CHAPTER 10

# A Multisensorial Approach to Urban Space: Placemaking through Sensory Insights

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**Abstract**

This chapter focuses on experimental research involving a hybrid in situ methodology that combines soundscape and visual/digital research for placemaking strategies. The main objective of this research is to develop and test a hybrid audiovisual methodology to thoroughly understand the events, practices and processes that transform an urban space into an urban place. Traditional methods of urban analysis are often neither comprehensive nor cross-disciplinary, failing to capture the complex essence of urban spaces. We believe it is essential to approach urban spaces by considering both sensory interactions – including the experiences of sound, light, smell, and touch – and the physical, spatial, cultural and social aspects, to fully capture the dynamics that bring

a place to life. This chapter focuses on a pilot study carried out in Eminönü Square in Istanbul, where two methodologies converged, one focusing on sound and qualitative aspects and the other on visual and quantitative aspects. This study fosters a collaborative environment between citizens and researchers by employing methodologies such as impromptu interviews and augmented sound walks. Delving into the sensory dimensions of these environments, it presents a nuanced view of how people perceive and relate to their surroundings, highlighting the benefits of incorporating auditory and visual perceptions into urban planning disciplines. The comprehensive analysis of Istanbul's Eminönü Square successfully demonstrates how a multisensory approach can enhance the understanding of urban spaces. This research unfolded in several phases: the first involved gaining theoretical knowledge about urban soundscapes and visualscapes; the second focused on designing hybrid techniques for data collection and related activities; the third encompassed the practical application and analysis of the results.

**Keywords**

soundscape – visualscape – soundwalk – visual/digital analysis – urban perception – Eminönü Square

## 1 Introduction

This chapter focuses on ongoing research exploring and experimenting with a hybrid in situ methodology that combines soundscape and visual/digital research. This approach integrates sound and visual variables to develop sensory-focused placemaking strategies. Eminönü Square in Istanbul is a testbed for this hybrid methodology. This approach aims to comprehensively capture the perceptual qualities of the urban environment by testing a combination of two in situ methodologies of exploration and experimentation. This multisensorial approach is also complemented with data related to urban and user attributes.

While the need for a multidisciplinary approach is widely accepted, few practices actively experiment with or debate how to effectively conduct analyses in the urban perception domain. The unique aspect is the interdisciplinary collaboration, audiovisual perspective in placemaking, and the merge of multiple measuring and representation techniques. These are, on the one hand, the methodologies used by Gülce Kırdar and Sabiha İrem Ardıç in the analysis of the visual landscape and, on the other hand, the soundscape evaluation

methodology developed by Cristina Palmese and José Luis Carles (2023) the *Madrid's Soundscape: Identity and Listening* project.

A brief summary of the methodological steps is identified as follows:

- **Providing theoretical knowledge:** The theoretical knowledge on soundscape and visualscape theories.
- **Drawing methodology:** Designing audio-visual data collection strategies, including impromptu interviews and augmented soundwalk, and develop a hybrid methodology to measure urban visual and sound perception.
- **Testing the methodology**: Eminönü Square, in Istanbul.

Placemaking processes are designed to make urban environments more liveable and inspiring by encouraging participation and creativity in future city design. This innovative methodology accounts for the multisensory complexity of the variables involved in these processes.

## 2 Theoretical Background

### 2.1 *Soundscape Study*

Soundscape studies shed light on understanding the sensory experience of a place through auditory aspects, employing methods such as soundwalks, cartographies, sound archives, and performances. Over the last few decades, several studies (Amphoux & Tixier, 2017; Duffy, 2020; Schulte-Fortkamp et al., 2023) have highlighted that sound and the senses are crucial for gaining new insights into environmental interactions and human–environment relationships. The concepts and methods of the soundscape study stem from the community-driven sensory experience of the place. In situ methods such as soundwalks, cartographies, sound archives, performances and collective sound actions generate a significant interest in the collective place listening.

Sound has physical, sensory, and perceptual qualities, intertwining emotional and rational aspects. Making explicit the complexity of the sound allows for the understanding of the experience of the place where we live. The sensations conveyed by a space form part of a complex perceptual process involving different senses, of which hearing is a fundamental one (Relph, 1976; Tuan, 1977). Sound offers rich and diverse information about a given spatial context, revealing not only data on objects and sound mixtures at present but also critical insights into the place qualities, forms, and textures within memory (Palmese, 2014). From a perceptual point of view, sound encompasses both abstract and analytical information, as well as affective and emotional insights, deepening the understanding of our relationships and feelings of belonging to the place. Indeed, a thorough understanding of this sonic dimension and

integration with the visual dimension can enhance the precision and richness of the placemaking strategies. Studies have shown that individual reactions to environmental sounds have a complex explanation affected by a combination of physical, ecological, and evolutionary factors, as well as cultural and psychosocial factors challenging to define and specify (Carles, 1995). In this evolving research domain, public participation is crucial. Citizen-based soundscape assessments have become a standard practice for effectively integrating noise considerations into urban design, guided by sustainability principles.

## 3 What Is Soundscape?

Soundscape studies have been consolidating theoretically and methodologically across diverse fields, including anthropology (Feld, 2012), geography (Rodaway, 1994; Wissmann, 2014), music (Duhautpas & Solomos, 2014; Solomos, 2020), and urban planning (Amphoux et al., 1991; Carson et al., 2021; Radicchi, 2013). This expansion leads to a multidisciplinary blend that encompasses the physical, cultural, sensory, and historical aspects of sound. Given this disciplinary diversity, the concept of soundscape varies significantly based on its intended use. The authors point to the difficulty of reducing it to a numerical-quantitative assessment, as is the tendency in environmental acoustics, due to the complex phenomenological characteristics of sound (Barrie, 2020). Nevertheless, efforts are being made to agree on the importance of taking sound into account when intervening in an urban space, and, above all, to consider citizens' experiences and memories of city sound.

The term "soundscape" was first used by Michael Southworth in 1967 on sound dimension of the city during his urban planning master's thesis at the Massachusetts Institute of Technology (MIT). Southworth (1969) was familiar with Lynch's work on *The image of the City*, in which he introduced the appreciation of the citizen's perception in urban studies. Subsequently, R. Murray Schafer and his team at Simon Fraser University expanded on this concept through their "World Soundscape Project" (Schafer, 1969). Schafer (1977) proposed listening to the world of sound as a collective musical composition, going beyond physical characteristics to consider the meaning that sound has for people in their changing social and cultural identities. The theory of soundscapes is based on the assumption that the sounds of the environment are not just physical elements of an abstract nature but have meanings, connotations and symbolisms that need to be studied (Schafer, 1977). Additionally, the artistic contributions of Max Neuhaus, through his "*Listen: Field Trips through Found Sound Contexts*" between 1966 and 1968,

further explored this concept. His proposal was to invite participants to sharpen their listening skills in unusual places on the streets of New York.

These three figures and their subsequent experiences contribute to configuring an important theoretical and practical environment of revaluation of the sensorial and the perceptive, moving in a wide, uncertain, attractive and challenging disciplinary field that covers urban, landscape and geography but also musical, artistic, etc. These initiatives aim to refocus the auditory perspectives of individuals, encouraging an openness to urban sound experiences, a concept that has gained traction over time. In this perspective, a fundamental change is the consideration of the importance of everyday sounds that neither correspond to spoken language nor are oppressive or musical. Traditionally, everyday sounds have been overlooked, since they are fallen outside the competence of the various specialists in acoustics and speech. These proposals, their relevance and connection with the quality of the environment will be studied, contributing new meanings to the construction of more habitable cities or the improvement of coexistence and social and interpersonal well-being. In a holistic manner, we approach to sound by listening at the forefront to transcend traditional noise pollution studies and consider broader, intricate urban phenomenologies. In this way, the urban environment is considered in a more complex way than the traditional, predominantly visual approach. Every sound in space has to be appreciated as part of the soundscape, whether in its quality as natural sound (for example, the sounds of birds, the wind, the ocean) or sounds resulting from human and/or cultural activity (such as the sounds of cars, bells or the bustle of interpersonal agglomerations). In the same way, these sounds are subject to possible appreciation by the listener and/or those who coexist in a given space-time; the sound in itself raises an affective, emotional or sensory relationship with those who perceive it. This can occur for multiple reasons, such as personal relationships with specific circumstances, sounds or sonorities, background, cultural similarities and/or differences, and established relationships with specific contexts. This interplay creates a cultural and political relationship with the sounds that surround us, which opens up possible studies that go beyond the exclusively cultural and could lead, for example, to studies on noise legislation in cities, among others.

## 4 Soundwalk Origin

In the 1970s, the World Soundscape Project introduced Hildegard Westerkamp's concept of soundwalking. Defined as any excursion primarily aimed at listening

to the environment, soundwalks encourage participants to explore specific sites using Westerkamp's guiding suggestions and questions.

The primary purpose of soundwalking is attentive listening, which can occur in various spaces such as malls, doctors' offices, neighbourhood streets, or bus stops (Westerkamp, 1974). Jean-François Augoyard described sound expression as "qualified time", a concept that provides a dynamic image of each place. In this concept, the "material" or spatial context acts as a sounding board for the everyday situations that give life to that space (Palmese & Carles, 2013). Employing various complementary techniques, the soundwalk is a complex tool for exploring urban soundscape. Its significance is recognised in the ISO standards as a part of a technical framework. The International Organization for Standardization (ISO, 2014-2018-2019) defines a soundscape as "a sound environment (or sonic environment) with emphasis on how it is perceived and understood by individuals or a society."

Building on the works of Thibaud (2020), Amphoux and Tixier (2017), another approach to researching sound involves capturing the in situ sensory experiences of citizens during soundwalks. The main goal of these soundwalks is to gather in situ sensory experiences from participants. Feedback, insights and representations collected during these soundwalks might inform potential transformations of the spaces, encouraging active and aware participation from the community to be implemented in the process of public space construction.

Audio-visual approaches open up new perspectives and understandings in situ, helping us to interpret new situations emerging today by developing participatory strategies in situ with inhabitants, artists and experts. Soundscape addresses these fundamental research questions:

- How to explore the body as a witness to the memory of a sense of place, culture, rhythm and rituals (the importance of heritage in the identity of place)?
- How to combine soundscape methodology and visual methodology to achieve a new understanding of urban planning?
- How to actively involve people in the assessment and creation of a collective environment?
- How to address human well-being in an interdisciplinary and intersensorial approach?

## 5 Visualscape

The quality of a city's urban scene influences urban imageability, or legibility. The imageability of city elements has a significant impact on the public and,

in turn, enhances place attachment (Lynch, 1960). Lynch (1960, p. 9) defines imageability as a "quality in a physical object which gives it a high probability of evoking a strong image in any given observer". Lynch emphasises the interrelationship between the observer and the environment, noting how observers select objects and attribute cognitive meanings to their observations. Accordingly, Lynch assesses the city's visual attributes based on the structure and identity of the urban form. Lynch developed a cognitive city map through observations and interviews with citizens to analyse the elements of the city's image. Within this framework, he presents the elements of the city image for the imageability of the urban form, based on public perceptions. Nasar (1990) highlights the lack of personal impressions in assessing urban image, supplements the concept of imageability with "likeability", which considers the urban image's evaluative aspects. Nasar indicates a close relationship between imageability and image evaluation: "evaluative reactions enhance imageability, which in turn intensifies evaluations" (1990, p. 42). The evaluative image assesses the visual quality of urban scenes from the public's perspective. It focuses on how the public perceives the visual quality and evaluates the imageable elements of streetscapes. People tend to visit places that elicit positive evaluations. According to Nasar (1990), the evaluative image forms the basis of a visual plan by revealing the public's assessment of the cityscape from a visual aspect. This evaluation focuses on visual appearance based on public assessment.

Likeability represents the positive outcome of the evaluative image of an urban scene. Likeability is defined as "the probability that an environment will evoke a strong and favourable evaluative response among the public experiencing it" (Nasar, 1998, p. 4). Liked areas are those where favourable features are prevalent, while disliked areas are the opposite (Nasar, 1998). Drawing from Evans, Smith and Pezdak (1982, as cited in Nasar, 1998), Nasar (1998) identifies naturalness, upkeep, openness, and historical significance as key criteria for likeability. Nasar (1998) creates an evaluative map of the urban environment based on public interviews that reflect likes and dislikes about the street image. According to this evaluative mapping, the evaluation of the city image depends on five criteria (Nasar, 1998):

- **Naturalness:** Denotes the natural elements and landscaping, such as countryside, urban greening and green areas, water landscapes and vegetation. Besides Nassar's (1998) observation, Lynch (1960) supports the appreciation of the natural elements by observing that people extend daily tours to visit the natural elements (citing Nassar, 1998).
- **Upkeep:** Denotes the good maintenance of the built environment. Upkeep concerns cleanliness, good maintenance and building conditions. Nassar

(1998) found out that participants have a positive attitude toward the maintenance and cleanliness of the area, while they have a negative attitude toward the disliked features affecting upkeep such as traffic, signs, poles, etc. Many researchers (Taylor, 1989; Newman, 1972) attribute these disliked upkeep features to physical incivilities, and they found evidence of how physical incivilities affect fear of crime and crime (citing Nassar, 1998). Among these disliked features, traffic density has adverse effects on the quality of life for residential streets, particularly in terms of visual attractiveness and street activities (Appleyard, 1981).

- **Physical incivilities:** Denotes the disliked features affecting upkeep (signboards, traffic signs, poles, traffic).
- **Openness:** Denotes an open view with vistas, panoramas and scenery. Nassar (1998) states that the appreciation of the vista depends on the context, i.e. what we look at in this area. The pleasant vista has a positive impact on memorability and perception of place (Lynch, 1960), while the vista of congestion and crowdedness affects likeability negatively (Nassar, 1998).
- **Order:** Denotes organisation, proportion, coherence and clarity of built environment elements. As Nassar (1998) notes, people favour clarity, coherence and organisation – in other words, the congruence of city elements with one another. Carmona et al. (2003) point out that a good proportion of the building enclosure plays a role in successful street design since it affects the perception of pedestrians.
- **Historical significance or content:** Denotes vernacular architecture or historical buildings, structures, and landmarks (Nasar, 1998). The historical elements improve legibility and likeability since they include visual richness (Nassar, 1998). Moreover, they are appreciated due to the revival of cultural associations in people's minds (Nassar, 1998).

## 6 Methodologies to Assess Urban Perception

Multiple methods and indices have been developed to assess urban dynamics by converting qualitative observations into quantitative metrics. Whyte's (1980) study focuses mainly on the analysis of user behaviour in public spaces, while Brower (1988) shifts the focus towards the examination of the physical characteristics of public spaces that impact their utilization. Gehl and Gemzoe's (1996) study focuses on the evaluation of public spaces, considering the use and activities in the place. Mehta (2014) conducts an assessment of the social dimensions of public spaces, encompassing inclusivity, meaningful activities, comfort, safety and pleasurability. Accordingly, The social dimensions of public

space focus on fostering social cohesion and encouraging interactions amidst diverse social groups (Mehta, 2014). Activities that promote socialisation and create a sense of attachment to a place are considered meaningful (Mehta, 2014). Safety encompasses a sense of security, perceived safety, visibility and how traffic density affects the area (Mehta, 2014). Pleasurability relates to the spatial attributes that enhance the likeability of a place (Mehta, 2014). In a similar vein, Zamanifard et al. (2019) developed an index to assess the experiential qualities (EQs) of public places. The index targets the evaluation of comfort, diversity, vitality, inclusivity, image and likability. The references demonstrate various ways to evaluate how people perceive urban public spaces, considering social, spatial, experiential and user factors. Building on these studies, this research aims to integrate soundscape and visualscape assessments with analyses of urban and user dynamics to forge a comprehensive understanding of urban perception.

## 7 Cases

### 7.1 *Case – Eminönü Square (Istanbul, Turkey)*

Located in the heart of Istanbul's Historical Peninsula, Eminönü Square is a testament to the city's rich and dynamic history. Urban developments have significantly influenced the physical and cultural landscape of Eminönü Square, affecting its sensory and perceptual qualities. This study investigates how these transformations have contributed to the square's perceptual qualities, encompassing aspects of its soundscape and visualscape. As a result of numerous historical developments, Eminönü Square's character has significantly evolved (Kuban, 1994). Kuban (1994) notes that the transformation began with the construction of the Galata Bridge, which connected Galata and Istanbul, fundamentally altering the architectural essence of the old Eminönü ambiance. The Galata Bridge, symbolizing the Ottoman Empire's industrialisation and Westernisation, held both symbolic significance and functional importance by linking the city's western and eastern commercial districts. As industrialisation reached Eminönü, steamship construction began, railways arrived at Sirkeci, the Tünel was built, and horse-drawn and electric trams were introduced. These innovations brought dynamism and change to Eminönü, with increasing traffic and commercial activities between Sirkeci and Galata. The migration of state officials and elites to Beyoğlu and the Bosphorus coast also led to population change in the place. The Eminönü district became a commercial and transportation zone rather than a residential one (Kuban, 1994).

During the Republican period, several urban interventions significantly transformed the Eminönü Square, as detailed by Kuban (1994). The construction of Sirkeci Station, alongside structures such as the Great Fourth Foundation Inn (IV. Vakıf Hanı) and the post office, further reshaped the region's character in the 1930s. Between 1938 and 1949, the square in front of the New Mosque underwent the most significant transformation as a result of the demolition of pre-existing buildings, which fundamentally altered the traditional urban fabric of Eminönü. The surroundings of the Spice Bazaar were cleaned up and restored; a park was created behind the mosque; and Haseki Sultan Hamam was removed. In 1955, with the opening of the Unkapanı-Eminönü road, the famous Fish Market, along with its taverns and fishermen disappeared. A significant intervention in 1986 cleared away much of the old fabric, leaving only a few important historical structures along the waterfront. Consequently, after the bridge's construction, the square evolved into a bustling traffic hub, resulting in a gradual reduction in its connection to the sea as traffic continued to increase (Kuban, 1994).

A SWOT analysis of Eminönü Square highlights the strengths, weaknesses, opportunities and threats that influence urban qualities, perceptions and experiences. Eminönü Square possesses strengths rooted in its historical heritage and cultural diversity. Eminönü Square is a hotspot for tourists and locals with its vibrant markets and historical buildings that contribute to its sensory richness. It has a unique urban silhouette, with historic landmarks and multilayered urban fabric. Its lively markets and historical buildings add to the sensory richness of the area. As part of intangible cultural heritage, the smells of spices and traditional Turkish food also improve the sensory experience in visual, auditory and tactile ways. Nevertheless, Eminönü Square faces several weaknesses related to overcrowding and traffic congestion that diminish the overall sensory experience. Placemaking initiatives, cultural events and technology integration with digital placemaking offer promising opportunities to enhance perceptual qualities. On the other hand, Eminönü Square is vulnerable to threats such as commercialization potentially diminishing its historical and cultural significance, a tourist-centric focus overshadowing its authenticity and impacting sensory qualities.

Supported by the European Cooperation in Science and Technology (COST) association through a short-term scientific mission (STSM), this case study was conducted over two weeks. Given the short duration, not all methodologies could be applied; however, researcher collaboration has enhanced the study's effectiveness. The study combined on-site audio-visual observations and recordings, supplemented by impromptu interviews and a soundwalk.

## 8 Methodological Steps

The study's methodological approach is rooted in a rich tradition of cross-disciplinary scholarship, tracing back to the shift in the 1960s towards qualitative urban studies and the pioneering work integrating visual and sonic perspectives. Michael Southworth, who was among the first urban planners to focus on the soundscape concept, was strongly influenced by Kevin Lynch's visual qualitative approaches. Similarly, Pascal Amphoux et al. (1991) applied Lynch's cognitive mapping techniques from *The Image of the City* (1960) in their groundbreaking soundscape studies of European cities. Building on these foundational studies, Cristina Palmese proposed an audiovisual cognitive map in her PhD thesis (Palmese, 2014). The study's methodological approach is deeply informed by this historical context. The study employs a structured methodology delineated into the following sequential stages:

- **Data-driven urban analysis:** Analysis of urban attributes, geosocial data outcomes and data about people's activities and postures from digital tracking applications to understand the dynamics of the place.
- **Soundscape and visualscape observations:** Collect visual and audio data to observe the soundscape and visualscape comprehensively. Soundwalk and impromptu interviews are the ways to collect observatory visual and auditory data.
- **Evaluations of audio-visual recording and observations:** Analyse participants' images using image segmentation techniques to assess the likeability of the streetscape and analyse the sound levels and source as a quantitative approach. Analyse the survey results derived from participants on visual and soundscape as a qualitative approach. Integrate the results to gain insight on urban audio-visual perception as a hybrid methodology.

## 9 Data Collection

### 9.1 *Data-Driven Collection*

This section examines the urban dynamics of Eminönü Square using both physical and digital data sources. Urban form and function data are derived from analytical survey maps of the Istanbul Historical Peninsula Master Plan, developed by the Istanbul Metropolitan Municipality (IMM) urban planning authority in 2011. These maps have been digitised through geographic information systems (GIS) to extract point-based urban form and function data.

Digital data layers are incorporated through location-based social network (LBSN) data, which includes information from various location-based technologies. The Springer dictionary (Lee & Ye, 2014) states that LBSN data, also called geosocial data, is information gathered from location-based technologies like websites, platforms, apps and mobile and online services. This study retrieves data on activity places' attributes, user density, and street imagery data from LBSN platforms. Web scraping, a common method for collecting crowdsourced data, employs automated tools and computational methods to extract data from digital services (Mitchell, 2015). Google Street View (GSV) images are retrieved to conduct a visual survey assessing the public likeability of the streetscapes with 60 participants. Data on activity places is collected using Google Places, while Foursquare check-ins provide data about user density.

Eminönü Square, situated in the Rüstempaşa neighbourhood of Tahtakale district, hosts numerous cultural landmarks, including the Eminönü New Mosque and the Spice Bazaar, Papaz Khan, within the view of the picturesque Karaköy coastlines and the iconic Galata Bridge. The cultural significance of the site is further enriched by the surrounding khans, bazaars, mosques and medreses. The abundance of cultural buildings underscores the area's historical role as a religious and commercial centre during the Ottoman period. These historical structures and religious institutions are indicative of the rich history and diverse activities that characterized the area during that time.

According to administrative maps derived from the Istanbul Metropolitan Municipality (IMM) Urban Planning Authority (2011), commercial land uses dominate this site. Building structures typically range from three to four floors and are generally in good condition. The site offers easy accessibility, supported by a variety of mobility options. The primary pedestrian pathways are prominently observed at the intersection of Eminönü's New Mosque and the Spice Bazaar, as well as within the open bazaar on Tahmis Street. Urban attributes (urban function and form data) are illustrated in the maps in Figure 10.1. Urban function data encompasses land use, activities and accessibility data, while urban form data involves green area, building height, density, historical landmarks and building density.

Geosocial data results reveal that the primary functions of buildings in the area are centred predominantly on shopping and dining activities. Activity places are rated lower in quality compared to their surroundings, as indicated by Google Places ratings. Activity places mainly operate during daytime hours (10–12 hours), and the limited presence of "eyes on the streets" contributes to perceptions of lower safety. The main streets surrounding this place have high likeability scores. Notably, high user density concentrated around the Spice Bazaar and the open bazaar significantly shapes the neighbourhood's unique urban dynamics. Figure 10.2 illustrates the overlap of urban and user data

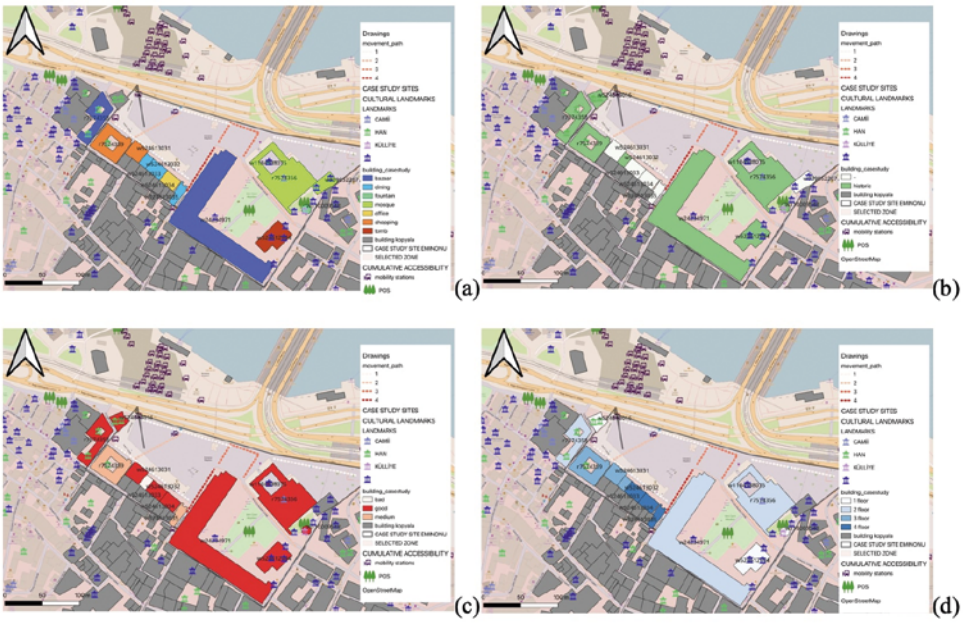


FIGURE 10.1 Urban data results showing (a) urban functions, (b) historical buildings, (c) building conditions and (d) building heights
SOURCE: KIRDAR

FIGURE 10.2 Urban data and user data results overlapped
SOURCE: KIRDAR

(geosocial data) collected through LBSN, providing a visual representation of urban dynamics.

Activities in Eminönü Square are tracked using digital applications, specifically the Counterpoint smartphone app, which is inspired by the Gehl PSPL (Public Space, Public Life) survey methods (Gehl Institute, 2017). The Counterpoint smartphone application is employed to crowdsource traffic data and count participants in various activities (Counterpoint, 2023).

The stationary activity mapping method captures different postures and activities of people. It categorizes different people by posture: standing, sitting (in public, private or commercial spaces), lying down and moving. This method also records different activity categories, including waiting for transportation, eating and drinking, engaging in commercial transactions, conversing, cultural participation, and recreational activities like playing or exercising. According to Gehl's framework (2010), activities are clustered as necessary (e.g., waiting for transportation), optional (e.g., participating in cultural activities) and social (e.g., engaging in recreation). This clustering is useful for conducting observatory methods to understand how public open space (POS) is functioning. Based on Gehl (2010), the necessary activities are independent of the physical quality of the urban environment (commencing, commuting, waiting for transport), while optional activities take place under favourable conditions in the urban environment (walking, relaxing). Making conservation, communicating, greeting other people or engaging in passive contact are examples of social activities that are the outcome of both necessary and optional activities (Gehl, 2010). The density of optional and social activities indicates the place's quality.

According to stationary activity results, recreational activities and commercial activities are high in Points 2 and 4, and cultural activities in Points 1 and 3. This indicates that the place quality is high enough to enable optional and social activities. At Point 2, a high diversity of activities is evident, with many people observed standing and sitting. This diversity suggests a dynamic range of interactions beyond commuting and commerce. The density of people in different postures also supports the conclusion that this place has a diverse range of activities, apart from commuting and commerce. The people density level is highest at Point 2, moderate in Point 3, and lower in Points 1 and 4. Accordingly, Point 2 is the hotspot with the highest people density, while Point 3 is the coldspot with the lowest people density. Predominant pedestrian movement is noted along four main axes: in front of the New Mosque and the Spice Bazaar (Axis 1), adjacent to the Spice Bazaar (Axis 2), along Ragıp Gümüşpala Street with the tramline (Axis 3), and on Reşadiye Street (Axis 4). The pedestrian movement density is highest along Axis 2 and Axis 1. Pedestrian

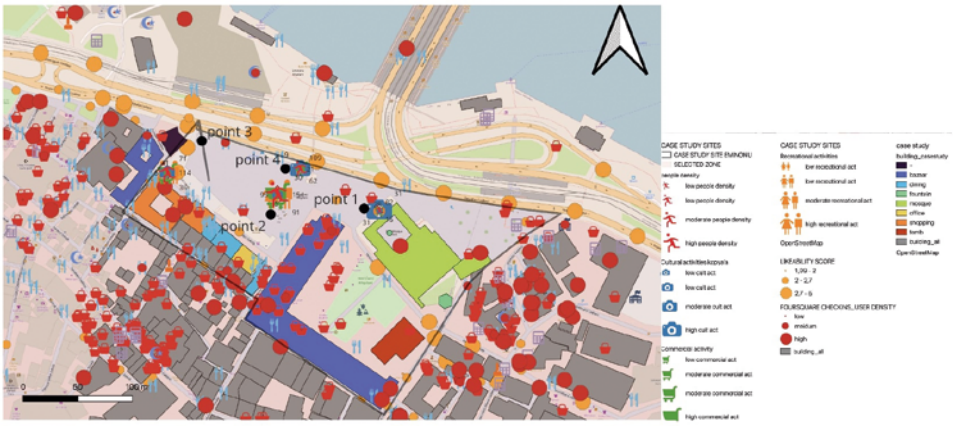


FIGURE 10.3 Stationary activity results overlapped with user and urban data
SOURCE: KIRDAR

movement is low at Axis 3 and Axis 4. These selected points for conducting a soundwalk are characterized by high people density, diverse activities and varied postures, all situated along the main pedestrian movement axes. Figure 10.3 juxtaposes stationary activities with urban and user data, illustrating the interplay of pedestrian dynamics and spatial use.

## 10 Evaluating Soundscape

This chapter provides an in-depth analysis of a soundscape study conducted within the vibrant urban setting of Eminönü Square. This research employs a multifaceted methodology that includes impromptu interviews and an augmented soundwalk within a survey to capture the sensory experiences of both residents and visitors in this location. The augmented soundwalk incorporates not only traditional listening practices but also uses technology to enhance and record the sonic environment, allowing for a deeper analysis of sound interactions and patterns. Impromptu interviews capture spontaneous, real-time reactions to the soundscape, while structured surveys collect systematic data on the auditory preferences and disturbances perceived by visitors and locals alike. This study aims to explore the diverse visual and auditory attributes that define the Eminönü Square and examine how these elements contribute to the character and perception of the place. This research uniquely integrates qualitative and quantitative methods by analysing the soundscape through direct observations, audio-visual recordings and public interactions to provide a holistic view of the visual-auditory urban environment. Findings from the study are expected

to inform urban planning decisions, suggesting ways to enhance auditory and visual comfort and enrich the sensory landscape of the area.

## 11 Soundscape Survey

The initial methodological step involves developing an online questionnaire designed to capture residents' feelings, perceptions, and familiarity with the soundscape concept. The survey aims to pinpoint specific sound situations that characterize the study area. Participants are prompted to discuss the sounds, sensations and emotions they experience, the most common sounds in their daily lives, their auditory memories, and their personal interpretations of these sounds. Participants are also asked to reflect on their interaction with community spaces through sound, discuss the intersensory and collective aspects of their daily auditory experiences and evaluate the sound quality in their neighbourhood. The survey is distributed digitally via email and accessible through quick-response (QR) codes. This survey serves as a crucial tool for collecting observational data on the visual and auditory landscape.

## 12 Impromptu Interview

Open interviews were conducted by approaching individuals on the street to capture their immediate reactions to the surrounding soundscape and visualscape. This method captures regular urban interactions, ensuring that responses are spontaneous and unprepared, thus recording genuine reactions to the soundscape. This interview method gauges both measurable sound qualities – such as type, pitch and identifiability – and more subjective experiences, including memories, intersensory interactions and emotional resonances. Urban experiences are often confined by routine behaviours, which can restrict our full engagement with and awareness of our surroundings. Engaging in conversations about the soundscape opens our ears to the environment, to others, and to ourselves. It is possible to access the sound map, which is still under development, and to listen to this interview (Palmese & Carles, 2022). Figure 10.4 displays the point of interviews. We asked visitors and locals to gain insight into the soundscape and visualscape of the site. In the conducted interviews, the questions involve the purpose in space, current sound, sounds representative of Istanbul, triggering memories, and affecting positive or negative experiences, visual likeability, and dominant likeable features within the suggested changes for place quality.

FIGURE 10.4 Interview points
SOURCE: GOOGLE EARTH, 2023

## 13 Interview and Survey Results

The square's polygonal layout creates a spatial barrier along the seaside, complemented by a sound barrier due to the adjacent tramway and busy roadway. Few sounds penetrate these barriers, with ship horns – identified by respondents as quintessential sounds of Istanbul – being among the few that are heard. Only 20% of interviewees reported hearing the sound of the sea, indicating its limited audibility within the square. Most interviewees were located in the shopping areas or near the mosque adjacent to the traffic barrier, where the predominant sounds are the voices of traders and passersby. Most of the respondents are in the shopping area or the mosque just in front of the traffic barrier. This means that the voices of the traders are among the most identified sounds. Outside of prayer times, the square lacks a homogeneous soundscape. However, during prayers, the muezzin's call transforms the area into a unified, polyphonic acoustic space, distinctly segmented into various acoustic and visual zones.

For this study, 14 on-site impromptu interviews were conducted at the points as shown in Figure 10.4. The majority of the interviewees were audio-recorded and five interviewees provided written responses, while two responded through remote interviews. To sum up, a majority (86.7%) of interviews were conducted impromptu on-site, while 13.3% were conducted remotely. On-site evaluations comprised 40% workers and 60% visitors and tourists. The results of the interviews are displayed in Figure 10.5. Based on the interview results, the voices of traders and mechanical sounds are frequently identified. Sounds from the shopping area, the mosque and ships are strongly associated with identity and memory, indicating they have cultural or historical significance. The mosque sounds and sea sounds are notably linked

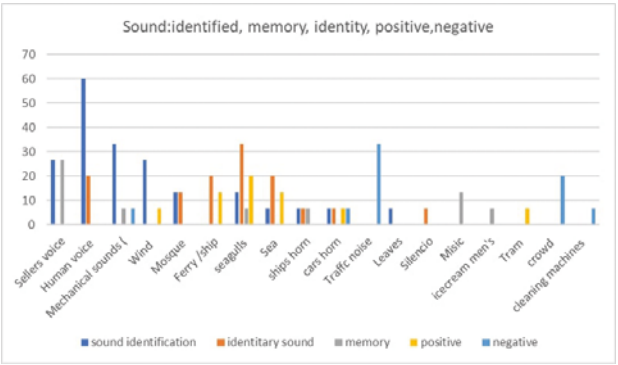


FIGURE 10.5
The soundscape results from in-prompt respondents
SOURCE: GOOGLE FORMS, 2023

with positive experiences, while traffic noise and crowd sounds are generally perceived negatively. Trams and machine sounds, although part of the soundscape, have less impact on the overall perception.

Challenges faced in the interviews are the language barriers, as most interviews were conducted in Turkish, complicating data collection and analysis. Additionally, some interviewees were initially reluctant to engage, though many expressed pleasure in discussing their environmental perceptions once the conversation began.

## 14 Augmented Soundwalk

This section introduces the "augmented soundwalk", an innovative method that blends technical and aesthetic elements to gather comprehensive qualitative and quantitative data on urban soundscapes. Lasting approximately 90 minutes, this method extends beyond traditional data collection by offering participants a sensory journey through Eminönü Square. Selected volunteers engage in this soundwalk by following a predetermined path through the square, and completing a questionnaire via Google Forms. Building on insights from impromptu interviews, the soundwalk was designed to further explore Eminönü Square's auditory and visual landscapes volunteers encouraged to listen actively, describe their perceptions, resonate with the environment, and share their experiences. The soundwalk route includes four specific points, detailed in Figure 10.6, guiding participants through key auditory and visual experiences of the square. Participants document their observations using a digital form, available via a Google Forms link. The data collected include the quality and quantity of sounds, the auditory and visual environment's quality, the congruence between soundscapes and visual landscapes, and associated memories.


FIGURE 10.6
The points on the soundwalk route
SOURCE: GOOGLE EARTH, 2023

In this phase, participants are given the opportunity to define their personal forms of representation and categorize sounds based on their perceptions. They can also suggest new ways to represent the space while responding to questions designed to quantify and unify perceptions of the place. At four designated points, volunteers are instructed to actively listen to their environment and document their observations and responses on paper forms.

A significant challenge in this research is the intricate integration of diverse methodologies and tools from the interdisciplinary field of soundscape studies. We initially developed a specific methodology for the Madrid Soundscape Identity and Listening project, which we have since adapted to the context of Eminönü Square in Istanbul, with a particular focus on integrating visual and audio-visual perceptions. The primary objective is to collaborating with participants to observe often overlooked urban events, practices and processes, such as the rhythms, rituals, and choreographies that animate the space. We encourage participants – including citizens, artists and experts – to engage directly with the urban environment, sharing their sensations, memories and collective interpretations of daily city life, thereby uncovering potentially hidden aspects of the space. All methodological steps are interconnected, ensuring that insights and findings from each phase inform and enhance the subsequent stages of the study.

## 15 Soundscape Results

In this soundwalk, five participants utilized tools such as the Decibel X iPhone app and H6 and H4 Zoom recorders for sound level measurement. A Google Form was used to gather participant assessments, photos, videos and sounds recordings. Participants assessed three sound categories – traffic, human and natural sounds – and sound characteristics using descriptors such as pleasant, chaos, vibrant, eventful, calm, annoying and monotonous.

Point 1 is characterized by a sound level of 67.7 dB, with the predominant human sound at 80%. In the responses, there is some uncertainty in the ratings, especially in the pleasant, calm and monotonous responses; only in the eventful response is there any uncertainty, which may be due to the unfamiliarity of rating a soundscape of urban space. The majority liked the soundscape, with 80% rating it 4 out of 5.

The participants are more in agreement with one another in Point 2, which has a sound level of 74.3 dB and a 60% human sound volume as its predominant component. Where the disparity of evaluation and disagreement persists is in the characteristic "pleasant", where all participants have different opinions. All evaluations agree that it is not a monotonous soundscape; most of them think it is eventful, annoying, not calm and not uneventful. As for vibrant, the ratings are divided into vibrant and somewhat vibrant. In chaotic, the majority find the soundscape chaotic or somewhat chaotic, but there are also opinions that it is not chaotic. The majority of participants disliked the soundscape, with 60% rating it 2 out of 5.

Point 3 is characterized by a sound level of 74 dB, a high sound level, and the predominant sound for all participants is traffic noise. Most participants find this soundscape uneventful or somewhat uneventful, which is in line with the statement that the traffic noise does not provide any information, so that in the eventful evaluation, the participants are divided in their assessment of it. For most of the participants, it is neither particularly annoying nor particularly calm. In the case of vibrant, each participant has a different opinion about whether it is mostly vibrant or somewhat vibrant. The majority of participants disliked the soundscape, with 40% rating it 1 out of 5.

Point 4 is characterized by a sound level of 63.3 dB, which increases to 69.1 dB during prayer. The soundscape here is composed of equal parts traffic noise and human sounds, each contributing 50%. In the centre of the square, where there is a mixture of sounds (human sound and a horizon of traffic noise), they are divided into those who find it pleasant and those who find it uneventful, while most agree that it is chaotic and most find it vibrant. Most say it is not calm, but half do not know whether it's annoying or not; the other half find it somewhat annoying. All agree that it is eventful or somewhat eventful, while half agree and half disagree that it is monotonous. The participants are neutral about the soundscape, with 40% rating it at 3 out of 5. Table 10.1 gives the numeric results of the soundscape characteristics.

Points 2 and 3 exhibit the highest noise levels; however, the nature of the noise contributes distinctly to annoyance levels. Point 3, dominated by traffic noise, is perceived as more annoying compared to Point 2, where human

TABLE 10.1 The soundscape characteristics results according to participants

| Characteristic | Point 1 | Point 2 | Point 3 | Point 4 |
|---|---|---|---|---|
| Pleasant | 100% neither agree nor disagree | 20% somewhat agree<br>20% neither agree nor disagree<br>20% somewhat disagree<br>40% disagree | 40% neither agree nor disagree<br>20% disagree<br>20% somewhat agree<br>20% somewhat disagree | 20% agree<br>40% somewhat agree<br>20% disagree<br>20% somewhat disagree |
| Chaotic | 40% agree<br>40% somewhat agree<br>10% neither agree nor disagree | 60% agree<br>20% somewhat agree<br>25% somewhat disagree | 20% agree<br>60% somewhat agree<br>20% disagree | 40% agree<br>40% somewhat agree<br>20% disagree |
| Vibrant | 40% agree<br>40% somewhat agree<br>10% neither agree nor disagree | 40% agree<br>60% somewhat agree | 20 % agree<br>20% somewhat agree<br>40% neither agree nor disagree<br>20% somewhat disagree | 40% somewhat agree<br>20% neither agree nor disagree<br>40% disagree |
| Uneventful | 60% disagree<br>10 % neither agree nor disagree<br>10% somewhat disagree | 80% disagree<br>20% somewhat disagree | 20% agree<br>20 % neither agree nor disagree<br>40% somewhat disagree<br>20% disagree | 20 % agree<br>60 % somewhat disagree<br>20% disagree |

TABLE 10.1 The soundscape characteristics results according to participants (*cont.*)

| Characteristic | Point 1 | Point 2 | Point 3 | Point 4 |
|---|---|---|---|---|
| Calm | 40% neither agree nor disagree<br>40% disagree<br>10% somewhat agree | 80% disagree<br>20% somewhat disagree | 20% disagree<br>40% somewhat agree<br>20% somewhat disagree | 40% somewhat agree<br>20% neither agree nor disagree<br>40% disagree |
| Annoying | 20% agree<br>20% somewhat agree<br>20% neither agree nor disagree<br>20% disagree<br>20% somewhat disagree | 80% somewhat agree<br>20% disagree | 40% somewhat agree<br>40% somewhat disagree<br>20% disagree | 40% neither agree nor disagree<br>60% somewhat disagree |
| Eventful | 40 % agree<br>60% somewhat agree | 80% agree<br>20% somewhat agree | 40% agree<br>60% somewhat agree | 40% agree<br>40% somewhat agree<br>20% disagree |
| Monotonous | 80 % disagree<br>20% neither agree nor disagree | 100% disagree | 40% disagree<br>40% neither agree nor disagree<br>20% somewhat disagree | 40% somewhat agree<br>20% neither agree nor disagree<br>20% somewhat disagree<br>20% disagree |

SOURCE: KIRDAR (2023)

sounds and occasional sound signals like sirens and horns prevail. This variation illustrates that soundscape assessments extend beyond mere sound levels. The perception of a soundscape is influenced by a mix of factors including the physical, spatial, subjective and cultural contexts.

Responses indicate that human activities such as voices, conversations and footsteps are the predominant sounds at Points 1, 2 and 4. In contrast, traffic noise dominates Point 3. The answers reflect sounds and sound situations recognized and identified by the participants, with human sounds, the voices of hawkers, marine sound signals (boat sirens, seagulls), and cultural sound signals (muezzins in mosques, voices and signals of hawkers) being the most representative and valued. In Points 1 and 2, sound from human beings with 80% and 60%, respectively, while traffic sound is dominant in Points 3 and 4 with 80% and 60%, respectively. Across the four points, the identified sounds fall mainly into two categories: human sounds and traffic sounds. Notably, at Point 2, 33% of responses also recognized other sounds. There is a consensus among participants that human sounds predominate at Point 1, while traffic sounds are most noticeable at Point 3. Participants provided descriptions of the soundscape that were richer and more varied than the categories initially provided in the interview, as illustrated in Figure 10.7.

Participants experienced challenges fitting their responses into predefined sound categories such as human, natural and traffic sounds. Certain sounds, such as the bells of ice cream vendors or the moving tourist trolley, blend mechanical and human elements, suggesting a need for additional categories that reflect cultural sound signals. Sounds such as ship sirens and the muezzin's

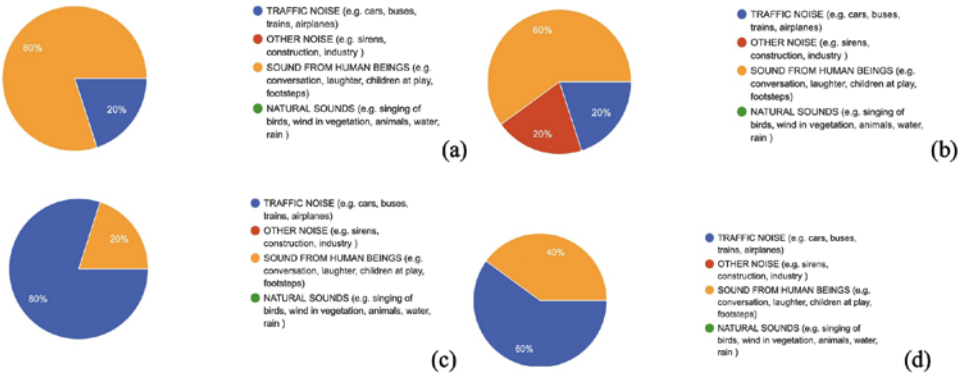


FIGURE 10.7 The sound categories in the four points
SOURCE: GOOGLE FORMS, 2023

call function as local perceptual markers, anchoring space and time within the cityscape and forming a distinct category of cultural sound signals.

In general, the sounds of the square are neutrally accepted, with the exception of traffic noise at Point 3, which consistently provokes negative reactions. There is unanimity in the rating of the sound environment in the categories of chaotic, lively and noisy. In summary, the square features distinctly different acoustic zones: Points 1 and 2 are dominated by human sounds, Point 3 by traffic noise, and Point 4 presents a mixed soundscape at the centre of the square.

This disparity is evident in the responses to congruency/incongruency between sound and image. One participant highlighted a notable sensory incongruence in the area: "When I look towards the bazaar, everything seems congruent. However, when I look towards the sea, although I continue to hear the sounds of the bazaar, what I see is quite different – dominated by traffic and trams."

According to the results, the varying sound levels and participant responses across the four points highlight distinct auditory environments within Eminönü Square. Differences in sound perception – ranging from vibrant and chaotic to uneventful and monotonous – illustrate the complex interplay between urban noise and activities. The majority of responses indicate a preference for more dynamic and human-centric sounds, while high traffic noise levels generally led to lower satisfaction.

## 16 Evaluating Visualscape

This chapter presents a comprehensive analysis of the visualscape in the dynamic urban environment of Eminönü Square. This research employs a multifaceted methodology, incorporating image segmentation techniques alongside Google Street View (GSV) to audit and analyze spatial features effectively. By integrating quantitative data from image segmentation with qualitative insights gathered through structured surveys and observational studies, the study aims to explore the visual attributes that shape the character and perception of the area. Image segmentation, through advanced deep learning algorithms, classifies and categorizes visual elements from streetscape images, providing a detailed ratio of the urban elements to the streetscape. The ratio values are utilized to calculate the proportion of likeability features. Additionally, interviews and surveys allow participants to express their visual preferences and perceptions, which enrich the zquantitative data with personal and collective experiences. The integration of these diverse methodologies not only enhances the understanding of the visual dynamics at play but also informs future urban planning and design strategies, aiming to optimize visual comfort and add to the aesthetic quality of the space.

## 17 Visualscape Analysis through Image Segmentation

Google Street View (GSV) is a web service integrated into Google Maps that has provided access to mapping services since 2007. Urban studies have increasingly utilized image segmentation of GSV images to audit and analyse spatial features, marking a significant trend in the field. Image segmentation leverages deep learning, an advanced branch of machine learning that uses an artificial neural network (ANN) to enable visual cognition and interpret complex image data. In urban studies, image segmentation has been applied to a variety of research areas, including measuring perceived streetscape quality (Zhang et al., 2019), analysing sky view factors (Liang et al., 2017) and counting pedestrians (Yin et al., 2015) and assessing streetscape complexity.

Image segmentation classifies objects within an image based on pixel data. In semantic segmentation, the process involves inputting an image and outputting categories associated with each segment of the image (Johnson et al., 2017). This technique categorizes and colours various objects within the image into distinct segments. Each pixel is labelled with a class label based on its characteristics, effectively parsing the image into categorized visual data. Figure 10.8 illustrates this segmentation, showing how a street image is categorized into distinct segments, providing a visual example of how semantic segmentation is applied in urban studies.

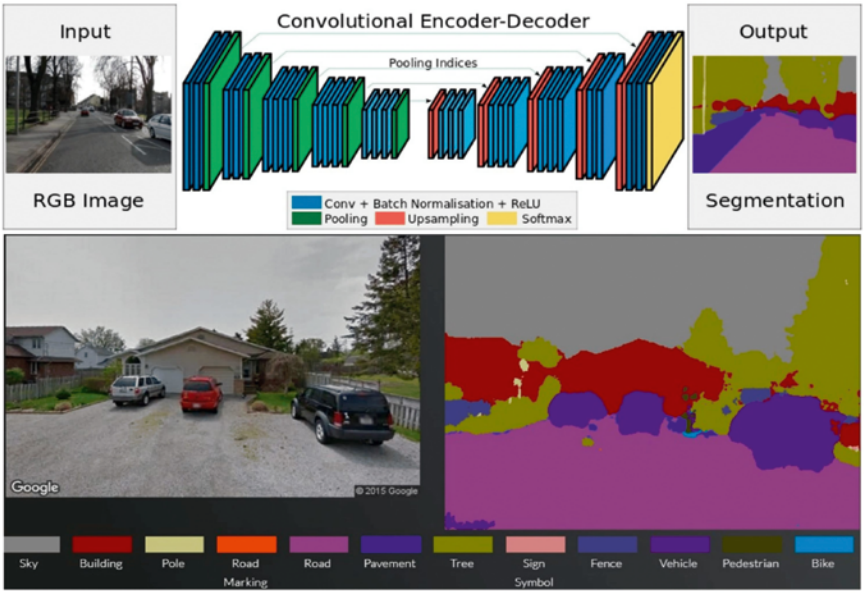


FIGURE 10.8 Image segmentation method
SOURCE: LIANG ET AL. (2017)

This research employs image segmentation to analyse and audit the likeability features of urban images. The likeability features are the building rate, urban greening, physical incivilities features and traffic density, as Nasar (1998) indicated. The analysis utilizes TensorFlow, a comprehensive framework developed by Google for machine learning algorithms, to process and analyse the data (Abadi et al., 2016). The image segmentation method applies a deep learning method that extracts image features and learns from the hierarchical feature representations (Liang et al., 2017). It trains the datasets by labelling them according to their related urban feature categories based on the created algorithm (Balaban, 2022). Post-training, the segmented images are analysed in a Python environment, where pixel sizes are proportioned and analysed relative to the overall streetscape.

This study captures likeability features such as building rate, urban greening and physical incivilities using the image segmentation method, following the guidelines outlined by Kırdar (2023). This process involves importing the necessary libraries (TensorFlow, Os, Matplotlib and Pandas) and constructing a deep learning model dedicated to labelling each pixel in the input images. The core of the study involves constructing a deep learning model specifically for semantic image segmentation to assign semantic labels to every pixel in the input images. Helper functions are defined to decode the images, and a colour map is generated corresponding to various label names. A significant aspect of the study is the formulation of a method to calculate the ratio of each image feature, as shown in this equation: $label\,frequencies\,[2] / total\_pixels) \times 100$. For example, "Building_ score" is calculated as the frequency of a particular label (e.g. buildings) relative to the total number of pixels multiplied by 100. In Tensorflow-based models, the common segmented categories are traffic elements within road users, road types, buildings and urban infrastructure, natural elements, street furniture signage and symbols. These categories are adapted to likeable features.

Likeability features analysed include urban greening, quantified through vegetation scores; traffic density, assessed by aggregating scores of vehicles and pedestrians; physical incivilities, evaluated by aggregating the street elements like signs and poles; and building enclosure through the score of building façades. Each of these categories contributes to a comprehensive understanding of the urban environment through their respective scores. The evaluation is conducted based on pixel accuracy, comparing predictions with the Cityscape datasets. Figure 10.9 illustrates the segmented images highlighting likeability features, and Table 10.2 presents the average likeability scores for each point, calculated based on pixel density, calculated using the equation mentioned above.

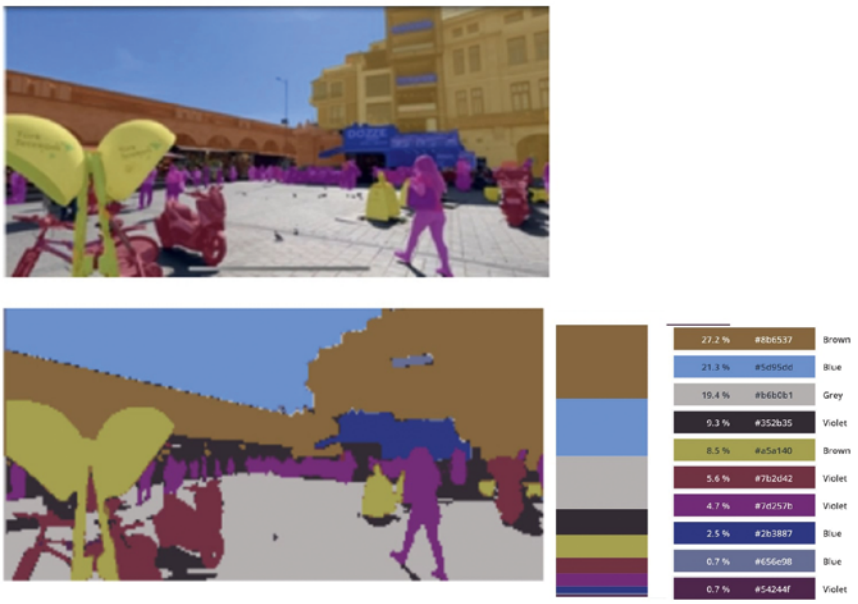


FIGURE 10.9 The segmented image and its label
SOURCE: KIRDAR (2023)

## 18 Visualscape Survey

This study compares quantitative results from image segmentation with qualitative insights about visualscape gathered through interviews and soundwalk. In this survey, participants responded to what extent they like the street image and which likeable feature is dominant in this place. Respondents' likeability preferences are gauged using five-point Likert scale questions, while their opinions on dominant features are collected through a feature-ranking. The survey question asks, "To what extent did you like the image of this place?" Responses are recorded on a five-point Likert scale, ranging from "1" (disliked extremely) to "5" (liked extremely).

Another question inquires, "Which likable feature is dominant in this place?" Answers are collected using a multiple-choice grid format, allowing participants to rank features based on their perceived dominance. Participants select how much they like the image and identify the most prominent likable feature, providing insights into their visual preferences and perceptions. These survey results are elaborated with the numeric results derived from image segmentation analysis in the following section.

TABLE 10.2 The pixel density of likeability features

| | Image Code | Building envelope | Historical buildings | Ground | Sky | Traffic (vehicles) | Urban greening | Physical incivilities | Pedestrian |
|---|---|---|---|---|---|---|---|---|---|
| Point 1 | Image 0131 | 30.90% | 30.90% | 23.90% | 21.70% | 1.70% | 10% | 1.60% | 10.80% |
| Point 1 | Image 0135 | 27.20% | 27.20% | 19.40% | 21.30% | 5.60% | | 11.80% | 4.70% |
| Point 1 | Image 0145 | 16.80% | | 24.20% | 40.70% | | 1.80% | 4.70% | 10.40% |
| ***Point 1 average*** | | ***24.97%*** | ***29.05%*** | ***22.50%*** | ***27.90%*** | ***3.65%*** | ***5.90%*** | ***6.03%*** | ***8.63%*** |
| Point 2 | Image 0132 | 16.20% | 16.20% | 9.50% | 46.70% | 5.20% | 1.80% | 13.80% | 4.80% |
| Point 2 | Image 0133 | 16.20% | 16.20% | 9.80% | 46.70% | 5.20% | 1.80% | 5.80% | 12.80% |
| ***Point 2 average*** | | ***32.40%*** | ***32.40%*** | ***19.30%*** | **46.70%** | ***10.40%*** | ***3.60%*** | ***19.60%*** | ***17.60%*** |
| Point 3 | Image 1088 | 19.20% | 19.20% | 56.20% | 30.60% | | 0.20% | 1.00% | 0.70% |
| Point 3 | Image 1089 | 3.10% | | 19.00% | 37.50% | | 36.50% | 1.30% | 0.40% |
| Point 3 | Image 0141 | 7.10% | 7.10% | 31.50% | 52.50% | | 4.60% | 0.80% | 1.90% |
| Point 3 | Image 0143 | 12.90% | 4.10% | 39.50% | 35.70% | | 6.40% | 2.60% | 2.20% |
| ***Point 3 average*** | | ***10.58%*** | ***10.13%*** | ***36.55%*** | ***39.08%*** | *0.00%* | ***11.93%*** | ***1.43%*** | ***1.30%*** |
| Point 4 | Image 0144 | 8.00% | | 22.00% | 17.30% | | 40.30% | 1.90% | 8.20% |
| Point 4 | Image 0140 | 12.50% | 12.50% | 13.70% | 25.60% | | 30.00% | | 5.00% |
| Point 4 | Image 1085 | 16.90% | | 28.50% | 12.50% | 15.50% | 12.70% | 2.70% | 2.30% |
| Point 4 | Image 1086 | 16.90% | | 21.70% | 16.20% | 12.10% | 15.00% | 2.00% | |
| Point 4 | Image 1087 | 26.50% | 21.40% | 19.30% | 29.40% | 10.30% | 2.70% | 0.60% | |
| ***Point 4 average*** | | ***16.16%*** | ***16.95%*** | ***21.04%*** | *20.20%* | ***12.63%*** | ***20.14%*** | ***1.80%*** | ***5.17%*** |

SOURCE: KIRDAR (2023)

## 19 Visualscape Results

At Point 1, 60% of participants liked the visualscape, while 40% were neutral. The area is noted for its blend of historical and modern elements, creating a lively yet historically rich atmosphere. At Point 1, the scene is a multiplicity of old and new urban layers, with historical buildings peeking through a bustling, crowded environment. It is a place of contrast, where the beauty of the historical ambiance meets the lively disorder of the present urban landscape, full of crowds. Cultural landscape and vista are dominant likeability features, appreciated by 60% of participants. Building condition and urban greening are also notable, each highlighted by 40% of participants. Supporting that, the quantitative image segmentation results (Table 10.2) show historical buildings make up 29.05% of the visualscape, with sky visibility at 27.90%, supporting the prominence of cultural and vista elements. Other features including building condition (24.97%) and urban greening (5.90%) also contribute to the visual likeability of the site, alongside minimal traffic (3.65%) and physical incivilities (6.03%) within the pedestrian presence (8.63%).

At Point 2, the majority of the participants (60%) disliked the visualscape. Participants attribute Point 2 as vibrant, colourful and chaotic with its dense crowds of shoppers. This spot is alive with activities that create a sensory-rich experience and evoke memories. Vista (40%) and physical incivilities (100%) are the most dominant likeability features, following with cultural landscape and building enclosure (both at 40%). Based on the quantitative results (Table 10.2), historical buildings and building enclosure contribute 32.40% each, affecting the visual perception, within the high sky percentage (46.70%). Interestingly, the physical incivilities (19.60%) and pedestrian crowds (17.60%) affect the likeability negatively, although their percentage are not significant.

At Point 3, participants' feelings were confused, with 40% neutral and 40% disliking the visualscape. The area is marked by a stark contrast between historical landmarks and a bustling modern cityscape. Based on participants' assessments, the historical landmarks and modern cityscape create a contrast. The area is teeming with traffic and pedestrians, which participants found chaotic and irritating due to its ambiguous nature. The contrast between people transiting or waiting for transportation creates a stark contrast that diminishes the overall appeal of this location. The area is perceived as chaotic, with the high traffic and pedestrian presence creating a less appealing environment. Traffic density is overwhelmingly noted (80%), and cultural landscape, urban greening and physical incivilities each at 40%. Quantitative analysis (Table 10.2) results that urban greening (11.93%), sky visibility (39.08%) and the presence of historical buildings (10.13%) indicate a cultural vista. However, this vista

receives unfavourable likeability ratings due to the detracting impacts of noise from crowds and traffic.

At Point 4, participants were split between neutral (40%) and liking (40%) the visualscape, describing it as relaxing yet vibrant with an open and eventful atmosphere. The participants expressed their visual experience as relaxing, movement, vibrant, open, amplitude, contrast, careless and eventful. According to the participants, there is a sense of movement and vibrancy at Point 4. This point gives the perception of spaciousness that allows for more relaxing activities. However, this point has an unplanned or neglected appearance, despite its potential, which affects the visual likeability negatively. At Point 4, vista and cultural landscape each received 60%, with building enclosure, condition and urban greening following at 40%. Based on quantitative analysis (Table 10.2), sky density (20.20%) and urban greening (20.14%) show the vista. Historical buildings (16.95%) and building conditions (around 16%) enhance the cultural landscape. The slight effect of pedestrian presence (5.17%) and traffic density (12.63%) also influences the visual perception at Point 4.

In each point, the quantitative data derived from image segmentation correlates with the qualitative survey responses, confirming the visual preferences and perceptions of participants. While traffic density was noted as high in participant surveys for Points 3 and 4, photographs captured lower traffic densities, indicating selective perception or timing of photo captures. Interestingly, at both Points 3 and 4, participants evaluated traffic density higher; however, the quantitative results of traffic density has a lower percentage, respectively. It can be deduced that even when their percentages – derived from image segmentation – are not high, the negative likability features significantly impact overall likeability. This suggests that these elements exert a disproportionately adverse effect, despite their lower proportion in image segmentation.

## 20 Results

To provide a comprehensive view, we assessed soundscape and visualscape results alongside urban attributes and activities in Eminönü Square. This place is characterized by its shopping and dining activities, particularly around the Spice Bazaar. The soundwalk observations on noise levels, soundscapes and participants' perceptions are well-aligned with the data analysis findings on people density, activities and urban dynamics in Eminönü. This study investigates the urban and user dynamics individually at each point. We take each point as a buffer zone centred from those points with a 10-metre radius.

Point 1 is characterized by a rich variety of human sounds – conversations, footsteps and cultural noises like muezzin calls from nearby mosques. These contribute to a lively yet culturally profound atmosphere. This zone known for its cultural significance, sees a steady flow of people and pedestrians, yet it is not overly crowded. Pedestrian movement on Axis 1 (the axis in front of the New Mosque and the Spice Bazaar) is noticeable but not dominant. The high density of cultural activities and the moderate density of commercial and recreational activities are conducted at Point 1, based on stationary activity results. Foursquare check-in data could indicate a high density of visitors in Point 1, drawn to the area's cultural attractions. Shopping and cultural activities dominate Point 1. The New Mosque and historical buildings surrounding this square are the cultural attractions. The visual likeability of Point 1 is very high due to the cultural landmarks and the well-maintained condition of buildings, which add to its overall attractiveness. Point 1 in Eminönü emerges as a culturally vibrant location, characterized by a rich soundscape. The majority of participants disliked the soundscape, however, they liked the visualscape. The soundscape is evaluated as pleasant, calm and eventful. According to the participants, the visualscape has a contrast effect with historical silhouettes and modern city views. This contrast is apparent with ranking results for likeable features. The cultural landscape is dominant, followed by buildings and urban greening. Sound from human beings is the most apparent dominant sound feature, following traffic noise. Point 1 is characterized by a dynamic environment with a diverse range of auditory experiences that reflect its status as a culturally significant and active urban space.

The soundwalk reveals that Points 2 and 3 are particularly notable. Point 2 is characterized by human sounds reflective of high visitor density and diverse stationary activities, which are commercial and social (recreational). People are engaged in shopping, walking or sitting in public on the benches. The high level and diverse sounds here are indicative of vibrant human interactions. Being at the intersection of two significant pedestrian axes – alongside the dead-end street close to the Spice Bazaar (Axis 2) and in front of the New Mosque and the Spice Bazaar (Axis 1) – adds vibrancy to this area. Dominated largely by commercial activities, Point 2 is nestled within bustling bazaars, amplifying both human density and sounds. Point 2 also hosts commercial activities with very high place ratings, in addition to dining and cultural activities. The area's high visitor density is measured through Foursquare check-ins. The very high level of visits and densely crowded people reduce the visual likeability, despite the presence of historical buildings that improve it. This reflects the likable features ranking as well. According to participants, the dominant

features are vistas, physical incivilities and historical buildings. The perception of chaos is observed in both the soundscape and visualscape evaluations. Due to the high density of shoppers, they found this place eventful, not calm or monotonous. The most dominant sound sources are coming from the crowds of shoppers. The majority of participants disliked both the soundscape and visualscape in Point 2. Participants evaluated the visualscape as vibrant, colourful and chaotic. The confluence of high pedestrian traffic, engaging soundscape and likeability of the visualscape not only underscores its significance as a commercial hub but also decreases its visual and audial attractiveness despite being a social gathering and shopping hotspot.

Point 3 in Eminönü is predominantly characterized by traffic noise, a dominant auditory feature that significantly shapes its soundscape. This encompasses sounds predominantly from vehicles, which markedly overshadow other auditory elements. In contrast to Point 2, human sounds such as conversations, footsteps or other activities are considerably less pronounced in Point 3, largely due to the dominant presence of traffic noise. This situation reflects as highest annoyance level in Point 3. Zone 3 exhibits a moderate to lower density of people, thereby being perceived as a cold spot. This relatively subdued human presence is likely influenced by the area's traffic-centric nature, which may discourage people from conducting social and recreational activities. Nevertheless, Point 3 remains an important locale for cultural activities. It serves as an attractive viewpoint for visitors, offering opportunities to capture photographs or to appreciate views of the sea, the Karaköy silhouette and the Galata Bridge. Despite this, both visitor and activity densities in Zone 3 are lower compared to Point 2. Activity places receive less favourable ratings as well. This demonstrates that visitors do not favour Point 3. The majority liked the soundscape, but they were neutral about the visualscape. Despite being close to famous landmarks like the Galata Bridge and the silhouette, the heavy traffic has an impact on this reduction. Similar to Point 1, the historical landmarks and modern cityscape create a contrast, while traffic and crowdedness create chaos in Point 3. Traffic density sets the most dominant likeable feature, and traffic noise is dominant within crowd sound. This neutrality reflects participants' evaluation of sound characteristics. Most participants find this soundscape uneventful and neither particularly annoying nor particularly calm. Additionally, Point 3 presents a sound and space incongruency. The visual and spatial elements of the area, set against the backdrop of a traffic-dominated environment, create a conflicted juxtaposition. In summary, Point 3 presents a diverse mix of cultural significance and varied sensory experiences. While the heavy traffic and the presence of fewer people somewhat

lessen its role as a cultural hub, its attractiveness as a scenic spot and its historical importance still make it a key part of Eminönü's urban setting.

According to the soundwalk results, Point 4, which is in the centre of the square, has a wide variety of sounds. This point includes a blend of human activities such as voices, conversations and footsteps, complemented by other elements like mechanical and cultural sounds, which vary depending on the specific activities and environment at this location. Point 4 exhibits a high density of people, yet it is characterized by a moderate level of recreational and cultural activities, alongside a lower presence of commercial activities, particularly from street merchants like simit sellers, corn vendors and chestnut sellers. While pedestrian density is high in this area, visitor density is comparatively lower, according to check-ins. This positions Zone 4 as a temporary area where they will pass by or take a short breath and rest. The surrounding streets and buildings have a big impact on how likeable the area is. Factors such as traffic density, the condition of buildings, the degree of enclosure and physical incivilities (such as signboards) play a crucial role in determining visual likeability. The participants are neutral about the soundscape and visualscape. At this point, there is a contradiction in the assessment of soundscape characteristics. Several participants found it calm, uneventful and pleasant, while others found it chaotic and vibrant. This inconsistency in evaluation can be associated with being neutral about the soundscape. According to participants' evaluations of the visualscape, this point gives a comfortable, vibrant and eventful image, despite its unplanned or neglected appearance. The most dominant likeable features are vistas and cultural landscapes, and the most dominant sound sources are traffic and human sounds. Point 4, located at the centre of the square, presents an interesting contrast in its urban dynamics, despite its central position. It functions primarily as a transitional space, where people tend to spend brief periods of time either passing through or pausing for a quick rest. The variety of sound sources at Point 4, ranging from intermittent conversations to the fleeting footsteps of passersby, align with its role as a hub of momentary activity and necessary, short-lived engagements. This convergence of sounds mirrors the area's character as a place of brief encounters and quick transitions.

In conclusion, the soundwalk and the data analysis collectively underscore Eminönü's lively and culturally rich atmosphere, despite challenges in noise levels and safety perceptions in certain areas. The combined results from the soundwalk and data analysis clearly illustrate Eminönü as an area rich in culture and bustling with activity. This portrayal emphasizes Eminönü's dynamic and multifaceted urban character by establishing a complex yet coherent relationship between the sounds of the area and its various urban activities.

## 21 Conclusion and Discussion

The predominance of visual approaches in the analysis of urban space and the dispersion of sound theories in multiple scientific fields (physics, psychology, music, linguistics, architecture, etc.) raise several interdisciplinary difficulties and a major methodological challenge to understand the multisensory characteristics of urban space. In this study, we have centred these characteristics around the audiovisual dimension, but we are aware that all senses must be involved. The analysis of urban spaces often prioritizes visual aspects, which can overshadow the multisensory nature of these environments. This research acknowledges the fragmentation of sound theories across various disciplines – physics, psychology, music, linguistics, architecture – highlighting the complexity of integrating these diverse perspectives.

From the soundscape evaluation, we have learned that the urban environment is a living, dynamic space in constant flux, characterised by both transient and enduring identities. Understanding this complexity requires sophisticated strategies that not only demand deep involvement from researchers but also significantly involve citizens, who are the true bearers of the area's knowledge, memories, and identity. From the visualscape evaluation, it is evident that the visual aspects of the urban environment shape the ambiance of the place contributing its identity, which is complemented by unique soundscape. The visualscape and soundscape are influenced from ephemeral dynamics and understanding them requires community involvement, as conducted through site surveys in this study.

Active participation from local citizens has been pivotal in deepening our understanding of urban dynamics at Eminönü Square. Their engagement in soundwalks and interviews has allowed us to explore the subtleties of the events, practices and processes that transform ordinary spaces into vibrant places. This participatory approach has also revealed the often-overlooked rhythms, rituals, and social choreographies that define urban life, providing valuable insights into the everyday experiences of the community. This is only the beginning of a process aimed at experimenting with the multiple methodological possibilities, applicable to different contexts which will allow a better understanding of sensory and spatial urban phenomena to incorporate them appropriately into the design of architectural and urban planning. In this sense, we advocate for the collective construction and design of place between memory, experience, attentive listening and awareness of our surroundings.

A methodological effort has been made to include movement as a fundamental part of the daily perception of the city. We have designed activities and

technical sheets that include the integration of quantitative and qualitative aspects. We advocate that further development of this study is necessary to obtain more reliable results. The addressed challenges are incorporating both quantitative and qualitative methods to capture the dynamic and multisensory characteristics of urban spaces, specifically through soundwalks, interviews and technical activities that emphasize movement and daily urban interactions.

From a placemaking perspective, the significance of this study lies in its methodical exploration of urban perceptions and engagement of community members to illuminate the sensory experiences of the place, while also fostering new relationships between citizens and researchers. This exploratory work aimed at delving into the complexity of everyday urban perception with the active participation of citizens (sound walk, improvised interview) we have also tested the involvement of researchers in the field.

The diverse perspectives gathered from Eminönü Square provide valuable insights into its cultural and social significance and form the foundation for a collective design of the square's future, reflecting the memories, desires and creativity of its inhabitants. The next step is to design actions capable of bringing the results of the research back to the citizens based on these initial results. In further stages, this study provides valuable multisensorial insights for placemaking in public spaces that are rich in sensory experiences. Moreover, the results also offer potential for creating inclusive public spaces, particularly for individuals with visual or auditory disabilities.

As the results demonstrate, both visual and auditory aspects of the place should be considered to enhance place experiences and perceptions. Unique sounds, such as those from merchants, ships and seagulls, should be preserved as they characterise the area and evoke memories of the place. On the other hand, traffic, machinery and other artificial sounds should be reduced as they create disturbances. In terms of visual perception, reducing traffic density is crucial. Elements of physical incivilities, such as bins and poles, can be removed. This place requires visual enhancements to fully realise its potential. To enhance visual likeability, the urban furniture elements within the square should be designed. This approach will improve the aesthetic quality of the space and optimize visual comfort. Notably, the vibrant and dynamic character of the place can be maintained, but the auditory, and visual disturbances elements can be minimised. This research acknowledges a key challenge in our cultural and social context: preserving the complexity of human perspectives in both the analysis and, most importantly, in the planning of future placemaking strategies.

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