Post-pandemic Urbanism for Healthy Cities: Evaluation of Urban Green Spaces in Izmir

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Figure 1. Kordon social distance circles, Konak. © İzmir Büyükşehir Belediyesi, 2020

Introduction

Recently, the importance of urban open and green spaces has once again been highlighted by the Covid-19 pandemic. Restrictive policies designed to reduce infection have limited social interactions and concentration of activities. It is observed that the scarcities of public spaces and urban green spaces have been effective in keeping citizens in their homes due to the need for isolation. Yet, cities with more adequate open and green spaces have provided mobility to their citizens through individual transportation activities, such as pedestrian access and bicycle transportation, that permit less social interaction (Eltarabily & Elghezanwy, 2020; Ozdede et al., 2021). Accessibility to urban green spaces that maintain social distancing and a healthy environment has increased the resilience of citizens by reducing stress levels and providing physical activity. Accordingly, urban open and green spaces, especially urban parks and neighbourhood parks, have serious potential to create more liveable and healthy cities in the process of re-planning in the post-pandemic era. Designing resilient cities through revitalization of ecosystem services integrated with green infrastructure (GI) strategies is a requirement for preventing the negative externalities of the post-pandemic era. In this context, it is thought that accessible public open and green spaces, and bicycle and pedestrian routes at the neighbourhood scale should be standardised soon (Barbarossa, 2020; Ozdede et al., 2021).

According to Daily (1997), ecosystem services are the 'conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life'. Ecosystem services maintain biodiversity, and the production of ecosystem goods represents a crucial part of the human economy. Ecosystem services are the actual life-support functions, such as cleansing, recycling, and renewal, and have many intangible and cultural benefits, which are the benefits people obtain from ecosystems and are co-produced by the interactions between ecosystems and societies (Daily, 1997; Balvanera et al., 2017). Thus, ecosystem services are vital to creating resilient and healthy cities, especially in the post-pandemic period within GI strategies. Emerged in Florida in 1994, the GI approach maintains that ecosystem services are crucial parts of urban infrastructure. The approach permits improvement and management of urban and rural biodiversity in the broader sense, improvement of air quality, water and ecosystem products and services, and connections between natural, semi-natural and urban systems, and maximisation of environmental, economic, and social benefits (IMM, 2017; EPA, 2019; Hazar & Ozkan, 2020).

It is crucial to constitute GI systems, adequate blue/green axes, and ecological corridors, especially for climate change mitigation strategies (e.g., heat island elimination, smart farming). The GI strategies cover areas such as industrial heritage, waterfront areas, green areas, transportation networks, military zones, squatter areas, and other possible areas for urban renewal (IMM, 2017; Hazar & Ozkan, 2020). Urban open and green space planning and design within GI strategies improve ecosystem services in urban areas, which are vital for creating resilient and healthy cities and increasing carbon absorption and heat island elimination capacity. Thus, along with climate change, the negative health impacts of Covid-19 restrictions may be mitigated by GI strategies and urban green space design that enables social distancing measures and accessibility within walking distance. The Covid-19 pandemic has highlighted the importance of urban green spaces and provided opportunities for future sustainable, resilient, and healthy cities. From this perspective, this study evaluates urban green spaces of central districts in Izmir in terms of accessibility and size as per capita units and proposes spatial

solutions for future planning practices. The evaluation was performed using the Post Pandemic Green Spaces (PP-GS) model, which reveals the required minimum size of urban green space per capita to sustain social distancing and healthy living conditions regarding Covid-19 transmission measures. The study reveals the deficiencies in terms of urban green spaces in Izmir and provides urban planning and design principles for sustainable, resilient, and healthy cities.

Urban Green Spaces in the Post-pandemic Era

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Urban green spaces have been one of the most crucial parts of the cities in terms of ecosystem services and public spaces. The Covid-19 pandemic has drawn more attention to the importance of these aspects as it has triggered debates on urban areas, mostly focusing on public space and urban green area planning and design (Ozdede et al., 2021). The Covid-19 pandemic has also revealed the urgent need for the accessibility of public parks in terms of spatial equity (Ozturk & Senol, 2022). The primary criteria in planning adequate urban green space are known to be accessibility, number, and size. According to numerous studies, accessing green spaces should be possible within an average of 15-minute walking distance from settlement areas. Accordingly, neighbourhood parks should be within 20-minute walking distance (approx. 800 m), and urban parks should be within 30-minute walking distance (Manlun, 2003; Altunkasa, 2004; Aydemir, 2004; Onder & Polat, 2012).

Hierarchical distribution, size, quality of design in terms of active use, landscape design, materials (e.g., urban furniture), safety, and accessibility of multi-functional green spaces, such as children's playgrounds, neighbourhood parks, and sports areas, should be considered when planning and designing urban green spaces (Onder & Polat, 2012). Although the minimum amount of green space per capita varies among cities, the minimum size recommended by the World Health Organization (WHO) is 9 sqm (Kucukali et al., 2016). In addition, while accessibility is calculated by walking distance, public transportation routes and alternative modes of individual transportation (e.g., bicycle) to public parks are also important for accessibility.

Adaptation to the 'new normal' standards in urban space has become the priority agenda of post-pandemic urbanisation, which has directly affected the transportation preferences (e.g., individual over public transportation) and promoted new bicycle paths and pedestrianised streets in many cities (Roe & Whiteley, 2021). Also, it is emphasised that urban density can be diminished by designing walkable neighbourhoods, and that mass gatherings that increase the risk of contamination in public transportation can be prevented (Honey-Roses et al., 2020).

In some cities, Covid-19 restrictions have revealed the necessity of providing healthier environments that respect social distance regulations. Accordingly, new design approaches have been applied in green spaces aiming to provide safety in open areas by providing social distance regulations (e.g., Kordon social distance circles, Figure 1). Restrictive policies in response to Covid-19 have made the accessibility of urban green areas an important issue, especially in dense urban settlements. Thus, improving GI strategies has been an urgent requirement to ensure the spatial equity of residents. It is thought that temporary urban practices can contribute to GI strategies by creating temporary and/or movable parks (parklets), gardens, and green space designs as post-pandemic urbanism practices (Andres et al., 2021). Post-pandemic urbanism for urban green spaces requires both increased green space per capita and a holistic approach to the GI

system. Accordingly, natural and cultural landscapes such as rural areas, forests, pastures, and lakes can also be considered within GI strategies along with urban green spaces (Yucesu et al., 2017).

Previous studies have shown that the demand for urban open and green spaces has increased in the post-pandemic era. To preserve the quality of urban life, to create healthy cities, and to actively use green spaces, post-pandemic urbanism should focus on existing standards, multi-functional spatial distributions, accessibility, and continuity of urban green spaces.

Methodology

The study aims to understand the deficiencies of urban green spaces in four central districts of Izmir (Figure 4) by applying the the PP-GS model, which reveals the minimum amount of green space required per capita, based on social distancing principles that emerged during the pandemic (Ozdede et al., 2021). The study examines the required amount of green space and accessibility of neighbourhood parks and proposes spatial suggestions for the districts and neighbourhoods from the perspective of healthy cities. Urban open and green spaces were spatialised by evaluating the green spaces of Konak, Balcova, Narlidere and Guzelbahce districts. These districts have been chosen for being located on the waterfront and having variable population density.

The PP-GS model

The PP-GS model (Ozdede et al., 2021) is based on mathematical models used to quantify green space standards previously used by Gedikli (2002) and Aytatli (2013), according to the social distancing requirements and restrictions of the post-pandemic era. The model variables are 'social area size per capita', 'group size', 'distance between two groups', and 'intensity and frequency of use of the park'.

The model was constructed on a hypothetical neighbourhood of 10,000 people (with a medium density of 150 people/ha) with a walking distance of 400 m from a primary school and a neighbourhood park unit in the centre. The minimum distance between two people was determined as 2 m, considering the social distancing requirements of the pandemic era, and the group size was determined as two people and the distance between two groups was determined as 4 m for situations where more than two people are prohibited from being together in a public space (Figure 2 and Figure 3). In determining the intensity and frequency of park use, the frequency of physical activity (three times a week, half an hour) recommended by health authorities was taken as the basis.

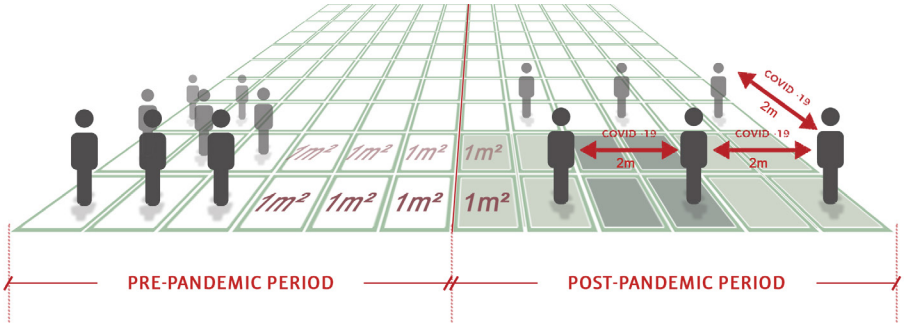

Figure 2. Minimum distance between two people before and after the pandemic. Source: Ozdede et al., 2021

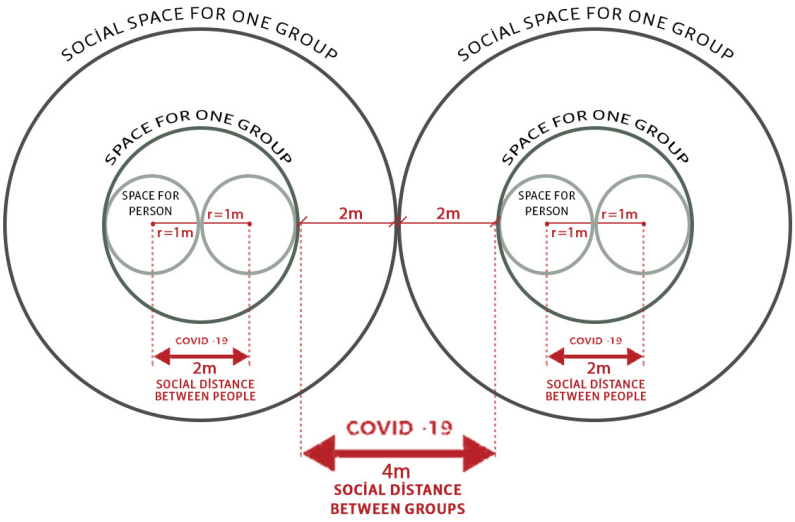

Figure 3. Social distance determined between individuals and groups. Source: Ozdede et al., 2021

According to the model, if everyone uses the neighbourhood park three days a week, the required size of neighbourhood parkland is 108,000 sqm in total, with a unit size of 10.8 sqm in a hypothetical neighbourhood of 10,000 inhabitants. When the size ratios among different levels of park determined in regulation are considered, the results revealed in Table 1 can be obtained for the total city.

In this context, it is revealed that the 10 sqm/pp standard specified in the regulations is insufficient in terms of quantity; and also, there is not any qualitative design guidance. Thus, urban open and green space standards need to be reconsidered in the post-pandemic era (Ozdede et al., 2021).

	NEIGHBOUR-HOOD PARK	CHILDREN'S PLAYGROUND	URBAN PARK	SPORTS AREA	TOTAL
TURKISH REGULATIONS	2	1.5	3.5	3	10
PP-GS	10.8	8.1	18.9	16.2	54

Table 1. The amount of green space per capita according to the PP-GS Model (sqm/pp). Source: Ozdede et al., 2021

Case study area and urban green areas evaluation approach

Izmir is the third largest metropolitan city of Turkey, located on the country's western coast, with a total population of 4,425,789, of which 2,959,355 people live in the central districts. In 2021, case study districts numbered 518,066 people including Konak, with a population of 336,545, Balcova, 80,513, Narlidere, 63,438, and Guzelbahce, 37,572 people (TURKSTAT, 2021). Konak is the former CBD of Izmir with a relatively greater population density, while the Balcova, Narlıdere, and Guzelbahce districts are located on the southwestern growth axis of the city. The study area and central districts of Izmir are shown in Figure 4.

The urban green spaces in the case study area were evaluated in terms of their adequacy and accessibility for the PP-GS model requirement. Firstly, the existing total green space sizes was calculated using AutoCAD software and converted to the quantity of green space per capita (divided by neighbourhood populations) and used in the model comparison. The green space sizes of Izmir's central dis-

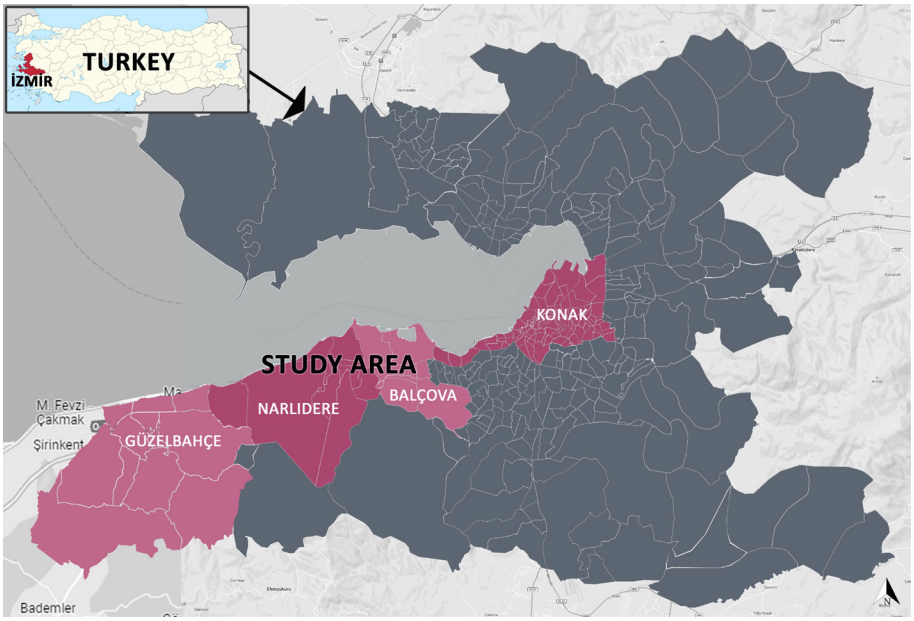

Figure 4. Case study area, Izmir, Turkey. Source: Authors

tricts were calculated using the 'area' tool in AutoCAD software on digital maps obtained from Izmir Metropolitan Municipality (IMM). Each neighbourhood was compared with standards produced by the PP-GS model in terms of their quantity of green space per capita and subsequently labelled as 'adequate' or 'inadequate'.

Secondly, accessibility was evaluated in terms of whether the size of each individual park could supply enough space for inhabitants within 500-metre walking distance. The population in a circle with a 500-metre radius was calculated using density data for each neighbourhood. In this calculation it was assumed that the population is distributed equally within the borders of neighbourhood. In this approach, the required minimum size of a park was determined for each neighbourhood. The parks larger or equal to a minimum size were retained, and the smaller ones were eliminated. To observe the spatial distribution of these parks and their range areas, 500-metre circles (accessible within walking distance) were drawn on a map (Figure 5). This map illustrates the spatial inequalities in the case study area.

Considering the often small, fragmented, and discontinuous green space morphology found in the 'park' layer, it is understood that passive green spaces such as 'refuges' are also included in the layers. However, it is understood that a clear distinction cannot be made without fieldwork; thus, all areas specified in the layers are included in the calculation.

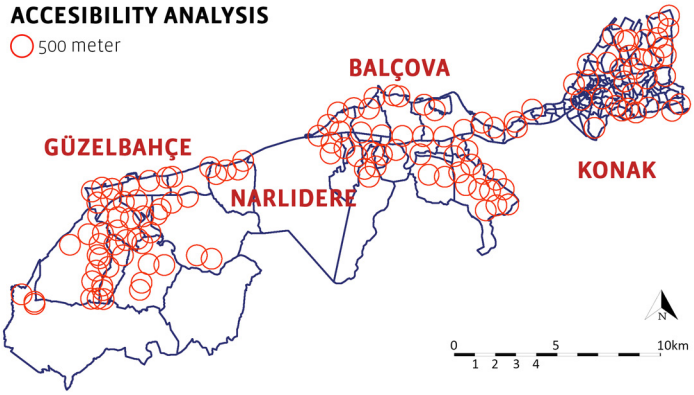

Figure 5. Accessibility of neighbourhood parks in districts. Source: Authors

Findings

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The total surface area of neighbourhood parks has been determined to be 830,733 sqm within the district boundaries, which have a total population of 518,066 (TURKSTAT, 2021). These numbers were compared with those recommended by the PP-GS model for Izmir's central districts (Table 2). It is important to underline that green space data used for 'neighbourhood park' includes refuges and cemeteries, and that there is lack of data on children's playgrounds, urban parks, and sports area. The total area has not been calculated either because it represents the required park area for the whole city. The study is limited to the four central districts of Izmir.

	NEIGHBOURHOOD PARK	CHILDREN'S PLAYGROUND	URBAN PARK	SPORTS AREA	TOTAL
REGULATIONS	2	1.5	3.5	3	10
PP-GS	10.8	8.1	18.9	16.2	54
KONAK	9.1	-	-	-	-
NARLIDERE	14.1	-	-	-	-
BALCOVA	33.3	-	-	-	-
GUZELBAHCE	45.1	-	-	-	-

Table 2. The amount of green space per capita in the districts according to the PP-GS Model (sqm/pp).
Source: Authors

According to Table 2, the Narlidere, Balcova, and Guzelbahce districts meet the minimum required green space per person proposed by the PP-GS model, while the Konak district does not. Of the four districts, Guzelbahce has the largest neighbourhood park area (45.1 sqm/pp) since it is located at the rural-urban fringe, and Konak has the smallest neighbourhood park area (9.1 sqm/pp) given that it is the former urban centre. It was observed that passive green areas (e.g., cemeteries) had been added to the 'neighbourhood park' layer, which limited the accuracy of green space evaluation (Figure 6).

The inclusion of passive green areas in digitised maps is very common in all green space digitalization of Turkey and, as such, it is believed that the real numbers are much lower than those revealed in the study. Also evaluated were density per person and green space adequacy per person at the neighbourhood scale. It was found that green area adequacy per person is lower than the PP-GS model standard (10.8 sqm/pp) in medium-high and very high-density areas, as well as in some low-density areas. At the neighbourhood scale, the number of inadequate (<10.8 sqm/pp) green areas is highest in the Konak district. The study prioritises the identified and mapped neighbourhoods for urban green space planning and design (Figures 7–11).

Accordingly, discontinuities and spatial inequalities are determined in terms of accessibility to urban green spaces in the neighbourhoods, especially in the Narlidere and Guzelbahce districts. Along with the lack of passive green areas leading to inadequate quantity and quality of urban green spaces, spatial inequalities in accessibility and discontinuities of urban green spaces are the main problems determined in the case study areas.

Figure 6. Examples of passive green areas in the case study area. Source: Authors

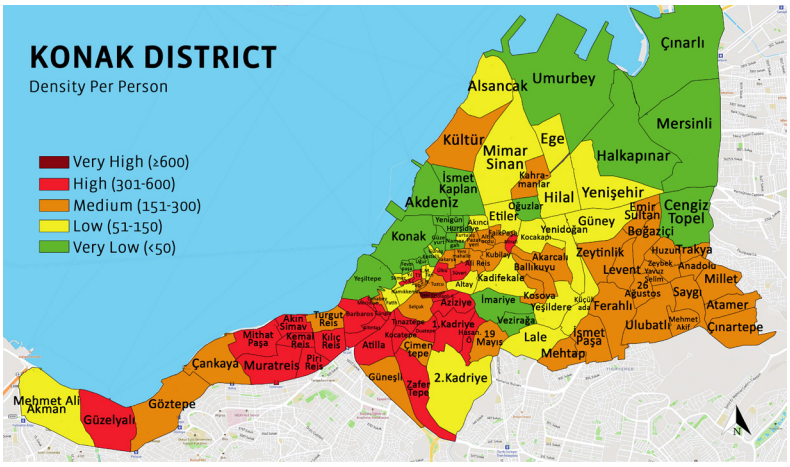

Figure 7. Density per person, Konak. Source: Authors

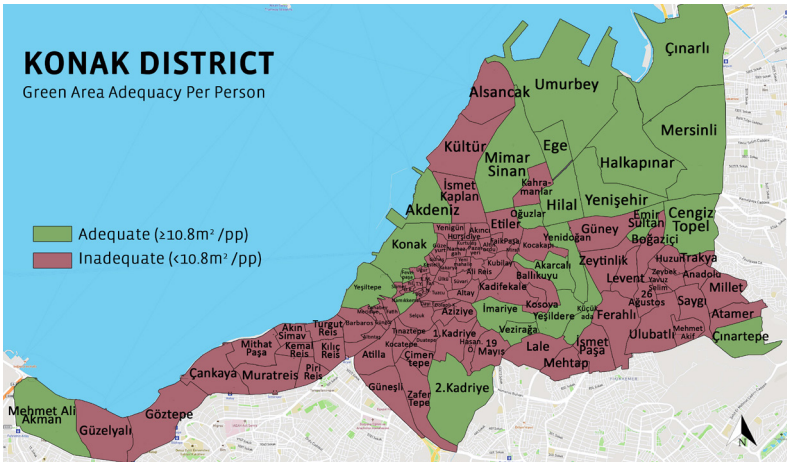

Figure 8. Green area adequacy per person, Konak. Source: Authors

Conclusions

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The study reveals the urban green spaces of the four central districts of Izmir, namely Konak, Balcova, Narlidere, and Guzelbahce, in terms of accessibility and size as per capita unit. The Covid-19 pandemic has had significant consequences, especially in metropolitan cities, affecting the lifestyles of present and future generations. The pandemic has also revealed the inadequacy of urban open and green spaces in cities due to the risk of contamination in densely populated settlements. In addition, accessibility inequalities to parks in terms of size, quality, and spatial justice have become more visible.

Considering the needs that have emerged with the Covid-19 pandemic, the planning and design of urban green spaces that protect physical and mental health and the quality of life is crucial, and their evaluation from the perspective of healthy cities can guide GI strategies in post-pandemic urbanism. According to the findings, it is revealed that there is not adequate amount of urban green space per capita in the Konak district and there are spatial inequalities in accessibility to urban green spaces, especially in the Guzelbahce and Narlidere districts. Thus, the deficiencies of the districts in terms of open and green space systems can be summarised as: 1) the size of the urban green spaces is not sufficient in the Konak

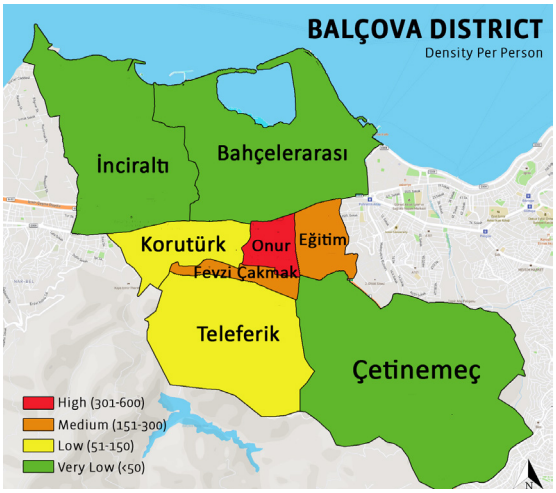

Figure 9. Density and green area adequacy per person, Balcova. Source: Authors

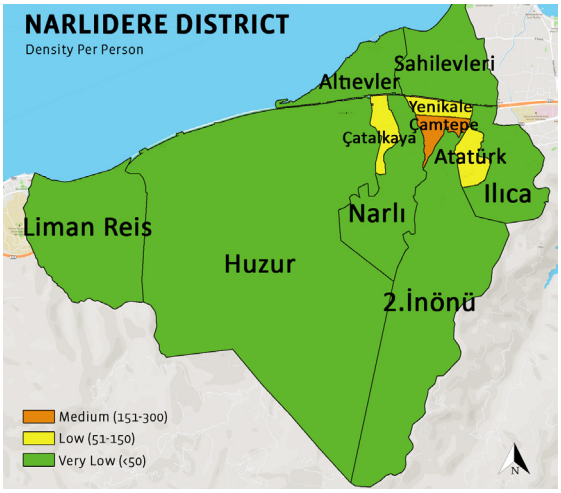

Figure 10. Density and green area adequacy per person, Narlidere. Source: Authors

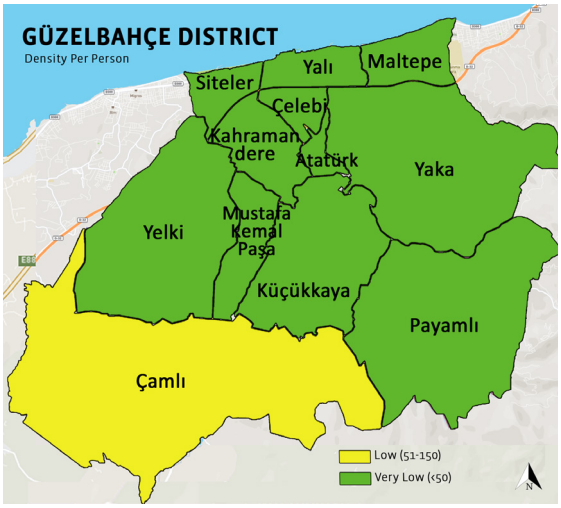

Figure 11. Density and green area adequacy per person, Guzelbahce. Source: Authors

district to meet the social distance rules; 2) passive green spaces are not suitable for the use of citizens are included in the green space systems; and 3) qualified green spaces exhibit a lack of continuity.

Regarding the deficiencies revealed by this study, the suggestions to guide future urban development strategies can be summarised as:

1. The green area per person standard in the regulation should be increased (10 sqm/pp is not sufficient.
2. Public spaces should be integrated into urban green system by designing pedestrian green paths, especially in dense urban areas like the Konak district.
3. The population within walking distance should be re-considered in determining the location and the size of parks in the plan.
4. Connections between parks should be provided by means of safe pedestrian and bicycle paths.
5. Contemporary design approaches such as 'tactical urbanism' can be influential for providing continuity in green infrastructure.

Moreover, waterfront neighbourhoods enjoy the advantage of having access to both natural open spaces and designed green spaces. However, the central areas of these neighbourhoods lack open spaces within walking distance and/or green connections to the waterfront. Higher density areas face greater difficulties in terms of urban green space per capita, yet the compactness of these neighbourhoods offers higher accessibility to adequately sized parks. The situation is quite different in low density areas, which districts have enough urban green space per capita as the population is relatively low. However, due to the nature of the fragmented settlement pattern of these districts, their accessibility to adequately sized parks is low. In other words, there are remarkably large parks in these districts, but they cannot serve inhabitants within walking distance, which creates spatial inequality.

From an ecological perspective, passive green spaces are quantitatively useful for the ecological sustainability of the cities as carbon sinks, which eliminates heat island effects and promotes biodiversity. However, urban green spaces have a great potential to become public spaces. For this purpose, both the quantity and the quality, active use, and accessibility of these spaces is important. Thus, urban green space planning and design in the post-pandemic era can help meet the needs of healthy cities and support ecological urbanism. All in all, the primary goal of Izmir should be to ensure the continuity of urban green spaces within current GI strategies, blue/green axes, and ecological corridors. Also, tactical and temporary urbanisation practices, including design elements such as pocket parks, pedestrian and bicycle paths, and accessible and qualified open and green space systems, can be designed throughout the city. It can be said that there are important advantages for post-pandemic urbanism in Izmir.

Each city has unique necessities in terms of its location, climate, population, and natural heritage. For example, Izmir, a city located on the Turkey's western coast, has natural open spaces that can be integrated with urban green spaces. The PP-GS model used in the study can be modified for other cities and/or settlements by considering the quantity and accessibility of the urban green spaces. In further studies, all 11 central districts of Izmir are projected to be comparatively evaluated for urban green space adequacy, continuity, and spatial justice in terms of accessibility within the necessities of post-pandemic urbanism. In addition, quality of design is another crucial factor to be measured in terms of active use, landscape design, materials, and safety. Multiple additional case studies and user surveys are required to evaluate the quality and active use of urban green spaces.

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