

PRESENT SECURITY OF THE NEIGHBOURHOOD URBAN PARKS CONSIDERING SARS-COV-2 POTENTIAL SPREADING – A CASE STUDY IN URSYNÓW DISTRICT IN WARSAW

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ABSTRACT

Motives: It is expected that COVID-19 pandemic will impact future design, use and perception of urban green spaces such as public parks. How to facilitate residents' safe use of the urban green spaces and reduce health risks has become important question to consider by landscape architects and municipal authorities responsible for the public green areas resources. This research focuses on examination of urban parks of a typical residential district of a large city in terms of their security in time of COVID-19 pandemic.

Aim: In urban parks of Ursynów district in Warsaw were assessed: quality and present security and possibilities of re-adjustments to increase their security.

Results: Ursynów district has good quality, accessible parks. Larger parks offer picnic areas and shelters, have more than one, entrance and paths with widening for benches. All playgrounds are enclosed with gates to install dispenser for hand sanitization. Gates and knobs are made of metal allowing frequent disinfection. Benches and tables are usually properly distanced and those in shelters may be marked 'for visitors from one social bubble only' but in the future an emphasis should be put on more scattered pattern of park furniture. All parks are equipped with trash cans, but usually open or semi-closed, which should be avoided.

Keywords: urban green spaces, public spaces, design, outdoor safety, recreational facilities

INTRODUCTION

Theoretical background

Urban parks are essential spaces for collective interaction (Peters et al., 2010; Dadvand et al., 2016; De Vries et al., 2013; Litt et al., 2015), physical activity (Richardson et al., 2013; Hunter et al., 2015), and relaxation (Lafortezza et al., 2009) in the urban environment. They improve public health and well-

being (Bedimo-Rung et al., 2005; Payne et al., 2005; McCormack et al., 2010; Wolch et al., 2014; van den Bosch & Sang, 2017; Vujcic et al., 2018).

The COVID-19 pandemic has highlighted the relevance of access to urban green spaces that are interlaced within the built-up areas. The research of Venter et al. (2020) carried out in Oslo, has shown that during the lockdown period, recreational use augmented within residential areas and city parks roughly as much as in the forested zone. Cheng

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et al. (2021) also found that subdistrict-scale urban parks presence correlated with residents' expressed happiness. According to Johnson's et al. study (2021) park use corresponded to decreased residual COVID-19 case rates, chiefly with green space low and contiguous (not patchy). The results demonstrate that a minimization in total mobility may be a good strategy for reducing case rates.

The research by Ugolini et al. (2020) on impact of the COVID-19 pandemic on the usage and perceptions of urban green space has shown an augmented number of people walking to small urban gardens close-by (e.g. in Italy) or tree-lined streets (e.g. in Spain, Israel), as well as driving their car to green areas outside the city (e.g. in Lithuania). This research has emphasised the significance of inclusion of diverse types and sizes of greenery in cities and neighbourhoods, so that each resident has access to urban green spaces (UGS). The authors argue that to create flexible cities, urban design and planning should regard diversification of green spaces. Important are both: large parks offering spacious open-air green settings, valuable for visitation (even excluding large gatherings) in the pandemic time and smaller pocket parks and gardens which as much as possible guarantee access to UGS within walking distance from home for all residents (Ugolini et al., 2020).

Also the results of research of Xie et al. (2020) carried out in China during the pandemic demonstrate that more than half of the residents opted for visiting parks next to their homes, and the time spent travelling to parks usually did not exceed 10 minutes; thus, visiting a park in the neighbourhood was generally the first choice. The authors suggest that a dispersed network of smaller green spaces would facilitate interaction with nature for the residents, bringing about physical and mental health benefits. So, within the city each community has equal access to urban green spaces and reduced commuting time to urban parks and other UGS (Xie et al., 2020).

Also Honey-Roses et al. (2020) considering the impact of COVID-19 on public space anticipate a growing demand for smaller green spaces or neigh-

bourhood parks which provide refuge from the loud and busy city. The authors have observed in places with stay at home orders, the renaissance of the small neighbourhood parks (van der Berg, 2020). They also argue that cities with an existing dispersed network of small green spaces will be better adapted to grant opportunities for the delight in nature and decentralized network of smaller green spaces will easily provide residents with their 'daily dose' of nature. Also Liu and Wang (2021) point out that the potential of pocket parks in delivering accessible urban green space to whole urban population should be considered a crucial 'lifeline' to improve urban residents' health during the pandemic.

Mehta (2020) points that during COVID-19 pandemic, people spend most of their time in their neighbourhood. He notes that many residential streets, sidewalks, parking lots, and other spaces have been repurposed and neighbourhood space have been transformed for active living, play, and sociability. This demonstrates the need of space for everyday recreation in the neighbourhoods.

According to Honey-Roses et al. (2020) COVID-19 pandemic also results in users' modifying preferences and expectations about green spaces which gives rise to original designs, uses and practices in green space planning. For instance, green space designers may necessitate to plan more spaces for individualized and introspective use over team sports. Paths and running trails may need widening. Contemporary expectations concerning social distancing may demand re-assessing where it is possible to exercise within green spaces. Also new or extended exercise infrastructure may be needed given that actual green spaces may not be capable to take in the influx of residents at the updated levels of acceptable density (Honey-Roses et al., 2020).

Recommendations on security considering coronavirus potential spreading

The first SARS-CoV-2 infection was diagnosed in Wuhan, China in December, 2019. The World Health Organization announced the outbreak of the worldwide pandemic in March, 2020. It resulted in the

implementation of various preventive measures to cut down the risk of infection, which has changed numerous aspects of everyday life, including leisure time.

The technical report on social distancing of the European Centre for Disease Prevention and Control (ECDC) of March, 2020 did not address public green spaces, it only advised outdoor sporting events cancellation and encouraging people to engage in physical activity alone outside (Considerations relating to social distancing measures in response to COVID-19, 2020).

In September, 2020 further ECDC guidelines on non-pharmaceutical interventions against COVID-19 addressed coronavirus transmission and listed the following pieces of advice.

The physical distance of 1–2 m as key preventive measure is to be maintained with use of floor markings spaced at recommended distance, seat markings and rearrangement of furniture in public spaces.

Respiratory hygiene such as using paper tissue, which should be later properly disposed of, using no-touch bins is suggested.

Hand hygiene e.g. washing hands with water and soap or alcohol-based sanitisers, with widespread availability of hand-washing facilities is to be implemented.

Use of gloves was considered ineffective but it was mentioned that some people use them to avoid accidental touching of their mouth, nose and eyes.

Environmental cleaning for outdoor spaces may be limited only to standard detergents use on frequently-touched surfaces (hand rails, handles, door knobs); spraying (fumigation) disinfectants outdoors was not recommended due to the lack of effectiveness and possible damage to the environment.

The ‘social bubble’ concept appeared, i.e. constantly meeting with the same people – family, co-workers or friends can mitigate the negative effect of social isolation by allowing increased contacts yet minimising the risk of coronavirus transmission (Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK, 2020).

In May, 2020 (updated November, 2020) United Kingdom Government published its guidance for owners and operators on public spaces, including green spaces (COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces, 2020).

It advised maintaining 2 m social distance (at least 1 m with other means of risk mitigation e.g. face covering) and exercising and visiting outdoor public places with people one lives with or from one’s ‘social bubble’.

It also suggested implementation of cleaning protocols for touch points (e.g. hand rails, gates) and keeping toilet open but carefully managed to promote good hygiene, yet to diminish the risk of COVID-19 transmission.

In the management of green spaces (park, recreational grounds, openly accessible playing fields, linked with housing developments public open spaces and public burial grounds) it addressed the following issues and interventions: footway widening to adopt distancing between pedestrians, markings to maintain social distancing (benches, floor, lawns), movement guidance around park promoting one-way flow of pedestrians, providing separate entry and exit routes, enlarging entrances to minimise queues.

It also encouraged implementing facilities for personal vehicle access, preferably bike, to reduce use of public transport.

It emphasised that visitors should be able to wash or sanitize hands.

Outdoor playgrounds and gyms could remain open but with safe distance between users, placing equipment back to back or side to side where possible and surface cleaning (COVID-19: Guidance for managing playgrounds and outdoor gyms, 2020).

But if an area of playground/gym is enclosed a limit on the maximum number of users at one time should be communicated and where practicable a booking system implemented (COVID-19: Guidance for managing playgrounds and outdoor gyms, 2020).

Cafés and bars could only provide food and drink for takeaway.

The American Centers of Disease Control and Prevention (CDC) has published in May, 2020

guidance concerning among others also cleaning and disinfecting public spaces (Reopening Guidance for Cleaning and Disinfecting Public Spaces, Workplaces, Businesses, Schools, and Homes, 2020). It stated that outdoor areas do not require disinfection e.g. spraying disinfectants on sidewalks and in parks. Use of disinfectants can be done only on objects frequently touched by multiple people or outdoor hard surfaces.

In July, 2020 it addressed the problem of parks and recreational facilities (Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19, 2020). It advised: to stay at parks and recreational areas nearby one's home, to stay physically active and relieve stress, yet to maintain 6 feet (1,83 m) distance from people one doesn't live with (e.g. the use of markings on lawn) and to avoid crowded parks. It also encouraged to wash one's hands often.

In September, 2020 recommendation for management of outdoor learning gardens and community gardens maintained previously mentioned 6 feet distance and suggested implementing of one-way traffic, if possible (Considerations for Outdoor Learning Gardens and Community Gardens, 2020).

In October, 2020 park, trails and open spaces have been rated as lowest risk of coronavirus spreading when they permit social distancing of at least 6 feet between individuals or household groups and often touched surfaces and shared equipment are being cleaned or disinfected between uses or on regular schedule (Guidance for Administrators in Parks and Recreational Facilities, 2020). These guidelines also strongly advised wearing masks, particularly when social distancing measures are problematic to maintain.

The recommended distance of 2 m, however, may not be sufficient for people in movement. Some researches show that more rapid respiration while walking, running or cycling may create aerosol travelling for 4 or even 10 m, thus increasing risk of virus spreading, and suggest widening of the safe zone (Blocken et al., 2020).

It is known that aerosol containing virus may be infectious but it depends on virus concentration and

environmental conditions. Highly concentrated virus aerosol in the laboratory remains infectious for up to 3 hours (van Doremalen et al., 2020) but in outdoor environment, in sunlight and with minor virus concentration, drying saliva containing virus loses 90% of its infectious potential after approximately 15 minutes (Ratnesar-Shumate et al., 2020).

In Poland, after the initial complete lockdown of public spaces in March/April, 2020, green spaces have been gradually reopened with public health organisations (mainly ECDC) recommendations implemented.

Ongoing COVID-19 pandemic (and unfortunately all pandemics yet to come) rise the question whether landscape architects and planners are aware of their responsibility to provide de novo designed comfortable and safe spaces or to adjust so those already present. Probably the process of education (which is also my personal concern and duty) should also include those problems solving.

Aim of research

Previous research on consequences of the COVID-19 pandemic for the use of urban green spaces has highlighted the importance of access to green spaces within residential areas (Venter et al., 2020; Xie et al., 2020; Ugolini et al., 2020). It has been shown that visiting urban green spaces can improve health condition as well as meet the social interaction needs (Xie et al., 2020). Moreover, due to limits on movement and gatherings as well as closing of indoor recreational spaces, the pandemic has augmented the contribution of outdoor public spaces to both mental and physical health (Freeman & Eykelbosh, 2020). It has been also noted that the green spaces, located within the nearest neighbourhood have been frequently chosen by many urban residents for everyday recreation (Venter et al., 2020; Xie et al., 2020; Ugolini et al., 2020; Mehta, 2020; Honey-Roses et al., 2020). The fact that in many cities, due to safety reasons, the residents were discouraged from using public transport reinforced the trend to visit green spaces within walking distance from home. To decrease the

transmission of coronavirus and secure public health, restrictions on the use of public space, including green spaces, and social distancing have been introduced (Honey-Roses et al., 2020). Facilitating the safe use of green spaces and providing place for outdoor activities and socializing during pandemics have become an important challenge. As it can be seen now, cities may experience numerous peaks of the virus outbreak and it leads to the protracted restrictions on the social distancing and the use of public space (Kissler et al., 2020). As pointed by Freeman and Eykelbosh (2020) closed parks, amenities and green spaces also impede healthy outdoor activity and stress relief, subsequently driving individuals to use less convenient and more crowded spaces (e.g. sidewalks and pavements). Thus, the administration of outdoor recreational spaces takes the considerate study to balance the needs of the inhabitants against the potential risk of community spread (Freeman & Eykelbosh, 2020).

It is expected that COVID-19 pandemic will impact future design, use and perception of public space (Honey-Roses et al., 2020), including urban green spaces like public parks. How to facilitate residents' safe use of the urban green spaces and reduce health risks has become important question to consider by landscape architects and municipal authorities responsible for the public green areas resources. This research focuses on examination of urban parks of a typical residential district of a large city (Ursynów district in Warsaw) in terms of their security in time of COVID-19 pandemic.

The aims of the research are:

1. to characterise and assess quality of urban parks in the Ursynów district;
2. to assess their present security, considering the coronavirus potential spreading;
3. to assess possibilities of re-adjustments in order to increase their security according to the European and the American guidelines.

STUDY AREA

The study area is located within the city of Warsaw which is the capital and the largest city of Poland. Ursynów is the southernmost district of Warsaw

(Fig. 1). The surface area of Ursynów is 4379 ha, including built-up land of 2255 ha. The district covers 8.5% of the capital city area, which makes it the third largest district in Warsaw. The district has a population of over 150,000 (the population density is 3455 inhabitants/km²), being one of the fastest growing neighbourhoods in Warsaw. In 2015 the natural growth rate was 5.26 per 1000 inhabitants. Almost 25% of its residents are below 18 years of age (*Statistical Yearbook of Warsaw*, 2019).



Fig. 1. Map of Warsaw's administrative territory with the Ursynów district location

Source: own preparation.

The eastern section of Ursynów is heavily built-up with multi-storey blocks of flats, constructed mainly in the seventies of the 20th century using prefabricated cement blocks, popular in those years for ease of construction. Western and southern sections of Ursynów, where single-family housing dominates, is characterised by lower population density and broad open spaces and green areas. Ursynów was once called 'the bedroom district' because of its purely residential nature. However, now it is beginning to change its

character, mainly due to the emergence of numerous shopping, recreational, cultural and sports centres, restaurants and educational institutions or public and private universities.

The largest green space in Ursynów is Kabaty Woods Nature Reserve covering 924.72 ha, located in the Ursynów's southern extremity. It is a place of leisure and recreation for the inhabitants of Ursynów and the whole city. In the reserve there are designated tourist trails, walking trails and nature trails. For active recreation there are fitness trails and bike paths, adapted also for winter sports. Those who prefer passive recreation will find many tourist shelters, benches or forest playgrounds for children. On the outskirts of the reserve there is also a large recreational meadow where it is possible to light a fire, play a ball or sunbathe.

Apart from the nature reserve, Ursynów district provides eight publicly owned and free accessible parks for the residents (Fig. 2). These parks vary in size and type of recreational facilities (Table 1). The largest park is the Powsin Park of Culture, located at the edge of Warsaw, established in the 1940s as the suburban complex of sports and recreation. In the early 1950s the complex was incorporated into the city limits. In recent years, the park has been revitalised, and recreational facilities have also been developed and modernised. The majority of Ursynów parks – the Pope John Paul II Park, the Roman Kozłowski Park, the 'Lasek Brzozowy' Park, the 'Moczydełko' Park, the 'Przy Bażantarni' Park and the 'Silent Unseen' – special-operations paratroopers of the Polish Army Park – have been created in the last two decades to provide for the needs of physical

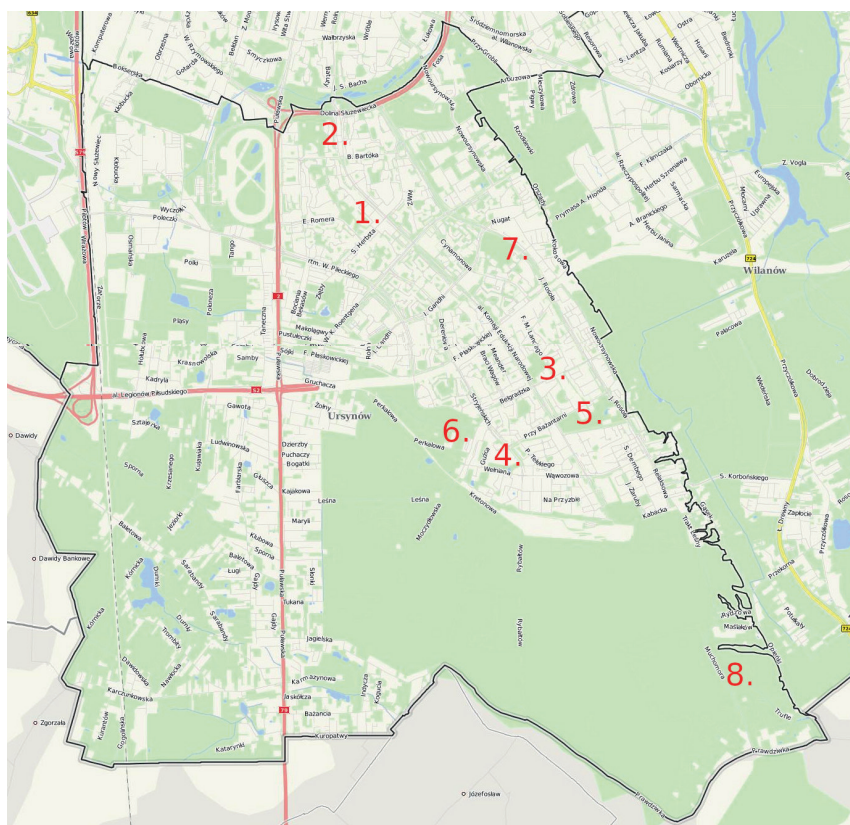


Fig. 2. Map of Ursynów's administrative territory with the eight parks location. Parks location is marked with the numbers as in the Table 1

Source: Map from the City of Warsaw Map Services available on <https://mapa.um.warszawa.pl/> customized by the author.

activity and recreation of the Ursynów inhabitants. The newest park of Ursynów – the Polish Inventors Park, officially established in 2018 within an open green space owned by the district, is still undeveloped.

Table 1. Size (ha) of the eight urban neighbourhood parks included in the study.

no.	Name	Size (ha)	% of the district
1.	Pope John Paul II Park	3,62	0.08
2.	Roman Kozłowski Park	8,68	0.20
3.	'Lasek Brzozowy' Park	3,64	0.08
4.	'Moczydełko' Park	0,83	0.02
5.	'Przy Bażantarni' Park	9,79	0.22
6.	'Silent Unseen' – special-operations paratroopers of the Polish Army Park	17,82	0.41
7.	Polish Inventors Park	8,10	0.19
8.	Powsin Park of Culture	49,53	0.13
			2.33

Source: own preparation.

MATERIALS AND METHODS

Data collection

Characteristics and quality of urban parks assessment

During the late summer and autumn beginning of 2020, each of the eight Ursynów's neighbourhood parks was visited and documented.

To describe the physical content of the Ursynów's neighbourhood parks, the Environmental Assessment of Public Recreation Spaces (EAPRS) tool was used (Saelens et al., 2009), previously applied in the research of Peschardt et al. (2016) concerning small public urban green spaces. In the assessment all elements of the EAPRS tool were considered. Some other elements originally not included in the EAPRS tool (e.g. outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, boudrome, fenced dog park, mini golf,

graduation tower, outdoor free library), and which were observed in the analysed parks, were also added to the assessment. All considered elements were as follows: path (distinct and designated walking area/route), paved trail (asphalt, concrete, brick), unpaved trail (gravel, grass), number of entrances, parking lot, roadway through, wooded area, meadow, wildlife areas, drinking fountain, picnic area, BBQ/fire place, shelter or pavilion, entertainment venue/stage, maps, soccer field, tennis court, basketball court, skate area/pump-track, pool, other (outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, boudrome, fenced dog park, mini golf, graduation tower, outdoor free library), restroom, open space (larger area at least 20x20 m, for active use), flowerbeds and special shrubs, water area, art/sculpture, bike rack, event postings, telephone, bench, lights along at least one trail, trash cans, sidewalks adjacent, rules/regulations sign, café, historical feature, table, other seating, view outside park and playground. It was determined whether or not an element is present in the park.

To assess the quality of the Ursynów's neighbourhood parks the Perceived Sensory Dimensions (PSDs) tool was applied (Grahn & Stigsdotter, 2010). The tool includes eight perceived dimensions: 'nature', 'culture', 'prospect', 'social', 'space', 'rich in species', 'refuge' and 'serene'. In each of the eight neighbourhood park, eight perceived sensory dimensions (PSDs) were evaluated and rated by the landscape architect, similarly to the research of Peschardt and Stigsdotter (2013). The rating of each park corresponds to the degree of the presence of the specific PSDs based on the factors that generate the PSDs as outlined in Table 2 (Peschardt & Stigsdotter, 2013). Each factor was rated according to a scale from 0 to 3. It was possible to award 7 different grades (0, 0.5, 1, 1.5, etc.) with 0 indicating that the factor was not present at all and 3 indicating that the factor was present to a very high degree. Then the grades awarded to all factors were summed up and divided by a number of factors that generate each PSD.

Table 2. Factors which generate the eight Perceived Sensory Dimensions (Grahn & Stigsdotter, 2010)

PSD	Factors
Nature	Nature quality
	Wild and untouched
	Free growing lawns
	Possible to light a fire
	Not crowded
	Feels safe
	Hilly
Culture	Fountains
	Statues
	Foreign plants
	City park characteristic
	Pond, canal
	Flowers
	Wooded pasture quality
Prospect	Plane, well-cut grass
	Prospect
	Cut lawns
	Football fields on grass
	Football fields
	Football fields are lit up
	Small ball grounds
	Showers, changing rooms
Social	Entertainment
	Exhibitions
	Restaurant
	Market stalls
	Paths made of gravel
	Special park animals
	General good lighting
	Roads well lit up
	Access to restrooms
	Places sheltered from the wind
	Sunny places
	Shady places
	Several seats and benches
	Tables and benches
	Plenty of people
Feels safe	
Paths with hard surfaces	

cont. Table 2

Space	Spacious
	Areas not crossed by paths
	Lots of trees
	Places sheltered from the wind
	Sunny places
	Shady places
	Places where people can gather
Rich in species	One can detect several species of animals
	Natural plant and animal populations
	Many native plants to study
Refuge	Many bushes
	Animals that people can feed and pet
	Sandpits
	Tables and benches
	Watching people being active
	Play equipment
	Feels safe
Serene	Silent and calm
	No bikes
	Not crowded
	No mopeds
	Clean and well maintained
	No traffic noise
	Feels safe

Source: own preparation.

Present security of the urban parks considering the coronavirus potential spreading assessment

A doctor of medicine – specialist in internal medicine, who has completed epidemiologic training in COVID-19 – patients dedicated large, multiprofile hospital in Warsaw in March/April 2020, was asked to identify safety measures concerning coronavirus spreading in public urban parks.

On basis of the ECDC, the UK government and the CDC recommendations and guidelines the list of following crucial safety issues was prepared and its elements were then identified in each park (Table 3).

Table 3. Crucial anti-COVID-19 safety issues on the basis of the ECDC, the UK government and the CDC recommendations and guidelines

Social distancing	Entrances	Critical objects/facilities	Other
Social distancing i. E. Maintaining minimal interpersonal distance of 2 m; on this basis maximal park capacity was calculated, giving for each visitor 4 m ² or 16 m ² (as for people in movement e.G. Running)	marked entrances, possibly more than one	presence of amenities that require cleaning/disinfecting protocols due to their being frequently touched: handles, handrails, door knobs	presence of trash cans – open, semi-closed or closed
Whether all, at least 75% or only solitary paths are wider than 2 m	presence of a gate at an entrance in order to supervise number of visitors	presence of toilet facilities	presence of bike path leading to a park and other bike-related facilities, in order to promote reduction in public transport use
Presence of path forming ring-road	whether entrances are wider than 2 m, allowing visitors to pass within safe distance when there is no separated entrance/exit	presence of cafés	
Presence of benches, tables and other types of seating and whether they all, at least 75% or only solitarily are distanced 2 m or more		presence of drinking fountains	
Presence of lawns where marking for social distancing can be placed		presence of playgrounds	
		presence of outdoor gyms	
		bench and table characteristic, concerning cleaning protocols	

Source: own preparation.

Possibilities of re-adjustments in order to increase security according to the European and the American guidelines

On basis of the ECDC, the UK government and the CDC recommendations and guidelines the list of following possibilities of re-adjustments in the parks were identified:

1. whether it is possible to separate entry/exit points;
2. whether it is possible to install dispensers for hand sanitization;
3. whether playgrounds and outdoor gyms can be separated from rest of a park and dispensers for hand sanitization can be placed;
4. whether footway can be widened where appropriate;

5. whether one-way movement can be created;
6. whether distancing of benches and tables can be improved.

Statistical analysis

All calculations were performed using Statistica 13.3 software. The continuous variables (area, PSD values) were reported as medians with a range, because they did not follow a normal distribution. To compare medians of the quantitative continuous variables (area, PSD values) in groups where the qualitative variables are present/absent (EAPRS values and presence/absence of the features related to the risk of coronavirus spreading) the U Mann-Whitney test

was used. The qualitative variables co-presence was assessed using Chi square test with Yates' correction and with Fisher exact test. The correlation between continuous variables was assessed with R Spearman correlation test.

To describe similarities between objects (parks) a cluster analysis was used.

For quantitative variables (PSD values) the Ward method was used, that involves an algorithm (dendrogram) which starts with n clusters ('leaves') and continues (forms 'branches') until observations are included into one cluster ('trunk'). The distance between objects in one cluster depends on how similar the objects in the cluster are – the smaller the distance the stronger the similarity.

Then the heat map was drawn to identify the variables that seem to be characteristic for each cluster. The columns and rows of the data matrix were subsequently re-ordered according to the clustering result, placing similar observations close to each other. Finally the colour scheme was applied for the visualization.

For qualitative variables (EAPRS values and presence/absence of the features related to the risk of coronavirus spreading) k-means algorithm was used, that attempts to subdivide the dataset into distinct, non-overlapping clusters as well as to make the intra-cluster data points as similar as possible while keeping the clusters as different as possible.

The significance of all statistics was given at the 0.05 level.

RESULTS

Parks characteristics

The median of park area is 8.39 (0.83–49.53) ha. The median of PSDs rating varies from 0.55 for 'culture' to 2.15 for 'serene' (table 5 and 6). The park characteristics according to EAPRS are presented in table 3.

The park area correlates strongly, positively with 'nature' ($r=0.83$, $p<0.05$) and 'culture' ratings ($r=0.95$, $p<0.05$), and the parks with 'picnic area' or 'shelter'

Table 4. Presence of elements included in the Environmental Assessment of the Public Recreation Spaces (EAPRS) in the eight urban neighbourhood parks included in the study

Elements included in the (EAPRS)	no.	%
Path (distinct and designated walking area/route)	6	75.0
Wooded area	4	50.0
Meadow	4	50.0
Drinking fountain	1	12.5
Picnic area	3	37.5
BBQ/fire place	1	12.5
Shelter or pavilion	3	37.5
Entertainment venue/stage	1	12.5
Wildlife area	7	87.5
Number of entrances	8	100.0
Parking lot	3	37.5
Roadway through	0	0
Maps	1	12.5
Soccer field	3	37.5
Tennis court	1	12.5
Basketball court	4	50.0
Skate area/pump-track	2	25.0
Pool	1	12.5
Other (outdoor gym, street workout area, climbing wall, rope park, tables for ping-pong, chess or board games, bouldodrome, fenced dog park, mini golf, graduation tower, outdoor free library)	7	87.5
Restroom	2	25
Open space (larger area at least 20x20 m for active use)	5	62.5
Water area	1	12.5
Art/sculpture	3	37.5
Bike rack	6	75.0
Event postings	2	25.0
Telephone	0	0
Bench	7	87.5
Lights along at least one trail	6	75.0
Trash cans	8	100.0
Sidewalks	6	75.0
Rules/regulations sign	7	87.5
Paved trail (asphalt, concrete, brick)	7	87.5
Unpaved trail (gravel, grass)	6	75.0

cont. Table 4

Café	2	25.0
Historical feature	2	25.0
Table	4	50.0
Other seating	3	37.5
Flowerbeds and special shrubs	3	37.5
View outside park	3	37.5
Playground	6	75.0

Source: own preparation.

have larger area. Also ‘unpaved trail’ tends to be more frequent in larger parks (Table 7). In all 6 parks with ‘bike rack’ there are also ‘path’ and ‘playground’ ($p < 0.05$) and in all 6 parks with ‘sidewalks’ there are also ‘lights along trail’ ($p < 0.05$). In all 3 parks with ‘picnic area’ there is also ‘shelter’ ($p < 0.05$) and in all 2 parks with ‘café’ there is also ‘restroom’ ($p < 0.05$).

Table 5. Ratings of the Perceived Sensory Dimension (PSD) in each urban neighbourhood park included in the study, ranging from 0 to 3

Name	Nature	Culture	Prospect	Social	Space	Rich in species	Refuge	Serene
Pope John Paul II Park	0.7	1.1	1.5	1.7	1.5	1.3	1.1	2.0
Roman Kozłowski Park	1.6	0.5	1.1	1.5	2.1	1.8	1.5	1.9
‘Lasek Brzozowy’ Park	1.4	0.7	0.4	0.9	1.3	1.2	1.5	2.1
‘Moczydełko’ Park	1.2	0.6	0.1	0.9	1.1	1.7	1.1	2.6
‘Przy Bażantarni’ Park	1.4	1.1	1.9	2.0	2.8	2.5	2.2	2.3
‘Silent Unseen’ – special-operations paratroopers of the Polish Army Park	2.5	0.1	0.8	1.0	2.2	1.2	1.3	2.1
Polish Inventors Park	1.9	0.1	0.9	0.6	1.6	1.0	0.8	2.2
Powsin Park of Culture	2.2	0.4	1.8	2.0	2.9	2.5	1.9	2.5

Source: own preparation.

Table 6. Median of the Ratings of the Perceived Sensory Dimension (PSD)

	Median	Range
Nature	1.5	0.7–2.5
Culture	0.55	0.1–1.1
Prospect	1.0	0.1–1.9
Social	1.25	0.6–2.0
Space	1.85	1.1–2.9
Rich in species	1.5	1.0–2.5
Refuge	1.4	0.8–2.2
Serene	2.15	1.9–2.6

Source: own preparation.

In all 2 parks with ‘historical feature’ there is also ‘skate area’ ($p < 0.05$).

The following correlations are observed between PSDs:

- strong negative between ‘nature’ and ‘culture’;
- positive between ‘prospect’ and ‘social’ and ‘space’;
- positive between ‘social’ and ‘rich in species’ and ‘refuge’;
- positive between ‘refuge’ and ‘rich in species’ (Table 7).

In the first step of the cluster analysis the following parks are included, according to their PSDs similarity (Fig. 3):

- in cluster one: Roman Kozłowski Park and ‘Lasek Brzozowy’ Park;
- in cluster two: ‘Silent Unseen’ – special-operations paratroopers of the Polish Army Park and Polish Inventors Park;

Table 7. Significant correlations between park area and PSD and EAPRS ratings

	Picnic area present	p	Picnic area absent
park area [ha]	17.82 (9.79–49.53)	0.037	3.64 (0.83–8.69)
	shelter present	p	shelter absent
park area [ha]	17.82 (9.79–49.53)	0.037	3.64 (0.83–8.69)
	unpaved trail present	p	unpaved trail absent
park area [ha]	9.23 (3.64–49.53)	0.07	2.22 (0.83–3.62)

Source: own preparation.

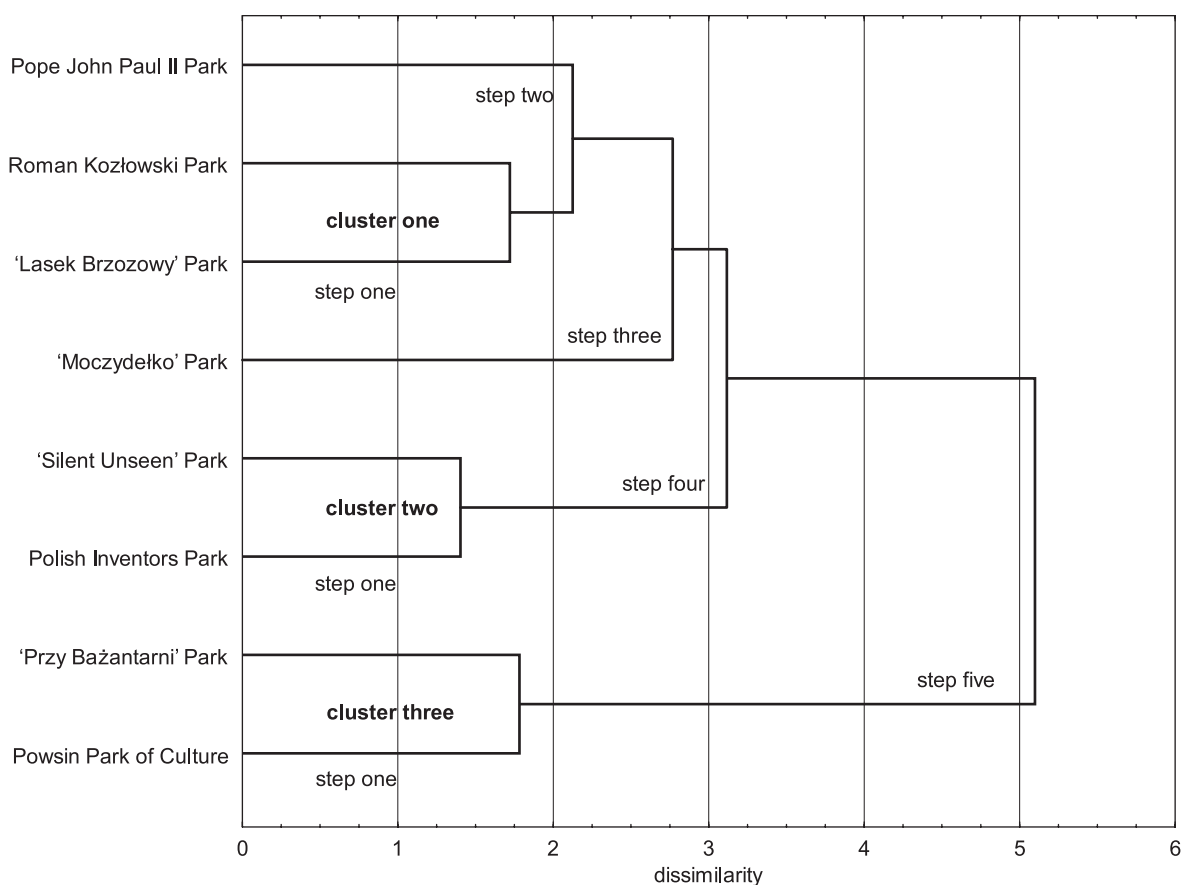


Fig. 3. Cluster analysis of Ursynów parks according to their PSDs (dendrogram)
Source: own preparation.

– in cluster three: 'Przy Bażantarni' Park and Powsin Park of Culture.

At step two, Pope John Paul II Park merges into cluster one while at step three 'Moczydełko' Park enters the same cluster one. The parks from cluster one and two merge into the same cluster at step four, while the parks from the last cluster – 'Przy Bażantarni' Park and Powsin Park of Culture – are strongly differentiated from the other, merging at step five.

As far as PSDs rating is concerned 'Przy Bażantarni' Park and Powsin Park of Culture are very similar, with the only difference of 'culture' and 'nature' rating, the first having high score in 'culture' while the second in 'nature' (Fig. 4). The parks from cluster two ('Silent Unseen' Park and Polish Inven-

tors Park) are similar with the exception of 'space' ratings, higher for the 'Silent Unseen' Park. The parks from cluster one have similar 'nature', 'culture' and 'serene' ratings.

When analysing EAPRS, 2 clusters are defined. In cluster one 6 parks (Roman Kozłowski Park, 'Lasek Brzozowy' Park, 'Przy Bażantarni' Park, Powsin Park of Culture, Pope John Paul II Park and 'Moczydełko' Park) are included, while remaining 2 parks ('Silent Unseen' Park and Polish Inventors Park) form cluster two. The parks in cluster one have always 'bench', 'rules' and 'paved trail' and usually 'lights along trail' and 'sidewalks'. Only in the parks of cluster one 'bike rack' and 'playground' are present. The parks in cluster two have always 'meadow' and 'open space' but they lack 'path', 'wooded area' and 'table'.

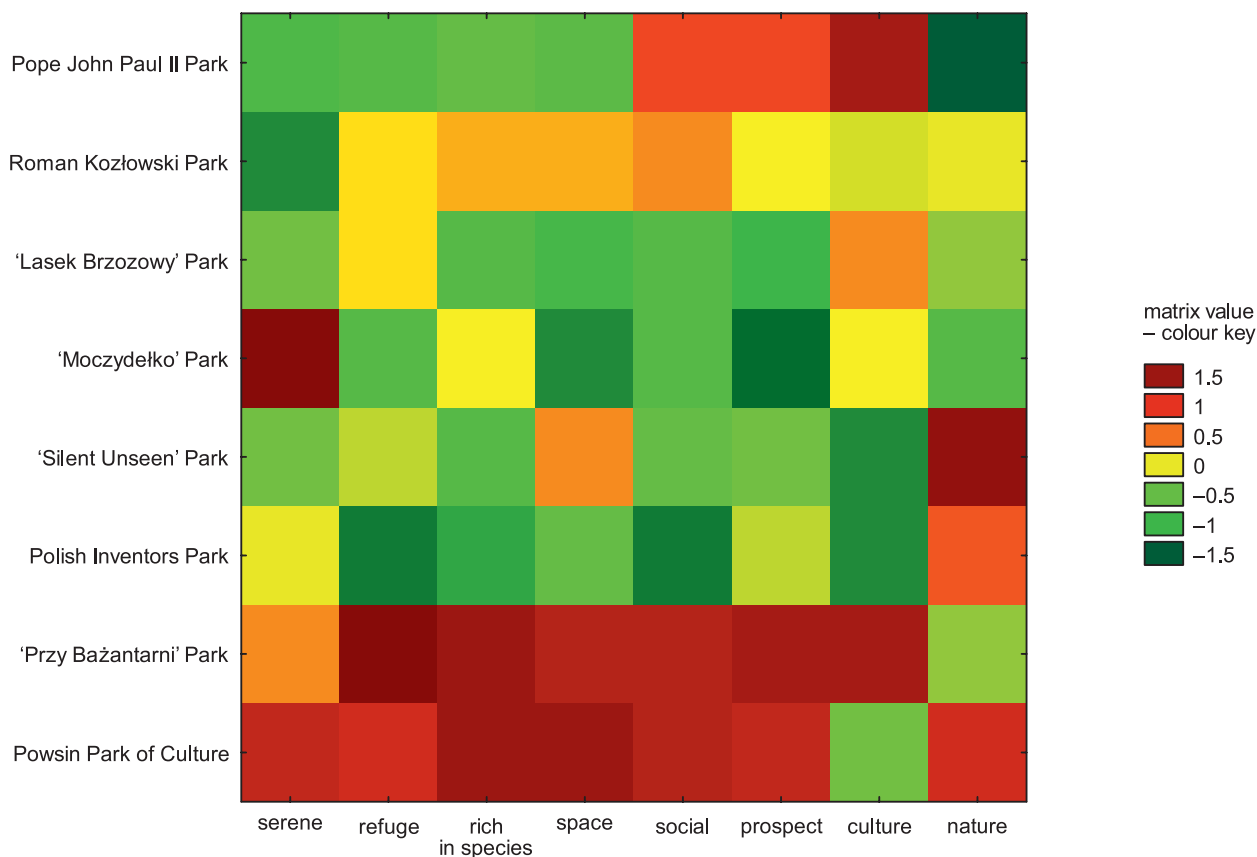


Fig. 4. Cluster analysis of Ursynów parks according to their PSDs ('heat map')
 Source: own preparation.

Security considering coronavirus potential spreading

The number of person per 4 m² and 16 m² for each park are presented in table 8.

All parks have more than one entrance and 6 of them (75%) have entrances wider than 2 m.

All paths wider 2 m are present in 25% of the parks, while wide paths constituting the majority of track are observed in 37.5%. In 2 parks (25%) there is no wide path. In 6 parks (75%) there are paths creating full ring road while in the remaining 2 parks there are surrounding paths but they do not form full circle.

The presence of aforementioned amenities critical for coronavirus spreading is presented in table 9.

Only in Polish Inventors Park there is 1 separate bench, in the remaining parks there are numerous

Table 8. Correlations between PSDs (p<0.05)

Correlation		r
nature	culture	-0.85
prospect	social	0.84
prospect	space	0,76
social	rich in species	0.83
social	refuge	0.73
rich in species	refuge	0.75

Source: own preparation.

benches. In 1 park ('Silent Unseen' Park) all benches are properly distanced, while in the remaining 6 parks – their majority. In 7 parks some of the benches are located in 1–1.5 m path widening. Benches are either wooden with concrete legs or entirely made of metal. Their average width is 180 cm. In 2 parks ('Przy Bażantarni' Park and Powsin Park of Culture)

Table 9. Number of person allowed simultaneously in park according to coronavirus precaution rules

	per 4 m ²	per 16 m
Pope John Paul II Park	9050	2263
Roman Kozłowski Park	21700	5425
‘Lasek Brzozowy’ Park	9100	2275
‘Moczydełko’ Park	2075	519
‘Przy Bażantarni’ Park	24475	6119
‘Silent Unseen’ – special-operations paratroopers of the Polish Army Park	44550	11138
Polish Inventors Park	20250	5063
Powsin Park of Culture	123825	30956
median for all parks	20975 (2075–123825)	5244 (519–30956)

Source: own preparation.

there are permanent wooden deckchairs disposed in pairs, sometimes with a table in between. In 1 park (‘Moczydełko’ Park) there are 3 wide concrete steps leading to the waterfront, where people use to sit.

In 3 parks there are less than 5 tables, while in another 3 parks they are more numerous. In 2 parks all tables are properly distanced, while

in 2 other – their majority. Tables are made of stone and metal, sometimes with some wooden elements and accompanied by 2 or 4 stools. Some of them are equipped with chessboard pattern (Fig. 5). In 3 parks there are longer (3–3.5 m) wooden benches and tables in wooden shelters or outdoors. They are too packed, both in shelters and sometimes outdoors (Fig. 6). In 1 park (Powsin Park of Culture) there is an outdoor amphitheatre equipped with plastic chairs.

In 7 (87.5%) parks there is lawn where markings on the ground can be placed to indicate safe distance. In 1 park (‘Moczydełko’ Park) by the pond there is the wooden deck 15x8 m with wooden balustrade where also markings can be placed.

In 1 park (Roman Kozłowski Park) there is the viewpoint at the top of the hill 4x3 m with one bench.

To 6 (75%) parks there is access via bike path. In 6 parks (75%) there are also metal bike racks. In 1 park (Powsin Park of Culture) there are even 2 bike-parks. Also in the same park there is the bike rental terminal. Bike racks are only present in the parks with the entrances wider than 2 m ($p < 0.05$) (Fig. 7).



Fig. 5. Examples of pieces of furniture present in the analysed parks
Source: own preparation.



Fig 6. Longer wooden benches and tables in wooden shelters or outdoors

Source: own preparation.



Fig. 7. Examples of the metal bike racks present in the analysed parks

Source: own preparation.

All parks are equipped with trash cans – open in all parks, semi-closed in 5 parks and closed in 3 parks. The closed trash cans are present only in parks with more than 5 tables ($p < 0.05$). In 1 park (Powsin Park of Culture) there are also separate, open ash-trays (Fig. 8).

Apart from mentioned in table 9, other facilities needing special hygienic regime are also present. In 2 parks ('Przy Bażantarni' Park and Powsin Park of Culture) there are rope parks fenced with gates and in 1 park (Roman Kozłowski Park) there is climbing wall. In 1 park (Powsin Park of Culture) there is detached football table equipment. In 2 parks ('Przy Bażantarni' Park and Pope John Paul II Park) there are outdoor free libraries. In single parks there are also: pool with its changing rooms (Powsin Park of Culture), saline graduation tower (Pope John Paul II Park), oligocene water spring (Powsin Park of Culture), small houses for chess and bridge players and camping

bungalows, shelter to change a baby (Powsin Park of Culture), fenced dog park ('Silent Unseen' Park), educational path (Roman Kozłowski Park) and tactile park plan ('Przy Bażantarni' Park).

In cluster analysis concerning coronavirus precautions in the parks also 2 clusters are defined. In cluster one 6 parks (Roman Kozłowski Park, 'Lasek Brzozowy' Park, 'Przy Bażantarni' Park, Powsin Park of Culture, Pope John Paul II Park and 'Moczydełko' Park) are included, while remaining 2 parks ('Silent Unseen' Park and Polish Inventors Park) form cluster two, as previously. The parks in cluster one have always more than 5 benches with benches in path widening and usually sport field and bike path. Only in the parks of cluster one entrance > 2 m, playground and bike rack are present. The parks in cluster two have always outdoor gym, semi-closed trash cans, only narrow paths and all well distanced benches.



Fig. 8. Examples of the trash cans present in the analysed parks
Source: own preparation.

Possibilities of re-adjustments in order to increase security according to the European and the American guidelines

As far as all parks have more than one entrance it is possible to separate entry from exit point.

Only in 2 parks it is possible to install dispenser for hand sanitization at the entrance. It is possible, however, to install it at the gates to all playgrounds (Fig. 9) and to 3 out of 5 sport fields (Fig. 10). In 1 park (Powsin Park of Culture) it is already installed. All 5 outdoor gyms lack gate (Fig. 11).

In 3 parks ('Silent Unseen' Park, Polish Inventors Park and 'Lasek Brzozowy' Park) it is possible to easily widen footways.

Although the parks have paths creating full or semi-ring road it is impossible to create one way movement, due to their too complex path system.

All tables as well as pairs of deck chairs and benches and tables in shelters are permanently attached to the ground and can not be easily repositioned to create proper distancing. In 6 parks there are the benches not permanently attached to the ground so they may be repositioned e.g. in quincunical arrangement, to create proper distancing.

Table 10. The presence of amenities critical for coronavirus spreading

	no. of parks	%
handle/door knob/handrail	6	75.0
restroom	2	25.0
playground	6*	75.0
outdoor gym	5	62.5
sport field	5**	62.5
drinking fountain	1	12.5

* 3 parks ('Lasek Brzozowy' Park, 'Przy Bażantarni' Park and Powsin Park of Culture) have more than one playground

** 1 park (Powsin Park of Culture) has more than one sport field
Source: own preparation.



Fig. 9. Examples of the playgrounds present in the analysed parks
Source: own preparation.



Fig. 10. Examples of the sports fields present in the analysed parks
Source: own preparation.



Fig. 11. Examples of the outdoor gyms and street workout areas present in the analysed parks
Source: own preparation.

CONCLUSIONS

1. The Ursynów district has sufficient number of good quality parks, which enables its inhabitants to enjoy nature in the vicinity of their homes.

2. The Ursynów's parks are safe place in time of coronavirus pandemic, providing their users with the most of worldwide recommended solutions. Their layout alone has proved to allow social distancing.

3. At no/low cost the missing problems regarding coronavirus spreading in parks can be adjusted.

DISCUSSION

Ursynów district has sufficient number of parks, well rated in EAPRS and PSD, especially in 'serene', 'space' and 'nature' category. This is important for the fact that people generally favor the dimension 'serene',

followed by ‘space’, ‘nature’, ‘rich in species’, ‘refuge’, ‘culture’, ‘prospect’ and ‘social’ (Grahn & Stigsdotter, 2010). Larger parks offer to the district residents also possibility of longer leisure in picnic areas and shelters. Parks with café pavilion also offer restrooms. However, public restrooms will require additional sanitation (Freeman & Eykelbosh, 2020; COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces, 2020).

Two parks (Park of the ‘Silent Unseen’– special-operations paratroopers of the Polish Army and Polish Inventors Park) still under construction, distinguish from the rest of the Ursynów’s parks, yet still add a lot to the district greenery, especially in ‘nature’, ‘space’ and ‘serene’ dimensions.

Two parks (‘Przy Bazararni’ Park and Powsin Park of Culture) are very homogeneous in respect of high PSD rating, with the difference of area and ‘culture’/‘nature’ balance.

The parks in Ursynów district are evenly distributed. They constitute decentralized network of green spaces of different sizes which can provide easily accessible opportunities for leisure and recreation (Honey-Roses et al., 2020). The majority of them has an access via bike path and provide visitors with places to leave their bikes which was suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). The residents can also reach the parks using the pedestrian walk network, well developed in Ursynów. This allows the district residents to chose green area close to their home and thus avoid public transport as suggested in the Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19 (2020). This is advantageous because during pandemic discouraged is travelling to far-off parks that provokes incidental contacts with services and people along the route, thus facilitating virus transfer into smaller or remote communities (Freeman & Eykelbosh, 2020). It is also in line with the Adaptation strategy of Milan (2020) which proposes to rediscover the neighbourhood dimension. This proposal assumes developing the availability of public services, including recreational amenities, in the community, with the objective

to make everything accessible within 15-minutes walk, reducing travel between neighbourhoods (Milan, 2020). The strategy also recommends to municipal authorities introducing decisions promoting use of bicycles and scooters (Milan, 2020).

In Ursynów there is also north-south subway train line, which passes near 5 parks and is within walking distance 1–3 km from 3 others. The subway train line seems a safer alternative than a bus because it can accommodate more passengers and runs more often.

It has been thus confirmed that Ursynów inhabitants have been given the opportunity to rest ‘close to nature’, yet within the short distance from their dwelling and that the green spaces available offer them high aesthetic and functional potential. This fulfils good practices in urban planning (Hunter et al., 2015; Honey-Roses et al., 2020).

As far as the 2 parks under construction are concerned, they still can be upgraded in terms of their services and these observations can be helpful during social consultations which take place in the district on the regular base.

The Ursynów parks are safe place in time of pandemic, regarding the European and American guidelines. They have more than one entrance, usually fairly wide, allowing easy accommodation and no queues or even to create separate entry/exit as suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). As park entrances and exits constitute gathering points, supervision to those zones should be provided to improve physical distancing (Freeman & Eykelbosh, 2020).

The majority of parks has sufficiently wide paths. There are also path widening for benches which allows no obstacles for pedestrian movement flow. In 3 parks – 2 still under construction (Park of the ‘Silent Unseen’– special-operations paratroopers of the Polish Army and Polish Inventors Park) and in the ‘wild’ part of ‘Lasek Brzozowy’ Park – it is possible to widen footways, as far as they are unpaved and cross the unorganised meadows. Although the parks have paths creating full or semi-ring road it is impossible to create one way movement to minimize interaction between park users, like for example has

been implemented in the City of Richmond (Freeman & Eykelbosh, 2020), due to their too complex path system.

All playgrounds are enclosed and have at least one gate, where it is possible to install dispenser for hand sanitization as suggested in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). Provision of opportunities for hand hygiene is recommended also by Freeman and Eykelbosh (2020).

All handrails, gates and knobs are made of metal which allows them to be frequently disinfected. Sanitizing surfaces, especially these non-porous, seems to be an important issue, since the viable virus may persist on them even for dozens of hours (Freeman & Eykelbosh, 2020).

In the majority of parks benches and tables are properly distanced. In the remaining cases it is possible to add seat marking where sitting is prohibited to maintain social distancing as recommended by the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020). Some of the benches are not permanently attached to the ground so they may be repositioned e.g. in quincunical arrangement to create proper distancing according to the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020).

Tables which are permanently attached to the ground and not properly distanced, as well as pairs of deck chairs and benches and tables in shelters may be marked 'for visitors from one social bubble only' as suggested in the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020) and COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020).

Also it is possible to place distancing markings on all lawns as recommended in COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020) and in the Visiting Parks and Recreational Facilities. Protect Yourself and Others from COVID-19 (2020).

All café pavilions are prepared to serve for takeaway according to the COVID-19 Secure: Safer

Public Places – Urban Centres and Green Spaces (2020).

All parks are equipped with trash cans, but they are usually open or semi-closed ones. There are no closed, no-touch bins, recommended by the guidelines, which allow to safely dispose of e.g. used paper handkerchief, mask or plastic gloves. This concern associated with the safe use of public spaces during the COVID-19 outbreak has been also addressed by Freeman and Eykelbosh (2020) who recommend to ensure trash containers for disposing of personal protective equipment (e.g. masks and gloves), which may otherwise turn into a public health hazard. It is also worth mentioning that irresponsible disposal of personal protective equipment might pose a risk to park animals who can accidentally eat them or become tangled in them.

Most of the parks possess such amenities like an outdoor gym and street workout area which are not fenced off from the park area. Thus, there is no place to install dispenser for hand sanitization. To prevent outdoor gym areas from being temporarily excluded from use, exercise equipment should be regularly disinfected. Keeping the possibility to use the outdoor gyms in urban parks is particularly important because during pandemic green spaces served as a substitute for forbidden indoor fitness and sport activities and a shelter from stress (Venter et al., 2020). Also the Adaptation strategy of Milan (2020) recommends allowing the use of the urban green areas for outdoor sports.

In several Ursynów's parks there are different types of sports fields. Some of them are enclosed, thus, there is possibility to install dispenser for hand sanitization. To avoid the risk of the virus transmission it would be recommended to mark these spaces 'for users from one social bubble only' according to the concept proposed in the Guidelines for non-pharmaceutical interventions to reduce the impact of COVID-19 in the EU/EEA and the UK (2020) and COVID-19 Secure: Safer Public Places – Urban Centres and Green Spaces (2020). It would be also advisable to introduce a use schedule that would allow e. g. for one-hour breaks between different groups of users, to allow sunlight

to inactivate coronavirus as recommended (Ratnesar-Shumate et al., 2020).

In the analysed neighbourhood parks there are also facilities like climbing wall or rope park, which need special hygienic regime; pool or camping bungalows, which may require temporal closure in order to maintain personal limits in enclosed areas; view point or outdoor amphitheatre where distancing marking should be placed or tactile park plan which should be included in cleaning protocols.

It has been confirmed that the Ursynów's parks are safe place for leisure as far as crucial safety issues in coronavirus spreading are considered. Because their form is well balanced between 'natural zones' and 'park facilities', it makes their function more flexible in time of pandemic, when e. g. cafés and bars serve only takeaways and park provides lawn for picnic.

However, it is important to introduce in landscape architecture education the problem of smooth pedestrian flow in parks, and the need to create both: wide open spaces and garden interiors for visitors from one social bubble. It is also worth to discuss with students the choice of materials used in landscape architecture taking into consideration antiviral and antibacterial properties and facility for cleaning.

Urban parks are important spaces for physical and mental health and allow residents to meet their social interaction needs. The COVID-19 pandemic is likely generate considerable changes to future use of public space, including urban parks (Honey-Roses et al., 2020). The recent observations of urban green spaces have shown that during the COVID-19 pandemic period, recreational use of urban green spaces, especially neighbourhood parks was intensified. The demand for social distancing and other coronavirus precautions would require adaptation of the urban green spaces to the new conditions. The presented conclusions might help to asses the quality of urban green spaces and improve the security of their use.

Study limitations

This study was situated in Poland – mid-European country with moderate continental/maritime climate, so the observations do not apply to all types of parks

and green spaces due to the e.g. seasonal changes in citizens activities, specific plant choice and small architecture materials.

However, it would be worth comparing these observations with corresponding ones from other mid-European countries and from countries within the same climate zone.

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