都市公園の景観要素に関する研究：福岡市と台北市の多様な都市公園 を事例に

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都市公園の景観要素に関する研究：福岡市と台北市の多様な都市公園を事例に

Research on the Landscape Elements in Urban Parks: Focus on the Various Cases of Fukuoka City and Taipei City

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This research clarifies the landscape elements inside the urban parks, including water, grassland, forestry space, hard spaces, sports facilities and so on. It explores the correlation of the distribution of sports facilities and the distribution of other landscape elements besides sports facilities. Landscape elements composition are examined using color-coding by QGIS. Counting the number of the sports facilities by field survey and examine the distribution of sports facilities via QGIS. The findings highlight the importance of integrating diverse landscape elements and sports facilities in urban park planning to enhance public engagement in physical activities and overall well-being. The research underscores the potential for cities to optimize park design strategies to promote health outcomes and improve quality of life for residents.

Keywords:　*Landscape element, urban parks, sport facilities, Fukuoka City, Taipei City*
景観要素，都市公園，スポーツ施設，福岡市，台北市

1. Introduction

In recent years, researchers and policymakers have increasingly recognized the multifaceted significance of urban parks, not only for ecological sustainability but also for human well-being. They serve as critical component of urban green infrastructure, providing ecosystem services that improve quality of life and bring benefits to public health (Wolch et al., 2014). The new evidence shows that people are increasingly visiting local parks and engaging in recreational activities, leading to a renewed appreciation for the natural environment. (Levinger et al., 2021) More and more research show that interacting with nature bring measurable benefits to people (Keniger et al., 2013).

These green spaces are particularly valuable in modern urban environments while rapid urbanization has led to reduced green areas and increased stress levels among residents. Parks are able to offer the spaces for recreation and physical activities, which are vital for mental and physical health. Besides, various landscape elements within parks, such as sports facilities, playgrounds, walking trails, and natural features, attract diverse populations and encourage outdoor activities. Visitor preferences for these elements significantly influence their activities within the parks (Hofmann et al., 2012; Mengwei Yang et al., 2023).

Among the various landscape elements within parks, sports facilities hold a particularly significant position. Sports facilities in urban parks are essential because they promote physical activity, which is a key component of a healthy lifestyle. Sports facilities within parks are especially important as they promote physical activity, offering significant health benefits. The layout of these facilities and their relationship with other landscape elements can greatly influence their effectiveness. Therefore, a well-thought-out distribution of sports facilities can enhance their accessibility and usage, thereby maximizing the benefits they provide to park visitors.

The main aim of this research is to analyze the relationship between the distribution of sports facilities and the distribution

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and characteristics of landscape elements in urban parks in Fukuoka City and Taipei City. The selected parks, including Ohori Park, are considered representative examples of urban parks in these cities due to their various functions and types, despite the predominance of water areas in some cases.

1.1 Health benefits of physical activity and the role of parks

Regular physical activity reduces the risk of numerous non-communicable diseases, including coronary heart disease, hypertension, type 2 diabetes, depression, and certain cancers (Haskell et al., 2007; Warburton et al., 2006; WHO, 2010). Urban parks, by their location and the facilities they provide, offer opportunities for social interaction and physical activities such as walking, running, and cycling (Bahriny & Bell, 2020; Santos et al., 2016). These parks are invaluable for improving human health by encouraging participation in physical activities and reducing morbidity (Wang et al., 2019). The physical benefits of regular exercise in such settings include improved cardiovascular health, enhanced muscular strength, better weight management, and increased flexibility and balance. Mental health benefits are equally significant, with studies indicating that regular physical activity can alleviate symptoms of depression and anxiety, improve mood, and enhance overall cognitive function (Hartig et al., 2014).

1.2 The impact of sports facilities on physical activity

Sports facilities within parks are crucial for stimulating and promoting physical activity. Research indicates that the presence of recreational facilities, green spaces, and attractive landscapes are key indicators for predicting physical activity levels (Bauman et al., 2012). Specific facilities such as basketball courts, soccer fields, fitness trails, and playgrounds can significantly enhance the health benefits provided by parks by attracting more users and promoting diverse types of physical activities (Kaczynski et al., 2008; Chow et al., 2016). For instance, parks equipped with a variety of sports facilities tend to see higher levels of engagement across different demographic groups, including children, teenagers, adults, and the elderly. The availability of such facilities not only promotes physical health but also fosters social interaction, creating a sense of community and belonging among users (Bedimo-Rung et al., 2005).

Different types of facilities serve different purposes and attract different user groups. Playgrounds, for example, primarily attract families with young children, whereas fitness stations and sports courts might be more appealing to teenagers and adults. Multi-use trails are versatile and can cater to a wide range of activities such as walking, jogging, cycling, and inline skating. The presence of water features, picnic areas, and shaded seating can also enhance the attractiveness of a park, encouraging longer visits and more diverse activities (Veitch et al., 2016). Furthermore, the perceived safety of a park, influenced by lighting, visibility, and maintenance, can significantly affect its usage. Well-maintained parks with good lighting and clear sightlines are more likely to be used, especially by women, children, and the elderly (Negi, N., 2019).

1.3 Effects of design and distribution on activity levels

Despite the well-documented benefits of urban parks, there remains a gap in understanding how the specific layout and distribution of landscape elements, particularly sports facilities, influence physical activity levels. Effective park design that maximizes physical activity among urban residents is essential but often lacks empirical guidance (Forsyth, 2007). Research has indicated that factors such as the proximity of facilities, the ease of access, and the aesthetic appeal of the park can significantly affect how and how much people use these spaces for physical activity (Koohsari et al., 2015). Parks that are well-integrated into residential areas and feature accessible pathways are more likely to be frequented by local residents. The placement of facilities within a park—whether centrally located or dispersed—also influences usage patterns. Centralized facilities may attract more users by being more visible and easier to find, while dispersed facilities can distribute activity more evenly across the park, reducing congestion and wear on any single area (Cohen et al., 2010).

The aesthetic quality of parks, including the presence of natural elements like trees, water bodies, and varied terrain, contributes to their attractiveness and the well-being of users. Studies have shown that naturalistic settings can reduce stress, improve mood, and enhance cognitive functioning (Tyrväinen et al., 2013). The integration of art and cultural elements, such as sculptures and historical markers, can also enrich the park experience, providing educational opportunities and fostering a deeper connection to the place (Carr et al., 1992). Therefore, park design should consider both functional and aesthetic aspects to maximize benefits.

1.4 Limitations and research gaps of existing studies

While the benefits of urban parks are well-documented, there is insufficient understanding of how the layout and distribution of sports facilities and landscape elements influence physical activity levels. Most existing studies focus on the presence or absence of facilities rather than their specific arrangement and integration within the park landscape. There is a need for more detailed research that examines how different configurations of park elements can optimize physical activity (Bedimo-Rung et al., 2005). This includes understanding the trade-offs between centralized and decentralized layouts, the role of connectivity and pathways.

In conclusion, while the multifaceted benefits of urban parks are well-recognized, there is a pressing need to deepen our understanding of how specific design elements and their spatial distribution impact physical activity levels. This research seeks to fill this gap by focusing on the parks in Fukuoka City and Taipei City, analyzing how their design influences user behavior and physical activity. The selected parks, including Ohori Park, are considered representative examples due to their various functions and types, even though some have predominant water areas. The findings aim to inform better park design practices that can enhance public health and well-being, contributing to the broader goal of creating more livable and sustainable urban environments.

2. Research aims and objective

The purpose of this research is to use GIS to classify landscape elements based on their characteristics, observe the relationship between sports facilities and other landscape elements in the surrounding area, and provide some suggestions and guidance for future urban park design. The goals of the research are:

1) Summarize and classify landscape elements from the literature and establish a grid in the park area to visualize the distribution of landscape elements.
2) Explore the relationship between the distribution of landscape elements and the distribution of sports facilities in the park by comparing the two Asian cities.
3) Provide some experience and suggestions for the construction of urban parks in the future.

3. Target cities

Fukuoka located in northern Kyushu, Japan, at the southernmost tip of the four main islands. It has a subtropical humid climate. Fukuoka city has a pleasant environment and strong livability because of its convenient transportation facilities and abundant tourism resources (Figure 1). Fukuoka's population grew by 7.1% between 2010 and 2017, giving it the biggest growth of any major city in Japan (Fukuoka Asian Urban Research Center, 2018). Against the backdrop of climate change and continuous population growth, urban development in Fukuoka City faces certain pressures. People are gradually becoming aware of the importance of green spaces. Through actions such as planting street trees, greening of public spaces, and greening of private residences, the area of 'created greenery' in Fukuoka City's defined built-up areas was increased by 9.1% from 1996 to 2008, and over the same time the area of formal parks and greenspaces increased by 21.4% due to creation and incorporation of new parks (Fukuoka City, 2009). Moreover, there is also a concurrent interest in Fukuoka in the provision of *Kaiteki Kankyou (快適環境)* – a livable environment – through urban planning and environmental governance (Mabon et al., 2019).

Taipei is the capital and a special municipality of Taiwan (The Taipei City Government World Wide Web, 2011). Located in the northern part of Taiwan, Taipei serves as the development center for Taiwan's financial, political, educational, cultural, and other fields. The city comprises 12 districts covering an area of 271.7997 square kilometers. With a population of about 2.5 million people and a population density of approximately 9,200 people per square kilometer (Department of Household Management, Ministry of Interior, 2022), Taipei experiences a subtropical monsoon climate with significant rainfall (Figure 2).

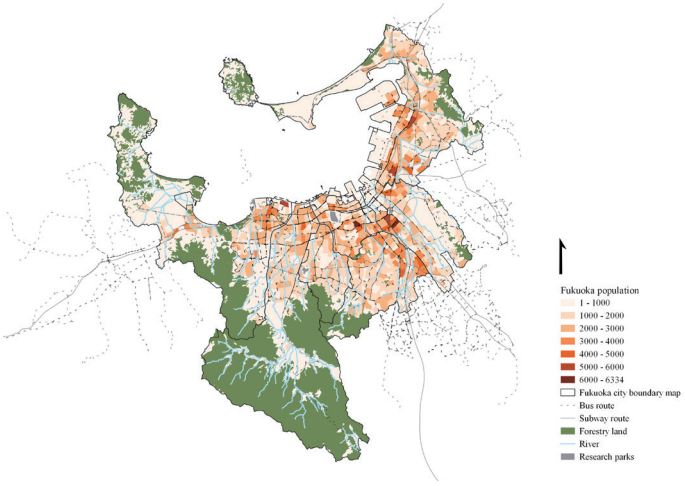

Figure 1. Basic information of Fukuoka City

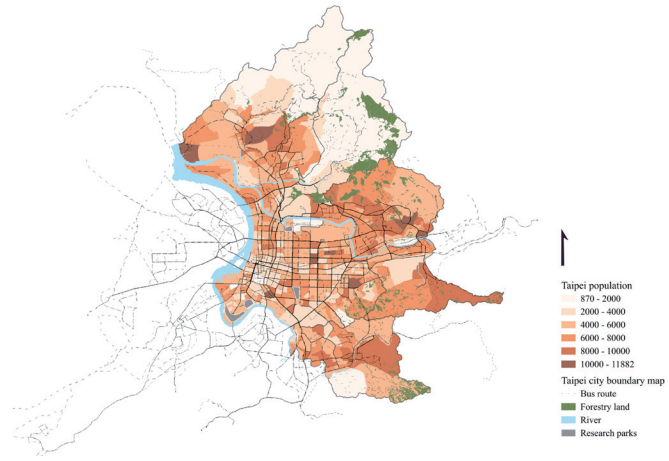

Figure 2. Basic information of Taipei City

The urban planning of Taipei has been significantly influenced by Japanese colonial rule. During the Japanese colonial period, urban planning was largely based on the experiences of large European cities. The Japanese authorities constructed new roads based on the old urban planning and the original road network, continuously developing Taipei into a modern city (Shengqing Zhang, 2003). After World War II, Taipei City continued the urban planning system established

during the colonial period, with existing road planning and the creation of large metropolitan parks following similar principles (Center for Humanities and Social Sciences, Academia Sinica, 2019). As of June 2023, Taipei City has 1,819.1 hectares of park green space, averaging 7.3 square meters per citizen (Taipei City Government, 2023).

This research selected five urban parks in Fukuoka City and two parks in Taipei City as research sites as Table 1 and 2. These parks exhibit a variety of types, including general parks, regional park, neighborhood park, forestry park and so on. These types of parks in Fukuoka City belong to neighborhood core parks (including children's parks, block park, regional parks, and neighborhood parks) and urban core parks (including comprehensive parks and sports parks) (https://www.city.fukuoka.lg.jp/jutaku-toshi/koenkeikaku/midori/02-01.html). And also, the selection of parks covers a significant portion of the types of urban parks and is highly representative. These parks cater to a diverse range of people and feature complex and comprehensive facilities that can meet various needs, including rest, observation, walking, playing, and sports. The selected parks vary in size, with areas ranging from 0.018 km² to 0.457 km², making them suitable for a comprehensive exploration of the impact of different park characteristics on public engagement and physical activities.

To clarify the types of each city park, we have created a typology based on factors such as size, location, regional characteristics, relationship with the transportation network, purpose of planning and maintenance, and historical background (Table 1). This typology helps to categorize the parks more accurately and provides a comprehensive understanding of their roles within the urban landscape.

By examining these parks, this research aims to understand how different configurations of park elements can optimize physical activity and inform better park design practices that enhance public health and well-being, contributing to the broader goal of creating more livable and sustainable urban environments.

4. Data and method

Related studies have found that public green spaces, green landscapes, and natural scenery attract more attention. According to "Basic Elements of Landscape Architectural Design" (Booth & Hiss, 2012), the landscape design process usually includes six major parts: landform, plant materials, buildings, pavement, site structure and water. In order to explore the landscape composition and distribution of urban parks, landscape elements are divided into the following categories according to the rules of landscape design: water, forestry space, grassland, green space, hard space, hard ground, pavement, road, parking and sports facility. Taking Odo Park as an example, green spaces typically adjoin hard surfaces, with a lower proportion of trees and grass, lacks distinct features. Hard ground primarily serves as integrated activity areas, while hard space offering versatile functionalities (Table 2 and Figure 3). The integration of green spaces with hard surfaces in urban parks can significantly influence user experience and park functionality, as noted by Gill et al. (2008) in their study on green infrastructure's role in adapting cities for climate change.

Geographic Information System (GIS) is primarily used for spatial analysis, mapping, and data visualization. In urban planning, it aids in land-use zoning, infrastructure development, and transportation planning. GIS allows for the integration of diverse data sources, offering valuable insights for decision-makers across various domains by providing a geospatial perspective on complex issues, enhancing decision-making processes, and facilitating effective problem-solving (Longley, et al., 2015).

In this research, GIS tools were employed to investigate land use, specifically the composition of land within the park. Using GIS, a 5-meter by 5-meter grid was created to identify and classify landscape elements using color-coding. This grid size was chosen to balance detail and computational efficiency, ensuring a manageable data set while providing sufficient resolution to identify landscape features accurately. Furthermore, the choice of a 5-meter grid is supported by the need for a resolution that captures detail without overwhelming computational resources, which is essential in urban park studies where diverse elements are closely spaced.

To create the grid, the "Create Fishnet" tool in GIS was utilized, which generated a grid overlay for the park. Each grid cell, measuring 5 meters by 5 meters, was then analyzed to classify the landscape elements. OpenStreetMap (OSM) data were referenced to aid in the classification process. Each landscape element, such as water bodies, green spaces, and hard surfaces, was color-coded for visual clarity. The use of OSM data is particularly valuable as it provides up-to-date and community-verified geographic information, enhancing the reliability of the landscape classification.

The classification of sports facilities was carried out with greater detail. Sports facilities were divided into three main categories: large sports facilities (e.g., playgrounds, basketball courts), sports equipment (e.g., horizontal bar, climbing frame) and tracks (e.g., running tracks). Each category was distinctly marked and analyzed for its spatial distribution within the park. Detailed GPS coordinates and descriptions were recorded

during the field surveys, ensuring precise classification and mapping (Appendix 1-5).

Table 1. Basic information of target parks in Fukuoka City and Taipei City

Park	Features	Content
Ohori Park	Location	Central Fukuoka
	Type	General Park
	Area (km²)	0.398
	Regional Characteristics	Located near the city center, adjacent to Fukuoka Castle ruins
	Transportation Network	Accessible by subway (Ōhorikōen Station) and several bus routes
	Planning and Maintenance	Designed as a public leisure area with a large pond, jogging tracks, and cultural facilities
	Historical Background	Originally part of the Fukuoka Castle moat system
Odo Park	Location	Western Fukuoka
	Type	General Park
	Area (km²)	0.173
	Regional Characteristics	Located near residential areas and the coast
	Transportation Network	Accessible by bus and a short walk from the nearest subway station
	Planning and Maintenance	Provides recreational space for nearby residents, includes sports facilities and open green areas
	Historical Background	Developed as part of the city's coastal reclamation projects
Sanno Park	Location	Southern Fukuoka
	Type	Regional Park
	Area (km²)	0.060
	Regional Characteristics	Situated in a suburban area
	Transportation Network	Accessible by local bus services
	Planning and Maintenance	Serves the local community with playgrounds and open spaces
	Historical Background	Established to provide green space in rapidly developing suburban areas
Nomaoikei Park	Location	Northern Fukuoka
	Type	Neighborhood Park
	Area (km²)	0.041
	Regional Characteristics	Located in a mixed residential-commercial area
	Transportation Network	Easily accessible by bus
	Planning and Maintenance	Offers a small green oasis for local residents
	Historical Background	Part of urban greening initiatives to enhance livability
Seinanmorinokohan Park	Location	Western Fukuoka
	Type	General Park
	Area (km²)	0.192
	Regional Characteristics	Located near educational institutions and residential areas
	Transportation Network	Accessible by bus and a short walk from the nearest train station
	Planning and Maintenance	Supports recreational activities and environmental education
	Historical Background	Developed to provide green space in conjunction with urban expansion
Qingnian Park	Location	Central Taipei
	Type	General Park
	Area (km²)	0.244
	Regional Characteristics	Situated in a densely populated urban area
	Transportation Network	Accessible by MRT and several bus lines
	Purpose of Planning and Maintenance	Provides recreational and cultural space for city residents
	Historical Background	Established as part of post-war urban redevelopment
Yuquan Park	Location	Northern Taipei
	Type	Neighborhood Park
	Area (km²)	0.018
	Regional Characteristics	Located in a residential area
	Transportation Network	Easily accessible by local bus routes
	Planning and Maintenance	Offers a small, peaceful area for local residents to relax
	Historical Background	Part of neighborhood development initiatives to improve local amenities

Table 2. Basic information of classification of landscape elements

Landscape elements	Description
Water	All bodies of water within the landscape, such as lakes, rivers, ponds, and fountains, even the swimming pools
Forestry Space	Areas with high coverage of tree and forest
Grassland	Refer to extensive areas covered with grass, often used for recreational activities, sports, or as part of the landscape's green coverage.
Green Space	Adjoining hard surfaces and have a lower proportion of trees and grass, often lacking distinct features. .
Hard Space	Hard spaces are paved areas within the landscape
Hard Ground	Refers to hardened surface areas, which can include concrete, asphalt, or stone-paved grounds. Primarily serves as integrated activity areas.
Pavement	Pavements are pathways specifically designed for pedestrian use, usually along streets or park edges.
Road	Roads are paved paths intended for vehicular traffic.
Parking	Parking areas are designated spaces for vehicle parking, typically hard surfaced.
Sports Facility	Areas designated for sports activities, such as basketball courts, soccer fields, tennis courts, and gyms.

Figure 3. Landscape elements diagram of Odo Park, Fukuoka

Data processing involved several steps to ensure accuracy and comprehensiveness. First, raw data from field surveys were cleaned and standardized. GPS coordinates were cross verified with OSM and Google Street View to confirm the locations and types of landscape features. Next, the data were imported into GIS software, where the "Create Fishnet" tool was applied to generate the grid. Each cell in the grid was then manually coded based on field survey data and OSM classifications, ensuring high accuracy in the representation of landscape elements. Overlap sports facilities with landscape feature classification maps.

5. Result

By examining the land use classification based on color-coding, it is evident that green spaces and hard-surfaced areas dominate in each of the studied parks. By calculating the area and proportion of each type of landscape element and summarizing the data for all the parks studied, it is observed from the charts that the area of green spaces is approximately twice that of hard spaces. Specifically, green spaces cover about 46% of the total area, while hard spaces account for around 23% (Table 3) These hard-surfaced areas provide residents with suitable spaces to engage in various physical activities, thereby promoting physical and mental well-being. Additionally, the presence of green spaces plays an important role in enhancing the aesthetic appeal of parks, which in turn attracts people to enter and utilize the hard spaces (Figure 4).

Through the master plans of these urban parks and the field survey, we can see that the layout of the sports facilities follows certain patterns. Sports facilities are usually located in the boundary areas of the park or close to the park roads, and the facilities have been distributed on hard fields, including the following three situations:

1) Large Sports Facilities: These include track and field fields, basketball courts, tennis courts, and baseball fields. They are usually concentrated together in the park and are typically set up on one side of the park. These large sports facilities are surrounded by green spaces, which help to distinguish them from the rest of the park.
2) Sports Equipment: These facilities are usually set up in hard spaces and often connect with the road or are close to it, providing good accessibility. Sports equipment areas typically have high vegetation coverage around them, creating a pleasant environment for users.
3) Tracks: These are strip-shaped sports facilities, usually consistent with the park's road distribution. When designing runway roads, attention must be paid to the landscape design on both sides because a well-designed landscape encourages people to engage in physical exercise.

Table 3. Landscape elements percentage of parks

	Ohori Park	Odo Park	Sanno Park	Nomaoikei Park	Seinanmorinokohan Park	Qingnian Park	Yuquan Park
Location	Fukuoka	Fukuoka	Fukuoka	Fukuoka	Fukuoka	Taipei	Taipei
Architecture	3.67%	0.63%	5.70%	0.45%	0.45%	4.86%	6.21%
Forestryspace	9.86%	49.94%	19.90%	10.91%	31.27%	30.46%	0
Grassland	4.48%	0	18.61%	12.72%	4.71%	9.70%	56.46%
Greenspace	0	15.24%	16.54%	17.72%	13.53%	19.50%	2.15%
Hardground	1.65%	7.86%	24.91%	32.71%	16.50%	16.92%	5.06%
Hardspace	1.89%	4.78%	8.01%	2.86%	2.51%	3.87%	0
Parking	2.67%	7.08%	2.02%	0	2.41%	0.30%	15.89%
Pavement	7.63%	12.49%	1.94%	13.17%	3.21%	10.93%	15.89%
Road	5.97%	1.97%	2.37%	0	3.34%	0.26%	0
Water	62.17%	0	0	9.45%	22.06%	4.20%	0
Num of SF*	22	15	26	12	5	35	6

*Num of SF: Number of sports facil

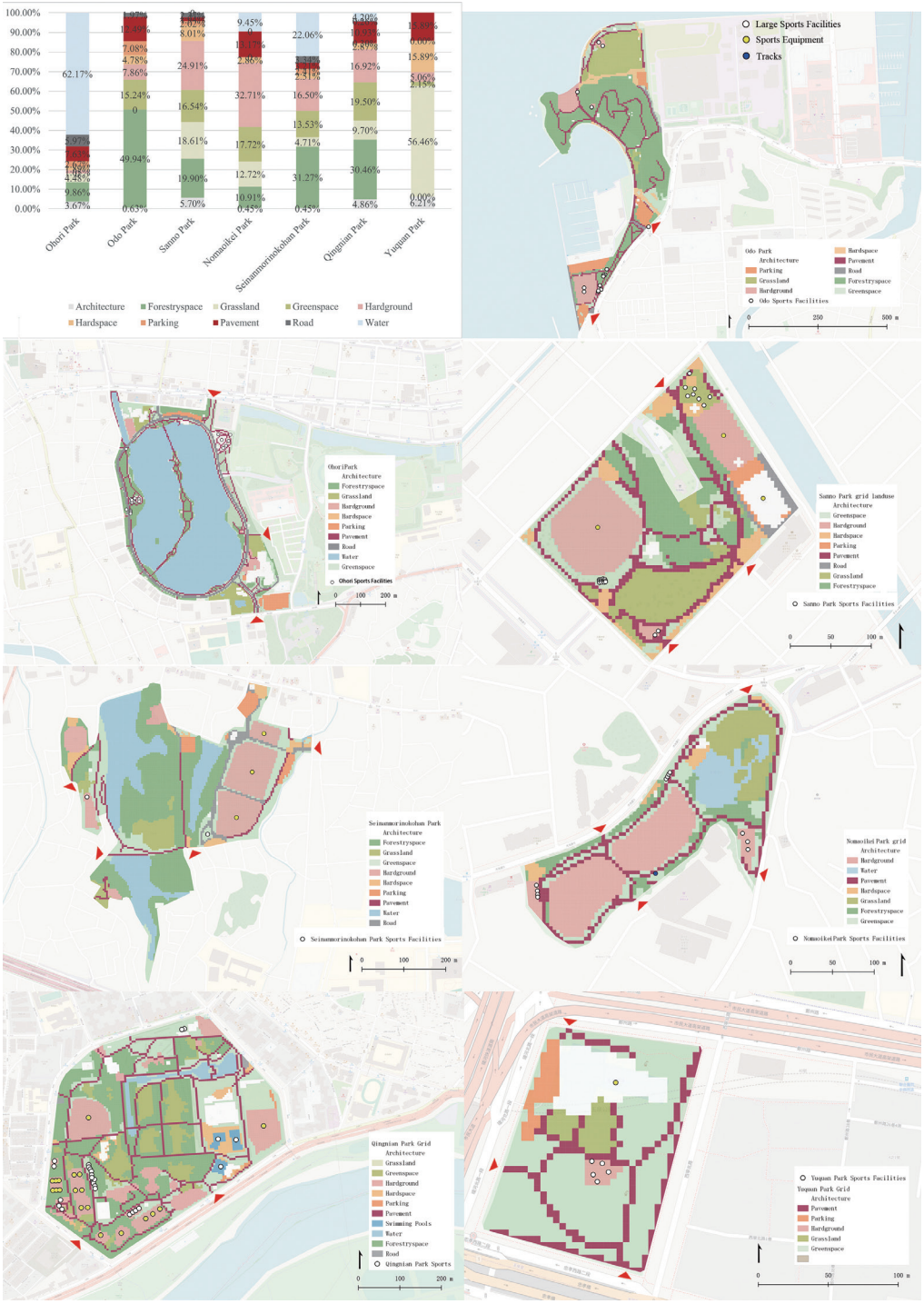

Figure 4. Distribution of sports facility and other landscape elements of urban parks in Fukuoka and Taipei

6. Discussion

The evidence presented in the literature review highlights a growing trend in people's engagement with urban parks, driven by increased awareness of the importance of nature exposure for physical and mental health. Interaction with natural environments can lead to measurable improvements in well-being, including reduced stress levels, enhanced cognitive function, and increased physical activity (Coldwell & Evans, 2018; WHO, 2016; Thwaites et al.,2005). The global pandemic has further underscored the critical role of urban parks in addressing mental health challenges exacerbated by prolonged social isolation and uncertainty (Xie et al., 2020). These green spaces offer individuals a means of connecting with nature and finding solace amidst turbulent times.

Urban parks serve as vital spaces for recreation and social interaction, facilitating opportunities for physical exercise, cultural activities, and community engagement (Zhang et al., 2012). The literature review underscores the diverse benefits associated with park recreation, ranging from improved mental well-being and social connections to enhanced physical health and resilience (Bancroft & Joshi, 2015; Ekkel & de Vries, 2017; Cohen & Marsh, 2010). Research consistently demonstrates the positive impact of urban parks on physical activity levels, providing conducive environments for walking, jogging, cycling, and organized sports (Santos et al., 2016; Daneshpour et al., 2009). By offering accessible and inclusive spaces for recreational pursuits, urban parks play a crucial role in promoting public health and fostering social cohesion within communities.

This research extends our understanding of urban park dynamics by examining the relationship between landscape elements and sports facilities distribution in two distinct Asian cities: Fukuoka City and Taipei City. Utilizing GIS technology, the research systematically analyzes park composition and design, offering valuable insights into the spatial patterns of landscape elements and their implications for public engagement in physical activities (Su et al., 2022). The findings highlight the importance of incorporating diverse landscape elements, such as green spaces, water features, and recreational facilities, in urban park planning to optimize public health outcomes and enhance urban livability.

The comparative analysis of Fukuoka City and Taipei City reveals commonalities in park design and utilization, despite differences in cultural context and historical development. Both cities show a strong commitment to providing accessible green spaces for residents, emphasizing the promotion of physical activity and well-being. The prevalence of green spaces and hard-surfaced areas in urban parks reflects efforts to create multifunctional spaces catering to diverse recreational needs and preferences. The presence of sports facilities within these parks enhances their utility as hubs for physical activity and community engagement, contributing to public health and social well-being.

However, there are several areas where this research could be further developed. As we all know, parks always serve people, although simple data analysis and visual map observation can provide a certain guiding role for the design and planning of parks, but from a practical point of view, it still needs to be related to crowd activities. Firstly, its geographical scope is limited to Fukuoka City and Taipei City, which may restrict the applicability of findings to cities with diverse cultural, climatic, and socioeconomic contexts. This suggests an opportunity to explore a broader range of urban environments to enhance the generalizability of results.

Secondly, this research predominantly utilizes GIS technology for data analysis, which, although robust, might not fully capture the intricate nuances of human interactions and experiences within parks. There is potential for incorporating qualitative data, such as user satisfaction and personal experiences, to provide a more holistic understanding of park utilization and its impact on well-being.

Thirdly, seasonal variations in park usage were not accounted for in the research. Considering how seasonal changes influence the frequency and types of activities in urban parks could offer valuable insights. This could involve examining how variations affect the availability and attractiveness of landscape features and sports facilities, thereby enriching the findings on public engagement.

Lastly, the research primarily focuses on the physical aspects of park design and usage, without delving deeply into policy implications or governance structures influencing park maintenance and accessibility. Exploring the role of municipal policies and community involvement in park management could offer deeper insights into optimizing urban parks for public health and well-being.

Although this research provides significant contributions, there remains ample room for further development in exploring diverse urban contexts, integrating qualitative perspectives, considering seasonal dynamics, and examining policy implications to enhance the understanding and management of urban parks.

7.Conclusion

Focusing on Fukuoka City and Taipei City, this research explored the relationship between landscape elements and sports facilities distribution in urban parks. By leveraging GIS

technology and comparative analysis, the research provides insights into park design and utilization across diverse cultural contexts.

The findings highlight the importance of integrating diverse landscape elements and sports facilities in urban park planning to enhance public engagement in physical activities and overall well-being. The research underscores the potential for cities to optimize park design strategies to promote health outcomes and improve quality of life for residents.

Moving forward, this research suggests the need for continued research and collaboration among urban planners, policymakers, and public health professionals to further optimize urban park design and management strategies. By leveraging GIS technology and interdisciplinary approaches, cities can better understand the complex dynamics shaping park utilization and develop targeted interventions to promote physical activity and improve public health outcomes. Additionally, future studies could explore the influence of socio-economic factors, cultural preferences, and environmental policies on urban park design and utilization, fostering more inclusive and equitable access to green spaces for all urban residents.

Declaration of competing interest

The author has no conflict of interest to report.

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Data availability

Data will be made available on request.

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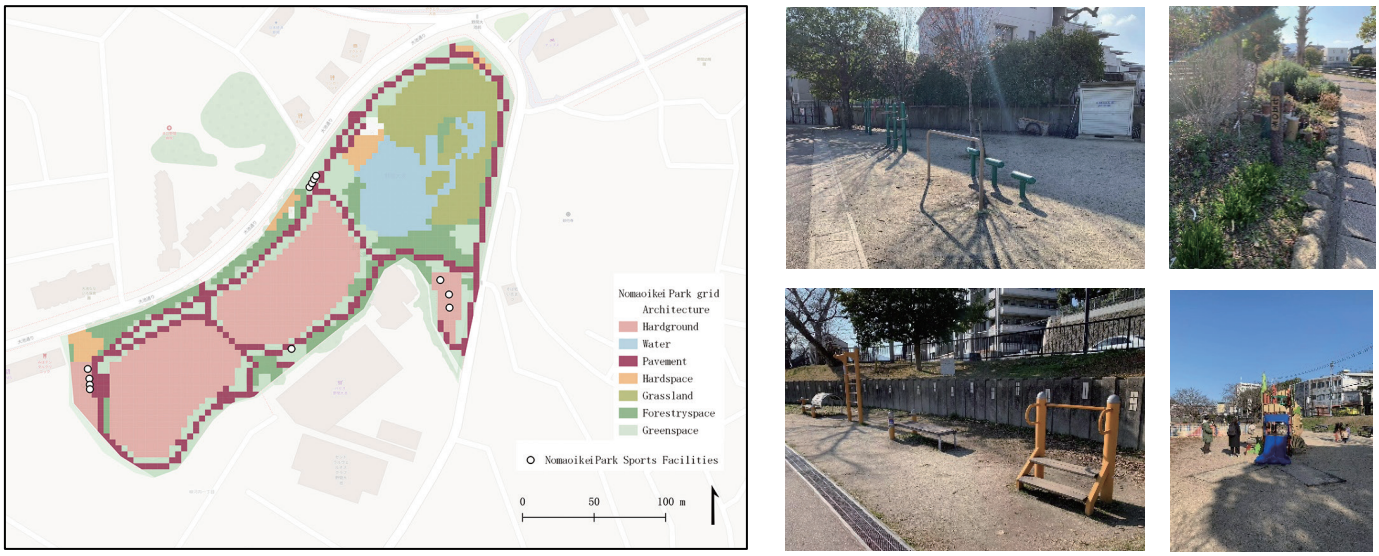
Appendix

Appendix 1. Sports facilities of Ohori Park

Appendix 2. Sports facilities of Odo Parkz

Appendix 3. Sports facilities of Sanno Park



Appendix 4. Sports facilities of Nomaoikei Park

Appendix 5. Sports facilities of Seinanmorinokohan Park

（受理：令和 6 年 5 月 14 日）