

## Urban Green Space for Sustainable Environmental Health in Relation to Pandemic Crises

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### ABSTRACT

Trace the timeline of a pandemic such as Ebola, SARS, and SARS-CoV-2. All these extremely infectious viruses led to a worldwide pandemic starting in 2002. All these three viruses are transmitted to humans by animals from the jungle. The novel human coronavirus COVID-19 is now the fifth documented pandemic since the 1918 influenza pandemic. Questions about pandemics are on the rise these days, and it is widely discussed in the media. Recently, awareness about urban green spaces is rising in this era, and numerous researchers claim that appropriate landscape planning and design with the conception of sustainability able to produce a beneficial and responsive environment for healthy urban improvement in relation to pandemic crises. Therefore, this paper aims to investigate the effectiveness of urban green spaces for sustainable environmental health. The result shows that the role of urban green spaces improves immune system function, increases social capital and cohesion, reduces mortality, and increases life expectancy, reduces potential negative health impacts, and makes urban beautification healthier. In addition, the finding shows the benefits of urban green spaces in pandemics, for example improving mental health and stress reduction, improving physical health, decreasing the risk of disease transmission, and improving social cohesion.

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### 1. Introduction

Nature has a positive influence on human behavior, and well-planned parks and environments can help improve the well-being of a community. The link between urban green spaces and potential health is regularly discussed through risk reduction approaches with sustainable design and maintenance of green spaces for a healthy metropolitan area. Nowadays, it is widely

recognized that health systems have an important role and significance in the quality of life and social well-being of modern society in cities. Today's environment is associated with many pandemics and other factors such as inadequate physical activity, chronic stress, and exposure to anthropogenic environmental hazards. Globally, concern for quality of life and sustainability has evolved, with a particular focus on cities. Society has been concerned with both the built or man-made environment, and the

conservation of nature in urban areas, resulting in specific landscape patterns in rural areas and the establishment of parks and gardens in cities (MacHarg, 1971, Roelofs, 1999, Turner et al. 1999). Green spaces in cities play an essential role in making our cities more livable. To live up to their position as vital social and visual centers, the livability and value of cities rely heavily on the design, management and maintenance of urban green spaces.

Urban green space is an essential component of urban value for city dwellers. Urban green spaces are important ecological and occasionally historical-ecological assets of any city. The relevance of "urban green" has long been recognised in urban architecture (see, for example, MacHarg 1971), as evidenced by Ebenezer Howard with its Garden Cities, Charles Fourier with its Phalansteries, and Ecotopia with its Ernest Calleback. SARS, Ebola, and now SARS-CoV-2 have caused worldwide fear since 2002, and all three of these highly infectious viruses have passed from wild animals living in dense tropical forests to humans. Three-quarters of the new viruses that infect humans come from animals. Many of these animals live in the forests we clear and burn for cropland, including biofuel plants, mining, and building construction. The more we clear and destroy, the more species of animals carrying bacteria and viruses encounter humans, which are ideally suited to kill us. The more we confine these creatures to smaller spaces that can exchange infectious viruses, the more likely it is that newer strains will emerge. Clearing land reduces biodiversity, and the species that remain are more likely to harbour host diseases that can be transmitted to humans. All these conditions will increase the spread of animal infections to humans.

Ending deforestation reduce our susceptibility to new disasters and slow down the spread of other pandemic diseases, including Zika, Nipah, malaria, cholera, and HIV, which initially come from rain forest environments. According to a study published in 2019, about 10 % rise in deforestation will result in a 3.3 per cent upturn in malaria infections, affecting 7.4 million societies worldwide. Deforestation remains unabated, despite years of international criticism.

Since 2016, an annual average of 28 million hectares of forest have been taken down, with no signs of slowing down. COVID-19 is a pandemic originally came from Wuhan, China, and is now spread all over the world. To trace how the pandemics germs or viruses are migrating, epidemiologists aim to sneak into wild areas and test species known that spread coronaviruses, such as bats, rats, badgers, civets, pangolins, and monkeys. In line with pandemic crises, the Kuala Lumpur Structure Plan/Pelan Struktur Kuala Lumpur 2040 (KLSP/PSKL2040) under the goal three and the goal six which targeted Kuala Lumpur as a healthy and vibrant city. Kuala Lumpur also will be a city of integrated and to achieve the sustainable development goals, which is goal 11 as to make the city inclusive, safe, resilient, and sustainable. In this research, urban green space is the main element to be highlighted as a medium of sustainable environmental health concerning pandemic crises to achieve sustainable development goals.

## **2. Sustainable Environmental Health Of Urban Green Space**

Many public health improvements have occurred in the past as a result of changes in the built environment. Other sanitation and sewerage measures, for example, have reduced infectious disease transmission in cities (Canadian Public Health Association, 2010). Urban green space offers space, clean air, and opportunities for activity and green space can improve negative aspects of urban lifestyle. According to Matthias Braubach et al (2017), The linkage between green spaces and health and well-being provides strong evidence for significant benefits such as improved mental health, lower risks of cardiovascular disease, obesity, diabetes, and death.

The importance of urban green space for vulnerable communities and its impact on health equity is highlighted. Löhmus and Balbus (2015) explained that urban green space may lead to well-being threats, for example increased exposure to allergenic pollen, viruses spread by arthropod vectors like ticks or mosquitoes. Harm risks, as well as the impact of future climate change and injuries risks, the effect of potential detrimental effects can be minimized or eliminated by operation of green space, maintenance, and proper design.

Urban green space dissimilarities in health-related to income, minority status, disability, and other socioeconomic and demographic variables can be reduced by decreasing socioeconomic differences in the existing of urban green space (Allen and Balfour, 2014). Fredrick Law Olmstead (1870/2013) had widely revealed ideas about the mental health benefits that urban parks could provide to city dwellers. He advocated for urban development that allowed for big, mature trees to grow along city streets and parks that were open to the public and provided accessibility to everyone and provided respite from the noise, congestion, and sights of the city. Georg Simmel (1903/2002) explained that the constantly shifting stimuli in the urban environment were stressful on residents' nerves, and that because of this overstimulation, city dwellers had developed a "blasé" attitude. They could only return to responding applicably to stimuli if their nerves had an acquittal from the continual stimulation. These links between mental health and urban parks remain essential today, especially given the increasing commonness and disease burden related with mental health issues.

## **3. Urban Green Space For Sustainable Environmental Health In Relation To Pandemic Crises**

Appreciating urban green spaces and ending deforestation are solutions for pandemics crises. It will assist in achieving six of the United Nations' 17 Sustainable Development Goals by respecting urban green areas and ending deforestation through ensuring healthy lives, achieving zero hunger, achieving gender equality, practicing responsible consumption and production, managing land sustainably, and acting on climate change. Although the

recent pandemic outbreak is extremely harmful, especially COVID-19, it can draw our attention to the vast benefits that humankind can get by not over-exploiting the natural world such as green space or forest. In short, pandemics crisis solutions are sustainability solutions.

The recent pandemic, which is COVID-19 pandemic has emphasized the value of green spaces in and around cities has sparked a need for more functional and sustainable urban planning and architecture. According to O'Brien et al. 2017, Several recent studies have found that green spaces provide a wide range of ecosystem activities and services that are critical to human well-being and urban sustainability, and that they are especially important during health emergencies. During lockdowns, urban green spaces contribute to the physical and mental health of city people. Green space in cities is important for providing urban areas with resilience capability, which is essential for urban sustainability.

Green space is a system of natural and artificial green spaces in urban areas that provide ecological and social benefits.

Everyone has heard of the term "social distance. "It has the potential to change the term "green space planning and design" to "social density.". The issues of pandemic response and public space management will have a significant impact on the design, development, and distribution of urban green and recreational spaces in the future. Ryan Weber (2014), a Senior Research Advisor at Nordregio, the design and accessibility of urban green spaces are important factors in developing "high-quality active public spaces.". Fortunately, planning measures exist to address this, such as setting green solid factor goal levels to assure a specific quantity of green public space and enhance local biodiversity.

The movement was restricted to a few hundred meters from home tended to visit neighboring green places during the lockdown, (Ugolini et al. 2020). When urban residents visited green spaces over long distances and on a more regular basis in nations where social separation processes were less constrained, however, social separation processes were less restricted. As a consequence, the pandemic and government-imposed norms altered urban green space users' choices. Thus, access to urban green space was critical.

While urban parks appear to be the most popular sort of green space, people are discovering other options such as neighborhood gardens, tree-lined streets, and even green spaces outside of the city as a fantastic way to exercise, relax, or simply walk the dog. Because vital activities are the only ones permitted during a pandemic, urban planning should improve access to green spaces for example pocket parks and green corridors into the urban fabric as places of comfort and refuge.

Numerous studies have utilized the vegetation index to assess the quantity of local green space to the provision of green space and the health effects of green space. Human crowds in urban parks are likely to contribute to the diffusion of viruses during the pandemics. Furthermore, it is uncertain how people in public

green spaces use safety procedures such as wearing masks and adopting social distance. Numerous studies have shown that green space has psychological and physical health advantages such as stress alleviation, increased physical activity, and social cohesiveness. The impact of pandemic changing human relationship with green space, which has multiple benefits such as public health and societal advantages.

In cities, green space gives health benefits as well as sustainability. Natural vegetation such as grass, bushes, plants, or trees, as well as constructed green constructions such as parks and unstructured vegetated spaces, are all examples of green space. Encouraging physical activity and providing direct encounters with nature are two potential avenues for health benefits from green space. Given the limitations on people meeting or gathering, mainly in indoor settings, during pandemic COVID-19, understanding the green space enables communities to cope with the stress of quarantine and pandemics, such as by offering an alternative area for physical activity.

A current study in Oslo, Norway, the researchers establish that when the lockout was implemented, outdoor physical activity levels increased, with the increases being most significant on routes with greener and more distant locations. According to research conducted in the United States, the loss in mobility to parks affected by state-of-emergency declarations was less than the drop in mobility to other venues throughout the states. As a result, green space may operate as a modulator to the effectiveness of covid 19 mitigation strategies. Such strategies may have an indirect impact on the public health advantages of greenness. Green spaces in cities may maintain high levels of biodiversity and provide several ecosystem services, such as provisioning, regulating, and cultural functions, that are critical to the well-being of urban inhabitants, particularly in terms of physical and psychological health benefits. (Tzoulas et al. 2007; Felappi et al. 2018; Yacamán Ochoa et al. 2020) explained that urban green spaces might enhance physical and psychological well-being by purifying air and water, lessen noise pollution, rise real estate values, and increase neighborhood and landscape aesthetics.

During the epidemic, studies revealed the importance of urban green space for citizens' physical and emotional health and well-being. As a result, urban green space can contribute to a city's social resilience by acting as a buffer for residents during times of high stress. Lockdowns and restrictions have had a significant impact on movement patterns, limiting access to recreational areas outside of the city. As a result, urban green spaces have become an important place for indoor sports.

Urban green space is claimed as an element of sustainable environmental health by many researchers due to its positive effects. Moreover, urban green areas such as Parks provide a diverse range of ecosystem services that can help people cope with a variety of diseases while also improving their quality of life and health. Because stress has a negative impact on psychophysiological health, recreational activities in green spaces like parks can help to alleviate these bad mood states.

Sturm and Cohen discovered a correlation between urban green spaces and mental health, with communities living within 400 meters walking distance from urban green spaces better perceived mental health. Visiting urban green spaces and being in a green environment can help the community feel better and lessen anxiety. Individuals who visit a park frequently are also more likely to be in good health than those who do not. Urban green spaces give space and possibilities for various outdoor activities, and they inspire people of all ages, ethnic groups, and socioeconomic classes to join in sports activities. According to a study conducted in underdeveloped countries, frequent park visits lessen health problems and boost happiness. Visitors' health is thought to be improved because of these participation options.

Many epidemiological studies have found that urban green spaces provide a variety of health benefits, including reduced depression and mental health, lower cardiovascular morbidity and mortality, and lower chronic disease rates. Two of the most frequent diseases are obesity and diabetes (reviewed by WHO Regional Office for Europe 2016). Green space in the city is a natural solution with a number of well-known health and well-being benefits.

#### 4. Methodology

A literature review is an investigation and evaluation of previous or current literature on a specific topic. The devotions are to summarize the information, to critically examine the material acquired, and to present the research in a systematic manner (Royal Literary Fund, 2016). In performing the literature review for this study, the researcher used secondary sources such as journals, papers, books, and websites. It is to have a thorough comprehension, as well as to demonstrate what has been learnt from previous scholars, and it can serve as a platform for new ideas.

This methodology of the literature review is divided into two significant studies, which are the roles of urban green space in relation to pandemic crises and the benefits of urban green space under Pandemics. Firstly, the literature review is focusing on the parts of urban green space with regard to pandemic crises such as enhanced functioning of the immune system, improved social capital and cohesion, reduced mortality and increased life span, potential adverse health effects, beautifying and making a healthier environment. Moreover, the literature review is focusing on the benefits of urban green space under pandemics, such as improving mental health and stress reduction, improving physical fitness and decreasing the risk of disease diffusion and increasing social cohesion.

## 5. Findings and Discussions

### 5.1 The Roles Of Urban Green Space In Relation To Pandemic Crises

#### 5.1.1 To Improve Functioning of the Immune System

Kuo (2015) highlights the urban green space role for enriched immune functioning in the passageways between nature and health. Li et al. (2008) indicate visiting forests will have beneficial immune responses, including the expressing of anti-cancer proteins. This shows that immune systems benefit from direct exposure to natural surroundings or contact with certain elements found in green spaces. It was also discovered that children exposed to the most allergens or microorganisms during their first year of life had the lowest risk of allergic sensitization and recurrent wheezing (Lynch et al., 2014). Living in a neighborhood with extra street trees has decreased asthma prevalence (Lovasi et al., 2008). According to Rook (2003), exposure to commensal microbes in biodiverse natural habitats, which can play an immunoregulatory role, is one theorized immunological pathway. Increased biodiversity in the environment around homes has been related to a lower risk of allergies, according to studies (Ruokolainen et al., 2015; Hanski et al., 2012). Better exposure to commensal bacteria, especially early in life, may result in more diverse skin and gut microbiomes, as well as protection against allergies and autoimmune (Kondrashova et al. 2013). It's also been suggested that, when paired with natural environments, the human microbiome can improve mental health (Logan 2015).

#### 5.1.2 To Improve Social Capital and Cohesion

Social connections are beneficial to one's health and well-being, but social isolation is a risk factor for disease and death (Nieminen et al., 2010; Pantell et al., 2013; Yang et al., 2016). Green space that can foster social relationships and foster a sense of community, which are both important for social cohesion and human health (Kim and Kaplan 2004). Children and adolescents have been shown to benefit from urban green space in terms of social networking and social inclusion (Seeland et al., 2009; Thompson et al., 2016).

Greenery has been linked to increased social cohesion at the neighbourhood level, both in terms of quantity and quality (De Vries et al., 2013). Loneliness and a lack of social support have been related to a lack of green space (Maas et al., 2009a). The relationship between green space and social well-being is complex. Despite the fact that observational studies have shown positive effects on happiness, classifying the core mechanisms remains a difficult endeavor (Hartig et al., 2014).

#### 5.1.3 To Reduce Mortality and Increased Life Span

Current meta-analysis found that increasing access to green space is associated with a lower death rate (Gascon et al., 2016). For

example, research in Japan found that having entree to green space ideal for strolling, as well as parks and tree-lined streets near the residence, was favorably correlated with five-year survival rates among senior people (Takano et al., 2002). Another research of England's pre-retirement population found that having more green space in the neighborhood was linked to lower all-cause mortality (Mitchell and Popham 2008). The findings backed with previous research based on England's 2001 census population, which revealed that a higher share of green space in an area was linked to improved self-reported health (Mitchell and Popham 2007).

Improved residential green space was linked with reducing mortality in a longitudinal study in Canada (Villeneuve et al., 2012); the most prominent effect was on death from respiratory diseases. Due to an urban heat island moderating effect, Xu et al. (2013) found that perceived more incredible neighborhood greenness was related to lower mortality risk during heat waves in Spain. Residential closeness to green space has been linked to a lower risk of stroke mortality (Hu et al. 2008) and higher survival rates following ischemic stroke in the United States (Wilker et al. 2014). In contrast to the previous findings, Richardson et al. (2012) found no link between the availability of green space and overall mortality in the United States' 49 largest cities. This could be attributable to the expansive nature of these cities and their great levels of car dependency.

#### 5.1.4 To Potential Adverse Health Effects

Better availability and enhanced usage of green space may also be linked to exposure to health concerns, according to (Lohmus and Balbus 2015). The evidence on negative health consequences of urban green space is based on fewer studies and is less reliable than the evidence on health benefits. The 11 Effects of Urban Green Space on Environmental Health, Equity, and Resilience 196 Potential hostile health effects were evaluated by the WHO Regional Office for Europe in 2016 in which linked arthropod vectors of infectious diseases, infectious pathogens in soils soiled with animal faeces, improved exposure to pesticides, allergic pollen, and a higher chance of injury are all potential harmful health impacts. However, data on the relation between green space and allergies is mixed, with some studies suggesting an association between green space and an increased risk of allergies. In contrast, other studies indicate considerable protective effects (Fuentes et al., 2016).

It is supported by research that has revealed links between enhanced biodiversity in the vicinity of homes and lower atopic sensitivity (Ruokolainen et al., 2015; Hanski et al., 2012). In-depth studies assessing pollen exposure, addressing potential confounding, and defining mechanisms of age-specific detrimental and favorable health impacts are needed. It's also important to note that risk-taking and exploratory behavior are necessary for children's proper development. Environments that encourage risky play promote more playtime, social interactions, creativity, and resilience (Brussoni et al., 2015). Most negative consequences

can be evaded by properly designing, maintaining, and operating green space (Lohmus and Balbus 2015). As a result, while creating green spaces such as parks, green paths, and playgrounds, these potential side effects should be considered, and measures are taken to reduce the possibility of allergens or significant injuries.

According to Haq (2011), once people were exposed to a natural environment, their stress levels decreased quickly. While when they were exposed to an urban environment, their stress levels remained high. Patients in a hospital whose rooms faced a park recovered 10% faster and required 50% less powerful pain relievers than patients whose rooms faced a building wall. This is clear evidence that urban green spaces can improve citizens' physical and psychological well-being. Another study in Swedish cities found that the more time people spend outside in urban natural spaces, the less stressed they are. Improved air quality because of vegetation has a good impact on physical health, with apparent benefits such as reducing respiratory infections. The relationship between humans and nature is critical for daily happiness, work productivity, and mental wellness. Mujahed (2021) claimed to increase the number of visible green spaces in the city and provide more flexible sharing of green areas in congested regions, according to new guidelines for public health and well-being. Furthermore, public green spaces are an essential element of the city. Since the lockdown, it has increased the percentage of individuals suffering from anxiety, depression, and non-communicable diseases. Public green spaces may be seen from people's windows; as a result, green space distributions in the city are significant and can aid in improving psychological factors.

#### 5.1.5 Beautifying And Make A Healthier Environment

According to Van Renterghem & Botteldooren (2009), green space can boost the aesthetic value of a building's property while also reducing noise levels both inside and outside. The green space also gives advantages to building and human lifestyle (Ries and Kosareo 2007). Planting trees also improves air quality by reducing particulate matter, as well as preventing erosion and pollution in streams (Hodson, 2009). Improved air quality, greater physical activity, stress compensation, and higher social cohesiveness are four interconnected pathways by which green space might benefit health and well-being ((Hartig et al. 2014). Urban green space is an important component of a city's green-space network. Maintaining green space, according to Tian & Jim Well (2012), helps relieve mental tiredness and encourages community contribution in busy communities and stressful urban contexts. New research published in the medical journal *The Lancet* discovered an inverse association between mortality rates and exposure to natural vegetation, or greenness. More than 23,000 people in China were followed for the research, with a median age of 93 and varying levels of exposure to nature.

According to Holland et al. (2018), greenness helps to increase physical activity, improved mental health, better sleep, and lower stress levels, improved cognition, and support patient recovery

fast. In addition, a seminal study published in the journal *Science* in 1984 followed the progress of patients recovering from gallbladder surgery in a suburban Pennsylvania hospital. Researchers discovered that patients who were allocated to rooms with a view of nature recovered faster and had more minor discomfort than those whose windows looked out onto a brick house. Green spaces in cities provide inhabitants with environmental, social, psychological, and health benefits as well as ecological services.

Furthermore, amid health crises and global pandemics, parks and green spaces help human mental and physical well-being, as well as social well-being (Holland et al., 2018).

## **5.2 The Reimbursements Of Urban Green Space Under Pandemics**

### **5.2.1 Reimbursements Of Urban Green Space On Mental Health And Stress Reduction.**

The National Recreation and Parks Association (2020) explained that green spaces are commonly known as serving significant public benefits during health crises. Due to the spread of the disease and the implementation of government responses, the community is now aware of certain previously unknown functions of urban green space (Hockings et al., 2020). Many people worldwide have experienced significant psychological effects because of the COVID-19 epidemic (Bavel et al., 2020). Brooks et al. (2020); Freeman and Eykelbosh (2020), claimed that the pandemic's influence on mental health, as well as self-quarantine and other response initiatives. The period of quarantine, fears of contagion, frustration and boredom, and a lack of knowledge are all factors that have a severe influence on people's mental health (Brooks et al., 2020). Bavel et al. 2020; de Bell et al. 2020; Brooks et al. 2020; Hossain et al. 2020 highlighted that self-quarantine for more extended periods could result in poor mental health, post-traumatic stress symptoms, and other severe psychological effects.

Those who have been detained for more than 10 days have significantly more stress symptoms than those who have been quarantined for less than 10 days (Hawryluck et al. 2004).

Fears of infection for individuals and their families, a change in routine, limitations on social and physical contact, and a lack of clear standards or guidelines for a COVID-19 information campaign are all factors that contribute to stress during pandemic quarantine (Brooks et al. 2020). The psychological burdens associated with COVID-19 have been justified in part by parks and green spaces (Freeman and Eykelbosh 2020). Parks can help human to relax and provide a variety of psychological and emotional benefits (Annerstedt et al., 2012; Hockings et al., 2020).

Annerstedt et al. (2012) claimed that green space offers traits such as quietness, spaciousness, wildness, culture, and a lush environment, all of which can help to minimize the risk of mental illness. Spending time in natural areas like parks and green spaces

can help people avoid feeling alone, reduce mental stress, enhance sleep quality, and so decrease the risk of depression and anxiety, as well as enhance people's resilience and capacity to manage everyday responsibilities (Bratman et al., 2019 and Cox et al., 2017). According to Annerstedt et al. (2012), pocket parks and green spaces may benefit one's health, primarily through social cohesiveness and stress reduction. Even a window with a glimpse of the greenery appears to be advantageous. Smaller green space areas may be better for children's play, whereas larger, perhaps more small green spaces may encourage adults and older children to exercise.

### **5.2.2 Benefits Of Urban Green Space On Physical Health**

Many daily activities have been hampered by government restrictions, but urban green spaces have compensated by providing places for physical activity and fresh air. Some individuals believe that a rapid and well-coordinated immune system response, together with good physical condition, is the first line of defense against disease (Catanzaro et al. 2020). The physical benefits of visiting green spaces and other natural spaces have long been known (Fisher and Grima 2020; Seaman et al. 2010). According to the Centres for Disease Control and Prevention in the United States, park visits can improve individual and community health, with persons who exercise in parks at least three times a week reporting a 25% boost in their perceived physical health (National Recreation and Parks Association 2020). The physical health benefits of access to urban green space improve cardiovascular health and pulmonary function (Lee and Lee 2014). The humans' Natural Killer (NK) cells can be activated by spending time in green space or parks and other natural environments. The NK cells play a crucial role in the human immune system because they cause virus-infected cells to die (Li et al., 2007). According to Kulinkina (2016), physical activity and stress alleviation were the critical health benefits examined for the indicator; however other benefits were not explicitly excluded. Numerous studies have found links between access to green spaces and more significant physical activity, but there is no conclusive evidence of the association. Green areas provide an atmosphere that is conducive to children's physical and cognitive development.

In addition, Kulinkina (2016) adds that Urban Green Space Indicator (UGSI) has been used as an environmental health indicator, as evidenced by studies that show the health benefits of having access to green space. The method is a user-friendly and informative approach to assess the accessibility of urban green areas, based on the amount of a city's population residing within a defined linear distance from a green space as a proxy measure for a healthy lifestyle. The indicator is assessed on its ability to be understood and used in cross-city comparisons, as well as for tracking progress toward the objective of developing healthy urban environments.

5.2.3 Urban Green Space Benefits For Decreasing The Risk Of Disease Transmission And Growing Social Cohesion

Admittance to parks could decrease the risk of pandemic transmission and increase community and social cohesion. People may migrate to less desired public spaces, such as sidewalks and pavements, if parks are closed or access is otherwise restricted. These public areas are not designed to foster and preserve physical distance (Barkhorn, 2020) but allow people to spread out, reducing crowding in less desirable areas (Freeman and Eykelbosh 2020; Public Health England 2014). Green spaces, mainly community parks, can strengthen social cohesiveness at a

community level by fostering a sense of incorporation and inclusion among people. Anti-social conduct can be reduced by increased social cohesion, as well as emotions of integration and belonging, particularly during public health crises (Seaman et al., 2010). The benefits of a park include reduced disease transmission risk and increased social cohesion. In short, pandemic virus transmission such as COVID-19 might be reduced, and community and social cohesion increased if people have access to urban green space. Table 1 below shows the summary of the roles of urban green space in relation to pandemic crises, and Table 2 below shows the summary of the benefits of urban green space under pandemics.

**Table 1** The roles of urban green space in relation to pandemic

The roles of urban green space in relation to pandemic crises	Findings
<ul style="list-style-type: none"> <li>• <i>Improved Functioning of the Immune System</i></li> </ul>	<ul style="list-style-type: none"> <li>• The role of urban green space role to enhance immune functioning between nature and health and it has the lowest risk of recurrent wheezing and allergic sensitization.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Improved Social Capital and Cohesion</i></li> </ul>	<ul style="list-style-type: none"> <li>• Social connections improve health and well-being, whereas social isolation is a predictor of disease and mortality. Green space can help create social relationships and develop a sense of community, which are vital for social cohesion and human health. Green space has been proven to facilitate social networking and enhance social inclusion.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Reduced Mortality and Increased Life Span</i></li> </ul>	<ul style="list-style-type: none"> <li>• Increasing residential green space is associates with a reduction in mortality. Residential closeness to green space is link to a lower risk of stroke mortality and higher survival rates following ischemic stroke.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Potential Adverse Health Effects</i></li> </ul>	<ul style="list-style-type: none"> <li>• Greater availability and enhanced use of green space is associated with exposure to health hazards. Most negative consequences are avoided or reduced by properly designing, maintaining, and operating green space. Potential adverse health effects are associated with arthropod vectors of infectious diseases, infectious agents in soils contaminated with animal feces, increased exposure to pesticides, allergic pollen, and increased risk of injuries.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Beautifying and make a healthier environment</i></li> </ul>	<ul style="list-style-type: none"> <li>• The green space can improve aesthetical value for the building property and attenuate of inside and outside noise levels. The green space also gives advantages to building and human lifestyle. Planting trees improves air quality by reducing particulate matter, as well as preventing erosion and pollution in streams. There are four connected elements by which green space can benefit health and well-being, including improved air quality, increased physical activity, stress compensation, and increased social cohesiveness. Thus, green spaces benefit human mental and physical well-being, social well-being, during health crises and global pandemics.</li> </ul>

**Table 2** The benefits of urban green space under Pandemics

<i>The benefits of urban green space under Pandemics</i>	<b>Findings</b>
<ul style="list-style-type: none"> <li>• <i>Benefits of urban green space on mental health and stress reduction</i></li> </ul>	<ul style="list-style-type: none"> <li>• Green spaces are known as serving significant public benefits during health crises in mitigating the psychological burdens associated with COVID-19. Parks can reduce stress and offer various psychological and emotional benefits. Green space offers traits such as quietness, spaciousness, wildness, culture, and a lush environment, all of which can help to minimise the risk of mental illness. Spending time in natural areas like parks and green spaces can help people avoid feeling alone, reduce mental stress, enhance sleep quality, and so reduce the risk of depression and anxiety, as well as enhance people's resilience and capacity to manage everyday responsibilities.</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Benefits of urban green space on physical health</i></li> </ul>	<ul style="list-style-type: none"> <li>• The first line of defense against infection is a quick and well-coordinated immune system response along with good physical condition</li> </ul>
<ul style="list-style-type: none"> <li>• <i>Urban green space benefits for reducing the risk of disease transmission and increasing social cohesion</i></li> </ul>	<ul style="list-style-type: none"> <li>• Access to parks could reduce the risk of pandemic transmission and increase community and social cohesion. People may migrate to less desired public spaces, such as sidewalks and pavements, if parks are closed or access is otherwise restricted. These public areas, however, are not designed to foster and keep physical distance. Urban green spaces allow people to spread out, reducing crowding in less desirable areas. Green spaces, particularly community parks, have the potential to strengthen social cohesiveness at a community level by fostering a sense of integration and inclusion among people.</li> </ul>

**6. Conclusion And Recommendations**

In conclusion, urban green space in cities is an essential component of urban quality of life during pandemics such as COVID-19. Urban green space as an indicator for sustainable environmental health in relation to pandemic crises as roles able to improve the immune system, enhanced social capital and cohesion, decreased mortality and increased life span, potential adverse health effects, beautifying and making a healthier environment. Furthermore, the benefits of urban green space under pandemics such as improved mental health and stress reduction, improved physical health and decreasing the risk of disease transmission and increasing social cohesion.

During a worldwide pandemic’s crisis, urban green areas are valuable urban settings that can support many forms of healing. Furthermore, given the beneficial relationship between urban nature and more significant public health, it can be converted into general economic advantages through lower healthcare costs (Natural Capital Committee, 2015). The pandemics such as COVID-19 have highlighted the importance of prioritizing

urban environmental services in planning and development. Therefore, creating a healthy urban environment that incorporates nature-based resolutions in the post-pandemic era may help cities become more resilient to the problems of the twenty-first century.

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