



THE ROLE OF MUSIC IN THE URBAN SOUNDSCAPE OF MADRID: MUSICAL DIMENSIONS AND URBAN ACOUSTIC ECOLOGY

An Approach to Its Function within the City

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ABSTRACT

Spaces dedicated to music listening in urban contexts have evolved in parallel with changing patterns of consumption. Urban planning frameworks, architectural design, regulatory regimes, and broader cultural dynamics have introduced new challenges, while simultaneously redefining the concept of “noise”. This study examines Madrid as a case study, where noise, understood as a subjective phenomenon, has long been a source of controversy and social conflict, prompting regulatory intervention by public authorities.

Adopting a literature review methodology, this exploratory study is grounded in the concept of the soundscape and investigates the relationships that shape the urban acoustic environment, as well as the ways in which it reconfigures the city’s lived habitat. Within this sonic context, music-listening practices have become increasingly confined to commercial venues with restricted access. This shift reflects the predominantly negative connotation attributed to noise, which ultimately constrains and reshapes the urban soundscape.

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1. Introduction

The debate surrounding music and noise has shaped contemporary thought in relation to both musical aesthetics and artistic developments. The fact that what were formerly known as the Fine Arts are now referred to as the Visual and Sound Arts reflects a transformation in the meaning of artistic material, as well as a process of contamination or, more precisely, an incursion of materials traditionally associated with other artistic disciplines.

Contemporary artistic practices operate from an interdisciplinary perspective, and the boundaries between specialities have gradually diminished over time, not only within the field of art itself but also between art and fields of knowledge as distant as science. This dissolution of boundaries has also altered the way in which audiences understand new uses of traditional materials that constitute a work of art. Spaces of expression have likewise changed, and art has long since moved beyond the museum in search of new sites in which to establish itself.

Contemporary cities have become spaces rich in possibilities for artistic expression. Any aesthetic manifestation may be situated within urban space and draw upon the possibilities it offers, eventually becoming part of its physiognomy. Beyond this dimension, cities have always possessed their own forms of expression that characterise them, giving them a distinctive appearance. They have a landscape, urban in nature, yet ultimately a landscape that shapes the city both visually and acoustically.

The visual dimension has been examined from multiple perspectives, including architecture, urban planning, painting, sculpture, and the humanities, such as anthropology and sociology. By contrast, the acoustic dimension has traditionally remained secondary, which justifies its examination in this study. Noise pollution has generated conflict in regulations governing coexistence as well as in urban planning policies. The sound of cities has been neglected, that voice which, like the landscape, design, or skyline, characterises and defines them as unique.

Music is a key element in the sound of the city. Its distribution within urban space is a characteristic that influences the configuration of metropolises, and its development clearly depends on the idea of the city held by both its authorities and its inhabitants. While in some cities music constitutes an essential part of their character, in others ongoing conflict relegates it to marginal areas, while large one-off events or macro festivals are promoted, provided they take place far from the city centre.

The configuration of the contemporary city requires a rich and diverse cultural environment, as indicated in the UNESCO report (2017), as well as a sound that confers upon it a distinctive personality, as argued by Palmese et al. (2024). Music is situated between these two spheres, culture and sound, which explains its importance in the development of cities with a distinctive identity and a commitment to their citizens.

This research is based on two articles that examine sound in the city of Madrid, the first by Cristina Palmese and José Luis Carles (2024), and the second by the same authors together with Alejandro Rodríguez Antolín (2024). Both studies emphasise the importance of sound in shaping the spirit of the city. The question guiding this research is what role music plays as part of the sound that structures the urban environment, and whether it possesses its own distinct entity through which to fulfil this function. To address this question, the following objectives are established, noting that the purpose of this article is to lay a theoretical foundation for more specific field research to be undertaken at a later stage.

To initiate the research, the role that music plays in the contemporary city within Western culture will be examined. The characteristics of this form of expression in this context will be analysed, together with the ways in which it may define urban cartography, as do the other sounds that populate cities. The study will define the space occupied by music within the specific soundscape of the city of Madrid and consider how it may be differentiated from other elements of that landscape, as well as the particular contributions it makes to distinguishing the city from others.

The evolution that music has undergone in recent years will be analysed, and the positive and negative aspects of this development will be considered. Finally, the research will address sound

management from the perspective of the city as a regulatory body that classifies the elements composing it according to the needs of its inhabitants, whether long standing residents or new occupants whom governing authorities seek to attract, and who are transforming the city's appearance.

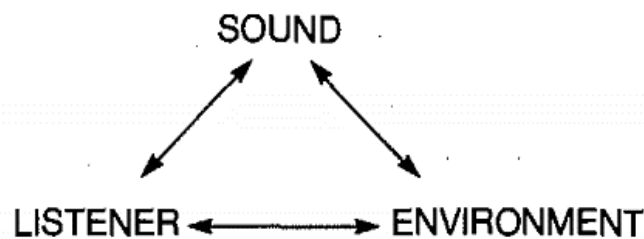
1.1. The Soundscape of the City

Later in this article, the concept of noise pollution and its legal framework in cities will be examined in light of prevailing norms. This regulation arises from the need to establish and control limits of noise exposure and to define the audible environment within creative practice. This issue is addressed by the Canadian composer and thinker R. Murray Schafer, as Cristina Palmese and José Luis Carles (2024) note, who proposed in his research and creative work an approach grounded in the positive sound that surrounds us, in contrast to the notion of noise pollution. The author begins from active listening to the sounds that compose our everyday soundscape. This approach was developed during the final decades of the 20th century and has provided important tools for research in this field.

Since Pierre Schaeffer (1988) initiated his work centred on sound, it has become an element with extensive possibilities for development. Sound has come to function not only as a vital accompaniment to everyday life but also as a means through which human beings affirm their presence in the world, shaping their own universe according to their needs. The works of R. Murray Schafer address the sensory adjustment required for individuals to become aware of the sound that surrounds them. In his text *The Soundscape* (1994), this Canadian composer and thinker defined for the first time the notion of the soundscape as a holistic system of audible events that constitute an acoustic environment and function in an ecologically balanced and sustainable manner. He emphasises the importance of a healthy relationship between people and their sound environment, since noise pollution resulting from sound saturation, as will be discussed later, may have significant negative consequences.

Building on Schafer's thesis of acoustic ecology, Barry Truax, professor at Simon Fraser University, articulated in *Acoustic Communication* (1984) the concept of acoustic communication as a framework that integrates multidisciplinary perspectives for the study of sound reception and production. This framework provides a structure for analysing and understanding the role of sound in contemporary culture, media and technology.

Figure 1. Relationship between the listener and his or her environment.



Source: Truax, 2001.

From this perspective, sound is positioned at the apex of the triangle formed by the relationship between listener and environment. Rather than being understood as something that simply emanates from the environment, sound functions as a mediator that facilitates this relationship.

The acoustic experience creates, influences and shapes the habitual relationships that listeners establish with any environment. This relationship may be highly interactive and even therapeutic, yet it may also become alienating and mentally oppressive, as in the case of noise. It can foster connection and collective experience, or isolate individuals and threaten the sense of shared belonging that characterises any community.

This author emphasises listening, following Schafer, as the central element in the cognitive elaboration of the soundscape. As the authors of the reference articles indicate, listening operates as a transformative tool, encouraging attention to elements that are typically overlooked in everyday life. Pierre Schaeffer (1988) introduced the concept of the acousmatic into contemporary thought, referring to sound that can be apprehended without reference to its source, thereby privileging listening over vision. In a context in which images dominate communication, it becomes necessary to reconsider a sense that has traditionally been regarded as secondary (Alonso Guisande, 2017).

The work of the Centre de Recherche Sur L'espace Sonore et l'Environnement Urbain (CRESSON) is particularly relevant, as it has developed analytical tools for examining contemporary sound environments, especially in urban contexts. As Jean François Augoyard and Henry Torgue (2006), members of this research group, observe, Western culture has historically sought to classify sound, including music and everyday sonic phenomena, according to degrees of purity, musicality and intelligibility. Music has often been distinguished from other sound material on the basis of intelligibility and its status as artistic expression. Radicchi et al. (2018) argue that the soundscape should be understood as a palette of resources rather than reduced to noise. In its urban dimension, it cannot be equated with the noise pollution criticised by Schafer (1994). These authors advocate citizen participation in defining sound environments, since those who inhabit and coexist within these spaces possess the most direct experiential knowledge of them. In a further study, Radicchi (2018) develops the concept of sensuous urbanism, linked to contemporary sensory studies. According to the author, such studies emerged from the epistemological shift towards the body and the senses that has characterised thought since the 1990s.

This approach to urbanism requires attention to sound in the configuration of urban structures, an issue also addressed by the architect Michael Southworth (2005) in his reflections on the form of cities. A city attentive to sensory perception is more effectively configured for habitability.

From a semiotic perspective, Cárdenas-Soler and Martínez-Chaparro (2015) argue that the soundscape does not function as a single sign but rather as a constellation of signs that convey a non-verbal message. It operates as an extralinguistic code with autonomous meaning. Consequently, the sounds that compose it must occupy positions that allow them to be perceived in an ordered manner and, as these authors indicate, are closely related to the context and community in which they develop.

1.2. Sound Perception and Spatial Localisation: Listening

As McLuhan et al. (1988) state, "...the sense of hearing places us at the centre of things. Sound surrounds us in a 360° circle, making us part of the world and situating us within a subjective and ecological relationship with our environment". With these words, McLuhan characterises the relationship between human beings, the auditory sense and the information provided by the physical environment, defined as acoustic space.

Because sound propagates omnidirectionally under free field conditions, rather than remaining confined within a closed acoustic enclosure, one of the most significant properties of the human auditory system is the ability to locate sound in three dimensions.

The duplex theory is the earliest theoretical framework addressing the spatial localisation of sound in humans (Strutt, 1907). Based on the hypothesis of a perfectly spherical head without auricles, this theory seeks to explain several fundamental characteristics of human sound localisation. When a sound source is positioned on the median plane, equidistant from both ears, the sound waves emitted by the source travel different distances before reaching the left and right ears. These differences give rise to temporal delays and level variations, depending on which ear receives the signal.

Through binaural hearing, enabled by the presence of two auricles, human listeners are able to estimate the direction from which a sound originates. This estimation remains possible even when

the listener is positioned behind the sound source or when the source location is initially unknown. By contrast, auditory perception is markedly altered when hearing occurs with only one ear, and localisation becomes considerably more complex, with a higher margin of error. This demonstrates the capacity of the auditory system to process and correlate the information received by each ear.

From a psychophysical perspective, a distinction is often drawn between stimulus and sensation. The stimulus indicates the physical direction of the sound source, whereas the resulting sensation determines the perceived direction, which does not necessarily coincide with the physical one. Numerous psychoacoustic effects can be identified on the basis of the distinct stimuli received by each ear. These effects form the foundation for the design and implementation of electroacoustic systems for spatial sound representation.

In the following section, the fundamental principles of the human auditory system are presented.

1.3. Binaural Hearing

In order to understand human spatial perception of sound, extensive research into the auditory system has been undertaken. Much of the earlier work, such as that of Wenzel et al. (1993), analyses auditory behaviour through the interpretation of acoustic signals received independently under binaural or monaural conditions. However, the most widely recognised foundational studies are those conducted by the psychoacoustician Jens Blauert (Blauert, 1997). A brief overview of the fundamental principles of spatial localisation is presented below. For more detailed accounts, see Pickles (2008) and Moore (2012).

In the specialist literature, the direction of a sound source is generally defined in relation to the position of the head. Localisation involves determining both direction and distance. Direction is specified by the angle in the lateral plane, θ , and the elevation angle, δ , both expressed in degrees. On the horizontal, or azimuth, plane, listeners identify the location of a sound source through binaural reception. By comparing the stimuli received at each ear, differences in two fundamental parameters, intensity and timing, can be detected. These parameters are known as interaural time differences, ITDs, and interaural level differences, ILDs, as described in the duplex theory proposed by John William Strutt, also known as Lord Rayleigh (Strutt, 1907).

These differences may be illustrated by imagining a sound source positioned to the right of a listener. The left ear, being further from the source, receives the sound slightly later than the right ear. This disparity in arrival time constitutes the interaural time difference, ITD. It varies according to the angle of the source and serves as the primary cue for localising low frequency sounds. In addition, the head creates an “acoustic shadow”, such that the sound reaching the left ear is less intense than that reaching the right ear. This difference in level, the interaural level difference, ILD, also varies with source angle and is particularly effective for determining direction at high frequencies (Akeroyd, 2006).

The same principle applies when the sound source is located to the left of the listener. In this case, the sound reaches the left ear earlier than the right, generating an ITD, and the head shadow results in a higher sound level at the left ear, producing an ILD.

Interaural time differences (ITDs) function as directional cues for frequencies approximately between 100 Hz and 1,500 Hz. This upper limit corresponds to a wavelength (λ) close to the average interaural distance (Braasch, 2005). When frequencies exceed 1,500 Hz, and their wavelengths become shorter than the distance between the ears, phase ambiguities arise. In these cases, the auditory system performs a comparative analysis of the phase relationships between the signals arriving at the left and right ears. These interaural phase differences play a crucial role in horizontal sound localisation (Blauert, 1997).

In contrast, interaural level differences (ILDs) are negligible at low frequencies. Because the dimensions of the head are smaller than the wavelengths below approximately 1,500 Hz, the head does not significantly obstruct sound propagation. As frequency increases, however, the head produces an acoustic shadow, generating measurable level differences between the ears.

Together, ITDs and ILDs provide the primary binaural cues required for determining the azimuth of lateral sound sources.

While binaural cues are essential for horizontal localisation, vertical localisation relies predominantly on monaural spectral information. According to Vile Pulkki (2001), accurate perception of elevation requires frequencies above approximately 6 kHz. This dependency is largely due to the physiological structure of the auricle (pinna), whose folds introduce direction-dependent spectral modifications. As sound waves interact with the complex geometry of the pinna, they produce characteristic patterns of reflection and diffraction that vary with the angle of incidence.

More broadly, the morphology of the torso, head, and pinna acts as a frequency-dependent filter, altering the spectrum of the sound that ultimately reaches the eardrum. The relationship between the emitted signal and the signal received at the ear can be described by a transfer function known as the head-related transfer function (HRTF) (Batteau, 1967). Collectively, these transformations constitute a complex response function that encompasses interaural time differences, interaural level differences, and spectral shaping cues. As noted by Kapralos et al. (2008, p. 8), HRTFs “encompass various sound localisation cues including ITDs, ILDs, and changes in the spectral shape (frequency distribution) of the sound reaching a listener.” By incorporating these spectral components, HRTF-based models overcome many of the localisation limitations inherent in approaches based solely on ITD and ILD cues.

HRTFs are highly individual, as they depend on each person’s anatomical characteristics. They can be measured through the head-related impulse response (HRIR) under free-field conditions or within controlled environments such as anechoic chambers. Because measurements must be captured at the entrance to the ear canal, acoustic mannequins or Head and Torso Simulators (HATS) are commonly employed. It is important to note that HRTF measurements capture primarily the direct sound field and do not account for environmental influences. In real listening situations, however, room acoustics, including spatial dimensions, material absorption coefficients, and architectural geometry, significantly shape auditory perception and modify the sonic message transmitted by electroacoustic spatial representation systems.

1.4. The Place of Music in the Soundscape

R. Murray Schafer (1994) considers music to be sound. He cites John Cage, who refers to *Walden*, in which Henry David Thoreau describes the music generated by the sounds of his surrounding environment. At an earlier historical moment, the inclusion of music within the broader category of sound might have generated considerable debate. However, following the musical developments of the twentieth century, particularly within experimental and electroacoustic practices, such a distinction has become increasingly difficult to sustain.

Schafer references composers such as Clément Janequin and Olivier Messiaen, both of whom incorporated birdsong into their musical works, thereby transforming elements of the natural soundscape into structured musical material. Similarly, in *Pacific 231*, Arthur Honegger employs orchestral resources to evoke the sonic character of a locomotive, demonstrating how mechanical sound has also entered the musical domain. These examples illustrate that the interaction between music and environmental sound, whether natural or industrial, has long been embedded within compositional practice.

Returning to the central question posed in this article, music should not be understood merely as a user or imitator of soundscape elements, but rather as an integral component of the soundscape itself. The soundscape can function as a mode of musical creation, a position that Schafer demonstrated throughout his career. More recently, Vargas and Sefcovich (2023) propose the incorporation of electronic music elements into environmental contexts to generate what they describe as surreal soundscapes. In this sense, the soundscape may constitute a work in its own right. This perspective invites further investigation into the role of music within the total sound spectrum, not as an external intervention, but as one of its constitutive elements.

There are instances in which composers incorporate the presence of other music within the orchestral fabric itself. Gustav Mahler, in several of his symphonies, Charles Ives in *Symphony No. 4* (1927), and Iannis Xenakis in *Hiketides* (1964) introduce musical materials that evoke externally situated sound sources, disrupting the conventional continuity of symphonic discourse. These inserted layers often resemble improvised performances or fragments of vernacular music, as if heard from a distance or from a public space. In such cases, concert music appears to encounter the soundscape. The orchestral work becomes permeable to external sonic references, creating a situation in which one musical system is affected by another.

While these examples clearly demonstrate mutual influence between different musical domains, the central concern of this research is not merely intermusical reference. Rather, it is to understand the function that music may assume within the soundscape itself, and how it operates alongside other environmental sound materials.

Schafer (1994) distinguishes between listening in the concert hall, listening at home through a reproduction system, and listening in outdoor environments. The first two forms occur within regulated and relatively enclosed acoustic spaces. They belong to what may be considered an exclusive sphere, governed by architectural design, insulation practices, and decibel regulations intended to prevent sound from projecting outward and becoming part of the surrounding acoustic environment. Despite such measures, musical sound frequently escapes these boundaries and integrates into the broader urban sound field.

The third mode of listening, which takes place in open or public space, involves the direct integration of music into the total sound of the city. In this context, music ceases to function as an isolated aesthetic object and instead becomes one element within the complex acoustic ecology of urban life.

According to Schafer (1994), the soundscape is structured around three fundamental elements: keynotes, signals, and soundmarks. Keynotes are background sounds that dominate the acoustic spectrum of a given environment. They may be consciously perceived or remain largely unnoticed, yet they define the characteristic sonic atmosphere of a place. Signals, by contrast, are foreground sounds that demand attention due to their clarity or intensity, such as horns or sirens. Soundmarks refer to sounds that possess cultural and social significance within a community, functioning as acoustic identifiers of a specific location.

Music has the capacity to operate within any of these categories. It can function as a keynote, forming part of the ambient sonic background; as a signal, attracting focused attention; or as a soundmark, contributing to the cultural identity of a space. When these functions are considered alongside music's internal organisation of sound and its status as artistic expression, it becomes clear that music occupies a position of considerable importance within the structure of the soundscape.

1.5. The City of Madrid, Its Sound, Its Music

According to the 2024 live music yearbook published by the Association of Music Promoters, Spain achieved record ticket sales figures last year, with projections suggesting continued growth in future editions of the report. These figures indicate significant expansion within the live music sector. However, such quantitative success contrasts with critical perspectives that seek to move beyond the large numbers celebrated by the music industry in order to interrogate the broader cultural reality they claim to represent.

In the mid twentieth century, Theodor W. Adorno criticised the industrialisation of culture and its reduction to statistical indicators which, like those cited above, risk obscuring deeper social and aesthetic conditions. More recently, scholars such as Justin O'Connor and Chris Gibson and Lily Kong have questioned the commodification of culture within neoliberal economies. Similarly, Jacques Attali, in *Ruidos*, interrogates the treatment of music as a commodity embedded within capitalist systems of production and exchange.

The figures presented by the APM yearbook primarily reflect aggregate results from the live music sector, which currently depends heavily on large scale festivals and internationally

recognised artists capable of filling major venues. This macroeconomic perspective, however, tends to marginalise small scale musical activity. Such activity, precisely because of its continuity and embeddedness in everyday life, contributes significantly to the acoustic identity and atmosphere of cities.

A city is shaped not only by urban planning and architectural design, but also by its cultural practices. In a 2018 study, Jesús Cruz Valenciano applied Jürgen Habermas' concept of the public sphere to the development of Spanish cities during the eighteenth and nineteenth centuries, examining how musical and scenic practices contributed to its formation. Within anthropological, ethnographic, and ethnomusicological research, the mapping of musical activity has emerged as a valuable methodological tool for analysing how cultural practices configure urban public space.

An example of this approach is the work conducted in Madrid by Josep Pedro (2017), who developed interactive musical maps of the city. Focusing on the blues scene and its intersections with jazz, soul, and funk, Pedro combined interviews and ethnographic observation to document both live performance spaces and venues where recorded music functions as background sound. His research demonstrates how the spatial distribution of musical venues contributes to the construction of an urban physiognomy, revealing the cultural density and diversity embedded within the city's sonic environment.

Since the publication of that study in 2017, Madrid has undergone significant transformation, driven in part by policies aimed at positioning the city as a global tourist destination in competition with other European and international capitals. This process has led to the closure or functional reconfiguration of many venues previously identified, thereby altering the musical ecosystem that once defined particular neighbourhoods. Such changes underscore the fragility of small-scale musical infrastructures and highlight the tension between cultural vitality and urban economic strategy.

To understand live music in the city of Madrid, it is essential to consider the role of Madrid en Vivo, formerly known as La Noche en Vivo. This association brings together sixty-two venues in which live music is performed, including concert halls, flamenco tablaos, and musical theatres. It maintains institutional links with various professional associations and rights management entities, and it has successfully lobbied the City Council to recognise forty-eight of its venues as part of the city's cultural heritage (ABC, 2025). In this sense, a significant portion of the city's organised live music infrastructure operates under its umbrella.

However, the acoustic identity of Madrid cannot be reduced to the venues affiliated with this association. Other dimensions must also be considered, including licensed venues that operate independently of Madrid en Vivo, as well as forms of musical activity that exist outside formal institutional frameworks. Among these, street music plays a particularly significant role in shaping the urban sound environment.

R. Murray Schafer (1994) discusses the debates surrounding street music, noting the longstanding tension between its defenders and detractors. According to Schafer, restrictive positions have often prevailed, resulting in regulatory measures that diminish its presence and, consequently, reduce the diversity of the urban soundscape. More recently, Samuel Stäbler and Kim Mierisch (2022) have argued that street music encompasses a wide range of performers, from highly skilled musicians using public space for artistic visibility to amateurs engaging in spontaneous performance.

In his doctoral thesis on street music in Madrid, Flávio Henrique Silva e Souza (2017) examines this practice through the conceptual framework established by Schafer. From this perspective, street music constitutes another element within the soundscape, characterised above all by its immediacy and lack of formal mediation. Unlike ticketed concerts, it does not require prior access or spatial delimitation. Its reception is contingent upon movement through the city, embedding it within everyday urban circulation. In this sense, street music becomes part of what Michael Southworth (2005) describes as the walkable city, where sensory experience, including auditory perception, plays a central role in shaping urban life.

Taken together, these dimensions suggest that any investigation into music within the soundscape of Madrid must account for multiple layers of activity. Major events, venues affiliated with and independent from institutional networks, and informal street performances all contribute to the city's acoustic ecology. Popular music, in its diverse forms of production and dissemination, becomes a structuring force within the urban soundscape, participating in the ongoing negotiation between cultural expression, regulation, and spatial transformation.

1.6. Noise Pollution: Legal Framework in the City of Madrid

One of the most decisive elements in relating sound to the city of Madrid is the legislative framework that regulates it. Every city establishes its own normative parameters to define how sound affects urban coexistence. In Madrid, this framework is commonly referred to as the Noise Law, under which all sound related matters are legally classified within the broader category of noise. As a result, music, when considered from a regulatory perspective, becomes subsumed under the concept of noise.

This classification is not ideologically neutral. Jacques Attali (1995) analyses noise as a political and economic construct, arguing that its regulation reflects relations of power. If music is framed as noise, it becomes more easily subjected to control and limitation, reduced to a regulated commodity that must not disturb the social order. Such a perspective reinforces a negative reading of the urban sound environment, in which music itself risks being labelled as noise pollution.

R. Murray Schafer (1994) identifies noise pollution as one of the central dangers of contemporary society. He argues that the indiscriminate and expansive dissemination of sound saturates the auditory field, producing what he metaphorically describes as a form of deafness, namely the inability to differentiate meaningful signals within an undifferentiated mass of sound. This critique underpins his concept of acoustic ecology, which advocates for a balanced and conscious relationship between individuals and the sonic environment.

From the perspective of urban legislation, noise pollution is treated as one of the most significant negative externalities affecting public health and quality of life. Its characterisation and control rely on a detailed regulatory framework that establishes maximum permissible levels of sound immission. In the Community of Madrid, acoustic regulation derives from state level legislation, particularly Law 37/2003 of 17 November on Noise and its subsequent development through Royal Decree 1367/2007. These regulations define acoustic zoning categories and assign acoustic quality objectives according to predominant land use.

Residential areas, considered acoustically sensitive zones, are subject to particularly strict thresholds. Sound levels are measured in A weighted decibels, abbreviated as dB(A), which adjust acoustic measurement to approximate the sensitivity curve of human hearing. The legislation differentiates three time periods: daytime, from 7:00 to 19:00; evening, from 19:00 to 23:00; and night time, from 23:00 to 7:00.

Inside residential premises, maximum permissible immission levels are set at 35 dB(A) during daytime and evening periods, and 30 dB(A) during night time. In bedrooms, the limits are more restrictive: 30 dB(A) during daytime and evening, and 25 dB(A) at night. These thresholds are designed to safeguard rest and prevent sleep fragmentation, one of the most widely documented psychophysiological effects associated with prolonged noise exposure.

The control of noise emissions into the external environment is also strictly regulated. In residential areas, the general limit is set at 65 dB(A) during the daytime period and 55 dB(A) at night. In industrial zones, where noise generating activity is considered inherent to land use, the limits are increased to 75 dB(A) during the day and 65 dB(A) at night. Conversely, in areas designated for healthcare or educational purposes, which require special protection due to their sensitivity, permitted levels are reduced to ranges between 50 and 55 dB(A) during the day and between 45 and 50 dB(A) at night.

Non-compliance with these thresholds activates a sanctioning system that classifies infringements as minor, serious, or very serious, depending on the degree to which established

limits are exceeded. Surpassing the maximum permissible level by more than 6 dB(A) is categorised as a very serious offence. This legal and technical framework provides institutional mechanisms for managing and regulating the urban sound environment. However, its effective enforcement and continuous monitoring remain complex challenges for municipal authorities.

Law 37/2003 also enabled the creation of Special Acoustic Protection Zones, known as ZPAE, under Article 25. In Madrid, this designation applies to the central district, an area characterised by intense commercial, leisure, and tourist activity. The implementation of the ZPAE has generated considerable tension, particularly in relation to musical practices, both within licensed venues and in public space.

When music is subsumed under the regulatory category of noise, an important conceptual question emerges. Can music, as cultural expression, be framed primarily as a disturbance to coexistence? The acoustic zoning of urban territory, while justified in terms of public health and quality of life, also reflects a broader logic of control over sound. This raises fundamental questions about how music participates in the soundscape of the city and whether its presence is understood as cultural value or as acoustic contamination.

2. Design and Method

This study seeks to address the question posed in the introduction: whether music constitutes a meaningful component of the urban soundscape and, if so, how it contributes to the shaping of urban space and whether it possesses an autonomous presence within it. Music is inherently part of the city's sonic environment and thus holds this potential, although it occupies a distinct domain as an artistic form in its own right. Patterns of use, regulatory frameworks, and social conflict have, however, rendered music in Madrid one of the most negatively perceived elements of urban sound, effectively categorising it as noise. As a result, music has been relegated to marginalised spaces where it can be controlled. Consequently, it has lost much of its capacity to shape urban environments and, like other marginal expressions, has been confined to spaces where it does not disturb. This process of containment has unfolded in parallel with broader transformations of the city, in which both gentrification and touristification have contributed to the development of urban space oriented predominantly towards service and consumption.

This research adopts an exploratory and descriptive approach to the literature and related documents, with the primary aim of synthesising, analysing and evaluating the convergence between acoustic noise and the urban soundscape. This provides a theoretical foundation to support future fieldwork on the role of music within the soundscape of Madrid. The study begins with the recognition of music as an integral component of the city's sound, conceptualised as the Soundscape.

This concept is applied to Madrid in the work of Cristina Palmese and José Luis Carles, *Madrid Soundscape Map: Listening and Identity_MADLIST* (2024), and in their co-authored article with Alejandro Rodríguez Antolín, *The Soundscape and Listening as an Approach to Sensuous Urbanism: The Case of Puerta del Sol (Madrid)* (2024). Both texts analyse the capacity of sound to shape urban spaces. Music forms part of this sonic substance and thus contributes to the soundscape. While much urban sound is contingent and improvised, music is created intentionally, requiring expression and projection. For this reason, it needs specific spaces in which to be presented to the public.

However, in urban contexts, music can also enter the realm of contingency when its communication occurs within dynamics of promotion, attention-seeking, or festivity, producing improvised performance spaces. Jacques Attali (1995) describes music as a medium through which new realities are articulated, noting that evolving urban spaces rely on music as an element with both presence and expressive capacity. Cities can thus act as a stage, providing music with opportunities for expression, which in turn can shape perceptions of urban identity and contribute to the broader soundscape.

The concept of soundscape, as developed in the above-cited studies, derives from an adaptation of the term landscape, replacing the prefix *land* with *sound*. As Mitchell et al. (2023) note,

conventional dictionary definitions of landscape do not adequately capture the spatial dimension essential to understanding soundscapes. The ISO 12913-1:2014 standard addresses this limitation by emphasising listening and the ways in which spatial contexts modify auditory experiences. According to this standard, a soundscape can be defined as the acoustic environment as perceived, experienced and understood by people within their context. The standard further highlights the interaction between place, human perception and the interaction of human and natural participants as critical to the creation of the soundscape.

The UNE EN ISO standards related to acoustics provide a framework for assessing and measuring sound in diverse environments. For example, the ISO 1996 series specifies methods for measuring environmental noise, including the evaluation of sound pressure levels such as L_{eq} and $L_{SEL} / S_{EL} / SEL$. The L_{eq} value represents the constant sound pressure level that, over a given time (t), contains the same total energy as the varying noise being measured, effectively describing the equivalent continuous sound level. L_e is a logarithmic measure of energy relative to a reference value, typically one second, thus eliminating dependence on measurement duration. ISO 12913 provides a framework for assessing soundscapes, which is crucial for urban development and, particularly, for supporting the coexistence of city residents by evaluating potential acoustic pollution (Vida Manzano, 2023).

R. Murray Schafer first introduced and popularised the concept of the soundscape in *The Tuning of the World* (1977), reissued in 1994 as *Our Sonic Environment and the Soundscape: The Tuning of the World*. Schafer emphasises the relational dimension highlighted by Mitchell et al., linking human experience to space through the act of listening. Central to this work is the idea of “listening as perception”, the basis for experiencing a soundscape. For an ecology of listening, Schafer proposes the practice of *ear cleaning*, a disciplined approach to perceiving the acoustic environment clearly, enabling full engagement with the surrounding sounds.

3. Results

Analysis of the specialised literature identifies three interconnected conceptual axes that correspond to the research objectives. The first phase of the study establishes the theoretical framework of the soundscape as a foundational tool for analysing the urban acoustic environment, guiding the identification of the variables that shape it. The second phase emphasises the centrality of listening as both a physiological and conscious act, which defines the perception of this landscape. The third phase examines the ambivalent role of music within this sonic ecosystem, oscillating between a cultural marker of identity and a source of conflict categorised as noise. The results obtained are presented below.

3.1. Conceptualisation of the Soundscape: From Acoustic Ecology to Sensory Urbanism

The literature review indicates a consensus around the concept of the soundscape, coined by R. Murray Schafer (1994), as a foundational framework for understanding the acoustic environment. In contrast to approaches focused on noise pollution, Schafer presents a positive perspective that recognises the ensemble of urban sounds as an ecologically balanced system. This approach is complemented by Barry Truax (1984), who introduces the framework of acoustic communication, positioning sound as a crucial mediator in the interactive relationship between the listener and their environment.

This theoretical foundation has subsequently been formalised and standardised. The ISO 12913 standard defines a soundscape as “the acoustic environment as perceived, experienced and understood by people in their context”, emphasising the centrality of human perception (Vida Manzano, 2023). Research conducted by CRESSON (Augoyard and Torgue, 2006), together with the work of Radicchi (2018) and Southworth (2005), extends these concepts to urban design, promoting the notion of “sensory urbanism”, which treats sound not as an unwanted or alienating factor but as a fundamental resource for shaping more liveable cities with distinctive identities.

The studies by Palmese, Carles and Rodríguez Antolín (2024) directly apply this framework to Madrid, providing the basis for analysing the city's sound characteristics.

3.2. The Centrality of Listening: Perception and Active Awareness

A cross-cutting finding in the literature is the centrality of the act of listening. Schafer (1994) advocates *ear cleaning* as a disciplined practice to develop full awareness of the environment, while Pierre Schaeffer (1988) revives the concept of acousmatic listening, the perception of sound without visualising its source, as a means of prioritising auditory perception in a visually dominated world (Alonso Guisande, 2017). Listening is thus not a passive activity, but a tool for transformation and concentration that actively shapes the soundscape.

From a psychoacoustic perspective, the human capacity to interpret auditory space relies on binaural hearing. Strutt's Duplex Theory (1907) posits that localisation in the horizontal plane depends on two key parameters:

- Interaural Time Differences (ITD): the brain processes the tiny delay with which a sound reaches one ear compared to the other, providing the principal cue for low-frequency sounds.
- Interaural Level Differences (ILD): the *acoustic shadow* cast by the head reduces sound intensity in the more distant ear, providing a crucial cue for high-frequency sounds.

Vertical and timbral localisation is influenced by the listener's own physiognomy, including the torso, head and pinna, which modifies the sound. This phenomenon is described by the Head-Related Transfer Function (HRTF) (Batteau, 1967; Kapralos et al., 2008). Collectively, these mechanisms demonstrate that perceiving a soundscape is a complex and highly sophisticated biological and cognitive process.

3.3. The Role of Music in the Urban Soundscape: Between Integration and Conflict

Research shows that music occupies a complex and often contradictory position within the urban soundscape. Schafer (1994) unequivocally considers it part of sound, noting how composers such as Honegger and Messiaen have integrated sounds from the landscape into their works. Similarly, symphonic works by Ives and Xenakis simulate the intrusion of street music into the concert hall, demonstrating a conceptual permeability between music traditionally classified as classical and urban sound. However, the role of music is not merely imitative or representational; it is an active component of urban sound. Schafer (1994) distinguishes between controlled listening, as in a concert hall, and listening in outdoor spaces, where music is fully integrated into the soundscape. In this context, music can function as:

- Keynote sound: a background sound that defines the character of a place.
- Signal: a sound that consciously attracts attention.
- Soundmark: a unique sound valued by a community that provides it with a distinct acoustic identity.

In dense urban contexts such as Madrid, however, music often falls into the category of noise. The literature suggests that, due to conflicts of coexistence and processes of urban transformation, including gentrification and touristification, music has been regulated, controlled and displaced to *liminal spaces*. Rather than actively shaping the identity of the city, it becomes a factor to be mitigated, thereby losing its capacity to contribute to the construction of the urban soundscape.

4. Conclusions and Discussion

This research examines the intricate dialectical relationship between music, noise and the urban soundscape, with particular attention to the metropolitan context of Madrid. The study is grounded in the premise that traditional disciplinary boundaries, especially within the arts, have progressively dissolved in contemporary times. This dissolution has facilitated a re-evaluation of sound, historically underestimated and relegated to a secondary position, as an ontological and structuring component of urban physiognomy, comparable in importance to visual and

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architectural dimensions. The principal objective of this research was to define and conceptualise the intrinsic entity and function of music within Madrid's soundscape. Within this context, music has frequently been subordinated under the pejorative category of noise pollution or indiscriminate noise.

The methodological approach adopts an exploratory-descriptive paradigm, including an exhaustive review of the seminal theories of acoustic ecology proposed by composer and educator R. M. Schafer. Schafer, a pioneer in popularising the term soundscape, emphasises the primacy of active listening as an essential epistemological tool for perceiving and critically analysing the acoustic environment.

In its final section, the study investigates the impact of legislation and urban policies on the configuration of the soundscape. It considers how regulatory frameworks, including the so-called Noise Law and the establishment of Special Acoustic Protection Zones (ZPAE) in Madrid, have contributed to the subordination of live and street music performances. Such measures have tended to strip music of its status as a central component in the articulation of a rich and diverse urban identity, relegating it to marginal and often clandestine positions. Ultimately, this relegation represents a significant loss, as music possesses the inherent potential to energise and enrich the urban experience, functioning as a cultural indicator and an agent of social cohesion.

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