

Pandemics Impact on City Design

Abdullah S. Yawer, Rania Raslan

Abstract— Because our cities are not equipped to adapt to pandemics, the unanticipated corona pandemic has rendered our environment uninhabitable. The 20th century saw six pandemics, beginning with the Spanish flu and ending with covid-19. Today, the age of pandemics has begun in order to construct healthy, sustainable cities whose streets would be devoid of occupants if a fresh pandemic breaks out. In metropolitan settings, the physical environment has a substantial influence, both in terms of supporting efforts to promote public health and reducing the probability of being ill. Among the replies are the organization of spaces, the development of physical barriers, improvements in building materials, and the planning of metropolitan regions.

Index Terms- Pandemics, City Design, Urban Spaces, Streets, public Transportation, green Areas and Nature, public services.

I. INTRODUCTION

The shutdown of urban areas as a result of the COVID-19 pandemic has revealed the flaws and vulnerabilities of structures and other urban elements. The primary worry is whether these lessons have been learnt and if the improvements will result in safer urban settings and a more affluent environment. Therefore, in order to comprehend the influence of COVID-19 on our cities, we must examine the effect of prior pandemics on urban planning and how cities overcame them.

II. AN EXAMINATION OF THE HISTORICAL EFFECT OF PANDEMICS ON OUR CITIES

• **Antonine Plague in the Roman Empire (165–180 AD):** this outbreak was the beginning of isolation hospitals as we know them now; in ancient Rome, tents were erected near hospitals for diseased individuals [1].

As a result of the Antonine Plague, they constructed aqueducts, public baths, and water distribution and sanitation systems [2].

• **Plague 1347 to 1351:** The Black Death epidemic caused 75–200 million fatalities [3]; quarantine and mobility restrictions are implemented.

Public baths are closed, and animal interaction is discouraged. **The consequences of the plague:** Urban development has started to construct more space between buildings—the removal of filthy and crowded neighborhoods. Greater public spaces and more structured configurations [4].

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• Between the nineteenth and twentieth centuries, six epidemics of **cholera** were responsible for millions of fatalities.

Cholera's repercussions: Verdant lands: Central city parks, broad avenues, and green spaces (like Paris), new facilities, and better drainage are all examples of what urban planning can accomplish.

• **SARS 2003–2004:** 8000 cases and over 800 fatalities recorded after 8 months in 26 countries [5].

The repercussions of SARS: Local house design: improved ventilation and drainage in some Asian regions; (e.g., Hong Kong).



Figure 1. pandemics timeline. (By the Authors)

There are different solutions in different ages, and each pandemic has had an influence on the design regulations in many nations; we can now use the comparable point of these impacts, which are all around urban design facilities, as our starting point.

1. public transportation.
2. streets.
3. public services.
4. Green space and urban areas

In order for the city to be prepared for any future pandemics, these factors should be recognized as the most influential ones.

III. CITY KEY ELEMENTS IN PANDEMICS

In recent years, there has been an increase in requests for cities to prioritize health in their urban development. Layla McCay, director of the Centre for Urban Design and Mental Health, states that urban planning must be created, analyzed, and approved through a health lens in order to create the resilient, sustainable communities that we all need and require [6].

A. Public transportation:

High population density and frequent personal contact are ideal circumstances for the fast spread of infectious illnesses in urban areas. The design of urban structures is crucial. Influences on the extent to which people interact with one another; for instance, the concentration of economic activity and resources in some regions enables a big portion of the population to concentrate in certain locations. In minute portions of the whole region. In addition, transportation

connections must be developed between business zones and residential areas.

As a result of these considerations, more and more individuals are using public transportation. In public transit, like other situations where there are many of people jammed into a small area, there is a high potential that contagious diseases may spread rapidly. [7].

• **The guidelines for safety public transportation:**

- A. Utilizing protective barriers for drivers of public transportation (buses, trams) as seen in figure 2 in order to prevent social interaction.
- B. Differentiate entry and exit doors to prevent individuals from crossing paths.
- C. Markers for establishing the social distance between seats, as indicated in figure 3.
- D. As seen in figure 4, safety distance indicators are placed at stops and in waiting areas to provide the necessary social distance.
- E. Public disinfectant containers for the cleanliness of the public.

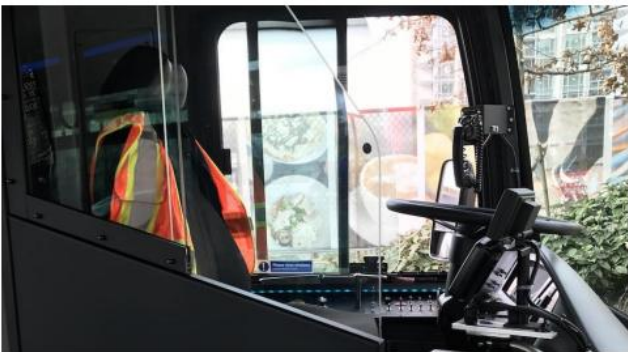


Figure 2. Bus driver safety barriers [8].



Figure 3. Safety distance markers between seats [9].

Figure 4. Safety distance markers at stop and in [9].

B. **Streets design:**

Our streets encourage more than just activity. Globally, streets give communities with easy access to nutritious food and important supplies. Our streets have designated waiting zones in front of grocery stores, retailers, and other companies. As limits are lifted, especially before to the disease's total containment or the development of a vaccine. In the period of COVID, streets give space for social services, allowing communities to reopen more rapidly. There is room on the streets for temporary medical and research facilities, as well as food and water distribution centers. The streets are equipped with Wi-Fi hotspots so that youngsters may attend school online and individuals can work from home. When we are ready to rebuild, the streets will be a site where our social support schools, libraries, religious and cultural organizations can simply continue providing the necessary services and activities [10].

• **The guidelines for new street usage:**

- A. Avoiding pedestrian crossings by constructing unidirectional footpaths. as seen in figure 5.
- B. Reduces the width of roads (temporarily or permanently) and increases the size of sidewalks and bike lanes to provide safe walking distances. Figure 6 shows this.
- C. a social destination where restaurants, cafés, food stalls, and/or street food sellers are concentrated over several blocks for outdoor eating. As Figure 7.
- D. Slow roadways with low vehicle flow and low to moderate speeds when vehicle volumes have decreased or perform a redundant through-traffic function during COVID outages. Presented in figure 8.

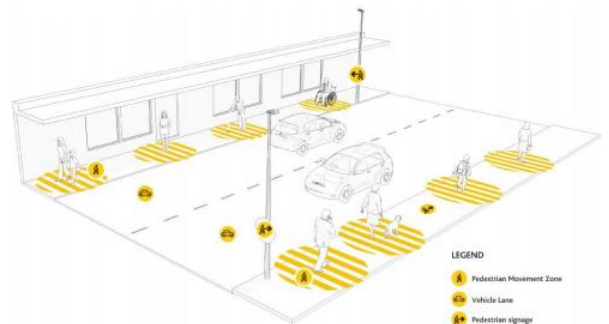


Figure 5. Unidirectional pedestrian paths [11].

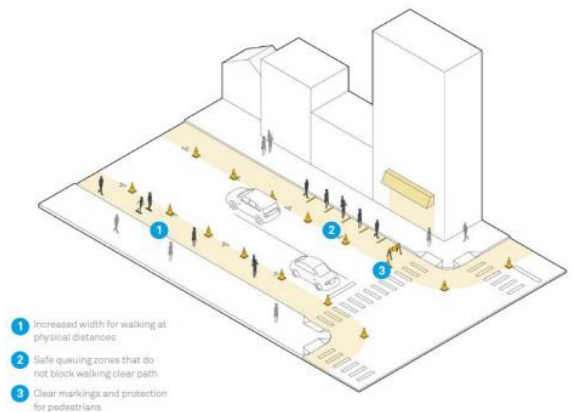


Figure 6. Sidewalk Extensions [11].

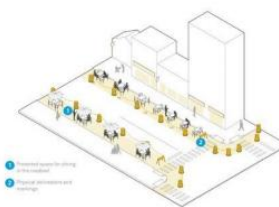


Figure 7. outdoor dining [11].

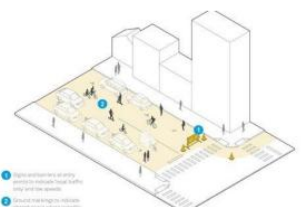


Figure 8. slow streets [11].

C. **Public services:**

Public service is an organized service that serves all members of society. It is often provided by the government either directly (via the public sector) or indirectly (through the financing of the provision of services) to persons under its authority [12].

• **The guidelines for more public services:**

- A. On benches, safety (distance) indicators provide for safe spacing between individuals. As seen in figure 10.
- B. Better community support and services closer to home (energy, food). in support of decentralization and augmented regional production. Referring to Figure 11.
- C. In Figure 12, we see a roller handrail disinfection system used to clean a communal touch surface.
- D. Distribution of health services on the streets to facilitate everyone's access to medical care when required. As seen in Figure 13.



Figure 10. Distance markers in public spaces [13].



Figure 11. More local services [11].



Figure 12. Roller handrail disinfection system [14].

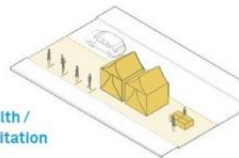


Figure 13. Health service distribution [11].

Dubai's COVID-19 mobile testing unit is one of the most beneficial solutions in public health service: As seen in figure 14.

In Dubai, a portable Covid-19 screening device has been set up, having the capacity to test 1,000 people every day. The 'very intelligent' study bus would provide transportation to high-density urban locations, such as job centers. Those who are physically unable to go to medical facilities, such as the elderly and those with long-term illnesses, may nevertheless benefit from this service. Director General of the Dubai Health Authority Humaid Al-Qutami has remarked that rolling out the mobile unit citywide would "increase screening capacity and prevent the spread of the virus." [15].



Figure 14. DHA's new mobile testing unit can screen [15].

D. Green area and urban spaces:

People are flocking back to parks when coronavirus lockdowns are lifted, but not everyone has easy access to green space in their city. Weber states that the phrase social distance is now common knowledge. "From the standpoint of green space planning and design, we could even rename this concept social density. Clearly, pandemic response and public

space management should now have a significant impact on the design, development, and distribution of urban green and recreational areas." [16].

The guidelines for designing an urban space:

- A. Creating safe zones inside metropolitan areas. By using furniture, signage, and the landscape. To create social separation. As seen in figures 15-16-17.



Figure 15. The Gastro Safe Zone [17].

Figure 16. The invisible Facemask. [18].

Figure 17. Post Corona- What Are the Cities Waking Up To? [19].

IV. DISCUSSION:

Substantial improvements in building and urban environment safety have been made in the wake of devastating pandemics like the Black Death. It is well understood that the danger of transmitting an infectious illness by airborne exposure or aerosolized particles, such as those delivered by touching common contact surfaces, is increased in confined environments with large numbers of individuals [21].

Several countries used temporary preventive measures during the COVID-19 pandemic by isolating their populations, instituting quarantines, and closing businesses, schools, and cultural institutions. The following were among the things that were done: All of these criteria were applied to a selection of therapies offered in urban centers. Such urban initiatives include social distance indicators for public transit and the widening of streets and consolidation of roads.

The current safety distance markers used at bus stops and on seats, as well as the distinction between entrance and departure zones, may be improved to increase passenger safety on public transit. The total carrying capacity of vehicles may also be restricted to avoid the spread of COVID-19 or other highly infectious diseases [7]. Safety measures for drivers and employees A rule that has been adopted internationally safeguards citizens against not just health problems but also crimes like robbery. This strategy might be explored in the near or distant future. Automatic doors are a smart and effective way to reduce the pros and cons of using common touch surfaces.

The phrase "positive community mobility" is used to describe an approach that has been refined to aid environmentally responsible urban growth. In response to the COVID-19

pandemic, several municipalities are planning to launch new programmed designed to improve the quality of active mobility and inspire more people to take part in it. Highway development and one-way walkways might help establish the necessary social distance, but they would also encourage people to take up fewer polluting forms of mobility (walking and cycling), so decreasing the need for public transit. In addition to reducing the spread of airborne illnesses, this also decreases the demand for public transportation and private automobiles, therefore decreasing the emissions of greenhouse gases caused by these sources [20].

Localized health service marketing, the installation of small disinfectant buckets in high-traffic locations, and disinfection systems for frequently touched surfaces like roller handrails are all possibilities when it comes to public equipment [20]. These actions are all taken to prevent or at least mitigate the spread of infectious diseases. If this method could reduce the spread of viruses, it would improve people's health and the state of the environment.

Putting social distance markers on park benches is also a viable option.

Since they have no further benefits outside lowering the danger of transmission across different populations in different locations, their usage will be restricted.

Although effective in the fight against COVID-19, social isolation strategies may become ineffective if and when the likelihood of catching the virus lowers. That wasn't the case during previous pandemics [21].

Local services (including food and energy) may become more accessible in densely populated regions. This may lead to decentralization and limit population expansion under certain conditions. Infectious illness transmission and emergence would be mitigated as a consequence of the resulting decrease in the need for travel. This, however, is just a stopgap measure, and its implementation should be staggered over time.

V. CONCLUSIONS:

At the end of this paper, we will summarize the article's key points on city planning by compiling them into a single comprehensive table.

The city's design has a major bearing on people's health habits and the spread of disease. This evolving connection may be seen as a shift away from a health-centric, siloed approach and toward a more holistic approach that considers factors like the built environment.

In order to rethink cities, there are two types of interventions that might be implemented:

COVID-19 in particular actions to mitigate danger
Temporary Measures: Safe distance markers (elevators, public transportation), disinfection, hands-free door opening, and one-way stairs. When the epidemic is finished, the possibility for these interventions will disappear; nevertheless, they may reappear in the event of future outbreaks, therefore they may be categorized as temporary or sporadic.

Permanent measures: that may be undertaken include It would also give benefits in terms of strengthening resilience, and its potential may be applied in the future, such as one-way pedestrian walkways and the enlargement of pedestrian sidewalks.

The emergence of a pandemic generates an economic and social crisis that will spark a discussion about which initiatives would contribute to a better and more sustainable development path.

Table 1. city elements and impacts (By the Authors)

City elements	Measures	Benefits	Sustainability
Public transportation	Protective barriers for drivers of public transportation	physical protection to avoid social contact	Reduces energy consumption and costs
	Identification of entry and exit doors	Avoid individuals from crossing paths.	
	Safety distance markings between seats	Social distancing	
	Markers for safe distances at stops and in waiting areas	Social distancing	
	Publicly accessible disinfectant dispensers for public hygiene	Increase the Public hygiene	
Streets	Unidirectional pedestrian paths	Avoids people crossing with one another	Enhanced mobility and lowers pollution.
	Wider pedestrian paths	safe distances between people	
	Outdoor dining	social destining	
	Slow streets with low vehicle volume	safe distances between people and social destining	
Public services	Safety (distance) markers on benches	safe distances between people	Reduces the transport needs of citizens (Benefits for energy use minimized and related emissions).
	More local services	decentralization of services and greater local supply	
	Roller handrail disinfection system	disinfection of a common contact surface	
	Health service distribution in streets	make it easy for everyone to take a medical treatment when it needed	
Green area and urban spaces	Making safe zones inside urban spaces by using the furniture or signs or by using the landscape	social distances	Biodiversity and climate change.

This coronavirus pandemic will provide an incentive for widespread adaptation to the danger of infection, while also taking climate change and other hazards into consideration. Moreover, this drive for sustainability will guarantee that technological advancements and lifestyles contribute to a healthy world with a decent balance between health and other social, environmental, and societal factors.

The purpose of this study is to provide such solutions by explicating the influence of past pandemics on the environment and how we might benefit from specific sustainable development measures.

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