

Covid-19 and outdoor recreation – Lessons learned? Introduction to the special issue on “Outdoor recreation and Covid-19: Its effects on people, parks and landscapes”

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ABSTRACT

The special issue presents international experiences with COVID-19 in the years 2020 and 2021 on outdoor recreation and nature-based tourism. To set the scene, a bibliometric and qualitative analysis illustrates and clusters recent publications on COVID-19. Against this background contributions from Japan, China, Brazil, Indonesia, Austria, Croatia, the United States, New Zealand, Taiwan, Australia, Sweden, Poland and Ireland draw a truly international picture of the pandemic crisis, the effects, coping behavior and related strategies. The papers contribute to the COVID-19 related research by documenting the shock in the field of outdoor recreation and tourism, by understanding the immediate consequences on behavior and the required managerial consequences and finally, by analyzing the possible follow up effects including long term effects, discussing resilient solutions and proposing new strategies. In the discussion section we try to answer the questions whether the high visitation rate in recreation facilities, forests, parks and protected areas will remain, and whether adapted visitor management concepts will be required. In addition, we discuss possible implications for urban planning and management. Finally, based on a changing connectedness to nature also possible positive effects by the pandemic are discussed which may lead to a new target group in outdoor recreation and nature-based tourism.

Management implications: The overview on the Covid-19 related literature suggests improvements in planning and management, such as

- new concepts for destination and visitor management, considering an ongoing risk-management,
- proactive urban planning and management considering short-term effects in the existing built environment as well as a long-term perspective with strategically planned green infrastructure, including not only the supply of green infrastructure, but also its accessibility, its amenities, and aspects of environmental justice,
- the consideration of new target groups in tourism and outdoor recreation.

1. Introduction

The Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus (WHO, 2022). The first COVID-19 cases were identified in late December 2019 in Wuhan, China, and the disease turned into a pandemic within a few weeks. As of September 30, 2020, more than 33 million cases have been reported globally, with more than 1 million deaths.¹ The COVID-19 pandemic posed serious challenge for securing public health worldwide. Public health preparedness and restrictions put in place impacted many aspects of human life, including recreational activities and access to outdoor recreational destinations. The paper at hand and the special issue introduces specifically on the role of green spaces, forests and protected areas which gained importance during the coronavirus crisis due to their restorative effects on psychophysical health and community well-being and missing

alternatives. In addition, parks, outdoor recreation and green spaces have been broadly considered to foster resilience in individuals by providing conditions for recreation, physical health and recovery (Cervinka et al., 2014; Bell et al., 2009; Pröbstl et al., 2010), spaces to facilitate social interaction (Kuo et al., 1998; Mann & Leahy, 2010), supporting mental health (Buchecker & Degenhardt, 2015; Kuo, 2015; Azara et al., 2018; Lackey et al., 2021), and allowing to learn and develop social-ecological knowledge together (Krasny & Tidball, 2009; Smith et al., 2016).

The special issue at hand summarizes international experiences with COVID-19 in the years 2020 and 2021 on outdoor recreation and nature-based tourism. Contributions from Japan, China, Brazil, the United States, New Zealand, Taiwan, Australia, Sweden, Poland and Ireland draw a truly international picture of the pandemic crisis, the effects, coping behavior and related strategies.

¹ <https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>.

With this editorial we want to position the papers of this special issue, highlight differences and similarities and finally discuss possible lessons learned.

2. Literature review

2.1. Overview and methodological approach

The aim of this literature review is to provide an overview on main research fields, to position the papers in this special issue and to provide

a background for the discussion about possible lessons learned. The following literature review is based on a mixed approach that combines a bibliometric and a qualitative content analysis; the articles considered are exclusively those listed in Web of Science (WoS) - without any time restriction. Combining quantitative bibliometrics with qualitative approaches is beneficial, since it provides (a) the methodologically rigorous identification of thematic patterns in larger bibliographic datasets; and (b) goes beyond statistics and includes a qualitative perspective on the narratives of each statistically identified cluster (Herrera-Franco et al., 2021; van Eck & Waltman, 2010) and thus

Table 1

Results from the co-occurrence analysis, illustrating the number of links and occurrences and the link-strength of the strongest keywords based on co-occurrence and keyword occurrences. The cut-off point for this illustration was 50 in link-strength. While 'links' refers to then number of an item' links, the link strength indicates the total strength of the co-occurrence links of a given keyword with other ones (van Eck & Waltman, 2010, 2017; Weerakoon & McMurray, 2021) These keywords served as filters for the article-identification for the content-analysis. Capitalisation and use of small letters have been kept from the original.

| | Number of Links | Total link strength | Occurrences Frequency | | Number of Links | Total link strength | Occurrences Frequency |
|-------------------------------------------------|-----------------|---------------------|--------------------------|------------------------------------------------|-----------------|---------------------|--------------------------|
| Cluster 1, total = 20 items (=keywords), (RED) | | | | Cluster 3, total = 17 items (keywords), (BLUE) | | | |
| urban | 46 | 117 | 24 | Health | 56 | 261 | 65 |
| Green infrastructure | 41 | 108 | 22 | Parks | 51 | 154 | 29 |
| Cities | 37 | 85 | 17 | Benefits | 47 | 137 | 27 |
| impact | 45 | 81 | 19 | exposure | 33 | 76 | 15 |
| urban | 35 | 63 | 16 | wellbeing | 40 | 72 | 11 |
| space | 35 | 63 | 16 | environment | 34 | 62 | 13 |
| recreation | 29 | 51 | 19 | Outdoor recreation | 32 | 52 | 20 |
| Biodiversity | 30 | 51 | 14 | Urban parks | 29 | 50 | 9 |
| management | 32 | 51 | 14 | | | | |
| Cluster 2, total = 17 items (keywords), (GREEN) | | | | Cluster 4, total = 11 items (keywords) (PINK) | | | |
| COVID-19 | 62 | 360 | 123 | Physical activity | 47 | 129 | 26 |
| stress | 51 | 155 | 30 | | | | |
| Mental-health | 44 | 115 | 20 | Ecosystem services | 49 | 127 | 28 |
| Green space | 42 | 108 | 24 | accessibility | 42 | 101 | 18 |
| Mental health | 45 | 90 | 18 | Urban green spaces | 45 | 100 | 21 |
| Environment | 41 | 78 | 16 | quality | 33 | 60 | 13 |
| lockdown | 37 | 71 | 16 | Community | 35 | 59 | 13 |
| nature | 31 | 61 | 11 | | | | |
| children | 33 | 54 | 11 | | | | |

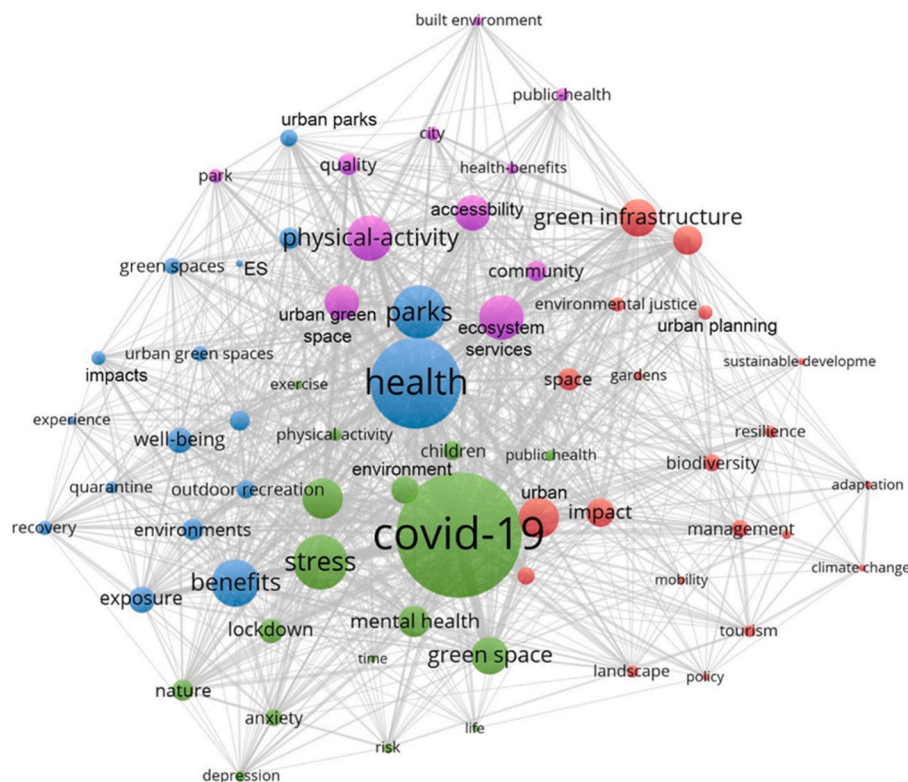


Fig. 1. Shows four different thematic clusters based on co-occurrence: the red cluster (1) focuses on (urban) green infrastructure for recreation; the green cluster (2) takes a strong mental health perspective and is mainly fueled by public health and (environmental) psychology debates. Cluster three (blue) is also focusing on health but in a broader context, discussing benefits of physical activity and outdoor recreation for wellbeing. The fourth cluster (pink) is delving into different aspects of ecosystem services and accessibility.

bridges the ambiguity of quantitative metrics (Retrouvey et al., 2020). For this overview, Web of Science (WoS) served as data base for reflecting the academic discourse emerging in high-quality publication outlets. However, we are aware that the focus on WoS most likely causes a limitation of the results and may not reflect the entire discourse. The Boolean search strategy used the following keywords ‘COVID’, ‘Green Infrastructure’, ‘Green Space’, ‘Landscape’, ‘Nature’, ‘recreation’, ‘open space’, ‘outdoor recreation’, also using the terms in plural (see Table 1). The WoS RIS data sets were imported into ZOTERO-Groups, doublets removed which left us with 287 records for the further analysis (full records, RIS) into program VOSviewer. For the co-occurrence analysis we used a minimum number of six which resulted in four clusters; the keywords ‘pandemic’, ‘coronavirus’, ‘covid-19 pandemic’, ‘sars cov 2’ and ‘framework’ were sorted out manually, as they would have resulted in self-referential analyses (e.g. co-occurrence of ‘COVID’ and ‘covid-19 pandemic’). Co-occurrence is one standard analysis in bibliometric measuring the potential relationships of frequently and proximity of highly connected terms or words in one text corpus or many text corpora in a specific field of research (see Figs. 1 and 2).

There was no need to set a cut-off point to limit items since our numbers stayed below the identified 120 items (van Eck & Waltman, 2010). A timeline analysis was conducted, but due to the overall short time of potential publications in that field, it did not yield any useful results. The second stage is a qualitative content analysis. The 287

articles from the bibliometric analysis formed the basis for the qualitative investigation: the core-keywords (based on total link strength, occurrence) served as filters to identify the potential article set of each cluster. The full records were downloaded in xls format, sorted along the publication date and number of citations; the final identification followed the following scheme: (i) most highly cited articles, (ii) the most recent articles, and three-four of the highest ranked articles of each year. In the case of overlaps, the next paper was included in the sample. With these four article-sets a qualitative content analysis was carried out (Kuckartz, 2016).

The following figures present the main findings and illustrate the main clusters which will be described in section 2.2. Fig. 1 shows the four thematic clusters from the bibliometric analysis: cluster 1 (red) is the largest cluster with 20 items that covers mainly aspects related to different impacts of urban green infrastructure and its value for recreation. Cluster 2 (green) comprises 17 items and takes a strong mental health perspective on green spaces and nature. Scholars from this cluster are strongly linked to the fields of (public-)health and (environmental) psychology. Cluster 3 (blue) also takes up health, but stays in a broader spectrum, focusing on benefits from (urban) green-spaces and outdoor-recreation on health and wellbeing more in general (17 items). Cluster 4 is the smallest cluster with only 11 items: while again emphasizing the potential benefits from green spaces for physical activities – but this time as cultural ES – this cluster highlights particular ecosystem services and

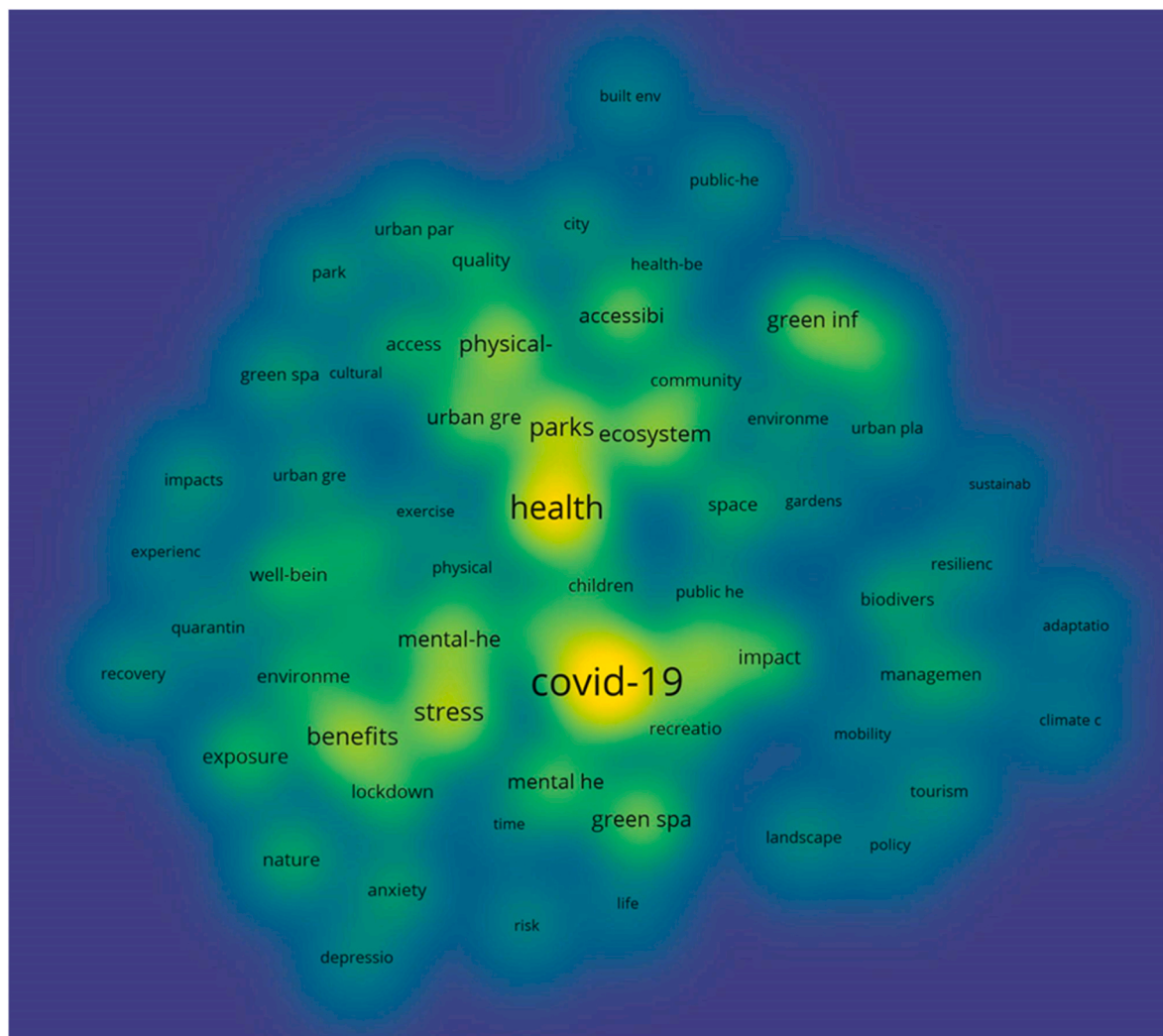


Fig. 2. (Density Plot) highlights in yellow main research fields and the related keywords and visualizes the respective proximity and familiarity of different keywords.

accessibility of (urban) green spaces in times of disruption. However, as the illustration shows, many of these aspects are closely related and many papers cover several aspects. Fig. 2 illustrates a density plot that visualizes the different field, related keywords and illustrates the respective proximity and familiarity of different keywords.

2.2. Thematic clusters on outdoor recreation, green infrastructure, health and well-being

2.2.1. Cluster 1 Urban green infrastructure for recreation

Cluster 1 (see Fig. 1, red) focuses on the urban context and emphasizes the role of green infrastructure in cities, its relevance for outdoor recreation and addresses adjoined management implications. The situation in large cities and urban centers were at the core of many publications, because population density impacted the local population during the pandemic significantly (Shentova et al., 2022). However, the scope and extent of restrictions and confinements varied greatly between different countries and cities. In particular people in cities and urban agglomerations experienced a strong impact of those restrictions on their everyday life and wellbeing during the pandemic (Ugolini et al., 2020; Weinbrenner et al., 2021). Green spaces have been proven beneficial in supporting people in times of disruption and to mentally and physically prepare them for challenging time periods (Herman & Drozda, 2021). Regular physical activity supports physical and mental health (Slater et al., 2020; Venter et al., 2021) which highlights the role of urban greens spaces as an important source of welfare for people living in cities and urban agglomerations (Herman & Drozda, 2021). Research from the first lock-down periods during the COVID-pandemic shows, that recreational activities notably increased: recreation in different types of green and/or open spaces such as streetscapes and (peri-)urban forests have significantly increased; in some cases authors highlight increases greater than 200% (e.g. Venter et al., 2021). All studies emphasize that activities in these different types of green spaces supported people in coping with social distancing. At the same time these activities opened a wiggle-room that provided sufficient institutional grey-space to meet friends, maintain social relationships and social bonds in times of confinement (Weinbrenner et al., 2021). Anecdotal knowledge illustrates the ‘Renaissance of walking and promenading’ as one of the few occasions to interact with friends and enjoy social contacts. Green spaces turned into compensation spaces, as many activities had to be shifted to open green spaces due to the closure of commercial spaces – but also the closure of (semi) private parks and historic gardens (Gugerell & Netsch, 2020; Herman & Drozda, 2021; Weinbrenner et al., 2021).

Within this cluster three types of public and private open spaces were discussed in detail: (i) private gardens, (ii) streetscapes and (iii) (peri-)urban forests. Private gardens were discussed in a positive light, in their role as a residential open space, as a recreational space and room for being active. The residents highlighted the important role of perceived biodiversity (contrary to actual biodiversity in terms of variety and abundance of different species) and opportunity for physical and recreational activity as beneficial for the mental health (Shentova et al., 2022). While only few urban dwellers might enjoy the benefits of private gardens, they all use streets. While the network of different types of urban green spaces plays an important role for the livability (Gugerell & Netsch, 2020; Reinwald et al., 2021) the quality of streetscapes is even more important for the everyday life and recreation activities (Shentova et al., 2022). (Peri-)urban forests gained significant popularity during COVID-19 for recreational activities, sports and retreat from everyday life during the pandemic. A sense of ‘feeling-free’ in times of confinement was another important reason for the significant increase of outdoor recreation in forests (Weinbrenner et al., 2021). However, the research also showed notable social bias regarding the use of (peri)urban green spaces: a consistent result was a stratification of green space use according to socio-economic attributes (e.g. Uchiyama & Kohsaka, 2020). Hence, neither health nor (access to) urban green spaces is

distributed evenly in society (Geary et al., 2021; Reinwald et al., 2021). From a planning and management perspective, tactical urbanism approaches were considered useful to flexibly deal with temporary and permanent adjustments to improve walkable and bikeable spaces (e.g. extension of sidewalks, provisional bike lanes, street closures) and temporary micro-spaces such as parklets or tiny-forests on a neighborhood scale. Consequently, refraining from ‘over-designing’ parks and open spaces and program greenspaces more flexibly to provide greater adaptivity for crisis situations is discussed (Herman & Drozda, 2021). Urban green spaces and (peri)urban forests are green refuges (Venter et al., 2021) and their capacity to support urban residents in crisis situations turns them into critical urban infrastructure, that should be adequately considered, planned and managed (Gugerell & Netsch, 2020; Shentova et al., 2022; Venter et al., 2021).

2.2.2. Cluster 2: Spaces in relation to mental health, stress and anxiety

This cluster emphasizes the relevance of nature and green spaces in the context of mental health, depression and anxiety with a particular focus on periods of confinement (see Fig. 1, green). Many governments have chosen quarantine as main measure to maintain public health. This forced isolation caused negative effects such as boredom, hopelessness, depression and unhappiness (Akbari et al., 2021). The experience of nature, landscapes and green spaces can provide a strategy for recovery and benefits to public health, such as improved cardio vascular and respiratory health, improved immune and lower risk of disease and mortality (Cavaleiro Rufo et al., 2021; de Keijzer et al., 2018; Twohig-Bennett & Jones, 2018). Access to public green and private gardens as well as physical activities in nature and green spaces are associated with better mental health and lower stress and anxiety levels, lower somatization symptoms, improved biomarkers of stress and an overall higher level of psychological wellbeing (Bratman et al., 2015; Hubbard et al., 2021; Triguero-Mas et al., 2017; Wendelboe-Nelson et al., 2019). Green spaces act as a barrier and buffer between adverse life experiences and circumstances and suggest that nature and green spaces are just as important for community resilience and mental health as social bonds and social networks (Poortinga et al., 2021). Exposure to nature during COVID-19 lockdowns has delivered mental health benefits: in particular visiting public green spaces and nature and contemplating those landscapes from home – but also window views of natural environments are associated with lower stress levels. On the flipside, the lack of contact with nature might have partly exacerbated the situation and produced worst mental health outcomes (Ribeiro et al., 2021). The literature highlights the importance of demographic factors on mental health: women have consistently reported higher levels of anxiety and depression than men and younger people have reported more anxiety than older adults; also results show differences in psychological stress, which is higher in deprived areas compared to affluent ones: also here women and people with worse illnesses and who lodge in deprived neighbourhoods are more likely to experience psychological stress during the COVID-19 crises (Hubbard et al., 2021). However, work from Poortinga et al. (2021) does not confirm causal relations between green spaces availability and deprived strata or adolescent adults.

Within the cluster two age-groups in context to green spaces/nature and mental health were highlighted: (i) children and adolescent, and somewhat less prominent (ii) elderly people. Experiences with nature during childhood plays an important role for developing human-nature relationships (Howlett & Turner, 2022; Lee & Burns, 2022; Soga et al., 2016). While social distancing played a crucial role for maintaining public health, it put notable stress on children and in particular on adolescents by changing routines, recreation behaviour and reducing interactions during a key-life stage with a high relevance of peers and friends outside the family. One third of this target group experienced isolation or quarantine and now meet criteria for post-traumatic stress disorders, depression and increased anxiety (Jackson et al., 2021; Ma et al., 2022). Access to nature and green spaces for children and adolescents have proven beneficial: participation in outdoor and nature

activities bear the potential to boost adolescents resilience to environmental stressors and promote resilience among young adults by facilitating health benefits associated with nature and improved mental well-being (Jackson et al., 2021). In addition, parents of children emphasize various reasons why green spaces are important, including positive effects on spiritual wellbeing, benefits for mental health and general health, stimulating effects including creativity learning based on social interaction and learning from nature and finally a sense of freedom (Howlett & Turner, 2022). Regarding the frequency of green-space usage the authors report mixed and even contradicting results: Howlett and Turner (2022) report that in 45% the outdoor time has increased, while 35% of their sample report reduced outdoor time and physical activities, with the highest number of outdoor time reported in rural areas. McCormack et al. (2021) report similar results, stressing that in compliance with social distancing for the majority of children the outdoor time with friends in the park has decreased. Ma et al. (2022) on the other hand emphasized changed visitation patterns in public green areas, with 50% of the sample showing higher visitation numbers, but safety concerns in general are expected to have lowered outdoor activities in green spaces and nature activities among children and adolescents (Jackson et al., 2021). In this context, the parents' attitude plays a crucial role. One third of the parents involved in this study reported high anxiety levels related to COVID-19 which impacted their children's play and nature activities. Therefore, children of parents with high anxiety levels visited green spaces less frequently and were restricted by their parents who rigorously followed COVID-19 distancing regulations (McCormack et al., 2021). COVID-19 negatively impacts adolescents social-well-being and participation in outdoor recreation activities regardless of race, gender, age, household income, community type and geographic region.

For elderly people three overarching and interlinked themes related to the contact with nature and green spaces emerged: (i) new and newly adopted activities in nature: physical activities, purposeful outdoor projects such as photography, gardening, but also passive activities such as contemplating, listening to nature, listening to birdsongs, etc. show positive effects on health and wellbeing; (ii) motivations to seek therapeutic encounters led to physical, mental and social wellbeing; (iii) finally, extrinsic barriers and enablers to take part in nature activities showed an effect such as weather conditions, behaviour of other people, the surrounding built environment, and further household characteristic (Bustamante et al., 2022). The findings underline that even passive engagement has proven beneficial such as listening to birdsongs, watching wildlife through the window, noticing nature through passing of seasons and growing elements like flowers. Against this background it was possible to create purposeful outdoor projects and activities, which supported health and well-being during the COVID-19 lockdowns. Life experience, individual beliefs and sensorial atonements influence the role of nature for older adults during the pandemic (Bustamante et al., 2022).

2.2.3. Cluster 3: benefits of parks and (Urban) green spaces for restoration, health and recovery

While the previous cluster strongly concentrates on mental health, anxiety and stress, cluster three takes a more general approach by emphasizing the benefits of physical activity, parks and urban green space for health and well-being (see Fig. 1, blue). Urbanisation and densification have resulted in changed availability of and access to green areas (Noszczyk et al., 2022), while urban green spaces and parks are considered to improve human health, reduce segregation and multiply opportunities and benefits for psychological restoration, build up resilience and support individual and community human well-being (Liotta et al., 2020; Morse et al., 2020; Noszczyk et al., 2022). Research shows that the citizens' behaviour and perceptions of park, urban green areas and environments have notably changed during the pandemic. In particular mobility restrictions and confinements were a significant driver for changing perceptions and environmental consciousness.

Ugolini et al. (2020) report that urban residents look at urban green areas and environments with a high awareness. While many studies report that most popular green spaces and parks are located in central urban locations and close to residential developments, individuals and families are willing to travel further distances within and beyond the city to visit green spaces (Noszczyk et al., 2022; Ugolini et al., 2020). Also mobility restrictions did not fully cut off visitation patterns, which points towards a fundamental need for greenery, nature experience and open spaces, but showed that people were forced to substitute their more favoured green spaces with available green spaces (e.g. streetscapes) in closer proximity or urban forests instead of more natural forests (Gugerell & Netsch, 2020; Ugolini et al., 2020).

Participation in regular physical activities in green environments deliver health benefits and support mental well-being. The studied literature showed group-specific details. Women were more engaged in activities like gardening, hiking, relaxation in groups and alone, walking and wildlife watching (Morse et al., 2020). Results show that the pandemic has increased professional and private pressure on women stronger than on men and they might be in higher need of stress relief and green areas for decompressing and recovery (Slater et al., 2020). Also, gardening, social relaxing, walking and wildlife watching showed a higher abundance in groups of people who lost their jobs during the pandemic: while gardening can be considered as response to establish food security, other activities indicate that nature and greens paces provide benefits for people in times of material crisis (Morse et al., 2020). Research results show differences between active and more 'inactive' individuals: active persons use physical activity actively to release and cope with stress and show higher levels of self-motivation; more inactive persons are more prone to extend sedentary activities and need even more social support to become active since the COVID-19 pandemic (Lachman et al., 2018; Lesser & Nienhuis, 2020). In this context active individuals show higher rates of relatedness to nature and green environments than inactive ones do (Lesser & Nienhuis, 2020). In general, COVID-19 shows stronger burdens on disadvantaged and marginalised individuals and communities (e.g. people/communities of colour, students, children, elderly, women). Slater et al. (2020) shows for the US that COVID-19 rates are higher in marginalised communities, who often live in so called park deserts, which are urban areas with limited provision of green spaces or only small parks on the neighborhood scale with limited features for physical activities. Shifting these physical activities into the private apartments is generally not an option, because they (e.g. students) often live in smaller or shared apartments (Larson et al., 2022; Slater et al., 2020). Various authors stress the importance to include housing provisions, apartment layouts and apartment sizes stronger into considerations on (mental) health and well-being (Akbari et al., 2021; Mironowicz et al., 2021; Ribeiro et al., 2021). In general, we can see that disadvantaged communities are unduly burdened resulting in intergenerational well-being problems and disparities (Noszczyk et al., 2022; Sharifi et al., 2021).

This cluster also provided more detailed ideas regarding the roles of planning, governance and management of green spaces and urban parks. Planning should support the implementation of sufficient and adequate green spaces and vegetation (trees) to improve health and wellbeing benefits across urban population (Ugolini et al., 2020). According to the literature key messages in the context of a short-term response to a pandemic crisis were (i) keep parks and green spaces open, (ii) ensure prioritized access of vulnerable groups and (iii) waive or lower access fees. On the long run urban planning should implement tailored high-quality green spaces and create healthy environments, and improve the street-design with quality greenery (e.g. complete streets, slow streets, improved connectivity). Where to locate parks and green spaces are crucial to ensure a fair distribution of health benefits for the urban population ensuring an equal opportunity to enjoy health and well-being in nature and green settings (Morse et al., 2020; Slater et al., 2020; Spotswood et al., 2021).

2.2.4. Cluster 4: Access to ecosystem services in times of disruption

Cluster 4 focuses on ecosystem services (ES) related to accessibility and physical activities in urban green spaces (see Fig. 1, pink). With only eleven elements it is a minor thematic string compared to the previous ones. Green spaces mitigate environmental hazards, air pollution, extreme weather events, heat waves, excessive rainfall and flooding. They also increase air quality, decrease noise, air and environmental pollution (Meo et al., 2021b; Taylor & Hochuli, 2017). The reduction of environmental pollution is of particular relevance regarding the transmission of pathogens of various bacterial and viral infections (Meo et al., 2021a, 2021b). Urban green spaces are essential elements in the urban fabric and provide multiple ES that have also proven beneficial during the COVID-19 crisis (De Luca et al., 2021; Razzaghi Asl & Pearsall, 2022), covering (i) provisioning (food provision) (Steenkamp et al., 2021), (ii) supporting (pollination, support for urban fauna and insects) (Gardiner et al., 2013); (iii) regulating: temperature regulation, cooling effects of vacant land and green spaces, improved air quality and carbon offsetting (Berland et al., 2017; Boschet & Rambonilaza, 2015; Eisenman et al., 2019; Kavehei et al., 2018), and (iv) (socio)cultural: health benefits, recreation learning (Lyytimäki & Sipilä, 2009; Peschardt et al., 2012; Razzaghi Asl & Pearsall, 2022). Cultural ES bridge the gap to nature and 'greenness' and emphasize nature connectedness (Beery et al., 2021; Lausi et al., 2022) but also deliver additional benefits such as social cohesion, positive and friendly relationships, feelings of being accepted and belonging (De Luca et al., 2021). Morse et al. (2020) highlight that cultural ES are shaped by their ecological and social context and are bundled; i.e. mental wellbeing bundled with aesthetic values. Individuals show a strong appreciation of aesthetic values and emphasize the value of aesthetic landscapes and cultural heritage as specific cultural experience (Lausi et al., 2022). Also, ES are not evenly distributed across urban areas and across society. Health benefits and cultural ES are strongly related to the accessibility of specific places which highlights the importance of the distribution of urban green spaces (De Luca et al., 2021). Research confirms a widespread inequality regarding the access to nature and to green areas, which produces cascading effects for individual and community wellbeing particularly in disruptive times like the COVID-19 crisis (Spotswood et al., 2021).

An additional aspect is provided by the work from Mazlan and Abas (2021) who are introducing 'indoor ecosystems' and their role for the provision of indoor ES. Given that people are spending increasingly time indoors, different aspects of so called 'human indoor environment liveability' appears as an interesting future research avenue: this debate connects to aspects of the relationship between the built environment and well-being that have already been presented in the previous clusters, emphasizing the importance of 'nature' and 'green' elements in the built and indoor environment, such as green walls, water (e.g. water basins), plants and greenery to support wellbeing.

2.3. Clustering around the perception of COVID-19, restrictions and following up effects

Beside the thematic clusters related to COVID-19 and outdoor recreation clustering is possible based on the main phases following the outbreak, related restrictions and related follow up effects. This approach leads to a grouping around three main themes (e.g. Aschauer et al., 2021; Brouder, 2020; Kuster & Bieger, 2021; Bieger et al., 2021; Steiger et al., 2021; Olbrich & Pechlaner, 2021; Prideaux et al., 2020):

- **Documenting the shock** based on an inventory trying to understand the impact of the pandemic and related restrictions in the field of outdoor recreation and tourism,
- **Understanding the immediate consequences** highlighting behavioral, environmental and managerial consequences of the pandemic,
- **Understanding the follow up effects** looking for long term effects, discussing resilient solutions and proposing new strategies.

This grouping can also be found within the accepted papers in this special issue.

3. Overview on the papers in the special issue

3.1. Documenting the shock

The first group of papers is dealing with the shock per se and tries to understand the impact of related restrictions in the field of outdoor recreation and tourism. These papers try to document the before and after, the changes on the demand and supply side and the need for adaptive management. A part of this documentation is also drawing attention to societal groups which are significantly affected by social distancing and other COVID-related management measures. The results are important for public health preparedness planning in crisis situations and for provisioning conditions supporting societal health and well-being.

Ciesielski et al. (2023 in this issue) analyzed the situation in Poland and asked "was it really different" before and after the pandemic period in Polish forests? Their results are based upon long-term visitor data acquired via pyroelectric sensors (Eco-Counter) in three forest districts. The number of visits to sub-urban forests and to remote nature-based tourist destinations during the pandemic increased, especially in the summer months of 2020, while it remained the same in a popular nearby recreation area. The authors recognized only minor temporal shifts in the distribution of weekly and daily visits. Smith et al. (2023 in this issue) used volunteered geographic information such as fitness platforms to understand the significant changes in outdoor recreation behavior occurring during the COVID-19 pandemic in Australia. Visitation increased at different stages of the pandemic, with mountain bikers' preferring urban parks with networks of mountain bike trails while some hikers preferred more remote large parks.

The increase in visitation was not only reported for Poland and Australia but also for the United States. Ferguson et al. (2023 in this issue) analyzed the consequences of the increased visitation upon recreation visitor behaviors and experiences in parks and protected areas in the United States. This study found that during the peak of the COVID-19 pandemic, social, situational, ecological, behavioral, and sociodemographic factors significantly influenced overall visitor decision-making and experience quality. Results report significant crowding and conflict impacts stemmed from interactions between in-state and out-of-state visitors, largely based upon perceived violations of pandemic protocols. The authors stated that social and general recreation impacts were reported by approximately 56% of the sample.

Beside the increasing visitation in forests, parks and protected areas general recreational infrastructure such as trails were intensively visited as Power et al. (2023, in this issue) report. They analyzed trends in recreational walking trail usage in Ireland during the COVID-19 pandemic in Ireland. Their paper illustrates trends in footfall count data on Irish trails during the COVID-19 period and triangulates findings with openly available mobility data. Their findings show an increased trail usage in Ireland, especially on trails closer to urban areas. They therefore suggest a further monitoring to whether the observed trend remains. Schlemmer and Schnitzer (2023 in this issue) looked at behavioural changes in ski touring on groomed slopes due to the COVID-19 pandemic in the Austrian Alps. Similar to other studies they report a significant increase of people practicing this sport for the first time.

Outdoor recreation during the pandemic was also influenced by the COVID-19 related management measures such as wearing masks and social distancing. A higher density on recreational trails and infrastructure required adapted behavior in many cases. Several papers in this special issue address the response on COVID-19 related management measures by outdoor recreationists.

Schneider et al. (2023a in this issue) analyzed mask-related behaviors among U.S. trail visitors during the COVID-19 pandemic.

Recommended protective measures against COVID-19 included physically distancing 1.8 m (six-feet) between parties and mask-wearing when distancing is not possible. The authors studied mask-wearing behaviors among trail walkers on multiple trails in the United States from November 2020 through May 2021. Trained observers identified if walking groups were prepared to mask or had masks correctly worn as well as if encounters were compliant with the 1.8 m recommendations. Results from seven U.S. states and nearly 3,000 encounters revealed a low compliance of mask-wearing in encounters less than 1.8 m, significant influence of both COVID-19 cases and vaccination rates on mask wearing at half the sites, and no impact of state-level mask mandates when controlling for cases and vaccinations.

Schneider et al. (2023b) in this issue) also analyzed the responsiveness on physical distancing on recreational trails during COVID-19 in the United States. The exposure to a risk can be minimized by considering a physical distance, however the compliance by the outdoor recreationists was unknown. The study analyzed more than 10,000 trail user encounters to understand the behavior. The authors show that wider trails, smaller groups and signage led to greater distancing compliance. **Schneider et al. (2023c)** in this issue) analyzed the COVID-19 compliance among urban trail users. They show that the environment matters as people negotiate the 'new normal' of physical distancing during physical activity and outdoor recreation participation. Given the ongoing COVID-19 pandemic and likelihood of future health crises, this study provides important information and insight for trail and other public green space management, monitoring, and modelling moving forward.

Handler and Kawaminami (2023) in this issue) tried to understand the different perceptions and behavioral intentions in the context of COVID-19 by using a psychographic segmentation analysis asking "Why do Japanese people visit hot springs during a pandemic?" The applied psychographic segmentation based on exploratory factor analysis results in three separate segments: Concerned Visitors, Carefree Visitors, and Trusting Visitors; these segments were based on perceived threat intensity, perceived infectability, response efficacy, self-efficacy, as well as crowded perception and attitude. These segments were then profiled using factors based on demographic information and visit intention. Interestingly, these segments differed significantly by age, marital status, and family composition, but not gender.

The study by **Xiao et al. (2023)** in this issue) contribute to the research which helps to understand the immediate consequences of the pandemic looking at the social carrying capacity and emotion dynamics in urban national parks in China. Moreover, this study suggests that the level of crowding, COVID-19 prevention strategies and implementation can affect visitors' emotions in nature-based parks significantly. These findings highlight the importance of enforcing the social carrying capacity limits and COVID-19 prevention strategies for urban parks and protected areas to mitigate physical and mental health risks during the COVID-19 pandemic.

While the previously described papers are based on surveys, direct or indirect observation of the recreationists and their behavior, other research papers involved the tourism and outdoor recreation industry to understand the impact by the pandemic.

Beery et al. (2021) in this issue) explored how outdoor recreation professionals perceived outdoor recreation by the public during the pandemic and whether professionals could identify specific implications from the COVID-19-outdoor recreation experience. Their results from Sweden confirm the described observations of an increased visitation. The professionals describe a rapid and significant increase in outdoor recreation participation. Furthermore, professionals identified critical trends in the increase of new or inexperienced outdoor recreation participants. However, the authors see in the new connectedness to nature an opportunity for further management.

Spennemann and Whisted (2023) in this issue) analyzed the impact of COVID-19 on the Australian outdoor recreation industry from the perspective of practitioners. In the light of internal border closures, stay

at home orders, social distancing requirements and travel restrictions the author surveyed outdoor recreation industry representatives in Australia to assess the impact of COVID-19 on professionals in the industry, views on career choices, and perspectives on the future of the industry in a post-COVID world. The findings revealed that COVID-19 affected outdoor recreation businesses in multiple ways, with a pessimistic outlook for the industry until travel restrictions and social distancing requirements are eased and economic confidence returns. In addition, the industry is likely to continue to suffer through loss of qualified staff and the flow-on effects of the imposed pause in guided outdoor recreation and tourism activities.

3.2. Understanding the immediate consequences

A second group of papers highlights the immediate consequences of the pandemic such as the discovery of nature and green spaces in the neighboring areas, the development of new pop-up cycling trails in cities or the greening of roads to develop missing playgrounds. Against this background these publications also discuss consequences for the environment, new environmental conditions and effects on the possible nature experience especially in parks and protected areas. They also propose opportunities of a revised visitor or protected area management, e.g. based on new digital opportunities or communication tools such as social media, and a re-thinking and re-planning of urban green infrastructure, outdoor recreation facilities as well as parks and protected areas. Finally, the impacts on travel motivation, booking behavior and behavioral changes in tourism and outdoor recreation have been covered in this context. The following case studies from Brazil, United States, New Zealand and China show, based on detailed and sound social science, how new strategies and management concepts can be developed and tailored to the changing conditions and new preferences. The proposed managerial implications embrace new information strategies, marketing concepts, advertising and ideas for an adapted product development.

Marconi et al. (2023), in this issue) analyzed the effects of the COVID-19 pandemic on scuba diving experience in marine protected areas in Brazil. Comparing a survey before and after the pandemic they found that the quality of the recreational divers' experience remained high even during one of the world's biggest health crises. This suggests that the combination of contact with a preserved environment and the adaptation of regulations in favor of visitor safety was enough to stimulate positive experiences. Therefore, they suggest to invest in adaptive management so that marine protected areas continue to promote ecosystem services such as human health and subjective well-being. The study by **Maharja et al. (2023)** in this issue) contributes to the expanding of evidence base, showing that interactions with blue spaces can be beneficial for mental health, especially in a potentially stressful time such as the current pandemic. The positive association between the activity of swimming or snorkeling on open seas and the mental well-being of rural coastal communities in Indonesia during the COVID-19 pandemic indicates that access to coastal blue spaces proved to be important in a time of uncertainties and high stress.

Humagain and Singleton (2023), in this issue) studied tourists' motivations, perceived constraints, and negotiation strategies to participate in outdoor recreation trips, within the COVID-19 context in the United States. Exploring tourists' motivations, constraints, and trade-offs led to a new understanding of how tourists negotiate their constraints: by extensive planning and information searching, avoiding crowds, and changing leisure aspirations. These findings lead to several managerial implications related to centralized and reliable web-based information, advertising strategies and destination operational guidelines to (re-)attract tourists.

Espinier et al. (2023), in this issue) explored outdoor recreationists coping strategies and experiences during the 2020 COVID-19 pandemic in New Zealand. This paper applies coping strategy theory to help document the strategies adopted by outdoor recreationists in response to

the national lockdown in 2020. The interviews with outdoor recreationists in New Zealand identified various coping mechanisms such as temporal, activity, and spatial displacement. These include increased appreciation for outdoor settings, discovery of local activities and microadventures, and increased walking activity across the restricted, reaction and reset periods. This research presents a unique insight of coping strategies to disruption and rapid on-set events and shows implications for participation and management of outdoor recreation in New Zealand in the coming years.

Fan et al. (2023 in this issue) analyze changes in travel behaviors and intentions in China. Their findings show that COVID-19 changed respondents' travel preferences in favor of natural, outdoor and uncrowded attractions over cultural, indoor and crowded attractions. Future management should focus on implementing strict preventive measures while improving the effectiveness, increasing tourists' trust, and adopting diverse marketing and promotion strategies adapted to the changing preferences and new demand. Promoting natural and outdoor attractions is perceived as a suitable first step to aid in the recovery of the tourism industry and a strategy to enhance the regional development and product development in rural areas.

3.3. Understanding the following up effects

A third group of papers goes beyond these immediate consequences looking for long term effects, discussing resilient solutions and proposing new sustainable strategies. This group of papers discusses the role of the pandemic as a driver of long-term development and re-thinking.

Changing conditions in the working environment such as home office or teleworking not only affect the business world but also the living conditions and relevance of recreation. The real estate market in Europe with a significant shift of preferences from urban to rural areas, the increasing price level of second homes even outside destinations is mirroring this change (Bieger et al., 2021). Papers in this category also discuss the "new normal".

Against the devastating effects of the COVID-19 pandemic on the local tourism offer Hsiao and Tuan (2023 in this issue) analyze how recreational farm operators in Taiwan use dynamic capabilities to respond to the pandemic and establish a "new normal". Their findings show that recreational farms have the required preconditions for a new development: sense, seize, and the willingness for transformation. The authors report a trend to change farm marketing channels, develop new products or services to respond to the new market. The recreational farm operators adopted resource optimization, computerization, and cost control strategies to respond to the market.

Perry et al. (2023 in this issue) examined park managers' responses in the United States to a novel stressor (COVID-19) in order to aid managers in communicating these strategies to visitors in their pre-visit phase and to test an adapted park management framework. The authors examined how park systems communicate with potential visitors about COVID-19. The data reveal that the existing management frameworks should be expanded by a section on "influence pre-visit decisions". The pandemic provided an opportunity for parks to communicate their managerial responses with consistency and creativity, as well as an opportunity for researchers and managers to advance the strategies and practices framework.

Mandić (2023 in this issue) analyzed financial losses for protected areas due to travel restrictions and park closures. This exploratory study incorporates a risk-assessment framework to investigate and provide first insights into the pandemic's influence on the delivery of management outputs in Plitvice Lakes National Park, Croatia. The applied risk-assessment framework provides a starting point for a post-pandemic reassessment of the delivery of PA management outputs and decision-making about output prioritization and resource allocation.

The call for papers in 2021, in the hot period of the pandemic limited the amount of papers in this third category discussing lessons learned and the "new normal". We expect many papers to address this question

in the future.

4. Discussion

4.1. Will the high visitation rates and the preference for remoteness remain?

"From backyards to the backcountry", this quotation from Espiner et al. (2023) summarizes best the perceived trend worldwide caused by the outbreak of the COVID-19 pandemic. An increase in visitation of parks, protected areas, rural hinterland, and remote forests was visible in all studies in this issue. However, it is still an open question whether these behavioral changes and new preferences will remain or change back to the previous recreational use (Kuster & Bieger, 2021).

A look at the situation in the United States show that there will be a partial return to the initial situation. Results reported by Wagner (2022) indicated that nearly 50% of adults from across the United States participated in outdoor recreation on at least a monthly basis during the pandemic, and approximately 20% may be new to outdoor recreation during the pandemic. Meanwhile, more than 13% of Americans ceased participation in outdoor recreation.

From European protected areas we know that the extreme high level of visitation went down, however, the visitation rate is still higher than before and remote areas perceive in core zones of protection – from an ecological perspective – more visitation than they should have (e.g. McGinlay et al., 2020; Venter et al., 2021). New trends such as micro adventures together with the new experiences during the pandemic result in a challenging situation for park and regional management. Traditional zoning systems considering both the demand of recreationists and the environment are no longer accepted and suddenly open for discussion. Traditional steering and guiding measures such as signposts or trail closures seem to lose their effectiveness in the face of the new demand and new density.

Therefore, considering the findings in this special issue we believe that a high visitation rate in natural environments will remain. According to Venter et al. (2021) it is likely to sum up to 30–40% more visitation than before. Crowding, new profiles of visitors, problematic behavior, and conflicts between different user groups and with conservation goals and wildlife protection are supposed to be handled by park, forest and land use management. However, for the managers the high proportion of unexperienced people will be an additional challenge.

As a result, several papers in this special issue suggest training and support for managers in the field of visitor management, crowding and conflict resolution, because these tasks will have to be prioritized in future. In addition, resource managers should consider adopting a broader social-ecological systems approach to parks and protected areas management, considering the experiences during the pandemic.²

4.2. Do we need new visitor management concepts for the future?

Several papers in this special issue suggest that we should learn from the experiences made during the pandemic and underline that there is a need for new concepts in destination and visitor management. These concepts should also consider an ongoing risk-management. The papers in this special issue identified an urgent need for the industry to adapt and futureproof itself against disruptors, including the possibility of future novel virus epidemics or pandemics. The findings by Smith et al. (2023) underline the necessity that managers should use beside traditional methods of visitor monitoring also new opportunities such as volunteered geographic information to monitor rapid and longer-term trends of visitation to protected areas.

² Possible approaches to this challenging task are provided in the special issue on socio-ecological systems approach in the Journal of Outdoor Recreation and Tourism in Volume 38.

In addition, the management implications of the papers in this special issue are full of proposals addressed to destinations and management units. They include information and/or educational campaigns as well as improved facilities and infrastructure e.g. by an enlargement of trails or its re-design towards a more natural appearance (e.g. new unpaved surfaces, greening). Beside a careful spatial planning and promotion of sustainable tourism models several authors highlight the relevance of the pre-travelling phase, which is perceived as an important step to influence visitation and travel behavior in advance. In this context the increasing role and potential of a digital visitor management has been highlighted several times. It is perceived as a suitable, major tool to avoid crowding experience and unsatisfied visitors (e.g. Steiger et al., 2021). Proposed solutions are for example digital booking systems, web-based information systems, and information for outdoor recreationists linked to traffic management. In Germany, intelligent parking lots report real time availability for further visitors online.³

In parallel, the number of outdoor apps is increasing, meant to steer the visitation and provide extraordinary experiences. However, often this guidance is not coordinated with communities, destination and park management units. Several severe accidents due to misleading information on a mountaineering app recently led to a critical discussion about standards, quality assurance and responsibility (e.g. Löwenstein 2022). In addition, many of these apps ignore the requirements of farmers (visitors open or destroy fences for cattle grazing), ignored information on forest management actions, protected areas and wildlife management (e.g. Wanner et al., 2021).

Ferguson et al. (2023) show that visitors are able to effectively cope with situational and ecological impacts, but only partially cope with crowding impacts, and are unable to cope with conflict-related impacts. These findings suggest that visitor conflicts, followed by crowding, should be prioritized by destination and park management. Additionally, managers should work with adjacent communities and stakeholders on communication and engagement strategies, especially in areas proximate to recreation sites prone to crowding and conflict. This adapted management should include the surveillance of digitally provided information as much as possible.

In this context it is important to remember, that due to COVID-19 the tourism and outdoor recreation branch lost qualified and experienced personnel. Therefore, outdoor recreation providers need to develop strategies to minimize such losses in future pandemics or similar conditions.

4.3. Will we need new green infrastructure and access to open landscape and forests at least in urban areas?

An impressive number of papers stated in the literature review that we need at least in urban areas more and more strategically planned green infrastructure (e.g. Geary et al., 2021; Herman & Drozda 2021; Liotta et al., 2020). Despite the convincing results of outdoor activities and physical activity on (mental) health and well-being, the actual supply and provision of green spaces in urban areas clearly falls short of the need (e.g. Mc Ginlay et al., 2020, Hubbard et al., 2021; Weinbrenner et al., 2021). In addition, a study from Indonesia (Maharja et al., 2023 in this issue) underlines that health benefits by blue and green infrastructure are only available if local communities have continuous access to these spaces. This is the key challenge for all relevant stakeholders involved in spatial planning and destination management particularly in light of the growing privatization of the local coastal environment for the sake of tourism. However, considering the importance that these blue spaces hold for the mental well-being of local communities, intensive dialogue amongst these stakeholders must be pursued to ensure that the development of the area does not jeopardize the collective well-being of the people already living there.

The pandemic made these deficiencies in many cities and their urban development even more tangible. The literature review and the contributions in this special issue highlight that these critical findings are true across continents, cultures and various lifestyles at least in urban areas (e.g. Mironowicz et al., 2021; Morse et al., 2020; Wagner, 2022). However, the pandemic and its impact has also poignantly highlighted the societal inequality that still exists, that it still makes a difference which socio-economic class and cultural background, race and gender one belongs to – whether individuals, families or communities are well-provided with adequate green spaces and opportunities to sustain their (mental) health and wellbeing. Since the majority of people worldwide live in urban areas and the fact that other forms of pandemics are likely to appear, a significant spatial redistribution in urban areas is required. This redistribution does not only concern green spaces, but also the redistribution of street spaces, especially parking spaces towards improved walkable, bikeable and useable green streetscapes. Consequently, this redistribution is not only a policy-issue, but a call to urban, spatial and landscape planning as well as to politicians and administration to develop and implement adequate solutions. The discussion of adequate solutions and the required increase of blue and green infrastructure in the context of biodiversity loss and climate change led to various solutions. For Germany, minimum requirements of green infrastructure for inhabitants and employees are discussed and adopted by various cities such as Munich for each new development. These minimum requirements take the supply of green infrastructure, its accessibility, its amenities, and aspects of environmental justice into account (Blum et al., 2022).

However, the literature review underlined the necessity of a broad proactive urban planning and management considering short-term effects in the existing built environment as well as a long-term perspective. Outlined short-term approaches which provided at least mitigating effects in many cities are:

- Keeping green spaces, parks and historic gardens open and waive possible fees for a defined time period,
- declare and implement temporal green spaces and playgrounds on parking lots, streets, unbuild land and vacant lots focusing on the accessibility for vulnerable groups and supplying urban neighborhoods that were insufficiently provided with green infrastructure,
- Improve the accessibility to urban forests and natural landscapes close to urban areas.

In the long run the literature review and the papers in this special issue point to the need for innovation and updated urban planning processes to ensure the suitable accessibility and quality of green areas that also support the attainment of other policy priorities such as climate change mitigation, public health, provision of ES and the improvement of biodiversity and environmental quality. This long-term strategy for urban areas should provide.

- feasible solutions for cities and urban neighborhoods with a significant lack of green infrastructure; such measures should particularly care of vulnerable groups such as children, elderly adults, women, people of color and other underrepresented groups
- tailor-made planning instruments evaluating and uplifting the existing infrastructure and suitable areas to improve the design and initiate further plantations,
- frameworks for a collaborative development of new green infrastructure, considering existing deficiencies and social justice, and
- provision of adequate budgets and financial funds to implement these measures and actions.

Finally, concepts for the mandatory compensation of further losses of green infrastructure in urban areas may enhance the awareness of its relevance in future. The means of compensation could be used to enhance the existing infrastructure. Frameworks for compensation and

³ E.g. <https://www.ausflugsticker.bayern/>, accessed 3.11.2022.

an enhanced urban planning may also contribute to remember the lessons we have learned the hard way during the pandemic.

4.4. Did the pandemic led to positive effects stimulating outdoor recreation and nature-based tourism development?

Beside the challenging situation for visitor management and tourism, the pandemic might also have long term positive effects. More people discovered the environment in their neighborhood, their local or regional parks, protected areas and recreational infrastructure. These experiences may lead to a long-term appreciation of nature and outdoor experiences on one hand and possible positive health effects on the other. Further results presented in this special issue indicate an opportunity for outdoor recreation to address concerns for diminishing nature experience and support connectedness to nature. The connectedness to nature outcome further strengthens the comparison with climate adaptation strategy given the potential relationship between connectedness to nature and pro-environmental behavior.

The need to select a place for recreation or holidays in one's home country or region in 2020 and 2021 had an impact on future behavior. The pandemic had a significant impact on second homes and a visible trend of families to move out of the cities into a green environment, at least in Europe and North America. Bieger et al. (2021) studied the market for second homes in the European Alps. Second homes offer their owners a place outside the confined urban centers that are affected by COVID-19 and in which the attractions such as restaurants, theaters, and shopping malls are closed. In contrast, the second home destinations offer safe opportunities for hiking, biking and winter sport activities. In addition, the pandemic coupled with advancing digitalization and home office obligation has also made working and living in the countryside more attractive. Interestingly these new second home buyers are looking for less density and cheaper offers in rural destinations rather than tourism hotspots. The authors state that nature as such has surpassed the role of destination infrastructure.

The new post-pandemic normal of tourism shows plunging numbers in overseas guests and a simultaneous substantial growth in domestic visitor numbers and overnight stays (Forbes, 2020). Not only domestic travel is recovering faster than its international counterpart, but people's preferences for long-haul destinations has also shifted towards smaller, nearby places (Patnait, 2021), which might be perceived as a positive effect in the light of climate change and sustainable development. Main reasons for this shifting preferences are beside the positive past experiences are also significant intra-personal drivers, arising from a complex valuing of travel risk perceptions, health concerns, fear of pandemic contagion, reduced behavioral control and different coping behavior (Pappas, 2021; Shahabi Sorman Abadi et al., 2021; Shin et al., 2022; Villacé-Molinero et al., 2021; Zheng et al., 2021). Therefore, it is no surprise, that an empirical study in three European countries, strongly suggests to keep domestic tourists as a target group and advocates practitioners to use the momentum of this renewed appreciation and acceptance of tourism as an economic activity (Gyimóthy et al., 2022). This may include specifically targeting a new profile of visitors.

5. Conclusions

The special issue aims to give a broad overview on COVID-19 and the relevance of nature and green infrastructure. Based on a literature review, the role of green infrastructure, urban forests and nature experience for recreation, health benefits, well-being and recovery in the context of COVID-19 are presented. Against this background we took a closer look at the impacts and new tasks for planning and management. Effects of COVID-19 related measures (such as social distancing) and considering both the effects on the supply and the demand side are presented. In addition, effects such as an increase visitation rate and preferences for remote and protected areas are analyzed. A second group of papers focuses on behavioral, environmental and managerial

consequences of the pandemic, leading to new information strategies, marketing concepts, advertising and adapted product development. A third group of papers addresses possible long-term effects, discussing resilient solutions, proposing new strategies and a possible "new normal". The discussion section shows that it is likely that a higher visitation rate in urban forests and natural destinations remains and that the future visitor management in the face of a new demand and new density will be challenging. Several authors highlight in this context the relevance of the pre-travelling phase, which is perceived as an important step to influence visitation and travel behavior in advance. In this context the potential of a digital visitor management is perceived as a suitable, major tool to avoid crowding experience and unsatisfied visitors. The many papers dealing with the critical situation in urban areas ask for a long-term strategic concept in urban planning. Finally, we discuss the likelihood of possible stimulating effects of the pandemic. A higher and long-term appreciation of nature, green spaces and natural destinations and the experience of domestic destinations may lead to new target groups and visitor profiles valuing a more sustainable, pro-environmental offer.

CRedit authorship contribution statement

Ulrike Pröbstl-Haider: wrote the manuscript and revised the article in consultation with the other authors. **Katharina Gugerell:** wrote the manuscript, revised the article and provided the data collection and visualization. **Sreetheran Maruthaveeran:** provided background information and revised the article in consultation with the other authors.

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