

The Intersection of Urban Planning and the Covid-19 Pandemic: Lessons for the Built Environment in ‘Building Back’ Resilient and Sustainable Cities

Stephen Olus Okeyo

Introduction

There is growing support for integrating resilience and sustainability into national and even global responses to public health threats, such as the Covid-19 pandemic. To effectively engage with these concepts, it is important to reflect on the interactions and implications at the intersection of Covid-19, public health and the built environment. (Frank & Engelke, 2005; Bamba et al., 2010). This linkage is especially significant for infectious disease conditions such as Covid-19.

With the biology of the virus evolving (mutating to several variants), and its pathophysiology undergoing changes, the world is reluctantly coming to accept that the virus will be with us for a long time. Besides the stark health statistics, the Covid-19 pandemic has had devastating economic and social effects that will last for a long time to come. The Covid-19 pandemic is showing signs of transitioning to an endemic condition, with experts proposing several strategic interventions: limit disease through effective use of vaccines, therapeutics, and other countermeasures, and slow transmission through testing and environmental/workplace modifications (Charumilind et al., 2022). As we plan for long-term strategies, it is important to reflect on the biological and pathophysiological aspects, diverse contexts, and social determinants of health and related human behaviours that influence transmission of the virus within the environment we live, and the implications for health and well-being.

While work on Covid-19 is a work in progress, there is a wealth of information about the virus and human behaviours at the intersection of public health and built environment that is driving public discourse on how to build back better resilient and sustainable urban centres able to adapt to this epidemic and better prepared for future infectious disease threats (Wiersinga et al., 2020; Ming et al., 2020). Unfortunately, research in the majority of developing countries is still limited, although these countries have, due to their large populations and numerous infrastructural bottlenecks, suffered to a great extent during the pandemic. The most visible loss was in the largest cities (Figure 1).

To plug that knowledge gap, this paper shows the results of a study undertaken to generate answers to the main question: what is the interaction between the main features of the built environment and Covid-19 that influence transmission and pathophysiology? Based on an overview of the extensive literature (academic and professional articles, health reports, and policy guidelines), the relationship between the built environment, on the one hand, and public health and wellness metrics, on the other, is described. The results are grouped into three categories, each related to the specific aspects (i.e., substantive – the physical environment; and the procedural – policies and instruments or their integration) of the built environment, as described in the following sections. The concluding remarks provide basic recommendations for improving the built environment to tackle urban health issues in Kenya, but also applicable in other African cities.

Urban Planning amidst Covid-19 Pandemic

Specific features of the built environment that promote infection transmission, such as social distancing, surface contact, and hand sanitation have been well documented. The risk of transmission in outdoor settings appears to be lower than indoors, although close contact with an individual with Covid-19 remains a risk even outdoors (Bulfone et al., 2021). The low risk of the outdoor setting is

clearly reversed in situations where large numbers of people congregate together in small spaces. Other features influencing infectivity and transmission include sunlight, ultraviolet light, ambient temperature, relative humidity, and size of inoculum (Frank & Engelke, 2005; Bambra et al., 2010).

Landscapes and green neighbourhoods as enablers of healthy environments

Landscape characteristics of the environment around buildings have the potential to promote health as well as physical and mental well-being. For example, the presence of natural greenery has positive psychological and emotional impacts by reducing stress and enhances happiness, encouraging physical activity, and lowering noise levels and air pollution (Brattig et al., 2021; Mears et al., 2019). Urban green spaces encourage mental relaxation, restore social cohesion, and minimise exposure to extreme urban heat (WHO, 2021). The Covid-19 pandemic lockdown brought to the fore the importance of open spaces, not only in neighbourhood environments, but also in relation to buildings. External building spaces, such as terraces, shared courtyards, flat open rooftops, and balconies offer access to fresh air and sunlight which is good for health and can be designed for alternate use as kitchen gardens or for sports (Sofa & Sofa, 2020). Challenges, however, include space limitations and regulatory requirements.

Population density, crowding, indoor air circulation, and ambient air pollution are documented as features of the built environment that increase the risk of Covid-19 transmission (Bulfone et al., 2021; Toderian, 2020). A report from China in the initial stages of the Covid-19 pandemic showed that the density of convenience shops, supermarkets, and shopping malls and inter-city population flow were the two most important variables that explained the ratio of cumulative infection cases, while population flow was the most important factor in measuring the policy effect metric (Ma et al., 2021b). Influencing factors also include poor neighbourhoods, especially slums, in cities such as Nairobi, Karachi, and Mumbai, which experience crowding indoors and even outdoors (Frumkin, 2012; Emeruwa et al., 2020). Other factors include health-promoting assets like wide streets, walkways, and parks/green spaces (Ma et al., 2021a). However, these are likely to be in short supply in low-income and minority communities due to poor planning, mismanagement, and even corrupt practices involving public land (Mensah, 2014; Cilliers, 2009).

The concentration of economic activities and services in specific areas in cities and towns means that large number of people routinely congregate in limited fractions of the total available space, which encourage transmission of infectious diseases such as Covid-19. The zoning of residential areas, workplaces, and service centres creates the need for transport systems, with implications for infection transmission (Brizuela et al., 2020; Neiderud, 2015). These reasons, among others, are strong drivers for rethinking the urban built environment. For example, a report from Rwanda documents that neighbourhood streets are increasingly becoming popular for recreational activities, and hence more valuable to users. This is facilitated by vehicle-free zones for pedestrian use (Malonza, 2020; Ferdinand et al., 2012). Also, urban green spaces could significantly improve physical and mental health for the citizens of cities like Nairobi, as well as act as logistical areas for humanitarian activities during a pandemic. Unfortunately, urban green spaces, such as those in Nairobi, have not been fully exploited to provide citizens with sufficient access to green spaces (Oketch & Nyadera, 2021). An example of a sustainable innovation neighbourhood is the innovative 'one cent levy', collected by the local government for services, to be used for creation of central park and

recreation upgrade of a local natural resource like a river or lakeshore (multiuse trail) (Urban Land Institute, 2013). The underlying health benefits of public spaces are largely grouped into three tracks: the provision of opportunities for physical activities, the recovery from stress and fatigue, and the facilitation of social contacts and cohesion.

High-risk neighbourhoods are more likely to be home to frontline workers – delivery workers, grocery store clerks, nursing home aides, and others whose jobs entail contact with the public, who were unable to work from home, and who often had to commute by public transit. The defining characteristics of Covid-19 hot spot neighbourhoods may vary from city to city. For example, in New York City, the concentration of frontline workers was the strongest predictor of disease incidence, whereas in Chicago, the levels of poverty and unemployment and the proportion of black residents were more predictive (Cox-Ganser & Henneberger, 2021). These and other reports reflect social determinants of health and ongoing inequities in the built environment as drivers of infectious pandemics, calling for economic, social, and political interventions (Naik et al., 2019).

Holistic approach towards healthy environments

Although not receiving adequate focus, built environment fits appropriately in the World Health Organization (WHO) Social Determinants of Health, including infectious disease pandemics such as the Covid-19 pandemic. Confounding factors such as economic/equity, social and behavioural factors compound limitations in proof of causal relations between built environment and Covid-19 pandemic transmission, as well weakness of evidence for the effectiveness of built environment interventions. However, available evidence strengthens the argument for an upstream shift to address key built and natural environment obstacles to enable people to increase control over, and improve their health. The Covid-19 pandemic provides opportunity for integrating health promotion and disease prevention into the built environment design. To achieve this, communication between built environment experts and health professionals is essential.

The changes observed during the Covid-19 pandemic point to potential long-term implications of Covid-19 for the built environment include changes in building design, increased teleworking, reconfigured streets, changing modes of travel, provision of parks and green space, and population shifts out of urban centres. Although it is too early to predict with confidence which of these responses may persist, identifying and monitoring them can help health professionals, architects, urban planners, and decision makers, as well as members of the public, optimise healthy built environments during and after recovery from the pandemic.

Planning for more local provision of services may contribute towards decentralisation and can restrict the occurrence of large clusters of people, which can be beneficial in preventing infectious diseases transmission, as well as reducing transport needs. The implications for and impact of Covid-19 on travel/transport systems are rather complex, and likely to be driven by economic considerations, though some authors assert that the shifts to walking and cycling may be a persisting effect of the pandemic, especially in cities that make long-term improvements to infrastructure such as dedicated streets, suggesting that the pandemic could propel the adoption of healthy, sustainable travel modes (King & Krizek, 2020; Schmidt et al., 2021).

The Covid-19 pandemic is reported to have driven people of means to move from urban centres to the periphery, leading to urban ‘depopulation’ and even businesses, though urban areas are likely to rebound after the pandemic. The implication of this is complex and uncertain. On balance, there would be re-

distribution away from the urban core toward the periphery, with far-reaching consequences, including shrinking of large cities and growth of intermediary and smaller cities, enabling more diverse urban populations, with positive implications for traffic congestion, housing shortages, and business models (Haag & Rubinstein, 2020).

Table 1 summarises potential interventions in reimagining the built environment for long term control and management of the Covid-19 pandemic and building resilience and sustainability for similar public health threats in the future.

The multiple interactions between features of built environment, Covid-19 mitigation strategies, health determinants, and health outcomes are depicted in Figure 2, showing the direction of influence.

Feature of built environment linked to infectious epidemics	Potential interventions
01 Buildings	› Spatial outlay that optimises landscape and neighbourhood reforms
02 Landscape, neighbourhood	› Urban planning for a sustainable built environment, integrating neighbourhood design: clean and open neighbourhoods, with larger public spaces with more organised layouts › Political and policy decisions to reduce population densities, and specifically address the problem of urban slums
03 Public open spaces, green spaces	› Increase and make accessible green spaces and parks in urban centres › Design innovative multi-use of open spaces
04 Streets, walkways	› Re-envisioning streets (wider pedestrian pathways, one-way walking paths, cycle tracks) › Active mobility that is health promoting, encourages social distancing, reduces public transport hence risk of infection transmission › Reduced speed limits and use of public and personal vehicles to reduce combustion and greenhouse gas (GHG) emissions
05 Public equipment	› Design urban furniture in parks; safe water fountains
06 Transport systems	› Rethink travel modes, and social mobilisation for more healthy and sustainable modes based on active mobility (walking and biking)
07 Information technology	› Growth of information technologies to facilitate access to public health information as well as capability to control indoor conditions › Leverage big data/Internet of Things for risk identification and gathering information for monitoring infection and response rates › Touch-free technologies or digital control, substituting specific common contact surfaces like switches and other types of interfaces, to reduce infection transmission, and energy and water costs
08 Protective barriers	› Systematic design of physical barriers, distance markings
09 Population shift	› Facilitate public participation in order to develop a policy to guide shifting of population between rural and urban centres, and between cities and towns
10 Food environment	› Increase advocacy and support for more sustainable national agricultural and food/nutrition policy, integrating urban agriculture

Table 1. Summary of interventions for built environment in control of Covid-19 pandemic.

Source: Author, based on multiple sources

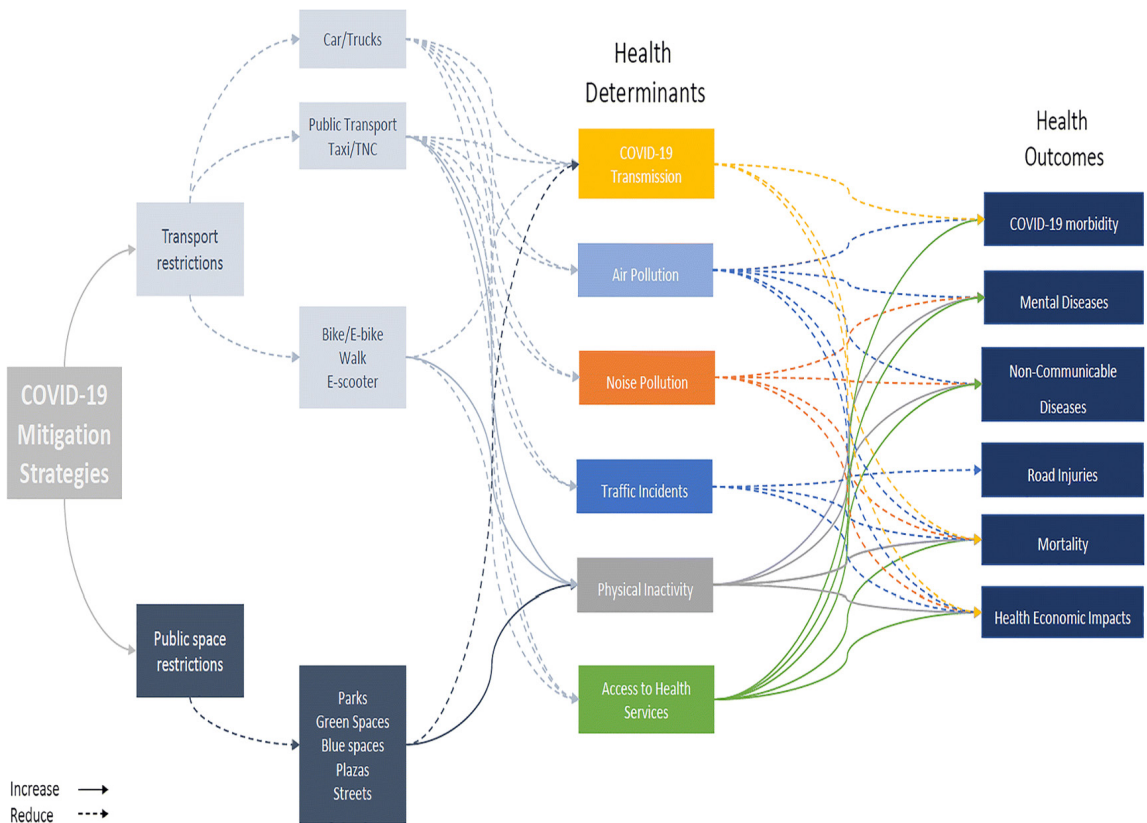


Figure 2. Framework of Covid-19 mitigation strategies, urban health determinants, and health outcomes.
Source: Rojas-Rueda & Morales-Zamora, 2021

Built environment policy interventions

In many national Covid-19 responses, decision-makers have had to juggle between options with somewhat opposite outcomes, for example strategies focusing on life (health) versus those focusing on livelihood (economics). Similarly, decisions around built environment (re)design entail somewhat opposite effects. Wholesome responses should integrate equity interventions and affirmative action for vulnerable groups. Comprehensive long-term interventions should be integrated into national and organisational visions, with strategic objectives, as well as include the requisite resource allocation and mobilisation mechanisms. These perspectives mean that policy, and in some instances legislative, actions must be taken by government leaders and organisational boards. In countries with devolved governance, these policy decisions and coordination/oversight of implementation may be shared between national and devolved governments, such as county governments. Finally, cities and towns have legal mandates over policy issues under their jurisdictions as regulatory bodies in charge of reviewing codes and guidelines for buildings and neighbourhoods' open spaces.

In resource-constrained settings, interventions can be initiated as 'tactical urbanism', which refers to low-cost, temporary, and scalable interventions and policies intended to improve urban environments (Lydon & Garcia, 2015). Examples

of this include temporary bike lanes that do not require high-cost infrastructure and could be supported with temporary signalling and low-cost physical barriers (such as traffic cones). The Covid-19 pandemic offers a unique opportunity to test urban interventions that could reduce environmental health risks and inequities. Tactical urbanism interventions could be designed with a long-term vision to support a more permanent healthy urban design. Finally, specific considerations to improve urban services, the built environment, and mobility infrastructures should use an equity vision to adapt to the pandemic needs and provide a safe urban environment for vulnerable communities and groups and those working in essential services (Rojas-Rueda & Morales-Zamora, 2021).

Lessons for Kenyan Cities

Covid-19 measures are considered a challenge for rethinking urban areas and potentially leveraging sustainable built environment solutions with win-win outcomes. The previous analysis helps identify measures that may not only reduce the risk of Covid-19 transmission (or even prevent it), but also increase resilience, improve air quality, and lower energy requirements or the use of materials, and thus potentially increase the sustainability of the built environment.

Promising interventions collated from literature above require inclusive discourse at multiple levels, and include operational, administrative, strategic, policy and legal and regulatory actions at varying scales, with leadership and coordination by governments. Significant delegated roles must be played by organisations such as professional associations and societies, primarily the Public Health Society of Kenya and the Town and County Planners Association of Kenya. Appropriate local assessment needs to inform actions moving forward, coupled with public and stakeholder participation. Because proposed changes require significant investments, some actions require political interventions through parliamentary acts and national treasury allocation of funds. National and international collaboration is critical to leverage not only funding, but also technical capacities.

Specific intervention areas can broadly be categorised into three groups: natural environment, urban design, and digitalisation.

1. **Utilisation of the natural environment.** Nairobi, the capital City of Kenya, is credited with the rare occurrence of having a national park and a river within its city limits, while several other major Kenyan cities are also situated on rivers, lakes, and the ocean, which can be leveraged and developed into health-promoting built environment, including waterfront walkways and urban green spaces (Figure 3). As Kenyan rivers suffer from extensive pollution, coordinated measures that include activities of various governmental agencies and expert bodies are necessary. Recently, the Nairobi River Life Project, initiated by the United Nations Settlement Programme (UN-Habitat) and the Government of Kenya, was launched to transform the Nairobi River corridor into a public good accessible to everybody (UN-Habitat, 2021).
2. **Improvement of urban design.** In preparation for the 7th Africities Summit, Kisumu, the third largest city in Kenya, has demonstrated significant improvement of street design with pedestrian walkways and urban green spaces (UCLG, 2022). Walkability has been improved by wide and spacious walkways, while trees provide shade inviting more people to walk (Figure 4). In addition to public open spaces, innovative utilisation of semi-private and private areas, such

as kitchen gardens, rooftops, and terraces has recently proven easy to design, and need not be expensive (Sofo & Sofo, 2020). Some innovative approaches for raising funds for these designs include ring-fencing service levies (Urban Land Institute, 2013).

3. **Leveraging digitalisation.** Kenya has recently made big strides in digitalisation manifested through the unparalleled development of information and communication technologies (Republic of Kenya, 2019), while the just launched Joint National Mapping Project can easily be leveraged to facilitate teleworking and use of ‘big data’ for design of a healthy and safe built environment as well as efficient and timely location and access to preventive, promotive, curative, and rehabilitative resources (Republic of Kenya, President, 2022). Additional government commitment is to promote digitalisation to allow citizens to access services from the comfort of their homes or business premises during the pandemic. Enhanced internet connectivity across the country enables many youths across the country access opportunities through the Ajira (‘Employment’) Digital Platform, and also support online learning through the digital literacy programme. As well as innovation opportunities in the areas of health, education, transport, e-commerce, entertainment, etc. Nevertheless, some of the initiatives that were planned for the future, for instance fibre connectivity to the homes, which facilitates working from home, have been hastened by the crisis (KARA, n.d.).

Supporting policy instruments for sustainable built environment interventions include the National Planning Policy, which must be read in conjunction with the current planning and development regulations, e.g., the National Construction Code, county planning schemes, and relevant city and town policies, guidelines, codes, etc. Further description of specific elements of these set of measures requires additional evidence. There is thus need to develop and undertake research in identified priority areas, and this calls for international collaboration in funding and technical resources.

—



Figure 3. Uhuru Park, Nairobi. © Harry Purwanto, 2013



Figure 4. Footpaths with trees, Kisumu. © ITDP Africa, 2021

References

- Bambra, C., Gibson, M., Sowden, A., Wright, K., Whitehead, M., & Petticrew, M. (2010). Tackling the wider social determinants of health and health inequalities: evidence from systematic reviews. *Journal of Epidemiology and Community Health*, 64(4), 284–291.
- Brattig, N.W., Tanner, M., Bergquist, R., & Utzinger, J. (2021). Impact of environmental changes on infectious diseases: Key findings from an international conference in Trieste, Italy in May 2017. *Acta Tropica*, 123, 106165.
- Brizuela, N.G., Garcia-Chan, N., Pulido, H.G., & Chowell, G. (2021). Understanding the role of urban design in disease spreading. *Proceedings of the Royal Society A*, 477, 20200524.
- Bulfone, T.C., Malekinejad M., Rutherford, G.W., & Razani, N. (2021). Outdoor Transmission of SARS-CoV-2 and Other Respiratory Viruses: A Systematic Review. *Journal of Infectious Diseases*, 223(4), 550–561.
- Charumilind, S., Craven, M., Lamb J., Sabow, A., Singhal, S., & Wilson, M. (2022, March 1). When will the COVID-19 pandemic end? McKinsey & Company. <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/when-will-the-covid-19-pandemic-end>.
- Cilliers, E.J. (2009). Bridging the Green-Value Gap: A South Africa Approach. *International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering*, 54, 1223–1228.
- Cox-Ganser, J.M. & Henneberger, P.K. (2021). Occupations by Proximity and Indoor/Outdoor Work: Relevance to COVID-19 in All Workers and Black/Hispanic Workers. *American Journal of Preventive Medicine*, 60(5), 621–628.
- Emeruwa, U.N., Ona, S., Shaman, J.L., Turitz, A., Wright, J.D., Gyamfi-Bannerman, C., & Melamed, A. (2020). Associations between built environment, neighbourhood socioeconomic status, and SARS-CoV-2 infection among pregnant women in New York City. *JAMA*, 324(4), 390–392.
- Ferdinand, A.O., Sen, B., Rahurkar, S., Engler, S., & Menachemi, N. (2012). The relationship between built environments and physical activity: a systematic review. *American Journal of Public Health*, 102(10), e7–e13.
- Frank, L.D. & Engelke, P. (2005). Multiple impacts of the built environment on public health: walkable places and the exposure to air pollution. *International Regional Science Review*, 28(2), 193–216.
- Frumkin, H. (2021). COVID-19, the Built Environment, and Health. *Environmental Health Perspectives*, 129(7), 075001.
- Haag, M. & Rubinstein, D. (2020, December 11). Midtown is reeling. Should its offices become apartments? *The New York Times*.
- KARA (Kenya Alliance of Residents Association). (n.d.). *ICT: Government to enhance digitization of public services to improve service delivery*. <https://www.kara.or.ke/index.php/2015-01-22-08-51-09/kara-news/481-ict-government-to-enhance-digitization-of-public-services-to-improve-service-delivery>. Accessed on June 29, 2022.
- King, D.A. & Krizek, K.J. (2020). The power of reforming streets to boost access for human-scaled vehicles. *Transportation Research Part D: Transport and Environment*, 83, e102336.
- Lydon, M. & Garcia, A. (2015). *Tactical urbanism: short-term action for long-term change*. Washington DC: Island Press.
- Ma, A.T.H., Lam, T.W.L., Cheung, L.T.O., & Fok, L. (2021a). Protected areas as a space for pandemic disease adaptation: A case of COVID-19 in Hong Kong. *Landscape and Urban Planning*, 207, 103994.
- Ma, S., Li, S., & Zhang, J. (2021b). Diverse and nonlinear influences of built environment factors on COVID-19 spread across townships in China at its initial stage. *Scientific reports*, 11, 12415.
- Malonza, J.M. (2020). Neighbourhood Streets as Public Space. COVID-19 Public Life in Kimisange, Rwanda. *The Journal of Public Space*, 5(3), 39–52.
- Mears, M., Brindley, P., Jorgensen, A., Ersoy, E., & Maheswaran, R. (2019). Greenspace spatial characteristics and human health in an urban environment: An epidemiological study using landscape metrics in Sheffield, UK. *Ecological Indicators*, 106, 105464.
- Mensah, C.A. (2014). Destruction of Urban Green Spaces: A Problem Beyond Urbanization in Kumasi City (Ghana). *American Journal of Environmental Protection*, 3(1), 1–9.

- Ming, H., Roberts, J.D., Azevedo, G.P., & Milner, D. (2020). The role of built and social environmental factors in Covid-19 transmission: A look at America's capital city. *Sustainable Cities and Society*, 65(12), 102580.
- Naik, Y., Baker, P., Ismail, S.A., Tillmann, T., Bash, K., Quantz, D., Hillier-Brown, F., Jayatunga, W., Kelly, G., Black, M., Gopfert, A., Roderick, P., Barr, B., & Bamba, C. (2019). Going upstream – an umbrella review of the macroeconomic determinants of health and health inequalities. *BMC Public Health*, 19, 1678.
- Neiderud, C.J. (2015). How urbanization affects the epidemiology of emerging infectious diseases. *Infection Ecology & Epidemiology*, 5, 10.3402/iee.v5.27060.
- Okech, E.A. & Nyadera, I.N. (2021). Urban green spaces in the wake of Covid-19 pandemic: reflections from Nairobi, Kenya. *GeoJournal* (online first), <https://doi.org/10.1007/s10708-021-10540-0>.
- Republic of Kenya. (2019). *Digital Economy Blueprint: Powering Kenya's Transformation*. <https://www.ict.go.ke/wp-content/uploads/2019/05/Kenya-Digital-Economy-2019.pdf>. Accessed on June 29, 2022.
- Republic of Kenya, President. (2022, June 21). *President Kenyatta Unveils Final Report of the Nationwide Airborne Geophysical Survey*. <https://www.president.go.ke/2022/06/21/president-kenyatta-unveils-final-report-of-the-nationwide-airborne-geophysical-survey/>.
- Rojas-Rueda, D. & Morales-Zamora, E. (2021). Built Environment, Transport, and COVID-19: a Review. *Current Environmental Health Reports*, 8(2), 138–145.
- Schmidt, K., Sieverding, T., Wallis, H., & Matthies, E. (2021). COVID-19 – A window of opportunity for the transition towards sustainable mobility? *Transportation Research Interdisciplinary Perspectives*, 10, 100374.
- Sofo, A. & Sofo, A. (2020). Converting Home Spaces into Food Gardens at the Time of Covid-19 Quarantine: all the Benefits of Plants in this Difficult and Unprecedented Period. *Nature Public Health Emergency Collection*, 48(2), 131–139.
- Toderian, B. (2020, April 6). Op-Ed: Dear Gov.Cuomo, The Problem Is Crowding Not 'Density'! *StreetsBlogNYC*. <https://nyc.streetsblog.org/2020/04/06/op-ed-dear-gov-cuomo-the-problem-is-crowding-not-density/>.
- UCLG (United Cities and Local Governments in Africa). (2022). *Tripartite Partnership for Networking for Partnership to Achieve SDG 11 and New Urban Agenda in Slums and Informal Settlements*. <https://africities.org/sessions/sou-21-tripartite-partnership-for-networking-for-psup-partnership-to-achieve-sdg-11-and-new-urban-agenda-in-slums-and-informal-settlements/>. Accessed on June 29, 2022.
- UN-Habitat. (2021, July 13). *Promoting health and well-being through urban forests and green public spaces in Kenya and Ethiopia*. <https://unhabitat.org/promoting-health-and-well-being-through-urban-forests-and-green-public-spaces-in-kenya-and-ethiopia>.
- Urban Land Institute. (2013). *Intersections: Health and the Built Environment*. Washington DC: Urban Land Institute.
- WHO (World Health Organization). (2021, September 22). *Household air pollution and health*. <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>.
- Wiersinga, W.J., Rhodes, A., Cheng, A.C., Peacock, S.J., & Prescott, H.C. (2020). Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. *JAMA*, 324(8), 782–793.