

1. Introduction

Borobudur Temple, one of the world heritage sites recognized by UNESCO, is famous for its architecture, intricate reliefs, and spiritual significance that attract national and international visitors [1]. Although research on its architectural and religious aspects has been investigated [2], little attention has been paid to the auditory experience at the temple. The concept of soundscape introduced by R. Murray Schafer refers to the acoustic environment perceived and understood by individuals or by communities to be an important part of cultural heritage conservation [3][4]. The acoustic environment is influenced by natural, man-made and cultural elements, shaping the perception and experience of a location [5].

The definition of soundscape involves objective and subjective understanding of the acoustic aspects of the environment [6]. Objective understanding comes from the acoustic conditions of the environment itself, which are perceived and understood by humans through auditory sensations, thus forming an understanding of the context of a place or environment as informed in Figure 1. Bruce and Davies investigated the effects of expectations on soundscape perception and found that individual expectations significantly influence the perception and evaluation of acoustic environments [7]. Unlike acoustic environments that refer to physical

phenomena, soundscapes refer to perceptual constructs. It influences individuals through their perspective and interpretation of the surrounding sounds [8]. Axelsson's research on the relationship between soundscape and social sustainability in an urban park showed that a positive soundscape characterized by natural sounds and low noise levels contributed to personal comfort and social cohesion among urban park visitors [9]. Therefore, considering soundscape in environmental management can improve social interaction and user well-being.

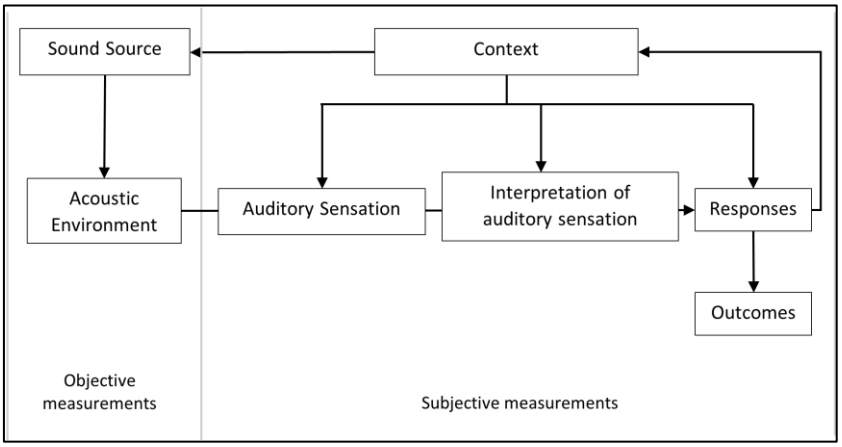

Figure 1. Soundscape Framework adapted from ISO 12913 – 1. (Sudarsono et al., 2022)

Auditory experiences result from an individual's perception of sound in a particular environment [10]. This experience is influenced not only by what is heard and where the sound is perceived, but also by the social conditions of the environment. The acoustic environment can directly influence the visitor experience when acoustic conditions remain consistent [11]. The diversity of auditory experiences can shape how individuals interpret and engage with their surroundings. Sacks explains that auditory stimuli have a direct pathway to the human emotional center, making it a powerful trigger for memories and emotions [12]. Therefore, auditory experiences play an important role in shaping the overall perception of a place or situation.

At cultural heritage sites such as Borobudur Temple, auditory experiences are an important part of the cultural landscape, such as the sounds of mantra chants and bells that contribute to the intangible heritage of a temple [13]. Acoustic environments influence the visitor experience, evoking emotions and enhancing appreciation in cultural and spiritual contexts [14]. Despite its importance, research on soundscapes in cultural heritage sites is limited. The Declaration of Florence emphasizes the need to preserve the integrity and authenticity of cultural landscapes through acoustic environment research [15]. Previous research has explored the acoustic environment at various historical sites, but there are still significant gaps in understanding the auditory experience at the iconic site of Borobudur Temple [16] [13] [17] [18] [19].

The auditory experience at Borobudur Temple Temple has yet to be comprehensively identified, despite the potential cultural significance of its acoustic elements. The characteristics of the soundscape and visitors' perceptions of the acoustic environment at Borobudur Temple Temple remain largely unexplored, limiting our understanding of how visitors interpret and respond to auditory experiences at this site. Therefore, in order to bridge the gap in understanding the auditory experience at Borobudur Temple Temple, research questions were proposed: (1) What are the characteristics of the soundscapes at Borobudur Temple Temple? (2) How do visitors perceive the sounds or acoustic environment at Borobudur Temple Temple? (3) What recommendations for soundscape management strategies at Borobudur Temple Temple that could enhance visitors' auditory experiences?

2. Method

This research employs a quantitative descriptive study, aimed to objectively characterize phenomena through numerical data analysis [20][21]. It focuses on identifying soundscape characteristics and visitors' auditory experiences at Borobudur Temple Temple.

2.1. Soundscape Characteristics

The soundscape characteristic data was obtained from noise level measurements and sound pattern recordings. Both measurements were conducted in zone 1, which is the courtyard of Borobudur Temple, the main area where tourists can closely view and enjoy the temple. Data collection was carried out on four sides of the temple courtyard between 08:00-15:00 WIB, with each side being measured for 10 minutes twice over two days. The measurements were performed using a PAA3 Sound Level Meter and a Zoom Handy H5 to record sound patterns. The measurement procedure followed the guidelines set by KEPMENLH No. 48/MenLH/11/1996, where the equipment was positioned at each side of the courtyard no more than 1 meter from the edge of the main road around the temple courtyard and at a height of 1.2 meters, or ear level. The data obtained includes numerical data indicating noise levels and sound recordings at each measurement point.

2.2. Visitor's Perception

A total of 82 respondents participated in the questionnaire distribution, which was conducted simultaneously with the field measurements. The demographic profile of the respondents is summarized in figure 2. The majority of respondents were in the age range of 20 - 29 years (55%), followed by the 40 - 49 years age group (17%). Of all the respondents, 52% were male, while 48% were female. Some respondents had obtained a bachelor's degree (29%), with 39% having completed high school. Most respondents were domestic tourists (63%), followed by local tourists (29%) and international tourists (7%). Most of respondents stated that this was their first visit to Borobudur Temple, while 33% had visited more than twice. Therefore, it can be concluded that the soundscape evaluation in this study primarily reflects the perspectives of first-time visitors to Borobudur Temple.

The questionnaire used in this study was adapted from Method B according to ISO/TS 12913-2, employing both closed and open-ended questions to identify and assess sounds, as well as to gather feedback on the perceived soundscape at Borobudur Temple by the respondent [22]. The questionnaire was organized into four dimensions: (1) personal information, (2) personal relationship with the site, (3) assessment of acoustic environment components, and (4) subjective understanding (perception) of the acoustic environment at Borobudur Temple, as shown in **Table *1***. Based on previous research [23][24] and the recorded data, the response options for dominant sounds were categorized into four types: (1) Natural sounds (birdsong, rustling wind, rustling leaves), (2) Human sounds (conversation, laughter, shouting), (3) Traffic sounds (cars, motorcycles, trucks), (4) Other sounds (loudspeakers, construction, sirens).

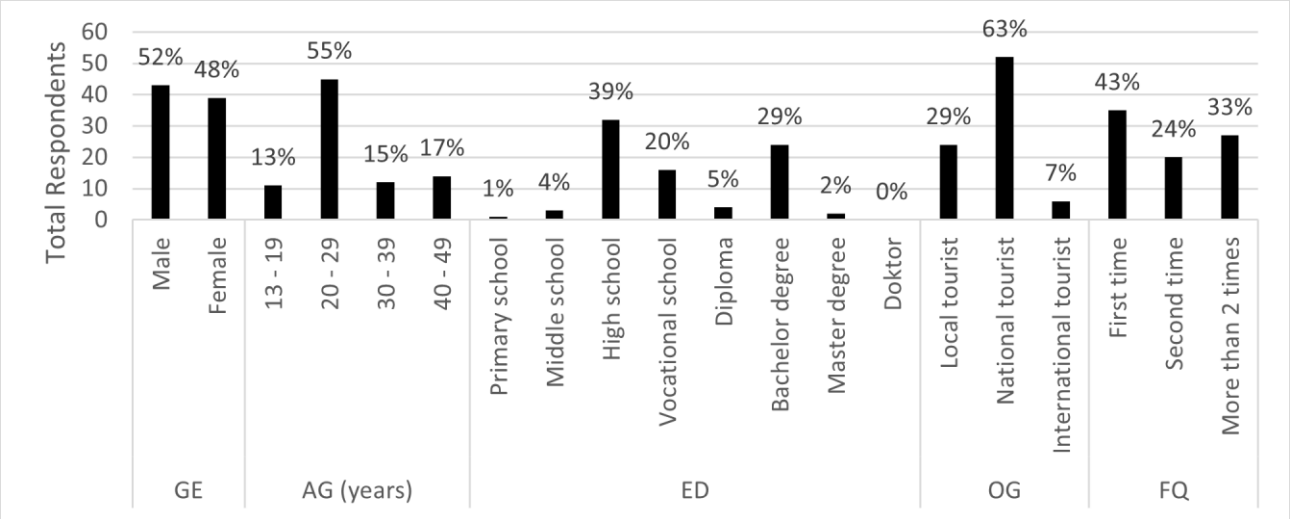

Figure 2. Demographic Profile of respondents

Table 1. Core questions of the questionnaire

ID	Questions	Response/Scale (0-5)
Dimension 1: personal information		
Dimension 2: personal relationship with the object		
RS	What is your purpose of visiting Borobudur Temple Temple? *(recreational tourism, educational tourism, religious tourism)*	*Multiple choice*
FQ	How many times have you visited Borobudut Temple?	*Multiple choice*
Dimension 3: assessment of acoustic environment components		
SQ	How would you describe the current sound environment at Borobudur Temple Temple?	Very bad – Very good
AP	The sound environment present in Borobudur Temple Temple are appropriate	Strongly disagree – Strongly agree
SP	To what extent do you currently hear the following types of sounds? *(Natural sounds – e.g.* birds chirping, wind blowing, rustling of leaves, etc.; *Human sounds – e.g.* conversations, laughter, shouting, etc.; *Traffic sounds – e.g.* cars, motorcycles, buses; *Other sounds – e.g.* loudspeakers, construction, sirens, footsteps, etc.)	Do not heat at all – Dominates completely
AT	For each of the scales below, to what extent do you agree or disagree about the current sounds around Borobudur Temple Temple? *(pleasant, chaotic, vibrant, uneventful, calm, annoying, eventful, monotonous)*	Strongly disagree – Strongly agree
Dimension 4: subjective understanding of the acoustic environment		
RSS	The sound conditions you heard during your visit around Borobudur Temple Temple helped you achieve your visit purpose	Not helping at all – Very helpful
PF	What sounds best supported your visit experience? *(Natural sounds, Human sounds, Traffic sounds, other sounds)*	*Multiple choice*
FB	The sounds atmosphere adds value to your experience while at Borobudur Temple Temple	Strongly disagree – Strongly agree
	What kind of sound environment improvement do you expect at Borobudur Temple Temple?	*Open answer*

3. Results and Discussion

3.1. *Borobudur Temple's Soundscape Characteristic*

SPL measurement data was obtained as much as 8 data. Each 1 SPL recording data is 10 minutes long. However, there is a system error in the recording so that the data can be read only in the first 3 minutes. The data was processed using formulas according to KEPMENLH No. 48/MenLH/11/1996 within 3-minute period to obtain the equivalent noise level (Leq) and fluctuation conditions through 10%, 50%, and 90% of the measurement time, with the results listed in Table 2.

Table 2. Measured SPL at all four points. U = North, T = East, S = South, B = West

Visitors Condition	Measured Point	SPL (3 min)				Average			
		L_{eq}	L_{10}	L_{50}	L_{90}	L_{eq}	L_{10}	L_{50}	L_{90}
Crowded	T1	55.3	56.6	54.9	52.8	56.1	57.3	55.9	54.1
	T2	56.9	57.9	56.9	55.3				
	U1	56.0	57.2	55.6	54.5	56.7	58.3	56.3	54.7
	U2	60.3	61.8	60.0	58.3				

Visitors Condition	Measured Point	SPL (3 min)				Average			
		L_{eq}	L_{10}	L_{50}	L_{90}	L_{eq}	L_{10}	L_{50}	L_{90}
Moderately crowded	B1	53.9	56.0	53.3	51.3				
Fairly quiet	S1	54.5	56.2	54.3	52.2	45.2	46.7	44.4	42.5
	B2	35.9	37.2	34.5	32.9				
Very quiet	S2	41.9	44.9	39.4	36.9	41.9	44.9	39.4	36.9

** The categories of visitor conditions were based on observations of the number of visitors and the duration of their stay at each side of the courtyard during the measurements. Very quiet: fewer than 5 visitors, and they do not stay long, fairly quiet: fewer than 10 visitors, either not staying or staying briefly, moderately crowded: 10 - 15 visitors, and they stay for some time, and crowded: more than 15 visitors, and they stay for an extended period.*

According to KEPMENLH No. 48/MenLH/11/1996, Leq measures noise levels over a specific period. Results show that in crowded conditions, noise levels range from 55.3 dB(A) to 56.9 dB(A), with L10 values of 56.6 dB(A) to 57.9 dB(A) and L90 values of 52.8 dB(A) to 55.3 dB(A). Moderately crowded conditions reach up to 56 dB(A), with L10 and L90 values at 57.2 dB(A) and 54.5 dB(A) respectively, characterized by visitor sounds and occasional artificial noises. Quieter periods range from 53.9 dB(A) to 60.3 dB(A), with L10 and L90 values from 56 dB(A) to 61.8 dB(A) and 51.3 dB(A) to 58.3 dB(A), often due to insect noises like cicadas. Very quiet times register 35.9 dB(A) to 41.9 dB(A), with L10 and L90 between 37.2 dB(A) to 44.9 dB(A) and 32.9 dB(A) to 36.9 dB(A), dominated by insects and birds, occasionally with faint footsteps. Overall, noise levels generally meet heritage standards, varying not just with visitor numbers but also influenced by natural factors, highlighting fluctuations in noise exposure across different conditions at Borobudur Temple.

Spectral analysis involved eight 10-minute sound recordings visualized using Audacity to analyze sound patterns at specific frequencies through spectrograms showing the varying conditions at Borobudur Temple Temple's grounds reveal distinct sound patterns (see Figure 3). According to Satwiko, frequency determines the pitch of sound, with human hearing typically ranging from 20 Hz to 20,000 Hz [25]. During crowded to moderately crowded times, sound patterns consistently exhibit strong energy in the range of 20 Hz to 4.000 Hz, primarily from visitor activities such as conversations, children's shouts, footsteps, and laughter. In these conditions, insect sounds are faint but present. Conversely, in quieter periods, significant energy fluctuations occur due to temporary sound suppression such as the sound of a visitor who is very close to the recording device. In these conditions, sounds from insects and birds, despite their relatively low energy, become more prominent and clearly visible in the spectrogram (in frequency of 4.000 Hz – 10.000 Hz). Additionally, sounds from lawnmowers are also distinctly identifiable.

3.2. Visitors Perception

The spectrogram analysis revealed that Borobudur Temple features a diverse range of sounds, from natural sounds such as insects and birds to human activities like footsteps, gardening, and guided tours. Visitors primarily heard natural sounds, followed by human-generated sounds, while traffic noise was negligible. The majority of respondents rated the sound quality in the temple area as very good and felt that the sounds they heard were highly appropriate for the environment. However, individual interpretations of the temple's context varied among respondents. Most visitors came for recreational purposes, followed by educational tourism. Specifically, 73% of respondents felt that the sounds they encountered enhanced their experience at Borobudur Temple, indicating that sound plays a significant role in shaping visitors' interpretation of the site.

The perceptual soundscape attribute assessment at Borobudur Temple Temple, based on Axelsson's eight attributes (pleasant, chaotic, vibrant, uneventful, calm, annoying, and eventful), reveals diverse descriptions of the sound environment [26]. Figure 4(a) shows average of likert scale assessment, sounds at the temple's grounds are primarily described as pleasant, vibrant, calm, and eventful, though some respondents found them chaotic, uneventful, annoying, and monotonous. The ISO Pleasantness and ISO Eventfulness calculations, visualized in a scatter plot shown in Figure 4(b), indicate a predominantly positive perception among 82

respondents, who described the sounds as vibrant. Spectral pattern analysis suggests that the perception of an eventful environment likely stems from a combination of human activities (conversations, laughter, shouting) and other sounds (loudspeakers, gardening). The perception of pleasantness and vibrancy is likely influenced by natural sounds associated with positive energy, while laughter and the presence of other visitors also contribute. Conversely, the perception of calmness, which contrasts with 'eventful' and 'vibrant,' emerges when the acoustic environment is dominated by natural sounds.

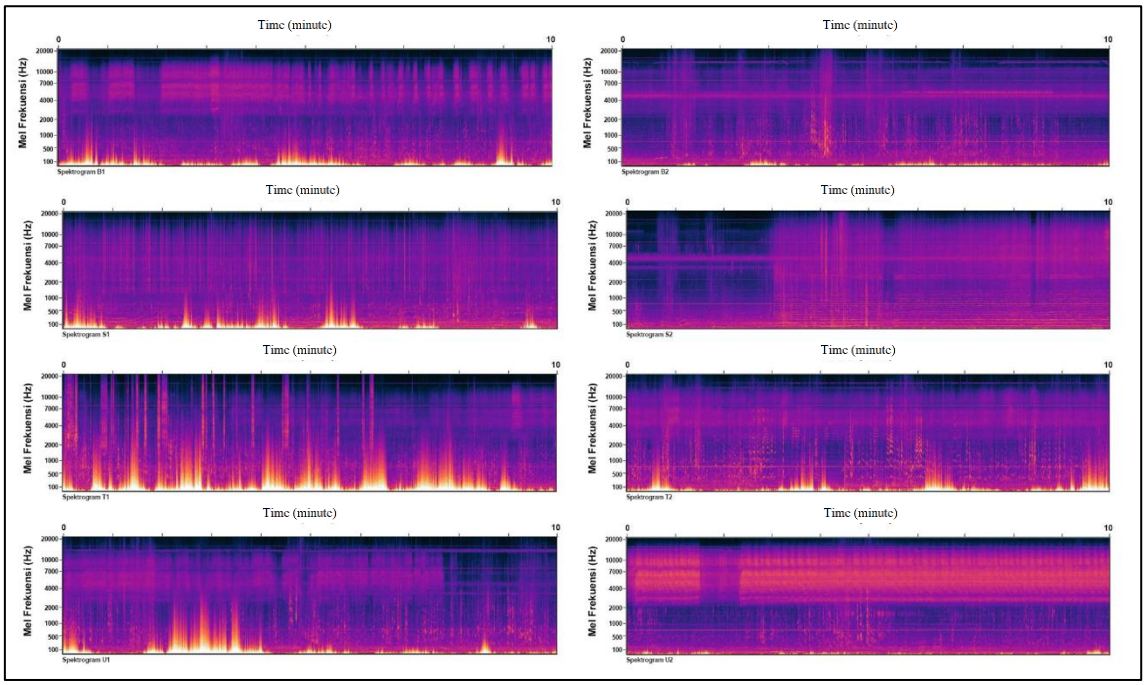

Figure 3. Sound patterns of each measurement in spectogram

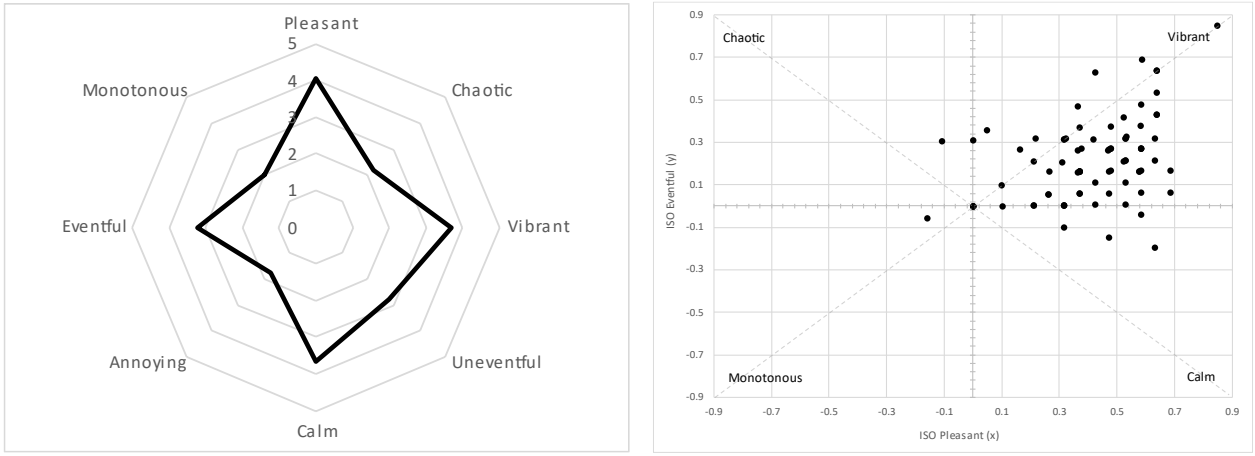

Figure 4. Perceptual of Soundscape Attribute (PA). (a) Radar plot shows dominance of attribute preferences, (b) Scatter plot shows individual assessment of PA

Eighty-nine percent of respondents favored natural sounds as enhancing their visit to Borobudur Temple Temple, aligning with research emphasizing natural sounds' importance in heritage sites. Visitors preferred diverse soundscapes, with 63% suggesting enhancements like bird songs, flowing water, and traditional music (see Figure 5). Some sought an immersive experience with sounds evoking ancient times. Liu and Kang, and Remy highlight natural and cultural sounds' role in creating authentic atmospheres and deepening historical appreciation [27][28]. Feedback underscored the importance of both natural and cultural elements in enriching visitors' recreational and educational experiences at Borobudur Temple.

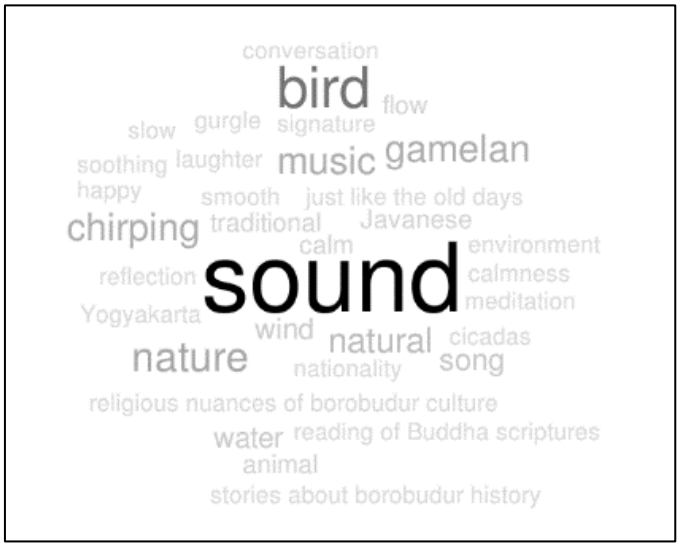

Figure 5. Word clouds of sound improvement feedback

3.3. The Relationship Between Soundscape Characteristics and Visitor Perception

Some visitors tend to have a relatively low sensitivity to noise levels at Borobudur Temple. The measured noise levels, ranging from 41 dB(A) to 56 dB(A), indicate a moderately noisy environment. However, based on the assessments shown in the graph in Figure 4(a), many visitors did not perceive the noise as disruptive or bothersome. Indonesians generally tend to have low sensitivity to noise levels due to frequent exposure to everyday noise, which has become a norm [29]. Most of the activities in Indonesian society are social in nature, such as activities involving conversations between individuals in open spaces [30]. As a result, the acoustic environment in public spaces is often dominated by human sounds.

However, these sounds are interpreted as lively, pleasant, and bustling. This perception can be attributed to the types of sounds heard and experienced by the visitors. Many visitors reported that natural sounds were the most dominant in their hearing, followed by human sounds (see Figure 6). Traffic and other sounds were also audible but only briefly. The pattern of these sounds may explain why visitors perceive the soundscape as lively due to the mixture of these four types of sounds. Lively and pleasant characteristics can arise from the combination of natural and human sounds, while a tranquil characteristic is primarily due to the dominance of natural sounds. Previous research has shown that natural sounds tend to have a positive effect, providing a sense of calm [9]. Moreover, the presence of natural sounds can increase tolerance for noise generated by traffic and other sounds [31].

Distinctive sounds at cultural heritage sites can serve as soundmarks that shape the acoustic identity of the place [31]. The acoustic environment at Borobudur Temple is characterized by the dominance of natural and human sounds. This dominance is due to the landscape of Borobudur Temple, which is surrounded by extensive gardens and courtyards with trees. Historically, the landscape of Borobudur Temple was surrounded by mountains, symbolizing the Buddhist cosmology and highlighting its sacredness as a holy structure [32]. Thus, the natural sounds arise from the landscape's characteristics, being enveloped by nature. Meanwhile, human sounds likely stem from Borobudur Temple's function as a recreational tourist destination, often visited by large crowds.

According to the word cloud generated from the data collection, many visitors perceive that the appropriate sounds for Borobudur Temple should be natural, as evidenced by the predominant suggestions to enhance natural sounds like birdsong, flowing water, and animal noises. Additionally, there is a desire to incorporate cultural elements, such as traditional music like gamelan, to enhance the site’s identity and character. This reflects visitors' expectations that a cultural heritage site should exhibit sounds that are represent the characteristic of the local culture [33].

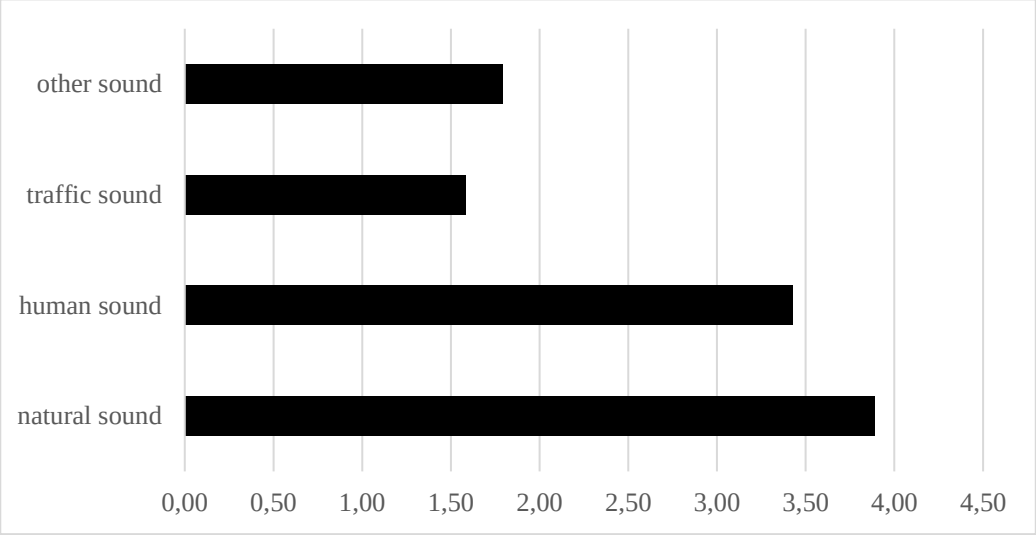

Figure 6. Domination Sound Profile

3.4. Soundscape Management Strategies

Based on the SWOT analysis depicted in Figure 7, the soundscape of Borobudur Temple has significant potential for developing a unique tourism experience through proper soundscape management. The primary strengths lie in the diverse sound sources that create a dynamic acoustic environment and the visitors' positive perception of sound quality. However, challenges include fluctuating noise levels and balancing diverse sound preferences. Proposed strategies include enhancing natural sounds, integrating local cultural sounds, conducting further research on soundscape history, and developing a more immersive and authentic soundscape. Careful management is needed to avoid overmanagement and conflicts between conservation and modern tourism needs. By considering these aspects, Borobudur Temple can optimize its soundscape to enhance visitor experiences while preserving its historical and cultural value.

INTERNAL / EKSTERNAL	**Strength** 1. Diversity of sound sources creates a dynamic soundscape 2. The majority of respondents rated the quality of sound at Borobudur Temple as good and appropriate 3. Sound helps visitors achieve their tourism goals 4. Perceptions of sound at Borobudur Temple tend to be positive (fun, excited, calm, lively)	**Weakness** 1. Significant fluctuations in noise levels depending on the number of visitors and activities undertaken 2. Some artificial sounds can interfere with the tourist experience 3. A small percentage of respondents consider the sound at Borobudur Temple to be monotonous 4. There are limitations in controlling the sound source
Opportunity 1. Potential to increase the sounds that respondents choose as sounds that support the tourism experience 2. Potential for integration of natural and cultural sound elements to enrich visitor experience 3. Potential to create an immersive and authentic soundscape 4. Development of further research on the history of the soundscape at Borobudur Temple 5. Optimization of the soundscape according to the various tourist destinations of visitors	**Strategy S - O** 1. Enhance natural sounds and keep noise levels to a lower standard 2. Integrate local cultural sounds to add a more dynamic and meaningful soundscape experience 3. Conduct further research on the history of the soundscape at Borobudur Temple and reconstruct the sounds from that research to create an authentic soundscape.	**Strategy W - O** 1. Scheduling yard management activities that do not coincide with public visitation times 2. Conduct further research into the sound preferences of different visitors to develop a more inclusive soundscape
Threats 1. The existence of conflicts related to the establishment of the Borobudur Temple tourism context 2. The challenge of balancing the diverse sound preferences of various visitor groups 3. Risk of soundscape overmanagement 4. Conflict between conservation and modern tourism needs	**Strategy S - T** 1. Establishing the tourist context of Borobudur Temple so that it can integrate a soundscape that fits the established context 2. Sound management that is more balanced between sound preferences and recommendations, and the actual sounds that exist today.	**Strategy W - T** 1. Conduct further evaluation of the soundscape and feedback given by visitors regarding the soundscape at Borobudur Temple. 2. Soundscape management based on dominant sound preferences to disguise sounds that are considered disturbing

Figure 7. SWOT Analysis

4. Conclusion

The soundscape at Borobudur Temple varies greatly depending on the activities taking place. Noise levels are higher during crowded conditions compared to quieter times, although even during quieter periods, significant sound intensity can still be observed. The acoustic environment at Borobudur Temple is dominated by natural sounds, followed by human sounds that fill the surroundings of the temple courtyard. Occasionally, some traffic noise can be heard in the courtyard, though faintly, along with other sounds from human activities such as gardening work and loudspeakers.

Despite the noise levels reaching up to 56 dB(A) and the mix of various sounds, some visitors do not find this situation disruptive. Many visitors tend to view the acoustic environment at Borobudur Temple positively, describing the sounds as pleasant, lively, calming, and bustling. Visitors also suggested improvements, such as enhancing the natural sounds and incorporating traditional music to create a deeper and more authentic atmosphere that resonates with the cultural heritage of Borobudur Temple.

Based on the SWOT analysis, here are initial strategic recommendations for managing the soundscape at Borobudur Temple: (1) Development and Empowerment of Soundscape Heritage; (2) Further research should be conducted on the acoustic environment of Borobudur Temple, considering both current conditions and historical context. By studying historical soundscapes, Borobudur Temple can create an atmosphere that is both authentic and distinctive; (3) Establishing Tourist Context; Setting a clear context can help managers focus on enhancing the desired sound environment. By evaluating the numerous improvement suggestions, managers can identify which sounds to prioritize and which to incorporate as background elements to shape the character of Borobudur Temple; (4) Balancing Sound Preference: Conducting regular surveys and collecting feedback to understand visitor sound preferences is another important step. Based on this feedback, managers can assess the effectiveness of sound management strategies. This approach ensures that sound preferences align with the context of Borobudur Temple, enhancing visitor interpretation through auditory experiences.

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6. Conflicts of Interest

The authors declare no conflict interest.

References

[1] TWC Borobudur. (2022). Borobudur Taman Wisata Candi. Retrieved May 14, 2024, from borobudurpark.com website: https://borobudurpark.com/temple/borobudur/ UNESCO. (2021). Borobudur Temple Compounds. Retrieved September 20, 2023, from https://whc.unesco.org/en/list/592/

[2] Kowal, Katarzyna. (2019). The Borobudur temple: the Buddhist architecture in Indonesia. Budownictwo i Architektura, 18(2), 005–019. https://doi.org/10.35784/bud-arch.550

[3]Martokusumo, Widjaja, Poerbo, Heru W., Sarwono, Joko, Sudarsono, Anugrah S., & Putu, Ni. (2019). Soundcsape and the Understanding of Historic Districts in Bandung. 371–380.

[4] Truax, Barry. (1980). Handbook for Acoustic Ecology. Leonardo, 13(1), 83. https://doi.org/10.2307/1577961

[5] Sutanti, Yelina. (2019). Dinamika keterhubungan soundscape dengan elemen arsitektural pada teras Cihampelas.

[6] Sudarsono, Anugrah Sabdono, Setiasari, Winda, Sarwono, Sugeng Joko, & Nitidara, Ni Putu Amanda. (2022). The development of standard perceptual attributes in indonesian for soundscape evaluation: Result from initial study. Journal of Applied Science and Engineering (Taiwan), 25(1), 215–222. https://doi.org/10.6180/jase.202202_25(1).0022

[7] Bruce, Neil S., & Davies, William J. (2014a). The effects of expectation on the perception of soundscapes. Applied Acoustics, 85, 1–11. https://doi.org/10.1016/j.apacoust.2014.03.016

[8] Zhang, Hui, Qiu, Mengyuan, Li, Li, Lu, Youhai, & Zhang, Jie. (2021). Exploring the dimensions of everyday soundscapes perception in spatiotemporal view: A qualitative approach. Applied Acoustics, 181, 108149. https://doi.org/10.1016/J.APACOUST.2021.108149

[9] Zhang, Xu, Ba, Meihui, Kang, Jian, & Meng, Qi. (2018). Effect of soundscape dimensions on acoustic comfort in urban open public spaces. Applied Acoustics, 133, 73–81. https://doi.org/10.1016/j.apacoust.2017.11.024

[10] Flügge, Elen. (2018). The consideration of personal sound space: Toward a practical perspective on individualized auditory experience. Journal of Sonic Studies, 1(1).

[11] He, Mang, Li, Jingwen, Li, Jun, & Chen, Huiyi. (2019). A comparative study on the effect of soundscape and landscape on tourism experience. International Journal of Tourism Research, 21(1), 11–22. https://doi.org/10.1002/jtr.2237

[12] Sacks, Oliver. (2007). Musicophilia: Tales of Music and The Brain. A. A. Knopf.

[13] Xie, Hui, Peng, Zhaohui, Kang, Jian, Liu, Chang, & Wu, Huifei. (2022). Soundscape Evaluation Outside a Taoist Temple: A Case Study of Laojundong Temple in Chongqing, China. International Journal of Environmental Research and Public Health, 19(8). https://doi.org/10.3390/ijerph19084571

[14] Djimantoro, Michael Isnaeni, Martokusumo, Widjaja, & Poerbo, Heru Wibowo. (2021). The Assessment of Soundscape as Intangible Heritage : Critical Approach in Understanding the Immaterial Qualities. (1), 231–243.

[15] ICOMOS. (2014). The Florence Declaration on Heritage and Landscape as Human Values. In 18th General Assembly. Retrieved from http://www.icomos.org/images/DOCUMENTS/Secretariat/2015/GA_2014_results/GA2014_Symposium_FlorenceDeclaration_EN_final_20150318.pdf

[16] Skeates, Robin. (2017). Soundscapes of Temple Period Malta. Time and Mind, 10(1), 61–67. https://doi.org/10.1080/1751696X.2016.1267920

[17] Zagorski, Marcus. (2023). The Sacred Soundscapes of Mountain Wilderness. Religions, 14(8). https://doi.org/10.3390/rel14080992

[18] Zhang, Dongxu, Liu, Xueliu, & Mo, Wei. (2023). Comparison of Soundscape Evaluation in Forest-Type and Urban-Type Han Chinese Buddhist Temples. Forests, 14(1). https://doi.org/10.3390/f14010079

[19] Zhang, Dongxu, Zhang, Mei, Liu, Daping, & Kang, Jian. (2016). Soundscape evaluation in Han Chinese Buddhist temples. Applied Acoustics, 111, 188–197. https://doi.org/10.1016/j.apacoust.2016.04.020

[20] Creswell, John W. (2014). Research design qualitative, quantitative, and mixed methods approaches. In SAGE. Retrieved from http://repositorio.unan.edu.ni/2986/1/5624.pdf%0Ahttp://fiskal.kemenkeu.go.id/ejournal%0Ahttp://dx.doi.org/10.1016/j.cirp.2016.06.001%0Ahttp://dx.doi.org/10.1016/j.powtec.2016.12.055%0Ahttps://doi.org/10.1016/j.ijfatigue.2019.02.006%0Ahttps://doi.org/10.1

[21] Sugiyono. (2013). Metode Penelitian Kuantitatif, Kualitatif, dan R&D. In ALFABETA. Retrieved from http://repositorio.unan.edu.ni/2986/1/5624.pdf%0Ahttp://fiskal.kemenkeu.go.id/ejournal%0Ahttp://dx.doi.org/10.1016/j.cirp.2016.06.001%0Ahttp://dx.doi.org/10.1016/j.powtec.2016.12.055%0Ahttps://doi.org/10.1016/j.ijfatigue.2019.02.006%0Ahttps://doi.org/10.1

[22] Jo, Hyun In, & Jeon, Jin Yong. (2021). Compatibility of quantitative and qualitative data-collection protocols for urban soundscape evaluation. Sustainable Cities and Society, 74(November 2020), 103259. https://doi.org/10.1016/j.scs.2021.103259

[23] Brown, A. L., Kang, Jian, & Gjestland, Truls. (2011). Towards standardization in soundscape preference assessment. Applied Acoustics, 72(6), 387–392. https://doi.org/10.1016/j.apacoust.2011.01.001

[24] Guastavino, Catherine. (2007). Categorization of environmental sounds. Canadian Journal of Experimental Psychology, 61(1), 54–63. https://doi.org/10.1037/cjep2007006

[25] Satwiko, Prasasto. (2009). Fisika Bangunan. ANDI Yogyakarta.

[26] Axelsson, Östen, Nilsson, Mats E., & Berglund, Birgitta. (2010). A principal components model of soundscape perception. The Journal of the Acoustical Society of America, 128(5), 2836–2846. https://doi.org/10.1121/1.3493436

[27] Liu, Fangfang, & Kang, Jian. (2016). A grounded theory approach to the subjective understanding of urban soundscape in Sheffield. Cities, 50, 28–39. https://doi.org/10.1016/j.cities.2015.08.002

[28] Remy, Nicolas. (2019). European Acoustic Heritage.

[29] Colombijn, Freek. (2007). Toooot! Vroooom! The urban soundscape in Indonesia. Sojourn, 22(2), 255–273. https://doi.org/10.1355/sj22-2e

[30] Mediastika, Christina E., Sudarsono, Anugrah Sabdono, Utami, Sentagi S., Fitri, Isnen, & Drastiani, Rizka. (2020). The Sound of Indonesian Cities. Internoise 2020.

[31] Nilsson, Mats E., Alvarsson, Jesper, Rådsten-Ekman, Maria, & Bolin, Karl. (2010). Auditory masking of wanted and unwanted sounds in a city park. Noise Control Engineering Journal, 58(5), 524–531. https://doi.org/10.3397/1.3484182

[32] Supandi, Yenny. (2021). Lanskap Candi Borobudur. In Modul Bimbingan Teknis Pemandu Wisata Sejarah Kawasan Borobudur (p. 164).

[33] Bruce, Neil S., & Davies, William J. (2014b). The effects of expectation on the perception of soundscapes. Applied Acoustics, 85, 1–11. https://doi.org/10.1016/J.APACOUST.2014.03.016