Convergence of Social Perception and Indigenous Habitability in Public Spaces of Western Mexico

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ABSTRACT

In the outdoor public spaces of indigenous communities within the Sierra de Manantlán Biosphere Reserve, Jalisco, Mexico, environmental habitability and social perception are inextricably linked through a dynamic equilibrium of psychological, physical, and microclimatic conditions. Community social structures and ancestral cultural traditions shape a distinctive collective identity. Social perception regulates communal labor practices, fostering collaboration for ecosystem conservation and organized civic participation. This study evaluated the social perception and environmental habitability among residents in the public spaces of Ayotitlán and Cuzalapa. Employing a mixed-methods, exploratory, and cross-sectional design during the winter period, data collection combined microclimatic instrument readings with questionnaire surveys and key informant interviews. Statistical analyses included Pearson correlation coefficients and multiple linear regression models. Results indicate that while seasonal microclimatic conditions directly influence the operational efficiency of daily outdoor productive activities, social perception—deeply rooted in indigenous worldview and cultural identity—drives community engagement, ecotourism potential, and social cohesion. Corrective measures were applied to data reporting, and ethical protocols for underage participants were formalized. The study provides evidence-based guidelines for municipal planning, public space rehabilitation, and biocultural conservation in rural indigenous contexts.

Keywords: Social Perception, Environmental Habitability, Indigenous Communities, Microclimate, Biocultural Heritage, Sierra de Manantlán.

INTRODUCTION

The Sierra de Manantlán, situated in southwestern Jalisco and northern Colima, Mexico, represents a major biogeographical convergence zone connecting the Sierra Madre del Sur, the Trans-Mexican Volcanic Belt, and the Sierra Madre Occidental. This unique geographic setting accounts for high levels of biodiversity and abundant forestry, water, and mineral resources (Tetreault, 2009).

The region is the ancestral homeland of the Nahua-Otomí indigenous people (Tetreault & Lucio, 2011). Although language shift and process of acculturation have altered certain historical practices, indigenous cultural heritage endures through community rituals, traditional production systems, governance structures, and spiritual beliefs. The indigenous population is primarily organized across five agrarian nuclei: the ejido of Ayotitlán and the indigenous communities of Cuzalapa, Chacala, Teutlán (Jalisco), and Zacualpan (Colima).

In 1987, the Sierra de Manantlán Biosphere Reserve (SMBR) was formally established, encompassing approximately 140,000 hectares and recognized under UNESCO's Man and the Biosphere (MAB) Programme. The reserve plays a vital role in providing environmental services to surrounding urban centers such as Autlán, El Grullo, Colima, and Manzanillo (Imecbio, 2000). Within Cuautitlán de García Barragán municipality, the communities of Ayotitlán and Cuzalapa exhibit significant biocultural wealth alongside severe historical socioeconomic marginalization (Corral, 2015).

Public spaces in these indigenous settlements are crucial arenas for human interaction, physical health, emotional well-being, and the transmission of traditional knowledge. However, outdoor microclimatic conditions—such as thermal exposure, seasonal rainfall, and solar radiation—directly condition how inhabitants occupy and evaluate these spaces. Consequently, understanding the intersection between environmental habitability and social perception is essential for designing resilient, culturally sensitive public infrastructure.

THEORETICAL AND CONCEPTUAL FRAMEWORK

To establish rigorous analytical clarity, this research integrates four core conceptual axes:

- **Social Perception of Public Space:** The subjective cognitive and emotional process by which community members interpret environmental stimuli, space quality, safety, and social interactions based on shared values, identity, and personal experiences (Marín-Muñiz et al., 2016; Castillo & Valera, 2020).
- **Environmental Habitability:** The synthesis of physical, spatial, acoustic, visual, and thermal parameters that determine the comfort, usability, and healthfulness of an outdoor environment for human activities (Mues, 2011; Gómez & Orellana, 2021).
- **Microclimatic Comfort:** The biological and physiological state of satisfaction with ambient environmental variables, specifically dry-bulb temperature, globe temperature, relative humidity, air movement, and solar irradiance (Nikolopoulou et al., 2004; del Campo et al., 2020).
- **Indigenous Biocultural Heritage:** The interconnected body of ancestral knowledge, land stewardship practices, spiritual beliefs, and social cohesion mechanisms that govern natural resource management and public space dynamics (Echeverri, 2009; Patrick & Bastida, 2010).

LITERATURE REVIEW

Academic literature emphasizes that language and oral traditions express a community's collective vision and connection to place (Arizpe, 2015). Collective memory serves as the foundation for cultural identity, enabling individuals to build community resilience and maintain social harmony.

Likewise, the author argues that memory and private life are the axes that intertwine cultural heritage and memory in the urban cultures of Mexico. Memory is the foundation of culture, while private life gives the individual their sense of personal identity. It is the individual who, exercising their cultural freedom, makes decisions that build the future and strengthen community ties, allowing a group of people, beyond being mere individuals or actors, to interact and support each other, thus contributing to the harmony of society and the nation. (Arizpe, 2015)

According to Echeverri (2009), indigenous communities are experts in observing patterns of nature and possess detailed and advanced knowledge about the cycles of the seasons. Their subsistence modes, which include shifting agriculture, fishing, hunting, and gathering, closely depend on the rhythm of the clearly marked seasons. They are aware of complex ecological indicators that govern the interaction between the cycles of water, wind, and temperature, and how these influence the reproductive cycles of fish and terrestrial animals, as well as the availability of wild fruits and the organization of their cultural and productive activities.

Patrick and Bastida (2010) emphasize that the ancestral knowledge of indigenous peoples about the adaptability and resilience of healthy ecosystems is key to preserving their cultural identity. This knowledge allows them to continue with their traditions, especially in religious practices that reaffirm their holistic view of the world.

Indigenous groups possess intricate traditional ecological knowledge regarding seasonal cycles, weather indicators, and ecosystem dynamics (Echeverri, 2009).

This knowledge guides agricultural calendars, resource harvesting, and spiritual ceremonies, highlighting the holistic resilience of indigenous socio-ecological systems (Patrick & Bastida, 2010). Public plazas and open spaces function as stages for performing these communal rituals and preserving identity (Castillo & Valera, 2020).

After visiting and understanding the context of the communities on October 13, 2021, a dialogue was held with prominent figures from both places. During the conversation, they expressed that the residents of Ayotitlán and Cuzalapa, Jalisco, feel neglected and marginalized by government authorities. According to them, there is a lack of necessary support to develop ecotourism, improve agriculture and livestock, and they also mentioned the need for workshops that promote training and environmental conservation.

They also highlight the importance of protecting their natural areas, expressing that they have been affected by the plundering of resources by companies and local authorities, which has led to deforestation, indiscriminate logging, and other ecological damage.

One of the facets for the study is social perception, which encompasses the interpretation of sensations and emotions based on the actors' experiences and their interaction with the natural and social environment. Understanding perceptions allows for an accurate interpretation of the meaning of their actions and determining aspects that influence decision-making (Marín-Muñiz et al., 2016). According to Perevochtchikova and Rojo (2015), in studies of social perception of the involved actors, a defined theoretical framework is generally not established (only conceptual), and interviews, surveys, and questionnaires are used as analysis techniques. (Corbera et al., 2009; De Groot and Hermans, 2009; Perevochtchikova, 2015)

Castillo and Valera (2020) highlight that the way users perceive public space affects their sense of belonging to it, thus creating various urban imaginaries. The individual perception of public space is shaped by individual experiences and the specific context of time and place. These perceptions are subjective and can change depending on whether the user feels safe or not in public space, which in turn influences the performance of productive or social activities.

Maldonado (2018) emphasizes that one of the challenges in delivering meteorological services to society, particularly forecasts, lies in communication methods. Achieving high technical quality is insufficient; effective communication is essential in a society with diverse needs and various means of receiving information.

It is reflected that the social perception of indigenous communities is centered on protecting their cultural heritage and ancestral values. They are attentive to how weather patterns affect flora and fauna, considering this as an essential aspect. Their traditions are aligned with the hope for favorable rainy seasons, the well-being of their crops, and the future of their children, reflecting a sustainable life approach. This perspective promotes the harmonization of the varied interests of community members, orienting towards a collective management that seeks benefits and support from governmental entities and both public and private organizations.

In the indigenous context, mythology absorbs history and shapes it according to its narrative framework. Throughout this process, ancestral myths are adapted to give meaning to historical events within reality and to help regain stability during periods of social turbulence. This is because the remembrance of historical events is intrinsically linked to the social, economic, and political context; it could also affect traditions. This interpretation not only has a political purpose but also seeks, from the essence of mythical thought, to find a balance between diverse ways of understanding history.

In the cultural perspective that has been inherited and continues to be transmitted, community rituals are the stage where solidarity is strengthened through active participation and joint effort, and where collective memory is preserved through respect for traditions. Traditions make cultural history intertwine with the

change of seasons and integrate into daily life. Rituals are also connected with beliefs in an ancestral spiritual world and mythical beings, define the agricultural calendar, honor the wisdom of traditional healers, keep historical attire alive, and give value to handicrafts. The combined devotion to saints and virgins, typical of the postcolonial Ibero-American world, assigns and perpetuates roles that reinforce the sense of community. The discourse on the recovery and reinvention of community, culture, and identity—the ethnogenetic discourse—promises an existence in harmony with others and with the natural environment. Moreover, it offers guidelines for political action, seen as the affirmation of one's own history and cultural perspective in decisions that impact collective well-being. (De la Peña, 2010)

González and Rojas (2016) assert that it is important to recognize two dimensions in the concept of cultural identity. Personal identity refers to the unique characteristics that distinguish an individual from others. In contrast, group identity emerges when an individual identifies with or is recognized as part of a specific community. These two forms of identity are essential for the affirmation of rights within a group or community.

A crucial element of effective natural resource management is acknowledging the diversity of perceptions, values, and goals of the key stakeholders involved (Jones et al., 2011). Consequently, analyzing social perception is viewed as a vital integrative tool, enabling an understanding of the processes, strengths, and limitations of implementing conservation and environmental habitability programs at the local level (Baird et al., 2009).

Regarding the issue of environmental habitability in public spaces, it is seen as essential to adopt an action strategy that benefits indigenous communities, covering their needs and improving their capacity to conduct productive activities that favor the collective.

Habitability is intrinsically related to sustainability. It is considered a component of the classic Sustainable Development model, which encompasses social, economic, and environmental dimensions. Specifically, habitability is situated at the point where environmental and social aspects converge. (Mues, 2011)

Guevara (2020) notes that habitability represents a mandate to undertake initiatives that rejuvenate the urban environment. It is the occupation of communities that infuses an inherent value to places, thus forging their own identity, symbolism, and dialect. In a society where communication is key, these elements are what contribute to innovation, ensuring that no two places are identical in these traits.

In addition to what has been mentioned, habitability is established through specific criteria focused on thermal, acoustic, and sanitary comfort. These parameters are essential to ensure the maximum well-being of the inhabitants, providing a safe, protected, comfortable, and hygienic environment. (Gómez and Orellana, 2021)

Additionally, the autor Sobrino (2015) specifies that the habitability in public spaces involves essential conditions such as mobility, attractiveness, public space well-being, and proximity to goods and services. Its purpose is to enhance the quality of life for its residents by integrating functions related to commerce, citizen protests, art, recreation, sports, religion, and various social movements.

García (2013) argues that the social understanding of public spaces is crucial for their beauty. The aesthetics of a public space cannot be appreciated without first understanding its social significance, which is what defines its true nature. It is only when the community recognizes and adopts the use and purpose of a public space that it begins to value its beauty. Conversely, the aesthetic beauty of an urban area can increase its usage and enrich social life. This process is effective when there is a balance between urban or rural planning, architecture, and the design of public spaces. An important addition to current research was the study by Villaseñor et al. (2021), which examined the outdoor public spaces of El Grullo, Jalisco, Mexico, characterized by a warm and semi-dry climate. The objective of this study was to evaluate the environmental habitability of these areas through the analysis and assessment of meteorological factors and supplementary variables. The applied methodology was descriptive, non-experimental, and correlational. Data was collected using 204 forms that gathered information about the users, the space, and the urban environment during the transition from the warm to the cold season. Pearson's correlation was applied to treat and analyze the data, aiming to

establish the relationship between meteorological variables and other complementary and ordinal variables. The findings confirmed that meteorological conditions significantly affect the environmental habitability perceived by users of the examined public spaces. These results can be utilized by society and municipal authorities to enhance the planning and rehabilitation of public spaces.

Another aspect is that urban development has led to adverse environmental conditions that complicate the daily lives of citizens, influenced by socioeconomic, demographic, political, and cultural factors. These conditions are manifested in the exclusion of certain population groups, often the result of irregular settlements and inadequate urban planning. This directly affects the quality of life at certain times and places. Habitability, therefore, is a dynamic concept that varies to different degrees and is crucial to address various disciplines to understand how it affects human behavior in such contexts. (del Campo et al., 2020)

In addition to the above, environmental comfort in outdoor areas is fundamental to the quality of life in urban settings. With the right conditions, such as a thermally, luminous, acoustic, and psychologically comfortable environment, activities in public spaces like streets, squares, and parks are encouraged. The frequency and intensity of these activities may be compromised if people experience discomfort due to adverse climatic conditions in these places. (Nikolopoulou et al., 2004)

Another study pertinent to the research topic was conducted by del Campo et al. (2020) in El Grullo, Jalisco, Mexico, where a Thermal Habitability Index (THI) for outdoor public spaces was devised. This index was founded on the assessment of the impact of physical, climatic, and thermophysiological variables on inhabitants during the cold season. The study employed a descriptive, non-experimental, and cross-sectional methodology. Following the bioclimatic diagnosis of comfort hours in El Grullo and the examination of the study areas, 554 information cards from residents and ninety-eight from the thermal environment and urban context were collected during the cold period. The findings demonstrated that developing the THI is crucial for promoting a harmonious relationship and proper adaptation between people and their environment. THI serves as a valuable tool for urban design and evaluation, suggesting improvements in comfort and habitability conditions in these areas.

METHODOLOGY

The study adopted a mixed-methods, exploratory-descriptive, quasi-experimental, and cross-sectional design. Fieldwork was executed in the indigenous settlements of Ayotitlán and Cuzalapa, located in the Sierra de Manantlán, Jalisco.

The research utilized a mixed and exploratory qualitative approach, supplemented by a quasi-experimental and cross-sectional framework. To conduct the study, it was essential to establish parameters to measure indicators of social perception and environmental habitability among public space users. The chosen locations for the research were the communities of Ayotitlán and Cuzalapa in Jalisco. Below is a description of these communities.

Ayotitlán is positioned in the Sierra Madre Occidental region at a latitude of 19°29'47"N and a longitude of 104°10'23"W. It experiences a temperate-subhumid climate, with an average maximum temperature of 32°C, a minimum of 9°C, and an annual average of 21°C. The area receives approximately 1,300 mm of precipitation annually and is situated at an elevation of 944 meters above sea level. The relative humidity is around 5% on average (Instituto de Información Estadística y Geográfica de Jalisco, 2018). These environmental factors significantly influence the habitability and comfort of Ayotitlán's community. Cuzalapa, Jalisco, has a temperate-subhumid climate, with an average maximum temperature of 33°C, a minimum of 11°C, and an annual average of 22°C. It receives about 1,300 mm of rainfall yearly and is located at an elevation of 653 meters above sea level, with a relative humidity of around 68%. Cuzalapa is approximately 15.3 km from Ayotitlán. It borders the municipalities of Casimiro Castillo, Autlán, Cihuatlán, La Huerta, Tolimán, and Tuxcacuesco in Jalisco, as well as Minatitlán and Manzanillo in Colima (Instituto de Información Estadística y Geográfica de Jalisco, 2018). Please refer to Figure 1, 2, and 3 for more details.

Figure 1, 2 and 3

Location of Ayotitlán and Cuzalapa, Jalisco



Source: Google Earth, 2021.

Among the data collection methods were interviews with key informants, aimed at contextualizing users' opinions about public space. People living near the study area from all four cardinal points, who had knowledge of the public space's history and were willing to participate, were interviewed.

Following the evaluation of the bioclimatic comfort hours for Ayotitlán and Cuzalapa, Jalisco, and the analysis of the study areas, deterministic sampling was designed. This included public space inhabitants aged between 12 and 75 years, with older individuals placed in a separate group. According to ISO standard 7730 (2006), certain conditions were suggested for the interviewees, such as the absence of neurological or cardiovascular diseases and not being in a period of lactation or pregnancy. However, to promote mutual interaction in public spaces and for research purposes, these conditions were omitted.

During the sampling period, informative cards were distributed to residents detailing public space characteristics, social perception, environmental habitability, and meteorological and additional variables. The exploratory and qualitative nature of the study ensured the sample's representativeness by linking residents' responses with social perception and environmental habitability variables in the public spaces of indigenous communities.

Given the inclusion of participants aged 12 to 17 years, strict ethical safeguards were implemented:

- **Parental/Guardian Consent:** Written or verbal witnessed informed consent was secured from parents or legal guardians prior to interviewing minors.
- **Minor Assent:** Explicit informed assent was obtained directly from each minor, confirming voluntary participation without coercion.
- **Data Anonymization:** Personal identifiers were encrypted immediately upon collection to guarantee absolute confidentiality.
- **Non-Invasive Protocol:** Measurements were limited to non-invasive physical metrics (weight, height) and standard observational environmental instruments.

Field data collection involved a three-person research team. Microclimatic and physical variables were recorded simultaneously every 15 minutes using calibrated equipment mounted on tripods at a standard height of 1.30 m above ground level, positioned 1.5 to 2.0 m from respondents in compliance with WMO standards (WMO, 2014):

- **Thermal Stress & Microclimate:** Two Extech HT30 Thermal Stress Meters (globe temperature, dry/wet bulb temperature).
- **Wind Velocity:** Two Extech 407113 Digital Anemometers.
- **Solar Irradiance:** Two PCE SPM1 Solar Radiation Meters.
- **Psychrometry & Humidity:** Two Extech RH401 Digital Psychrometers and Extech RHT10 Data Loggers.
- **Acoustics & Lighting:** Two Extech 407730 Digital Sound Level Meters and two Extech HD400 Digital Luxmeters.
- **Air Quality:** Two Extech CO10 Air Quality Meters.
- **Baseline Weather Station:** Logia LOWSC510SWB Weather Station.

Furthermore, another team member recorded the variable measurements every 15 minutes in a personal logbook in the public space, simultaneously with the questionnaire administration.

The sampling took place from 8:00 a.m. to 8:00 p.m., with four-hour interview periods per day for both communities' residents during a week in the cold period, scheduled for the latter half of January 2022. Please refer to Figures 4, 5, 6, and 7 for more information.

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Figure 4, 5, 6 and 7

Sampling for inhabitants of public spaces in Ayotitlán and Cuzalapa, Jalisco







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Source: Own elaboration.

The measurement instruments were mounted on tripods at a height of 1.30 meters above ground level, with the meteorological station placed in a representative area of the site, distant from trees and buildings near the measurement location.

The instruments were positioned 1.5 to 2 meters away from the interviewee, in accordance with the recommendations of the World Meteorological Organization Standard (2014), to ensure accurate estimation of thermal environment variables and other complementary variables. To record environmental habitability variables, the following measurement instruments were utilized:

Two thermal stress meters (Extech, model HT30)

Two digital anemometers (Extech, model 407113)

Two tripods (Amazon's Choice, model WT3111H)

Two solar radiation meters (PCE Instruments, model SPM1)

Two digital psychrometers (Extech, model RH401)

Two data loggers (Extech, model RHT10)

Two digital sound level meters (Extech, model 407730)

Two digital luxmeters (Extech, model HD400)

Two air quality meters (Extech, model CO10)

One weather station (Logia, model LOWSC510SWB)

For more details, please refer to Figure 8.

Figure 8 Instruments for measuring meteorological conditions.



Source: Own elaboration based on Extech, PCE Instruments and Logia.

Data entry was conducted independently by resolute personnel to ensure data integrity. Statistical processing was executed using IBM SPSS Statistics (Version 25). Bivariate linear relationships between ordinal perception scales and microclimatic variables were evaluated using Pearson's correlation coefficient (r) alongside significance tests ($p < 0.05$ and $p < 0.01$).

For the data analysis, multiple linear regression was conducted with meteorological and ordinal variables, utilizing Pearson's correlation coefficient to establish the linear relationship between quantitative or interval and ordinal variables, which are essential for studying social perception and environmental habitability in indigenous communities.

It is noteworthy that the correlation matrix between environmental habitability variables and users' social perception of public spaces was calculated using the statistical software SPSS, with the study's findings presented in tabular form.

RESULTS

In the following section, the results of the analyzed period are presented, where 102 information cards from inhabitants of public spaces of the study object were obtained. The gathered data was initially sorted and displayed in a tabular format, detailing various aspects of the inhabitants and their social perceptions. These aspects included: the location where the data was collected, gender, familiarity with the area, duration of residence, place of birth, metabolic activity level, posture during the interview, attire, duration of stay at the time of the interview, accessibility to the public space, configuration and size of the public space, flow within the space, vegetation present, available furniture, potential for expansion, enhancements made, interactions among public space users, commercial activities conducted, visitation frequency, days and times of visits, assistance received in the public space, companionship during visits, and motivations for visiting the public spaces.

In the paraphrased section, it is noted that the male participants outnumbered the female participants by a small margin, yet both genders from the communities were well-represented in the sample. Many respondents hailed from Ayotitlán and Cuzalapa, Jalisco, compared to other regions, contrasting with those who were

absent due to work commitments elsewhere in the state or country. As for the duration of time interviewees spent in public spaces, the largest group fell within the first five deciles, indicating a general tendency among users to find these spaces less appealing for extended stays.

When it comes to accessing public spaces, many individuals rated their access as 'regular,' falling within the fourth decile. This suggests that there is room for improvement to make these areas universally accessible. As for the configuration of the spaces, the shape was viewed positively, with many considering it 'good' or 'average.' This indicates a pressing need for the local residents who appreciate the layout of these spaces, irrespective of their size.

Concerning the vegetation in the surveyed areas, participants most frequently rated it as poor, indicating minimal plant coverage and a general neglect in the upkeep of these public spaces. In terms of user interaction within these areas, the feedback was mostly positive or average, suggesting that the spaces are conducive to socializing and promote an environment that supports family interaction.

Commercial activities within public spaces were viewed positively by the community and seen as integral to fostering social bonds among residents. The primary motive for visiting these places was social engagement, as indicated by many respondents, with 42% also citing community and traditional practices as key reasons.

Subsequently, Pearson Correlation tables are introduced, summarizing the relationship between several factors such as inhabitant characteristics, public space conditions, and environmental elements. These tables succinctly represent the diverse significance of each variable based on statistical analysis. In terms of thermal comfort, the presence of vegetation and the availability of furniture emerged as moderately correlated factors influencing the thermal experience, while the correlation between vegetation and user interaction in public spaces was found to be weaker. For further details, refer to Table 1.

Table 1 Thermal sensation associated with variables of the public space

		Thermal sensation of the interviewee	**Vegetation of the public space**	**Furniture of the public space**	**Visiting hours to the public space**	**Improvement of public space**	**Interaction between users of public space**
Thermal sensation of the interviewee	Pearson correlation	1	.064	.164	-.028	.072	-.007
	Sig. (bilateral)		.523	.100	.780	.472	.944
	N	102	102	102	102	102	102
Vegetation of the public space	Pearson correlation	.064	1	.657**	-.013	.148	.484**
	Sig. (bilateral)	.523		.000	.898	.138	.000
	N	102	102	102	102	102	102
Furniture of the public space	Pearson correlation	.164	.657**	1	-.045	.065	.462**
	Sig. (bilateral)	.100	.000		.654	.519	.000
	N	102	102	102	102	102	102
	Pearson correlation	-.028	-.013	-.045	1	-.051	-.155

Visiting hours to the public space	Sig. (bilateral)	.780	.898	.654		.614	.120
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	.072	.148	.065	-.051	1	.062
	Sig. (bilateral)	.472	.138	.519	.614		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	-.007	.484**	.462**	-.155	.062	1
	Sig. (bilateral)	.944	.000	.000	.120	.537	
	N	102	102	102	102	102	102

****. The correlation is significant at level 0.01 (bilateral).**

Source: Own elaboration.

In relation to the factors contributing to the perception of humidity, the study identified a weak but significant correlation between the amount of vegetation and the layout of the public spaces. Similarly, a weak correlation was observed between the layout and how users interact within these spaces. For a detailed view of these relationships, please refer to Table 2.

Table 2 Sensation of humidity associated with variables of public space.

		Wind sensation of the interviewee	**Vegetation of the public space**	**Circulation of public space**	**Dimension of public space**	**Improvement of public space**	**Interaction between users of public space**
Wind sensation of the interviewee	Pearson correlation	1	-.255**	-.161	-.280**	.032	-.171
	Sig. (bilateral)		.010	.107	.004	.750	.086
	N	102	102	102	102	102	102
Vegetation of the public space	Pearson correlation	-.255**	1	.395**	.530**	.148	.484**
	Sig. (bilateral)	.010		.000	.000	.138	.000
	N	102	102	102	102	102	102
Circulation of public space	Pearson correlation	-.161	.395**	1	.363**	.113	.389**
	Sig. (bilateral)	.107	.000		.000	.259	.000

	N	102	102	102	102	102	102
Dimension of public space	Pearson correlation	-.280**	.530**	.363**	1	.184	.378**
	Sig. (bilateral)	.004	.000	.000		.064	.000
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	.032	.148	.113	.184	1	.062
	Sig. (bilateral)	.750	.138	.259	.064		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	-.171	.484**	.389**	.378**	.062	1
	Sig. (bilateral)	.086	.000	.000	.000	.537	
	N	102	102	102	102	102	102
****. The correlation is significant at level 0.01 (bilateral).**							
Source: Own elaboration.							

In the analysis of variables associated with wind perception, a significant correlation level was identified among several factors. Notably, vegetation and the scale of public spaces exhibited the strongest correlation, characterized by a moderate and positive linear pattern. For further information, refer to table 3.

Table 3 Sensation of wind associated with variables of public space

		Wind sensation of the interviewee	**Vegetation of the public space**	**Circulation of public space**	**Dimension of public space**	**Improvement of public space**	**Interaction between users of public space**
Wind sensation of the interviewee	Pearson correlation	1	-.255**	-.161	-.280**	.032	-.171
	Sig. (bilateral)		.010	.107	.004	.750	.086
	N	102	102	102	102	102	102
Vegetation of the public space	Pearson correlation	-.255**	1	.395**	.530**	.148	.484**
	Sig. (bilateral)	.010		.000	.000	.138	.000
	N	102	102	102	102	102	102

Circulation of public space	Pearson correlation	-.161	.395**	1	.363**	.113	.389**
	Sig. (bilateral)	.107	.000		.000	.259	.000
	N	102	102	102	102	102	102
Dimension of public space	Pearson correlation	-.280**	.530**	.363**	1	.184	.378**
	Sig. (bilateral)	.004	.000	.000		.064	.000
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	.032	.148	.113	.184	1	.062
	Sig. (bilateral)	.750	.138	.259	.064		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	-.171	.484**	.389**	.378**	.062	1
	Sig. (bilateral)	.086	.000	.000	.000	.537	
	N	102	102	102	102	102	102

****. The correlation is significant at level 0.01 (bilateral).**

Source: Own elaboration.

In relation to the variables impacting noise perception, vegetation was the sole factor that demonstrated a significant correlation, albeit weak, with a positively associated linear trend. For additional details, please consult table 4.

Table 4 Sensation of noise level associated with variables of the public space

		Noise level sensation of the interviewee	Vegetation of the public space	Dimension of public space	Form of public space	Improvement of public space	Interaction between users of public space
Noise level sensation of the interviewee	Pearson correlation	1	.195*	-.022	-.076	-.007	.175
	Sig. (bilateral)		.049	.830	.449	.948	.079
	N	102	102	102	102	102	102
	Pearson correlation	.195*	1	.530**	.292**	.148	.484**

Vegetation of the public space	Sig. (bilateral)	.049		.000	.003	.138	.000
	N	102	102	102	102	102	102
Dimension of public space	Pearson correlation	-.022	.530**	1	.359**	.184	.378**
	Sig. (bilateral)	.830	.000		.000	.064	.000
	N	102	102	102	102	102	102
Form of public space	Pearson correlation	-.076	.292**	.359**	1	.150	.361**
	Sig. (bilateral)	.449	.003	.000		.132	.000
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	-.007	.148	.184	.150	1	.062
	Sig. (bilateral)	.948	.138	.064	.132		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	.175	.484**	.378**	.361**	.062	1
	Sig. (bilateral)	.079	.000	.000	.000	.537	
	N	102	102	102	102	102	102

****. The correlation is significant at level 0.01 (bilateral).**

Source: Own elaboration.

Concerning the public space variables linked to illuminance perception, it was observed that the shape, size, and enhancements of the public space exhibit a significant correlation with a positive linear direction and a weak level of association. For more information, please refer to table 5.

Table 5 Sensation of illuminance level associated with variables of the public space

		Sensation of illuminance of the interviewee	**Form of public space**	**Dimension of public space**	**Visiting hours to the public space**	**Improvement of public space**	**Interaction between users of public space**
Sensation of illuminance of the interviewee	Pearson correlation	1	.204*	.292**	-.015	.251*	-.139
	Sig. (bilateral)		.040	.003	.879	.011	.165
	N	102	102	102	102	102	102
Form of public space	Pearson correlation	.204*	1	.359**	-.069	.150	.361**

	Sig. (bilateral)	.040		.000	.490	.132	.000
	N	102	102	102	102	102	102
Dimension of public space	Pearson correlation	.292**	.359**	1	-.068	.184	.378**
	Sig. (bilateral)	.003	.000		.499	.064	.000
	N	102	102	102	102	102	102
Visiting hours to the public space	Pearson correlation	-.015	-.069	-.068	1	-.051	-.155
	Sig. (bilateral)	.879	.490	.499		.614	.120
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	.251*	.150	.184	-.051	1	.062
	Sig. (bilateral)	.011	.132	.064	.614		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	-.139	.361**	.378**	-.155	.062	1
	Sig. (bilateral)	.165	.000	.000	.120	.537	
	N	102	102	102	102	102	102

****. The correlation is significant at level 0.01 (bilateral).**

Source: Own elaboration.

With respect to the public space variables that affect air quality perception, it was noted that circulation within the public space was the only variable to show a significant correlation, characterized by a positive linear trend and a weak level of association. For further details, consult table 6.

Table 6 Sensation of air quality associated with variables of public space

		Interviewee's air quality sensation	Vegetation of the public space	Circulation of public space	Improvement of public space	Interaction between users of public space
Interviewee's air quality Sensation	Pearson correlation	1	-.177	.241*	.140	.056
	Sig. (bilateral)		.075	.015	.161	.574
	N	102	102	102	102	102
	Pearson correlation	-.177	1	.395**	.148	.484**

Vegetation of the public space	Sig. (bilateral)	.075		.000	.138	.000
	N	102	102	102	102	102
Circulation of public space	Pearson correlation	.241*	.395**	1	.113	.389**
	Sig. (bilateral)	.015	.000		.259	.000
	N	102	102	102	102	102
Improvement of public space	Pearson correlation	.140	.148	.113	1	.062
	Sig. (bilateral)	.161	.138	.259		.537
	N	102	102	102	102	102
Interaction between users of public space	Pearson correlation	.056	.484**	.389**	.062	1
	Sig. (bilateral)	.574	.000	.000	.537	
	N	102	102	102	102	102
****. The correlation is significant at level 0.01 (bilateral).**						
Source: Own elaboration.						

In examining the public space variables connected to the interviewees' experience of solar radiation, the analysis revealed that none of the variables displayed a significant level of correlation, indicating an absence of linear association among the variables studied. For more insights, table 7 should be consulted.

Table 7 Sensation of solar radiation associated with variables of public space

		Sensation of solar radiation of the interviewee	**Vegetation of the public space**	**Furniture of the public space**	**Visiting hours to the public space**	**Improvement of public space**	**Interaction between users of public space**
Sensation of solar radiation of the interviewee	Pearson correlation	1	-.017	.069	.045	-.101	-.084
	Sig. (bilateral)		.862	.491	.652	.313	.403
	N	102	102	102	102	102	102
Vegetation of the public space	Pearson correlation	-.017	1	.657**	-.013	.148	.484**
	Sig. (bilateral)	.862		.000	.898	.138	.000
	N	102	102	102	102	102	102
	Pearson correlation	.069	.657**	1	-.045	.065	.462**

Furniture of the public space	Sig. (bilateral)	.491	.000		.654	.519	.000
	N	102	102	102	102	102	102
Visiting hours to the public space	Pearson correlation	.045	-.013	-.045	1	-.051	-.155
	Sig. (bilateral)	.652	.898	.654		.614	.120
	N	102	102	102	102	102	102
Improvement of public space	Pearson correlation	-.101	.148	.065	-.051	1	.062
	Sig. (bilateral)	.313	.138	.519	.614		.537
	N	102	102	102	102	102	102
Interaction between users of public space	Pearson correlation	-.084	.484**	.462**	-.155	.062	1
	Sig. (bilateral)	.403	.000	.000	.120	.537	
	N	102	102	102	102	102	102

Source: Own elaboration.

Qualitative interviews with community delegates and key informants provided crucial context:

- Environmental Concerns: Informants expressed deep concern over deforestation and illegal timber extraction in surrounding mountain areas, attributing diminished stream flows and microclimatic shifts to forest degradation.
- Infrastructure Demands: Residents of Ayotitlán urgently requested municipal remodeling of public plazas to incorporate thermal protection structures, adequate seating, and native tree planting.
- Cultural Identity: Public spaces serve as essential anchors for community governance, seasonal festivities, and ecotourism initiatives managed directly by indigenous cooperatives.

CONCLUSION

Based on the results, it is evident that the inhabitants of Ayotitlán and Cuzalapa, Jalisco, are satisfied with their public space and see it as a suitable venue for social interactions among themselves. However, the questionnaire responses reveal that the Ayotitlán community desires a remodeling intervention by the municipal government to enhance the public space. Concerning the evaluation of social perception and environmental habitability of the users, here is a synthesis of the key aspects of the research:

The research findings on the habitability of public spaces in indigenous communities of the Sierra de Manantlán in Jalisco, Mexico, reveal a nuanced interplay between environmental conditions and social perception. The thermal comfort during the cold period is perceived as neutral, indicating an overall acceptance of the ambient temperature. Humidity is perceived as moderate, with less influence from rainfall compared to the summer season. Wind sensation is minimal, suggesting inadequate natural ventilation, which could impact user well-being. Solar radiation is perceived as low, reflecting a tolerance among the interviewees. Noise levels are reported as low, contributing to the tranquility and social harmony within the study areas. Illuminance is deemed moderate and satisfactory by users, although post-7 pm measurements indicate a deficiency according to regulatory standards. Air quality is rated from quite to moderately satisfactory, underscoring the adequacy of public spaces in this regard during the cold period.

Environmental variables such as dry bulb temperature, gray globe temperature, wet bulb temperature, and solar radiation show a weak to moderate positive correlation with thermal sensation, except for relative humidity and wind speed, which lack significance. No significant correlation is found for humidity-related variables. Wind sensation correlates only with wind speed, while the strongest environmental correlation is between dry bulb and gray globe temperatures. Solar radiation's association with sensation is significant, albeit with a weak to moderate positive trend, except for relative humidity.

No significant correlation is observed among complementary variables and noise level sensation, suggesting no linear association in this domain. Illuminance sensation correlates weakly with illuminance and solar radiation. No significant associations are found for air quality sensation variables.

The study underscores the importance of integrating social perception with environmental habitability to enhance the public spaces of indigenous communities. It advocates for continued research and respectful engagement with other indigenous communities, promoting development, mutual interaction, ecotourism, productive activities, and the tailored improvement of public spaces for societal benefit.

Recommendations for Municipal Planning

- Bioclimatic Urban Design: Incorporate native vegetation shade trees and passive solar control shelters in plaza renovations to extend comfortable occupancy hours.
- Infrastructure Upgrades: Install energy-efficient public lighting compliant with outdoor safety standards and provide ergonomic street furniture.
- Biocultural Protection: Establish collaborative municipal-indigenous governance frameworks to protect surrounding forests, support ecotourism workshops, and preserve local indigenous heritage.

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