

Research Article

**URBAN USES PUT TO THE TEST BY THE COVID-19 PANDEMIC:
A LITERATURE REVIEW AND EVIDENCE FROM ALGERIA**

Meriem Naimi Ait-Aoudia*, Samira Khettab, Oumelkheir Boukratem

OVAMUS Research Laboratory, Institute of Architecture and Urban Planning, Blida1 University, Algeria

Article history:

Submission 15 February 2024

Revised 28 March 2024

Accepted 29 March 2024

**Corresponding author:*

E-mail:

naimiataoudia.meriem@univ-blida.dz
meriem.aitaoudia@gmail.com

ABSTRACT

The COVID-19 pandemic advent has put the spotlight back on debates about the relationship between urban planning and health-related issues, prompting a certain amount of research works worldwide. This study set out to build an analysis grid for this relationship on the basis of a literature review and apply it to the case study. To this end, our work used two levels of bibliographical analysis: the first level focused on review of research papers, which helped identify three topics related to the consequences of coronavirus disease and subsequent restrictive measures on urban uses, namely public open space, mobility, and online uses. Our study considers these latter because of their impacts on urban use and, by ricochet, on urban planning and design. The next level based exclusively on original articles review, allowed more in-depth investigations, to break down these topics into sub-topics, and to define criteria for analyzing them, which mainly include use patterns and behavioral changes and perceptions. Drawing from the insights revealed by these studies, the present article endeavors to examine the Algerian case with the aim of nourishing the debate on the resilience of cities to health crises and suggesting better guidance for urban planning and design measures.

Keywords: *Algeria, COVID-19, Pandemics, Sustainable city, Urban resilience, Urban uses*

Introduction

Since the outbreak of COVID-19 in December 2019, the virus has rapidly rampaged worldwide, causing almost 7 million deaths to date [1]. At first, the world was taken by surprise by the pandemic, whose transmission mode was poorly understood [2]. From then on, the first measures to combat contagion in human settlements, particularly in cities, were

to restrict mobility and public space use [3], [4], which translated, among other measures, into closures, lockdowns, social distance setting, gathering bans or postponements, hygiene measures in public spaces, and travel restrictions. The health crisis has paralyzed nations and dealt a heavy blow to their economic development, adversely affecting the standard of living of the most vulnerable social strata [5],

How to cite:

Naimi Ait-Aoudia, M., Khettab, S., & Boukratem, O. (2024). Urban Uses Put to The Test by The Covid-19 Pandemic: A Literature Review and Evidence from Algeria. *Indonesian Journal of Social Science Research*, 5(1), 61 – 83. doi: 10.11594/ijssr.05.01.07

[6]. More particularly the impact of COVID-19 has been severely felt in urban areas [7], [8], home to more than half of the world's population [9], and has affected the quality of infrastructure and services, local economy, mobility and, in short, public life in general [10]–[13]. It also goes without saying that cities have been, and continue to be, hot spots for the epidemic, with high numbers of infections and deaths, making the pandemic an urban crisis par excellence [14] and prompting reflection on urban planning and design for resilient cities in the face of health crises.

Recall that spatial planning as we know it today owes something to earlier interventions to deal with diseases and epidemics of the past: cholera, Spanish flu, the Black Death, etc. [15], [16]. The latter led to the shaping of European urban landscapes through establishing zoning laws and creating more public spaces, initially used as quarantine zones [17], [18]. Urban planning, as a discipline, emerged in the 19th century in response to concerns about insalubrity that arose in the wake of the industrial revolution [19], [20]. Once again, a pandemic crisis is challenging our cities, forcing planners, practitioners, policymakers, and decision-makers to rethink urban planning to develop sustainable pandemic-resilient cities. It is therefore of paramount importance to understand how COVID-19 will reshape the links between cities and quality of life [21]. This raises questions about the involvement of physical and social urban patterns, and thus regional and urban spatial organization, in worsening the effects of coronavirus. Furthermore, the restrictive measures and local interventions that followed to meet the new health requirements led to questions about the evolution of urban uses and urban planning and design. Since the advent of the coronavirus pandemic, worldwide studies on the city/COVID-19 duo have multiplied, enriching knowledge on the subject [22]. In light of relevant studies' main findings, including literature review and case study research on urban uses during the coronavirus pandemic, this paper sets out to build an analysis grid of topics related to urban uses and their characterization criteria, whose aim is to target the key elements to be examined when analyzing the relationship between urban uses and

pandemic, with the goal of providing better guidance for urban planning measures in favor of cities that are more resilient to health crises. The grid will be applied to the Algerian case.

As in other parts of the world, Algeria has had to contend with this pandemic. The first confirmed case of COVID-19 was on February 25, 2020, and since then, the country has undergone four waves of COVID-19 infections. Currently, the country is experiencing a lull in coronavirus infections, although this pandemic has led to unprecedented upheavals in lifestyles and social practices. The Algerian case is examined through a literature review, with the aim of drawing lessons and advancing the debate on the resilience of cities in the face of health crises.

Method: Construction of topics and criteria grid

First level of literature review

The studies selection was made on the basis of inclusion and exclusion criteria, i.e. only works that dealt with the relationship between the COVID-19 pandemic on the one hand and the city and built environment on the other were considered. We conducted a first search for relevant scholarly peer-reviewed papers collected from the Web of Science, Scopus, and other databases, as well as professional or "grey" literature related to this issue. For this purpose, the combination of the following keywords: COVID-19, virus, coronavirus, pandemic, outbreak, cities, urban planning, urban design, virus spread, lockdown, social distancing, impacts on human activities, and urban resilience, was used to collect the initial set of related literature.

This preliminary search has led us to focus on the relationship between COVID-19 pandemic and urban uses and allowed us to pinpoint the main terms that we used to collect research papers for the subject of our study, namely public space use, green space use, street use, mobility, transportation, walking, cycling, and online activities. These latter were considered in this work because of their impact on the physical use of public space during the pandemic and its spin-offs for the organization of resilient cities in the future. The results of this preliminary research guided the second

level of bibliographical research and the construction of the analysis grid.

Second level of Literature review on case-study-oriented research

The second level targeting exclusively case-study-oriented research conducted worldwide, enabled us to further define the sub-topics addressed by research into urban uses during coronavirus disease. Hence, the topic “Open and green public spaces” is divided into “Green spaces” and “Other outdoor spaces”; “Mobility” into “Total mobility”, “Motorized and Non-motorized mobility” and “Public and Private mobility”; and finally, “Online uses” into “E-learning”, “E-working”, and “E-commerce”.

Public spaces are venues for multiple social interactions and human relationships. However, during a pandemic, this social proximity can encourage the spread of the virus among populations. This is why sanitary restrictions have been implemented to limit public space use or ensure physical distancing. In this context, numerous academic studies have discussed the significance of public spaces in controlling virus transmission, as well as the impact of the pandemic and subsequent restrictive measures on people's relationship with these spaces. Furthermore, given its proven importance for physical and mental health, visits to green spaces during the pandemic crisis have been the subject of intense research.

Mobility - be it public transport, private cars, or so-called soft mobility (walking, cycling) - has also had its share of research interest, as it was associated with the geographical spread of viruses. In addition, mobility is an essential activity in modern society, where residents and visitors alike need to get from one point to another for a variety of purposes: work, leisure, shopping..., and so on. And even in times of crisis, it remains indispensable for a large proportion of residents, if only for work or for acquiring essential necessities.

Online activities, the third topic, were explored by studies due to their contribution to reducing person-to-person contact during the pandemic, while allowing for the continuation of activities that were originally conducted in person. In fact, the implementation of containment measures made it necessary to switch to remote mode of working, learning and other activities, thereby reducing the need for physical mobility.

The case-study-oriented literature also enabled us to identify the analytical criteria addressed by research on these topics and sub-topics, which are twofold: “Use patterns and behavioral changes” which describes whether there is an increase or decrease in uses, and to uncover the factors that govern these changes; and “Perception” which could be safe or unsafe, or positive or negative. Figure 1 shows the process for building the grid of topics and criteria analysis.

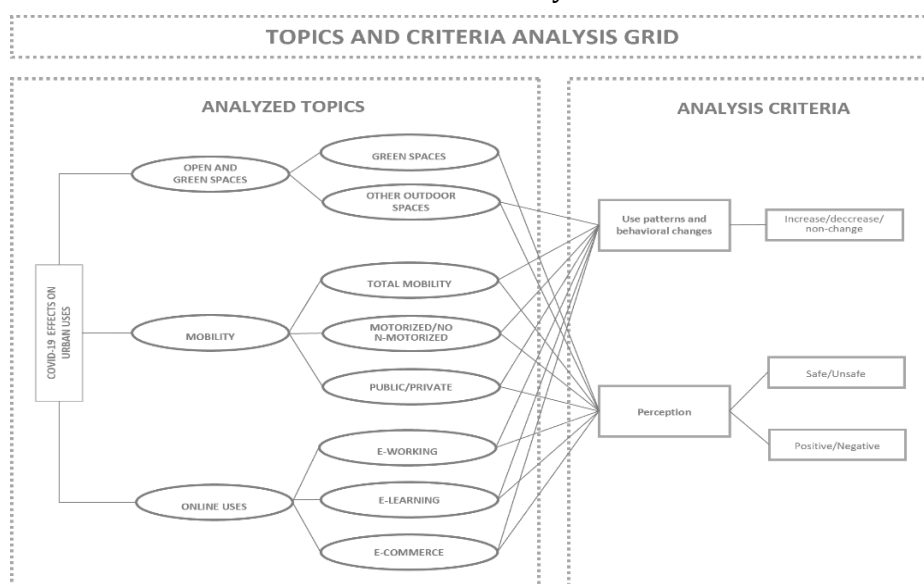


Figure 1. Topics and criteria analysis grid

Results

Urban uses during COVID-19 pandemic: a review of main findings

The COVID-19 pandemic has led to significant changes in urban uses and people's relationship with public space. The various studies consulted concur that the two main reasons that have influenced the perception of urban uses, leading to changes in behavior and use patterns are the restrictive health measures and the fear of being contaminated by the virus. Our study focused on the three uses: mobility, public space and online activities. The latter were addressed because of their impact on other urban uses.

The following paragraphs endeavor to give reading of the changes in use and perceptions observed in the research collected. In the appendix, we provide a summary table (Table 1) with extensive literature, of these observations, according to the criteria of change of use (increase/decrease), and perception (safe/unsafe; positive/negative).

Mobility: Public transportation was one of the most affected sectors, having experienced an unprecedented decline in ridership due to the adoption of travel restrictions, on one hand, and the perception of mass transit means as a risk factor for the virus' spread on the other hand. This state of affairs has led to residents self-restricting their use of public transportation [15], [21]. It should be also emphasized that the risk of infection was considered higher with public transport than with other travel modes [23]–[25].

Overall, the choice of mode of transport has been influenced by pandemic-related concerns [26]. Consequently, the reluctance to use public transport has unfortunately led to a massive return to the private car use, especially for long-distance commutes [27]–[29]. This trend was more prevalent among the higher socioeconomic status population, who are typically vehicle owners. Otherwise, and for those who can afford it, they have switched to cabs [30]. That said, the use of taxis is not unanimously supported [26], as some individuals perceive them as an unsafe mode of transport, since they carry several people a day and the passenger is too close to the driver [31], [32].

Another notable change is the renewed interest in non-motorized transport, walking, and cycling for short journeys, encouraged by public actions [15], [33], [34]. Indeed, cities worldwide have expanded emergency cycling and walking infrastructure for social distancing [35]. Additionally to their inherent benefits for physical and mental health in particular during lockdown times [36], active travel modes were considered to pose a lower risk of infection [37]. However, walking behavior is determined by several factors influencing commuting and non-commuting trips such personal beliefs, attitudes, perceptions towards walking mode like safety concerns and comfort, distance to destinations, land use and built environment [38]. A study of cities in the Middle East and North Africa underlined that walking levels in these countries declined during the pandemic [39]. This decline is particularly noticeable in non-walkable neighborhoods [40], [41], hence the necessity in such countries to expedite strategies for improving walkability in cities.

Open and green spaces: Similarly, the coronavirus pandemic brought to the fore the use of common open spaces issue and the role it could play in the virus' spread, so their use had been restricted [3]. To compensate for this limitation in using of outdoor spaces, neighborhood streets and parking lots have been used as socializing areas and for a variety of physical, educational, and recreational activities [42]–[44]. On the other side, green spaces have acquired an increasing importance as they were privileged places for visitors seeking refuge after long hours of painful confinement [45], [46], by providing space for multiple recreational activities with less risk of infection [47], [48]. This increase in attendance was particularly noticeable in the case of green spaces nearby the place of residence [49]. On the other hand, some studies have shown a decrease in the use of green spaces [50], [51]. Beyond containment measures, which forced people to stay at home, the reasons for reduced use of green spaces were attributed to higher levels of depression, anxiety and distress, particularly among urban residents and those perceiving a high risk of epidemic [52]. Understanding the reasons behind this reluctance to use green spaces during the pandemic could provide elements of a response

to future urban planning strategies for spaces that are inclusive and adapted to all.

Online uses: Finally, another fact noted during the confinement is the rise of remote activities (e-work, e-education, e-commerce, etc.), which enabled maintaining activities during stay-at-home orders while avoiding displacements and physical contact [53], [54]. Teleworking has experienced considerable growth [29], [32] and has been positively received by workers who have used it [55]. The main benefits of e-working identified by studies can be summarized as follows: reduced commuting time, improved work-life balance, a more comfortable home working environment, cost savings, increased freedom, autonomy and control, enhanced convenience of home working, greater flexibility, and more time in general [56], [57]. On the other hand, some disadvantages were noted, including feelings of isolation stemming from the absence of a work environment and direct interaction with colleagues, a negative work-life balance, increased stress and anxiety, reduced productivity and efficiency, diminished mood and mental health, and decreased concentration [56], [58]. As far as distance learning is concerned, it has rapidly become an alternative to face-to-face teaching, following the implementation of lockdown measures [59], [60]. This option has been well received, as it addresses concerns related to commuting costs and living in dormitory [61]. However it has also revealed inequalities in terms of access to the internet network, and computer equipment among learners [62]. Other negative issues related to distance learning have been also raised, including poor communication between professors and students, decreasing interactions among classmates, and interference of home affairs with online learning [61], [63]. But despite these drawbacks, many agree that the digitization of activities has brought greater flexibility and autonomy in the accomplishment of different tasks and holds out the prospect of a shift towards widespread digitization, at least in hybrid mode. Online shopping also took off during the pandemic [64], firstly because of the fear of contamination, but also due to the possibility of shopping 24/7, and the ease of finding online items. Furthermore, studies carried out during

the COVID-19 pandemic revealed that customer trust in e-commerce was a major concern [65]. Trust drivers include information quality, security concerns, ease of use, privacy and security assurance seal, and willingness to accept third-party certification, according to the same study. However study conducted in Saudi Arabia found that the trust factor were weakly correlated with e-commerce shopping [66].

In any case, whether for e-working, e-learning or e-commerce, the online mode of use is set to become more widespread and seems to be transforming our relationship with public space in the long run [21], [42], [67]. A trend that had already been in place well before the advent of the COVID-19 crisis, which only acted as an accelerating agent.

Algeria case study: COVID-19 impacts on urban uses

Mobility patterns:

In reaction to the pandemic, the authorities have taken the radical decision to forbid all forms of public transportation without any accompanying measures or minimum service, consequently penalizing millions of users [68]. While travel restrictions affected people's mobility behaviors, the perception of COVID-19 dangerousness was not necessarily responsible for a decrease in mobility, according to the study carried out by [69]. Moreover, drop in people mobility could also be attributed to the limitation of outings to the strictly necessary, for instance, usual practices such as visiting family and friends or participating in social gatherings, were consciously avoided during the pandemic wave [13].

The COVID-19 pandemic has had the effect of causing many people to choose walking, and, to a lesser degree, biking for short commuting distances [13]. The reasons behind the choice of walking as a travel mode are that walking is a way to do physical activity and the fear of being contaminated by the virus in crowded transportation. These so-called soft modes of transportation remain, however, dependent on the availability of proximity facilities and shops, which is not always the case. In addition, the observation of the streets configuration in Algerian cities lets us assume that pedestrian

circulation is not always favored, due to the bad condition of sidewalks and their narrowness that does not allow the maintaining of a physical distance between people [70]. Similarly, bicycle use is not at all encouraged, given the total absence of bicycle paths that ensure the safety of cyclists [13], [70].

Regarding long-distance commuting, and in the absence of any means of transportation, be they mass transit (bus/train/subway/trolley) or shared or individual taxis during the lockdown, the use of clandestine taxis became unavoidable [71], which resulted in a double negative effect: on passengers because the fares were more expensive during the period of restrictions and the rarity of the offer that they involved, and on taxi services sector affected by disloyal competition from illegal cabs. The transportation problem did not concern people owning cars, except during the total containment, when all travel was submitted for authorization [72]. The question of whether the pandemic has impacted car use has not yet been addressed by studies on the Algerian case, but two essential facts allow us to sketch out an answer. On one side, the dysfunction of the transportation system exacerbated by the current pandemic [73] has the effect of discouraging car owners from giving up using their cars [74], and on the other side, the crisis in the automobile market following the lengthy suspension of imports, has affected car prices and made it difficult to purchase a new car by a large part of the population [75]. This statement leads us to conclude that the impact of the pandemic on the modal shift to car use could only be minor, and the trend is toward maintaining the same level of pre-COVID-19 car use.

Public space use patterns:

Studies that addressed public space use and mobility patterns issues in the Algerian context are unfortunately few and far between. However, the results provide us with preliminary lessons, given the socio-economic and cultural homogeneity between the cities of the country. Regarding the use of public space, the results of the work conducted by [76] in the city of Anaba during the second wave of COVID-19 (01/12/2020; 22/12/2020) show a significant decrease in public spaces attendance.

According to the study, the main reasons for this reluctance are the fear of catching the virus in spaces that are often overcrowded owing to their small size, failure to comply with the barrier gestures, and inadequate maintenance of such areas. Therefore, the SARS-COVID-2 pandemic has engendered an unprecedented decrease in social interaction because of the forced decrease in public space attendance [77]. However, some neighborhoods' residents were continuing to practice their outside daily activities in narrow streets, in public interstitial spaces between buildings, and even on roof terraces [78], which were used among others for performing collective prayer when mosques were closed during the lockdown [77], [79].

The importance of green space for health and well-being was raised by the respondents of the study carried out by [76] and by opinions gathered in the work conducted by [80]. Unfortunately, cities in Algeria lack green spaces, and when they exist, they are mostly poorly maintained or unsafe [81]–[84], which could have a dissuasive effect on the frequentation of these spaces before as well as during the COVID-19 pandemic.

Increase in online uses:

The health restrictions that have led to a decrease in mobility and public space attendance have concurrently incentivized individuals to switch towards online uses. Online chat and social networks have replaced face-to-face meetings and exchanges. For activities involving large gatherings of people, we highlight three notable developments: orientation towards E-commerce E-working and E-learning, which constitute effective solutions when social distancing becomes a necessity to prevent the spread of COVID-19.

E-commerce and electronic payment: Electronic commerce and transactions have grown compared to the pre-COVID-19 era background [85]. In response to this trend, online sites have intensified their advertising activities to attract more customers [86]. Online sites such as Jumia, Batolis, Neqdilek..., have seen their subscribers increase significantly since 2019 [87]. In addition, an electronic payment integration platform was launched in April 2021, targeted at online merchants [88]. But despite these

developments accelerated by containment measures, overall Algerian consumers still manifest a distrust towards this purchasing mode and the quality of products sold; to that can be added the lack of familiarity with online shopping and complicity in using sales websites [86].

E-learning: One of the main consequences of the coronavirus pandemic advent is the closure of education and higher education establishments early, two weeks after the start of the outbreak, which was conducted over the period of March 2020 to the return of the school year. Afterwards, a series of school closures was undertaken, which gave rise to distance learning, a little-known concept in Algeria for both universities and schools [89]. Indeed, to not penalize the education of some 10 million pupils at all education levels [90] and 1.5 million students in higher education [91], the ministries in charge of the two sectors have decided to switch to distance learning. In the absence of floors and platforms dedicated to the education levels, the sector leadership has launched a YouTube channel and some sites to support distance learning [92]; unfortunately, many do not have computers or mobile devices and not even an internet connection, so the most democratic option was television [89]. Regarding the Higher Education sector, the universities throughout the national territory have ensured the prosecution of teaching by using the e-learning Moodle platform [93], along with the employment of video conferencing applications. Before the COVID-19 restrictions, distance learning was very limited, but the application of this mode of teaching on a relatively large scale and its adoption by university teachers during the lockdown periods led the Ministry of Higher Education and Scientific Research to institute the generalization of distance learning with on-site teaching in higher education establishments starting from semester two of the 2022-2023 academic year [94]. However, the project's implementation would face the following challenges: lack of videoconferencing equipment and rooms and of qualified personnel to handle this equipment, slow internet speed and connection dropouts; and lack of availability of equipment for online learning among students [95]. Integrating e-learning

has helped to raise awareness of the conditions for its implementation and the need to provide all the human and material means and resources, as well as effective training for teachers, staff, and students, to promote its integration into pedagogical practices.

E-Working: More than in any other circumstance, COVID-19 has forced the Algerian authorities to issue regulations favoring teleworking, hitherto little or not practiced, to reduce physical contact between employees and between employees and third parties [96]. The executive Decree no. 20-69 of March 21, 2020, on measures to prevent and combat the Coronavirus spread, incites to take all possible actions to encourage remote working in compliance with current labor laws and regulations. This shift to telecommuting has taken place mainly in the communications, media, IT, and telecoms sectors, and generally in the tertiary sector, whether public or private institutions and companies, which are the most conducive to telecommuting. However, the lion's share will go to the education and higher education sectors due to the obligation to provide distance courses through digital platforms and TV and YouTube channels (Ministerial notes: no. 288/2020 of 29 February 2020; no. 416/2020 of 17 March 2020; no. 444/2020 of 23 March 2020, and no. 898/2020 of 26 August 2020), to ensure continuity of learning during the health crisis. Surveys carried out among teleworkers [97], [98] reveal a widespread appreciation of the principle of des-pacialization of the workplace, and rightly so, since this type of work allows indeed: flexibility and better management of time and organization of work and day-to-day life, reduction in travel and thus saving time and costs associated with travel, catering, and beverages, as well as reduction of fatigue and stress experienced during working days, and greater efficiency and commitment at work. As for the main negative points, respondents cite the encroachment of professional life on private life and the loss of contact with colleagues, which can lead to social isolation. But this can be qualified by the fact that a good number of respondents claimed that teleworking in a confinement situation has mostly affected their personal lives. This forced shift to online working has not been without revealing

the difficulties that stand in the way of adopting this mode of working, mainly the insufficient speed of the Internet, along with the unavailability of computer equipment for employees [99]. Another set of difficulties highlighted by these studies relates to teleworking conditions. In fact, due to cramped housing conditions combined with high occupancy rates, teleworkers generally have no dedicated workspace, which hinders work productivity in a climate where the work-at-home culture is completely absent. In addition, the absence of an adequate legislative framework governing the telecommuting field constitutes a brake on its deployment. Texts issued in the heat of a health emergency do not sufficiently clarify the notion of teleworking nor define the rights and duties of each party (employer-employee), leaving companies at a loss as to how to manage human resources in this specific case [100]. But despite these constraints, the survey respondents said they intended to continue teleworking or would like to see it extended in the future, provided the government allocates adequate resources for its development.

Examination of the Algerian case reveals a lack of studies, particularly on the two aspects of use of public space and mobility, as well as related perceptions. This may be due to the difficulty of undertaking surveys during the pandemic. As a result, it is difficult to provide a complete picture of the situation of urban uses during the COVID-19 pandemic. That said, the results obtained show both similarities with the observations gathered by the studies reviewed, and local specificities linked to the country's socio-economic and political context.

Discussion: Lessons for urban planning and design

Public open space for all

The pandemic has highlighted the importance of public open spaces as arenas of sociability as well as several forms of human activities, and in providing moments of freedom after a period of dreadful lockdown [101]. Increasing all forms of open spaces (green spaces, squares, play areas, walkways, etc.), turns out, therefore, to be crucial to ensure equal access for all residents, including those from marginalized areas, and to prevent overcrowding. In

this sense, it is also important to rethink public spaces and develop designs more adapted to the requirements of social distancing. On a city scale, large spaces are necessary to accommodate the growing flow of visitors, who need to be able to move around efficiently and safely. Furthermore, especially during pandemic episodes, neighborhoods require local public spaces (playgrounds, squares, and pedestrian alleys) where residents can play, relax, stroll, and get some fresh air. To this end, urban designers should introduce a hierarchy of places, from public and semi-public spaces to nearby semi-private open spaces [102]. Such organization helps prevent congestion in public spaces during pandemics.

The existing street system could also contribute to increasing the public space supply, through the widening of sidewalks and even the conversion of streets into pedestrian spaces. These measures are all the more important in developing countries where, besides the traffic function, informal trade occupies the sidewalks, leaving little room for pedestrians to walk safely [103]. In this respect, some temporary urban transformations experimented worldwide in order to allow the observance of social distancing [104], should serve as a test bed for changes that may become permanent. In addition, these responses to the pandemic crisis have further strengthened the trend toward pedestrianization and the development of soft modes of transportation that have been underway in recent decades, especially in Western countries [105]. Several projects were launched, such as the new pedestrian area in the heart of Brussels [106], the Barcelona Superblock model [107], the pedestrianization of Oxford, and so on. Initiatives aimed at relieving the city center of cars and their associated nuisances and enhancing the overall quality of life for the residents. This trend is particularly notable in a context where allocating public spaces to individuals gains importance as a means of containing the risk of viral contamination.

The undeniable benefits of green spaces for the well-being and mental health of citizens during lockdown periods were reported as more essential than before, as they allow for the enjoyment of a variety of physical, social,

and cultural activities, with a lower risk of infection [108]. Hence, ensuring access to green spaces for all represents a challenge for future cities [109], and in particular, to mitigate the effects of pandemics on the physical and mental health of residents. This is even more important for developing countries where cities suffer from a lack of green spaces for their growing populations [110]. It is, therefore, strongly recommended increasing the green spaces portion in the city by incorporating them into the implementation of a green network composed of green spaces of various sizes, allowing a diversity of functions and uses [111]; and especially nearby green areas for accessibility, even during travel restrictions mandated by the pandemic. In this respect, green roofs, with their proven effects on social well-being and attachment to place, could fill the gap left by the lack of nearby space available for ground-level green spaces [112]. This type of development is already very common in cities such as Toronto, Chicago, Berlin, and Singapore, all of which have adopted strong incentive policies to promote their implementation in order to reduce the urban heat island effect, improve air quality, and contribute to storm-water management [113]. Overall, achieving resilient cities to withstand COVID-19 and future shocks, challenges land-use policies on the need to put open space back at the heart of urban development, whether in terms of new urbanization or urban renewal projects.

Safe travel and transportation

It is recognized that the risk of infection is higher on public transport than on other modes. However, it remains vital for low-income social groups, especially long-distance travel [31]. That is why keeping the current transportation system is contingent upon strict compliance with health protocols. Nevertheless, implementing health restrictions has affected the low-income population's travel, as the reduction in seating capacity has led public transport owners to increase ticket prices to compensate for the income loss during the pandemic [114]. Moreover, such a measure may have negative consequences for the economic viability of urban transport in the long run

[115]; without overlooking the effect of the increase in remote activities (e-work, e-learning, etc.) on people's mobility and, consequently, on public transport use [25]. Therefore, governments need to support public transport, increase transport supply, and, particularly, develop multimodal transport systems that allow for more efficient passenger travel. These measures are all the more paramount in developing countries, where public transport is mostly insufficient, making it difficult to enforce social distancing [116]. In these countries, restructuring the public transport system is of prominent importance, especially by prioritizing low- and zero-emission and energy-efficient modes such as rail, electric buses, and Bus Rapid Transit (BRT) systems. Moreover, it would be necessary to control the private sector and even reactivate the public sector to improve the quality of service and to face the spread of the disease. Besides that, there are some technical solutions, such as using HEPA filters or UV disinfection technology, that allow to mitigate viral transmission in public transport [117]. Maintaining an adequate supply of public transport services enabling safe travel also aims to discourage the mass return to the individual car among more affluent populations.

On the other side, we have seen that the experience of living with the pandemic has made people more willing to adopt walking or biking in their daily commute, so local authorities should consider urban interventions that promote these modes of travel, which are also beneficial to health. Along with ecological and health benefits, this type of travel contributes to cities' resilience to pandemics because the increase in the amount of space dedicated to pedestrians and bicycles allows for the respect of social distancing. However, the street configuration observation in developing country cities suggests that soft mobility is not always favored because of the poor condition and narrowness of sidewalks and the almost total absence of urban bicycle paths that make displacement safer. The rehabilitation of sidewalks and the development of pedestrian and bike pathways should be a critical part of urban planning options in such countries to increase

resilience to pandemics. Moreover, communities should strive to improve walkability within the city. Actions will then be directed towards ensuring pedestrian safety and comfort, improving the urban landscape, and strengthening the connectivity of street networks and neighborhoods to central areas [40].

Overall, mobility remains, in more than one respect, a key issue in urban and territorial planning, leading to spatial patterns that strengthen the proximity and relationships between housing, employment, and services to optimize land use and reduce motorized mobility. In this regard, the concept of the '15-minute city' advocates for planning based on proximity to services within a neighborhood [118]. This proximity to essential services would also reduce the need for communication within cities, recognized as one of the factors in the transmission of the covid-19 virus [119].

Adapting urban planning and design to digitalization

The current pandemic seems to be accelerating trends, such as the shift to remote, work, commerce, and education, as well as all kinds of virtual services delivery. This switch to digitalization has allowed, to some extent the continuation of human activities, during partial or total lockdowns. On another note, this transition to digital life will ultimately yield changes in the organization and use of urban space, which calls for rethinking of how to adapt urban design and planning to cope with the ensuing upheavals.

Teleworking will likely become part of the company practices of the future, challenging the prevailing office real estate model since companies will be looking to reduce their real estate costs, thereby lowering demand for office premises and buildings [120]. Some even predict a decline of certain business districts, which would result in a rise of the challenge of reclaiming these urban areas and transforming them into mixed-use neighborhoods [121]. Such concerns embrace the concept of adaptable building, flexibly designed so that it can be modified to meet changing needs and requirements [122]. Similarly, the spread of distance or hybrid learning is prompting the design of

adaptable buildings, as well as the reconfiguration of existing school spaces, so that they can accommodate new functions linked to learning and inclusive community activities.

Furthermore, working from home acts as a mechanism to reduce commute burden, hence it can contribute to urban sprawl and land artificialization [123]. Local authorities are therefore called to do their utmost to control the spatial growth of cities and initiate thoughtful densification operations in the outskirts already affected by urbanization [114].

Although working from home offers greater comfort and flexibility, it can also prove difficult, as it reduces face-to-face interaction and creates inequalities between employees, some of whom have limited resources and will therefore have to work in a less optimal environment than the traditional workplace. [124]. The history of telecommuting demonstrates that there are alternative locations for telecommuting, including regional telework centers and neighborhood satellite offices [125]. The increasing telecommuting may drive demand for such nearby space. Once again, recycling disused buildings or the redevelopment of space at the bottom of buildings could serve as a viable solution to accommodate this growing demand.

In terms of mass transit, widespread remote working and learning will probably lead to a drop in public transport use, jeopardizing the economic viability of this sector. With significant support from the government, the offer will have to adapt to tomorrow's world, and in this respect, specific subscriptions for teleworkers are already being considered [126], [127], alongside the development of multimodal transport systems, allowing passengers transferring from one mode of transport to another. The shift to digital work could also widen social inequalities because unlike skilled populations or *white-collar workers*, generally vehicle owners who can work remotely, the proletarian strata remain obliged to travel to work and are de facto excluded from this emancipation from dependence on public space during pandemic crises, a trend which, if continued or amplified, would affect its role as a place of social mixing, exacerbating exclusion and social inequalities [108]. Creating inclusive, safe, and

accessible public spaces is now more crucial than ever to meet the challenges of resilience to health crises. To this end, some recommendations could be implemented, such as increasing the proportion of open spaces and rethinking their design to adapt them to the demands of social distancing, making public spaces more pedestrian-friendly, more accessible to soft mobility, calmer and greener, planning for associative, recreational, sporting, and cultural activities, improving inter-neighborhood links, etc.

Furthermore, the rise of e-commerce questions the fate of commercial space in urban centers, along with management of warehouse and delivery. In retail areas, the downturn in demand for premises poses the question of the future of these spaces [128], which need to be recycled for new uses to maintain liveliness in these central areas. Household goods transport and home delivery service could have consequences in the urban areas, with an increase in vehicle traffic and parking demand [129]. Indeed, the current model based on distribution platforms located on the outskirts of urban centers has the corollary of increasing the number of kilometers traveled and multiplication of conflicts of use on roads [129]. Anticipating traffic congestion is tomorrow's challenge, so the key role assigned to urban logistics is to optimize flows and delivery time management. It is of utmost importance to implement a more coherent network of logistics facilities throughout the national territory to manage efficiently national and international goods flows and, in the heart of city centers, close to customers' homes. On the urban scale, an appropriate spatial distribution of loading and unloading areas, as well as pick-up points, will reduce distances travelled and optimize delivery routes. Such spatial organization of delivery favors transport modes adapted to short distances

(bicycles, electric cars, etc.), and thus reduces the carbon impact of this sector.

In conclusion, we have seen that the cities challenged by the latest health crisis caused by the coronavirus have been able to maintain a level of urban activity thanks to digitization. Nevertheless, vulnerable social groups in cities, especially those in developing countries, are still excluded from digital technology [62]. In response, development policies must be oriented more towards the expansion of the Internet network and the allocation of financial and material resources to ensure equal and safe access to digital technology and the Internet for these populations. On the other hand, the generalization of digitization should prompt local authorities to proactively incorporate this issue into urban planning instruments so as to take advantage of this technology while safeguarding urban quality across its social, environmental and economic dimensions.

The Figure 2 below presents the three topics examined regarding urban uses, recommended measures, and their implications for urban planning and design, aiming to foster the transition to a city resilient to health crises.

All in all, when considering the alignment of objectives and appropriate solutions that could be embraced in urban planning and design, it turns out that in the end, the current pandemic only supports already emerging trends towards a sustainable city. In other words, the pursuit and acceleration of actions already underway to achieve sustainability objectives will also support the transition to resilience against pandemic crises. Without forgetting the benefits of using ICTs, recognized during the health crisis, thereby revealing the possibilities that smart cities can offer in terms of efficiency of urban management and provision of urban services.

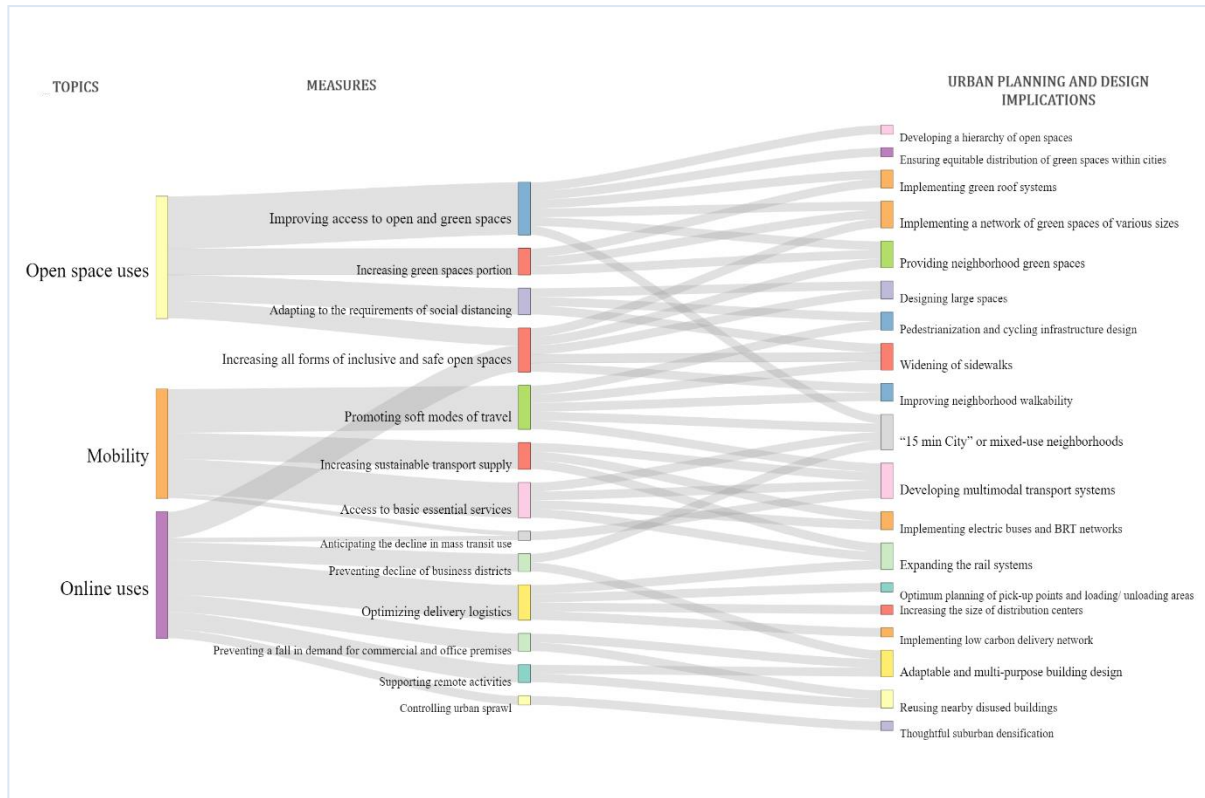


Figure 2. Urban planning and design implications

Conclusion

In this article, we have addressed the relationship between the pandemic and subsequent restrictive measures on people's urban uses of open public spaces. To this end, we have drawn up an analysis grid of urban use topics and their characterization criteria, based on a review of the literature including research papers and case-study-oriented papers carried out worldwide. It was found that the advent of the current outbreak has led to changes in public space-use patterns and mobility, particularly after the establishment of social distancing and the prohibition of public gatherings. Although these health restrictions have led to a decline in the attendance of public spaces, the pandemic has highlighted the importance of green spaces and neighborhood open spaces for health and well-being. Regarding the mobility issue, the current health crisis has had the impact of incriminating public transport in the virus' spread. Thus, the car emerged as the safest means of transportation, particularly for long journeys, whereas for short distances, this period was marked by a return to walking and

cycling. Alongside the reduction in urban use imposed by restrictive measures or fear of contamination, we are witnessing a rise in online activities, which, despite its advantages in times of crisis, risks causing significant upheavals in urban uses, and indeed in all the activities of human life. The analysis grid allows studying the impact of COVID-19 on urban uses, thereby aiding in the implementation of necessary measures to improve cities' resilience to the pandemic crisis. Its application to the Algerian case revealed similarities with the studied cases, while also highlighting local specificities associated with the country's socio-economic and political conditions. Given the above, the COVID-19 crisis is generating a great deal of debate and raising questions about the development, planning, and design of the urban environment. Taking into account the constraints imposed by this pandemic and the resulting changes in urban uses, must be part of an overall strategy of territorial requalification and urban improvement, whose key components are, accessibility for all to high-quality public spaces, travel safety and sustainable mobility,

availability of the necessary services, and last but not least, preparing cities for the digital transition. In the final resort, these actions outline the contours of the "sustainable city" project, to be carried out within a negotiated and participatory approach in which the citizen is recognized as an essential stakeholder in the planning process.

Acknowledgements

The authors would like to thank the Directorate-General for Scientific Research and Technological Development (DGRSDT) of the Algerian Ministry of Scientific Research for providing access to the resources required for this study.

References

- World Health Organization WHO, "Coronavirus disease (COVID-19)," *World Health Organization WHO*, 2023. https://www.who.int/emergencies/diseases/novel-coronavirus-2019?adgroup=survey%7D&gclid=Cj0KCQjw7uSkBhD-GARIsAM-CZNJuEftUsQcC4pP1PuUgzrpbQ36PBwERNJ1uiVqjyUPC3dr-ZU8vpgoaAknHEALw_wcB (accessed Jun. 26, 2023).
- M. Jayaweera, H. Perera, B. Gunawardana, and J. Manatunge, "Transmission of COVID-19 virus by droplets and aerosols: A critical review on the unresolved dichotomy," *Environ. Res.*, vol. 188, no. September, p. 109819, Sep. 2020, doi: 10.1016/J.ENVRES.2020.109819.
- O. L. Glavan, N. Nikolić, B. Folić, B. Vitošević, A. Mitrović, and S. Kosanović, "COVID-19 and City Space: Impact and Perspectives," *Sustainability*, vol. 14, no. 1885, pp. 1–19, Feb. 2022, doi: 10.3390/SU14031885.
- J. Sainz-Santamaria and A. L. Martinez-Cruz, "Adaptive governance of urban green spaces across Latin America – Insights amid COVID-19," *Urban For. Urban Green.*, vol. 74, no. August, p. 127629, Aug. 2022, doi: 10.1016/J.UFUG.2022.127629.
- S. A. Sarkodie and P. A. Owusu, "Global assessment of environment, health and economic impact of the novel coronavirus (COVID-19)," *Environ. Dev. Sustain.*, vol. 23, no. 4, pp. 5005–5015, Apr. 2021, doi: 10.1007/S10668-020-00801-2/FIGURES/7.
- C. Bukari et al., "Impact of COVID-19 on poverty and living standards in Ghana: A micro-perspective," *Cogent Econ. Financ.*, vol. 9, no. 1, p. 1879716, Jan. 2021, doi: 10.1080/23322039.2021.1879716.
- Y. Kang, A. Baidya, A. Aaron, J. Wang, C. Chan, and E. Wetzler, "Differences in the early impact of COVID-19 on food security and livelihoods in rural and urban areas in the Asia Pacific Region," *Glob. Food Sec.*, vol. 31, no. December, p. 100580, Dec. 2021, doi: 10.1016/J.GFS.2021.100580.
- K. Sasaki and T. Ichinose, "The Impact of the COVID-19 Pandemic on the General Public in Urban and Rural Areas in Southern Japan," *Sustain.*, vol. 14, no. 4, p. 2277, Feb. 2022, doi: 10.3390/SU14042277/S1.
- World Bank, "Cities Key to Solving Climate Crisis," *World Bank*, 2023. <https://www.worldbank.org/en/news/press-release/2023/05/18/cities-key-to-solving-climate-crisis> (accessed Jun. 26, 2023).
- S. W. Patrick et al., "Well-being of Parents and Children During the COVID-19 Pandemic: A National Survey," *Pediatrics*, vol. 146, no. 4, p. e2020016824, 2020, doi: 10.1542/peds.2020-016824.
- A. M. Rogowska, C. Kuśnierz, and A. Bokszczyński, "Examining Anxiety, Life Satisfaction, General Health, Stress and Coping Styles During COVID-19 Pandemic in Polish Sample of University Students," *Psychol. Res. Behav. Manag.*, vol. 13, pp. 797–811, 2020, doi: 10.2147/prbm.s266511.
- A. Layachi and M. J. Schuelka, "The Impact of the COVID-19 Related School Closure on the Mental Health and Well-Being of Children with SEN and Their Parents in Algeria," *Int. J. Disabil. Dev. Educ.*, pp. 1–18, 2022, doi: 10.1080/1034912X.2022.2092080.

13. S. E. Boutebal, A. Madani, and C. R. Bryant, "COVID-19 pandemic: rapid survey on social and mobility impact in Algerian cities," *J. Public Heal.*, pp. 1–10, Jan. 2021, doi: 10.1007/S10389-020-01457-Y/TABLES/8.
14. W. Otchere-Darko, "COVID-19, spatio-epidemiology and urban planning," *Town Plan. Rev.*, vol. 92, no. 2, pp. 209–213, Mar. 2021, doi: 10.3828/TPR.2020.64/ASSET/49F6D48C-11CD-47FD-BEB9-F5C5A9DBA3C3/ASSETS/TPR.2020.64.FP.PNG.
15. A. Sharifi and A. R. Khavarian-Garmsir, "The COVID-19 pandemic: Impacts on cities and major lessons for urban planning, design, and management," *Sci. Total Environ.*, vol. 749, no. December, p. 142391, Dec. 2020, doi: 10.1016/J.SCI-TOTENV.2020.142391.
16. X. De La Barra, "Fear of epidemics: The engine of urban planning," *Plan. Pract. Res.*, vol. 15, no. 1/2, pp. 7–16, 2000, doi: 10.1080/713691875.
17. K. D. Lilley, "Urban planning after the Black Death: Townscape transformation in later medieval England (1350-1530)," *Urban History*, vol. 42, no. 1, pp. 22–42, 2015, doi: 10.1017/S0963926814000492.
18. H. A. A. Hussein, "Investigating the role of the urban environment in controlling pandemics transmission: Lessons from history," *Ain Shams Eng. J.*, vol. 13, no. 6, p. 101785, Nov. 2022, doi: 10.1016/J.ASEJ.2022.101785.
19. A. Jachnow, "What will be the Post-Pandemic Urban Path?," *URBAET*, 2020. <https://www.urbanet.info/the-post-pandemic-urban-path/>
20. L. Duhl and A. Kristin-Sanchez, "Healthy Cities and the City Planning Process," Copenhagen, 1999. [Online]. Available: <https://apps.who.int/iris/handle/10665/108252>
21. K. Mouratidis, "How COVID-19 reshaped quality of life in cities: A synthesis and implications for urban planning," *Land use policy*, vol. 111, no. December, p. 105772, Dec. 2021, doi: <https://doi.org/10.1016/j.landusepol.2021.105772>.
22. D. Kusumah and D. Aji, "Evaluation Performance Covid-19 Tasikmalaya Task Unit," *Indones. J. Soc. Sci. Res.*, vol. 2, no. 1, pp. 44–51, Jun. 2021, doi: 10.11594/IJSSR.02.01.07.
23. A. Gutiérrez, D. Miravet, and A. Domènech, "COVID-19 and urban public transport services: emerging challenges and research agenda," *Cities Heal.*, vol. 5, no. sup1, pp. S177–S180, 2021, doi: 10.1080/23748834.2020.1804291.
24. C. Amoako, K. K. Adarkwa, and M. Poku-boansi, "Effects of COVID-19 on Urban Mobility and Public Space Use in Kumasi, Ghana," in *COVID-19 and a World of Ad Hoc Geographies*, 2022, pp. 987–1007. doi: https://doi.org/10.1007/978-3-030-94350-9_55.
25. T. Campisi, S. Basbas, A. Skoufas, N. Akgün, D. Ticali, and G. Tesoriere, "The impact of covid-19 pandemic on the resilience of sustainable mobility in sicily," *Sustain.*, vol. 12, no. 21, p. 8829, 2020, doi: 10.3390/su12218829.
26. M. Abdullah, C. Dias, D. Muley, and M. Shahin, "Exploring the impacts of COVID-19 on travel behavior and mode preferences," *Transp. Res. Interdiscip. Perspect.*, vol. 8, Nov. 2020, doi: 10.1016/J.TRIP.2020.100255.
27. G. Rannard, "Coronavirus: challenge of reshaping UK cities after lockdown," *BBC*, 2020. Accessed: Oct. 24, 2021. [Online]. Available: <https://www.bbc.com/news/uk-52524807>
28. S. Das, A. Boruah, A. Banerjee, R. Raoniar, S. Nama, and A. K. Maurya, "Impact of COVID-19: A radical modal shift from public to private transport mode," *Transp. Policy*, vol. 109, no. August, pp. 1–11, Aug. 2021, doi: 10.1016/J.TRANPOL.2021.05.005.
29. M. J. Beck and D. A. Hensher, "Insights into the impact of COVID-19 on household travel and activities in Australia – The early days of easing restrictions," *Transp. Policy*, vol. 99, no. December, pp. 95–119, 2020, doi: 10.1016/j.tranpol.2020.08.004.
30. E. Sogbe, "The evolving impact of coronavirus (COVID-19) pandemic on public transportation in Ghana," *Case Stud.*

- Transp. Policy*, vol. 9, no. 4, pp. 1607–1614, 2021, doi: 10.1016/j.cstp.2021.08.010.
31. R. Basu and J. Ferreira, “Sustainable mobility in auto-dominated Metro Boston: Challenges and opportunities post-COVID-19,” *Transp. Policy*, vol. 103, no. March, pp. 197–210, 2021, doi: 10.1016/j.tranpol.2021.01.006.
 32. A. Shamshiripour, E. Rahimi, R. Shabanpour, and A. (Kouros) Mohammadian, “How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago,” *Transp. Res. Interdiscip. Perspect.*, vol. 7, no. September, p. 100216, Sep. 2020, doi: 10.1016/J.TRIP.2020.100216.
 33. R. Buehler and J. Pucher, “COVID-19 Impacts on Cycling, 2019–2020,” *Transp. Rev. ISSN*, vol. 41, no. 4, pp. 393–400, 2021, doi: 10.1080/01441647.2021.1914900.
 34. K. J. Schaefer, L. Tuitjer, and M. Levin-Keitel, “Transport disrupted – Substituting public transport by bike or car under Covid 19,” *Transp. Res. Part A Policy Pract.*, vol. 153, no. September, pp. 202–217, 2021, doi: 10.1016/j.tra.2021.09.002.
 35. M. Paydar and A. K. Fard, “The Hierarchy of Walking Needs and the COVID-19 Pandemic,” *Int. J. Environ. Res. Public Health*, vol. 18, no. 14, p. 7461, Jul. 2021, doi: 10.3390/IJERPH18147461.
 36. J. P. Ehsani, J. P. Michael, M. L. Duren, Y. Mui, and K. M. P. Porter, “Mobility Patterns Before, During, and Anticipated After the COVID-19 Pandemic: An Opportunity to Nurture Bicycling,” *Am. J. Prev. Med.*, vol. 60, no. 6, pp. e277–e279, Jun. 2021, doi: 10.1016/J.AMEPRE.2021.01.011.
 37. N. Aydin, A. O. Kuşakçı, and M. Deveci, “The impacts of COVID-19 on travel behavior and initial perception of public transport measures in Istanbul,” *Decis. Anal. J.*, vol. 2, no. March, p. 100029, 2022, doi: 10.1016/j.dajour.2022.100029.
 38. M. J. Kamelifar, B. Ranjbarnia, and H. Masoumi, “The Determinants of Walking Behavior before and during COVID-19 in Middle-East and North Africa: Evidence from Tabriz, Iran,” *Sustainability*, vol. 14, no. 7, p. 10.3390/su14073923, Mar. 2022, doi: 10.3390/SU14073923.
 39. M. Abouzid et al., “Influence of COVID-19 on lifestyle behaviors in the Middle East and North Africa Region: a survey of 5896 individuals,” *J. Transl. Med.*, vol. 19, no. 1, p. 129, Dec. 2021, doi: 10.1186/s12967-021-02767-9.
 40. A. Lotfata, A. G. Gemci, and B. Ferah, “The changing context of walking behavior: coping with the COVID-19 Pandemic in urban neighborhoods,” *Archnet-IJAR Int. J. Archit. Res.*, vol. 16, no. 3, pp. 495–516, Jan. 2022, doi: 10.1108/ARCH-09-2021-0240.
 41. S. Zeb, S. S. Hussain, and A. Javed, “COVID-19 and a way forward for restaurants and street food vendors,” *Cogent Bus. Manag.*, vol. 8, no. 1, p. 1923359, 2021, doi: 10.1080/23311975.2021.1923359.
 42. H. B. Bingöl and F. Terzi, “The Effect of COVID-19 on Leisure Related Public Space Use in Turkey,” *Pap. Appl. Geogr.*, vol. 8, no. 4, pp. 377–392, 2022, doi: 10.1080/23754931.2022.2068156.
 43. S. Hamidi and A. Zandiatashbar, “Compact development and adherence to stay-at-home order during the COVID-19 pandemic: A longitudinal investigation in the United States,” *Landsc. Urban Plan.*, vol. 205, Jan. 2021, doi: 10.1016/J.LANDURBPLAN.2020.103952.
 44. B. Steckler and T. Swift, “How are communities reallocating the street right-of-way to safely accommodate recreational and social activities during the COVID-19 pandemic?,” *COVID Mobility Works*, 2020. <https://www.covidmobilityworks.org/insights/how-are-communities-reallocating-the-street-right-of-way-to-safely-accommodate-recreational-and-social-activities-during-the-covid-19-pandemic>
 45. M. Beaudoin, P. Bergeron, G. Désilets, L. M. Emmanuelle, É. Robitaille, and A. St-Louis, “COVID-19: utilisation sécuritaire des parcs et des espaces verts urbains en contexte de déconfinement graduel,” Québec, 2020. Accessed: Oct. 26, 2021. [Online]. Available: <https://www.inspq.qc.ca/publications/3043-utilisation-parcs-espaces-verts-covid19>
 46. [R. van den Berg, “How Will COVID-19 Affect Urban Planning? |,” *TheCityFix*, 2020. [https://thecityfix.com/blog/will-covid-](https://thecityfix.com/blog/will-covid-19-affect-urban-planning/)

- [19-affect-urban-planning-rogier-van-den-berg/](#) (accessed Oct. 25, 2021).
47. F. Ugolini et al., "Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study," *Urban For. Urban Green.*, vol. 56, no. December, p. 126888, Dec. 2020, doi: 10.1016/J.UFUG.2020.126888.
 48. D. (Christina) Geng, J. Innes, W. Wu, and G. Wang, "Impacts of COVID-19 pandemic on urban park visitation: a global analysis," *J. For. Res.*, vol. 32, no. 2, pp. 553–567, Apr. 2021, doi: 10.1007/S11676-020-01249-W.
 49. J. Xie, S. Luo, K. Furuya, and D. Sun, "Urban parks as green buffers during the COVID-19 pandemic," *Sustain.*, vol. 12, no. 17, p. 6751, 2020, doi: 10.3390/SU12176751.
 50. P. L. Marconi, P. E. Perelman, and V. G. Salgado, "Green in times of COVID-19: urban green space relevance during the COVID-19 pandemic in Buenos Aires City," *Urban Ecosyst.*, vol. 25, no. 3, pp. 941–953, 2022, doi: 10.1007/s11252-022-01204-z.
 51. T. Noszczyk, J. Gorzelany, A. Kukulska-Kozieł, and J. Hernik, "The impact of the COVID-19 pandemic on the importance of urban green spaces to the public," *Land use policy*, vol. 113, no. February, p. 105925, 2022, doi: 10.1016/j.landusepol.2021.105925.
 52. M. Borgi, B. Collacchi, F. Cirulli, and E. Medda, "Reduction in the use of green spaces during the COVID-19 pandemic and its impact on mental health," *Health Place*, vol. 83, no. September, p. 103093, Sep. 2023, doi: 10.1016/J.HEALTH-PLACE.2023.103093.
 53. D. Turnbull, R. Chugh, and J. Luck, "Transitioning to E-Learning during the COVID-19 pandemic: How have Higher Education Institutions responded to the challenge?," *Educ. Inf. Technol.*, vol. 26, no. 5, pp. 6401–6419, 2021, doi: 10.1007/s10639-021-10633-w.
 54. R. Winangsih, D. Sagita, and B. Mujtaba, "Media and Face-to-Face Communication Behavior Serang District Communities in Conditions Reducing Cases of Covid-19," *Indones. J. Soc. Sci. Res.*, vol. 3, no. 2, pp. 102–112, Dec. 2022, doi: 10.11594/IJSSR.03.02.06.
 55. A. Przybylowski, S. Stelmak, and M. Suchanek, "Mobility behaviour in view of the impact of the COVID-19 pandemic-public transport users in gdansk case study," *Sustain.*, vol. 13, no. 1, p. 364, 2021, doi: 10.3390/su13010364.
 56. P. F. Franco and M. L. D'Abundo, "Turned on or Off by Telework? Perceptions of Quality of Life While Working from Home in the United Kingdom During the COVID-19 Pandemic," *Am. J. Qual. Res.*, vol. 8, no. 1, pp. 1–21, 2024, doi: 10.29333/ajqr/14013.
 57. M. Sousa-Uva, A. Sousa-Uva, M. M. e Sampayo, and F. Serranheira, "Telework during the COVID-19 epidemic in Portugal and determinants of job satisfaction: a cross-sectional study," *BMC Public Health*, vol. 21, no. December, p. 2217, Dec. 2021, doi: 10.1186/S12889-021-12295-2/TABLES/2.
 58. B. A. Mostafa, "The Effect of Remote Working on Employees Wellbeing and Work-Life Integration during Pandemic in Egypt," *Int. Bus. Res.*, vol. 14, no. 3, pp. 41–52, Feb. 2021, doi: 10.5539/IBR.V14N3P41.
 59. T. F. Qazi, M. Z. Shaukat, A. A. K. Niazi, and A. Basit, "Evaluating the Immediate Response of Country-Wide Health Systems to the Covid-19 Pandemic: Applying the Gray Incidence Analysis Model," *Front. Public Heal.*, vol. 9, p. 635121, Jul. 2021, doi: 10.3389/FPUBH.2021.635121/BIBTEX.
 60. S. Grynyuk, O. Kovtun, L. Sultanova, M. Zheludenko, A. Zasluzhena, and I. Zaytseva, "Distance Learning During the COVID-19 Pandemic: The Experience of Ukraine's Higher Education System," *Electron. J. e-Learning*, vol. 20, no. 3, pp. 242–256, 2022, doi: 10.34190/ejel.20.3.2198.
 61. N. Salmani, I. Bagheri, and A. Dadgari, "Iranian nursing students experiences regarding the status of e-learning during COVID-19 pandemic," *PLoS One*, vol. 17, no. 2, p. e0263388, 2022, doi: 10.1371/journal.pone.0263388.
 62. A. R. Alsoud and A. Ali Harasis, "The Impact of COVID-19 Pandemic on Student' s E-

- Learning Experience in Jordan," *J. Theor. Appl. Electron. Commer. Res.*, vol. 16, no. 5, pp. 1404–1414, 2021, doi: <https://doi.org/10.3390/jtaer16050079>
63. K. ; Stecuła, R. Wolniak, K. Stecuła, and R. Wolniak, "Advantages and Disadvantages of E-Learning Innovations during COVID-19 Pandemic in Higher Education in Poland," *J. Open Innov. Technol. Mark. Complex. 2022, Vol. 8, Page 159*, vol. 8, no. 3, p. 159, Sep. 2022, doi: 10.3390/JOITMC8030159.
 64. N. M. Kitukutha, L. Vasa, and J. Oláh, "The Impact of COVID-19 on the economy and sustainable e-commerce," *Forum Sci. Oeconomia*, vol. 9, no. 2, pp. 47–72, Jun. 2021, doi: 10.23762/FSO_VOL9_NO2_3.
 65. M. S. Alzaidi and G. Agag, "The role of trust and privacy concerns in using social media for e-retail services: The moderating role of COVID-19," *J. Retail. Consum. Serv.*, vol. 68, no. September, p. 103042, Sep. 2022, doi: 10.1016/J.JRETCONSER.2022.103042.
 66. S. S. Al Hamli and A. E. E. Sobaih, "Factors Influencing Consumer Behavior towards Online Shopping in Saudi Arabia Amid COVID-19: Implications for E-Businesses Post Pandemic," *J. Risk Financ. Manag. 2023, Vol. 16, Page 36*, vol. 16, no. 1, p. 36, Jan. 2023, doi: 10.3390/JRFM16010036.
 67. Y. Vereycken, K. Lenaerts, L. Meylemans, F. Naedenoen, and S. Bernard, "La digitalisation des services publics belges: L'impact sur la prestation de services, le travail et la stratégie syndicale," 2020. Accessed: Oct. 24, 2021. [Online]. Available: <https://www.lacsc.be/csc-services-publics-congres-2021/documentation-et-continuu>
 68. M. Ouchichi and H. Bouguenoune, "Economic Crisis and Covid-19 in Algeria : An institutional analysis," 2021. [Online]. Available: <https://en.issra-dz.org/crise-economique-et-covid-19-en-algerie-une-gestion-revelatrice-de-la-fragilite-institutionnelle/>
 69. L. Idres, M. Lassassi, F. Djani, and N. Yousfi-halimi, "Algerian perception on COVID-19 and its impact on post lockdown mobility: a survey study," *les Cah. du Cread*, vol. 36, no. 3, pp. 285–318, 2020, [Online]. Available: <https://www.ajol.info/index.php/cread/article/view/202204>
 70. D. El Mestari, S. Mouloudji, A. Mohand-Amer, K. Mokeddem, F. Nouar, and A. Belegheerras, "Covid-19 en Algérie : enseignements et regards croisés (premiers éléments de réflexion)," 2020. Accessed: Apr. 13, 2022. [Online]. Available: <https://crasc.dz/index.php/fr/bulletins-et-rapports/covid-19-et-la-société-premières-lectures/covid-19-en-algérie-enseignements-et-regards-croisés-premières-éléments-de-réflexion>
 71. [R. Nasri, "Transports interwilayas: Tous les moyens sont bons! – Algeria-Watch," *Algeria-Watch*, 2020. Accessed: Apr. 16, 2022. [Online]. Available: <https://algeria-watch.org/?p=74604>
 72. A. Benali, "Covid-19 : Liste des 29 wilayas concernées par les mesures de circulation," *ALGERIE ECO*, 2020. [Online]. Available: <https://www.algerie-eco.com/2020/07/10/covid-19-liste-des-29-wilayas-concernees-par-les-mesures-de-circulation/>
 73. S. Souiah, R. Nourine, and N. Bakhti, "Le transport collectif dans la deuxième grande ville algérienne (Oran) : avant , pendant la pandémie de la Covid-19 et perspectives en situation de déconfinement," in *Les ouvrages du CRASC : SOCIÉTÉ(S) ET PANDÉMIE*, no. 2, CRASC, 2022, pp. 173–187. [Online]. Available: <https://ouvrages.crasc.dz/index.php/fr/les-ouvrages/1196-société-s-et-pandémie>
 74. F. Z. Djekrif, L. Bouyaya, and R. Chaib, "Towards a Better Understanding of the Reasons for the Extensive Use of Private Cars: a Case Study in Skikda, Algeria," *Transp. Probl.*, vol. 17, no. 4, pp. 103–114, 2022, doi: 10.20858/TP.2022.17.4.09.
 75. S. Hamza, "Automobile : le marché algérien s'enfonce dans une crise endémique," *Algérie Expat A-E*, 2022. Accessed: Apr. 16, 2022. [Online]. Available: <https://www.algerie-expat.com/actualite/automobile-le-marche-algerien-senfonce-dans-une-crise-endémique/10248/>
 76. R. M. Bachtarzi, D. Alkama, and H. Salah-Salah, "Urban Public Space in The Context of

- a New Era, Case of Annaba City-Algeria," pp. 681–684, 2021, doi: 10.38027/ic-caua2021199n3.
77. B. Melis, J. A. Lara Hernandez, Y. M. Khemri, and A. Melis, "Shifting the Threshold of Public Space in UK, Algeria and Mexico during the COVID-19 Pandemic," *J. Public Sp.*, vol. 5, no. 3, pp. 159–172, 2020, doi: 10.32891/jps.v5i3.1387.
 78. [78] A. Messaoudene and M. Belmahi, "Social Distancing and Its Effect on Social Connectedness in the Algerian Society," *Int. J. Soc. Sci. Humanit. Invent.*, vol. 7, no. 05, pp. 5958–5968, 2020, doi: 10.18535/ijsshi/v7i05.04.
 79. Observatoire-Pharos, "L'impact du Covid-19 sur les manifestations et rites musulmans en Algérie – Observatoire Pharos," 2020. <https://www.observatoirepharos.com/pays/algerie/limpact-du-covid-19-sur-les-manifestations-et-rites-musulmans-en-algerie/> (accessed Apr. 13, 2022).
 80. N. Noui, D. R. Saffeddine, and khaled Harizi, "Detecting changes in land occupation and use (between 1984-2021) using 'GEE' and GIS tools: focus on the green structure of the future metropolis of Annaba (north-east Algeria)," *Indones. J. Soc. Sci. Res.*, vol. 4, no. 2, pp. 155–170, Nov. 2023, doi: 10.11594/IJSSR.04.02.08.
 81. M. Mili, H. Boutabba, and S. D. Boutabba, "Urban nature: Quantitative and qualitative degradation of urban green spaces, case of the steppe city of M'sila, Algeria," *urbe. Rev. Bras. Gestão Urbana*, vol. 11, p. e20180138, 2019, doi: 10.1590/2175-3369.011.e20180138.
 82. A. Djefel, "Ville et problématique urbaine en Algérie: constat et perspective," *Ann. des Sci. Soc. Hum. l'Université Guelma*, vol. 5, no. 1, pp. 45–53, 2011, Accessed: Apr. 11, 2022. [Online]. Available: <https://www.asjp.cerist.dz/en/article/27929>
 83. M. Ouzir, B. Khalfallah, S. Dehimi, and A. aKdi Ahmed, "Quantitative and qualitative assessment of urban green spaces in Bousaada City, Algeria using remote sensing techniques," *J. Geogr. Reg. Plan.*, vol. 14, no. 3, pp. 123–133, Aug. 2021, doi: 10.5897/JGRP2021.0831.
 84. C. A. Mensah, "Urban Green Spaces in Africa: Nature and Challenges," *Int. J. Ecosyst.*, vol. 4, no. 1, pp. 1–11, 2014, doi: 10.5923/j.ije.20140401.01.
 85. M. Benai, S. Guettafi, and S. Larab, "The impact of the Covid-19 pandemic on e-commerce in Algeria," *Rev. des Sci. Adm. Financ.*, vol. 05, no. 02, pp. 560–573, 2021, doi: 10.37644/1939-005-002-030.
 86. N. Chanoune and M. Boukrif, "The effect of containment caused by the pandemic COVID-19 on the e-commerce sector in Algeria," *Rev. Algérienne d'Economie Gest.*, vol. 15, no. 02, pp. 898–910, 2021, Accessed: Mar. 06, 2023. [Online]. Available: <http://www.sante.gov.dz/13>
 87. Comparili.net, "Top 10 e-commerce Algérie : classement des meilleurs sites web de vente en ligne - Comparili.net," 2023. <https://comparili.net/hub/top-ecommerce-algerie-classement-sites-vente/> (accessed Mar. 11, 2023).
 88. CIB Web, "GIE Web Marchand : Plateforme d'intégration de paiement électronique," 2023. <https://www.cibweb.dz/fr/home> (accessed Mar. 11, 2023).
 89. H. Zermane and S. Aitouche, "Digital Learning with Covid-19 in Algeria," *Int. J. 3D Print. Tech. Dig. Ind.*, vol. 4, no. 2, pp. 161–170, 2020, doi: 10.46519/ij3dptdi.776978.
 90. ONS, "Les principaux indicateurs du secteur de l'éducation nationale," no. 915. Algiers, p. 20, 2020. doi: 10.3917/rindu1.214.0089.
 91. [91] MESRS, "Rapport sur la situation de l'enseignement supérieur," Algiers, 2022. Accessed: Mar. 15, 2023. [Online]. Available: <https://whec2022.net/resources/Country report - Algeria.pdf>
 92. M. Ait Aissa and F. Tebaa, "The Shift to E-Learning during Covid-19 in Algeria: Case study of YouTube and ONEFD website for Baccalaureate students," *Rev. El-Tawassol*, vol. 28, no. 01, pp. 252–260, 2022.
 93. E. Zigh, R. H. Abdalli, and B. Kouninef, "Impact of E-Learning on INTTIC Students during the COVID-19 Ehlem," *J. Educ. e-*

- Learning Res.*, vol. 9, no. 1, pp. 28–37, 2022, doi: 10.20448/jeelr.v9i1.3738.
94. L. Louifi, "Enseignement supérieur: La plate-forme « Moodle » généralisée – Le Jeune Indépendant," *Le jeune indépendant*, Algiers, 2023. Accessed: Mar. 17, 2023. [Online]. Available: <https://www.jeune-independant.net/enseignement-superieur-la-plate-forme-moodle-generalisee/>
 95. N. Madene, "L'intégration du e-learning aux Universités Algériennes: Réalisations et Contraintes," *Al Bashaer Econ. J.*, vol. VII, no. 02, pp. 941–954, 2021, [Online]. Available: <https://www.asjp.cerist.dz/en/downArticle/196/7/2/161135>
 96. A. Rachedi, "Le télétravail en période de la pandémie de la Covid-19," *La Rev. des Sci. Gest.*, vol. 3, no. 315–316, pp. 81–9, 2022, [Online]. Available: <https://www.cairn.info/revue-des-sciences-de-gestion-2022-3-page-81.htm>
 97. R. Benghebrid, A. Guedjali, N. Lounici, H. Guernoub, and L. Fairouz, "Le télétravail pendant la pandémie de la covid-19 en Algérie: état des lieux et perspectives de développement," Alger, 2021. [Online]. Available: <https://www.cread.dz/les-series-covid/>
 98. N. Mebarki, "Télétravail en période de crise sanitaire: Etat des lieux de quelques entreprises Algériennes," *Les Cah. Du Cread*, vol. 39, no. 1, pp. 157–184, 2023, doi: 10.4314/cread.v39i1.6.
 99. R. Benghebrid, H. Guernoub, and A. Guedjali, "Le management en télétravail en Algérie: effets et défis," *Econ. Res. Rev. VOL10,NO*, vol. 10, no. 2, pp. 65–75, 2022, [Online]. Available: <https://www.asjp.cerist.dz/en/article/210752>
 100. A. Benredjhal, "La problématique du télétravail dans la législation algérienne comme modèle moderne d'organisation du travail pendant la pandémie de COVID19," *les Cah. du cread*, vol. 36, no. 3, pp. 581–608, Dec. 2020, doi: 10.4314/cread.v36i3.
 101. A. Lak, S. S. Asl, and A. Maher, "Resilient urban form to pandemics: Lessons from COVID-19," *Med. J. Islam. Repub. Iran*, vol. 34, p. 71, 2020, doi: 10.34171/MJIRI.34.71.
 102. M. Amirzadeh, S. Sobhaninia, S. T. Buckman, and A. Sharifi, "Towards building resilient cities to pandemics: A review of COVID-19 literature," *Sustain. Cities Soc.*, vol. 89, no. February, p. 104326, Feb. 2023, doi: 10.1016/J.SCS.2022.104326.
 103. A. H. Salama, A. Wanas, and N. M. Abdel-Moneim, "Transforming Cairo's downtown with tactical urbanism: Translating informal activities into formal enhancements for a thriving urban life," *Ain Shams Eng. J.*, vol. 15, no. 3, p. 102504, Mar. 2024, doi: 10.1016/J.ASEJ.2023.102504.
 104. R. Steuteville, "Cities converting streets to public space in coronavirus crisis | CNU," *A CNU Journal*, 2020. Accessed: Apr. 13, 2023. [Online]. Available: <https://www.cnu.org/publicsquare/2020/05/19/cities-converting-streets-public-space-coronavirus-crisis>
 105. O. H. Hagen and A. Tennøy, "Street-space reallocation in the Oslo city center: Adaptations, effects, and consequences," *Transp. Res. Part D Transp. Environ.*, vol. 97, no. August, p. 102944, Aug. 2021, doi: 10.1016/J.TRD.2021.102944.
 106. G. te Boveldt, L. De Wilde, I. Keseru, and C. Macharis, "Pedestrianisation as a step in a societal transformation? An analysis of support and opposition in Brussels," *Cities*, vol. 143, no. December, p. 104577, Dec. 2023, doi: 10.1016/J.CITIES.2023.104577.
 107. N. Mueller et al., "Changing the urban design of cities for health: The superblock model," *Environ. Int.*, vol. 134, no. January, p. 105132, Jan. 2020, doi: 10.1016/J.ENVINT.2019.105132.
 108. J. Honey-Rosés et al., "The impact of COVID-19 on public space: an early review of the emerging questions-design, perceptions and inequities," *Cities Heal.*, vol. 5, no. sup1, pp. S263–S279, 2020, doi: 10.1080/23748834.2020.1780074.
 109. J. R. Wolch, J. Byrne, and J. P. Newell, "Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough,'" *Landsc. Urban Plan.*, vol. 125, no. May, pp. 234–244,

- 2014, doi: 10.1016/j.landurbplan.2014.01.017.
110. V. H. Heywood, "The nature and composition of urban plant diversity in the Mediterranean*," *Flora Mediterr.*, vol. 27, no. October, pp. 195–220, 2017, doi: 10.7320/FlMedit27.195.
111. N. A. Megahed and E. M. Ghoneim, "Antivirus-built environment: Lessons learned from Covid-19 pandemic," *Sustain. Cities Soc.*, vol. 61, Oct. 2020, doi: 10.1016/J.SCS.2020.102350.
112. H. A. Nguyen Dang, R. Legg, A. Khan, S. Wilkinson, N. Ibbett, and A. T. Doan, "Social impact of green roofs," *Front. Built Environ.*, vol. 8, no. 4, pp. 1–10, 2022, doi: 10.3389/fbuil.2022.1047335.
113. T. Liberalesso, C. Oliveira Cruz, C. Matos Silva, and M. Manso, "Green infrastructure and public policies: An international review of green roofs and green walls incentives," *Land use policy*, vol. 96, no. July, p. 104693, 2020, doi: 10.1016/j.landusepol.2020.104693.
114. UN-Habitat, *Cities and Pandemics: Towards a More Just, Green and Healthy Future*. Nairobi, 2021. Accessed: Oct. 06, 2021. [Online]. Available: https://unhabitat.org/sites/default/files/2021/03/cities_and_pandemics-towards_a_more_just_green_and_healthy_future_un-habitat_2021.pdf
115. A. Tirachini and O. Cats, "COVID-19 and Public Transportation: Current Assessment, Prospects, and Research Needs," *J. Public Transp.*, vol. 22, no. 1, pp. 1–21, Jan. 2020, doi: 10.5038/2375-0901.22.1.1.
116. E. Mogaji, I. Adekunle, S. Aririguzoh, and A. Oginni, "Dealing with impact of COVID-19 on transportation in a developing country: Insights and policy recommendations," *Transp. Policy*, vol. 116, no. February, pp. 304–314, Feb. 2022, doi: 10.1016/J.TRANPOL.2021.12.002.
117. B. A. Fezi, "The Role of Architecture and Urbanism in Preventing Pandemics," in *SARS-CoV-2 Origin and COVID-19 Pandemic Across the Globe*, 2021, pp. 273–292. doi: DOI: <http://dx.doi.org/10.5772/intechopen.98294>.
118. Z. Allam, M. Nieuwenhuijsen, D. Chabaud, and C. Moreno, "The 15-minute city offers a new framework for sustainability, liveability, and health," *Lancet Planet. Heal.*, vol. 6, no. 3, pp. e181–e183, Mar. 2022, doi: 10.1016/S2542-5196(22)00014-6.
119. S. Antar, A. Aboukorin, H. Han, M. Gamal, and N. Mahran, "Role of urban planning characteristics in forming pandemic resilient cities-Case study of Covid-19 impacts on European cities within England, Germany and Italy Resilience City size City density City form City connectivity," *Cities*, vol. 118, no. November, p. 103324, 2021, doi: 10.1016/j.cities.2021.103324.
120. S. Van Nieuwerburgh, "The remote work revolution: Impact on real estate values and the urban environment: 2023 AREUEA Presidential Address," *Real Estate Econ.*, vol. 51, no. 1, pp. 7–48, Jan. 2023, doi: 10.1111/1540-6229.12422.
121. Ramanath Jha, "Reimagining Central Business Districts," *Obs. Res. Found.*, no. 502, p. 15, 2021, Accessed: Jun. 19, 2023. [Online]. Available: <https://www.offonline.org/research/reimagining-central-business-districts/>
122. K. Arge, "Adaptable office buildings: Theory and practice," *Facilities*, vol. 23, no. 3–4, pp. 119–127, 2005, doi: 10.1108/02632770510578494.
123. J. de Abreu e Silva, "Residential preferences, telework perceptions, and the intention to telework: insights from the Lisbon Metropolitan Area during the COVID-19 pandemic," *Reg. Sci. Policy Pract.*, vol. 14, no. February, pp. 142–161, 2022, doi: 10.1111/rsp3.12558.
124. OIT, *Le travail à domicile en réponse à l'épidémie de COVID-19: guide de l'employeur*. Organisation internationale du Travail OIT, 2020.
125. M. E. W. Fritz, K. Higa, and S. Narasimhan, "Toward a telework taxonomy and test for suitability: A synthesis of the literature," *Gr. Decis. Negot.*, vol. 4, no. July, pp. 311–334, 1995, doi: 10.1007/BF01409777.

126. M. Gustin, "L'abonnement MAX ACTIF : mode d'emploi - SNCF Connect," *sncfconnect*, 2022. <https://www.sncf-connect.com/article/mon-forfait-annuel-teletravail> (accessed Jul. 15, 2023).
127. M. Dalley, "The 10 Best Travel Programs for Remote Workers," *CareerAddict*, 2022. <https://www.careeradict.com/work-remote-travel> (accessed Jul. 15, 2023).
128. D. Zhang, P. Zhu, and Y. Ye, "The effects of E-commerce on the demand for commercial real estate," *Cities*, vol. 51, no. January, pp. 106–120, Jan. 2016, doi: 10.1016/J.CITIES.2015.11.012.
129. J. A. Cano, A. Londoño-Pineda, and C. Rodas, "Sustainable Logistics for E-Commerce: A Literature Review and Bibliometric Analysis," *Sustain.*, vol. 14, no. 19, p. 12247, 2022, doi: 10.3390/su141912247.
130. F. Baig, K. Kirytopoulos, J. Lee, E. Tsamilis, R. Mao, and P. Ntzeremes, "Changes in People's Mobility Behavior in Greece after the COVID-19 Outbreak," *Sustain.*, vol. 14, no. 6, p. 3567, 2022, doi: 10.3390/su14063567.
131. L. Oestreich, P. S. Rhoden, J. da S. Vieira, and A. Ruiz-Padillo, "Impacts of the COVID-19 pandemic on the profile and preferences of urban mobility in Brazil: Challenges and opportunities," *Travel Behav. Soc.*, vol. 31, no. April, pp. 312–322, Apr. 2023, doi: 10.1016/J.TBS.2023.01.002.
132. Z. S. Venter, D. N. Barton, V. Gunderesen, H. Figari, and M. S. Nowell, "Back to nature: Norwegians sustain increased recreational use of urban green space months after the COVID-19 outbreak," *Landsc. Urban Plan.*, vol. 214, no. October, p. 104175, 2021, doi: <https://doi.org/10.1016/j.landurbplan.2021.104175>.
133. M. A. Habib and M. A. H. Anik, "Impacts of COVID-19 on Transport Modes and Mobility Behavior: Analysis of Public Discourse in Twitter," *Transp. Res. Rec.*, vol. 2677, no. 4, pp. 65–78, 2023, doi: 10.1177/03611981211029926.
134. N. M. Zafri, A. Khan, S. Jamal, and B. M. Alam, "Risk perceptions of COVID-19 transmission in different travel modes," *Transp. Res. Interdiscip. Perspect.*, vol. 13, no. March, p. 100548, Mar. 2022, doi: 10.1016/J.TRIP.2022.100548.
135. T. Li, X. Iogansen, and R. Stern, "Assessing the Impact of Disruptive Events on Urban Mobility: A Case Study of Chicago Taxis during COVID-19," *ACM Int. Conf. Proceeding Ser.*, pp. 141–145, May 2023, doi: 10.1145/3576914.3587708.
136. B. Ozbilen, K. M. Slagle, and G. Akar, "Perceived risk of infection while traveling during the COVID-19 pandemic: Insights from Columbus, OH," *Transp. Res. Interdiscip. Perspect.*, vol. 10, no. June, p. 100326, Jun. 2021, doi: 10.1016/J.TRIP.2021.100326.
137. M. R. Fatmi, "COVID-19 impact on urban mobility," *J. Urban Manag.*, vol. 9, no. 3, pp. 270–275, Sep. 2020, doi: 10.1016/J.JUM.2020.08.002.
138. A. Möllers, S. Specht, and J. Wessel, "The impact of the Covid-19 pandemic and government intervention on active mobility," *Transp. Res. Part A Policy Pract.*, vol. 165, no. November, pp. 356–375, Nov. 2022, doi: 10.1016/J.TRA.2022.09.007.
139. S. Korpilo, A. Kajosaari, T. Rinne, K. Hasanzadeh, C. M. Raymond, and M. Kyttä, "Coping With Crisis: Green Space Use in Helsinki Before and During the COVID-19 Pandemic," *Front. Sustain. Cities*, vol. 3, no. September, pp. 1–13, 2021, doi: 10.3389/frsc.2021.713977.
140. W. L. Rice and B. Pan, "Understanding changes in park visitation during the COVID-19 pandemic: A spatial application of big data," *Wellbeing, Sp. Soc.*, vol. 2, no. February, p. 100037, 2021, doi: 10.1016/j.wss.2021.100037.
141. M. A. Khan, Vivek, M. K. Nabi, M. Khojah, and M. Tahir, "Students' perception towards e-learning during covid-19 pandemic in India: An empirical

- study," *Sustain.*, vol. 13, no. 1, p. 57, 2021, doi: 10.3390/su13010057.
142. L. Vyas and N. Butakhieo, "The impact of working from home during COVID-19 on work and life domains: an exploratory study on Hong Kong," *Policy Des. Pract.*, vol. 4, no. 1, pp. 59–76, 2021, doi: 10.1080/25741292.2020.1863560.
143. A. Bhatti, H. Akram, and A. U. Khan, "E-commerce trends during COVID-19 Pandemic E-commerce trends during COVID-19 Pandemic," *Int. J. Futur. Gener. Commun. Netw.*, vol. 13, no. 2, pp. 1449–1452, 2020, [Online]. Available: <http://sersc.org/journals/index.php/IJFGCN/article/view/24523>
144. NetComm Suisse UN-UNCTAD, "COVID-19 and E-commerce: findings from a survey of online consumers in 9 countries." UN, p. 50, 2020. Accessed: Mar. 24, 2024. [Online]. Available: <https://digitallibrary.un.org/record/3886558>
145. OECD, "E-commerce in the time of COVID-19," *OECD Policy Responses to Coronavirus (COVID-19)*, 2020. <https://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/> (accessed Mar. 24, 2024).
146. T. Kawasaki, H. Wakashima, and R. Shibasaki, "The use of e-commerce and the COVID-19 outbreak: A panel data analysis in Japan," *Transp. Policy*, vol. 115, no. January, pp. 88–100, 2022, doi: 10.1016/j.tranpol.2021.10.023.

Appendix

Table 1. Extensive and synthetic literature review on urban uses behavior and perception during COVID-19*

	Effects of COVID-19 virus	Selected Studies	Perception	Selected studies
Mobility	Decrease	[24]; [130] [31]; [29]; [25]; [36]; [55]; [30]; [131]; [69]; [13]	Unsafe	[132]; [130] [31]; [29]; [25]; [36]; [55]; [30], [26]; [32]
Mass transit	Decrease	[26]; [132]; [31]; [29]; [2]; [25]; [36]; [34]; [30]; [15]; [21]; [133]; [131]	Unsafe	[26]; [132]; [31]; [29]; [25]; [32]; [30]; [37]; [23]; [134]
Taxis/TNCs	Increase	[132]; [30]; [71]	Safe	[24]; [30]; [37]
	Decrease	[26]; [31]; [32]; [135]	Unsafe	[26]; [31]; [32]; [136]
Private car	Increase	[26]; [31]; [29]; [34]; [55]; [27]; [28]; [133]; [137]	Safe	[26]; [31]; [32]; [29]; [37]; [134]
Active modes mobility	Increase	[26]; [34]; [36]; [15]; [33]; [133]; [13]	Safe	[26]; [37] [32]; [134]; [136]; [13]
	Decrease	[41]; [40], [39]; [131]; [138]	Unsafe	[40]; [41]
Green spaces	Increase	[132]; [139]; [140]; [49];	Safe	[132]; [139]; [140]; [49]; [47];
	Decrease	[50]; [51]; [76]	Unsafe	[50]; [51]; [52]; [76]
E-Learning	Increase	[55]; [32]; [59]; [60]; [94]	Positive	[55]; [141]; [60]; [61], [63]
			Negative	[61], [63]
E-working	Increase	[29]; [55]; [32]; [76]	Positive	[29]; [55]; [142]; [56]; [142], [57]; [58]; [97]; [98]
			Negative	[56], [142]; [58]; [97]; [98]; [99]
E-commerce	Increase	[64], [143]; [32]; [144]; [145]; [85]	Positive	[143]; [32]; [146]; [66]
			Negative	[65]; [86]

* References in bold pertain to the Algerian case.