



## A COMPARATIVE SOUNDSCAPE STUDY IN MARKET AREAS EXAMPLE OF BERLIN AND DRESDEN

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### ABSTRACT\*

Street market can be defined as the gathering of buyers and sellers at regular intervals in places approved by the authorities. Market areas have been places that provide rich social and cultural interaction for the citizens. Due to its potential to improve social relations, it has been the subject of much research in terms of different disciplines. The acoustic environment of market spaces is one of these research areas. The user perception of the acoustic environments of the market areas can change with the cultural structure of the city. In this framework, the study investigates the user's perceptions of market areas in two cities with different cultural and social dynamics. Field studies were carried out in market areas in Berlin and Dresden. The market area in Berlin is a multicultural area where different languages are spoken and there are different products sold, mainly vegetables and fruit. The market area in Dresden is an area where mostly local producers offer organic and local products. In this study, acoustic measurements and surveys collecting in-situ ratings were made in both areas. The soundscape of both regions has been systematically investigated and compared with each other.

**Keywords:** *cultural soundscapes, market areas, comparative study*

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### 1. INTRODUCTION

Market areas can be defined as the gathering of buyers and sellers at regular intervals in places approved by the authorities [1]. Market areas can be categorized based on their frequency of establishment (annual, weekly, or seasonal), the types of products sold (secondhand goods, fruit and vegetables, and clothing), and their location. (open areas, indoor places). Numerous disciplines, including sociology, urbanism, linguistics, architecture, and economics, have studied market areas from different points of view.

The selected **market areas** within the scope of the study are those that are established on particular days of the week and sell a variety of goods such as fruits, vegetables, food, and clothing. These market areas are usually temporary, flexible public spaces established on the street. Because of this distinction, they are also referred to as "street markets". The mobile benches and covers make it easy to set up these marketplaces. The ease of installation helps these temporary locations to be flexible and adaptable. Weekly street markets are preferred for a variety of reasons, including the availability of fresh products, variety, and the ability to haggle. In addition, social and cultural relations are established, and interactions are realized in markets. Markets are significant public gathering places that allow access to diversity, distinction, openness, cross-cultural exchange, and communication. Market areas are unique due to the variety of social relationships that have been created there.

Many studies have investigated the **social relationships** developed in market areas [2], [3]. These relationships are categorized in various ways. First, in market areas, people share small spaces. There is at least some exchange of information and sharing between a vendor and a buyer. Due to the small area and close proximity, people might hear

many viewpoints and ideas. Second, market areas provide the possibility of encounters between people of many ages, genders, ethnicities, and socioeconomic backgrounds, hailing from a wide variety of social backgrounds. Third, the marketplaces are currently increasingly multicultural. Individuals from many ethnicities bring items from their own traditions to the market areas. This eases cultural interaction. Fourth and another aspect of marketplaces is the presentation, marketing, and handover of the product during the selling process. The product is offered for sale in a variety of guises, and the vendor makes extensive use of both visual and aural cues to attract customers. In this instance, also known as a theatrical performance, the vendors introduce their products and attempt to attract attention. In addition, **social interactions** contribute to the aural variety that can be found in these locations [4].

The acoustic characteristics of market areas are influenced by numerous factors, including population density [5], site selection, and the products offered. Utilizing the various modes of social relations and sociability, the effects of these relationships on the acoustic environment of market areas were examined. They have a unique acoustic character due to the fact that there are numerous simultaneous utterances in many languages, and even different languages are blended and used there. The acoustic nature of market areas is comprised of all the speech, jokes, and shouting used by sellers to gain attention of potential purchasers. These sellers' cries, which contribute to the acoustic character of these locations, are the soundmarks for these areas. For this reason, the seller cries in market areas are cultural heritage [6]. The perception of the acoustic environment is also altered by people's positive attitudes toward these places and their appreciation of cultural heritage. Additionally, because these markets are temporary, noise is produced during the installation and assembly processes. Important sources of noise include the installation of benches and the trucks that transport the products for sale. The acoustic and social aspects of market areas are of particular importance to warrant research in this field.

In this study, two market areas are compared under the concept that each market area has its own acoustic character based on its social, geographical, and cultural qualities. This study examines users' acoustic perceptions of market areas in two cities with distinct cultural and social dynamics. Field research was carried out in two different marketplaces located in Germany: Berlin and Dresden. Acoustic measurements and on-site surveys were conducted at both of these locations for the purpose of this research. The soundscapes of the two areas have been thoroughly analyzed and compared.

## 2. MATERIAL AND METHODS

Acoustic measurements and surveys were carried out in both areas. The characteristics of the markets and the details of the measurements and surveys are described below.

### 2.1 Berlin Kreuzberg Maybachufer market area

Today, Berlin is a multicultural metropolis. Berlin-Kreuzberg is also a multicultural area that unites people from many different cultures. Due to affordable rents near the Berlin Wall in the 1960s, many Turkish guest laborers relocated to Kreuzberg [7]. As a result, the majority of buyers and sellers in the market are of Turkish origin to this day. For this reason, this market area is also known as the "Turkish Market" [8].

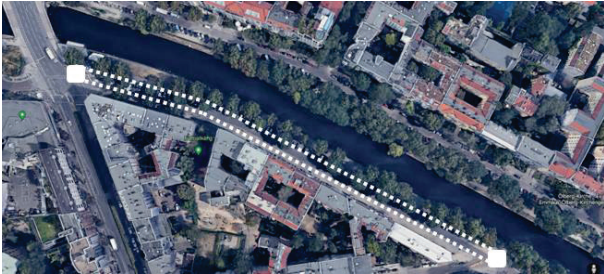
In this market area, which is established on Tuesdays and Fridays between 11.00 a.m. and 18.30 p.m., fresh organic vegetables and fruits, bakery products, sausage and meat specialties, cafes and various snacks, Turkish specialties, and a wide variety of fabrics are sold. Figure 1 shows pictures that were taken in the area.



**Figure 1.** Berlin Kreuzberg Maybachufer market area (Photos taken by first author at 17<sup>th</sup> September 2021)

In order to determine the acoustic characteristics of the market area, recordings were made on three separate occasions for this study. Audio recordings were made in the region in November 2021, April 2022 and June 2022. Within the scope of this study, the audio recordings were taken in June 2022 were used. From twenty distinct locations in the study area, audio recordings were made. The audio recordings were obtained between 14:00- 17:00 on 10 June 2022. Each recording was limited to 3 minutes, as proposed by the ISO/TS 12913-2 [9] as the minimum measurement interval. The measurements were made with

the HEAD acoustics SQuadriga II equipped with an omnidirectional, and binaural microphone.



**Figure 2.** Berlin Kreuzberg Maybachufer market area Google Earth image / Market area marked.

Figure 2 shows the location of the market area on the Google Earth image. Measurements were taken along 10 points at 50 m intervals along both axes. The distance between the measurement location and walls and other main reflective surfaces was at least 1 m, and the height of the microphone was 1.2–1.5 m.

## 2.2 Dresden Sachsenmark

Dresden is a city in the state of Saxony in eastern side of Germany. The market area in Dresden which is called Sachsenmark, is an area where mostly local producers offer organic and local products. There are more than 20 fruit and vegetable stands, 8 bakeries, 15 meat and sausage specialties suppliers. It is set up every Friday between 8.00-16.00 [10]. Figure 3 shows pictures that were taken in the area.



**Figure 3.** Dresden Sachsenmark (Photos taken by first author at 14<sup>th</sup> October 2022)

In Dresden Sachsenmarkt, audio recordings were taken from 16 different points. The audio recordings were taken between 12:00-14:00 on 14 October 2022. They were limited to 3 minutes. The measurements were made with the HEAD acoustics SQuadriga II equipped with an omnidirectional, and binaural microphone.



**Figure 4.** Dresden Sachsenmark market area Google Earth image / Market area marked.

Measurement points were made within the market area, along 8 points determined at 50 m distances, by taking 2 measurements in each shopping line because of the green space in the middle of the market area. The distance between the measurement location and other main reflective surfaces was at least 1 m, and the height of the microphone was 1.2–1.5 m. Figure 4 shows the location of the Sachsenmark on the Google Earth image.

## 2.3 Survey Study

The same survey form was used in Berlin and Dresden. Considering the multicultural character of Berlin, the questionnaires were prepared in three languages: German, English, and Turkish. Dresden, the survey study carried out in the market area, was prepared in two languages: German and English. The translation of the soundscape questionnaire is based on the reference source [11]. The survey study is divided into three distinct parts. The first part is related to personal information; the second part is about the usage of the market; and the last part is about the perceived acoustic environment. The second part on market usage is excluded from this study. The last part, which is related to soundscape, has been created according to the questions stated in ISO/ TS-12913-2 [9]. The last part of the questionnaire was evaluated comparatively in both areas. All of these questions on the acoustic environment were used on a 5-point rating scale. The survey questions are given in Table 1.

**Table 1.** The survey questions

Questions About Acoustic Environment	
1.	To what extent do you currently hear the four types of sounds?"
2.	How loud is there?
3.	How unpleasant is it here?
4.	How would you describe the present surrounding sound environment?"
5.	For each of 8 scales below, to what extent do you agree or disagree that the present surrounding sound environment is...?

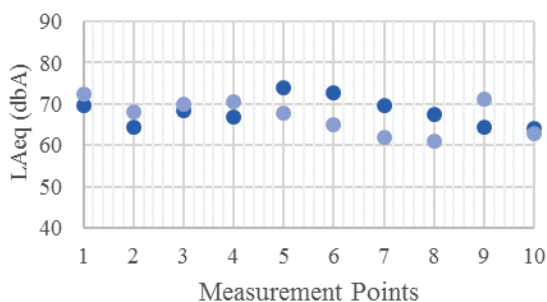
### 3. RESULTS AND DISCUSSIONS

The acoustic measurements taken in both market regions are evaluated first. Afterward, both regions' questionnaires were discussed. Then, in each section, both the differences and the similarities between the two areas are discussed.

#### 3.1 Acoustic Measurements

Both market areas are organized on two parallel horizontal axes. Therefore, the measurements made on the same horizontal axis are shown in the same color. In Figures 5 and 6, dark and light tones show the measurements on the different axes.

In the Berlin market area, the range of A-weighted energy equivalent continuous sound pressure level ( $L_{Aeq}$ ) was in the range of **61.3 to-74.1 dB (A)**. The measurement points and the respective measured  $L_{Aeq}$  values are given in Figure 5.

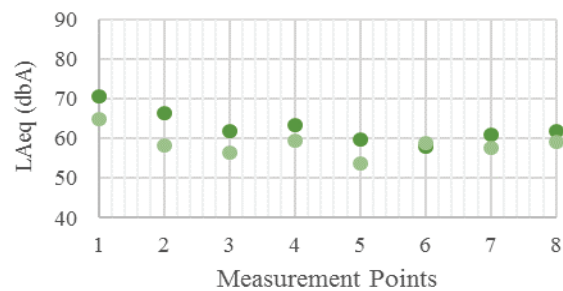


**Figure 5.** Berlin Kreuzberg Maybachufer market area measurement points

The Berlin Kreuzberg Maybachufer market area is located near busy streets, cafes, and stores in the neighborhood. In

particular, the market is situated in a bustling neighborhood. Additionally, the fruit and vegetable vendors shout to attract customers. These elements raise the Berlin market area's sound pressure levels.

In Dresden Sachsenmarkt, the range of A-weighted energy equivalent continuous sound pressure level ( $L_{Aeq}$ ) was **52.9 to-68.1 dB(A)**. The measurement points and the measure  $L_{Aeq}$  values and are given in the Figure 6.



**Figure 6.** Dresden Sachsenmarkt measurement point

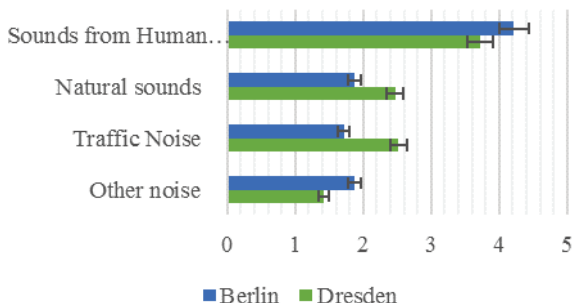
Dresden Sachsenmarkt, unlike Berlin, is located in a park, far away from a residential area. Noise from traffic only affects a small part of it. There are green areas on both sides and also in the middle of the horizontal axes, where the market is established. Additionally, one of the factors contributing to this area's lower sound pressure level than Berlin is the fact that local vendors do not shout while they are advertising or making a sale.

#### 3.2 Survey Results

In this part, the results of the survey questions addressing the perception of soundscape evaluated. In Berlin, 25 people, participated in the survey. The participants were aged from 23 to 74 years (14 males and 11 females, mean age = 43.2, standard deviation = 14.91).

In Dresden, 21 people participated in the survey. The participants were aged from 23 to 70 years (13 males and 8 females, mean age = 45.7, standard deviation = 15.03).

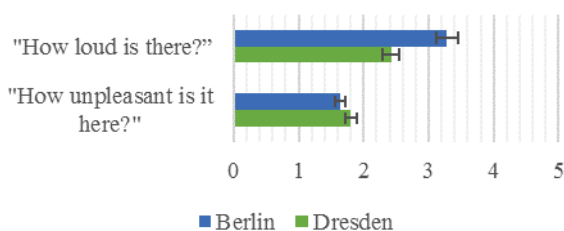
In the first question, a 5-point rating scale (1-not at all, 5-dominates completely) was provided for the individuals to relate to the audibility of sound sources, divided into categories such as traffic noise, other noise, sounds from people, and natural sounds. Figure 7 shows the average values and standard deviations of the responses for Berlin and Dresden.



**Figure 7.** Average values related to question “To what extent do you currently hear the four types of sounds?” for Berlin and Dresden markets.

Based on the average values, it can be concluded that sounds from humans exhibit a greater prevalence in both regions compared to other sources. Sounds from humans are the main sound source in both market areas, contributing to their acoustic character. The market area of Dresden has an abundance of natural sounds and traffic noise. Due to its lower sound pressure levels and park location, the acoustic environment of this location can be considered to be more hi-fi in character than in the Berlin market area. Although the indicated higher amount of audible traffic noise in Dresden compared to Berlin does not reflect the result of the level measurements.

The second and third questions inquired about how loud the areas were and about the disturbing/unpleasant qualities of these locations. In these questions, respondents were asked to provide a rating on a 5-point rating scale (1 - not at all, 5- extremely). Figure 8 displays the average responses and the standard deviations.

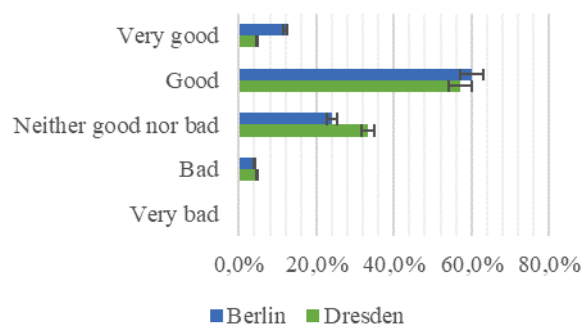


**Figure 8.** Survey results for Berlin and Dresden to the question "How loud is there?" and “How unpleasant is it here?” (average values and standard deviation)

The average values of the responses to these questions indicate that the Berlin market area is perceived to be louder but less unpleasant than Dresden market area, indicating the

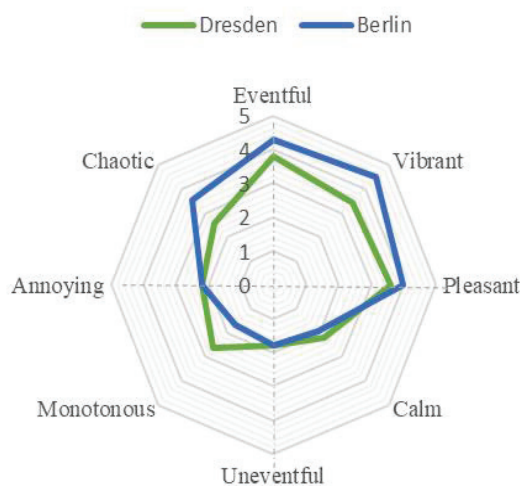
general difference between loudness perception and unpleasantness assessment.

Another question was related to how people assess overall the present surrounding sound environment. Figure 9 shows the average answers given as percentage values and standard deviation separated for Berlin and Dresden.



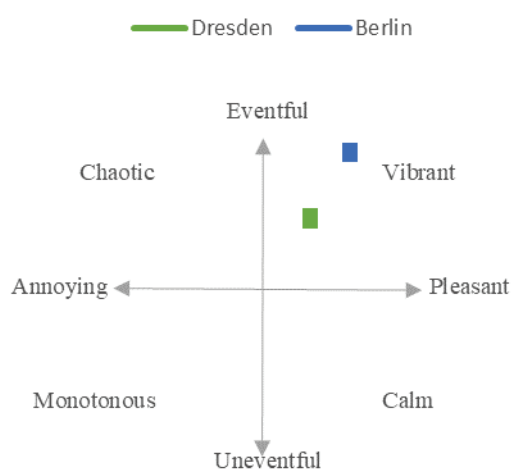
**Figure 9.** Survey results for Berlin and Dresden to the question “How would you describe the present surrounding sound environment?”(average values and standard deviation)

In this question, which presents an overall evaluation, it can be seen that the market areas' acoustic environment is positively evaluated by the users in general. The rate of good and very good answers is higher in Berlin than in Dresden, based on the provided responses, which is consistent with the unpleasantness ratings.



**Figure 10.** Survey results for Berlin and Dresden regarding the perceived affective quality according to the ISO/TS 12913-2 (average values)

The last question is about the **perceived affective quality**. In this part of the questionnaire, eight adjectives are judged on a 5-point rating scale as defined in the ISO/TS 129913-2 were given. For each adjective, it is asked to indicate the level of agreement or disagreement that accurately characterizes the acoustic environment. The answer options vary from "strongly agree" to "strongly disagree"; the numerical value ranges from five to one. The single arithmetic values of the eight attributes are displayed in Figure 10.



**Figure 11.** Pleasantness and eventfulness values of the investigated markets in the two-dimensional model according to ISO/TS12913-3.

In Berlin Kreuzberg market area, the pleasantness value as defined in the ISO/ TS 12913-3 was found to be  $p = 2,64$  and the eventfulness value as  $e = 5,59$ . In Dresden Sachsenmark, the pleasantness value was found to be  $p = 1,72$  and the eventfulness value as  $e = 2,84$ . This result is shown in the two-dimensional model in Figure 11. It shows that both places are perceived as vibrant and exciting as a combination of pleasantness and eventfulness, whereas the Berlin market elicits higher pleasantness and eventfulness. Market areas can be considered as examples of regions where human activities are highly concentrated connoted with a high valence. Based on the findings, the respondents perceived the surroundings as **eventful, pleasant, and vibrant**.

Upon analysis of the outcomes obtained from the market areas of Berlin and Dresden, it is evident that the acoustic environment of the market area in Berlin is comparatively

more eventful and pleasant in comparison to Dresden. It is still not fully understood which acoustic, social, and cultural aspects cause the stronger perceived affective qualities of the visitors to the Berlin market. Additional comments from the respondents refer to the strong collective identity of the place and people, which might be reflected in the ratings of the acoustic environment.

#### 4. CONCLUSION

According to the findings of the research, the participants in the study were not annoyed by the acoustic environment in the market areas. On the contrary, many individuals found the soundscapes in this area to be pleasant and vibrant.

Upon initial observation, it seems that the Dresden market nearby, situated in the park and characterized by reduced sound pressure levels, presents a visually and acoustically more pleasant environment. However, the findings indicate a contrary outcome, supporting the soundscape concept, which emphasizes the particular role of context. This observation indicates that the evaluation of the acoustic environment in urban settings is a complex procedure and that the cultural and social attributes of the people located in the vicinity exert a significant impact.

Design interventions in market areas should therefore be supported by extensive user consultation. It is evident that not all marketplaces establish a strong connection with the user. Comprehensive surveys should be conducted to explore the meaning of these areas for urban dwellers.

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