Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company’s public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Use and design of public green spaces in Serbian cities during the COVID-19 pandemic

Ilija Gubić a,⁎, Manuel Wolff b
a University of Belgrade - Faculty of Architecture, Belgrade, Serbia
b Department of Geography, Humboldt Universitat zu Berlin, Berlin, Germany

ARTICLE INFO

Keywords:
COVID-19
Citizen perceptions
Movement restrictions
Public green space
Urban design
Urban greening

ABSTRACT

Since December 2019, the global community has been challenged by managing the COVID-19 health crisis. Some governments have restricted the use of public green spaces (PGS), as part of measures for limiting the spread of the virus. Although many scholars studied the changing perception of using PGS during the pandemic, the extent to which the planning and design of new PGS recognize new realities and lessons learned from the ongoing pandemic including requirements for social distancing is less illuminated. Against this background, this article seeks to assess the intersection between the institutional responsibility in planning, designing and managing PGS, and the corresponding perception by PGS users in the two Serbian cities Belgrade and Novi Sad during the ongoing pandemic. Therefore, the paper surveyed 400 respondents about their perception of introduced measures and physical settings of PGS including their specific suggestions concerning which features, if included, would help them remain vigilant during a pandemic. The findings suggest that people have very clear and diverse ideas about the planning, design and management of PGS during a health crisis adapted to their individual needs but also beneficial to the whole local community. In reviewing public green space design competition calls and results published from 2019 to 2021, this study finds that the global lessons learned about the use of public green spaces during the pandemic were not considered by local governments and professionals in Serbia when planning and designing them. In addition, residents are less likely to request changing ways of implementing, designing or managing PGS from their local government. These two aspects are striking in successfully shaping and managing PGS as a crucial resource in cities and communities bouncing back after the COVID-19 pandemic.

1. Introduction: COVID-19 related measures for public green spaces in cities

The world is getting more urban with an urbanization level of 60.4% and an estimated urban population of 5.2 billion by 2030 (United Nations, 2018). Above all and regardless of the level of the country’s development, cities are exposed to climate change, environmental disasters, and health pandemics, as the COVID-19 pandemic has shown recently. Usually hosting high densities of residents and jobs, cities have a significant effect on the health status of broader populations due to their high concentration of public infrastructure (e.g., public transport, squares, parks, etc.), as well as their transmitting potential, given the large international airports and seaports situated in or near cities (WHO, 2009; WHO and UN-Habitat, 2010; Ren et al., 2020; Carteni et al., 2020; Pan et al., 2021). Since the outbreak of COVID-19 in 2019, virus caused millions of deaths. Since COVID-19 is transmitted by contact, droplets, and fomites (WHO, 2020a; Centers for Disease Control and Prevention, 2020), studies suggest that non-pharmaceutical interventions might be able to reduce influenza transmission significantly (Pan et al., 2020; Perkins and Españo, 2020; Bo et al., 2021; Zou et al., 2022). Hence, many countries introduced measures for closing their international borders, banning non-essential travel, public events and gatherings, and closing places of worship, tourism and recreation, especially in cities (Seyfi et al., 2020; Gössling at al., 2021; Bickley et al., 2021). In particular, public green spaces (PGS) where social interaction usually happens become points of concern. Four measures can be grouped with respect to PGS:

1) Some governments restricted completely the use of PGS at an early stage of the response to COVID-19 (Fig. 1) as part of citywide measures, resulting in PGS becoming empty in many cities (Mews and Muminovic, 2020; Sepe, 2021). The first such measures were taken...
by the Chinese government in Wuhan and other cities in the Hubei province in January 2020 (Beck & Tobin, 2020). In Montenegro, the government took proactive steps and restricted people’s movement and the use of PGS even before the country registered the first positive case of COVID-19.

2) Several countries introduced more flexible movement measures in 2020, for example, Sweden and Hong Kong (Samuelsson et al., 2020). In March 2020, the German government ordered playgrounds to be shut, while in France the government enforced a mandatory lockdown in which limited movement was possible with governmental permission. In Serbia, the population was allowed, at the later point, to use PGS only for a few hours daily (Ministry of Internal Affairs, 2020).

3) Within a year of the outbreak, ideas and proposals were developed to support policies and programmes on increasing greenery, open and recreational spaces, and pedestrian and bicycle paths in cities globally (Herman and Drozda, 2021; Maruna and Đorđević, 2021; UN-Habitat, 2020). Local governments continued to improve existing PGS and call for design proposals in order to build new ones. Belgrade and Novi Sad in Serbia, for example, have seen numerous design competitions for PGS, published just before and during the COVID-19 pandemic (Drustvo arhitekata Novog Sada, 2020; 2021).

In Serbia, the first case of COVID-19 was detected on 6 March 2020. By 22 March, the country had recorded 222 infected cases, at which point, the Government of Serbia implemented restrictions on the use of PGS, among other measures. Due to the COVID-19 pandemic, the Government of Serbia declared a state of emergency to attempt to halt the further spread of the coronavirus in March 2020. Due to the state of emergency, the population was allowed to use PGS from 5:00 a.m. to 5:00 p.m., but only for essential tasks (Ministry of Internal Affairs, 2020). Citizens older than 65 could leave their homes only for essential business, such as buying food or medicines, in the restricted period between 03:00 a.m. and 08:00 a.m. (Radio Television of Serbia, 2020). The government later announced that pet owners could take their pets for a walk from 08:00 p.m. to 09:00 p.m. for 20 min maximum and no further than 200 m away from their residence (Jocić, 2020). The military and police dutifully monitored the use of PGS and other public spaces. In consequence, the number of citizens visiting PGS during the COVID-19 pandemic declined very fast in the first half of 2020, since restrictions were in place and were changed frequently.

From this perspective COVID-19 brings a new confronting aspect, namely, governmental restrictions seek to provide a safe environment during the pandemic, while previously, social gathering and cohesion was seen as health benefits of using PGS (Andrews and Gatersleben, 2010). The extent to which the planning and design of new PGS recognize new realities and lessons learned from the ongoing pandemic including requirements for social distancing was hardly illuminated by scholars. This is the starting point of this paper.

Against this background, this article seeks to assess the intersection between the institutional responsibility in planning, designing and managing PGS, and the corresponding perception by PGS users in the two Serbian cities Belgrade and Novi Sad during the pandemic. The basic idea for this study is to foster the understanding of how policy measures have been put in place, how visitors perceive both the introduced measures and the physical setting of PGS during the pandemic, and whether the local governments of Belgrade and Novi Sad and the designers in practice informed their decisions and designs based on the ongoing global debate on limited usage of PGS and their flexibility during the pandemic. Consequently, three research questions guide this paper:

1. What have been policy reactions in Serbian cities in response to the COVID-19 pandemic?
2. What is the perception of visitors regarding the way the pandemic has influenced their use behavior of visiting PGS?
3. What are matches and mismatches between desired/expected improvements of, and actual plans for PGS in Serbian cities?

Understanding the need for the use of PGS in cities during COVID-19 and putting the recommended improvements into practice for such spaces would contribute to planning, designing, and managing PGS for the benefits discussed in this study, including during any future events on a scale similar to the COVID-19 pandemic.

2. Theoretical background: on the role of PGS before and during the pandemic

It is widely known that PGS brings a variety of ecological and social benefits. PGS can reduce the impact of urban heat island, smog levels, and health risks caused by heat stress and poor air quality, and also provide a wildlife habitat (Andersson, 2016; Kaplan, 2019). The 2030 Agenda for Sustainable Development, with Sustainable Development Goal 11, and the New Urban Agenda call for the provision of accessible PGS (United Nations 2015, 2017, 2020), regardless of cities reporting the challenges they face concerning place-keeping (Fongar et al., 2019). Accessible PGS are a key element that contributes towards physical and mental health, social cohesion, civil identity, culture, and human well-being, for example they have a positive role in relieving stress and anxiety (Calvin Wan & Shen, 2015; Andersson, 2016; Kabirsch et al., 2016; Jian et al., 2021). Adequately planned and designed PGS play a key role in community resilience and socialization (Chan et al., 2015; Shimpo et al., 2019), in particular in post-disaster recovery and reconstruction processes. Within the framework of environmental justice, the argument is that socio-economically vulnerable residents and neighbourhoods, which are usually low-income groups, have limited access to PGS and their benefits (Shen et al., 2017; Wolch et al., 2014). As PGS are a limited resource for many urban dwellers also because of their distance, small PGS in dense city areas might compensate this lack (Peschardt et al., 2012). Small PGS can serve to increase the availability of natural resources of the city (Chiesi and Costa, 2022).

The benefits PGS may provide are enabled by multiple interacting social, ecological, and technological factors. In order to help better understanding and operationalizing these factors in rapidly changing cities, Andersson et al. (2019) developed a framework which positions the flows of benefits from PGS to urban inhabitants as mediated by three filters: the interactions among green and built infrastructures; people’s individual and shared perceptions and values; and the regulatory power and governance of institutions. As scholars underline, three aspects need to be considered. First, these filters need to be seen in the broader context of ongoing social-ecological processes (Kronenberg et al.,...
2021). This also implies external shocks such a health pandemic, which results in changes of behavior (Lopez et al., 2020), or the need to introduce measures e.g. for the purpose of social distancing. Changes in the temporal patterns and spacing of users over the day, are expected (Honey-Roses et al., 2020; Ode Sang et al., 2020), taking into consideration also previously reported contributing predictors such as age and gender (Mertens et al., 2019). Studies show that PGS are frequented for physical fitness, entertainment, and social gatherings of family and friends, but these benefits have largely vanished during the COVID-19 pandemic restrictions (Luo, Xie, & Furuya, 2021). Second, the way PGS are perceived and appraised by potential users is crucial for understanding the actual use behavior (Wang et al., 2015). Despite PGS in people's living environment having a positive association with the perceived general health (Maas et al., 2006), government restrictions for using PGS fostered staying at home in self-isolation. Isolation of people being unsafe reduced number of visits in countries with no movement restrictions (Lopez et al., 2021), although researchers reported that reason for visiting PGS changed from non-essential to essential during the pandemic (Ugolini et al., 2020; Larcher et al., 2021). Perception of PGS being unsafe reduced number of visits in countries with no movement restrictions (Lopez et al., 2021), although researchers reported that reason for visiting PGS changed from non-essential to essential during the pandemic (Maas et al., 2006), government restrictions for using PGS fostered staying at home in self-isolation. Isolation of people being unsafe reduced number of visits in countries with no movement restrictions (Lopez et al., 2021), although researchers reported that reason for visiting PGS changed from non-essential to essential during the pandemic (Ugolini et al., 2020; Larcher et al., 2021). Planning, designing, and maintaining PGS are thereby key processes for facing complex urban challenges (Cheshmehzangi, 2020), such as another pandemic.

3. Material and methods

Guided by the three research questions outlined above, this paper seeks to assess the intersection between the infrastructure, institutional and perceptual filters as detailed by the framework developed by Andersson et al. (2019, 2021). Therefore, we used a mixed-method approach (Creswell, 2009) merging qualitative and quantitative from three research methods. We detail the three corresponding methodological steps in the following section after having introduced the two case studies Belgrade and Novi Sad. Finally, the way of how the findings have been analyzed and presented as explained below helps to assess the complex interrelation between physical settings, institutional impacts, and their perception by visitors by looking for consistencies or discrepancies.

3.1. Case study introduction

The capital of the three successive Yugoslav states, Belgrade, has a population of 1.7 million (RZS, 2019), expanded mostly by transforming the neighboring rural settlements into residential areas or city industrial zones. Approximately 12%, 39,572.78 ha, of the total city area is covered by urban and natural forests and parks, public and private. Government owns 17,057.92 ha (City of Belgrade, 2015), while PGS mostly lack in the city center (Guduric et al., 2011; Krajter Ostoic et al., 2017; Wolff & Haase, 2019). The second-largest city Novi Sad with 370, 000 residents is the financial, educational, and cultural capital of Serbia’s northern province. The city has 310,5 ha of urban forests and parks (Krajter Ostoic et al., 2017). In recent years, both cities have invested in their PGS. Novi Sad did this within the framework of being awarded the title of European Capital of Culture for 2022 (Apostolović, 2020). Design competitions, or the implementation of previously selected winning designs were ongoing regardless of the coronavirus pandemic in 2020 and 2021.

3.2. Methods

The first step was to examine the spread of COVID-19 to better understand how the progression of the COVID-19 pandemic was linked to Serbian government decisions to ban or restrict the use of PGS in cities. A document review covering 2020 and 2021 was also utilized to understand recent developments in the policy measures introduced to restrict the use of PGS in cities during the COVID-19 pandemic. This focused on tracking the emerging patterns in day-to-day policy formulation and implementation related to COVID-19 and the use of PGS in two cities in Serbia: Belgrade and Novi Sad.

In the second step, a questionnaire survey was employed to determine the behavioral pattern in relation to accessing PGS before and during the COVID-19 pandemic in two cities in Serbia. The questionnaire was composed of 18 survey questions and two demographic questions: age group and sex. It comprised 10 open-ended and eight closed-ended questions, including yes or no answers. In addition to socio-demographics, the survey questions were grouped into four categories to address the type and frequency of activities undertaken by the respondents in their local PGS, including their accessibility, existing equipment, and the impact of the imposed restrictions on the use of these spaces. The survey also had four open-ended questions related to the future use of PGS and the equipment needed. The respondents were targeted randomly based on their use of a green space and whether they were willing to provide consent in order to participate in the study seeking for gender balance and equal age group representation. A total of 400 respondents completed the questionnaire online or on-site, half the respondents were female, and half male. The 38 respondents who live in Belgrade were surveyed remotely via e-mail in June 2021 and 162 in person in February 2022, while in Novi Sad 42 respondents were surveyed in person in June 2021 and 158 in February 2022. Out of those surveyed in both cities, distribution by age category is as follows: 85 respondents from 18 to 25; 87 respondents from 26 to 35; 85 respondents from 36 to 45; 70 respondents from 46 to 65; and 73 respondents from 65+. In Novi Sad, the authors approached users of Dunavski park, Futoski park, Limanski park and Universitetski park, while in Belgrade the authors surveyed users at the Tasmajdan Park and around the sports and recreational center “Milan Gale Muskatirović”, conducting each survey for, in average, 7 min. Single local government agency is mandated to maintain and manage existing PGS hence authors decided to present all survey results heterogeneously. All the respondents were well-informed on the COVID-19 pandemic, what causes it, and the ways it is transmitted. Such a high result is not surprising given the theme being covered extensively in the Serbian media.

In the third step, the authors reviewed design competition calls published in 2019, 2020 and 2021 for PGS or public spaces with green elements in Belgrade and Novi Sad and the competition results, in order to understand whether they reflected COVID-19 pandemic-related physical distancing spatial measures. The design competition calls were scanned to understand whether they specified certain design criteria linked to easing the usage of PGS during the pandemic. Design entries and comments by the jury were reviewed against two criteria: 1) sustainability of the PGS usage (accessibility and safety); and 2) contemporary concepts of space usage (flexibility). For the design of PGS in
Novi Sad, we analyzed: 4 design competition calls and 29 design submissions in 2021 for: Gallery Square; the PGS next to the provincial government building; green area above the tunnel; and the green area on Patrijarh Pavla Boulevard (Fondacija Novi Sad, 2021; Portal javnih nabavki, 2021); and the children’s playground in Detelinaara, whose call and winning design were announced in 2017 (Bede, 2017), yet implemented during the pandemic in 2020 and 2021. In Belgrade we analyzed the competition call and results for Linear Park: 4.6 km of continuous, 10 linked public spaces along the Danube and Sava rivers (Ivanović, 2020). In addition to design competitions analyzed in this manuscript, there were no other main PGS design competitions in Serbia during the 2019–2021.

3.3. Analysis and presentation of findings

The results have been presented in subchapters along the structure of the research questions and largely in line with the presentation of mixed method results as outlined in (Creswell, 2009). The results of the policy responses have been presented chronologically while for the presentation of the survey results frequency statistics have been used. For the intuitive combination of the survey and the analyzed documents we distilled keywords of the answers for the question “What are the three most critical things that you feel the government would need to implement in order to improve the green public open space experience especially in a context of potential new health pandemics?” In line with previous research (Wolff et al., 2022) we clustered them into three categories: urban planning and policy, landscape design, green space management (Cheshmehzangi, 2020). The keywords and their categories are displayed with the online word cloud creator WordArt.com for which the size of each keyword indicates its frequency of occurrence (Annex 1). We finally tested each keyword against its occurrence within the analyzed design competition calls and assigned either one of the following categories: not addressed, partly addressed, addressed.

4. Results

4.1. Accessing PGS in Serbia’s cities

Most of the surveyed respondents described their well-being as very good or good before the COVID-19 pandemic when they discussed their daily routine of frequenting PGS for sport or leisure in their respective cities. The majority of the respondents, 96%, have access to PGS within walking distance, and the main reasons given for frequenting such spaces included basic walking and leisure, coupled with individual sport activities. More than half of the respondents use PGS quite frequently: 72% one to three times a week and 28% daily.

Almost one third of the respondents spend more than 1 h in PGS, while 38% spend 30 min or less per visit. However, 58% of visitors report public green space because of the available equipment (benches, equipment for children’s play, open air gym, etc.), while 49.5% of the respondents reported that having water facilities in their nearest public green space is important for their frequent use.

The restrictions introduced influenced the frequency of visits and the scope of activities in PGS in Belgrade and Novi Sad. During the lockdown, most respondents stayed in their place of residence with 64% agreeing that the measures introduced at the beginning of the pandemic in 2020 were needed. If the measures that restricted movement had not been in place, 65% respondents would not have felt safe visiting PGS. The frequency of visits to PGS in 2021 is at the same level as before the COVID-19 pandemic, since 62% of the respondents are able to keep a physical distance between themselves and other users because their closest public green space is big enough and their paths are wide enough. Still, several activities were missing from PGS during the lockdown in particular the recreational benefit of walking or leisure (64%), sport activities (16%), as well as cultural events such as exhibitions, concerts, or movie theatres (11%). Only 9% of respondents miss options for peoples gathering in PGS.

The responses related to potential improvements in the PGS in order to be safe to use during the next potential health pandemic can be categorized into “Urban planning and policy”, “Landscape design”, and “Green space management” (Fig. 2, Annex 1).

In terms of urban planning and policy, the most important improvement suggested can be performed by creating more parks and public spaces in order to reduce the current crowding in existing PGS. Additionally, smaller-scale parks or community parks would already provide green space alternatives in the neighborhood for certain activities with a limited time budget, e.g., a short walk. This needs to be accompanied by providing diverse accessibility options for the PGS which form a green and blue infrastructure network connected with the Danube and Sava rivers. Beside these physical interventions, urban planning and policy is asked to foster a participatory planning process with regard to PGS in order to account for the individual requirements of landscape design. Respondents selected widening paths, and the design and position benches and other urban furniture as the most critical design interventions for PGS, so that distancing measures are met. Providing water, sanitation and water fountains allowing for contactless hygiene is also as fundamental as the introduction of better routing (incl. lights for allowing visits in the dark) and signage (also digital). Although more trees and green elements in general were requested, it was highlighted that greening could also be used as green “barriers” to form some kind of temporary design that would indicate distancing measures to separate park users e.g., of different age (elderly) or activities (e.g. children).

Ways in which green space management can improve PGS in the context of potential new health pandemics are measures of general cleaning, and providing clean water, sanitation, and trash bins. This could be carried out by means of regular, frequent maintenance of flora and urban furniture and by providing trash bins and handwashing stations. In addition, safety in general and safety from transmission of the virus in public green space was seen as critical by the respondents. Most importantly, they stated that monitoring the public usage of green space either by a designated guard or ICT would make them feel safer in a pandemic. Another solution given for the safer use of PGS was raising awareness, including providing environmental and health education for the general population and preparing and disseminating guidelines on the safer use of PGS, also including also the temporary prevention of large gatherings. This should go hand in hand with capacity development of stakeholders e.g., in terms of lessons learnt.

4.2. Accessing design competitions for PGS and their implementation in Serbia’s cities before and during the COVID-19 pandemic

In Novi Sad, the local government’s Foundation Novi Sad – European Capital of Culture 2022 partnered with local architects’ association DaNS to call for design proposals for PGS. The last call was published in June 2021 for the design of 4 city locations. These design competition calls were not different in their narrative from the public green space design competitions published in 2019 (Fondacija ‘Novi Sad 2021 – Evropska prestonica kulture’, 2019, 2021). Further, there are instances where calls for design proposals were made before the pandemic but implementation took place in 2020 and 2021. The competition calls were for a design that, in addition to meeting programmatic requirements, should have: 1) a spatial concept, connection with the existing urban matrix and the natural surroundings; 2) an original and creative design and proposed usage, contemporary usage concepts, multifunctionality and transformability; 3) rationality, implementability (economically); and 4) Sustainable use of space: accessibility, safety, easy maintenance, potential space for social interactions (Fondacija ‘Novi Sad 2021 – Evropska prestonica kulture’, 2019, 2021).

Regardless of lessons learned from the COVID-19 pandemic, the local government did not reassess the designs, but instead implemented the project as previously planned. Urban policy and planning did not follow
a diverse strategy e.g., by implementing a connected network of small and bigger parks and green walks, nor was it accompanied by a participatory planning process or environmental and health education campaigns. The implementation concentrated on a set of landscape elements which only to some extent put into practice the lessons learned, whereby PGS were used in the pandemic as an alternative space for activities that could not be organized in an indoor environment. The calls for PGS invited designers to consider including pavilions to be used as coffee shops, bookstores and souvenir shops in their designs (Ponadacija Novi Sad, 2021). However, there is only a small need for pavilion structures according to the respondents. The results of the survey show that the users of public green space would feel safer using the space if paths were wider and the urban furniture were designed and positioned to allow the required physical distancing. However, these aspects have not been considered by the calls or in relation to their implementation (Figs. 3 and 4). Most crucially, handwashing and sanitation facilities have not been considered at all, although they have shown to be very important from a user perspective. In the example of Rumenačka street (Fig. 3), large closed, narrow tubes have been installed for children to slide on, which can be seen as a main point of contact with potentially contaminated surfaces. The survey indicated that users would prefer diversely designed open spaces for children’s play rather than equipment. The measures conducted in terms of management only focus on measures which were already in play before the pandemic, such as general cleaning and maintenance. No particular focus was expressed in terms of monitoring the use of PGS or releasing guidelines on their safe use.

A bottom-up approach to planning, designing and implementing PGS is not common practice in cities in Serbia (Colić & Dzelebdžić, 2018), although the respondents highlighted participatory planning in PGS as an essential practice. While restricted in their use of PGS, 26% of respondents stated that they joined various online activist groups during the COVID-19 pandemic to help plan and design or re-design the urban environment. One respondent (A.C.) stated, ‘In my area in Belgrade there are “Zavruni Rukave” [Roll up your sleeves], “Eko Straža” [Eco Guards], and “Trash Hero Serbia” organizations that are focusing their attention on PGS’, while another respondent from Novi Sad (M.S.) stated, ‘There is an organization, Zaštitičim Liman od betona [Let us protect Liman from concrete], that insists on protecting PGS from commercial or any other development within the neighborhood’.

5. Discussion: emerging perspectives and conclusions

The COVID-19 pandemic and its related restrictions on movement and use of PGS have significantly affected people’s daily routines and lives, influencing healthcare, the economy, and social habits for people from different age groups globally (Qiu et al., 2020). Cities rely on such spaces to generate financial, social, environmental, and health benefits; however, during pandemics and other public health crises, if not adequately managed and monitored, they could become spaces where massive virus outbreaks occur. Most importantly, the design and implementation of new PGS which pay attention to the new requirements in terms of reducing exposure to health risks are essential for planning a healthy urban environment (Sharif and Khavarian-Garmsir, 2020). For this paper, citizens from Belgrade and Novi Sad in Serbia were surveyed in order to understand the influence of the lockdown measures and restricted access to PGS on their habits, and learn from citizens about how PGS could be designed to make them safe for use during a pandemic. In the following section, we discuss three relevant lessons learnt against the background of this survey:

First, the survey respondents reported that their social lives and interactions, walking, jogging and other sport related habits and leisure time were negatively affected by the introduced changes and restrictions regarding access to PGS. A similar decline in the quality of life and frequency of use of PGS of citizens was reported by researchers conducting surveys in other countries, such as the United States (Zheng et al., 2020), Sweden (Beam & Kim, 2020), Canada (Volk et al., 2021), and Italy (Parola et al., 2020). However, all those surveyed complied with the lockdown rules imposed by the government regarding the use of PGS and distancing, otherwise, they would feel unsafe. Even more,
people understand the reasons behind the restriction measures which, in turn, allow them to continue using PGS in a safe way (besides lockdown).

Second, the survey has revealed that people have very clear and diverse ideas about the planning, design and management of PGS during a health crisis. Although most people called for the implementation of more green areas in order to limit crowding effects on existing PGS, it is clear that it is not necessarily big new parks that are needed. Small PGS would considerably address people’s need for public green space activities in the immediate surrounding of their homes. This is also indicated by the small time-budget the majority of respondents has for visiting PGS e.g. for walking the dog. However, several public green space design competitions and implemented winning designs initiated by local governments in Serbia were not informed by lessons learned on the design of PGS to be safe for use during a pandemic. Equally, designs were not informed by citizens safety concerns and suggestions on how those spaces could benefit from certain urban and architectural elements in order to be safer for use during a health crisis. The (intended) design of PGS is mostly restricted to traditional design elements and methods of maintenance, but the need for designing furniture, pathways, and sanitation (if there is any) so that they can be used, even in a pandemic, has been largely neglected, as the survey shows. Also, existing PGS can be designed in a more pandemic-robust manner beyond physical interventions. Providing diverse accessibility options, formulating and sharing guidelines for safer use, or improving signage and monitor the use, allow them to deal with potential health risks, and make them feel confident in using PGS (Wolff et al., 2022). Consequently, PGS built during the pandemic in Belgrade and Novi Sad might not be best examples of forward-thinking designs and might, again, become restricted for use if this pandemic becomes more severe or in the case of the next potential public health crisis.

Third, stronger collaboration and coordination between the government and various stakeholders, including the non-government organizations, the private sector, academia, media, and others is needed to localize, implement, and communicate all measures for the safe use of PGS during the pandemic (Boulton et al., 2020). However, the results have demonstrated that residents are less likely to request changing in particular are NGOs. This is in line with other findings pointing out that urban residents are less likely to indicate they intend to join a movement “less likely to indicate they intend to join a movement” (da Schio et al., 2021).

To conclude, the COVID-19 pandemic has brought into question the use of PGS in cities and the way we plan and design them, especially as their use was restricted and monitored during the COVID-19 pandemic. The restricted use during the pandemic does not undermine their critical importance in providing convivial places that connect people in cities. The reconfiguration of public green space needs to ensure that physical distancing is possible and enhance the accessibility and inclusion in our cities. PGS not only bring vibrancy to city life but also support the local urban economy by attracting tourism and cultural opportunities, promoting business investments, improving the living environment and public health, and providing public safety, among many other benefits (Anderson, 2016). PGS will now play a crucial role in cities and communities bouncing back after the COVID-19 pandemic, yet the question remains, will cities implement some of the lessons learned during the pandemic? This study suggests that local governments and other government entities should: include suggested distancing measures in the calls for proposals; review current designs against the listed conclusions; and enhance a participatory approach to the planning, design and implementation of PGS. This will remain an important topic in designing resilient and sustainable cities globally, whether during the current pandemic or in view of any new emerging crisis.

Authorship contributions

Conception and design of study: Gubic & Wolff; Acquisition of data: Gubic; Analysis and interpretation of data: Gubic & Wolff; Drafting the manuscript: Gubic & Wolff; Revising the manuscript critically for important intellectual content: Gubic & Wolff; Approval of the version of the manuscript to be published: Gubic & Wolff.

We understand that the Corresponding Author is the sole contact for the Editorial process. He is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
Annex

Annex 1

Frequency of words occurred in answer for the question “What are the three most critical things that you feel the government would need to implement in order to improve the green public open space experience especially in a context of potential new health pandemics”.

| Answer (standarised) | Category | Freq. [#] | Freq. [%] | Addressed in design calls |
|----------------------|----------|-----------|-----------|--------------------------|
| More parks           | Urban planning and policy | 104 | 9,7% | Not addressed |
| Monitor & manage use | Green space management | 64 | 6,0% | Not addressed |
| Better designed & distributed benches | Landscape design | 58 | 5,4% | Parally addressed |
| Wider, better paved paths | Landscape design | 54 | 5,1% | Not addressed |
| Cleaning              | Green space management | 49 | 4,6% | Addressed |
| Safety & security     | Green space management | 41 | 3,8% | Not addressed |
| Prevent large gathering | Green space management | 36 | 3,4% | Not addressed |
| Bike paths            | Landscape design | 35 | 3,3% | Parally addressed |
| Security Guard        | Green space management | 34 | 3,2% | Not addressed |
| Vaccinate & sanitize  | Green space management | 34 | 3,2% | Not addressed |
| Themed parks          | Urban planning and policy | 33 | 3,1% | Addressed |
| Equipment for childrens play | Landscape design | 33 | 3,1% | Parally addressed |
| Small parks           | Urban planning and policy | 32 | 3,0% | Parally addressed |
| Drinking water fountains | Landscape design | 32 | 3,0% | Not addressed |
| Green design for distancing | Landscape design | 32 | 3,0% | Addressed |
| More garbage cans     | Landscape design | 32 | 3,0% | Parally addressed |
| Wider green spaces    | Urban planning and policy | 31 | 2,9% | Not addressed |
| Community parks       | Urban planning and policy | 30 | 2,8% | Partly addressed |
| Bigger parks          | Urban planning and policy | 29 | 2,7% | Not addressed |
| More trees            | Landscape design | 26 | 2,4% | Partly addressed |
| Street lights         | Landscape design | 23 | 2,2% | Addressed |
| Diverse access to parks | Urban planning and policy | 20 | 1,9% | Partly addressed |
| More green walks      | Urban planning and policy | 20 | 1,9% | Not addressed |
| Maintenance            | Green space management | 20 | 1,9% | Partly addressed |
| River waterfront developed | Urban planning and policy | 18 | 1,7% | Not addressed |
| More grass            | Landscape design | 17 | 1,6% | Partly addressed |
| Individual sport & open gym | Landscape design | 16 | 1,5% | Not addressed |
| More bike paths       | Urban planning and policy | 15 | 1,4% | Partly addressed |
| Hand washing stations | Landscape design | 14 | 1,3% | Not addressed |
| Introduce single public chairs | Landscape design | 14 | 1,3% | Not addressed |
| Park signage          | Landscape design | 12 | 1,1% | Parally addressed |
| More flowers          | Landscape design | 11 | 1,0% | Not addressed |
| Covered areas in park | Landscape design | 10 | 0,9% | Not addressed |
| Connected parks/green corridors | Urban planning and policy | 8 | 0,7% | Not addressed |
| Landmarks             | Landscape design | 8 | 0,7% | Partly addressed |
| Lessons sharing       | Green space management | 8 | 0,7% | Not addressed |
| Car free extended     | Urban planning and policy | 4 | 0,4% | Not addressed |
| Designed spaces for elderly | Landscape design | 4 | 0,4% | Not addressed |
| Green city courtyards | Landscape design | 4 | 0,4% | Not addressed |
| Capacity development of officials | Green space management | 3 | 0,3% | Not addressed |

Summary statistic for categories

| Urban planning and policy | Landscape design | Green space management |
|--------------------------|-------------------|------------------------|
| 344 | 435 | 289 |
| 32,2% | 40,7% | 27,1% |

References

Alhusban, A. A., Alhusban, S. A., & Alhusban, M. A. (2022). How the COVID 19 pandemic would change the future of architectural design. *Journal of Engineering, Design and Technology, 20*(1), 339–357. https://doi.org/10.1108/JEDT-03-2021-0148

Andersson, C. (2016). Public space and the new urban agenda. *J. Public Space, 1*(1), 5–10. https://doi.org/10.5204/jps.v1i1.4

Andersson, E., Langemeyer, J., Borgström, S., McPhearson, T., Haase, D., Kronenberg, J., Barton, D. N., Davis, M., Naumann, S., Roschel, L., & Bars, F. (2019). Enabling green and blue infrastructure to improve contributions to human well-being and equity in urban systems. *BiScience, 69*(7), 566–574. https://doi.org/10.1093/bioci/biz058

Andrews, M., & Gatersleben, B. (2010). Variations in perceptions of danger, fear and preference in a simulated natural environment. *Journal of Environmental Psychology, 30*, 473–481. https://psyco.net/apa.org/doi/10.1016/j.jenvp.2010.04.001

Apostolovic, N. (2020). Pristup projektovanju savremenih javnih prostora male razmere u Novom Sadu. *Casopis za arhitekturu i urbanizam, 35*(7), 1305–1308. https://doi.org/10.24867/08FAl6Apostolovic

Biederman, D. G., & Kim, A. J. (2020). Psychological sequelae of social isolation and loneliness might be a larger problem in young adults than older adults. *Psychol Trauma Theory Res Pract Policy, 12*(51), 58–60. https://doi.org/10.1037.trap0000774

Beck, M., & Tobin, D. (2020). The 2019/2020 novel coronavirus outbreak: An international health management perspective. *The Open Public Health Journal, 13*, 52–54. https://doi.org/10.2174/18749445020130100052

Bede, A. (2017). Konkurs: Nova mesta. Urbanističko-arhitektonski konkurs za uređenje urbanih drypova u Novom Sadu. *DaNS Casopis za arhitekturu i urbanizam, 34–48, 083

http://dans.rs/wp-content/uploads/2018/12/DaNS_083_Web-01.pdf. (Accessed 15 December 2021). Available online.

Bickley, S. J., Chan, H. F., Skali, A., Stadelmann, D., & Togler, B. (2021). How does globalization affect COVID-19 responses? *Globalization and Health, 17*, 57. https://doi.org/10.1186/s12992-021-00677-5

Bo, Y., Guo, C., Lin, C., Zeng, Y., Bi Li, H., Zhang, Y., et al. (2021). Effectiveness of non-pharmaceutical interventions on COVID-19 transmission in 190 countries from 23 January to 13 April 2020. *International Journal of Infectious Diseases, 102*, 247–253. https://doi.org/10.1016/j.ijid.2020.10.066

Boulton, C., Dedekoruk-Howes, A., Holden, M., & Byrne, J. (2020). Under pressure: Factors shaping urban greenspace provision in a mid-sized city. *Cities, 106*. https://doi.org/10.1016/j.cities.2020.102816

Calvin Wan, C., & Shen, Q. G. (2015). Encouraging the use of urban green space: The mediating role of attitude, perceived usefulness and perceived behavioural control. *Habitat International, 50*, 130–139. https://doi.org/10.1016/j.habitatint.2015.08.010

Cartenì, A., Di Francesco, L., & Martino, M. (2020). How mobility habits influenced the spread of the COVID-19 pandemic: Results from the Italian case study. *Science of the Total Environment, 741*. https://doi.org/10.1016/j.scitotenv.2020.140489

Centers for Disease Control and Prevention. (2019). Coronavirus disease COVID-19 and you. Available online: https://www.cdc.gov/coronavirus/2019-ncov/factsheet.pdf . (Accessed 21 June 2021).

Chan, J., Dubois, B., & Tulboll, K. G. (2015). Refuges of local resilience: Community gardens in post-Sandy New York City. *Urban Forestry and Urban Greening, 14*, 625–635. https://doi.org/10.1016/j.ufug.2015.06.005
Shen, Y., Sun, F., & Che, Y. (2017). Public green spaces and human wellbeing: Mapping the spatial inequity and mismatching status of public green space in the Central City of Shanghai. *Urban Forestry and Urban Greening, 27*, 53–68. https://doi.org/10.1016/j.ufug.2017.06.018

Shimpo, N., Wesener, A., & McWilliam, W. (2019). How community gardens may contribute to community resilience following an earthquake. *Urban Forestry and Urban Greening, 39*, 124–132. https://doi.org/10.1016/j.ufug.2018.12.002

UN-Habitat. (2020). Spatial planning guidelines during COVID-19. Nairobi: UN-Habitat. Available online: https://unhabitat.org/sites/default/files/2020/11/covid19_spatialplanning_english.pdf. (Accessed 2 April 2022).

United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. A/RES/70/1. Available online https://sustainabledevelopment.un.org/post2015/transformingourworld/publication. (Accessed 21 June 2021).

United Nations. (2017). New urban agenda. A/RES/71/256. New York, NY: United Nations. Available online: http://habitat3.org/wp-content/uploads/NUA-English.pdf. (Accessed 21 June 2021).

United Nations. (2018). World urbanization prospects: The 2018 revision. Available online: https://population.un.org/wup/. (Accessed 21 June 2021).

United Nations. (2020). Sustainable development goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable. Available online: https://sustainabledevelopment.un.org/sdg11. (Accessed 21 June 2021).

Wolff, Manuel, & Haase, Dagmar (2019). Mediating sustainability and livability—Turning points of green space supply in European cities. *Frontiers in Environmental Science*. https://doi.org/10.3389/fenvs.2019.00061

World Health Organization. (2009). *Cities and public health crises: Report of the international consultation*, 29-30 October 2008. Lyon, France: World Health Organization. Available online: https://apps.who.int/iris/handle/10665/70465. (Accessed 21 June 2021).

World Health Organization. (2010). *Hidden cities: Unmasking and overcoming health inequities in urban settings*. World Health Organization. Available online: https://apps.who.int/iris/handle/10665/44439. (Accessed 21 June 2021).

Wolff, Manuel, et al. (2022). Conceptualizing multidimensional barriers: A framework for assessing constraints in realizing recreational benefits of urban green spaces. *Ecology & Society*. https://doi.org/10.5751/ES-13180-270217

Wolff, Manuel, & Haase, Dagmar (2019). Mediating sustainability and livability—Turning points of green space supply in European cities. *Frontiers in Environmental Science*. https://doi.org/10.3389/fenvs.2019.00061