Experienced affordances of urban green spaces in comparison with planning standards: The case study of Xirokrini – Ampelokipi – Menemeni area in western Thessaloniki

Ioannis Totsikas[1,*], and *Garyfallia* Katsavounidou[1]

[1]School of Spatial Planning and Development, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece

Abstract. Adequate provision of Urban Green Spaces (UGS) is a fundamental pillar for sustainable urban development and resilience. Greek planning laws mandate standards for their size and service radius in neighbourhood units. Since the outbreak of the COVID-19 pandemic, in Thessaloniki, as in many cities around the world, residents' use of green spaces has intensified due to the need for close contact with nature, showing lack and uneven distribution of UGS in many residential districts. The scope of this paper is: to examine whether the size (surface) of available green spaces, which is the parameter taken into account in planning standards to calculate indexes such as "m2 of green space/inhabitant," is a safe indicator for the fulfilment of residents' needs for recreation and contact with nature; to investigate how other key factors, such as the physical design of UGS, the characteristics of the connecting routes etc., influence residents' use of them; and to examine how green spaces can be comprehensively integrated in urban fabric, advancing quality of life of the residents, through interventions that promote connectivity of and accessibility to available green spaces. It does so by using as a case study the area of Xirokrini – Ampelokipi – Menemeni in western Thessaloniki.

1 Introduction

Urban Green Spaces (UGS) are an integral part of cities, and their contribution is considered fundamental for achieving urban resilience covering all three pillars of sustainability (economy, society, environment) [1]. The rational distribution of green spaces in the urban fabric enhances their impact, increasing the surface of residential areas served by them and reducing the travel distances needed to be covered by users, especially benefiting the most vulnerable groups [2]. A metric often used in determining the location of UGS is the service radius, which is generally calculated according to the area and nature of a park. Large, comprehensive parks develop a bigger green space service radius. However, a park's actual service radius may often be constrained by the road system, transport, etc. [3]. In densely built cities, especially in degraded areas of large urban centers, rational distribution of UGS is often absent, despite the fact that in most countries, urban planning standards define the minimum surfaces of public spaces per neighborhood unit. It is however important to emphasize the need to combine quantitative characteristics (such as ratio per inhabitant, area, service radius), with qualitative ones, such as ease of access, activities and affordances offered by each park, and overall users' experience [4]. For example, it has been shown that users' perception of local green space provision matters more than objective measures of the provision [5]. In the case of Thessaloniki,

Greece, a public survey regarding citizens' attitudes, satisfaction level, actual behavior towards and future expectations about UGS, showed that users are dissatisfied with the current green areas and are very supportive of the development of new (and especially large-scale) green projects [6].

The aim of this paper is to draw conclusions about whether existing planning standards for UGS (namely, surface of UGS per inhabitant and service radius) are sufficient or, in reality, the frequency and quality of use of these spaces depend on other key factors (such as the existence of safe connecting routes, the provision of specific elements that promote people's activities in a green space etc.) [7]. The main hypothesis is that planning standards do not suffice for the provision of UGS that will be used to the maximum satisfaction by the residents; instead, planning or redesigning green infrastructure should be enriched with the provision of other important elements of physical design, so as to enhance neighborhood sustainability. To test this hypothesis, the paper focuses on the densely-built area of Xirokrini – Ampelokipi – Menemeni, in the western part of Thessaloniki.

After the introduction, the second part of the paper presents an overall picture of how cities have been responding to the COVID-19 pandemic by focusing on public space and what changes have been observed in Greek cities. The third part describes the methodology of the research. In the fourth section we present the findings

* Corresponding author: *johntotsikas@gmail.com*

of the spatial analysis of the study area, focusing on UGS distribution and service areas. The fifth part presents the results and conclusions and the final section is a description of the proposal.

2 UGS in the context of the COVID-19 pandemic and the case of Greece

2.1. COVID-19 pandemic strategies in European cities

Historically, cities have proven to have the ability to absorb shocks of social, economic, and technical systems, maintaining their functions, structure, and identity after periods of crises and adverse situations [8]. In this case to deal with the COVID-19 pandemic, each city adopted its own ways to cope with the changing conditions. Characteristic examples of cities that immediately implemented strategies in their public space to adapt to the unprecedented conditions of the pandemic are Paris, Milan, and New York. More specifically, the Paris strategy included the implementation of the concept of "15-minute city" in which the basic functions (work, education, health, leisure) are available within a service radius of 15 minutes on foot or by bicycle from the place of residence [9]. In practice, the creation of functionally independent neighborhoods constitutes a kind of deconstruction of the city, smoothing out the uneven distribution of land uses between districts. The purpose of the strategy is to decentralize transports and strengthen local centers, based on the concept of proximity. In the cases of Milan and New York, the main focus was on providing "open streets" for the inhabitants to walk, cycle and participate in activities in the street space [10]. The objectives were to discourage the use of car and to promote active mobility, with urban interventions such as the conversion of parts of the road network into cycle paths and pedestrian streets. Some common points between these strategies concern: (a) the return of public space to citizens, (b) the strengthening of alternative modes of transport, (c) the localization of services. The consequence of these interventions is the reduction of air pollution, due to the increase in green spaces and the reduction in car usage.

2.2 The state of UGS in Greek cities

The ratio of green spaces per inhabitant in the two large urban centers, Athens and Thessaloniki, is one of the lowest in the world. In Athens it is estimated to be about 2 – 2.5 square meters (m2) per inhabitant [11], while in Thessaloniki it is 2.6 m2 per inhabitant [12]. These figures are problematic, as they are much lower than the minimum necessary, which should be at least 9 m2 per capita, while an ideal UGS value is 50 m2 per capita [13]. The Greek planning standards, from 2004, are dated [14]. and the requirements they contain regarding the provision of UGS have a guiding character only, with the aim of adapting them to the particularities of urban areas such as social, economic, climatic, geographical, cultural characteristics, a fact that renders the application of a generalized regulatory framework almost impossible. These planning standards do not have a compulsory nature in already developed areas, unless there is a specific case brought to legal courts, for example in the case of a private owner's demand to de-characterize an open public space that has not been compensated by the Municipality in due time.

In the current era, climate change and the recent health crisis have served as an opportunity to reconsider the role of UGS in Greek cities. More specifically, the condition of the COVID-19 pandemic brought into focus issues concerning city planning and confirmed the fundamental role of UGS in achieving urban resilience. At the same time, it led to changes in urban life showing new needs such as proximity, connectivity, and close contact with nature. Since the outbreak of the COVID-19 pandemic, in Thessaloniki, like in many cities around the world, it has been observed that residents' use of green spaces has intensified 6, due to the need for being outdoors and close to nature. These new conditions have highlighted weaknesses of urban planning but also problems of densely built areas, such as a lack of green spaces in the urban fabric, their uneven distribution etc., as a result of the way urban areas developed during the previous decades.

3 Methodology

The case study concerns the area of Xirokrini - Ampelokipi - Menemeni which is located on the western side of Thessaloniki's metropolitan area. The research methodology included (a) a spatial analysis of the study area, (b) a questionnaire survey and (c) a field observational study. More specifically:

a. *Spatial analysis of the study area*. The spatial analysis included a review of the district's historical identity, socio-spatial characteristics, economic development trends, and a detailed analysis of the adequacy, condition, and function of its UGS. The historical review provided an overview of the urban development and the general character of the area. Subsequently, the demographic, social and economic characteristics were examined, based on census data. Afterwards, the urban characteristics and the existing planning framework of the region were analyzed. In addition, the transportation network and the organization of existing land uses were studied, in order to diagnose existing problems and to select appropriate areas in which modifications could be proposed in the direction of securing new green spaces and achieving the best accessibility to them. Conclusions were drawn with tools such as service radius for each green space, based on experiential observation, in comparison to population densities and planning standards per neighborhood.

b. *Questionnaire survey*. An investigation was carried out of the residents' opinions and needs, regarding the UGS of the study area. The primary research of the questionnaire was addressed to the residents of the area with the aim of integrating the concept of participation in the context of the study, integrating residents' opinions in

a direct way. The random sampling includes answers from 214 residents of the study area (total population 55,242). The publication of the questionnaire on a local news website (https://ditika.gr/) played an important role in the collection of responses, which significantly reduces the sampling error. The responses were collected during the month of April 2021, during the lockdown period due to the COVID-19 pandemic. The research participants were invited to visit the questionnaire website online. The questions were close-ended and some were open-ended, allowing respondents to answer in their own way. It is noted that the questions were based on those of a comprehensive research carried out on the use and quality of green spaces in the Greater Urban Area of Thessaloniki, carried out during February-March 2021 [6].

c. *Field observation*. Along with the questionnaire, research included on-site field observation, focusing on the activities taking place in the open spaces of the area, with photographic documentation, emphasizing on which social groups use the spaces and in what manner.

4 Spatial analysis of the study area and the public spaces within it

4.1 Location

The district of Xirokrini - Ampelokipi – Menemeni lies in the western part of Thessaloniki's metropolitan area, which with a population of 1.006.112 inhabitants, is the second largest city in Greece, after Athens (National Statistical Authority, 2021). The specific district is located on the fringes of the densely built historic center of Thessaloniki, to the northwest of the central train station (Figures 1a and 1b). The area is bisected and strongly delimited by railway lines, but also by road arteries that enclose it. It consists of dense construction, small building blocks and is characterized by mainly residential development.

The specific district was chosen because it constitutes an interesting case study, located as it is in the immediate proximity of the center of the city of Thessaloniki, sharing the common attributes of compact Greek towns (degradation of housing stock, lack of green spaces and high population and urban density). It is a rather typical example of a residential neighborhood developed at the western outskirts of the center, with a population of low to median income. Thus, the results from the study are transferable to many other similar districts, sharing the same attributes. The aim of the study is to propose an urban design strategy specifically focused on UGS, based on the conclusions of the analysis, to provide a boost to the local economy, to the quality of life of the residents, taking into account local specificities and social needs, thus ensuring a quality urban environment.
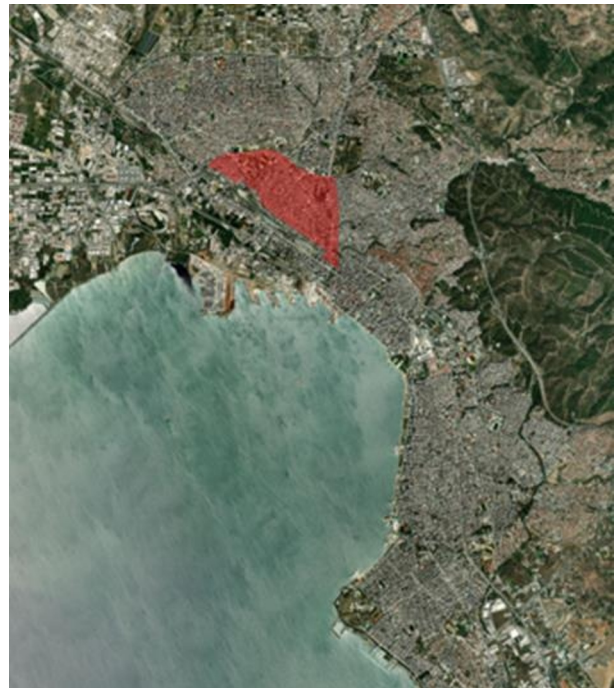

Fig. 1 a. Integration into the wider urban space. The location of the study area in Thessaloniki's Greater Urban Area, outlined in red. Source: Google Earth and own processing.

Fig. 1 b. Study area boundaries. Source: Google earth and own processing.

4.2 Demographic and economic trends

With regard to the statistical data of the region which were drawn from the EL.STAT service, the population during the period 1991-2011, increased significantly with a percentage of 18% in the first decade, while during the second decade is observed stagnation, which is estimated to be due to, the increase in the attractiveness of neighboring areas which are located on the outskirts of the metropolitan area (suburbanization trend) on the one hand and on the other hand, in the stagnation of the inflows of economic immigrants [15]. Regarding the nationality, 10% of the population comes from another country, a high percentage compared to the urban complex of Thessaloniki, a fact which indicates the multicultural character of the region. Regarding education, medium and low levels prevail. Considering the age structure of the

inhabitants, the population of the area is characterized as mature. Finally, regarding the economic characteristics, the majority of the population is employed in the 2nd and mainly in the 3rd productive sector, as it is a purely urban area. Furthermore, unemployment is high (30% of the total population).

4.3 Existing land uses

Main use is residential. Land use conflicts are not identified due to the absence of supralocal uses or other activities incompatible with residential use. Roughly, the organization of land uses is presented as follows: Pure residential use is located inward the neighborhoods, while mixed residential use is concentrated and developed along the main road network, with a depth of one building block. Around the perimeter of the residential area, pockets of shared and communal uses are placed. In addition, three clusters of central functions can be identified and two areas of special uses: an active military camp and a cemetery. Parking spaces are scattered in the study area, while it is worth noting that several of them occupy spaces designated as UGS in the urban plan.

4.4 Transportation infrastructure

Regarding the issues of existing transportation infrastructure, the longitudinal zone adjacent to the railway lines fragments the region by creating a continuous linear barrier. At the same time, there is a high use of the car, which creates traffic congestion on the main roads of the study area. In addition, it is noted that there are no streets designated as woonerf, while there is a deficiency in pedestrian streets, while sidewalk widths are often inadequate, or – in some cases – sidewalks are absent.

4.5 Analysis of existing UGS in the study area

As mentioned above, emphasis is placed on the adequacy, service radius and usage of UGS. All public spaces (parks, squares, playgrounds) are included in the analysis. This is a conscious choice, as potentially all these open public spaces could incorporate elements of greenery, although currently this is not the case. It is observed, on the contrary, that especially the squares are mostly covered by hard, impermeable surfaces, with minimal greenery. The same applies to playgrounds 16[16]. Nevertheless, in the context of sustainable development and the strengthening of the city's resilience to climate change, it is crucial that there is an immediate shift in the design standards of these typologies of spaces, so that they can be included in the green infrastructure network.

From the recording and mapping of these spaces, we conclude that the main characteristics are fragmentation and limited areas, especially in the central part. In total, they occupy 8.1% of the total area of the study area and show a scattered distribution with concentration at the western and eastern ends. Finally, at the neighborhood unit level, an inverse ratio is recorded between population densities and the extent of green spaces per inhabitant.

Table 1. Public spaces per neighborhood unit in the Xirokrini - Ampelokipi – Menemeni district.

	Urban unit area (HA)	Public spaces (sq.m.)	Number of units of public spaces	Population (residents)	m2 of public spaces per resident
Study area	**236**	**192,094**	**44**	**55,242**	**3.48**
P.E. 1 Menemeni	8.6	7,114	2	2,468	2.88
P.E. 2 Menemeni	8.3	5,668	2	3,054	1.86
P.E. 3 Menemeni	15	6,894	3	2,459	2.8
A. Kaistri	9.4	567	1	1,998	0.28
K. Kaistri	14	1,954	2	4.157	0.47
Akriton	6.8	2,156	2	1,684	1.28
Metagogon	14.6	1,564	2	3,431	0.46
Dimarxiou	8.4	0	0	2,617	0
Skeparni	14.4	530	3	5,318	0.1
Z. Pigis	11.7	3,697	2	2,299	1.61
Vaziouli	7.9	7,193	2	3,395	2.12
Ergatikes Katoikies	10.2	5,185	5	3,473	1.49
Philipou	14.5	0	0	6,879	0
Pl.Dimokratias	9.9	1,369	1	2,334	0.59
Xirokrini	52.6	27,404	16	9,676	2.83
Stratopedo	23	120,799	1	-	-

Regarding adequacy, the surface and service radius as defined by planning standards for UGS is shown in the map presented in Figure 2.

Fig. 2. The service surface based on the service radius as defined by planning standards for UGS.

However, this mapping does not capture the holistic picture of functionality and actual service. Key parameters are the function, the distance from the place of residence (proximity) and the state of the route of this distance (degree of connectivity). Consequently, the urban planning standards for the necessary land for UGS, do not fully reflect the desired situation. For example, a playground area is more functional than a large island of greenery given that it offers some specific service. However, the degree of functionality of a green island with high connectivity and proximity to the residential area is greater as in most cases it shows more visitation than a park space that is distinguished by a low degree of accessibility (for example, if it is necessary to cross an avenue of great width so as to reach it). If these parameters are taken into account, especially the quality of the route and the affordances of each space, the map shows significant portion of the district not being covered by any UGS service area (Figure 3).

Fig. 3. Service radius of public - green spaces based on empirical observation.

More specifically, comparing the two maps (fig. 2 and 3), differences emerge in terms of the service radius of UGS. From Figure 2, the extracted wrong conclusion that the entire area of the study area is served sufficiently by UGS. This contradicts the findings presented in the map of Figure 3, which captures what is actually happening in the study area in terms of adequacy of UGS, if the experienced affordances of UGS is taken into account.

5 Results and conclusions

5.1 Spatial Analysis

Through the research on the way of using the green spaces of the study area, especially during the period of the COVID-19 pandemic, the following conclusions were drawn: a) The study area is characterized by a fragmentation and inadequacy of UGS; b) UGS are unequally distributed in the urban fabric, leaving a significant proportion without a substantial green space in proximity to residential areas; c) there was an observed increase in the needs for visiting green spaces during the COVID-19 pandemic; d) the choice of green spaces was based on the criteria of easy accessibility, connectivity and proximity to the residential area.

In summary, in the study area there is a deficiency in green spaces especially in the central-eastern part of the area, a lack of connection between the green spaces, limited safety for pedestrians and bicycles and the absence of UGS with a functional character. These findings are not evident by the implementation of the planning standards, but rather by combining quantitative criteria (size, distance) with qualitative criteria (safety and quality of connecting routes, affordances for activities for various age groups).

5.2. Questionnaire

The main results obtained from the answers to the questionnaire are the following: (a) During the pandemic, the number of visits to the public - green spaces of the study area increased. (b) The most basic criteria for choosing a shared space are primarily the distance from the residential area (proximity) and secondarily the size of the area, with the optimal solution being the combination of these two. (c) The most used means of transportation for the residents of the area is walking. (d) The time distance participants travel from home to the open spaces corresponds to 5 to 10 minutes. (e) The common green spaces are overall evaluated moderately to negatively in terms of quality and quantity. (f) The ideal common green space consists of walking paths, vegetation, seating areas, play areas for children's activities, sports facilities, and landscape aesthetics.

5.3 Field observation

The field research involved direct observation and photographing of the UGS of the study area during the COVID-19 pandemic, and in specific during the period of the month of April 2021. Based on this field research, the area's public - common green spaces are gathering places for all age groups (Figure 4). For the most part, most popular activities observed were the following: children's free play in playground areas, young people's outdoor activities in open sports areas and older people's socializing gatherings in parks and squares.

Fig. 4. Intensive use of the grounds of Megalou Alexandrou ex-military camp, the area's largest public space, during the field observation in April 2021.

6 Proposal

As the analysis shows, in order to achieve the maximum benefits of UGS, special emphasis is required on detail physical design in order to ensure the maximum possible accessibility for all social and age groups. In the proposal, UGS in the area are redesigned so as to include green corridors, pedestrian routes and woonerf-type streets that will ensure connectivity, especially for children and the elderly. This proposal is shown in the proposal map (Figure 5).
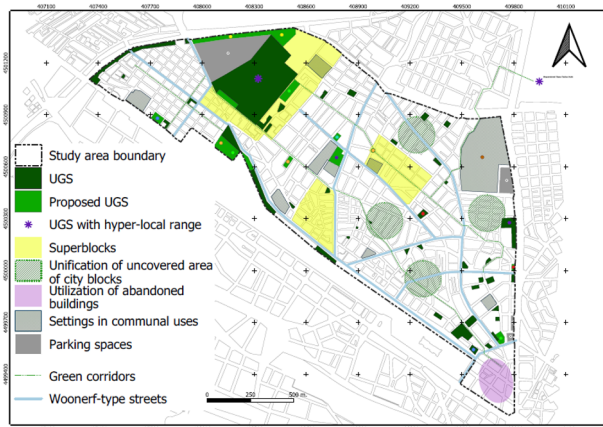
Fig. 5. Proposal map

According to the map above, the proposal includes the following:

1. The creation and acquisition of new UGS in place of existing parking spaces and urban voids.

2. The creation of superblocks in order to reduce the traffic and parked cars, in three areas: a) in a part of the district that lacks UGS, b) in an area with very narrow streets which makes existing car circulation difficult and pedestrian movement problematic c) in the perimeter zone of the most important UGS in the area (the Megalou Alexandrou ex-military camp), in order to make the transition smooth from urban to natural environment.

3. The unification of the uncovered spaces of urban blocks, in areas which have rectangular blocks and large uncovered spaces inside.

4. Regulation in 6 schoolyards, suggesting free access during the afternoon hours.

5. The conversion of part of the street network into green routes, so as to increase the connectivity of UGS with each other and with the residential area.

6. Conversion of the main road network to woonerf-type streets in order to enhance sustainable mobility and discourage the use of cars. In this way, the road network is going to be decongested by traffic and car parking. Parking areas are proposed to be moved to circumferential parts of the study area to avoid additional traffic on the roads.

7. Safe and accessible public spaces for vulnerable social groups. In particular, proposed areas are designed so as to include the elderly, children, people with special needs. Proposed UGS also include: open sports areas, agricultural areas, areas for teenagers and young people and areas for families.

Further research should focus on how the above findings could lead to an institutional change and in particular to a review of planning standards regarding UGS, so as to secure that existing and new green spaces are more accessible, especially by vulnerable groups, and that their physical design offers opportunities for a variety of users' activities, increasing their functional capacity.

References

1. K. Campbell et al., *Start with the park: Creating sustainable urban green spaces in areas of housing growth and renewal* (CABE Space, London 2005)

2. B. Martins, Urban For Urban Green **72**, 127571 (2022)

3. L. Zhang, C. Guo, Y. Jiang, IOP Conf Ser Earth Environ Sci, **170**, 032005 (2018)

4. A. Shoaib, K. Nadeem, H. S. Islam, A. Saleemi, GeoJournal **87**, 4975 (2022)

5. M. Schindler, M. Le Texier, G. Caruso, Applied Geography, **141**, 102673, (2022)

6. D. Latinopoulos, EuroMediterr J Environ Integr, *7*, 299 (2022)

7. S. Nissen et al., Sustainable Earth, **3**, 1, 17, (Dec. 2020), doi: 10.1186/s42055-020-00039-w.

8. A. Galderisi, Z Magaine **11**, 36 (2014)

9. C. Moreno, Z. Allam, D. Chabaud, C. Gall, F. Pratlong, Smart Cities, **4**, 93 (2021)

10. A. Renken, Open Streets and Community Process, Places Journal (2020)

11. P. Karanikola, T. Panagopoulos, S. Tampakis, G. Simoglou, A. Tzelepi, Nature-Based Solutions **3**, 100063, (2023)

12. D. Latinopoulos, Z. Mallios, P. Latinopoulos, Land Use Policy **55**, 130 (2016)

13. A. Russo, G. Cirella, Int J Environ Res Public Health, **15**, 2180, (2018)

14. L. Kissas, Planning standards and the urgent need for their careful review [in Greek], b2green, (2021)

15. G. Katsavounidou P. Kourti, *Chronicle of an announced exodus: The urban shrinkage of Thessaloniki* in Proceedings of the International Interdisciplinary Conference City under construction: plans, procedures and practices for the space of Thessaloniki (Thessaloniki: University Studio Press, pp. 40–50 [in Greek] 2019)

16. G. Katsavounidou, , IOP Conf Ser Earth Environ Sci, **899**, 012016 (2021)