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A Comparative Study of Soundscape Perception in Historic and Contemporary Urban Areas of Ghadames

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ABSTRACT

This paper investigates the perceived soundscape differences between the old and modern urban environments of Ghadames, Libya, a UNESCO World Heritage site. A questionnaire survey was administered to 32 local residents to explore their perceptions of acoustic comfort, noise levels, leisure preferences, and the influence of weather on the sound environment. The findings indicate no statistically significant difference in overall acoustic comfort between the two city sectors, suggesting adaptive perceptions or diverse comfort dimensions. However, the modern city was perceived as significantly noisier than the old city, reinforcing the old city's reputation for tranquility. Consequently, a majority of participants expressed a clear preference for spending their leisure time in the historic old city. Furthermore, the study confirmed that weather conditions play a palpable and influential role in shaping the acoustic experience. These results provide valuable insights for urban planning, heritage management, and the preservation of unique urban acoustic identities, particularly in culturally significant cities undergoing modernization.

Keywords: Soundscape perception, Old city, Modern city, Ghadames, Acoustic comfort.

دراسة مقارنة لإدراك المشهد الصوتي في المناطق الحضرية التاريخية والمعاصرة في مدينة غدامس

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ملخـــــص البحـــــث

تبحث هذه الورقة في الاختلافات الملحوظة في المشهد الصوتي بين البيئات الحضرية القديمة والحديثة في غدامس، ليبيا، وهي أحد مواقع التراث العالمي لليونسكو. تم إجراء استبيان على 32 من السكان المحليين لاستكشاف تصوراتهم عن الراحة الصوتية ومستويات الضوضاء وتفضيلاتهم الترفيهية وتأثير الطقس على البيئة الصوتية. تشير النتائج إلى عدم وجود فرق ذي دلالة إحصائية في الراحة الصوتية الإجمالية بين قطاعي المدينة، مما يشير إلى تصورات تكيفية أو أبعاد راحة متنوعة. ومع ذلك، تم تصور المدينة الحديثة على أنها أكثر ضوضاءً بشكل ملحوظ من المدينة القديمة، مما يعزز سمعة المدينة القديمة بالهدوء. ونتيجة لذلك، أعرب غالبية المشاركين عن تفضيلهم الواضح لقضاء أوقات فراغهم في المدينة القديمة التاريخية. علاوة على ذلك، أكدت الدراسة أن الظروف الجوية تلعب دورًا ملموسًا ومؤثرًا في تشكيل التجربة الصوتية. توفر هذه النتائج رؤى قيمة للتخطيط الحضري وإدارة التراث والحفاظ على الهويات الصوتية الحضرية الفريدة، لا سيما في المدن ذات الأهمية الثقافية التي تمر بمرحلة التحديث.

الكلمات الدالة: إدراك المشهد الصوتي، المدينة القديمة، المدينة الحديثة، غدامس، الراحة الصوتية.

1. INTRODUCTION

The soundscape concept treats sound as a resource rather than just noise, emphasizing qualitative factors like comfort and pleasantness. It considers non-acoustic influences such as spatial context and culture, unlike traditional noise control, which focuses on quantitative metrics. By integrating insights from acoustics, psychology, sociology, and urban planning, soundscape research promotes a human-centered approach to improving urban sound environments. [1]. Preis et al.'s study shows that visual context significantly influences how people perceive environmental noise and its annoyance levels. Their experiments comparing audio-only and audio-visual stimuli highlight the need to consider both senses in noise evaluation. The findings support a multisensory approach to environmental noise management [2]. Sound perceptions differ between historical and modern religious spaces due to design, acoustics, and culture. Traditional sites emphasize quiet for spirituality, while modern spaces blend sacred and secular sounds [3]. Moreover, Interviews at Çengelhan Caravanserai indicated that although visitors expected a quiet atmosphere, they valued the authenticity of the historic space. However, inconsistencies in sound levels—ranging from too loud to too quiet—caused frustration, especially when external noise interrupted their experience. Uncontrolled sounds in crowded areas overwhelmed some visitors, while well-designed soundscapes positively enhanced the museum experience, creating a unique ambiance that encouraged engagement. The findings emphasize the need for carefully designed auditory experiences in historical settings to boost visitor involvement. [4]. The research offers recommendations to enhance soundscapes in historical blocks by managing disruptive noises such as hawking, construction, and traffic to improve the environment. It encourages the promotion of natural sounds, like birdsong, to enhance calmness and harmony, and stresses the importance of preserving traditional sounds associated with cultural activities. The study suggests favoring live music over broadcasted music to boost visitor satisfaction. Furthermore, it advocates for a comprehensive strategy to manage sound sources, ensuring overall pleasantness and considering the interplay of different sounds. Implementing these strategies can enhance visitor experiences and contribute to a more enjoyable atmosphere while preserving cultural heritage [5]. The integration of soundscapes into urban design is essential for cultivating a unique sense of place and identity. The sounds of a location, whether they are human voices, nature, or cultural expressions, contribute to the character that defines that space. Addressing sound can thus be a supportive element in preserving and promoting a place's identity [6]. The proposed indoor soundscape model introduces dimensions like Comfort, Content, Familiarity, Engagement, and Privacy–Control, setting it apart from outdoor soundscape models. It integrates both outdoor and indoor sounds, highlighting their interactions through listening tests. The model emphasizes tailored measurement systems for indoor acoustics evaluation. It offers actionable insights for residential design, advocating for a balance of indoor and outdoor sounds to improve soundscape quality. This approach focuses on the unique experiences of indoor occupants, contrasting with outdoor noise reduction goals [7]. Acoustic characteristics contribute to the cultural and historical context of a location. If soundscapes do not reflect the historical significance of an area, it may lead to a loss of identity and cultural heritage. Maintaining coherence between the acoustic and visual aspects helps preserve the historical essence of urban environments [6]. Validate translations of soundscape perceptual attributes across languages through a two-stage process. In Stage

1, research institutions generate initial translations from English, focusing on meaning rather than literal translations, informed by prior studies. In Stage 2, standardized listening experiments will engage native speakers to assess soundscapes using these translations and a common set of auditory stimuli, with the goal of ensuring consistent perceptual responses across different languages and populations [8]. On the other hand, expectations of the indoor soundscape in mosques are influenced by architectural design and acoustics that foster a tranquil atmosphere, especially in historic mosques like Hacı Bayram. Cultural backgrounds and religious practices shape sound preferences, with many individuals favoring Quran recitations while being sensitive to disruptive noises. Personal experiences and community feedback further inform these expectations, and the use of modern technologies, such as sound systems, can modify perceptions of the desired quietude, leading to varied opinions on their impact. Together, these factors significantly shape how individuals perceive and respond to the auditory environment in mosques. [3]. Understanding the interaction between soundscape perception and spatial experience is essential for improving environmental design and enhancing occupants' overall experiential quality. moreover, The authors propose that changes in physical space can affect sound perception and vice versa [9]. The concept of intelligibility provides urban designers with crucial insights into how spatial configurations can enhance or hinder navigation and user satisfaction, ultimately impacting the experience of urban environments [10]. The interplay between aural and visual factors in residential spaces has been examined, suggesting that individual visual elements can significantly influence residents' perceptions of appropriateness. This study reinforces the idea that soundscapes are not isolated auditory experiences but are interacted with the visual characteristics of urban environments [11]. The final spatial-acoustic dataset merged subjective soundscape data, psychoacoustic metrics, and spatial attributes, allowing for an in-depth analysis of the connections between contextual spatial factors and soundscape perception metrics [12]. Introduce a temporal dimension to soundscape perception, arguing that sound environments are not static but vary significantly over time. Their insights into the synchronicity of sounds enhance the understanding of how different acoustic sources interact, drawing attention to the complexities of auditory experiences in urban settings. This perspective invites further exploration of how time influences soundscape appreciation and the implications for urban planning [13]. As research progressed, Aleta et al, expanded on the notion of soundscape by examining specific auditory elements, such as walking sounds in urban parks. They highlight the dual role of sound as both a resource and a potential source of annoyance, emphasizing the importance of congruence between expected and actual sound environments. This study underscores the restorative qualities of urban parks, suggesting that soundscapes contribute significantly to the overall quality of life and well-being [14]. Music literacy influences soundscape perception, shaping auditory experiences through cultural and contextual factors. Perceptions of pleasantness and eventfulness vary by location, reflecting residents' backgrounds. This highlights the deep connection between urban soundscapes and personal experience [15]. A scientometric analysis highlights noise exposure as a key concern in urban soundscape research. It urges planners to integrate sound principles to reduce noise pollution and improve public health [16].

Overall, these articles collectively illustrate the multifaceted nature of soundscape perception in urban contexts, highlighting the historical, cultural, and environmental factors that shape auditory experiences in both old and modern cities. This comparative analysis of soundscape perception in Gadames will build upon these foundational insights to further explore the

implications of sound in urban identity and quality of life.

2. Methodology

2.1. Study Area

The study was conducted in Ghadames, Libya, an oasis city located in the Sahara Desert. Ghadames is divided into two distinct parts:

- **The Old City (Historic Ghadames):** A UNESCO World Heritage site, famous for its unique traditional architecture with mud-brick houses, narrow, covered alleyways, and a sophisticated underground irrigation system. It is a largely pedestrian zone, preserving a traditional way of life and attracting tourists. Its dense, introverted urban fabric provides natural shading and insulation, creating a microclimate often cooler than outside.
- **The Modern City:** Developed in the 20th century to accommodate population growth, it features contemporary housing, wider streets, vehicular traffic, and modern amenities. It represents the typical urban expansion found across many developing nations.

The stark contrast between these two sectors makes Ghadames an ideal setting for a comparative soundscape study.

2.2. Participants

A total of 32 residents of Ghadames participated in the study. The participants were local inhabitants with lived experience in both the old and modern sectors of the city, ensuring familiarity with their respective acoustic environments. Due to the exploratory nature of this study and resource constraints, a convenience sampling method was employed. While specific demographic details (age, gender, duration of residency) were not provided in the initial brief, it is assumed that the participants represented a cross-section of the local population residing in or frequently visiting both parts of the city.

2.3. Data Collection

Data was collected through a structured questionnaire. The questionnaire was designed to elicit subjective perceptions of the soundscape in both the old and modern cities of Ghadames. It likely included:

2.4. Processing and analysis of the data

In order to investigate the perception of soundscape in both old and modern city, a questionnaire was conducted to 32 of participants in the city of Gadames. A digital coding was used to code individuals' answers to the four-point scale, where one point was given to the first answer, two points to the second answer, three points to the third answer, and four points to the fourth answer. The direction of the answer for each question of the questionnaire was determined by comparing the arithmetic mean value with the length of the four-point scale category, and according to the length of the scale category by dividing (3) by (4).

Table 1. Coding of answers and length of the category for determining the direction of the answer.

Answer	Coding	Period length
Very discomfortable or very low or strongly no or strongly don't effect	**1**	1 to less than 1.75
discomfortable or low or no or don't effect	**2**	1.75 to less than 2.5
comfortable or high or yes or effect	**3**	2.5 to less than 3.25
Very comfortable or very high or strongly yes or Very effect	**4**	3.25 to 4

2.4.1. Distribution of individuals according to gender:

The data in the table above regarding the distribution of individuals by gender indicate that the percentage of males represents (25.4%) while the percentage of females represents

(74.6%) of the individuals participating in the study.

Table 2. repetitive distributions and percentage of the sample individuals according to gender.

Gender	No.	Percentage
Male	28	87.5
Female	4	12.5
Total	32	100

The repetitive Distribution and percentage of the individuals on the basis of Gender showing in figure (1).

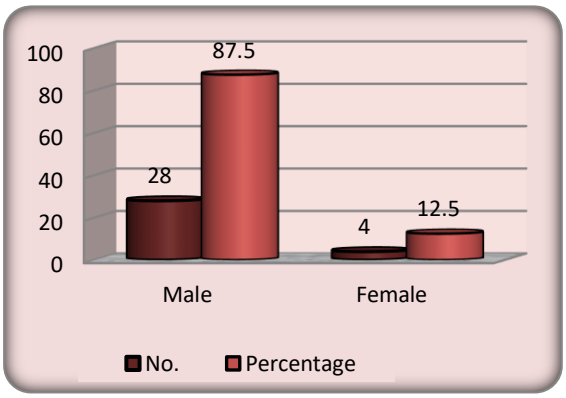

Fig 1. The Repetitive Distribution and percentage of the individuals on the basis of Gender

2.4.2. Distribution of individuals on age basis:

The data set out in the table (3) regarding the distribution of the Individuals on the basis of age categories , indicated that (3.1%) of the Individuals were under 20 years of age, and (28.1%) of the Individuals were aged from 31 to 40 years, and (34.4%) of the Individuals were aged from 41 to 50 years, and (21.9%) of the Individuals were aged from 51 to 60 years, and (12.5%) of the Individuals were aged from 60 year and more, The mean age of all participants was 43.84 ±11.098 years with a range of 19 to 64 years.

Table 3. The Repetitive Distributions and Percentage of Individuals according to age.

Age category	No.	Percentage%
Less than 20years	1	3.1
31 to 40 years	9	28.1
41 to 50 years	11	34.4
51 to 60 years	7	21.9
60 year and more	4	12.5
Total	32	100
Mean ± SD	43.84± 11.098	
Range	19 - 64	

However, the Repetitive Distribution and percentage of the Individuals on the basis of age summarized in figure (2).

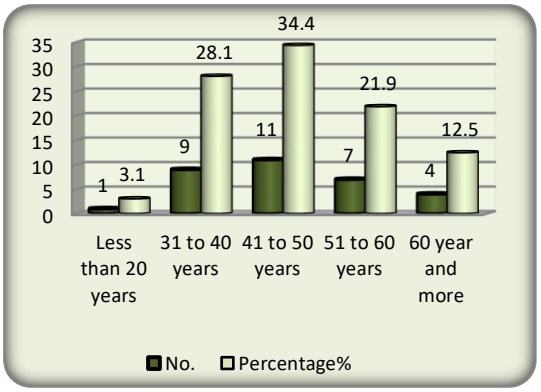

Fig 2. The Repetitive Distribution and percentage of the Individuals on the basis of age

2.4.3. Distribution of individuals on Education Level basis:

From Table No. (4), it is clear that (53.1%) of the study individuals hold a high school qualification, while (37.5%) of them hold graduate qualifications, and (53.1%) hold post graduate.

Table 4. The Repetitive Distributions and Percentage of Individuals according to Education level.

Education level	No.	Percentage%
High School	3	9.4
Graduate	12	37.5
Post Graduate	17	53.1
Total	32	100

However, the Repetitive Distribution and percentage of the Individuals on the basis of Education level summarized in figure (3).

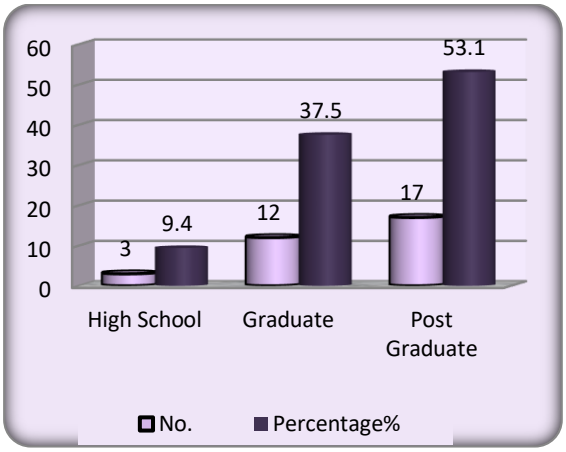

Fig 3. The Repetitive Distribution and percentage of the Individuals on the basis of Education level.

2.4.4. The Feeling of comfortable in the old and modern city

From Table No. (5), it is clear that the majority, with a percentage of (59.4%), feel comfortable in the old city, while (71.9%) feel comfortable in the modern city. It is also clear from the table above that the mean opinion about comfort in the old city is equal to (3.09) according to the four-point scale, while the average value of opinions about comfort in the modern city is (2.97), resulting in a difference of (0.12). To determine whether this difference is statistically significant, the statistical significance value is (0.255), which is greater than 0.05, indicating that there are no statistically significant differences between comfort in the old city and comfort in the modern city. This conclusion is reinforced by the calculated T value (1.161), which is less than its tabular value (2.042).

T-Test Calculated = 1.161 DF=31 T-Test Tabular = 2.042

Table 5. Descriptive analysis and t-test to determine the differences in comfort between the old and modern city

	Old City				
	No.	**Percent**	**Mean**	**Std. Deviation**	**P- value**
Discomfortable	5	15.6	3.09	0.641	0.255
Comfortable	19	59.4			
Very comfortable	8	25.0			
Total	32	100.0			
	Modern City				
	No.	**Percent**	**Mean**	**Std. Deviation**	
Discomfortable	5	15.6	2.97	0.538	
Comfortable	23	71.9			
Very comfortable	4	12.5			
Total	32	100			

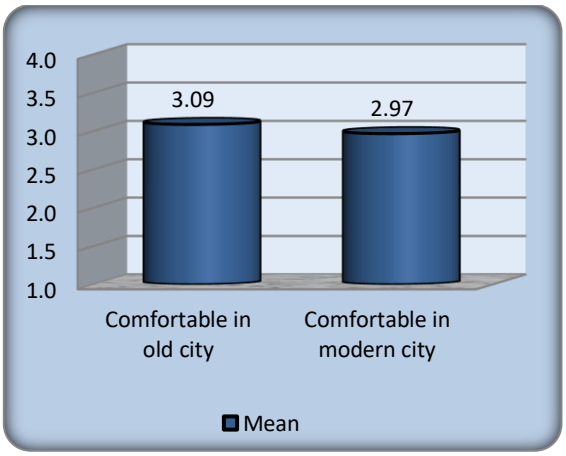

Fig 4. Mean of comfortable for old and modern city.

2.4.5. The noise level in the city

From Table No. (6), it is clear that the percentages of responses regarding noise in the old city were close, while for the modern city, the majority, with a percentage of (50%), indicated that the noise rate was high. It is also clear from the table above that the mean opinion about noise in the old city is equal to (2.06)

according to the four-point scale, while the average value of opinions about noise in the modern city is (2.66), resulting in a difference of (0.6). To determine whether this difference is statistically significant, the statistical significance value is (0.007), which is less than 0.05, indicating that there are a statistically significant differences between noise in the old city and noise in the modern city. This conclusion is reinforced by the calculated T value (2.895), which is greater than its tabular value (2.042). From the above, it is clear that the noise in the modern city is higher than the noise in the old city, meaning that the old city is quieter than the modern city.

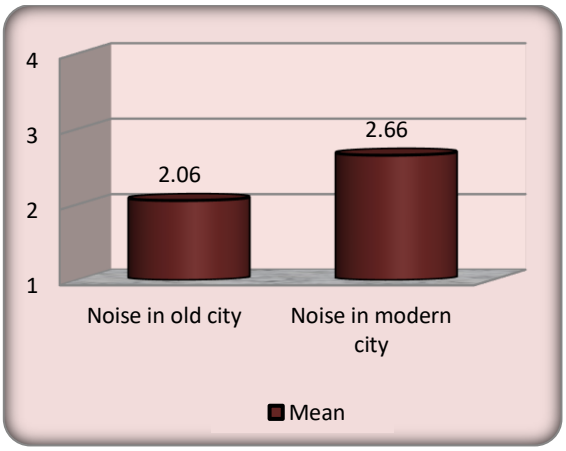

Fig 5. Mean of Noise for old and modern city.

Table 6. Descriptive analysis and t-test to determine the differences in the noise level between the old and modern.

	Old City				Modern City				P- value
	No.	Percent	Mean	Std. Deviation	No.	Percent	Mean	Std. Deviation	
Very Low	10	31.3	2.06	0.84	1	3.1	2.66	0.701	0.007
Low	10	31.3			12	37.5			
High	12	37.5			16	50			
Very High	0	0			3	9.4			
Total	32	100.0			32	100			

cT-Test Calculated = 2.895 DF=31 T-Test Tabular = 2.042

2.4.6. Spend some time in the old city

From Table No. (7), it was shown that one individual strongly refused to spend rest time in the old city, while (15.6%) of the individuals refused to spend rest time in the old city, and the majority, at a rate of (56.3%), preferred to spend rest time in the old city, and (25%) of them strongly preferred to spend rest time in the old city. The results of the descriptive analysis in the table above showed that the arithmetic mean value was (3.03), and according to the data in Table No. (1), the result shows that the majority of individuals prefer to spend leisure time in the old city. The researcher believes that this is due to the fact that the old city often have deep historical significance, offering a glimpse into the past through architecture, and preserved sites. An addition the old city tend to be less crowded than modern urban areas, providing a peaceful environment for relaxation and reflection. And Old city often feature beautiful architecture, and picturesque landscapes, making them visually appealing. It is noticeable in the old city typically foster a sense of community, allowing for more interactions with locals and a more authentic experience.

Table 7. Frequency distributions and results of descriptive analysis for t Spend some time in the old city.

Do you prefer to spend the rest time in the old city	Frequency	Percent	Mean	Std. Deviation	Results
Strongly no	1	3.1	3.03	0.74	Yes
no	5	15.6			
yes	18	56.3			
Strongly yes	8	25.0			
Total	32	100.0			

2.4.7. The role of weather in assessing the acoustic environment

From Table No. (8), it was shown that one individual stated that the weather has no role at all in influencing the acoustic environment. Therefore, (15.6%) of them stated that the weather has no role in influencing the acoustic environment, while the majority, at a rate of (75%), confirmed that the weather has a role in influencing the acoustic environment, and two of them stated that the weather has a major role in influencing the acoustic environment. It was also shown that the arithmetic mean value (2.84) and according to the data in Table No. (1) indicated that the weather does indeed have an influential role in the acoustic environment. This effect is attributed to several factors, including: Changes in temperature affect the speed of sound. Sound travels faster in warmer air, which can alter how sound waves propagate and are perceived. In addition High humidity can increase the density of air and reduce the attenuation of sound, allowing it to travel further. Conversely, low humidity can lead to increased sound attenuation. And Wind direction and speed can influence how sounds travels. Sounds can be carried further downwind and attenuated when traveling against the wind, affecting how sounds are perceived over distances.

Table 8. Frequency distributions and results of descriptive analysis for the role of weather in assessing the acoustic environment.

Does the weather play a role on your assessment of acoustic environment?	Frequency	Percent	Mean	Std. Deviation	Results
Strongly no	1	3.1	2.84	0.574	Yes
no	5	15.6			
yes	24	75			
Strongly yes	2	6.3			
Total	32	100.0			

2.4.8. The role of the aesthetic elements in the perception of the soundscape

From Table No. (9), it was shown that one individual indicated that aesthetic elements have no role at all in influencing the soundscape, and (31.3%) of them indicated that aesthetic elements have no role in influencing the soundscape, while the majority, at a rate of (59.4%), confirmed that aesthetic elements have a role in influencing the soundscape, and two of them indicated that aesthetic elements have a major role in influencing the soundscape. It was also shown that the arithmetic mean value (2.69) and according to the data in Table No. (1) indicated that aesthetic elements do indeed have an influential role in the soundscape. This effect is attributed to several factors, including: Aesthetic elements such as harmony, melody, and rhythm can evoke emotions and influence how a listener perceives and experiences a soundscape. In addition, cultural aesthetics can

shape how different soundscapes are interpreted, as each culture may have its own understanding and appreciation of sound and music. Aesthetic qualities can also help focus attention, drawing listeners to particular sounds or aspects of a soundscape that they might otherwise ignore.

3. RESULTS

The analysis of the questionnaire data yielded several key findings regarding the perception of soundscape in the old and modern cities of Ghadames.

3.1. Acoustic Comfort: Old vs. Modern City

Despite the distinct acoustic environments, the study found no statistically significant differences between perceived acoustic comfort in the old city and comfort in the modern city. This suggests that residents' overall feeling of comfort with the sound environment is relatively similar across both sectors, or that other factors contribute to comfort that balance out differences in sound characteristics. This finding contravenes some general expectations that historic districts inherently offer higher acoustic comfort, hinting at a more nuanced perception.

3.2. Perceived Noise Levels

In contrast to the comfort finding, the study revealed a clear distinction in perceived noise: the noise in the modern city is significantly higher than the noise in the old city. This means that the old city is perceived as substantially quieter than its modern counterpart. This result aligns with common observations and architectural characteristics of traditional urban settlements, where narrow alleys and dense structures intrinsically mitigate the propagation of mechanical noise, and where traffic is largely absent.

3.3. Leisure Time Preference

When asked about where they prefer to spend their leisure time, the results showed a strong inclination: the majority of individuals prefer to spend leisure time in the old city. This preference, despite the lack of a statistically significant difference in overall comfort,

Table 9. Frequency distributions and results of descriptive analysis for the role of aesthetic elements in the perception of the soundscape.

Do the aesthetic elements of the place play a role in your perception of the soundscape	Frequency	Percent	Mean	Std. Deviation	Results
Strongly no	1	3.1	2.69	0.644	Yes
No	10	31.3			
Yes	19	59.4			
Strongly yes	2	6.3			
Total	32	100.0			

strongly suggests that the perceived quietness of the old city, combined with its cultural and aesthetic appeal, makes it a more desirable location for relaxation and recreation. The old city likely offers a restorative environment that the modern city, with its higher noise levels and different ambiance, cannot replicate for leisure activities.

3.4. Influence of Weather on Acoustic Environment

The study confirmed that the weather does indeed have an influential role in the acoustic environment. While the specific mechanisms were not detailed in the brief, this finding implies that different weather conditions (e.g., temperature, wind, humidity, precipitation) significantly alter how residents perceive and experience the sounds around them in Ghadames. This influence could range from physical changes in sound propagation to psychological effects on mood and activity, thereby impacting the overall perceived quality of the soundscape in both old and modern sectors.

4. DISCUSSION AND RECOMMENDATIONS

4.1. Discussion

The findings from this study in Ghadames offer valuable insights into the complex nature of soundscape perception, particularly in urban

environments with distinct historical and modern sectors.

The most striking result is the apparent contradiction between no statistically significant difference in overall acoustic comfort and the strong preference for the quieter old city for leisure, coupled with higher noise perception in the modern city. This suggests that "comfort" as a perceived attribute is multi-dimensional and not solely determined by objective noise levels or even subjective perceptions of noise.

One possible explanation for the similar comfort levels could be an adaptive perception on the part of the residents. In the modern city, the presence of certain types of noise (e.g., traffic, commercial activity) might be expected and accepted as part of urban functionality and convenience. Residents might also value the access to modern amenities and services in the new city, which contributes to their overall comfort, even if it comes with higher ambient noise. Conversely, while the old city is quieter, its comfort might be impacted by other factors not directly related to sound, such as accessibility challenges, lack of modern infrastructure, or different types of social sounds. People might compartmentalize their comfort, finding the modern city comfortable for certain activities (e.g., shopping, work) and the old city comfortable for others (e.g., relaxation, social gathering).

The clear perception of higher noise in the modern city and the tranquility of the old city aligns with a wealth of existing literature on urban soundscapes. The architectural design of Ghadames' old city, with its enclosed, shaded alleys and mud-brick structures, intrinsically dampens sound propagation, creating quiet microclimates. This is a common feature of traditional Islamic urbanism. The absence of significant vehicular traffic further contributes to this perceived quietness, making human and natural sounds more prominent. In contrast, the wider streets, modern building materials, and increased vehicular movement in the modern city contribute to its noisier character, a common challenge in contemporary urban planning [17].

The strong preference for the old city for leisure time is a direct consequence of its perceived quietness and, likely, its unique cultural and aesthetic appeal. Quiet spaces are increasingly recognized as essential for mental restoration and well-being in urban environments. The old city of Ghadames offers a refuge from the sensory overload of modern life, allowing for contemplation, social interaction in a more intimate setting, and a connection to heritage. This echoes findings from other studies where historic centers are valued for their restorative qualities and unique sense of place [18]. This preference highlights the significant role of soundscape in shaping the quality of public spaces and their capacity to support different types of activities. While the modern city serves a functional purpose, it evidently falls short in providing the desired acoustic environment for relaxation and leisure for the majority of residents.

Finally, the finding that weather plays an influential role in the acoustic environment underscores the dynamic nature of soundscape. In a desert environment like Ghadames, extreme temperatures, wind, and occasional rain can dramatically alter both the physical propagation of sound and the human perception of it. For example, high temperatures might lead residents to seek the cooler, shaded alleys of the old city, thus increasing human-generated sounds there, while the modern, exposed areas might be less utilized during peak heat. Wind can mask distant sounds or create its own distinct audible presence, and the rare sound of rain can be highly salient and meaningful. This emphasizes that soundscape management must consider the seasonal and daily variations influenced by local climate.

4.2. Recommendations:

1. Implement measures such as sound barriers and green spaces to reduce undesirable noise and minimize traffic congestion.
2. Involve residents in soundscape assessments to understand their perceptions, fostering a sense of ownership and community.
3. Preserve historical soundscapes in old cities while integrating modern sounds in new developments to maintain cultural identity.
4. Educate citizens on the effects of sound on health and promote environments that support mental and physical well-being.
5. Conduct ongoing research to assess changes in soundscapes and their effects on quality of life to guide data-driven urban planning.
6. Increase the presence of parks and green areas that provide natural sound absorption and contribute positively to the sound environment.
7. Implement programs in schools that teach students about the impact of sound on health and the importance of maintaining a balanced sound environment.
8. Utilize sound mapping technology to visualize and analyze the sound environment in the cities, identifying areas for improvement and enhancing community engagement.

5. CONCLUSION

This study provides a pioneering comparative analysis of soundscape perception in the old and modern cities of Ghadames, Libya. While surprisingly revealing no statistically significant difference in overall acoustic comfort between the two sectors, it unequivocally demonstrated that the modern city is perceived as significantly noisier, establishing the old city as a notably quieter environment. This perceived tranquility, combined with its cultural significance, drives a strong preference among residents to spend their leisure time in the historic old city. Furthermore, the study confirms the influential role of weather conditions in shaping the acoustic experience.

These findings highlight the complex interplay between urban form, cultural context, and human perception in defining a quality soundscape. They underscore the critical need for urban planning and heritage management strategies that actively preserve the unique acoustic identity and quietude of historic areas like Ghadames' old city, while simultaneously seeking to enhance the acoustic quality of modern urban developments. By recognizing soundscape as a key component of urban liveability and cultural heritage, city planners can foster environments that support both functional needs and human well-being for generations to come.

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