

City Development: Issues and Best Practices

Series Editors: Huhua Cao · John Zacharias · Claude Ngomsi

Kh Md Nahiduzzaman *Editor*

# Making Sense of Planning and Development for the Post-Pandemic Cities



Springer

# **City Development: Issues and Best Practices**

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The current rate of urbanization is unprecedented and poses enormous challenges for governing bodies. New approaches to development and urban management are needed in the context of globalization and the need for local sustainability. While the developing world itself offers an abundance of lessons, case studies and best practices, these have rarely been positioned as cutting-edge contributions to reformed practices in city development. It is well recognized that the experience of the developed world is an incomplete guide to the new challenges posed by urbanization in the contemporary world.

The “City Development: Issues and Best Practices” book series includes academic research, comparative and applied research, and case studies at the scale of the neighborhood, city, region, nation and supranational levels. This series will offer an opportunity to present the latest academic research and best practices in urban development with the goal of promoting sustainable and inclusive development, learning from the diverse and complementary experiences of rapidly urbanizing areas of the world. Although this book series focuses primarily on the developing world, we intend to include the latest academic research and evolving best practices from developed countries.

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- Industrial Parks and Agro-Processing Zones
- Housing and Land Tenure Issues

Kh Md Nahiduzzaman  
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# Making Sense of Planning and Development for the Post-Pandemic Cities

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# Preface

The International Conference on Canadian, Chinese and African Sustainable Urbanization (ICCCASU) is pleased to present the second book of the series: “Making Sense of Planning and Development for the post-pandemic Cities”, a cooperative venture with Springer Publishing. This book stands at the forefront of post-pandemic transformational planning, disseminating novel academic research and exemplary urban development practices to foster sustainable, inclusive, and resilient growth. By drawing insights from diverse, rapidly urbanizing regions, the series confronts the unprecedented challenges of urbanization, advocating for a re-evaluation of planning strategies in the globalization era while prioritizing local resilience and what does it mean for the local sustainability. Embracing a holistic perspective, it integrates lessons from both the developing and developed nations, showcasing research, analyses, and case studies across various scales. This inclusive approach invites scholars and practitioners from diverse disciplines to engage in collaborative dialogues aimed at enhancing territory-specific (urban, rural or regional) resilience.

The convergence of rapid urbanization and the deepening impact of the recent global pandemic has reinstated the need for a paradigm “shift” toward more resilient and inclusive planning approaches. As we navigated through the post-COVID era, transformational planning emerges as a pivotal domain to *re-imagine* urban and rural territorial landscapes and their interrelationships. Beyond the traditional scope of integration, this “transformative” wave of planning emphasizes the need to include health-centric infrastructure into mainstreaming urban planning, design, and governance domains. By fostering resilient, inclusive communities and prioritizing equitable access to healthcare and other essential services, transformational planning seeks to safeguard and strike a balance between sustainability of the built-environment and human well-being. This all-encompassing approach recognizes the intrinsic interplay between resilient planning, public health, and need for ecological preservation, advocating for innovations that harmonize the needs of people living under diverse social, economic, environmental, and cultural contexts.

Through collaborative efforts and forward-thinking initiatives, transformational planning endeavors to forge a future where cities thrive as livable, resilient hubs of prosperity, and sustainability.

Kelowna, BC, Canada

Professor Kh Md Nahiduzzaman

# About ICCCASU

ICCCASU, established in 2015 as a collaborative venture between the United Nations Human Settlements Program (UN-Habitat) and the University of Ottawa, has since evolved into a consortium comprising numerous Canadian, Chinese, and African universities, NGOs, and partners worldwide. Serving as an international hub for urban research and dialogue, ICCCASU convenes diverse stakeholders—ranging from government representatives to civil society, industry leaders, and academics—to delve into the issues of urbanization and city development. It fosters a unique triangular dialogue among African nations, Canada, and China.

ICCCASU has organized five conferences and training programs thus far: ICCCASU I [2015] in Ottawa; ICCCASU II [2017] in Yaoundé, Cameroon; ICCCASU 3 [2019] in Chengdu, China; ICCCASU 4 [2021] in Montreal, Canada, and ICCCASU 5 [2023] in Nairobi, Kenya. Moreover, it has hosted various side events, including a roundtable at Habitat III in 2016 and workshops at the 10<sup>th</sup> World Urban Forum in Abu Dhabi in 2020. At the 11<sup>th</sup> World Urban Forum in Katowice, Poland, in 2022, ICCCASU organized a roundtable on city transformations in the context of the pandemic, underscoring its ongoing commitment to global urban dialogue and collaboration.

In addition to its renowned conferences, ICCCASU has expanded its activities to include training sessions, workshops, consultations, publications, research endeavors, and exemplary case studies. This multifaceted approach has solidified ICCCASU's status as a respected and influential international urban planning think tank, fostering extensive networks among researchers and practitioners worldwide. Recognizing cities as hubs of innovation, ICCCASU advocates for sustainable and inclusive urban planning practices that uplift marginalized communities, enhance educational opportunities, stimulate economic prosperity, and revolutionize land management practices, thus contributing significantly to global discussions on the sustainable urban development.



# Contents

<b>Introduction—Navigating Pandemics in Urban Spaces: Challenges, Strategies, and the Future of Urban Planning</b> .....	1
Seyed Navid Mashhadi Moghaddam	
<b>Urban Infrastructure and Resilience</b>	
<b>Poland’s Small Towns from Pre- and Post-pandemic Perspective: On Life Quality as a Resilience Measure</b> .....	29
Ewa Korcelli-Olejniczak	
<b>Infrastructure Resilience in the Post Pandemic Urban Areas of Bangladesh</b> .....	47
Amena Jahan Urmy, Sadia Binte Rahman, and Abue Jawfore Taufique Ahamed Ahade	
<b>Dynamics of Urban Transformation and Real Estate Market</b>	
<b>The Variability of Dynamics in Urban Spatial Transformation During the Post-COVID Era: Perspectives of the Global South and North</b> .....	67
Sujit Kumar Sikder, Md Moynul Ahsan, Hassan Radoine, Omar Al-Mahadi, and Kh Md Nahiduzzaman	
<b>Sustainable Urban Transformation as an Approach to Solving the Paradoxical Challenges of Contemporary Cities</b> .....	85
Wail Ismail Bakhit	
<b>Reimagining Travellers’ Airport Experience: Innovative Approaches for a Post-COVID-19 Pandemic Future</b> .....	97
Johannes Bhanye, Mareli Hugo, Abraham Matamanda, and Kgosi Mocwagae	

**Picturing Pandemics as Urban Disaster: Enumerations of Post-Covid Life in Informal-Windhoek, Namibia** ..... 139  
 Uchendu E. Chigbu, Penehafo Ricardo, Cathrine Marenga, and Malcon L. Mazambani

**What Implications Do Transformational Mobility and the Real Estate Market Hold for Cities in the Post-Pandemic Era?** ..... 163  
 Tiziana Campisi, Talha Tasnim, and Kh Md Nahiduzzaman

**Urban Planning and Development**

**Development Incentives in the South African Local Government and Administration, a Significant Growth Factor for Municipal Planning, Innovation and Service Delivery During and Post-Covid 19** ..... 179  
 E. M. Lentsoane and George Onatu

**Shortcomings of Urban India in Dealing With the Pandemic: A Study on the Response From the Rural Regions in India** ..... 203  
 Arun Baby M. Wilson and Jayaprakash Chadchan

**Older Adults’ Experiences of Social Exclusion in Pakistan: A Qualitative Study** ..... 223  
 Muhammad Ahmad Al-Rashid, Tiziana Campisi, Muhammad Nadeem, and Bilal Saghir

**Rethinking Urban Planning and Development for the Post-Pandemic Urban Crowd Management** ..... 245  
 Jiyon Shin, Reazul Ahsan, and Soumaya Ezazaa

**Rethinking Urban Development and Built Environment Attributes in the Post-Pandemic World: A Case of High-Density Hong Kong** ..... 261  
 Kazi Humayun Kabir and Md. Ayatullah Khan

**Conclusion—Navigating Changes: Influence of the Disruptive Forces on Transformational Urban Planning Conventions** ..... 279  
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# Introduction—Navigating Pandemics in Urban Spaces: Challenges, Strategies, and the Future of Urban Planning



Seyed Navid Mashhadi Moghaddam

**Abstract** The COVID-19 pandemic has exposed the vulnerabilities of urban environments, necessitating a reevaluation of urban planning and development to enhance city resilience, sustainability, and equity in the post-pandemic era. “Making Sense of Planning and Development for the Post-Pandemic Cities” provides a comprehensive analysis across four thematic areas: Urban Infrastructure & Resilience, Dynamics of Urban Transformation, Transformational Real Estate Market, and Urban Planning & Development. These themes collectively explore the impact of the pandemic on urban areas, with specific case studies from Poland and Bangladesh, the rapid urban transformations necessitated by global crises, the changing dynamics of real estate markets, and the critical role of urban planning in fostering economic growth and social development. The book highlights the importance of local governance, sustainable urban forms, and adaptive social practices in building resilient cities. It also discusses the challenges of managing crowd density in temporary events and emphasizes the need for clean drinking water and healthy indoor ventilation. Through varied geographical contexts and perspectives, the work aims to guide policymakers, urban planners, and academics towards creating more resilient, sustainable, and inclusive urban spaces in the aftermath of the pandemic.

**Keywords** Urban Planning · Pandemic · Post Pandemic Cities · Vulnerable cities · COVID-19 Urban Transformation

## 1 Introduction

The COVID-19 pandemic has highlighted the vulnerability of our cities and the pressing need to reassess urban planning and development. As the world emerges from the crisis, there is a growing consensus that we must reshape our urban environments to better withstand the challenges of the post-pandemic era. “Making Sense

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of Planning and Development for the Post-Pandemic Cities” is a comprehensive exploration of the transformations and adaptations required to make our cities more resilient, sustainable, and equitable. The book is organized into three themes, each addressing a key aspect of post-pandemic urban life.

Theme 1: Urban Infrastructure and Resilience delves into the importance of urban size, functions, and resilience to external impacts. It examines the COVID-19 pandemic’s effect on urban areas in Poland and Bangladesh, with a focus on how local governance, urban form, and social practices contribute to resilience.

Theme 2: Dynamics of Urban Transformation and Real Estate Market highlights the rapid changes in urban spaces brought about by the pandemic, and the need for cities to adapt and become more resilient to crises such as natural disasters, violent conflicts, and epidemics. The chapters in this section explore the challenges and complexities surrounding contemporary cities, urban sustainability, and the experiences of air travelers.

They also attempted to investigate the critical effects of the pandemic on cities, with a focus on economic and social environment, mobility patterns, and real estate markets. How transformational changes in public transport services, multimodality, complementary modal choices, hybrid work arrangements, and residential location choices might shape the future cities are the other facets that these chapters attempted to delve into.

Theme 3: Urban Planning and Development offers a comprehensive examination of the critical aspects of urban planning in the post-pandemic world. The chapters in this section discuss the role of municipal planning in driving economic growth and social development, the shortcomings of urban infrastructure, the public transport experiences of the older adults, crowd management in temporary events, and the importance of factors such as social distancing, clean drinking water, and healthy indoor ventilation in pandemic response.

By offering insights from various perspectives and geographical contexts, “Making Sense of Planning and Development for the Post-Pandemic Cities” aims to inform policymakers, urban planners, and academics on the necessary steps to make our cities more resilient, sustainable, and inclusive in the post-pandemic world.

## **2 Challenges in Urban Spaces During Pandemics**

Urban spaces, characterized by their dense populations and diverse socioeconomic structures, are the engines of growth and innovation in modern societies. However, they also present unique challenges during pandemics, as the interconnected nature of urban life can facilitate the rapid spread of infectious diseases and exacerbate the consequences for various aspects of urban living. This section aims to provide a comprehensive understanding of the multifaceted challenges that urban spaces face during pandemics by exploring the following sub-sections:

1. **Public Health Concerns:** Ensuring the well-being of urban residents during pandemics is of paramount importance, as factors such as high population density and the built environment can contribute to the transmission of infectious diseases. This sub-section will delve into the public health concerns that arise during pandemics in urban spaces, including disease transmission, healthcare infrastructure, vulnerable populations, and the role of the built environment.
2. **Accessibility and Mobility Issues:** Urban mobility and transportation systems play a crucial role in connecting people to jobs, services, and amenities. However, pandemics can disrupt these systems, necessitating the rethinking of urban transportation to ensure safe, efficient, and accessible mobility options for all residents. This sub-section will explore the challenges and opportunities associated with enhancing mobility and transportation systems during pandemics.
3. **Social Distancing and Public Space Usage:** The imposition of social distancing measures during pandemics can significantly impact the way public spaces are used in urban environments. This sub-section will discuss the challenges associated with maintaining social distancing in urban spaces and the importance of reimagining the design and function of public spaces to accommodate evolving public health guidelines.
4. **Psychological Impact on Residents:** The psychological well-being of urban residents can be severely affected during pandemics, as fear of infection, social isolation, and economic hardship can lead to increased stress, anxiety, and depression. This sub-section will explore the mental health challenges faced by urban residents during pandemics and discuss potential strategies for addressing these concerns.

This section aims to provide a comprehensive understanding of the complex challenges faced by urban spaces during pandemics and to contribute to the development of more resilient and adaptable cities in the face of future health crises by examining these sub-sections.

## ***2.1 Public Health Concerns***

Public health concerns are of paramount importance when addressing the challenges posed by pandemics in urban spaces. The concentration of people in cities makes them particularly vulnerable to the rapid spread of infectious diseases, and the high population density exacerbates the potential impact of pandemics on various aspects of urban life. In this subsection, we will discuss the most significant public health concerns that arise during pandemics in urban spaces, including disease transmission, healthcare infrastructure, vulnerable populations, inadequate housing and slums, mental health issues, air quality and pollution, food security and nutrition, waste management, health information and communication, and public health preparedness.



### **2.1.1 Disease Transmission**

The transmission of infectious diseases in urban areas is a major concern during pandemics. High population density and the extensive interaction between individuals in public spaces facilitate the rapid spread of infectious diseases, such as the COVID-19 virus [1]. Several factors contribute to the increased risk of disease transmission in urban areas, including crowded living conditions, the use of public transportation, and the presence of large public gatherings [2]. In addition, the built environment, such as the design of buildings and the ventilation systems within them, can also influence the transmission of airborne pathogens [3].

### **2.1.2 Healthcare Infrastructure**

Urban healthcare infrastructure plays a crucial role in responding to pandemics, as it provides essential services for the prevention, diagnosis, treatment, and management of infectious diseases. However, during pandemics, healthcare systems can be quickly overwhelmed due to the rapid surge in demand for medical services and resources [4]. This can lead to the insufficient availability of healthcare facilities, healthcare workers, medical equipment, and supplies (such as personal protective equipment and ventilators), which in turn can compromise the quality and accessibility of healthcare services for the affected population [5].

### **2.1.3 Vulnerable Populations**

Certain groups within urban populations are particularly vulnerable to the adverse effects of pandemics, including the elderly, people with underlying health conditions, low-income individuals, and those living in informal settlements [5]. These vulnerable groups often experience higher rates of morbidity and mortality during pandemics, as they are more susceptible to infection and have limited access to healthcare services [6]. Moreover, the social determinants of health, such as poverty, education, and employment, can exacerbate the health disparities experienced by these vulnerable populations during pandemics [7].

### **2.1.4 Inadequate Housing and Slums**

Inadequate housing and informal settlements (slums) pose significant public health challenges during pandemics. Poor living conditions, such as overcrowding, lack of access to clean water and sanitation, and limited waste management facilities, contribute to the increased risk of infectious disease transmission in these settings [1]. Furthermore, residents of informal settlements often face barriers to accessing

healthcare services, including affordability, availability, and geographical accessibility [8]. This can lead to delayed diagnosis and treatment, which in turn can increase the risk of disease transmission and the severity of illness among these populations [1].

### **2.1.5 Mental Health Issues**

Pandemics can have profound effects on the mental health of urban residents, as the fear of infection, social isolation, economic hardship, and the disruption of daily routines can lead to increased levels of stress, anxiety, and depression [9]. Moreover, the closure of schools, workplaces, and recreational facilities, as well as the imposition of lockdowns and social distancing measures, can exacerbate feelings of loneliness and disconnection among urban residents [10]. Mental health services may also be strained during pandemics, as healthcare resources are often diverted to address the immediate needs of managing the outbreak [11]. This can result in reduced access to mental health support and treatment for those in need, further exacerbating mental health challenges in urban spaces [12].

### **2.1.6 Health Information and Communication**

Reliable health information and communication are vital for ensuring effective public health responses during pandemics. Urban residents need timely and accurate information about the risks, symptoms, and preventive measures associated with infectious diseases to make informed decisions about their health and wellbeing [13]. However, the rapid spread of misinformation and disinformation during pandemics can hinder public health efforts and contribute to confusion, fear, and mistrust among urban populations [14]. Ensuring effective communication and countering misinformation are essential for promoting adherence to public health guidelines and mitigating the impact of pandemics on urban spaces [15].

### **2.1.7 Public Health Preparedness:**

Public health preparedness is crucial for managing the challenges posed by pandemics in urban spaces. This includes the development and implementation of comprehensive plans and strategies to prevent, detect, and respond to infectious disease outbreaks [16]. Factors such as insufficient funding, inadequate surveillance and monitoring systems, and limited coordination between different levels of government can undermine public health preparedness in urban areas [17]. Strengthening public health systems and building resilience to future pandemics are essential for protecting the health and wellbeing of urban residents [18].

In conclusion, pandemics pose significant challenges to urban spaces, with public health concerns being at the forefront of these issues. High population density and the

concentration of people in cities create environments that are conducive to the rapid spread of infectious diseases, putting immense pressure on healthcare infrastructure and disproportionately affecting vulnerable populations. Additionally, inadequate housing, mental health issues, air quality, food security, waste management, health information, and public health preparedness are all critical aspects that need to be addressed to effectively manage pandemics in urban settings.

Urban planners and policymakers must consider these public health concerns when developing strategies to create pandemic-resilient urban spaces. This includes enhancing healthcare infrastructure, improving living conditions, ensuring access to essential services, addressing mental health issues, mitigating the impacts of air pollution, promoting food security, and implementing effective waste management systems. Moreover, disseminating accurate health information and fostering robust public health preparedness are essential for mitigating the impacts of pandemics on urban residents.

By adopting a comprehensive and interdisciplinary approach to urban planning, cities can build resilience against future pandemics and safeguard the health and wellbeing of their residents. This will not only benefit urban populations during times of crisis but will also contribute to creating healthier, more equitable, and sustainable cities in the long term.

## ***2.2 Accessibility and Mobility Issues***

During pandemics, urban spaces face significant challenges related to accessibility and mobility, which can exacerbate existing inequalities and contribute to adverse health, social, and economic outcomes. In this section, we will discuss various aspects of accessibility and mobility issues that arise during pandemics, including reduced public transportation services, impact on non-motorized transport, social distancing and transportation infrastructure, barriers to accessing essential services and employment opportunities, mobility challenges for people with disabilities and the elderly, digital divide and access to information and communication technologies, shifts in travel behavior and demand, and strategies for enhancing mobility and accessibility during pandemics.

Reduced public transportation services are a common challenge during pandemics, as governments and transportation authorities may limit or suspend services to contain the spread of the virus [19]. This can lead to overcrowding and increased wait times for the remaining services, making it difficult for residents to maintain social distancing and increasing the risk of disease transmission [20]. Moreover, reduced transportation services can disproportionately affect low-income and vulnerable populations, who rely more heavily on public transportation and may not have access to alternative modes of transport [21].

The impact on non-motorized transport, such as walking and bicycling, is another important aspect to consider during pandemics. While these modes of transport can offer a safer alternative to public transportation in terms of disease transmission,

urban spaces may not be adequately designed to accommodate increased demand and ensure safe travel for pedestrians and cyclists [22]. Moreover, the closure of public spaces and the enforcement of social distancing measures can limit opportunities for walking and cycling as recreational activities, contributing to sedentary lifestyles and adverse health outcomes [23].

Social distancing and transportation infrastructure are closely interrelated during pandemics, as the design and layout of urban spaces can either facilitate or hinder the implementation of effective social distancing measures. Narrow sidewalks, crowded public spaces, and inadequate cycling infrastructure can make it difficult for residents to maintain a safe distance from others and increase the risk of disease transmission [24]. Furthermore, the lack of safe and accessible transportation options can exacerbate existing inequalities and further marginalize vulnerable populations, such as low-income residents, people with disabilities, and the elderly [25].

Barriers to accessing essential services and employment opportunities are another critical challenge during pandemics, as reduced transportation services and social distancing measures can make it more difficult for residents to reach healthcare facilities, grocery stores, and other essential destinations [26]. Moreover, the closure of businesses and the shift to remote work can lead to job losses and reduced income for many residents, particularly those working in the informal sector and in occupations that cannot be performed remotely [27].

Mobility challenges for people with disabilities and the elderly are further exacerbated during pandemics, as these populations may face additional barriers to accessing transportation services and public spaces due to their heightened vulnerability to the virus and potential difficulties in complying with social distancing measures [28]. Moreover, the closure of specialized services and support facilities can further limit their mobility and independence, leading to increased social isolation and adverse mental health outcomes [29].

The digital divide and access to information and communication technologies (ICTs) are also important factors to consider in addressing accessibility and mobility issues during pandemics. With many services and activities shifting online, residents who lack access to digital devices or reliable internet connections may be unable to access essential information, healthcare services, or employment opportunities [30]. This digital divide can disproportionately affect low-income residents, older adults, and those living in underserved areas, further exacerbating existing inequalities and contributing to social exclusion [31].

Shifts in travel behavior and demand during pandemics can have significant implications for urban transportation systems and planning. The fear of disease transmission and the adoption of remote work and online services can lead to a decrease in demand for public transportation and an increase in the use of private vehicles, contributing to traffic congestion and air pollution [32]. Additionally, the increased reliance on e-commerce and home deliveries can lead to a surge in last-mile delivery traffic, further exacerbating congestion and environmental impacts [33].

Strategies for enhancing mobility and accessibility during pandemics should focus on addressing the needs of diverse urban populations and promoting safe, sustainable, and inclusive transportation options. These may include expanding and improving

public transportation services, investing in cycling and pedestrian infrastructure, promoting carpooling and ridesharing services, and leveraging digital technologies to facilitate access to information and services [34]. Furthermore, urban planners and policymakers should consider the long-term implications of these shifts in travel behavior and demand, and develop strategies to promote more resilient and adaptable transportation systems in the face of future pandemics and other crises [32].

In conclusion, addressing accessibility and mobility issues during pandemics is essential for ensuring the well-being of urban residents and promoting more resilient and inclusive urban spaces. This requires a comprehensive understanding of the diverse challenges faced by different populations and sectors, as well as the development of innovative and context-sensitive strategies for enhancing mobility and accessibility in the face of uncertainty and change.

### ***2.3 Social Distancing and Public Space Usage***

Social distancing and public space usage are critical aspects of urban planning that have been significantly impacted during pandemics. The need to maintain a safe distance from others to curb disease transmission has required a rethinking of how urban spaces are designed and utilized. This section will explore the challenges and implications of social distancing on public space usage in urban settings, drawing on a range of academic literature.

The concept of social distancing has become central to public health strategies during pandemics, such as the COVID-19 crisis [35]. Social distancing refers to maintaining a safe distance between individuals to reduce the risk of disease transmission, with the World Health Organization (WHO) recommending a minimum distance of 1 m (3 feet) between people [36]. This measure has necessitated changes in public space design, usage, and management to accommodate these guidelines and minimize the risk of contagion.

One of the primary challenges of social distancing in urban spaces is the need to balance public health concerns with the desire to maintain social interactions, a vital aspect of urban life [37]. Urban spaces often serve as hubs for social interaction, commerce, and cultural activities. During pandemics, the need to maintain social distancing can disrupt these functions, leading to reduced opportunities for social connection, increased feelings of isolation, and potential negative impacts on mental health [10].

Temporary and adaptive urban design interventions have emerged as a response to these challenges, aiming to create more space for social distancing while preserving the social and economic functions of urban spaces [38]. These interventions have included widening sidewalks, creating temporary pedestrian and bike lanes, and repurposing parking spaces or streets for outdoor dining and recreation [39]. Such measures have been critical in maintaining a sense of community and enabling businesses to continue operating during pandemics.

Urban parks and green spaces have also played a crucial role in providing opportunities for physical activity, relaxation, and social interaction during pandemics [40]. However, the increased demand for these spaces has raised concerns about overcrowding and the potential for disease transmission. Policymakers and urban planners have had to devise strategies for managing park usage, such as implementing capacity limits, timed entry systems, and one-way circulation routes to maintain social distancing and ensure public safety [41].

Supporting local businesses and street life during pandemics has been another significant challenge. With many businesses struggling due to reduced foot traffic and enforced closures, there has been a need for creative solutions to support economic recovery while adhering to social distancing guidelines. Some cities have implemented measures such as expanding outdoor dining, offering financial assistance to small businesses, and promoting local shopping through marketing campaigns [42].

Designing for resilience and adaptability has emerged as a key priority for urban planners in the context of pandemics. This approach involves creating flexible spaces that can be easily reconfigured to accommodate changing needs, such as modular furniture, convertible street spaces, and adaptable building designs [38]. Such strategies can help cities respond more effectively to pandemics and other shocks, ensuring that urban spaces can continue to serve their vital social and economic functions.

Inclusive and participatory decision-making processes have also become increasingly important in addressing the challenges of social distancing and public space usage during pandemics. Engaging diverse stakeholders, including residents, businesses, and community organizations, can help ensure that urban planning decisions reflect the needs and priorities of different groups and promote social equity [43].

In conclusion, the challenges of social distancing and public space usage during pandemics have necessitated a reevaluation of how urban spaces are designed, managed, and utilized. Strategies such as temporary and adaptive urban design interventions, supporting local businesses, and promoting inclusive and participatory decision-making processes have emerged as critical approaches to maintaining social connections and preserving the vitality of urban spaces while protecting public health. By drawing on these insights and engaging in interdisciplinary research and knowledge sharing, urban planners and policymakers can develop more resilient and adaptable urban spaces that are better equipped to cope with pandemics and other future challenges.

## ***2.4 Psychological Impact on Residents***

The psychological impact of pandemics on urban residents is a multifaceted issue that extends beyond the immediate health concerns associated with infectious diseases. The COVID-19 pandemic, for instance, has led to widespread feelings of fear, anxiety, stress, and uncertainty, which have been exacerbated by the numerous social, economic, and environmental challenges faced by urban populations during these

times [9, 10]. In this sub-section, we will explore the various aspects of the psychological impact of pandemics on urban residents, including mental health consequences, the role of social isolation and loneliness, the effects on children and adolescents, the impacts on frontline workers, and the implications for urban planning and design.

**Mental health consequences:** The mental health consequences of pandemics have been widely documented, with increased rates of anxiety, depression, post-traumatic stress disorder (PTSD), and substance abuse observed during and after such events [9, 10]. The uncertainty and fear associated with the spread of infectious diseases, coupled with the economic instability, job losses, and other stressors experienced by urban residents during pandemics, contribute to this heightened psychological distress [44]. Additionally, the prolonged duration of pandemics can exacerbate existing mental health issues or lead to the development of new disorders, particularly among vulnerable populations such as the elderly, low-income individuals, and those with pre-existing mental health conditions [9].

**Social isolation and loneliness:** The implementation of social distancing measures, quarantine protocols, and stay-at-home orders during pandemics has led to increased social isolation and loneliness among urban residents [45]. The loss of social connections, limited access to support networks, and disruptions to daily routines can have profound effects on mental health and well-being, increasing the risk of depression, anxiety, and other mental health disorders [10, 45]. Furthermore, the digital divide in urban areas can exacerbate feelings of isolation for those without access to digital communication tools, creating additional barriers to social interaction and support [46].

**Effects on children and adolescents:** Pandemics and their associated social and economic disruptions can have significant psychological impacts on children and adolescents [47]. School closures, social isolation, and the loss of extracurricular activities can lead to increased stress, anxiety, and feelings of loneliness among young people [45]. Moreover, children and adolescents from disadvantaged backgrounds may be disproportionately affected by the loss of access to educational and support services during pandemics, further exacerbating existing inequalities [47]. The long-term psychological effects of these disruptions on child and adolescent development are not yet fully understood, but early evidence suggests that they may be substantial [47].

**Impacts on frontline workers:** Frontline workers, including healthcare professionals, emergency responders, and essential service providers, are at particular risk of experiencing psychological distress during pandemics [48]. The high levels of stress, long working hours, and exposure to traumatic events can contribute to increased rates of burnout, depression, anxiety, and PTSD among these workers [48]. Additionally, the fear of contracting the virus and spreading it to family members may further exacerbate the psychological burden faced by frontline workers during pandemics [48].

**Implications for urban planning and design:** The psychological impacts of pandemics on urban residents highlight the need for urban planning and design strategies that prioritize mental health and well-being. This includes creating spaces that facilitate social connections while adhering to public health guidelines, ensuring

access to essential services and support networks, and promoting equity and inclusiveness in urban environments [49, 50]. For example, the development of green spaces, pedestrian-friendly streets, and mixed-use neighborhoods can encourage social interaction and physical activity, which have been shown to improve mental health outcomes [49, 50]. Additionally, addressing the digital divide in urban areas can help to alleviate feelings of isolation and loneliness by increasing access to digital communication tools and online resources [46].

Urban planners and policymakers should also consider the needs of vulnerable populations, such as children, adolescents, the elderly, and frontline workers, when designing and implementing strategies to mitigate the psychological impacts of pandemics [47, 48]. This might involve developing targeted mental health interventions and support services, as well as ensuring that the urban environment is responsive to the needs and preferences of these groups [47, 48].

In conclusion, the psychological impact of pandemics on urban residents is a complex and multifaceted issue that warrants further attention from urban planners, policymakers, and researchers. By adopting a holistic and inclusive approach to urban planning and design, it is possible to create urban spaces that promote mental health and well-being, foster social connections, and mitigate the negative psychological consequences of pandemics and other public health crises. Urban planning and design strategies should consider the psychological impacts of pandemics on residents by creating spaces that promote mental health, well-being, and social connections while adhering to public health guidelines. This can be achieved by developing green spaces, pedestrian-friendly streets, mixed-use neighborhoods, and ensuring access to essential services and support networks. Addressing the digital divide in urban areas can also help to alleviate feelings of isolation and loneliness by increasing access to digital communication tools and online resources. Furthermore, urban planners and policymakers should consider the needs of vulnerable populations, such as children, adolescents, the elderly, and frontline workers, when designing and implementing strategies to mitigate the psychological impacts of pandemics. This might involve developing targeted mental health interventions and support services, as well as ensuring that the urban environment is responsive to the needs and preferences of these groups.

### **3 Urban Planning Strategies for Pandemic-Resilient Urban Spaces**

Urban spaces, with their high population density and interconnected nature, are particularly susceptible to the impacts of pandemics. The unprecedented challenges brought forth by global health crises, such as the COVID-19 pandemic, have highlighted the need for rethinking urban planning strategies to create more resilient and adaptive urban spaces. This section aims to provide insights into innovative urban planning approaches and strategies that can help mitigate the effects of pandemics



and enhance the overall resilience of urban environments. The following sub-sections will be discussed in detail:

1. **Flexible and Adaptive Public Spaces:** As social distancing and other public health guidelines reshape the way public spaces are used during pandemics, it is essential to consider how urban design can accommodate these changing needs. This sub-section will explore strategies for creating flexible and adaptive public spaces that can support various functions and activities while adhering to evolving health recommendations.
2. **Strengthening Urban Green Infrastructure:** Green spaces play a crucial role in enhancing urban resilience and promoting public health. This sub-section will delve into the importance of urban green infrastructure during pandemics, discussing the benefits of integrating nature-based solutions in urban planning and management.
3. **Enhancing Mobility and Transportation Systems:** Efficient and accessible mobility is vital for urban spaces, connecting people to jobs, services, and amenities. This sub-section will discuss the challenges and opportunities associated with enhancing mobility and transportation systems during pandemics, exploring the potential for innovative solutions that prioritize safety, sustainability, and equity.
4. **Encouraging Mixed-Use Development and Neighborhood-level Self-sufficiency:** Mixed-use development and neighborhood-level self-sufficiency can contribute to more resilient and adaptable urban spaces during pandemics. This sub-section will discuss the benefits of promoting mixed-use development and fostering neighborhood-level self-sufficiency, highlighting the role of urban planning in creating vibrant, sustainable, and pandemic-resilient communities.

By exploring these sub-sections, this section aims to provide a comprehensive understanding of the urban planning strategies that can help create pandemic-resilient urban spaces, ultimately contributing to healthier, more sustainable, and adaptive cities in the face of future health crises.

### ***3.1 Flexible and Adaptive Public Spaces***

Flexible and adaptive public spaces play a crucial role in promoting urban resilience and livability during pandemics. The ability to quickly adapt and reconfigure public spaces to meet changing demands can help cities maintain their social and economic vibrancy while protecting public health [51]. This section will discuss key concepts and principles of flexible and adaptive public spaces, and explore a range of innovative urban design interventions and strategies that have emerged in response to the COVID-19 pandemic.

Flexibility and adaptability in public spaces refer to the ability of urban environments to accommodate a wide range of activities, user groups, and changing

circumstances [52]. This can involve the use of modular, multi-functional, and reconfigurable design elements, as well as the incorporation of temporary, pop-up, or event-based installations and programming [53]. By creating public spaces that can be easily adapted and repurposed, cities can better respond to the diverse and evolving needs of their residents, while also enhancing their capacity to cope with shocks and stressors, such as pandemics.

Several key principles underpin the design and management of flexible and adaptive public spaces:

- **Multi-functionality:** Designing spaces that can accommodate a wide variety of activities and user groups, both concurrently and at different times [52].
- **Modularity:** Incorporating elements and infrastructure that can be easily assembled, disassembled, and rearranged to create different spatial configurations and uses [53].
- **Temporality:** Embracing temporary, pop-up, and event-based interventions as a means of testing and experimenting with new ideas, fostering innovation, and engaging communities in the process of urban transformation [53].
- **Responsiveness:** Ensuring that public spaces can quickly adapt and respond to changing needs, preferences, and circumstances, including public health crises and other emergencies [51].

The COVID-19 pandemic has prompted a range of innovative urban design interventions and strategies aimed at creating more flexible and adaptive public spaces. These interventions can be grouped into several broad categories:

- **Expanding and repurposing public spaces:** Many cities have sought to increase the amount of available public space by repurposing streets, parking lots, and other underutilized areas for pedestrian and recreational use [54]. This has involved the temporary or permanent closure of streets to vehicular traffic, the installation of parklets and pedestrian plazas, and the conversion of parking spaces into outdoor dining areas, among other measures [54].
- **Implementing modular and reconfigurable design elements:** Cities have also experimented with modular and reconfigurable design elements, such as moveable seating, planters, and barriers, to create flexible and adaptable public spaces that can be easily reconfigured to accommodate different activities and social distancing requirements [55].
- **Encouraging temporary and pop-up installations:** Temporary and pop-up installations, such as outdoor art exhibits, performances, and markets, have been used to activate public spaces and support local businesses during the pandemic [55]. These interventions can help to foster a sense of community and social cohesion, while also providing opportunities for economic recovery and resilience [55].
- **Adopting digital and smart city technologies:** Digital and smart city technologies, such as sensors, data analytics, and mobile applications, can be used to monitor and manage the use of public spaces in real-time, helping to ensure that social distancing and other public health guidelines are being followed [56]. For example, cities like Barcelona and Amsterdam have implemented smart crowd

management systems to monitor the flow of pedestrians in public spaces and provide real-time information to residents about the safest and least congested routes [56].

As cities continue to grapple with the challenges posed by pandemics, it is essential to draw upon the lessons learned and best practices that have emerged from the experiences of urban areas around the world. In doing so, policymakers, urban planners, and community stakeholders can work together to create more resilient, inclusive, and sustainable public spaces that are better equipped to withstand future crises.

Several lessons and best practices have emerged from the experiences of cities in implementing flexible and adaptive public spaces during the COVID-19 pandemic:

- **Collaboration and partnership:** Successful implementation of these interventions often requires close collaboration between various stakeholders, including local governments, businesses, community organizations, and residents [54]. By working together, these stakeholders can pool resources, share expertise, and engage in creative problem-solving to address the complex challenges posed by pandemics [54].
- **Experimentation and iteration:** The pandemic has highlighted the value of adopting an experimental and iterative approach to urban design and planning, as cities have had to rapidly adapt and innovate in response to the evolving crisis [55]. By embracing temporary, modular, and adaptable interventions, cities can test and refine new ideas, learn from successes and failures, and build a more robust evidence base for future planning and decision-making [55].
- **Equity and inclusiveness:** It is crucial to ensure that flexible and adaptive public spaces are designed and managed in ways that promote equity and inclusiveness, particularly for vulnerable and marginalized populations who may be disproportionately impacted by pandemics [51]. This may involve prioritizing investments in underserved neighborhoods, conducting inclusive and participatory planning processes, and ensuring that public spaces are accessible and welcoming to people of all ages, abilities, and backgrounds [51].
- **Integrating public health considerations into urban design and planning:** Public health should be a central concern in the design and management of public spaces, particularly in the context of pandemics [51]. This may involve incorporating features that promote physical distancing, hygiene, and ventilation, as well as ensuring that public spaces can accommodate a range of health-related activities and services, such as testing and vaccination clinics [51].
- **Strengthening community engagement and ownership:** Engaging local communities in the planning, design, and management of public spaces can help to ensure that these spaces are more responsive to local needs, preferences, and cultural practices [52]. This can involve conducting participatory planning workshops, crowdsourcing ideas and feedback, and involving local residents in the implementation and stewardship of public space projects [52].
- **Leveraging partnerships and innovative financing models:** The creation and maintenance of flexible and adaptive public spaces often require significant financial

resources, particularly in the context of pandemics when municipal budgets may be strained [54]. By forging partnerships with the private sector, philanthropic organizations, and other stakeholders, cities can tap into new sources of funding and expertise, as well as promote more innovative and cost-effective approaches to public space provision and management [54].

Ultimately, the development and implementation of flexible and adaptive public spaces can serve as a vital strategy for enhancing urban resilience and livability in the face of pandemics and other global challenges. By embracing innovative design interventions, fostering collaboration and partnership, and prioritizing equity and inclusiveness, cities can create public spaces that not only protect public health but also foster social cohesion, economic vitality, and environmental sustainability.

### ***3.2 Strengthening Urban Green Infrastructure***

Urban green infrastructure (UGI) refers to an interconnected network of green spaces, including parks, gardens, green roofs, street trees, and natural habitats, which provide a range of environmental, social, and economic benefits to urban residents [57]. In the context of pandemics, UGI can play a crucial role in enhancing urban resilience by promoting physical and mental health, facilitating social distancing, and mitigating the impacts of climate change and other environmental stressors [58]. This section will discuss the importance of UGI in fostering pandemic-resilient urban spaces and provide evidence-based recommendations for strengthening UGI in urban planning and design.

UGI can contribute to pandemic resilience in several ways. First, access to green spaces has been shown to have significant positive effects on physical and mental health, which can be especially important during periods of increased stress and uncertainty [59]. For instance, green spaces can provide opportunities for physical activity, which can help to reduce the risk of chronic diseases, boost immune function, and improve overall well-being [60]. Furthermore, exposure to natural environments can promote psychological restoration and stress reduction, helping to alleviate the mental health impacts of pandemics [59].

Second, UGI can facilitate social distancing by providing additional outdoor spaces for people to gather and engage in activities while maintaining physical distance [58]. During the COVID-19 pandemic, many cities around the world have witnessed a surge in the use of parks and other green spaces, as people sought safe and accessible environments for recreation, socialization, and relaxation [61]. By expanding and diversifying the provision of green spaces, cities can ensure that residents have adequate access to outdoor areas during pandemics, reducing the risk of overcrowding and transmission of infectious diseases [58].

Finally, UGI can help to mitigate the impacts of climate change and other environmental stressors, which can exacerbate the challenges faced by cities during pandemics [57]. For example, green spaces can reduce urban heat island effects,

improve air quality, and promote stormwater management, thus helping to create healthier and more resilient urban environments [57]. In this way, UGI can contribute to the overall resilience of cities, supporting their capacity to withstand and recover from various shocks and stressors, including pandemics.

Given the importance of UGI in fostering pandemic-resilient urban spaces, the following strategies can be employed to strengthen UGI in urban planning and design:

**Prioritizing equitable access to green spaces:** Ensuring that all urban residents have equitable access to green spaces is critical for promoting public health and social cohesion during pandemics [62]. To achieve this, cities can conduct spatial analyses to identify areas with limited access to green spaces, prioritize investments in these areas, and incorporate social equity considerations into their planning and decision-making processes [62].

**Creating multifunctional and adaptable green spaces:** Designing green spaces that can serve multiple functions and adapt to changing needs and circumstances can help cities better respond to pandemics and other crises [63]. For example, parks can be designed to accommodate a range of activities, such as exercise, relaxation, and socialization, while also providing space for emergency services or temporary health facilities if needed [63]. Incorporating elements such as modular furniture, movable planters, and flexible programming can further enhance the adaptability of green spaces.

**Promoting nature-based solutions:** Nature-based solutions, such as green roofs, rain gardens, and urban forests, can contribute to the overall resilience of cities by providing ecosystem services and improving environmental quality [64]. By integrating nature-based solutions into urban planning and design, cities can strengthen their green infrastructure networks and enhance their capacity to cope with pandemics and other stressors.

**Engaging communities in the planning and management of green spaces:** Involving local communities in the planning, design, and management of green spaces can help to ensure that these spaces meet the diverse needs of residents and foster a sense of ownership and stewardship [65]. Community engagement can also facilitate the sharing of local knowledge and the identification of innovative solutions for enhancing the resilience of green spaces during pandemics.

**Establishing partnerships and collaboration:** Strengthening UGI requires collaboration among various stakeholders, including government agencies, private sector actors, non-governmental organizations, and local communities [66]. Establishing partnerships and fostering cooperation can help to mobilize resources, share knowledge and expertise, and coordinate efforts to enhance the resilience of green spaces during pandemics.

In conclusion, strengthening urban green infrastructure is essential for creating pandemic-resilient urban spaces that support the physical and mental well-being of residents, facilitate social distancing, and mitigate the impacts of climate change and other environmental stressors. By prioritizing equitable access to green spaces, creating multifunctional and adaptable green spaces, promoting nature-based solutions, engaging communities in the planning and management of green spaces, and establishing partnerships and collaboration, cities can enhance their capacity to cope