The Role of Urban Planning and Design in Generating Urban Vibrancy.
A comparative study between Edinburgh and Berlin.

Bachelor's Thesis
(Final Concept)

University of Groningen
Spatial Planning and Design

Author: Albena Drumeva
Supervisor: Dr. Christian Lamker
Date: 16.06.2023
Word Count:6157

ABSTRACT:

The urban design of open public spaces in European cities is a crucial element in the process of sustainable transformations towards healthy, lively, inclusive and safe cities. In the context of the complex dynamics of larger European cities, green urban areas received increasing attention, however, it is evident that the space itself does not facilitate sustainable urban development focused on improving the lives of residents and communities. The main concern of this research is to investigate the relationship between the urban design and vibrancy of public space by mapping user activities and characteristics in several large and medium-sized parks in Edinburgh, Scotland and Berlin, Germany. The central research question is focused on the potentiality of design elements to enable a wider range of activities and social diversity, and to contribute to the implementation of efficient design standards to serve the user needs. Empirical findings suggest that urban park design and management systems impact usage patterns, and more specifically type, duration and spatial clusters of activities, to a great extent. Furthermore, geographic and climatic conditions play an important role in the generation of urban vibrancy, and have to be taken into consideration in the urban design practices.

Key words: city vibrancy, urban design, urban parks, activity mix, social diversity

Table of contents:

1. Introduction:

1.1. *Background*

The ongoing urbanization processes, especially prominent in European cities, stress the importance of urban parks and open green spaces as a vital component for achieving a higher quality of life (Chiesura, 2004). As part of the 17 Sustainability Development Goals (SDG) adopted by the United Nations (2015), the Sustainable Cities and Communities (SDG 11) is a global agenda reinforcing the need for providing "universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities" (SDG 11, target 11.7). Nevertheless, green and public spaces constitute a spectrum of environmental, social and psychological benefits (Chiesura, 2004; Gehl 2010; Haq, 2011) which is crucial for generating urban vitality (Jacobs, 1961) in contemporary cities. In the context of sustainability, urban vitality is perceived as a driving force for sustainable urban development (Liu et. al, 2022). Also, the urbanist and architect Jan Gehl (2010) emphasizes on the need of urban planning oriented towards the human scale, which prioritizes the use of public space and aims at creating a safe and attractive environment for all social groups. Urban vitality in parks is a self-generating process (Gehl, 2010) driven by the need for social interaction, recreation and physical activity. However, vitality is oftentimes influenced by the park environment, attractiveness and quality (Liu et al, 2023), and therefore, should be incorporated in the principles of urban and park design. Previous studies have highlighted the need for future research on urban planning processes in green and public spaces' opportunities for serving people needs and preferences for social interaction (Wallis et al, 2023). This paper aims to address the research gap in whether design principles and guidelines coincide with the public space suitability to serve users' needs and how urban designers can make accurate predictions on the use of urban parks in modern cities using GIS techniques (Golicnik and Thompson, 2009), based on empirical research.

1.2. *Research problem*

The increasing complexity of large economic regions is leading to a phenomenon known as the "deconstruction of cities", as described by Jacobs (1961). Due to the urbanization rate, 68% of the world population is expected to live in cities by 2050 (United Nations, 2018), which will put additional pressure on the quality of life in urban areas and therefore, quality of public spaces. Therefore, it is crucial that our planning approaches shift towards sustainability, resilience and improving the quality of life. Planning for lively, safe, and attractive public spaces that accommodate a diversifying social and physical environment should be the primary goal of city planners and designers. However, there is an evident controversy between the design of public space and the intended use (Golicnik and Thompson, 2009), which later becomes an invincible barrier to making the space meaningful. This paper aims to contribute to the establishment of efficient urban design standards and guidelines for open public spaces by evaluating the potentiality of three parks in two West-European capitals (Edinburgh and Berlin) to generate urban vibrancy.

In order to elaborate on the central research question:

> *"How does urban design facilitate or restrict the vibrancy of open public spaces?"*

the following sub-questions would be discussed:

(1) Why are social diversity and activity mix crucial factors for generating vibrancy in parks in large West-European cities?

(2) What urban design approaches can promote the use of sustainable, lively and diverse open public spaces?

(3) What are the primary factors that impact the vibrancy in the inner cities of Edinburgh and Berlin?

1.4 *Structure of the paper*

The structure of this paper is as follows: first, the theoretical framework presents the main literature findings and concept definitions, as well as the expected relationship between the urban vibrancy and the design of open public spaces, based on previous studies. In the methodology section the research design and methods are discussed by (1) giving information and background of the selected case studies and (2) by explaining the method of observation for data collection combined with the statistical and GIS techniques for the analysis. Following that, in the results part, the empirical findings are derived from the analysis of the primary data. It was expected that there would be distinguishable patterns of visitors' flow, as well as spatial clusters of undertaken activities, which could be related to specific design elements and landscape features in the selected parks. Lastly, the conclusion section presents an overview of the results implications in policy and public space design, and possible limitations related to the research design.

2. Theoretical Framework:

2.1 *Public Space*

In the scope of this research public space is a crucial compound of the city planning, vitality and sustainability concepts, therefore it does not have a straightforward definition but can be interpreted from different perspectives. For example, Madanipour introduces the universal definition of "space that is not controlled by private individuals or organizations, and hence is open to the general public" (Madanipour, 1996, p.144), whereas Mehta (2014) focuses on public space as a freely accessible and usable space without ownership constraints. Furthermore, in the context of the urban fabric, public space is perceived as a bridging component of the physical-spatial organization in the city, described also as a "relation and communication between objects and places" (Frick, 2007, p.268). Wojnarowska (2016) points out the strategic importance of public space in town centers for the quality of life and the attractiveness of the town. She defines the concept as an accumulation of elements, formed by separate units, thus resulting in one whole entity with an overarching function. In the context of this research the precedent definitions remain valid, however, due to the focus on urban parks, public space is delimited to medium and large-sized parks in the inner centers of the cities. This kind of open public space corresponds to Wojnarowska 'nodes' (2016), which are described as areas with more than one primary function, also referred to as a 'mixture of uses' - an underlying principle of city diversity and vitality - by Jacobs in 1961.

2.1.1 *Public Space Index*

Mehta's Public Space Index (2014) is a primary tool for evaluating public space quality in this research, especially in the case of Tiergarten, Berlin. The index comprises five aspects: inclusiveness, safety, comfort, meaningful activities and pleasurability, including 27 variables in total for the park adapted version. Frick (2007) outlines similar characteristics of public space at different scales divided into the categories of activities, functionality, intelligibility and construction of public space. Furthermore, as the activity category is a key element in measuring urban vibrancy in this research, it is relevant to take into consideration Gehl's supportive characteristics (1996), which are applicable to urban parks, such as the availability of appropriate 'primary

seating' and 'secondary seating', direct routes to the destination if in sight, protection from unpleasant weather and access to good weather, etc. Mehta's Public Space Index has also been used for evaluating the quality of mid-sized parks by Evans et al. (2018), which contributes to the validity and reliability of the method in the setting of urban parks.

2.2 *Urban vitality*

Gehl (2010) states that planning for the lively city entails direct contact between people and the surrounding environment. The result would be lively public spaces used by a wide range of social groups, which is crucial for creating an attractive urban environment. The ultimate theory of the urban vitality is that city life has the ability to self-generate (Gehl, 2010), as what attracts people is other people (Whyte, 1980), which is an inertial process, and therefore vitality and diversity attract more vitality and diversity (Jacobs, 1961). The need for concentration of people and activities is also central for Jacobs (1961) who suggests concentration of diversity and the multi-layered way of living for achieving vitality. Moreover Gehl (2010) claims that opportunities for recreational and social activities are intertwined with the space for pedestrian flow and this way it invites people to participate in urban life and creates a feeling of involvement. Nevertheless, the slower pace of pedestrian flow is a prerequisite for more lively cities and is reflected in the assumption that activity is a product of quantity and time (Gehl, 2010).

2.3 *Urban vibrancy*

In this research the term urban vibrancy is defined as a compound unit of the broader concept of urban vitality and therefore, is viewed through the lens of the social diversity and activity mix aspects (Fig.1). According to Jacobs (1961), city vitality can be achieved through planning practice, but never by plans and designs alone. A critical precondition for the occurrence of vitality is the structure of the built environment, which has to consist of a diverse range of buildings combining different functions and therefore, attracting people with different lifestyles spread throughout different times of the day (Jacobs, 1961). Parks as public spaces, which do not usually host a variety of functions and their use is usually limited to the daytime, should be planned according to this principle in order to be populated and safe, rather than becoming a "border vacuum" (Jacobs, 1961). The term "border vacuums" entails the conceived sprawl of oversimplifying use of functions, which results in massive isolated areas constraining urban vitality. Therefore, the design of parks should take into consideration the potential user schedule and encourage the use by a diversity of groups to achieve this level of vitality. In the process of planning and designing green spaces J. Jacobs also mentions four elements that were applied in practice and resulted in successful public spaces: complexity, centrality, sunlight, and boundaries. On the other hand, Lynch (1984) defined urban vitality as the resilience of the urban system and the ability to maintain its survival, growth, and development. He distinguished four characteristics of urban vitality: sustenance, safety, consonance, and ecosystem diversity and stability. A similar approach to defining urban vibrancy is used by H. Liu et. al (2022) who emphasize on the need for diversity as a method to increase the ability for resilience.

2.3.1 *Social diversity and desnsity*

Density and diversity are crucial elements in urban vitality (Jacobs, 1961) and refer to the number of visitors, and the interaction and exchange between different visitors, respectively (Low, 1996). Chuang et al. (2022) have conducted research on the urban park characteristics effect on visitors' density and diversity in Singapore parks using georeferenced social media data. Their findings on the spatial correlation between density and diversity suggest that parks with low density and high diversity are concentrated in inner cities, whereas parks

6

with high density and low diversity serve specific social groups like tourists or neighbourhood residents. In the context of this research social diversity implies the characteristics of the visitors, such as gender and age, and both high social diversity and density are perceived as prerequisites for urban vibrancy. Furthermore, Cooper and Marcus (1998) highlight that several user groups seem to be neglected in the process of park design - elderly, disabled, preschool and school-aged children, and teenagers. Gehl (2010) and Cooper and Marcus (1998) address the potentiality of urban design to respond to the needs of elderly people, e.g. by providing an availability of comfortable seating infrastructure or loop walking routes with adjacent connections to serve recreational and exercise purposes. According to Cranz (1981) women continue to constitute a minority among park users, which is to a great extent caused by safety concerns. Therefore, it is considered that spatial characteristics of urban parks have to be planned accordingly to the needs of visitors of all age and gender groups, in order to accumulate social diversity and density (Gehl, 2010). In this research facilitating diversity is prioritized over density as a driving force of generating vibrancy (Jacobs, 1961; Chuang et al, 2022).

2.3.2 *Activity mix*

According to Gehl (1987) three types of activities can take place in the public space: (1) necessary - activities embedded in the daily routine, such as going to work or walking a dog, (2) optional - activities that only take place when the weather conditions are favourable, and (3) social - activities with the main purpose being social interaction. The last two are considered as most affected by the environmental quality of the space, however, crucial for facilitating social cohesion and urban vibrancy. Gehl (1987) also states that urban design can have an impact on the duration and type of undertaken activities in open public spaces, which is also justified by Liu et al. (2021) in their research on recreational flows in urban parks. Their findings imply that duration of recreation varies across different sites, and the peak of staying at a place is in the first half of the trip due to the increasing levels of tiredness and boredom of similar landscape features. This also influences the pace of recreation, which is faster in the second than the first half of the trip. Regarding the park environment, Liu et al. (2021) identified that regular users of the park spend significantly shorter time than infrequent and first-time visitors, and that highest concentration of visitors occurs at the park entrances. In their paper Golicnik and Thompson (2009) acknowledged that active use by larger groups in the park can be encouraged by providing large flat open spaces, e.g. for playing games, and that the presence of larger groups is a crucial factor in determining the 'comfort' distance between different types of activities.

2.4 *Urban design*

Another research which explores the relationship between design and use of urban parks shows that design is crucial for facilitating certain types of activities and attracting different age groups (Golicnik and Thompson, 2009). They researched the usage-design relationship in urban parks and identified gaps between the activity range facilitated by the urban parks design and the actual activities taking place. The findings suggested that the dimensions of activity zones is a key factor to the level of participation in certain activity and the distribution of users in the spatial organization. Furthermore, the spatial organization of open space implying a synthesis of the different landscape features, plays a major role in the level of occupancy and location of undertaken activities, as some elements of design act as barriers to certain activities. For example, steep slopes and elevation of the terrain may restrict physical activities in the area (Golicnik and Thompson, 2009), and geographic factors like the exposure to sunlight may be favourable for the recreational value of the place (Gehl, 1987). Previous studies (Kara, 1997; Zhang et al., 2019) also found that physical attributes of urban parks like size, greenness, amenities, landscape features, etc. can influence the duration and density of visit flows, which corresponds to the fact that morphology and arrangement of landscape features can affect the degree of urban

vibrancy (Meng and Xing, 2019). Nevertheless, it is crucial for urban parks design in West-European cities to provide exposure to sunlight as it has been considered a major attraction in the use of open public spaces (Whyte, 1980; Loukaitou-Sederis, 1992; Mehta, 2014).

Fig. 1: Conceptual model showing the interrelation between the core concepts of the research. *Source: Author*
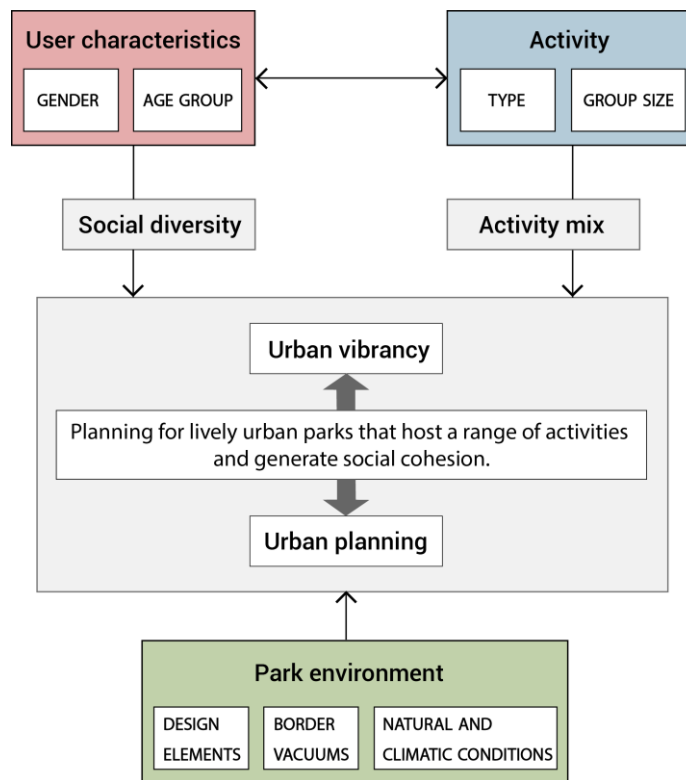
3. Methodology:

3.1 *Research methods for urban parks*

The research design of this paper consists of direct non-participatory observations as an instrument for primary data collection. Gehl and Svarre (2013) emphasize on the method of observation in studying public life as most efficient to understand the dynamics of space use. In this research, for the park observations, activity mapping is the primary goal for each observation session (Golicnik and Thompson, 2009). This implies mapping each user's characteristics and activities with predefined pictograms (see Appendix A) on their exact location at the time of observation session, lasting between 10 and 15 minutes. In addition, field notes of the weather conditions and specific user behaviour patterns are used as a complementary data source for further analysis. A similar research method was used by Golicnik & Thompson (2009) for mapping activities and user characteristics in two large parks in Edinburgh.
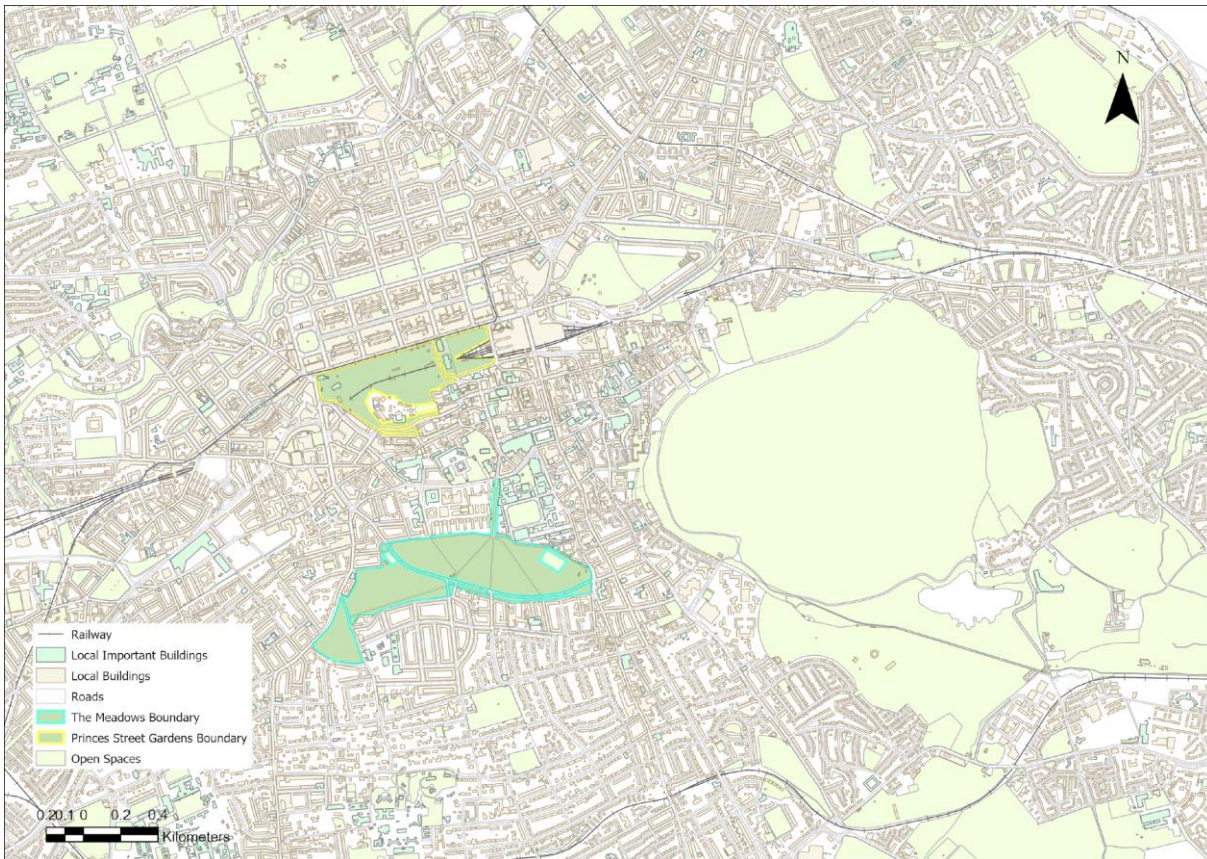
3.2 *Case studies*

Figure 2: Location of The Meadows and Princes Street Gardens in the context of Edinburgh. *Source: Author.*
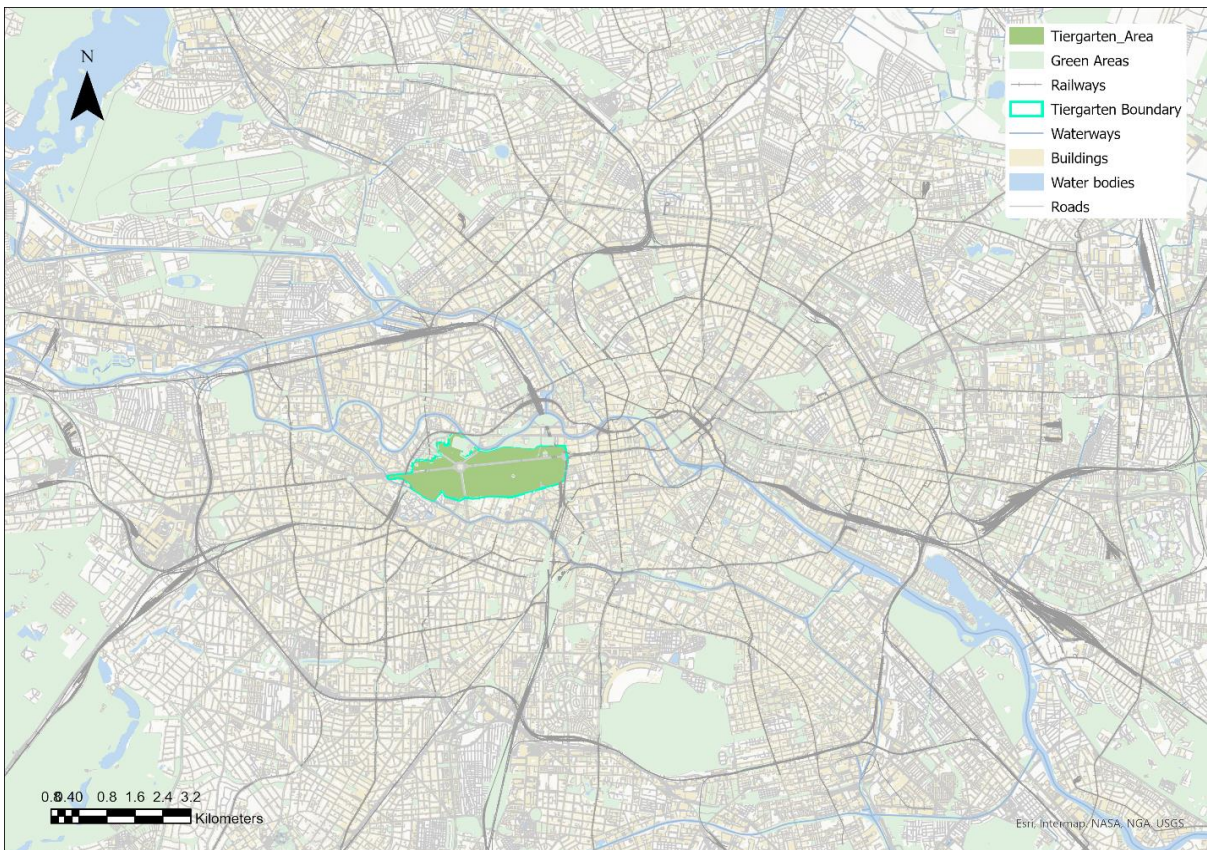

Figure 3: Location of Tiergarten in the context of Berlin. *Source: Author.*

3.2.1 *The Meadows and Bruntsfield Park, Edinburgh*

Located in the South East of Edinburgh (Fig. 2), The Meadows has a total area of 25.5 hectares, and according to the Park Quality Report (2022) carried out by Edinburgh Council, it has scored 72% on Park Quality, equal to grade 'Good'. Even though the park is not known for its high biodiversity and historical value, it still has great cultural significance for the citizens of Edinburgh. In the past, the future development of the park was a topic of controversial political debate due to the urban planners' ideas to tackle traffic congestion in the inner city with the construction of a six-lane motorway across the Meadows, as well as shopping centre and tower blocks, which led to numerous citizen protests in the 1950s and 1960s. Today, the park has a variety of design elements and facilities, such as golf and cricket pitches, tennis courts, playgrounds, community gardens, food courts and benches across the footpaths. The Park design consists of large open flat spaces and linear footpaths aligned with trees (Fig. 4), which allows certain types of activities, such as playing golf, football, volleyball, etc. This makes it favourable for playing sports and hosting summer festivals and concerts but also for getting maximum sunlight, which is greatly valued by people living in northern cities.
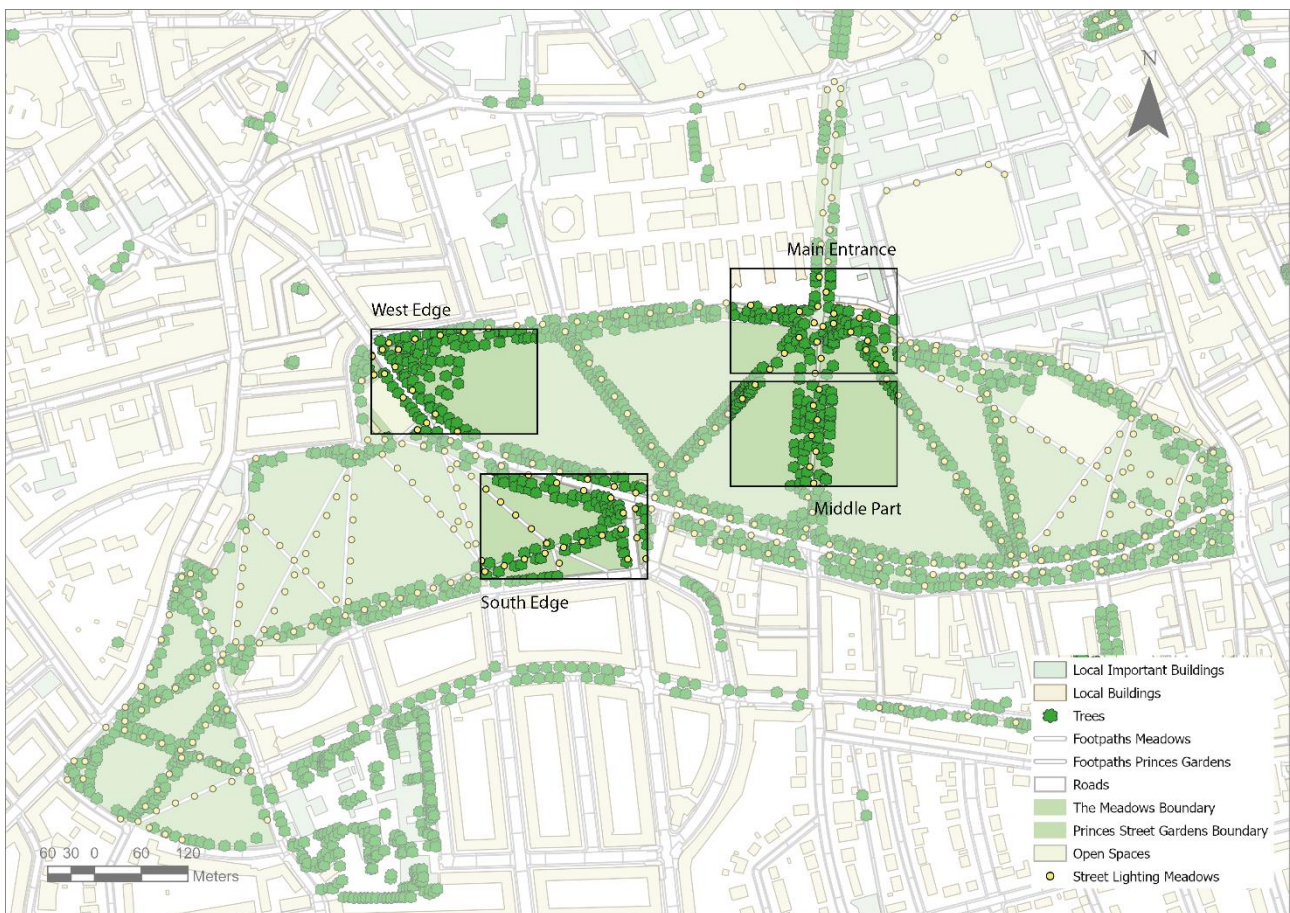

Figure 4: Land use and delineated zones in The Meadows.
Source: Author.

3.2.2 *Princes Street Gardens, Edinburgh*

10

The Princess Street Gardens Park is a central urban park in Edinburgh (Fig. 2) with historical significance and a World Heritage Status. The West Gardens were created in 1820 with an area of 13 hectares and the East was created in 1830 adding 3 hectares to the total area of the park. Some of the main features include stunning gardens, plant collections, heritage trees, monuments, memorials, the Ross fountain, play area, café, kiosks, seating and shelters (Princes Street Gardens Management Plan 2017 – 2020). Regarding infrastructure, the park has an availability of seats, litter bins, tarmac paths, bridges, buildings and information boards. Pedestrian access is provided via street footways to ten gates in the West gardens and eight gates in the East (Fig. 4). In terms of opening times the park is open at 7 a.m throughout the year and closed at 6 p.m during the winter and

at dusk throughout the rest of the year, which is regulated by park rangers security. Furthermore, according to the Park Quality Assessment (Edinburgh Council, 2021) the score for Princes Street Gardens is Good+ (76%) with a notice to improve signage and accessibility for people with disabilities. Moreover, the park has hosted a number of events in the past years and their frequency has become a starting point for a conflict between the citizens and the public

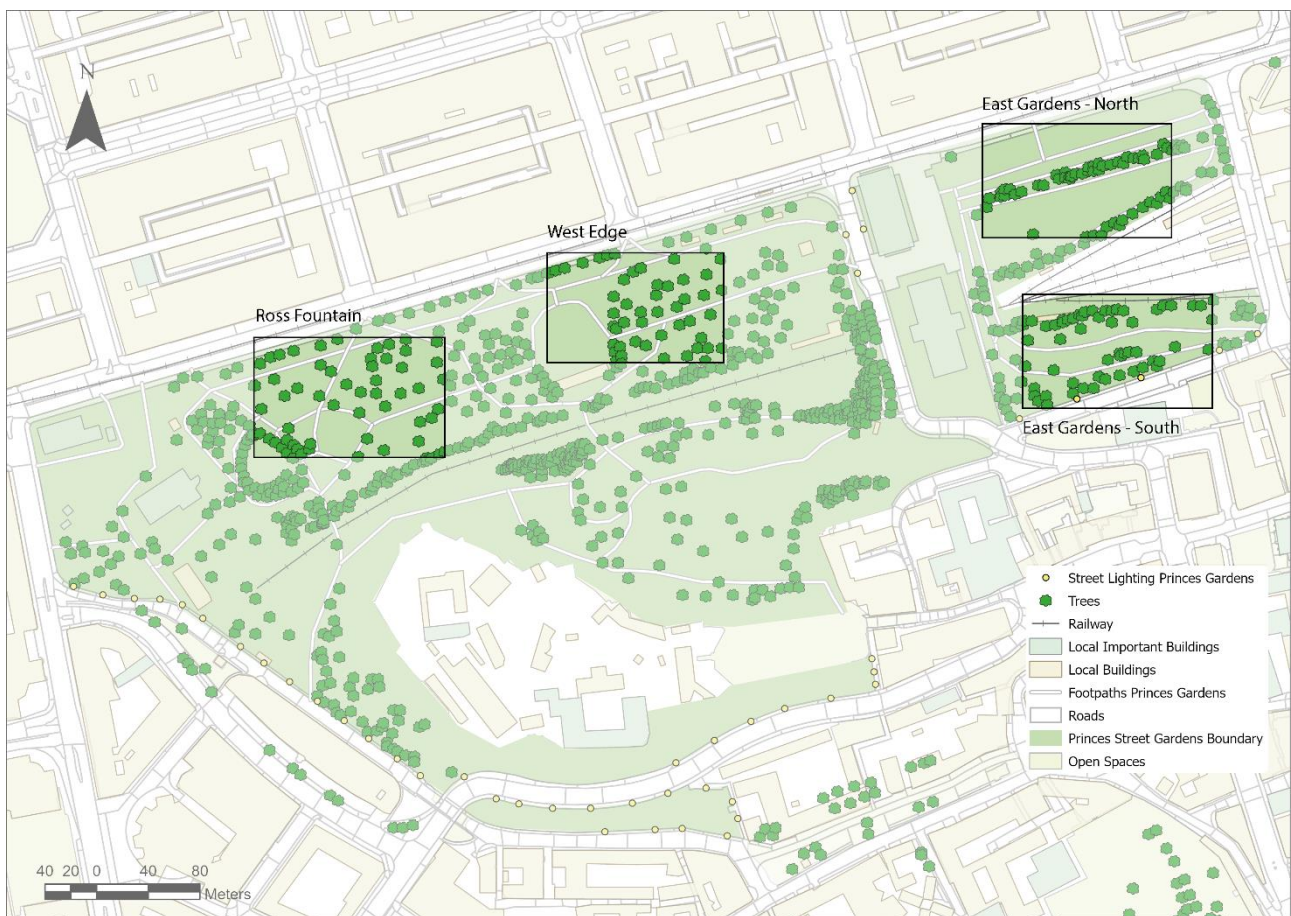Figure. A sign for the closing times of the park, Princes Street Gardens. *Source: Author.*

Figure 5: Land use and delineated zones in Princes Gardens. *Source: Author.*

authorities on the topic of festivalization of the Scottish capital (The Scotsman, 2021). This park is an example of how management and design of urban public spaces has become influenced by contradictory political demands (McGillivray et. al, 2020) which resulted in collective action of local activism and citizen protests in 2021.

3.2.3 *Tiergarten, Berlin*

Berlin's largest and oldest urban park Tiergarten (Fig. 3) has been a subject of political debate and various transformations since its original establishment. Before its opening to the public in the mid-18th century by King Friedrich II, it was a private royal game reserve. The current layout of the park is Leneé's "People's Park" plan implemented in 1840 (Bartels, 1982). Due to its central location, historical significance and ecological value, the 210 hectares of ancient forest now play an important role in political discussions, social policy and sustainability. It is a leading global example of cultural heritage conservation and high biodiversity concentration surrounded by a dense urban environment. Furthermore, the park manages to combine the aspects of heritage, ecology, urbanism and humanism in one spatial unit, depicted by Bartoli & Stollman (2019) as a "transgression landscape". Furthermore, Tiergarten is considered as the "lungs" of Berlin, where the residents come into contact with nature and other people, and are able to detach from the dense urban environment without traveling large distances, which makes the park a highly appreciated aspect of the city. However, it is still controversial whether the preserved historical park design fulfills the changing needs of the residents and to what extent it has maintained the same value throughout the ages.
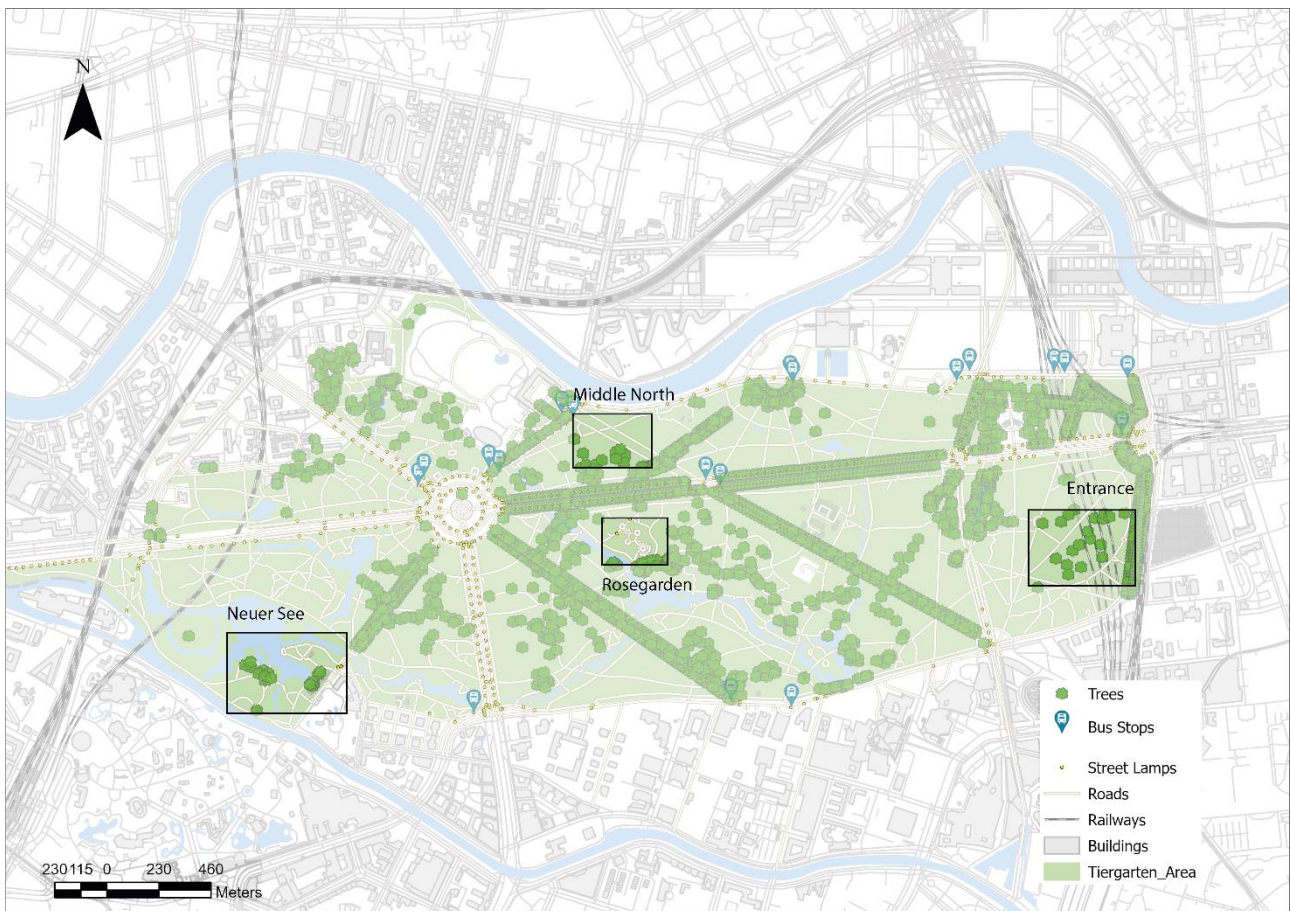

Figure 6: Land use and delineated zones in Tiergarten. *Source: Author*.

3.3 *Observations*

In total 33 observation sessions in open public spaces were conducted - 19 in Edinburgh and 14 in Berlin. Each park was split up into four different zones (Fig. 4,5,6) where the researcher position for the observation session was chosen according to the most capturing view location. The criteria for the delineation of the zones were to select areas with the most similar design features in the three parks in order to identify more accurately the differences in activity patterns among the visitors. For the time frame of 10 to 15 minutes, visitors characteristics including age, gender and group size, and undertaken activity were mapped. However, for some of the visitor characteristics, such as gender and age, it was not possible to get information due to the large distance between the researcher and the visitor. Similarly to the subjectively defining the gender of the visitor as male or female, the age of the person was subjectively established and placed in one of the seven age groups (Appendix A). In Cities for People (2010), Gehl specifies that the human eye is capable of recognizing a person from a distance of 100-150 m and his gender and age from a distance of 70-80 m, therefore, these characteristics were missing for a number of records.

The observation sessions took place at different times during the day with the main distinction between morning and afternoon. For the data analysis the observation session maps were transposed to ArcGIS using X, Y point data. Databases for the three parks were created by combining the map datasets for each session and setting the foundation for the data analysis process. The analysis in ArcGIS Pro has been conducted using Spatial Analyst tools such as Kernel Density (Fig. X) to identify the spatial clusters of activities. Moreover, descriptive statistical analysis in SPSS was conducted to summarize the data and compare the three park locations.

3.2 *Sustainable Transformations of Urban Regions in Europe (STOURIE)*

STOURIE is an Erasmus+ Blended Intensive Program which has created an opportunity for collective research in groups of five people and a field week from 31 April to 7 May 2023 for data collection in Berlin. Being part of the STOURIE program, our group managed to collect data using a quantitative index-based method inspired by Mehta's Public Space Index (Mehta, 2014) to evaluate the quality of Tiergarten in Berlin. The index was pre-formulated according to the research aim and Google forms were used to assign the score for each variable, which were weighted based on their influence, and the average values of all sessions were calculated and analyzed using SPSS software. Some of the variables in the category 'pleasurability for parks' include sense of enclosure, sensory complexity, visual and physical connection, etc. and can be directly linked to the urban design of the park in this research. The index provides additional support to the observation data in Tiergarten by quantifying the aspects of public space quality and enriching the factors of urban vibrancy.

4. Results

4.1 *The Meadows*

In the morning observations (9:00-12:00) the occupancy rate was 119 and the visitors flow was concentrated at the park entrances (Fig. 7), which is in line with the findings by Liu et al. (2021). This can also be explained by the type of undertaken activities, as the majority of them can be classified as 'necessary' (Gehl, 1987), e.g., cycling to work or walking a dog, which was subjectively defined based on the dressing style. 'Optional' activities, such as jogging and walking a child, as well as 'social' activities, like sitting on a bench and having

a picnic, took place mainly during sunny mornings. In fact, the difference in visitor flow on a partially cloudy day with light wind and sunny day with no wind, constituted of approximately 30 units of observation with respect to the pleasant weather conditions, which confirms that weather is a fundamental factor in park use (Jacobs, 1961; Gehl, 1987; Whyte, 1980). In the morning, the most prominent age groups were 18-24 (35) and 24-35 (32), accounting for 64% of the total number of users, which can be due to the location of Edinburgh University Campus at the north-east edge of the park. Regarding activities, visitors were mainly walking (38), cycling (32), walking with a dog (15), sitting on a bench (9), walking with a child (8) or jogging (7), while only a few were having a picnic or playing football. The gender distribution among users was 53 female, 42 male and 22 male-female couples, and

Figure 7: Distribution of activities in The Meadows. *Source: Author*

regarding group size, visitors were primarily individuals (64) and couples (46). From these results it can be derived that during the morning the dominant activity type is 'necessary' with a note that elderly visitors were engaged in 'social' activities (Cooper and Marcus, 1998). However, based on the characteristics of users, there is moderate social diversity, as people from all age groups were present and female-male ratio was greater than 1, which according to Cooper and Marcus (1998) is an indicator of a safe and vibrant public park.

.

In the afternoon observations (13:00-18:00), the occupancy rate was 215 visitors, almost double the number of users in the morning. The footpaths near entrances were still the main concentration points, however, there was a visible sprawl of activities towards the inner parts of the park. The flat open areas were occupied by groups of people sitting on the ground or having a picnic at a 'comfort' distance (Golicnik and Thompson, 2009), which has attracted passers-by to deviate from the footpaths and walk across the meadows (Liu et al,

2021; Gehl, 2010). In terms of age, most visitors were aged 18-24 (93) or 25-34 (45), and people aged above 55 were only a few, which was significantly lower during morning. The most prominent activities consisted of walking (45), having a picnic (35), cycling (29), sitting on a bench (21), walking with a child (21), walking with a dog (16), laying in the sun (14) and in general, playing sports (10), which can be considered as a high degree of urban vibrancy. The gender distribution consisted of 84 male, 62 female and 51 male-female couples. Regarding group size, the individuals were still the most prominent users (114), while small groups (21) and large groups (9) were significantly more than during the morning hours. In the afternoon, the activity mix and density were much higher with a peak of the occupancy for recreation purposes at 17 p.m, which was also influenced by the sunny and warm weather conditions at that time of the day (Fig.8).

Figure 8: People having picnics and barbecues in the Meadows. *Source: Author.*

.

4.2 *Princes Street Gardens*

In the late morning (11:00-12:00) there was a relatively high occupancy rate and activity mix. The observation sessions in the West part identified two main points of concentration of activities: the footpaths near the entrance gates and the pedestrian alley crossing the park in the middle (Fig. 6), which is also where the majority of historical monuments and sculptures are located (Fig.9,10). This phenomenon can be explained by the sensory complexity provided by old buildings and sculptures (Mehta, 2014). For this reason, this part was also mainly visited by tourists as non-frequent users (Lie et al, 2021) who spent more time exploring the park than regular visitors. Furthermore, the West part has more primary seating infrastructure to serve the elderly visitors' needs (Gehl, 2010) and therefore, was preferred from this age group, which could be derived from the observation that the main activity they engaged in was sitting on a bench and reading a book. The density of trees scattered through the area and the steep slope do not allows for sport activities, such as playing football, volleyball or with frisbee (Golicnik and Thompson, 2009). In the East part, the area closer to the main street was most occupied, predominantly by people who work in the nearby office buildings (Fig.11), but also by younger people who were playing sports and having picnics. Regarding the age group, the majority in both parts was 18-24, while people above 55 (13) were only present in the West part. The gender distribution in the West was 30 female, 12 male and 23 male-female couples, while in the East the ratio between men and women was almost equal to 1. In general, the main activity among users was sitting on a bench (49), while those who were walking were only 24. In fact, almost all benches in both parts were occupied and were used by up to

five people, who in most of the observed cases did not talk to each other and were sitting at the opposite edges, meaning that they were probably strangers. Furthermore, in the East part a total of 20 younger people were sitting on other infrastructure, e.g., the stairs of the café, monuments and even the sidewalk (Gehl, 2010), and 15 were laying in the sun at slope bottom (Fig.12). Regarding group size there were no significant differences as individuals were still the dominant users, followed by couples and several small and large groups in both parts of the park.

In the afternoon sessions, contrary to The Meadows, the activity levels and the occupancy rate has decreased, even though the number of the registered observation points remained similar for the morning (139) and afternoon sessions (126). However, in the afternoon the majority of visitors were walking (71), sitting on a bench (23) or walking with a child (13), which means that their recreational path had a relatively short duration (Liu et al, 2021). The weather conditions could have influenced this as even though the temperature was 15 degrees, it was mostly cloudy. Regarding visitors age, in the East the dominant age group was 18-24 (15) and 25-34 (10), while in the West all age groups were present and equally distributed.
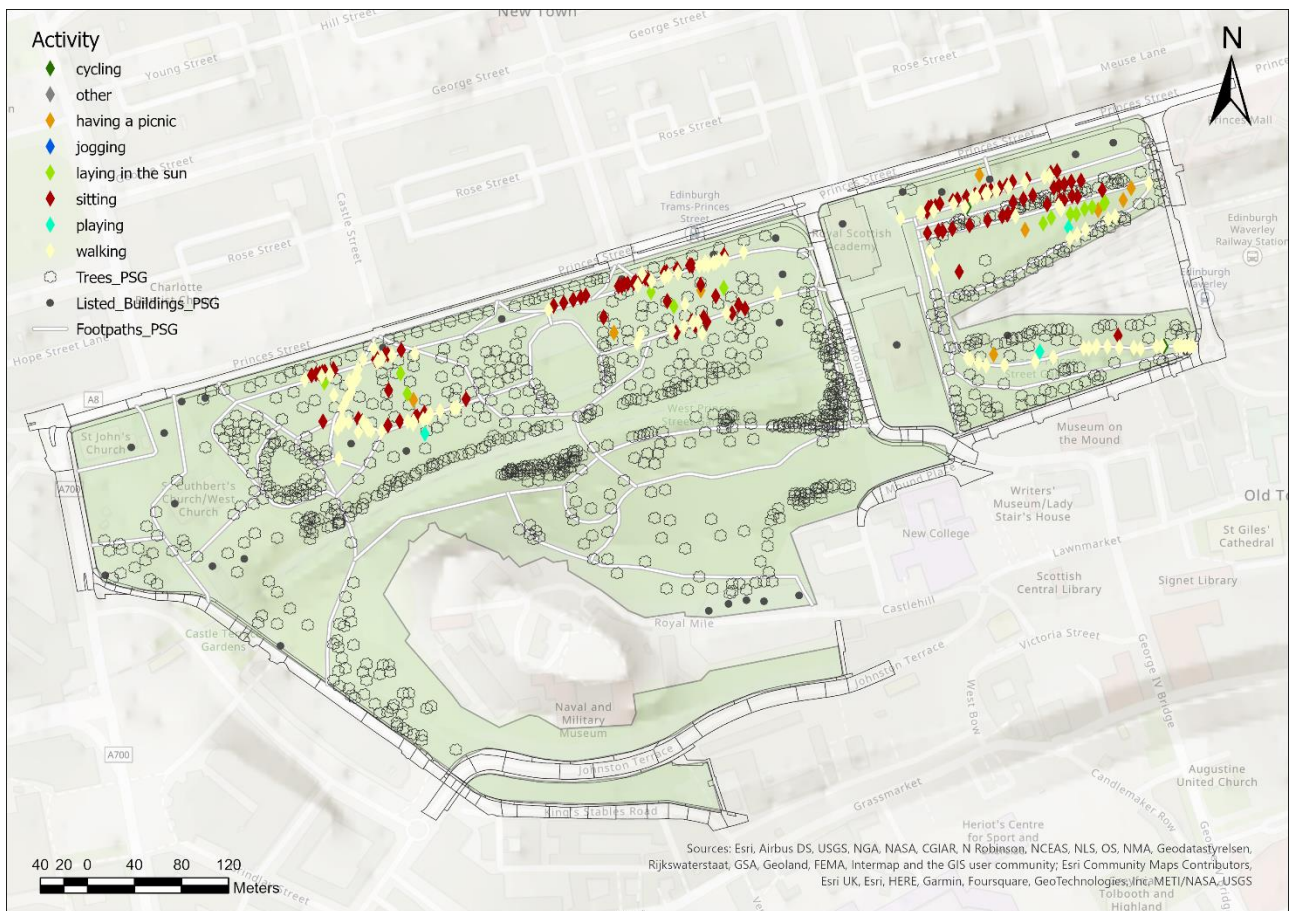

Figure 9: Distribution of activities in Princes Street Gardens. *Source: Author*

Figure 10. Memorable acrhitecture and seating availability in Princes Street Gardens. *Source: Author.*

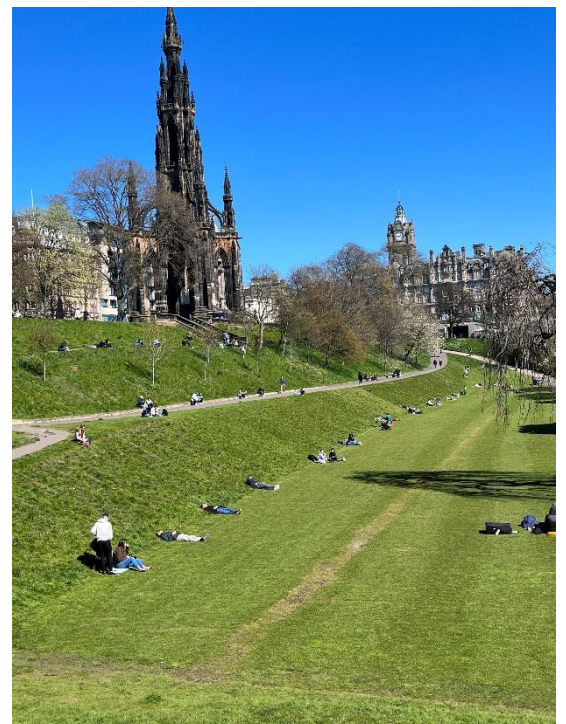Figure 11. People having lunch in the East Gardens. *Source: Author.*   Figure 12. People laying in the sun, East   Gardens. *Source: Author.*

Furthermore, with respect to the interaction of the visitors with the spatial characteristics of the park, it was identified that a significant proportion of activities takes place outside the designated roads, with a peak in the East part of the East Gardens (Fig.13).
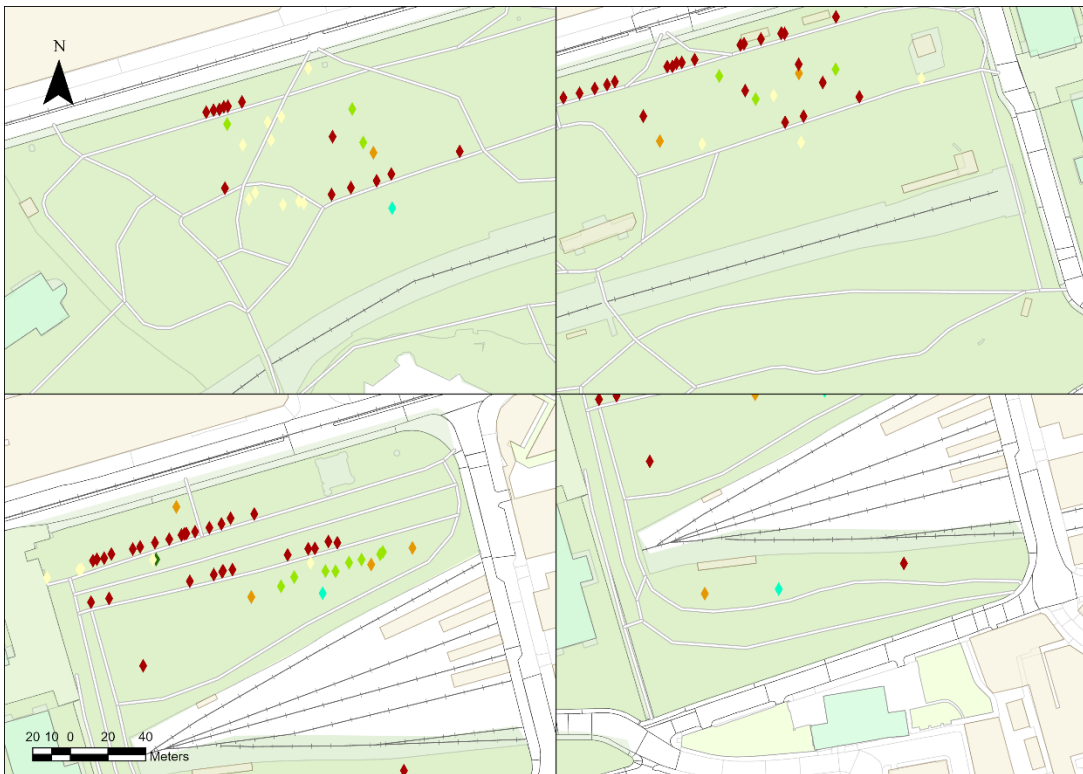

Figure 13: Activities on non-designated roads. *Source: Author*

4.3 *Tiergarten*

Figure 14: Distribution of activities in Tiergarten. *Source: Author*

In total, 196 points were recorded during three observation sessions in the morning, midday and afternoon, which account for the lowest occupancy rate of the three parks. Another contrasting feature is the gender distribution, which is 56 female, 100 male and 40 male-female couples, with the ratio male-female approximately equal to 2. This corresponds to the assumption that women are a minority, which can be caused by safety reasons (Cranz, 1981; Cooper and Marcus, 1998). Regarding activities, in the morning walking (49) was most prominent, followed by jogging (14) and cycling (9), while in the afternoon walking (36) was followed by sitting on benches (27), laying down or sitting on the ground (10) and playing sports (5) (Fig. 7). The weather conditions were sufficient for undertaking 'optional' and 'social' activities during all observation sessions, however during one of the afternoon sessions the weather was most favourable (Fig.14), with a temperature of 20 degrees and sunlight. There is a significant difference in the density and type of activity during the sunny and cloudy days (Fig.14 and Fig.15), which confirm that sunlight is a crucial factor for generating vibrancy (Whyte, 1980). The age distribution was similar throughout the day - a relatively equal distribution with dominant age group 25-34 followed by 18-24; with the addition that in the afternoon the elderly visitors have almost doubled. With respect to the group size, in the morning individuals and couples constituted 95% of the total population, whereas in the afternoon this number decreased to 85% and the remaining 15% accounted for small and large groups.

It is important to mention that the four observation zones serve different purposes and cover design elements (Fig.6), such as historical monuments and sculptures, flower gardens, playgrounds, cafés, water bodies, etc., which influences the type and duration of activity. In the Entrance zone a total of 76 records were registered, equal to 38%, which makes it the most popular of the four zones in the park (Liu et al, 2021), contrary to the Middle North part, where the number of records is 52, the transitional activities like cycling and walking were not the only ones. In fact, in the Entrance part 10 people were sitting, 5 were laying in the sun and one big group was playing sports (Fig.16), which contributes to the relatively higher, compared to the other parts, activity mix and social diversity.

In addition to the activity mapping, joint observation sessions as part of STOURIE research supported the presented results. Based on the Public Space Index, Tiergarten has scored highest on Inclusiveness (20) due to the lack of restrictive signs and gates, and presence of people of different ages and genders; and lowest on Meaningful Activities (5,3) due to the lack of businesses providing food or seating. The Comfort (18.8) also scored relatively high, which was primarily indicated by the variable 'space flexibility to serve the user needs. The Safety (8.3) was relatively low, which could be explained by the lack of good visual and physical connections in the selected zones, as well as, lighting quality that was completely missing in some parts of the park. Furthermore, the current design of the park is constraining certain types of activities like playing sports, and can easily become a "border vacuums" (Jacobs, 1961), which is also reflected in the Meaningful Activities score. However, due to this park's significantly larger area than the other two, it is uncertain if the four delineated zones accurately reflect the level of activity and social diversity throughout the whole park.

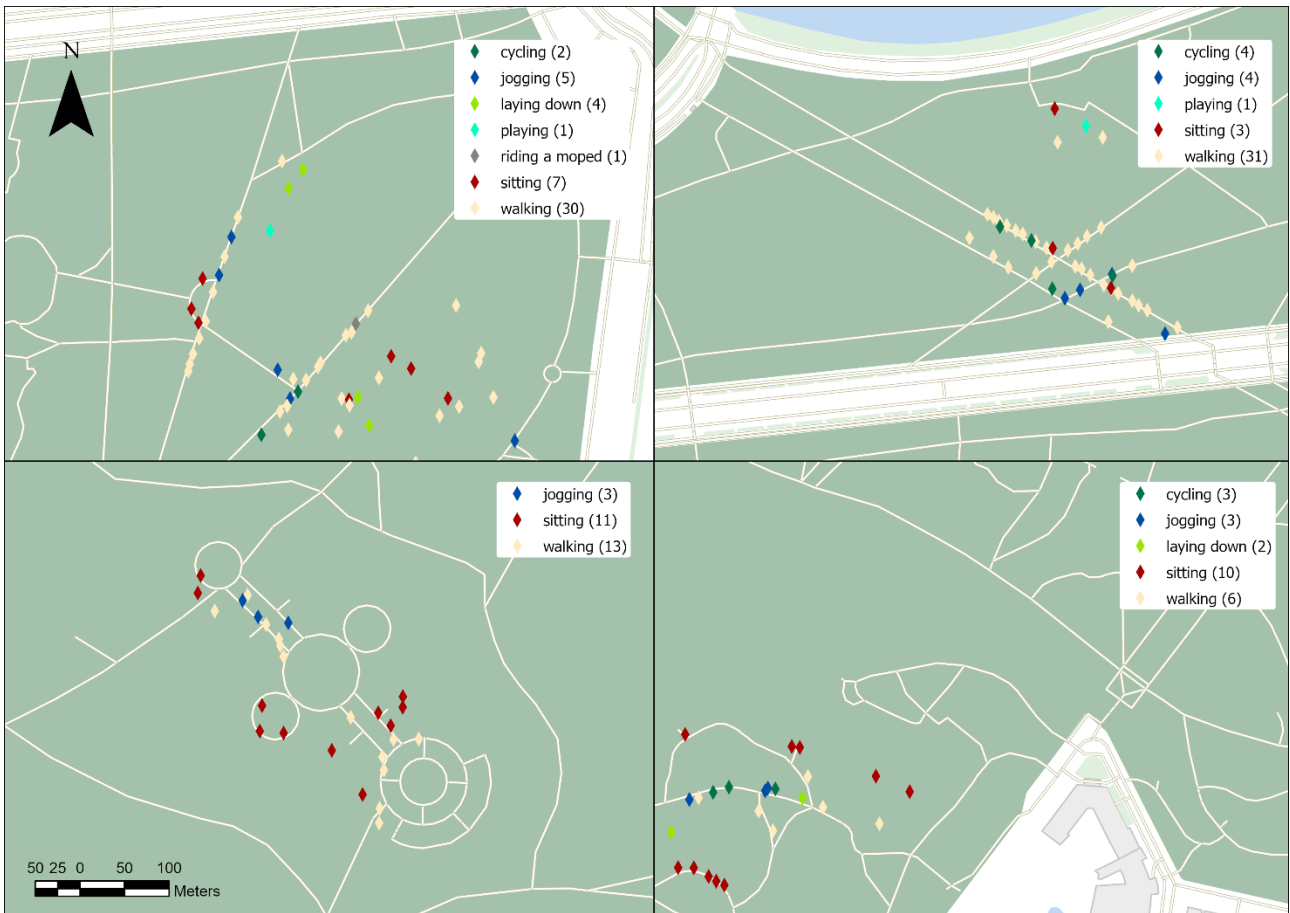Figure 13: Activities on non-designated footpaths. *Source: Author*
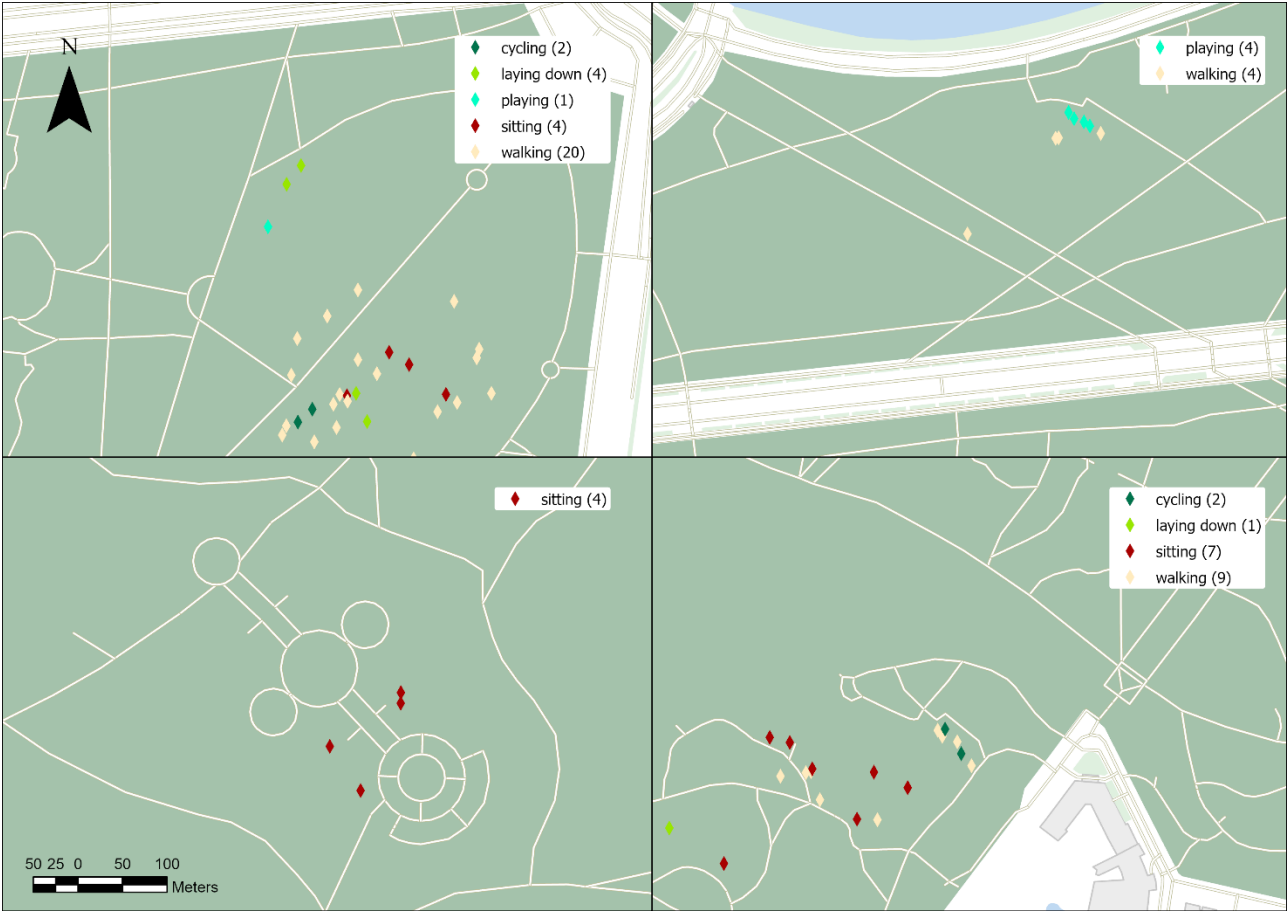
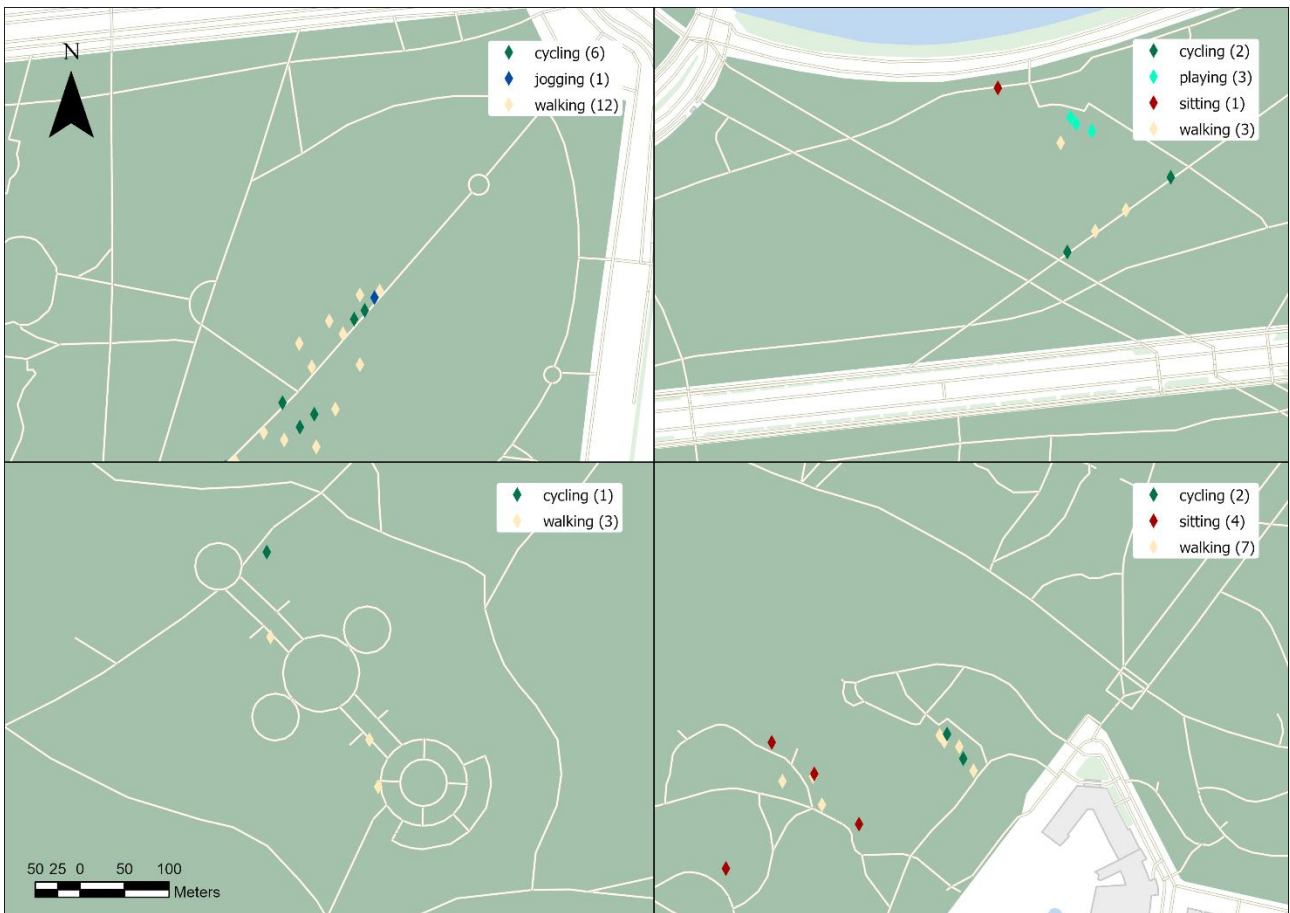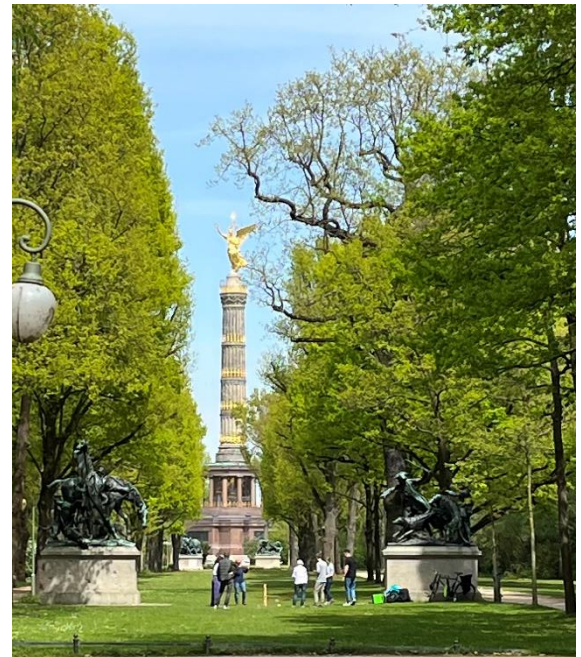Figure 14: Activities on a sunny day. *Source: Author.*

Figure 15: Activities on a cloudy day. *Source: Author.*

Figure 16. People engaging in physical and social
activities, Tiergarten. *Source: Author.*

5. Conclusions

This research has gathered data on the visitor characteristics and activities in three medium and large-sized parks in European cities by using observations, activity mapping and Public Space Index. The results were linked to the concepts of social diversity and activity mix, which were considered as crucial for generating urban vibrancy. Moreover, the physical environment of the parks was investigated as a barrier or enabler of urban vibrancy. The empirical findings suggest that concentration of activities is located closely to the main entrances of the parks, which means activities have a short duration and are probably undertaken by regular visitors. In terms of design elements, The Meadows is relatively simplistic and compared to the diversification of landscape features in Princes Street Gardens and Tiergarten, has lower historical and cultural value. However, it appeared to be most popular even during less pleasant weather conditions, which could be due to its high space flexibility to support various activity types. Moreover, the tourist attractions in Princes Street Gardens contributed to longer duration of activities and social density. Limitation of the research imply that for Tiergarten, due to its large area, it is difficult to determine what is the exact level of activity and visitor rate in the park but based on the derived results, it is visible that. Comparing the study cases of Edinburgh and Berlin, the urban design elements to some extent support the needs of the visitors, however amendments could be made in order to increase the degree of urban vibrancy. This research outlined that the main factors which influence the activity mix and social diversity, are the availability, comfort and position of places to sit, the availability of areas serving more than one, the concentration of people at focal points to ensure the feeling of safety and the opportunities for interaction with the public life and reconnection with nature. These results aim to contribute to establishing more efficient design guidelines in urban parks in order to increase quality of public space and move towards sustainability.

Bibliography:

Atiqul Haq, Shah Md. (2011). 'Urban Green Spaces and an Integrative Approach to Sustainable Environment', *Journal of Environmental Protection*, 2, p.601-608. Available at: https://www.researchgate.net/publication/276488760.

Adele K. Wallis, Marleen F. Westerveld & Paul Burton (2023) 'Ensuring communication-friendly green and public spaces for sustainable cities: Sustainable Development Goal 11', *International Journal of Speech-Language Pathology*, 25(1), p.27-31. Available at: https://doi.org/10.1080/17549507.2022.2138544

Bartoli, S. and Stollmann, J. (2019) *Tiergarten Landscape of Transgression (This Obscure Object of Desire)*. Park Books AG.

Chiesura A. (2004) 'The role of urban parks for the sustainable city', *Landscape and Urban Planning*, 68 (1), pp. 129-138. Available at: https://doi.org/10.1016/j.landurbplan.2003.08.003

Chuang, I.-T.; Benita, F.; Tunçer, B. (2022). 'Effects of urban park spatial characteristics on visitor density and diversity: A geolocated social media approach', *Landscape and Urban Planning*, 226(104514). Available at: https://doi.org/10.1016/j.landurbplan.2022.104514.

Cooper, M. and Francis, C. (1998) *People Places: Design Guidelines for Urban Open Space*. 2nd edn. John Wiley & Sons, Inc., Toronto.

Cranz, Galen. 1981. 'Women in urban parks', *Chicago: University of Chicago Press*, In Women and the American city, ed. Catherine Stimson et al., p.76-92.

Frick D. (2007) 'Spatial Synergy and Supportiveness of Public Space', *Journal of Urban Design*, 12(2), p. 261-274. Available at: https://doi.org/10.1080/13574800701306369

Ferguson B. (2021). 'Edinburgh's Princes Street Gardens: Protests over revival of events are baffling', *The Scotsman*, ©National World Publishing Ltd. Available at: https://www.scotsman.com/news/opinion/columnists/protests-over-princes-street-gardens-events-are-baffling-brian-ferguson-3382625. Accessed: 10.06.2023.

Gehl, J. (1987) *Life Between Buildings: Using Public Space*. Washington, DC : Island Press, ©2011.

Gehl, J. (2010) *Cities for People*. Island Press, ©2010.

Gehl J. and Svarre B. (2013). *How To Study Public Life*. Washington, DC : Island Press.

Global Sustainable Development Report (2015). United Nations. Available at: https://sdgs.un.org/publications/global-sustainable-development-report-2015-advance-unedited-version-gsdr-2015-17874.

Golicnik, B. and Thompson, C.W. (2009) 'Emerging relationships between design and use of urban park spaces', *Landscape and Urban Planning*, 94, pp. 38–53. Available at: https://doi.org/10.1016/j.landurbplan.2009.07.016.

Evans, J. *et al.* (2018) 'Evaluating the quality of mid-sized city parks: a replication and extension of the Public Space Index', *Journal of Urban Design*, 24(1), pp. 119–136. Available at: https://doi.org/10.1080/13574809.2017.1411185.

Heekin Bartels, E. (2012) 'Berlin's Tiergarten: Evolution of an urban park', *The Journal of Garden History*, 2(2), pp. 143–174. Available at: https://doi.org/10.1080/01445170.1982.10412400.

Jacobs, J. (1992) *The Death and Life of Great American Cities*. Vintage; Reissue edition.

Kara, K. and Cervero R. (1997). 'Travel demand and the 3Ds: density, diversity, and design. *Transportation Research Part D: Transportation Environment,* 2(3), p.199–219. Available at: https://doi.org/10.1016/S1361-9209(97)00009-6.

Liu, W. *et al.* (2021) 'Application of GPS tracking for understanding recreational flows within urban parks', *Urban Forestry & Urban Greening*, 63(127211). Available at: https://doi.org/10.1016/j.ufug.2021.127211.

Liu, H., Gou, P. and Xiong, J. (2022) 'Vital triangle: A new concept to evaluate urban vitality', *Computers, Environment and Urban Systems*, 98(101886). Available at: https://doi.org/10.1016/j.compenvurbsys.2022.101886.

Liu, Y. et al. (2023) 'Investigating factors influencing park visit flows and duration using mobile phone signaling data', Urban Forestry & Urban Greening, 85(127952). Available at: https://doi.org/10.1016/j.ufug.2023.127952.

Loukaitou-Sideris A. (1995). 'Urban Form and Social Context: Cultural Differentiation in the Uses of Urban Parks. *Journal of Planning Education and Research*, 14(2), p. 89-102. Available at: https://doi.org/10.1177/0739456X9501400202.

Low S.M. (1996). 'Spatializing culture: The social production and social construction of public space in Costa Rica', *American Ethnologist*, 23(4), p. 861-879. Available at: https://doi.org/10.1525/ae.1996.23.4.02a00100.

Lynch, K. 1984 'A theory of good city form' Massachusetts Institute of Technology.

Madanipour, A. 1996. Design of Urban Space. New York: Wiley.

McGillivray, D., Guillard, S. and Reid, E. (2020) 'Urban Connective Action: The Case of Events Hosted in Public Space', *Urban Planning*, 5(4), pp. 252–266. Available at: https://doi.org/10.17645/up.v5i4.3406.

Mehta, V. (2013) 'Evaluating Public Space', *Journal of Urban Design*, 19(1), pp. 53–88. Available at: https://doi.org/10.1080/13574809.2013.854698.

Meng Y. and Xing H. (2019) 'Exploring the relationship between landscape characteristics and urban vibrancy: A case study using morphology and review data', *Cities*, 95 (102389). Available at: https://doi.org/10.1016/j.cities.2019.102389.

Princes Street Gardens Management Plan 2017 – 2020 () Edinburgh Council. Available at: https://www.edinburgh.gov.uk/downloads/file/22597/princes-street-gardens-management-plan.

Park Quality Assessments (2022). Edinburgh Council. Available at:https://www.edinburgh.gov.uk/downloads/file/32202/parks-quality-report-2022.

Park Quality Assessments (2021) Edinburgh Council. Available at: https://www.edinburgh.gov.uk/downloads/file/30233/parks-quality-report-2021.

Wallis A., Westerveld M. and Burton P. (2023) 'Ensuring communication-friendly green and public spaces for sustainable cities: Sustainable Development Goal 11', *International Journal of Speech-Language Pathology*, 25(1), p. 27-31. Available at: https://doi.org/10.1080/17549507.2022.2138544.

Whyte William H., Jr. (1980) *The social life of small urban spaces.* Conservation Foundation, Washington, D.C.

Wojnarowska A. (2016) 'Model For Assessment Of Public Space Quality In Town Centers', *European Spatial Research And Policy*, 23(1). Available at: https://doi.org/10.1515/esrp-2016-0005.

Zhang, A., Xia, C., Chu, J., Lin, J., Li, W., & Wu, J. (2019). 'Portraying urban landscape: A quantitative analysis system applied in fifteen metropolises in China', *Sustainable Cities and Society*, 46(101396). Available at: https://doi.org/10.1016/j.scs.2018.12.024

Appendix A: Pictogram Table

Gender	Male	♂
	Female	♀

Age group	Under 18	I
	18 - 24	II
	25 - 34	III
	35 - 44	IV
	45 - 54	V
	55 - 64	VI
	65 +	VII

Group size	Individual	•
	Couple/Family	^
	Less or equal to 5 participants	o
	More than 5 participants	☐

Activity	Walking	X
	Cycling	XX
	Jogging	X'
	Having a picnic	$\underset{\_}{\circ}$
	Sitting on a bench	L⌒
	Laying in the sun	L◖
	Sitting near a tree	L I
	Walking with a dog	X'
	Walking with a child	X•
	Playing football	ø
	Playing volleyball	⊗
	Playing frisbee	⬭
	Playing golf	⊖
	Entertainer/Musician	✳

Appendix B: Activity Count per Park

Activity * Location Crosstabulation

Count

		Location			
		Princes Street Gardens	The Meadows	Tiergarten	Total
Activity	cycling	2	29	18	49
	cycling, walking with a child	0	2	2	4
	educational activity	0	1	1	2
	having a picnic	8	38	0	46
	having a picnic, walking with a child	1	1	0	2
	having a picnic, walking with a dog	0	1	0	1
	jogging	1	11	16	28
	laying in the sun	14	12	5	31
	laying in the sun, walking with a child	1	0	0	1
	laying on the ground	0	0	1	1
	musician	0	1	0	1
	playing	1	4	5	10
	playing football	2	7	0	9
	playing frisbee	1	1	0	2
	playing golf	0	1	0	1
	playing volleyball	0	2	0	2
	riding a moped	0	0	1	1
	sitting	2	0	0	2
	sitting in the sun	0	2	0	2
	sitting near a tree	6	6	5	17
	sitting near a tree, reading a book	1	0	0	1
	sitting on a bench	72	30	32	134

sitting on a bench, cycling	0	1	1	2
sitting on a bench, reading a book	3	1	0	4
sitting on a bench, walking with a child	3	1	0	4
sitting on a bench, walking with a dog	1	0	1	2
sitting on a bench, walking with a dog, walking with a child	0	1	0	1
sitting on stairs	1	0	0	1
sitting on the ground	20	3	0	23
sitting on the ground, reading a book	0	2	0	2
sitting on the ground, walking with a child	2	0	0	2
walking	87	115	85	287
walking with a child	19	24	8	51
walking with a child, walking with a dog	0	4	1	5
walking with a dog	6	30	12	48
walking with a suitcase	7	2	1	10
walking, cycling	0	0	1	1
walking, photoshooting	4	1	0	5
walking, wheelchair	0	1	0	1
Total	265	335	196	796

Appendix C: Public Space Index