

Sustainable Urban Development in the Post-Pandemic Era: Smart Shenzhen based on the 15-Minute City Concept

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Abstract. In the face of the pandemic, there has been a global focus on urban planning and sustainability. These have attracted attention in innovative cities. The 15-Minute City approach aims to address the COVID-19 pandemic, enhance urban sustainability, and encourage citizen involvement in urban planning and management. In 2018, the municipality of Milan launched the Fifteen Minute City project. The project aims to redefine the use of streets and public spaces, encourage cycling and walking, and reshape neighborhoods. By studying the success of Milan's 15-minute City, this paper aims to deeply analyze the necessary factors for the successful implementation of the 15-minute plan based on the Notice of Shenzhen Municipal Bureau of Commerce on printing and distributing the Implementation Plan for the Pilot City Construction of Shenzhen Quarter Hour Convenient Living Circle. This paper will establish causal connections between the variables within the plan and propose strategies for mitigating the identified risks. Additionally, the document will present a fair and objective evaluation of the plan's consequences, along with practical suggestions for future execution. The paper highlights the importance of community involvement in urban planning and emergency management by examining key initiatives in Shenzhen, such as the implementation of digital technologies, green transport policies, community support, and public education. The research provides valuable lessons for both Shenzhen and other cities on sustainable development and infection management and highlights the need for community collaboration and public participation.

Keywords: Shenzhen, Smart city, 15-minute city, Governance, Post-pandemic.

1. Introduction

Cities are hubs of economic development and innovation, while urban planning oversees the process. Urban planning is closely linked to public life. There exists a significant correlation between urban planning and disease outbreaks. The pandemic has had a substantial effect on urban transportation, lifestyle, and planning. The most obvious change is that to avoid the risk of communication, the frequency and number of people using public transportation have decreased significantly, which promotes the way of a home office and distance learning office, thus resulting in the change of office space demand and the reduction of traffic demand. The proportion of bicycle, walking and other modes of travel is gradually increasing, which leads to the increase in the use of bicycle lanes and sidewalks, and the demand for public space and green space. The status of traffic congestion depends on factors such as epidemic control, population density, and transport infrastructure in the region. In the context of today's smart city, the concept of the 15-minute city was born in response to public diseases.

15-Minute City concept to respond to the COVID-19 pandemic, improve urban sustainability, and promote people's participation in urban planning and management. The Smart city concept and the 15-minute city concept are two different but related urban planning and development concepts. Their integration can create a more sustainable, efficient, and accessible urban environment. Here's a breakdown of their convergence: Technical support for smart cities, Reduced traffic congestion, Sustainable Energy, and Environmental protection, Digital social interaction and engagement, and Data-driven decision-making. The combination of a smart city and a 15-minute concept is the trend of innovative city development.

In response to the call of the Shenzhen government to support the 15-minute city construction, the Shenzhen Municipal Bureau of Commerce issued the Implementation Plan for the Pilot City

Construction of the Shenzhen Quarter Hour Convenient Living Circle to promote the construction of the 15-minute city [1]. Based on this implementation plan, this article aims to provide further explanation of the factors that must be considered in the plan's execution, as well as the risk of new public epidemics. The study provides useful lessons for Shenzhen and other cities on sustainable development and coping with infectious disease threats, while highlighting the indispensability of community cooperation and public participation.

2. Introduction to the case of Milan: a new 15-minute city of the post-pandemic context

The Fifteen Minute Life Circle is an urban planning and development concept. The concept aims to enable urban residents to walk or cycle to everyday infrastructure and services such as business centers, medical facilities, educational facilities, parks, etc., within a 15-minute travel time. Through the concept of neighborhood units [2], and sustainable communities [3], the 15-minute city concept was finally born. The concept is mainly aimed at urban transportation systems, with the fundamental aim of building convenient cities, improving the walkability of communities, and enhancing the sustainability of cities and the quality of life of residents.

Since 1990, Milan has been committed to urban transformation from an industrial city to an innovative city, with knowledge-intensive and creative industries as the core driving industries, aiming to develop a creative city. The demand for office space is increasing due to the influx of multiple industries into urban areas. However, due to the integration of the city center and the old community and the impact of the original historic buildings, the planning and renewal of the community are more urgent. Therefore, in the subsequent development of Milan, great importance was attached to industrial development and urban renewal, and detailed policies were issued to promote the transformation. In 2018, to mitigate the impact of extreme meteorological disasters, improve traffic conditions, and enhance the function of public Spaces, the municipal government launched the "Open Square in Every Community" project. This marks the first time Milan has experimented with the concept of semi-open Spaces and the 15-minute city [4]. The 2019 outbreak hit countries around the world, particularly directly affecting the functioning and structure of communities. In response to the new environmental changes, the city of Milan has developed several adaptation strategies to combat new public health diseases and improve the urban space, including a new project called "The 15-Minute City". The project aims to redefine the use of streets and public spaces, encourage cycling and walking, reshape neighborhoods, and experience the city in different ways without worrying about overcrowding [5]. Since then, the city of Milan has calculated and compared the 15-minute infrastructure accessibility of the boroughs, and the study shows that the higher-ranked neighborhoods are located between the city center and the suburbs, along the intermediate urban ring. The main reason for this result is that these areas are influenced by the university and cultural activities in the region, which leads to more basic services such as health care and shops, and public spaces such as parks and green Spaces. Such cultural networks also influence and promote the surrounding areas of these areas, and even drive urban development. This means that the cultural environment greatly promotes the mobility of the community and adds modern community services around it, thus enhancing the sustainable development of the community.

In the new version of the residential district specification, "fifteen minutes living circle" is defined as the principle that residents can meet their material and life cultural needs by walking for fifteen minutes, which delimits the scope of the residential area, namely in the traditional sense of the community. However, the outbreak of the novel coronavirus has led to the implementation of excessive epidemic prevention measures in most communities across the country, which has caused the collapse of the normal governance system of communities, and triggered three major difficulties in health security, living needs, and internal and external circulation [6]. The following will systematically analyze the basic conditions of Shenzhen's 15-minute city transformation, focusing on

the aspects that have not been considered in detail after the implementation of the pilot policy and the construction of blocks under the threat of new public health diseases.

3. Analysis of the current situation of smart city in Shenzhen

Today's urban and transport planners face enormous challenges in designing and transforming cities to accommodate growing urban populations and their service and transport needs. Changing the way cities are planned, built, and managed requires a multidisciplinary approach that considers the interrelationships between the urban fabric, mobility, environmental quality, and citizens' health and well-being [7].

3.1. Infrastructure and Urban Planning

Starting from the international airport, Shenzhen has gradually expanded outward, forming six districts and four new districts. The transportation facilities are mainly subways, buses, and small cars, among which the subway and bus networks are mainly concentrated in the vicinity of the airport, Nanshan District, Futian District, and Longhua District. Due to the existence of national forest parks in important areas of the airport, the traffic network structure is unbalanced and unevenly distributed. Shenzhen Municipal Government is located in the Futian District, which is not well connected with other areas and has no prominent functions in the central area. In addition, the number of medical constructions in Shenzhen is small, most of them are community hospitals, and the number of first-class hospitals is small and scattered, and the radiation radius is far from covering the whole city, which consumes the travel time of citizens. There are three main central areas: Futian District is a high-density urban village and modern commercial housing collage-type secondary mixed block, Longhua District is relatively lacking in public service supporting facilities, mainly serving the planning community of high-end talents, emphasizing localization and centralized regional functions.

The primary issues in Shenzhen are the availability and affordability of housing. Due to the full development of the market economy, more job opportunities, and the continuous influx of migrants, high demand and rapid urbanization have led to soaring property prices, a prominent contradiction between housing supply and demand, inadequate housing security, and unreasonable housing structure. Since 2006, Shenzhen has launched public rental housing and residential commercial housing in succession to relieve residents' housing difficulties. In 2010, Shenzhen widened the scope of security to include talent groups and enhanced housing security from a "solution type" to an "equal emphasis on solution and development".

3.2. Technology and innovation

3.2.1. Upgrading of infrastructure construction

Shenzhen actively updates and upgrades infrastructure, improves the city's integrated information data platform, and continues to explore new ways to drive digital transformation. One thing worth mentioning is Shenzhen's innovation in the transportation system. Shenzhen has not only built a comprehensive spatio-temporal intelligent transportation platform, but also built a smart parking cloud platform and smart roads. Finally, the wisdom sharing the status of "one picture comprehensive perception" of the traffic situation, "one operation linkage" of traffic governance, and "one screen intelligent life" of citizens' travel is realized [8].

3.2.2. Orderly urban governance

Shenzhen is actively promoting the construction of a digital government. Digital technology is used to electronically screen and recruit candidates, and this kind of talent application and introduction will further promote the construction of innovative cities. At the same time, the city is also building a comprehensive perception platform for the Internet of Things to achieve unified collection and data supervision of Internet of Things data. In addition, in terms of intelligent decision-making, the establishment of multiple monitoring and early warning platforms, and the use of big

data to achieve market regulation. Driven by innovative enterprises such as Huawei and Tencent and supported by relevant regional innovation policies, the innovative industry continues to recharge and inject fresh blood, providing rich fertile soil for technology and innovation in Shenzhen. For example, Shenzhen Longgang District Centeng AI artificial intelligence integration enabling platform [9].

3.2.3. Establishment of Digital Twin Cities

Actively build digital applications and a unified digital twin platform for the city, combining smart infrastructure, public services, and urban operations to promote the construction of digital twin cities. By giving full play to the anchor role of the "digital site", HarmonyOS improves the convenience and security of terminal devices accessing the sensing network system, and realizes the plug-and-play of sensing terminals[10]. Technology and innovation capabilities to support efficient and convenient city operations. Data analytics tools and techniques can also continuously monitor and optimize city operations.

3.3. Public epidemiology and environmental sustainability

In response to the COVID-19 outbreak, Shenzhen has taken several important community and urban planning initiatives to slow the spread of the epidemic, improve response capacity, and safeguard public health. Conduct community isolation and isolation facilities, set up multiple isolation points, makeshift hospitals, and community screening testing stations to rapidly screen, respond, isolate, and treat patients and reduce the risk of transmission. Use digital technology and big data analytics to track the flow of patients and conduct risk assessments. Implement strict quarantine policies, including centralized isolation and home isolation, to prevent imported cases. Measures to restrict and manage public transport, including limiting the number of passengers and regularly cleaning and disinfecting vehicles. Community workers provide information, health education, and support in residential areas to assist in epidemic prevention and control efforts.

These measures have effectively responded to the epidemic, slowed down the transmission rate, and improved urban public health and community safety. The importance of communities in responding to public health emergencies was highlighted.

3.4. Public epidemiology and environmental sustainability

Shenzhen has adopted a series of important initiatives aimed at improving the transportation system, reducing pollution, and improving the quality of life of city residents. Establish a public bicycle system, support and regulate shared bicycle and electric scooter services, provide convenient and low-carbon travel options, and encourage citizens to choose bicycles as short-distance transportation.

The continuous expansion of the subway and bus system has improved the coverage of public transportation. An intelligent traffic management system is introduced to monitor traffic flow in real-time and optimize traffic signal control. Introduce parking policies that encourage the use of green vehicles, such as providing free or discounted parking Spaces for electric vehicles, to encourage the public to choose environmentally friendly means of transport.

4. Suggestions

4.1. Strategy

Implement the requirements of "one circle and one policy", every distinct should have systematic and non-linear urban planning, according to the characteristics of each area to create different block patterns. Formulate specific construction and renovation plans for each pilot convenient living circle, and meet the construction target of not less than 10% of the total construction area of the new community commercial and comprehensive service facilities. The development of high-quality, high-cost, capital-intensive science and technology communities in Nanshan District is not sustainable enough, but most of the universities in the region can try to build a new type of community-driven by

industrial innovation in colleges and universities, continue to output high-level innovative talents, and inject fresh blood into smart cities. In three forms of "university city-innovation urban agglomeration-metropolis", Shenzhen should reform higher education by improving quality, enlarging the scale, optimizing the structure, and innovating the mechanisms to support its innovative city construction strategy in the future. Shenzhen has a large immigrant population due to the interaction of geography, policies, and foreign companies. Consider creating permanent immigrant communities.

4.2. Resistance to public transmission of disease

In developing the Fifteen Minute City, especially considering the spread of public infectious diseases such as the novel coronavirus, Shenzhen needs to pay attention to the following issues and take corresponding measures:

i) Infrastructure: Ensure that the city's infrastructure and distribution of basic resources, such as water, electricity, communications, and supply chains, continue to function normally during the pandemic. Strengthen the resilience of critical infrastructure and backup systems to ensure the normal operation of the city. Community health facilities: improve health facilities in each community, increase the number of community health centers and testing stations, and improve the capacity and response capacity of health facilities. ii) Digital monitoring and tracking: Establish a digital system to track contacts, process and distribute data to various regions for point tracking, which should pay attention to privacy protection and data encryption when sharing data. iii) social distancing and green cities: Promote the planning of the fifteen-minute city to encourage the establishment of more green spaces and outdoor recreation Spaces within the community to reduce the density of people. iv) Emergency plans: Establish adequate health and emergency plans to deal with future public health emergencies. Develop and implement a comprehensive emergency response plan, including resource deployment, isolation measures, and the preparation of health facilities. In promoting the 15-minute city run, Shenzhen should ensure that it develops resilience and protection against public infectious diseases. This requires concerted efforts by governments, communities, healthcare institutions, and the public to build safer and more sustainable cities.

4.3. Participation of residents

Smart city construction focuses on people-oriented sustainable innovation. Focus on starting from the needs of the public, strengthen user participation through multi-platforms and multi-channels, and constantly promote innovation to achieve sustainable economic, social, and environmental development. Smart cities should focus on areas that are closely related to citizens' lives and of great concern to society to improve the public happiness index. Shenzhen builds a smart city from the three aspects of science and technology, culture and ecology, and takes this as a breakthrough to build a national innovative city. To ensure the success of smart city development, it is crucial to establish transparent urban planning and supervision mechanisms involving government, the public, enterprises, and non-profit organizations. This involves: i) Transparency and information disclosure: Ensure the transparency of urban decision-making processes, provide information to citizens, and enable them to understand the impact and opportunities of decision-making. ii) Citizen education: Carry out citizen education activities to enhance citizens' understanding of urban planning and governance and encourage them to actively participate. iii) Digital participation: Utilize digital technologies such as online voting and feedback platforms to enable citizens to easily participate in planning and decision-making processes. iv) Community organization support: Support community organizations so that they can represent the interests of residents and participate in decision-making. Use indicators to continue appropriate regulatory feedback, such as the number of stores, the number of employees, residents' satisfaction, construction and transformation investment, etc. Besides, the population structure of each region is analyzed accordingly, and multiple groups and marginalized voices should be considered. By co-creation methods to improve the efficiency and effectiveness of regulatory.

5. Conclusion

Building on the Shenzhen pilot scheme for a living circle, this paper offers further insight into key considerations for the implementation plan and the potential risks of new public outbreaks. The aim is to demonstrate Shenzhen's ability to successfully transition to a 15-minute city. This paper examines the 15-minute urban planning and policy in Milan, analyses the application of digital technology, green transportation, community support, and public education, and evaluates their importance for realizing 15-minute urban planning in Shenzhen. Amidst the public health risk, the concept of the Shenzhen 15-minute City highlights the importance of collaborative efforts from the community and the promotion of smart city technology. It emphasizes the necessity of policy-making and public engagement in the administration of urban areas. The primary aim of this paper is to address the limitations of the 15-minute city concept in Shenzhen's urban management and epidemic response, and to provide insights into the reform strategies adopted by different communities in Shenzhen. Future research could focus on how to maximize the use of block space as public green space and define the balance between private and public transport in different areas to create sustainable and livable cities.

By studying the 15-minute urban planning and policy of Milan, analyzing the existing key initiatives of Shenzhen, such as the application of digital technology, green transportation policy, community support, and public education, etc., and studying the importance of realizing the 15-minute urban concept in Shenzhen under the threat of public diseases, This paper finds the necessity of community cooperation and smart city mutual promotion, as well as policy and public participation in urban governance. These aspects should be noted in subsequent operations. The main contribution of this paper is to supplement the gaps in the operation of the 15-minute city concept in Shenzhen's urban governance and response to public epidemic diseases, which is conducive to other researchers studying the change methods of various communities in Shenzhen with the help of multiple conditions. This study is not specific to each community, and future studies should discuss operational measures in each community separately.

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