Research Article

Urban Street Space after Covid-19: (Indicators of safe and healthy urban street space)

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Abstract
Restrictions on the movement of people and the social distancing in public urban spaces are among the main measures taken to limit the spread of Covid-19 virus. The research focuses on these measures that led to a change in the urban space organization at the street level as well as the performance and characteristics of social and recreational activities to suit those changes at the level of urban spaces (open urban spaces and urban mobility), which prompted many countries of the world to think of new models for urban street space and its urban uses in healthy and sustainable ways. The research aims to shed light on the measures followed by some global countries with a focus on the cases of Italian cities - being the most affected than the rest of the European countries during the outbreak of the Corona epidemic in the year 2020. The research assumes that flexible and sustainable space organization has an effective role in accommodating new movement patterns and events, and achieving a safe and healthy environment, then the research reached the importance of sustainable mobility plans, and a rethinking of the way we move across the city and the way we use urban street space to form a flexible space organization that controls the volume of flows and rapid response to emergency developments, thus achieving better job performance and a safe and healthy environment.

1. Introduction

At the end of January 2020, the World Health Organization (WHO) declared the new corona virus a global emergency. The main reasons for this announcement were not related to the outbreak in China but to the possible spread in the rest of the world (World Health Organization, 2020). As expected, in the next five months, the global spread of the virus has overwhelmed health systems and caused widespread social and economic disruption worldwide. Cities are not only on the front lines of the response to the epidemic, but they are also called upon to radically change their approach to such crises, from physical planning to economic and social structures. Cities are making new commitments to combat the spread of the disease and implementing new strategies, actions, rules and planning tools aimed at building a post-pandemic urban environment capable of dealing with future health crises (Klaus, 2020).

The challenge is to ensure a new right in the city that includes basic services, as well as a different lifestyle adapted to the new health crisis. "1Right to the city" is also the right to reinvent and change the shape of the city and the urban environment according to new needs (Lefebvre, 2014, pp. 101-103); It is the right to create a new model of justice in the city, opportunity and social innovation, which fights inequality, promotes a sense of community, builds local resilience and sustainability and helps cities recover from this crisis, (Secchi, 2013, pp. 3-9).

One of the causes of the spread of Coronavirus in cities is related to urban mobility, and in particular the relationship between urban street level and mobility. Therefore, we need to adopt flexible regulatory measures at the level of street space and the level of urban mobility to address these causes through sustainable urban models.

In accordance with this vision, the research paper reviews the concept of urban space after Corona and the procedures of local governments in the countries of the world and Italian cities in particular

1 An idea and slogan proposed by Henri Lefebvre in his book "Le Droit à la ville" in the year 1968, to reclaim the city as a co-created space and a place of life and social interaction separate from the growing influences of commodification and capitalism as well as the emergence of spatial inequalities in the world's cities during the past two centuries.

relating to street level regulation and urban mobility, for exploring the effectiveness of these trends in creating a safe and healthy urban environment.

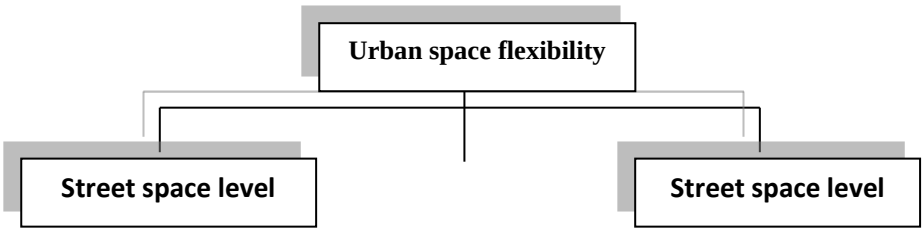

Figure 1. Strategy adopted by the research of urban space flexibility

2**. The concept of urban space after Corona**

The concept of public space changed dramatically during 2020 due to the COVID-19 pandemic, where many public spaces were closed for a long time, and regular recreational urban spaces were replaced by streets, corridors, and open parks. People have adapted to these enormous changes by exploring the surroundings of their homes and housing units.

The ongoing epidemic has strictly linked mobility, urban spaces and health (Honey-Rosés, et al., 2020), highlighting the need for immediate action in transforming cities through new sustainable models. People in cities live in less travel and change online activities. It was a great opportunity to rethink our work and leisure practices and retail habits. In particular, the most widespread measures are being directed at changing urban streets and public arenas and enhancing residents' safety. Also bearing in mind that physical distancing will be the norm for the near future. In order to respond quickly to these new needs and accommodate the reopening of businesses, many local governments are devising and adapting urban spaces to cope with this new urban situation according to the concept of controlling the volume of flows (human and mechanical from traffic movement, etc.) and the rapid response to immediate and expected changes by re-evaluating the spaces allocated for the performance of events and organizing the times of presence within the urban space. Most of the measures are aimed at promoting non-automatic mobility as well as providing public spaces and services within the city. In particular, the most widespread measures are directed at changing urban streets and public urban spaces and enhancing the safety of the population.

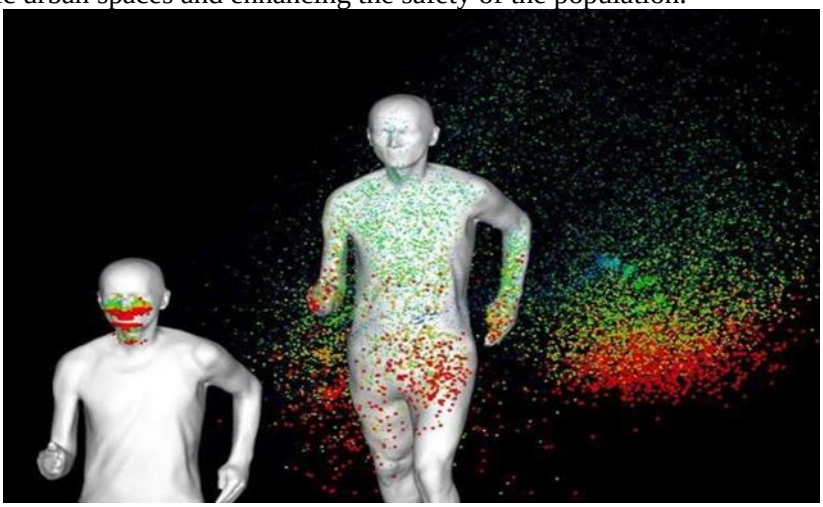

Figure 2. The virus is transmitted within a social distance between people (Shawket & El khateeb, 2020, p. 597)

In the early days of the crisis, there was much discussion about the need to expand sidewalks and redesign pedestrian crossings in order to meet physical distance recommendations (Alter, 2020). Milan city is the first to announce permanent changes, with the expansion of sidewalks, 35 km of new bike lanes and the removal of vehicle lanes (EFE, 2020). Other large cities including Boston, London, Vancouver, Brussels, New York, Paris and Barcelona have begun to reshape the streets to accommodate more cyclists and pedestrians over longer distances (Hawkins, 2020).

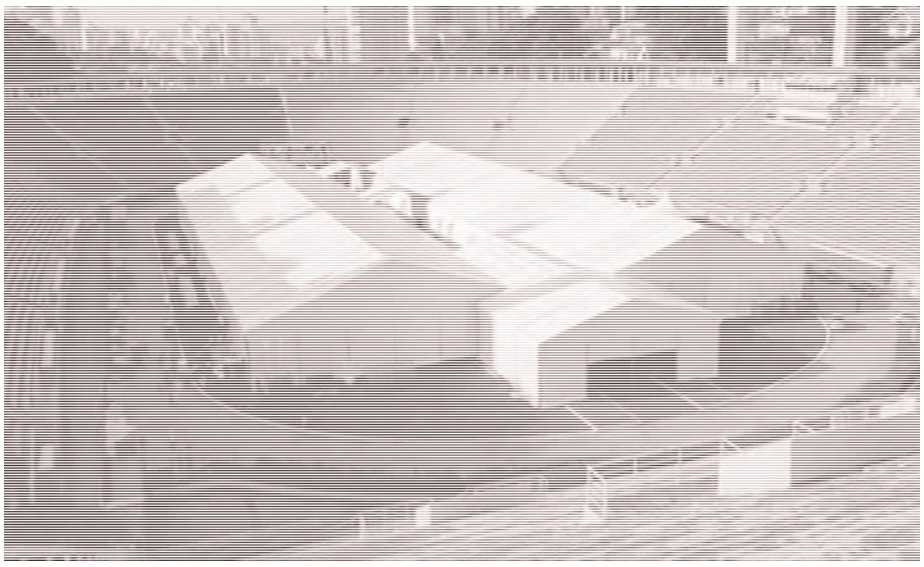

Figure 3. A field hospital inside the Pacaembú Stadium in Sao Paulo, Brazil (Oliveira, 2020)

Architect, MIT Professor Carlo Ratti and engineer Italo Rota developed in 2020 a modular intensive care unit ICU made from rehabilitated shipping containers.These units can be quickly deployed and replicated in cities around the world for their flexible design that responds instantly to the shortage of intensive care space in hospitals and the spread of COVID-19. The idea is to create temporary structures that can be deployed quickly, like traditional hospital tents, but with a high level of bio-containment to prevent the spread of the virus, (www.dezeen.com.).

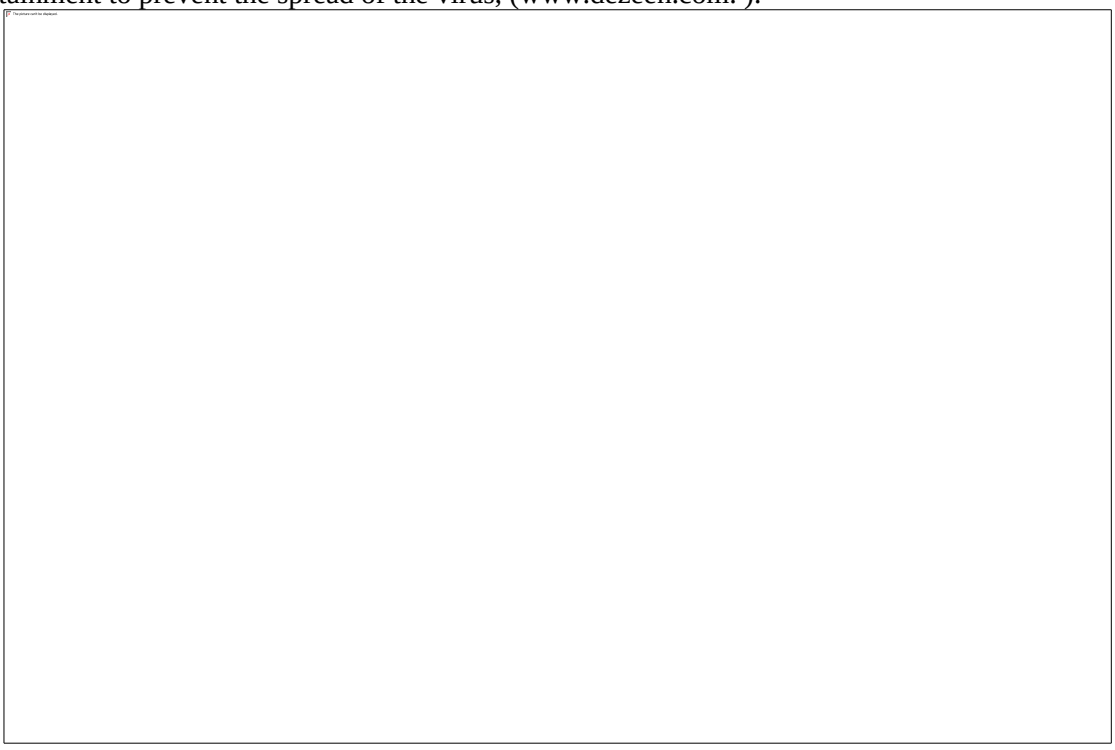

Figure 4. Intensive care unit www.archdaily.com.

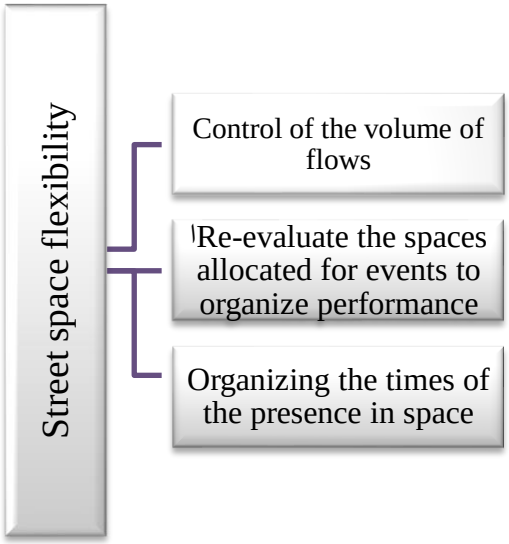

Figure 5. Street space flexibility strategies

Optimists argue that COVID-19 is an opportunity for city planners to free up more street space for cycling and cyclists, bringing us closer to greener cities and a lower carbon economy.

1. Case studies- global experiments

Among the most common measures adopted by smart front-line and global cities in particular, and at the level of urban mobility:

1. Remove traffic from residential streets and extend sidewalks near shops, schools and parks to make walking safe and fun for transit and sports .
2. Create safe bicycle routes to and from schools and offices and near major roads, by closing roads and lanes when necessary, so that people can have a safer alternative to private cars and public transport.
3. The establishment of safe access routes on foot or by bicycle, as well as safe public spaces and green areas across the neighborhood, and the closure of roads and fields to automated traffic.

Most of these actions were included in a new street design guide to the ongoing epidemic and future recovery, issued by the National Association of City Transportation Officials (NACTO), whose president, Janet Sadiq Khan, declared: "Today, people-centred streets are a proven global best practice and first-line response to transport and transit agencies during the COVID- 19 crisis. This is a historic moment when cities can change course. "The guide, entitled Streets for Response to the Epidemic and Recovery, is produced by (NACTO) Examples and Tools of Urban Design in Smart World Cities "to keep essential workers and goods moving, provide safe access to grocery stores and other basic businesses, and ensure that people have a safe space for social/physical distance during exit (NACTO, 2020). As for street space, the basic principles for rethinking the streets and public urban spaces of a post-pandemic city are:

Support public health guidance, taking into account physical divergence, increase external space for people, establish a safer street that gives priority to public transport, cycling and walking, support local economies and involve communities in the process.

The report describes emerging practices from around the world as well as suggestions for their implementation; our cities have felt different during the epidemic. In particular, residents in cities with severe closures have observed a significant reduction in noise, air pollution and even a return to normal semi-life (Lombrana & Roston, 2020). These temporary changes allowed residents to re-imagine their city as a better place, with satellite data showing a dramatic decrease in air pollution throughout China when restrictions were in place (NASA, 2020). While the links between urban air pollution and premature death are well established, if extended to higher mortality rates in COVID-19 cases, cities will have strong arguments for making these temporary changes permanent, with far-reaching positive effects on health at both ends of the age scale (Null & Smith, 2020).

A mid-April poll in the UK found that a clear majority would welcome these changes as permanent, while only 9% wanted a "complete return to normalcy" (RSA, 2020). Cities such as Vienna, Boston, Oakland, Philadelphia and Minneapolis have closed roads to provide more space for pedestrians and cyclists (Laker, 2020), specifically addressing the following street features:
Bicycling and rolling lanes biking & rolling, sidewalk accessories, transit lanes, slow slough streetcars, assembly and delivery areas, outdoor restaurants and markets (NACTO).
The guide is also inspired by past experiences of urban transitions to accommodate people and non-motorized transportation, in particular, the design of streets and public spaces implemented in New York and other American cities (Solomonow & Sadik-Khan, 2016, pp. 47–90). Following these experiments, many cities have already announced or implemented measures such as hundreds of miles of new bike lanes, pedestrian areas, street modification, large-scale tree planting and investments in renewable energy. In particular, a number of smart world cities, around the world, have turned their streets to pedestrians and cyclists, using the COVID health emergency to start the urban revolution needed to see green for the future. The ongoing crisis has become the starting point for a new urban revolution based on green principles (Walker, 2017).
Paris is already planning a radical change to the city's urban spaces by 2024. Plan Velo is a plan born out of the idea of "ville du quart d'heure," a city in which all the needs of a resident can be reached within 15 minutes without an engine, (Paris à Vèlo, 2021). The plan provides all neighborhoods with all necessary amenities in terms of recreation, shopping, schools and public services, all within walking distance or cycling. Launched in 2019, it has already achieved a more than 50% increase in bicycle use. The local government has already allocated 300 million euros to a network of permanent and emerging bike lanes in the Ile de France region, many of which will follow current metro lines, to offer an alternative to public transport. The London Mayor's Office and Transport in London has announced the London Streetscape Plan, a massive turnaround of public roads aimed at creating new walking and cycling routes along the main lanes, including temporary bike lanes. The plan will increase cycling and pedestrian spaces tenfold to encourage walking and cycling as people get back to work (Streetspace for London, 2020).

Figure 6. Plan of main bicycle routes of the city of Paris (Paris à Vèlo, 2021)

Because of physical distance, which is almost impossible in crowded public transport, millions of daily trips must be made by other means. Mayor Sadiq Khan, who declared COVID- 19 the "greatest challenge to the London public transport network," declared that the city was already working with the boroughs on the rapid establishment of a strategic bicycle network. The new road network will

reduce congestion in public transport and transform local city centres entirely so that people can walk and ride bikes wherever possible in low-traffic neighborhoods (Frangoul, 2020).

To promote social distance, in Mexico City, one of the world's most populous cities, the administration announced new bike lanes to keep people away from public transportation. The "Ciclovia al CDMX" consists of 80 miles of temporary bike lanes as an extension of the ongoing Plan de Movildad no motorizada (Movilidad no Motorizada, 2020) initiated by the Department in previous years. The new bike lanes, which follow the main lines of public transport, have been planned to ensure a viable alternative to sustainable urban mobility in terms of social distance.

New York has unveiled plans to open 100 miles of street for socially responsible entertainment during the COVID-1999 crisis (Vanderbilt, 2020). Major de Blasio announced that it would add temporary protected bike lanes to two of the busiest bike lanes in the city. These emergency corridors are an opportunity to reallocate empty roads and create walking and biking spaces as a preferred mode of mobility. Up to 60 miles of available open streets will be adjacent to parks, up to 20 miles will be permanently protected bike lanes and these measures have already begun to be implemented, although they are few and not integrated with other land use policies.

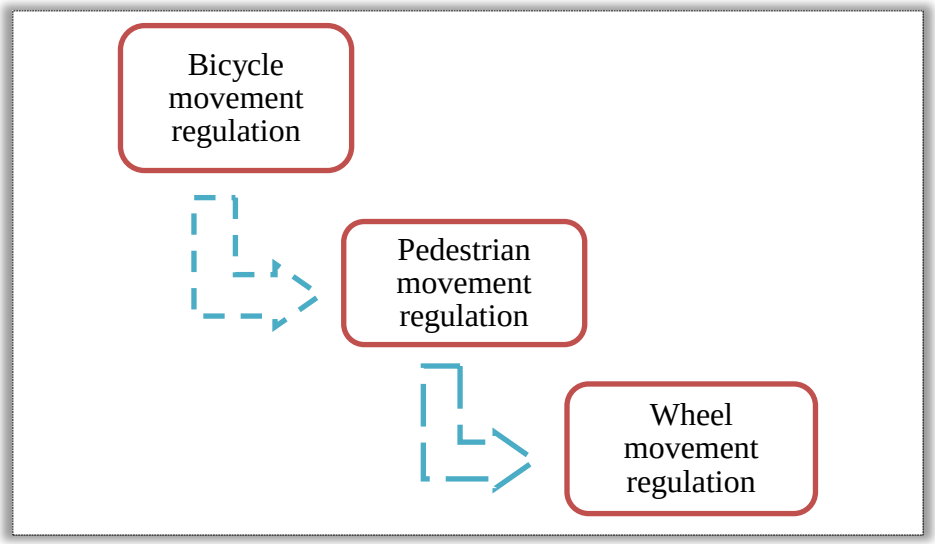

Figure 7. Hierarchy of organizing urban mobility according to global experience

4. Italian case

Within the COVID- 19 pandemic, Italy is one of the countries with the highest incidence, both in terms of infection and mortality. Italy was the first European country to be severely affected by the epidemic because of many similarities with countries where infection originated, mainly due to social and cultural factors that can affect infection rates (Fanelli & Piazza, 2020).

Milan City Council has implemented the "Milan 2020" adaptation strategy, with the aim of reorganizing the city to accommodate social divergence and other actions aimed at reducing infection. Urban sustainability and mobility are the pillars of the entire strategy, and are part of the 2Open Streets program, which brings together a range of almost immediate actions including the creation of a network of 35 km of pedestrian and bicycle trails, 22 km of which have been completed (Figure 8), (Milano Open Street, 2020).

Most of the tracks will be achieved using tactical urbanization procedures, in order to reduce costs and construction times. The project is the result of an integrated advisory activity among city council members for mobility, urban and green planning and agriculture. However, the municipality of Milan is not new to tactical urbanization strategies:

2 It is the program launched by the government to promote sustainable mobility, open urban public spaces and green areas within the city. The program, based on the principles of tactical urbanization, aims to achieve a temporary and rapid urban transformation in response to the coronavirus crisis and social distancing.

Their experience stems from 2019 with the Open Squares Project, in collaboration with Bloomberg Associates, the National Association of City Transportation Officials (NACTO) and Global City Design Initiatives.

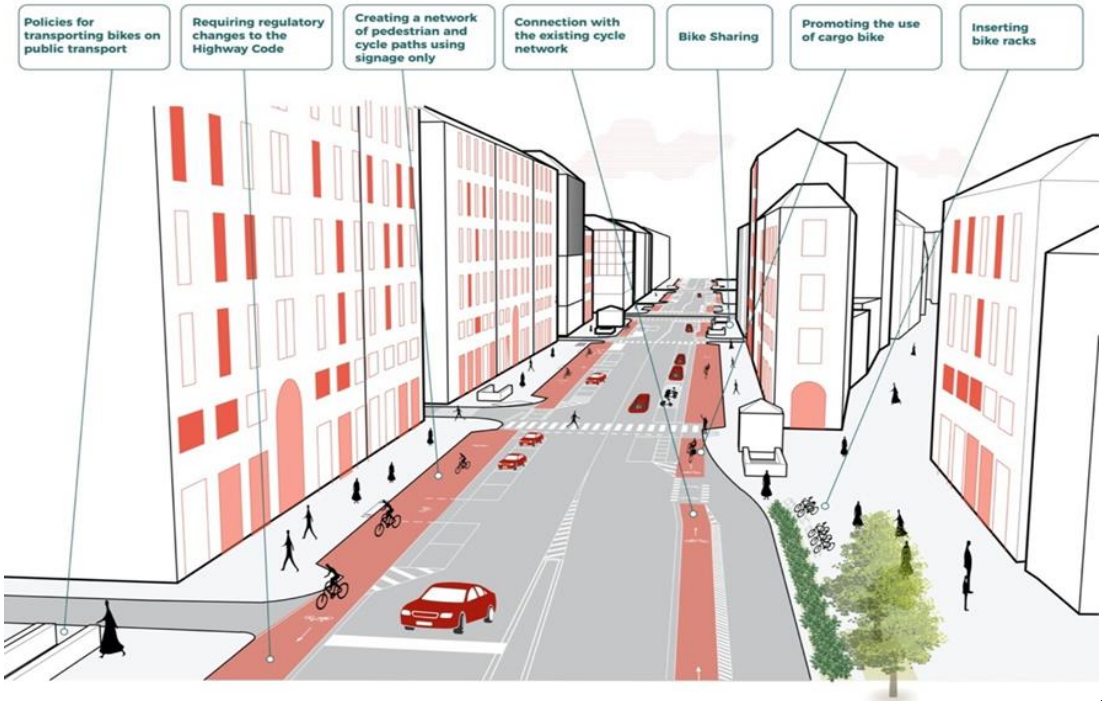

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Figure 8. City of Milan. (A) New bike path along Corso Buenos Aires' design plan (b) Implementation (c) Square Sicily (current and project) (Source: https://www.comune.milano.it.)

Bike pride is a program approved in Turin, urban mobility strategies were recently approved after COVID through a municipal law providing a massive transformation of urban roads with the aim of creating 80 km of inner-city bicycle lanes (Torino, 2020). New cycling lanes will be constructed alongside major urban roads, using existing car lanes.

Smart Move is the programme adopted by Genoa Municipality, to regulate sustainable urban mobility after COVID. The programme consists of 40 actions already identified in the recently approved local government sustainable urban mobility plan. Among the actions, 3 emergency bike lanes will be built, with a total length of 30 km, partially achieved using tactical physical design tools. The new corridors are part of a 130-km network that will cover the entire city in the near future, (Assandri, 2020).

Mobility Project after The COVID is the programme launched by the municipality of Rome with the aim of promoting sustainable urban mobility at the end of the closure. In going into details of the plan, it provides 150 kilometres of new temporary bike lanes, in accordance with the recently approved municipal sustainable urban mobility plan .The corridors, which are partly under construction, will become permanent in the near future and will be achieved in several phases. The plan also provides mobility sharing services (e-bikes and motorcycles), as well as pedestrian calm areas and traffic within the city, (Roma, 2020)

Figure 9. Rome. New cycling path along Viale Egeo, Eur, (source: Rainews.it.)

Bari is one of the few urban cities in southern Italy to develop a post-COVID mobility strategy. The Open Space program, based on the principles of 3tactical urbanization, was introduced by the municipality to promote sustainable mobility, consisting of the development of 57 km. Cycling trails, pedestrian spaces, public open urban spaces and green spaces in densely populated urban areas within the city, (comune bari, 2020)

3 Tactical urbanization is also known as DIY Urbanism, practice planning, urban acupuncture or urban prototypes, and refers to the city's and/or regulatory and/or citizen-led approach to neighborhood construction using short-term, low-cost and scalable interventions to stimulate long-term change. Examples include very clear and formal efforts, such as New York's Plaza, or smaller projects (usually lasting 1 to 7 days). Tactical urbanization projects can lead governments, non-profit organizations, grass-roots groups or residents. Although formality may vary, tactical urbanization projects share a common goal of using low-cost materials to experiment and collect inputs on potential street design changes. Over the past decade, tactical urbanization has become an international movement, profoundly transforming how societies think about developing and delivering the project.

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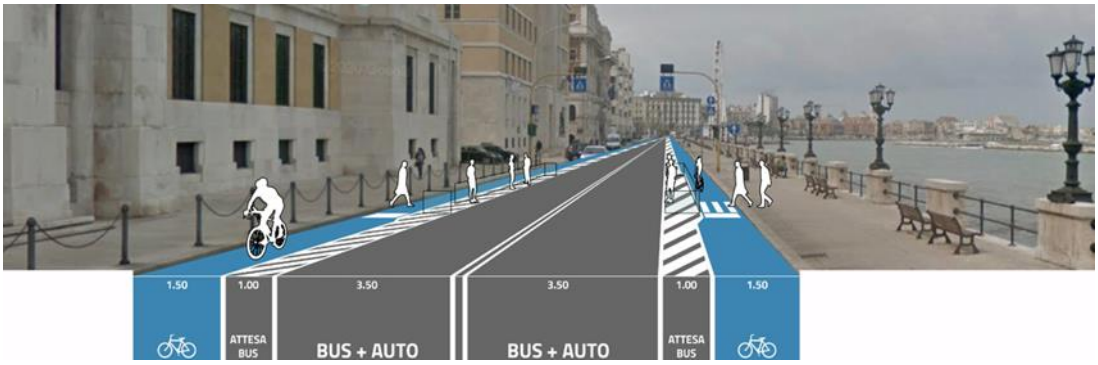

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Figure 10. City of Bari: (a) a new bike path along Lungomare Nazario Sauro, (b) a design drawing of the route, (c) Square of Via Manzoni, d) Design Diagram for the Square (comune bari, 2020)

Table 1. Urban mobility programs after covid-19 in main Italian cities

City	Program	Action	Added bicycle path length (km)
Milan	Open street	Lanes/ new pedestrian areas/ public spaces renewal/ sharing mobility programs	35
Turin	Bike pride	Temporary bike lanes beside major urban roads	80
Genoa	Smart move	Permanent bike lanes/ sharing mobility programs	30
Rome	Post covid mobility project	Temporary bike lanes/ sharing mobility programs	150
Bari	Open space	Temporary bike lanes/ Permanent bike lanes/ new pedestrian areas/ public spaces renewal/ traffic calming areas	57

5. Conclusions

Comparing the experiences analyzed clearly highlights the awareness of local governments and policy makers of the need for deep urban transformations based on urban flexibility. While urban life quickly returns to the usual rhythms of work, entertainment and other social behaviors, our cities will never be the same, because of our newly discovered awareness that another health crisis may occur. The continuing crisis has thus become the starting point for a profound change in urban space regulation. In particular a new type of urban space at the level of street space and urban mobility. There is a marked change in understanding that our public urban streets and spaces are incredible assets that can be used to change interaction and mobility in urban areas finally.

After lessons learned from a number of cities around the world, major smart global cities temporarily reallocate the road space from cars to people, making them move, during the restart phase, healthy and active as they move socially. By comparing programs, the approved procedures, such as cycling lanes, pedestrian and traffic spaces, shared mobility programs and others, are repeated in many programs. In addition, the analysis shows that temporary interventions based on tactical urbanization tools are widely used to implement the new measures. The analysis framework also emphasizes the central role of local governments in particular with regard to planning options for sustainable urban mobility, which occurred before COVID. Cities that have not implemented appropriate policies risk losing the opportunity to participate in the ongoing revolution and remain based on old unsustainable models, despite the ongoing serious pandemic and the risks of similar events in the near future.

The strategies followed in the countries of the world clearly reveals the awareness of local administrators, in relation to urban mobility:

1. Cycling, which ensures social distancing and does not pollute, is the most effective means of transport post-pandemic in urban areas.
2. The newly adopted formula of temporary or pop-up bike lanes significantly reduces implementation times and costs, allowing the local government to identify widespread networks in the city in a short time and with a low budget, which will contributing strongly to the creating true cycling cities in the near future.
3. Increase more sustainable and uncontaminated transportation.

Some common strategies that can be observed in many case studies regarding the level of urban street space; are:

1. Give more space to people and improving the city's environmental conditions.
2. Redefine urban streets for recreational, cultural or retail use and respect social distance requirements.

Participatory design, widely recognized as an effective design tool, played an important role in the organization of a flexible space that controls with the volume of flows and rapid response to emergency development, and thus achieving better functional performance as well as a safe and healthy environment.

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