

Next City: Learning from Cities during Covid-19 to tackle climate change

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Arizona, 17 Feb 2022

Based on the paper

Kakderi, C., Komninos, N., Panori, A., & Oikonomaki, E. (2021). Next city: Learning from cities during Covid-19 to tackle climate change. *Sustainability*, 13(6), 3158.

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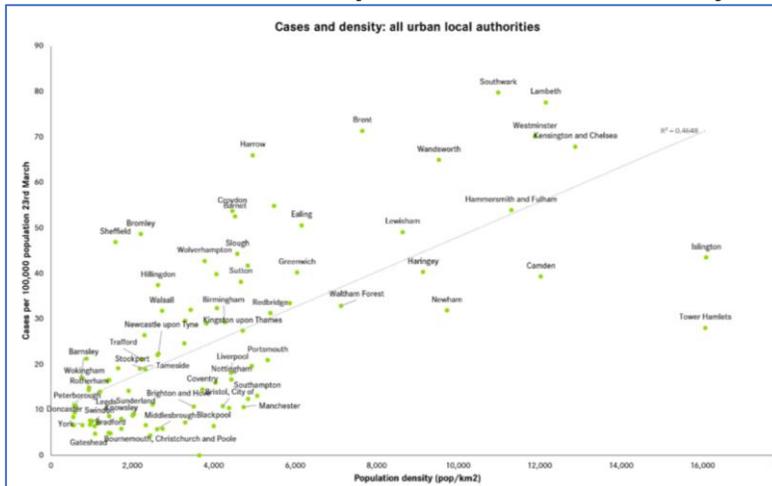
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1. Introduction and problem statement

Two crises: Learning from Covid-19 crisis to address climate change

Covid-19 is a major global crisis, but also an urban crisis:

- Infections rise with respect to density



- Fundamental principles of urban planning are challenged: advantage of size, high density, mass transport, free use of public space
- Cities developed various measures and policies to mitigate the risks of the pandemic. **Hugh experience is gained**

“Covid-19 is awful. Climate change could be worse”

Gates, B. Climate and the Coronavirus. The Blog of Bill Gates. 4 August 2020.

<https://www.gatesnotes.com/Energy/Climate-and-Covid-19>

Moving from one global crisis to another, **climate change**, the paper is about **transfer learning**.

Question: How, based on the Covid-19 experience, cities should be organized to tackle the grand challenge of environmental sustainability and climate change.

2. Cities and the Covid-19 pandemic: Literature survey

Research question and literature

The research challenge we address in this article: Build on the knowledge gained in tackling the current major crisis to meet another grand challenge, namely climate change

Table 1. Publications on Google Scholar on cities and COVID-19 since 2020.

Search Terms on Google Scholar	Number of Publications	Most Relevant Publications According to Google Scholar	Publications Relevant to the Topic of the Paper
“city COVID-19”	190	60	11
“cities COVID-19”	105	60	25
“city planning COVID-19” and “urban planning COVID-19”	4	4	4
Total	299	124	40

Source: Google Scholar.

By analysing the arguments and the methods used in these publications, we identify a set of 7 thematic areas that describe the relationship between cities and the Covid-19 pandemic

2.1. Covid-19, cities and global challenges

The pandemic exposed complex global interdependencies and **highlighted six challenges**: (1) food systems; (2) education; (3) cities and sustainable infrastructure; (4) security, protracted conflict, refugee crises, and forced displacement; (5) environmental resilience; and (6) global health.

The pandemic is unlikely to significantly alter the dominant economic geography and spatial inequality of the global city system, but at **micro-geographic scale**, it may bring about a series of changes in the **structure and morphology** of cities and suburbs, transformations of work and shopping, changes in city functions, and creation of new local opportunities.



2.2. *The pandemic, socio-economic and spatial disparities*

Covid-19 has **exposed the effects of the unequal social geography** within cities, as socio-spatial inequities in cities have played a critical role in the pandemic impact.

US data **reveal many divides**

- overall Covid-19 mortality rate for Black Americans is 2.4 times higher compared to the rate of white populations,
- 2.2 times higher compared to the rate for Asians and Latinos
- Indigenous American, mortality rate is five to eight times higher compared to the mortality rate of the white population.

Statistical analysis shows the **dependence of infection rate** from the city population size, number of patients under surveillance, number and efficiency of health facilities.



...luxury apartments loom over the Paraisópolis Favela in São Paulo, Brazil. Shutterstock.

2.3. Covid-19, environment and climate change

There is a two-way relationship between Covid-19 and the environment:

The effect of geographical conditions on the pandemic: Research shows that temperature and relative humidity were driving factors of transmission, but these relations vary with season and geographical location.

On the other hand, there is **impact of Covid-19 on the environment and climate change**, and progress in the climate agenda and sustainable solutions in production and consumption.

This favourable conjecture to environment is accomplished in two primary ways: (a) the pandemic accelerates the **decline of carbon-intensive industries** and practices, and (b) leverages responses that drive **low-carbon innovation in mobility**, recreation, and work.



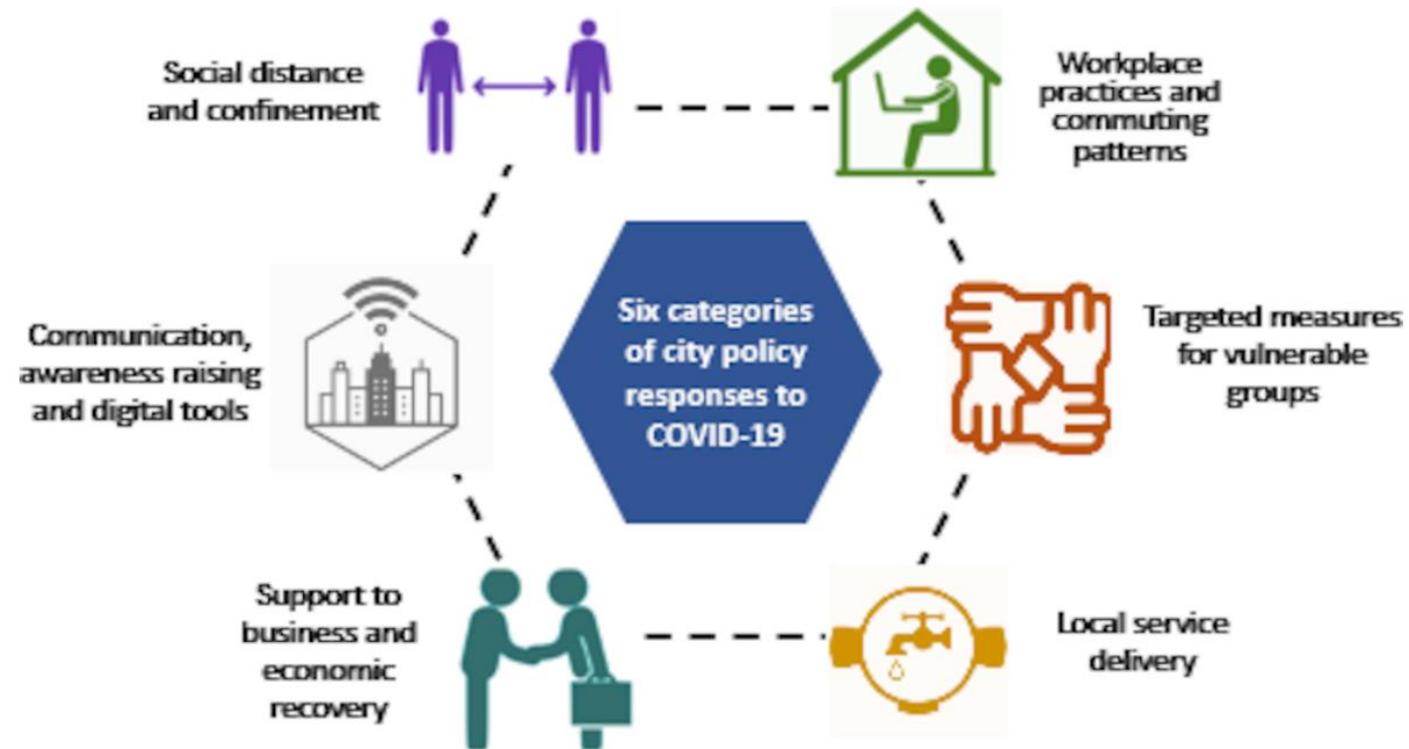
2.4. Urban policies and measures to address the pandemic

The measures taken to address the pandemic **vary with respect to the urban and regional context** and the resources available.

Surveys on approaches applied in several large urban agglomerations show that the **most frequent practices** are about increasing housing options, on-the-ground outreach and resource allocation, and integrated communications.

Without a vaccine, practicing **social distancing** hygiene was the most effective measure to limit the spread of the virus.

Figure 2. Six categories of city policy responses to COVID-19



Source: OECD Policy Responses to Coronavirus (Covid-19).
Cities policy responses, 2020

2.5. Addressing the pandemic with rules and restrictions

The **first restrictive responses** that have been applied during the pandemic came from the Chinese government in Wuhan City that applied **quarantine and isolation** control at a city and regional level.

Quarantine measures effectively reduced and delayed Covid-19 infections, which is essential for controlling the pandemic outbreak.

Restrictions on mobility have also been implemented, as well as **market access** restrictions. A survey in 75 Canadian and American cities shows that school closures, day-care closures, limits on nursing home visits, shelter-in-place rules, non-essential business closures, restaurant closures, fitness centre closures, and cinema closures had a strong impact on mobility reduction.

Coronavirus alert levels in UK

Stage of outbreak		Measures in place
Risk of healthcare services being overwhelmed	5	Extremely strict social distancing
Transmission is high or rising exponentially	4	Social distancing continues
Virus is in general circulation	3	Gradual relaxation of restrictions
Number of cases and transmission is low	2	Minimal social distancing, enhanced tracing
Covid-19 no longer present in UK	1	Routine international monitoring

Source : UK government

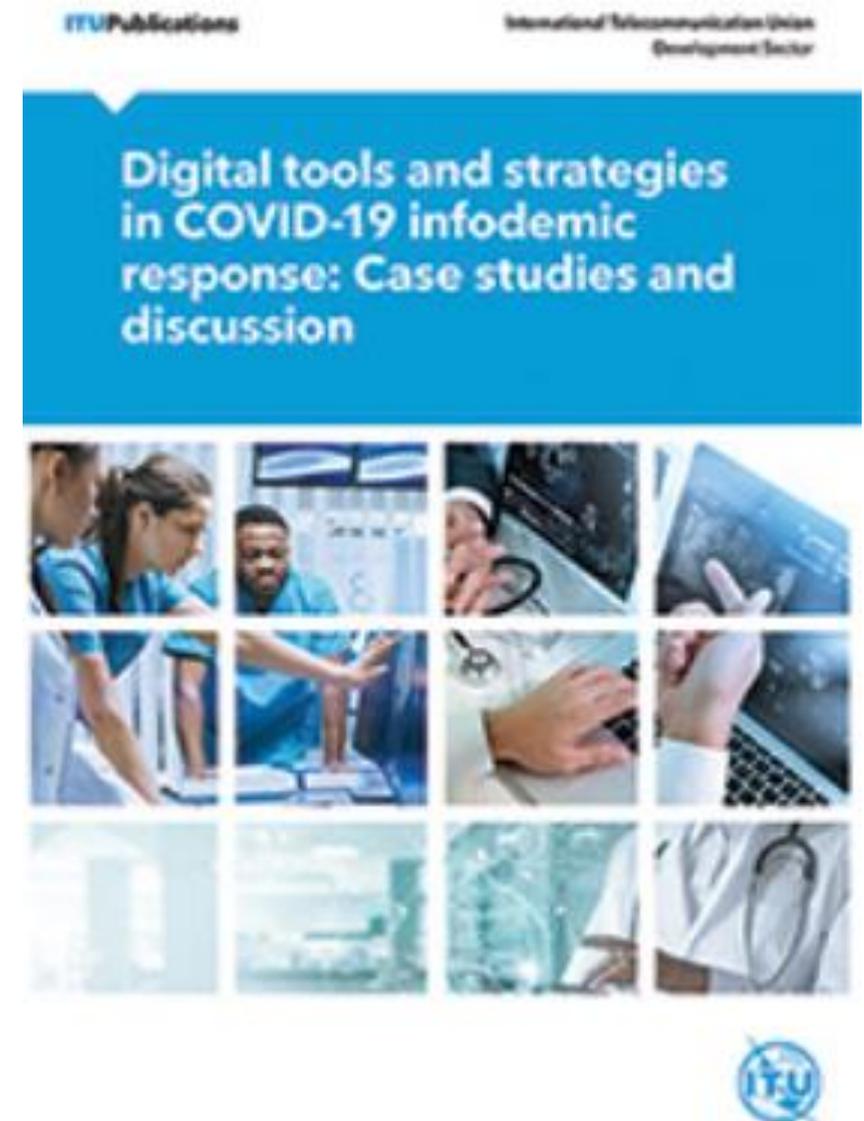
2.6. Addressing the pandemic with digital means

Direct relation of digital means to health

- Digital means have helped in tracing the spread of infections. Agent-based models simulate the spread of Covid-19 infections across locations and daily practices.
- Digitalisation improves communication efficacy for better communicating health strategies, insights, and scientific outcomes.
- Deploying digital systems and solutions facilitate and support the enforcement of social distancing.

Relation to the economy of cities

- e-Commerce, e-learning, contact-less transactions allowed cities to operate
- Telework lowered workspace density and commuting, added resilience to cities



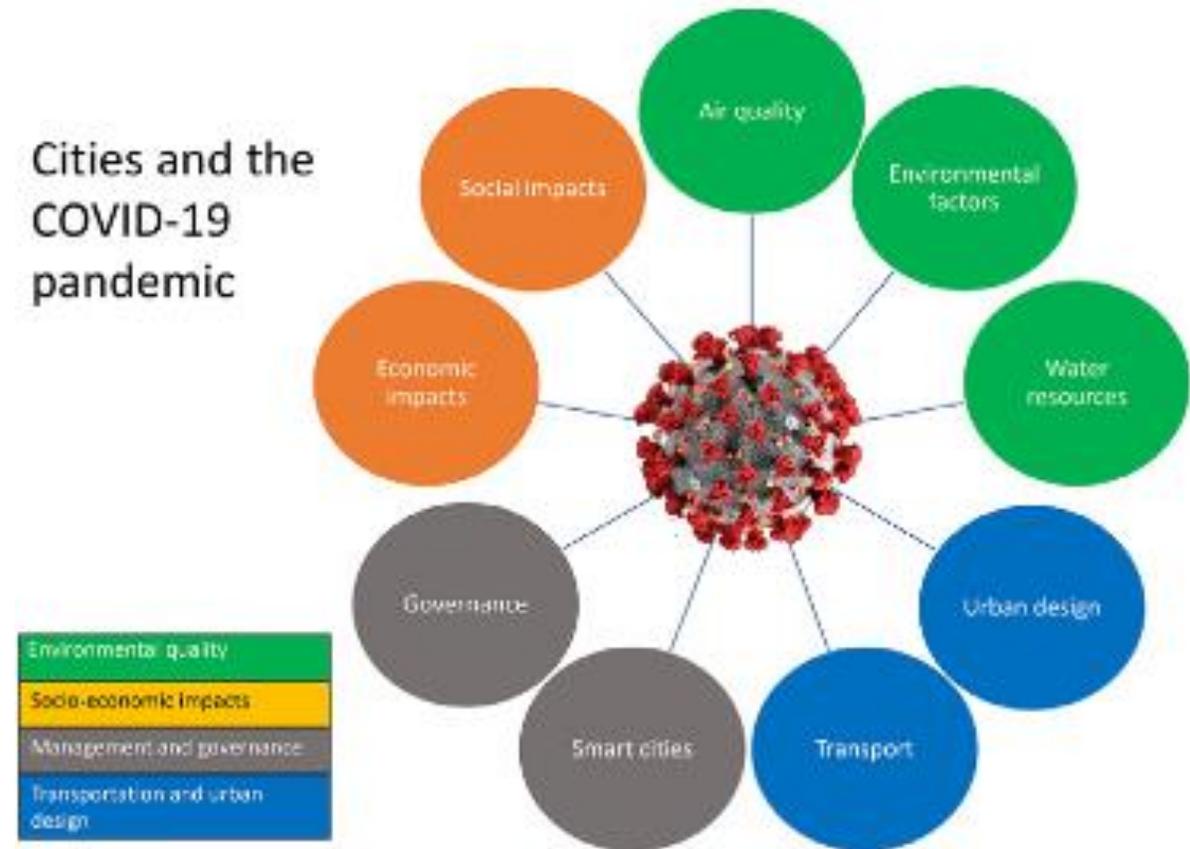
2.7. Addressing the pandemic with urban planning

Core principles of urban planning have been questioned: high-density urban environments, mass transit transport systems, need to reassess most city planning theories.

Changes in activities that affect cities: aviation (-75%), surface transport (-50%), industry (-35%), public buildings and commerce (-33%), power production (-15%), air pollution is diminished, and the levels of atmospheric nitrogen dioxide (NO₂) and carbon dioxide (CO₂).

New planning practices and standards, such as population density planning, increase of open and green areas in the city, changes in real estate forecasting, changes in working conditions, increase in agricultural areas in cities, change in relationship between housing and work, housing and learning, new environmental standards, institutional changes.

Cities and the COVID-19 pandemic



3. City ecosystems during the pandemic: Three cases

The literature we have reviewed assessed the impact of Covid-19 on cities, considering cities as homogenous entities without internal differentiation.

However, this does not reflect accurately the urban conditions. The city is a system of systems, composed of many ecosystems that behave differently.

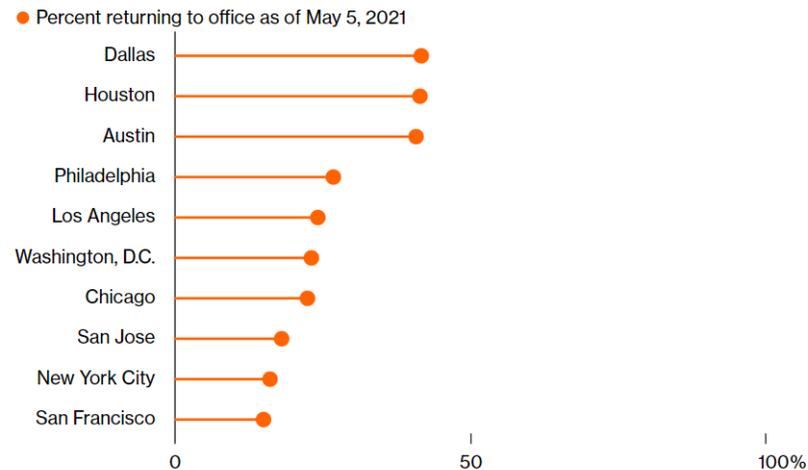
Here, we focus on three types of ecosystems that were strongly affected by the health crisis: (1) the **central business district**, (2) the **urban transport ecosystem**, and (3) the **ecosystem of tourism and hospitality**.

3.1. Restructuring of the Central Business District

Traditionally, **office work is located in the CBD** and spatially expressed with large office buildings, spacious meeting rooms, tenderness for open floor plans, supported by other adjacent amenities such as canteens, cafeterias, gyms, all leading to high-priced business operations.

This spatial model is challenged during the pandemic.

Most Office Workers Haven't Returned in Major U.S. Cities



Source: Kastle Systems
Note: Counts workers who are entering offices via keycards and other similar technologies.

San Francisco: Till the beginning of 2020, the **CBD** had a constant arrival of talent from all over the world, high concentration of technology companies and start-ups, a most attractive global start-up ecosystem, ranking 1st in the US.

During the pandemic, this situation has changed, and the city has been facing a massive exodus, a huge increase in workspace and housing vacancy, and the fall of rents.

The CBD restructuring program

- Rapid zoning amendments flexibility in zoning and outdoor space such as the “Shared Spaces”
- “Slow Streets” program that enhances micro-mobility and a healthy post-car urban living
- Replacing car travel with green transport, 80% of trips by transit, biking, walk, and carpooling
- Hybrid work model balancing presence in the office and remote working

3.2. Changes in the urban transport and mobility ecosystem



An independent platform dedicated to collecting, synthesizing, and sharing mobility initiatives that are keeping the world moving during the Covid-19 pandemic.

<https://www.citiesforglobalhealth.org/home>

29

Initiatives related to urban transport

Initiatives

Displaying 1 - 6 of 29

Country:
 Name of the local/regional government:
 Type of initiative:
 Type of response:

TAIPEI

Taipei Rapid Transit Corporation Modifies Mandatory Face Mask Requirement

With the subsiding of the COVID-19 threat in Taiwan and in compliance with the directives of Taiwan Centers for Disease Control, the Taipei Rapid...

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To reduce the crowding of people and the possibility of contamination by the Coronavirus, the City of Belo Horizonte restricted the circulation of...

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BELO HORIZONTE

Changes in the functioning of public transport

The Municipality of Belo Horizonte determined that Belo Horizonte's bus companies ensure that buses in the capital travel only with seated passengers...

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MONTEVIDEO

Espacio sin motores en la rambla de Montevideo

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Estrategia "En Bogotá la Bici nos mueve con seguridad"

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TYPE OF ACTION	PROCESSES TRIGGERED	CASES	%
RULES OF PUBLIC TRASPORT OPERATION	Lower capacity; face mask; seated passengers; open windows; fines; no cash payments; no interaction to driver; no tickets on board	13	44.8
CITY CIRCULATION RESTRICTION	Reduced public transport flow; restricted city areas; stay at home	4	13.8
USE OF BIKES	Safety for cyclists; new network for bikes; new pedestrian areas	4	13.8
SMART SYSTEMS	Social media use; free car sharing; sms application for passenger tracing	3	10.3
FINANCIAL SUPPORT	Free parking; subsidies to public bus operators	3	10.3
CLEAN TRANSPORT	Daily disinfection and sanitation; all types of public transport and infra	2	6.9

3.3. Changes in the tourism and hospitality ecosystem



Three types of business strategies are identified:

- (i) **a self-reliant dimension**, identifying and using alternative processes for revenue;
- (ii) **a vigilant dimension** aiming at increasing health and safety measures
- (iii) **an inoperative dimension**, discontinuity of operations and novel approaches for business

Two types of city strategies are identified:

First, some cities promote **a more international profile as a travel destination**. In this case, the city of Reykjavik (Iceland) has promoted actions focusing on developing marketing campaigns for the city as an international travel destination when returning to normality. Another approach is promoted by Milan (Italy) where the city-branding approach is related to a “Safe City” fully aligned with health protocols.

Second, cities follow a **more sustainable model**, shifting away from large-scale tourism. Florence’s (Italy) recovery plan for tourism focuses on posing restrictions on touristic buses to the city center, alongside promoting investments relevant to local uses for residents and businesses there. Barcelona (Spain) and Budapest (Hungary) follow a similar approach by reorientating their tourism models towards cultural and family-friendly models.

4. Learning from Covid-19 to tackle climate change

Literature and case studies reveal three directions of action and measures that cities used to address the Covid-19 pandemic:

- rules for re-organizing and planning cities,
- digital means and smart city solutions,
- science, technology, and innovation

These measures have strong environmental and sustainability impact.
They can be effective to fight climate change.

4.1. New rules, city re-organization, and city planning

The health crisis **introduced a new agenda for cities**, very relevant to sustainability, green transition, and climate change adaptation. Key principles of this agenda are:

- ***Flexibility***: High-intensity, high-density, high-rise areas, large-scale, mass-based systems limit flexibility and the capacity to deal with unexpected events during a crisis.
- ***Decentralization***: Work and mobility patterns depict a current exodus out of crowded urban business centers and a return to the suburbs. There is a clear trend towards decentralization, lower density areas, smaller cities and rural communities.
- ***Getting closer to the global city planning*** goals outlined in the Paris Agreement, the Sustainable Development Goals, or the New Urban Agenda, shifting from oil-based economies to social, environmental, and economic sustainability.
- ***Experimentation***, testing of planning policies, rethinking of how spatial and transportation planning could make cities more resilient and flexible to adjust to unforeseen events. Testing of new spatial concepts, such as the 'complete neighbourhood' reducing the need for long commutes and mass transit, the '15-min city' or '20-min Neighbourhood', the 'walkable city' less car-dependent cities, all are forms of greener and more sustainable cities.

4.2. Digital means, e-services, and smart cities

Digital services and smart city solutions, e-commerce, telework, online learning, digital media entertainment, allowed cities to continue operating during the health crisis. Also, digital transformation opened pathways towards sustainable development:

- ***Dematerialization*** through digital technologies, transferring many urban activities at the digital level, such as remote working or education, assisted with platforms and apps that enhance online communication/collaboration and monitor, reduce GHG and CO2 emissions.
- ***Use of data and analytics*** for monitoring, forecasting, and knowledge-based decision making, in combination with smart city technologies improve efficiency, awareness, and flexibility of urban ecosystems through real-time adjustment. Potential areas of application involve renewable energy, green transportation, waste management, pollution management.
- ***Leveraging the power of social media*** and digital services for crowdsourcing innovative solutions harnessing the users' collective intelligence. Social media and digital platforms provide new environments of social interactions that cultivate learning, networking, collaborative innovation, and adaptation to new behaviour routines.

4.3. Scientific discovery and innovation

The end of Covid-19 is expected through scientific discovery and innovations in drugs and vaccines. Zero carbon technologies, fighting climate change through research and innovation, will be the equivalent of Covid-19 vaccines in the field of environmental sustainability.

Many technologies can address climate change, ranging from new materials and technologies (photocatalysis, self-cleaning and coatings material, paints and glass for urban use that can eliminate greenhouse gases), new renewable energies (Seawater Steam Engine), to food production technologies (aquaculture), and other technologies.

Carbon capture and removal technologies hold a preeminent role in this agenda of technological engineering for climate change. The amount of removal is estimated from the Intergovernmental Panel on Climate Change at 3 to 7 gigatons of CO₂ per year by 2050 to limit warming to 1.5° C.

No single technology will be sufficient to tackle climate change and a mix of technologies would be needed

- Energy generation and storage such as photovoltaic, wind, storage infrastructure
- Interconnection and usage optimisation with the extension of smart grid
- Conversion to electric mobility with electric vehicles, e-bikes, e-scooters, and mobility-as-a-service
- Building technologies for better insulation and less thermal energy loss
- Nature-based solutions, regeneration of green spaces, planting trees, encouraging urban agriculture

5. Conclusion: Tackle climate change with connected intelligence

The pandemic offered important **evidence, lessons, and global-scale initiatives** on how cities respond to a grand and complex crisis, by improving the functioning of cities and updating urban planning. These measures had also a positive environmental impact:

- ***Policy measures and city planning*** have been the first line of defense and demonstrated the capacity of rules and regulations to adapt human behaviour to conditions of a crisis.
- ***Digital services***, smart city solutions, data, analytics, and intelligence effectively helped urban actors to develop resilient and counter-crisis behaviour. Cities maintained a good level of activity due to digital transactions, e-commerce, online services, and teleworking. Smart cities can provide numerous solutions to climate change adaptation and environmental sustainability.
- ***Scientific discovery and innovation***, vaccines, rational human behaviour based on science and technology have been essential to end the crisis. In the case of climate change, equivalent technology breakthroughs are needed in the fields of renewable energy, smart systems optimisation, CO2 capture technologies, and nature-based solutions.

The lesson from the Covid-19 crisis is that all three types of action, (a) new rules and city planning, (b) digital services and smart systems, and (c) scientific discovery must be combined to address a complex challenge. A holistic approach is needed.

Fight climate change with connected intelligence

Based on the same mix of capabilities used to deal with the Covid-19 pandemic

- (1) community capabilities based on rule-based operation and organisation of cities,
 - (2) machine capabilities based on digital systems for optimization and dematerialisation,
 - (3) human capabilities based on scientific discovery, innovation, and rational behaviour,
- we can elaborate strategies for environmental sustainability and fight climate change across city ecosystems and sectors of activity.

Collective intelligence based on rules & planning <ul style="list-style-type: none">• Distributed intelligence• Collaborative problem-solving• Sharing knowledge & skills• Consensus-based decision making• Rule-based thinking	Machine intelligence based on digital systems <ul style="list-style-type: none">• Digital services• Smart systems and networks• Performance dashboards• Data, analytics, AI• Optimisation• Autonomy	Human intelligence based on science & technology <ul style="list-style-type: none">• Communication, cognition• Adaptation• Problem-solving• Rational decision-making and behaviour• Science, discovery, innovation
	<i>Human + machine intelligence</i> <ul style="list-style-type: none">• Digitally-guided behaviour• Awareness raising, user motivation, engagement• AI assisted decision-making / innovation• Operating in VR/AR environments	
<i>Collective + machine intelligence</i> <ul style="list-style-type: none">• Platform-based collaboration & sharing• Digitally assisted crowdsourcing• AI assisted distributed systems/groups• Digital externalities		

Thank you!