Key Levers to Reform Non-Motorized Transport: Lessons From the COVID-19 Pandemic

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Abstract
The objective of this research was to understand key levers that enabled city, regional, and national governments to improve non-motorized transport (NMT) infrastructure during the lockdowns necessitated by the COVID-19 pandemic. The research focused primarily on cycling and adopted a case study approach focusing on three cities: Bengaluru (India), Bogota (Colombia), and London (UK). The selected cities were chosen for diversity across geographies, country income levels, and the scale of interventions. Eight key levers were identified to understand how cycling interventions can be supported, implemented, sustained, and scaled up. These included institutional and organizational arrangements; technical capacity; financing; leadership; policy and regulatory framework; plans, strategies, and technical resources; role of civil society; and communications, messaging, and outreach. The research used secondary literature reviews and key informant interviews, which were validated through an online round table. Research revealed that certain levers were necessary in initiating and continuing successful NMT interventions. These included supportive leadership, participative civil society, and adequate financial and technical capacity. Communications and outreach helped bring behavioral change amongst residents while a coordinated institutional framework and plans and strategies were necessary to sustain momentum. This research contributes to urban mobility and public administration literature in understanding processes and enablers of sustainable mobility interventions. It is relevant for cities in low- and middle-income countries beginning to focus on NMT interventions to combat climate change and public health challenges.

Keywords
equity in transportation, micromobility and active transportation, planning and policy, public health impacts, strategic management

The COVID-19 lockdowns saw a global resurgence of walking and cycling in urban areas (1), which was actively supported by city and national governments. This research aimed to understand key levers that enabled cities to successfully improve their (walking and) cycling environments and provides learnings for sustaining these measures.

Cities used the pandemic interventions as opportunities to improve public health and environmental outcomes. Records of such interventions can be found on the Shifting Streets database, the COVID Mobility Works database, COVID-19 Cycling Measures Tracker, and the COVID-19 Policy Database. While there is no accurate information on the total number of interventions, the Shifting Streets database documented more than 1,400 interventions in 500 cities and regions (2). For non-motorized transport (NMT), these can largely be grouped into three typologies:

1. Curbing motorization: To ensure physical distancing, cities have increased space for pedestrians and cyclists by restricting motor vehicles in markets, avenues, and other public spaces and distributing carriageway space to footpaths and cycle lanes. These initiatives ranged from a permanent

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These initiatives have largely focused on cities and countries in middle- and high-income countries. The European Cycling Federation’s COVID-19 Cycling Measures Tracker focused only on member nations in Europe (3); 88% of 1,100 interventions recorded in the Shifting Streets database are from North America, Europe, and Central Asia, with 58% being from North America and 30% from Europe and Central Asia. In contrast, only seven interventions (0.6%) were from Sub-Saharan Africa and South Asia (2).

However, these regions have also seen numerous initiatives furthering cycling, ranging from a national NMT strategy for Ethiopia (5) and pop-up cycling lanes in Cape Town, Nairobi, and Kampala (6) to the Cycles4Change challenge run by the Indian government involving more than 100 cities (7).

**Approach**

The research intended to understand how cities and countries utilized the pandemic and lockdown to improve NMT outcomes. Some cities and countries were quick in addressing by improving (walking and) cycling environments and in scaling up. The study highlights the contexts, approaches, and processes leading to successful interventions, which would serve as lessons for cities in low- and middle-income countries.

For an in-depth understanding of interventions and enabling factors, the study went beyond the “best practices” narrative. A ‘best practice’ approach often overlooks contextual relevance, making it difficult for cities to adopt learnings (8). This study undertook a “key levers” approach. Unlike a “best practices” approach, a key levers approach uses the filters of pragmatism and contextual relevance to identify factors that lead to successful policy responses.

**Understanding “Key Levers”**

This study expands on the definition of policy levers as “instruments” used by governments to direct, manage, and shape public services (9). While policy instruments are critical to achieving stated goals, the organizational framework of governments, their capabilities, and the role played by stakeholders outside government also need to be factored.

The study used “levers” as a heuristic to understand commonalities amongst cases from varied backgrounds. Similar heuristics have been undertaken to create a framework for understanding sustainable urban transport systems. Kennedy et al. (10) created a “four pillar” approach that identifies effective governance frameworks, stable funding mechanisms, strategic infrastructures, and decentralized design as critical to creating sustainable transport systems. Another study identified “trigger points” for creating a sustainable transport paradigm at the local level (11). These included institutional strengthening backed by legal and regulatory mandates, financing for incentivizing sustainable modes, and implementation strategies and plans. Similarly, another study identified five strategies to advance sustainable policies in urban transportation (12). These included strategic timing for pushing interventions, citizen-friendly communications and messaging, a strong institutional framework involving consultation with diverse stakeholders, technical expertise and capacity, and monitoring and evaluation frameworks.

Studies have also looked at other parameters that influence the ideation and implementation of sustainable transport interventions. State capacity, defined as the discipline and competence of the bureaucracy, was identified as crucial to successful policy reforms (8). It also included the role and ability of the state to delegate roles and responsibilities to autonomous institutions. Another study expanded on institutional capacity, both as technical capacity present within bureaucracy and also the legal and regulatory frameworks that enabled smooth functioning of governments. A key barrier for sustainable transport in developing countries was the absence of political will and leadership (13).

Advocacy and technical support organizations play a crucial role in promoting strategies and interventions as “best practices” to be replicated globally (14). Varied implementation experiences across geographies also show the importance of communications and messaging and the role played by political and public acceptance in furthering such interventions (15). A review of interventions promoting cycling in the Netherlands, Denmark,
and Germany pointed out that continued government funding was integral to building infrastructure and to increase ridership over time (16). Additionally, dedicated strategies and public outreach were essential for creating a cycling culture in these countries.

Based on the above literature, this study identified an initial set of eight key levers. These are:

1. Institutional and organisational arrangement: as the clear distribution of functions and responsibilities between and within government departments and agencies. Dedicated teams for (walking and) cycling within transport ministries or urban local bodies could have responsibilities for planning and implementation or liaising with other government and non-government bodies to improve cycling.

2. Technical capacity and expertise: as the ability of a(n) (government) organization or agency to understand, plan, and execute its mandate. Technical capacity involves domain knowledge in NMT, sustainable transport, public policy and finance, and other related sectors. Additionally, the number of technical staff and experts available is crucial to ensure adequate service delivery.

3. Financing: as the ability of a city to obtain funds for planning and implementation. Funds could be generated through own revenues, negotiations with regional and national governments, private sector involvement, or domestic and international financial institutions.

4. Leadership: as the ability of public officials—in elected or administrative positions—to identify, collaborate, plan, and execute innovations and interventions. Leadership helps to bring diverse stakeholders together in pursuing shared goals and is essential to initiate difficult conversations and interventions.

5. Policy and regulatory framework: as (usually long-term) instruments created by government entities to achieve specified societal outcomes. Policy and regulatory pathways can therefore envision and set goals, create (mostly) formal procedures for the stakeholders involved toward implementation, and ensure the achievement of the goals.

6. Plans, strategies, and technical resources: as (usually short-term) tools used by stakeholders to operationalize and implement policy goals. They can help to bridge the gap between policies and existing practices. Specific examples include city mobility plans, development plans, NMT strategies, public health strategies, street design guidelines, and urban design guidelines amongst others.

7. Role of civil society: This category includes civil society organizations (neighborhood associations, citizens’ collectives, etc.), technical advocacy organizations, academic institutions, and for-profit private sector companies. Their activities range from lobbying and advocacy (in service provision, equity, environment and sustainability, public health, etc.) to providing technical expertise for governments and even serving as custodians of public infrastructures.

8. Communications, messaging, and outreach: as tools to generate public awareness about the need for sustainable transport interventions and their associated positive externalities (such as improvements in air quality, public health and road safety, customer spendings etc.).

Methods

The methods and tools adopted for the study are detailed below.

1. Situation analysis: A situation analysis was conducted to understand COVID-19 initiatives and responses by national governments and cities in South America, Sub-Saharan Africa, and East, South-East, and South Asia, and Europe. This helped understand current scenarios, institutional frameworks, and responses across different socio-economic, cultural, and political contexts.

2. Selection of case studies: Databases documenting (walking and) cycling interventions—Shifting Streets, COVID Mobility Works, COVID-19 Cycling Measures Tracker, and the COVID-19 Policy Database—helped identify cases. These were shortlisted to ensure diversity in geographies, income levels, and prior experience in implementing cycling initiatives. Based on these parameters, Bengaluru (India), Bogota (Colombia), and London (UK) were selected.

3. Stakeholder mapping: A stakeholder map of actors—city and national governments, academics, technical and advocacy experts, and civil society organizations—was created for each city.

4. Key informant interviews: These stakeholders were selected as key informants; snowball sampling helped to identify further interviewees. Semi-structured interviews (60–90 min) were conducted with 20 key informants to understand past and current interventions, and the key levers. Bengaluru and London had four key informants each while Bogota had two. In total, 10 experts with cross-cutting knowledge on regional,
5. **Data analysis and findings**: Interviews were recorded, transcribed, coded, and analyzed to understand policies and legislations, institutions, and processes facilitating cycling (and walking) at city and national levels. City analysis was guided by the key levers, and challenges and opportunities for sustaining and scaling up were identified.

6. **Data validation**: An online roundtable was organized to present research findings and obtain feedback. This provided an opportunity to re-engage with key informants to reflect on findings and share learnings across cities. Feedback was analyzed and incorporated into the final manuscript.

### Results

Table 1 provides a brief overview of the selected case studies. The table lists public authorities in charge of (walking and) cycling as well as an overview of interventions undertaken during the early days of the COVID-19 lockdown.

#### Bengaluru

Bengaluru, capital of Karnataka state, is the fifth-largest urban agglomeration in India with a population of 9.4 million (2011); 26% of trips in the city are by walk, 27% by two-wheelers, and 32% by public transport (22).

**Transport Governance.** Physical infrastructure in Bengaluru is largely owned and maintained by the urban local body Bruhat Bengaluru Mahanagara Palike (BBMP) and Bangalore Development Authority (BDA). BBMP’s network of roads is in the core central areas of the city, while BDA, as the city’s development authority, owns land and roads in the peripheries. The Directorate of Urban Land Transport (DULT) is a state-level agency coordinating mobility projects across Karnataka. In Bengaluru, it has championed initiatives around improving accessibility to metro stations, and NMT infrastructure with the help of civil society and technical advocacy organizations.

**Walking and Cycling Initiatives.** In 2011, the India Urban Space Foundation, a civil society and technical advocacy organization, published the “TenderSURE” street design guidelines. These were the first in India to prioritize the movement of vulnerable road user groups such as pedestrians and cyclists. With the help of senior bureaucratic and political leadership, these guidelines were implemented through a demonstration project involving 27 roads (42 km). The first roads were completed in 2015. At the project inauguration, the state government announced an
expansion to 50 more roads after gauging the popularity of the initiative amongst the public (32).

In 2013, the DULT organized the first Cycle Day event in the city along with a coalition of civil society organizations. Over 500 Cycle Day events have been conducted since, spread across 50 neighborhoods in the city (33). These events drew large turnouts because of the presence of alternative physical and recreational activities. Its success lay in its ability to scale up in a decentralized manner. In initial events, DULT brought together diverse stakeholders, including residents, BBMP, and the traffic police. Over time, it withdrew from this central role and provided support to resident groups in conducting the events (34).

An overview of (walking and) cycling initiatives in Bengaluru is shown in Table 2.

### COVID-19 initiatives

**Pop-Up Cycle Lanes.** At the start of the pandemic lockdown, DULT saw an opportunity to improve the condition for cycling following an increase in cycle sales and demands from the cycling community for infrastructure. Pop-up cycle lanes were seen as a quick and effective solution. A pilot stretch (17 km) was identified on a major “IT corridor” of the city. Alongside the creation of cycle lanes, the project also aimed to reconfigure junctions for safe crossings. DULT has started on a cycling master plan and engaged with BBMP to connect these initiatives with cycle lanes built under Smart Cities Mission, the national government’s flagship urban development initiative (34).

**Clean Air Street Initiative.** From November 2020, under the “Clean Air Street” pilot project, initiated by DULT and the Indian Institute of Science (IISc), Church Street, a key high street, was pedestrianized during weekends for four months. The project initially faced resistance from traders, who worried that the move would reduce footfalls to their establishments. Based on enthusiastic responses from citizens followed by politicians, DULT and BBMP have announced the expansion of the initiative to seven streets.

### Key Levers in Bengaluru

Institutional and organizational arrangement: Since its inception, DULT has played a key role in promoting walking and cycling in Bengaluru. The Commissioner of DULT, a senior bureaucrat in the state government, played a crucial role as a bridge between government agencies and civil society. DULT played a crucial role in convincing political leaders at city and state levels of the necessity of interventions and ensured coordination between various departments and agencies (Traffic Police, BBMP, and state pollution control board). Despite regulatory constraints, DULT built a team with dedicated technical capacity and coordinates with civil society.

Plans and strategies: Piloting of projects has been used as a consistent strategy. Piloting helps stakeholders to analyze the effects of an intervention and learn about aspects to replicate and mistakes to avoid. Both initiatives received political support for scaling up. The success of TenderSURE has made scaling up and openness to new initiatives easier, as bureaucrats and contractors are familiarized with the strategy.

Role of civil society: The TenderSURE project was initiated by civil society and technical advocacy organizations from the beginning; it also showed that such organizations were able to interact directly with state-level senior bureaucrats and politicians to bypass slower local bureaucracies (35).

The two lockdown initiatives, pop-up cycle lanes on Outer Ring Road and Clean Air Street, were initiated by non-government organizations. In the former case, implementation provided evidence to advocate for making the cycle lanes permanent and expanding the network (34). The Clean Air Street initiative was conceptualized by a technical advocacy unit within IISc who approached DULT to implement the pilot.

Communications, messaging, and outreach: When the pandemic lockdown came into place, Cycle Day events had to be stopped. However, to keep the conversation and momentum flowing, DULT initiated Sustainable Urban Mobility Accords, a program to encourage communities to envision and implement NMT plans for their neighborhoods. Communities would be technically and financially supported by DULT and experts from civil society organizations.

Businesses in Church Street struggled during the pandemic lockdowns. The Clean Air Street Initiative positioned sustainable mobility as an approach for business recovery after the lockdown; public messaging also focused on an improvement in the quality of life for residents through improved air quality and public health. Consistent outreach by stakeholders ensured that businesses were open to experimenting with this approach.
Other Levers

The availability of technical capacity and expertise at scale has been a bottleneck for the city, with no permanent solution in sight. The capacity for raising funds and financing is limited, and largely based on special one-off grants from state and national governments. Although DULT has taken up a key leadership role in promoting cycling, it has not been matched by the leadership in BBMP. The city also lacks a policy and regulatory framework to set goals and outcomes and is dependent on piecemeal interventions.

Sustaining Momentum. The involvement of civil society organizations in sustainable mobility in Bengaluru has also resulted in different technical standards being adopted, depending on the organization. This can also create confusion amongst engineers and other stakeholders. This can be addressed with BBMP formally adopting a set of standardized street design guidelines.

The financing for NMT has been ad hoc, and the initiatives have been alongside capital-intensive infrastructure projects encouraging motorized vehicles. There is a need for sustained financing for walking and cycling in Bengaluru, along with building technical capacity within BBMP to plan and implement NMT initiatives.

Bogota. Bogota, the capital of Colombia, is estimated to have a population of nearly 11 million (as at 2020). It has had an influential role in sustainable transport globally because of the interventions that it undertook over the past 50 years.

One of the first sustainable mobility interventions to take place in Bogota was the Great Pedal Demonstration in 1974. It was against the proliferation of cars in the city and to showcase the potential of cycling. Its success led to institutionalization by the city in 1976 under the name of Ciclovía.

The 1980s and the early 1990s saw the decline of Ciclovía, as concerns over crime and security led to a drastic reduction in the usage of public space in Bogota. The revival of Ciclovía began in 1995, with organizational responsibility changing to the autonomous Recreation and Sports Institute (IDRD) of the city administration. By 2000, there was a network of 232 km of ciclorutas in Bogota.

Between 1995 and 2014, the mode share of cycling increased from 0.5% in 1995 to 6% (36). In 2016, the Plan Bici was introduced to increase the mode share of cycling to 10% by 2020 and to create 120 km of new bike-ways, including a 25-km dedicated cycling avenue (23).

An overview of (walking and) cycling initiatives in Bogota is shown in Table 3.

COVID-19 Initiatives

Pop-Up Bicycle Lanes. The newly elected mayor announced in February 2020 that the city would add 280 km to the 550 km of cycling infrastructure in the city. In March 2020, even before a lockdown was put in place, Bogota opened up 22 km of temporary bike lanes by taking space from cars. By the end of March, this was scaled up to 76 km; this would also ensure that public transport could operate within physical distancing guidelines. By September, Bogota had seen cycling trips double from 6.6% to 13% of all trips.

Supporting Systems. To encourage cycling, citywide speed limits were reduced to 50 km/h. The city increased parking for cycles in both public and private parking spaces. A cycle registration database was also created to curb bike thefts—a chronic problem in the city—and to curb the resale of stolen bikes. Bogota also deployed a pilot project where health workers were provided with e-bikes.

Key Levers in Bogota

Institutional and organizational arrangement: Mayoral administrations recognized the necessity of reforming institutional structures and initiated a proposal for creating a single entity in charge of transportation and with dedicated funding (37). The IDU was strengthened to undertake construction and maintenance of street infrastructure and monitoring and evaluation; it has a dedicated department for implementing walking and cycling interventions.

Within SDM, policies, and planning related to NMT is the responsibility of the office of walking and cycling (having seven members). The city also instituted an office of a city manager of cycling within SDM. This office coordinates cycling interventions involving various agencies and was created for the implementation of Plan Bici. Capacity and processes enabled the setting of long-term priorities as well the execution of agile interventions such as those undertaken during the pandemic lockdown (38). The city had a network of contractors who were familiar with implementation processes and ready availability of materials for tactical experiments. The pop-up cycle lanes were planned to cover gaps within the existing network.

| Year | Initiatives |
|------|-------------|
| 1974 | The Great Pedal Demonstration. |
| 1976 | Ciclovía instituted and extended to 54 km |
| 1995 | Revival and expansion of Ciclovía to 120 km |
| 1998 | Large scale expansion of dedicated bikeways |
| 2016 | Plan Bici |
Financing: IDRD is one of two departments in Bogota that can engage in commercial relations with advertisers. This enabled them to raise funds for Ciclovía from private sources—25% of Ciclovía’s requirements are funded by the private sector (39). This provided autonomy to Ciclovía from government resources and also helped to widen the scope by incorporating other activities and programs under the brand of Recreovia.

Leadership: The role of continued city leadership in improving public space and mobility has been well documented (14, 40). In the 1990s, the focus of political and institutional leadership was on building a civic culture through Ciclovía. This also had the effect of nurturing a civil society that demanded better infrastructure (40). Later administrations focused on preparing a Cycle Route Master Plan, adopting standardized street design guidelines, and expanding and building cycling infrastructure. The creation of SDM as the apex mobility institution, with the mandate to coordinate between agencies, was also undertaken by mayoral leadership (40). The current mayor took steps to expand the cycling infrastructure rapidly to support Transmilenio at the start of the COVID-19 pandemic, and improve the mode share of cycling, especially amongst women. Bogota, however, has also struggled when mayors have lacked the vision and decisiveness for promoting NMT (14).

Plans and strategies: The strategic adoption of Ciclovía has been a key lever for the expansion of walking and cycling (14). IDRD hired guards for Ciclovía events and brought in school children as volunteers. The increased number of guards and volunteers led to an increase in spatial coverage and public participation. Institutionalization of Ciclovía removed dependence on political support. Ciclovía also led to citizens demanding permanent cycling infrastructure and resulted in the expansion of the city-wide cycle track network (39). It also helped to ensure that cycling became ingrained into daily life.

Other Key Levers. The strong institutional framework led to the creation of a municipal cadre with technical capacity and expertise in planning and implementing cycling improvements across agencies. As the system had become largely autonomous, the presence of a cycling policy did not make much change when introduced in the early 2000s. Civil society has been continuously involved in pushing innovations and advocating. With cycling ingrained into the public mindset, messaging and outreach have been used to communicate new developments.

Sustaining Momentum

Motorization has increased, driven by motorcycles imported from Asia. The perceived lack of safety and security from violent crime, especially in public transport and on the cycling network, has also led to reduced popularity of cycling.

During the pandemic, cycling shares increased to 13% of all trips. As the lockdown eased, congestion levels returned to pre-pandemic levels, which has led to aggrieved motorists demanding the removal of the cycle lanes to ensure faster motorized traffic flows.

London

Greater London is divided into 33 entities (32 boroughs and the City of London) and extends over 1,500 km². Its population is estimated to be 9.2 million as of 2020 (18). Under the Greater London Authority Act (GLA) of 2000, the post of Mayor was created as the executive head accountable to an elected London Assembly. The powers of the GLA and the Mayor are restricted to strategic sectors such as transport and economic development, ensuring that boroughs remain largely autonomous (41).

Governance of Transport in London. Since 2000, Transport for London (TfL) has been the integrated authority managing and operating public transport. It oversees long-term planning for mobility in the metropolitan area; it is also in charge of monitoring and evaluation and setting standards and frameworks in place. Long-term planning is set by a Mayor’s Transport Strategy. The Walking and Cycling Commissioner heads NMT initiatives, and reports to the mayor.

Mode Share in London. As of 2018, 35.5% of trips in London were made by public transport, and walking and cycling accounted for 25% and 2.5% of trips, respectively (42). The share of walking trips has remained constant over the past 20 years while cycling trips doubled from 1.2% in 2000.

Cycling Superhighways. In 2008, cycling superhighways were announced by the government. With 12 radial routes, these superhighways were intended to connect residential suburbs with central London (43). Criticism of the first phase centered around the lack of physical separation between cycle lanes and the rest of the carriageway. Phase two included a redesign of existing streets and junctions to create segregated cycle tracks.

Mini-Holland Scheme. The scheme was launched in 2014 to improve the conditions for cycling and to initiate a shift away from the car in the outer boroughs of London. Three boroughs were selected for implementation of the scheme with funding of 100 million pounds. A longitudinal study reported an increase in walking and cycling
trips. A marked increase in positive public perception toward walking and cycling in the boroughs was observed. The study also showed that the scheme had not increased congestion or travelling times for motorists (44).

**Mayor’s Transport Strategy 2018.** In 2017, the incoming Mayor adopted a “Healthy Streets Approach” as the cornerstone of future mobility planning in London. The approach pushed for investment and interventions in walking and cycling and their integration with public transport (43). Based on this approach, the Mayor’s Transport Strategy for the next two decades was published in 2018. The three key components of the Strategy were the Walking, Cycling, and Vision Zero Action Plans.

The Action Plans allocated 2.2 billion pounds. Through campaigns and improved placemaking (through schemes such as Legible London), they also tried to affect a culture change (46). The Plans included the creation of 450 km of cycleways as well as funding for the mini-Holland schemes (46).

An overview of (walking and) cycling initiatives in London is shown in Table 4.

**COVID-19 Initiatives**

**Streetspace for London.** TfL reallocated carriageway space for pedestrians and temporary cycle lanes for cyclists (89.1 km) through the Streetspace for London initiative. In 20 crossings, the Green Man Authority protocol was introduced, which provided for a continuous pedestrian signal. TfL also undertook the planning of a “Bike Tube” as part of Streetspace. This included wider pavements, low traffic corridors, and an expanded PBS system. 88 Emergency Low-Traffic Neighbourhoods (LTNs) were also created in response to COVID-19.

**Gear Change.** In May 2020, the Department for Transport (DFT) of the Government of the UK announced two billion pounds of funding for promoting NMT. Over 220 million pounds have been allocated in two phases toward emergency active travel funds to help cities to implement both short-term temporary and permanent long-term interventions in the expansion of NMT infrastructure. DFT also recognized the need to encourage citizens to take up or return to cycling. It introduced a voucher scheme to pay for bike repairs and allocated funds for free cycling training.

**Regulatory Amendments.** The national government has sought to amend the existing Highway Code to improve road safety and to place vulnerable road user groups at the forefront of the road hierarchy. It eased regulations for local authorities to enact permanent or temporary interventions such as bicycle tracks or lanes. It also created a technical note for local authorities with detailed guidance on planning, construction, and maintenance of cycling infrastructure.

**Key Levers in London**

Institutional and organizational arrangement: The clarity in roles and responsibilities between and within directorates has enabled TfL to execute its own duties and support boroughs in planning and implementation. Within the Surface Transport Division of TfL, the portfolio of London Streets manages work relating to the red routes network (TfL Road Network) and other work relating to walking and cycling. There is a dedicated team for walking and cycling present in the City Planning directorate, which coordinates and works with boroughs. The Network Management directorate within the Surface Transport Division takes care of design and implementation—including cycling superhighways—on the TfL Road Network.

Leadership: Since the creation of the GLA and TfL in 2000, there has been a continuous political focus on improving cycling. These included attempts to improve the London Cycling Network, the creation of cycling infrastructure design standards, cycling superhighways, and the PBS system. Learning from previous experiences, the next mayorality built on these efforts and introduced their own schemes, such as the mini-Holland schemes and the Healthy Streets approach. The current administration created the post of a Walking and Cycling Commissioner as a champion for NMT and institutionalized the Healthy Streets Approach and acted decisively during the lockdowns. At the same time, the national government also initiated the Gear Change program. Incidentally, the advisor to the Prime Minister was previously the Cycling Commissioner of London, showing a transference of ideas from the city level to the national level.

| Year | Initiative |
|------|------------|
| 2000 | TfL created under the Greater London Authority Act |
| 2004 | London Cycle Action Plan |
| 2005 | Cycling Design Standards |
| 2010 | PBS scheme introduced |
| 2014 | Mini-Holland schemes announced |
| 2016 | Segregated cycling superhighways opened |
| 2018 | Mayor’s Transport Strategy published |

Table 4. Cycling Initiatives in London
Strategies and plans: Since 2014, the Healthy Streets Approach has been present in mobility planning in London. This approach was made the cornerstone of the planning process for the Mayor’s Transport Strategy. As funding for projects (such as Mini Hollands and LTN) is tied to Healthy Streets, this incentivizes the uptake of the approach amongst boroughs. TfL assessed the impact of the mini-Holland scheme, and used it as evidence for expansion. The approach has also scaled up nationally through Gear Change.

Role of civil society: Civil society and technical advocacy organizations provide consulting services to boroughs and local councils. They have been instrumental during the lockdown, advocating for and reviewing the Gear Change strategy (47) as well as the Healthy Streets approach (45). Civil society organizations came together to form a Walking and Cycling Alliance (2017) to present a collective voice for the improvement of walking and cycling conditions nationally. As a coalition, they have pushed design standards for NMT infrastructure and prioritization of pedestrians and cyclists in the national Highway Code (47).

A unique aspect of the functioning of such organizations in London (and the UK) is their role as custodians of infrastructure. The National Cycle Network—a UK-wide network of cycling routes—created by the civil society organization SusTrans in the 1970s is an example (48). This network is mostly located on private lands; SusTrans sets design principles and standards that ensure a uniform network. It helps landowners and communities with maintaining and expanding the network and, through monitoring and evaluation, shares evidence with citizens.

Other Key Levers. Similar to Bogota, a strong institutional framework has led to the creation of sufficient technical capacity and expertise within the nodal agency; individual boroughs have also begun to improve their capacity. Analysis of long-term trends suggest that financing might be an issue for TfL, leaving it dependent on national grants. London has also successfully integrated communications and messaging into its policy and regulatory frameworks such as the Mayor’s Transport Strategy.

Sustaining Momentum

The DFT had provided unconditional grants to TfL to the order of two billion pounds at the start of the decade; over the last few years, this has been converted into conditional loans (49). Political rivalries at the city and national levels have resulted in reducing TfL’s budget and restricting it to activities that generate direct revenue. It will need to explore avenues to create a dedicated and sustained budget for walking and cycling.

Most roads (94%) in London are under the jurisdiction of boroughs. Political differences, cultural differences, or both, have led to opposition to LTNs through legal challenges, demonstrations, and vandalism, resulting in an uneven network (50). Civil society support is critical in building demand for cycling, especially in outer boroughs.

Discussion

This research identifies key levers enabling cycling in response to the COVID-19 pandemic and opportunities and challenges for sustaining and scaling up. While each lever has taken a unique form depending on national and local contexts, their learnings are applicable for cities in low- and middle-income countries.

Institutional and Organizational Arrangement

The experiences of Bogota and London show the importance of a cogent institutional arrangement to envision, plan, and implement cycling improvements. Both SDM and TfL coordinate all modes of transport at the city level. This reduces fragmented decision-making and ensures better organizational alignment and priorities. Moreover, SDM and TfL both have dedicated departments for NMT, who are integrated into the functioning of the organizations. In Bengaluru, there are nine agencies responsible for different modes of transport. However, BBMP does not have dedicated team or a department for NMT.

Technical Capacity and Expertise

Adequate in-house technical expertise is necessary to ensure cycling environments can be built at scale at the city level. Bogota was able to build its cycling network at scale because of the presence of adequate capacity in SDM as well as IDU; similarly, it was able to quickly build pop-up cycle lanes because of this capacity reaching down to private contractors. In London too, the availability of technical expertise within TfL has been crucial toward implementing city-wide efforts such as the cycling superhighways. In Bengaluru, the lack of internal technical capacity at the city level has been a major bottleneck; efforts are being made to improve capacity through partnerships with technical advocacy and civil society organizations. This has also led to a proliferation of multiple street design standards and guidelines adopted by different agencies.

Financing

Clear and dedicated allocations for NMT in annual transportation budgets should be legislatively mandated
to ensure that a city-level network can be built and maintained (51). In the case studies, ambitious initiatives were based on short-term plans and strategies rather than as integral components of transport budgets; Bogota is an example to the contrary. In Bengaluru, and even lately in London, authorities have relied on national-level interventions to finance NMT; this has led to civil society concerns over the longevity of such strategies. Recently, Bengaluru has begun to impose a dedicated cess on property taxes for the upkeep of NMT infrastructure (52).

Leadership
Political and bureaucratic buy-in is crucial for initiating and sustaining cycling improvements. In London and Bogota, the creation of dedicated leadership positions was instrumental in championing cycling. In London and the UK, the elevation of local leaders to the national level led to the expansion of interventions across the country, and improved funding. In Bengaluru, the leadership of DULT held a facilitating role; the organization worked with a wide variety of stakeholders—academic, technical advocacy, residents, government agencies, political leadership—and helped in implementation and building public support and capacity.

Policy and Regulatory Framework
Existing policies and regulatory frameworks are important as they set a long-term vision and set goals to be achieved. The Transport Strategy sets the tone for mayoral interventions in London, and has been largely followed in spirit and implementation by the administration. In Bengaluru, DULT recently initiated the Active Mobility Bill to prioritize walking and cycling at the state level. The institution of TenderSURE guidelines has been accepted by both bureaucratic and political leadership, despite the absence of a formal mandate.

Plans and Strategies
In the absence of or to supplement formal policies, cities have relied on plans and strategies. London’s strategy of institutionalizing the Healthy Streets Approach (merging public health and NMT) is an example for other cities attempting to reinvigorate (walking and) cycling amongst residents. Bogota, too, undertook efforts such as the Plan Bici to bring in innovations such as cycling avenues. In Bengaluru, the administration and civil society have undertaken the informal strategy of piloting of interventions to test implementation, provide evidence and build support amongst citizens and politicians.

Role of Civil Society
Civil society across the three cities played a key role through consistent advocacy, building demand through events, providing technical expertise, building capacity, introducing innovations, and even as custodians of infrastructure. There were examples of advocates in civil society with prior work experience in government. They brought the experience of working with bureaucracies back to civil society organizations.

Civil society organizations provided continuity during governmental and bureaucratic transitions. They largely worked alongside each other and formed broad coalitions with similar outlooks and agendas. However, even when organizations have similar outlooks, different mandates can cause fragmentation, as seen in Bengaluru.

Communications, Messaging, and Outreach
Communications, events, and messaging have been strategically used to encourage walking and cycling. In Bogota, Ciclovía played a key role in nurturing a civic culture of cycling and the use of public spaces. In Bengaluru, the same approach was facilitated in a decentralized manner through Cycle Day events.

In Bengaluru, reduced air pollution and improved public health were immediate keys to pedestrianization. Support from local businesses was gained through consistent messaging on business recovery after the lockdowns. London institutionalized public health messaging and encouraged active travel through the Mayor’s Transport Strategy. Furthermore, the current Walking and Cycling Commissioner was selected for his prior experience in inculcating behavioral change (53).

Conclusion
This study introduced the “Key Levers” approach as an analytical tool to understand and evaluate cycling improvements during the initial COVID-19 lockdown and identified an initial list of eight key levers. In-depth literature review and key informant interviews suggest that several of these were crucial in Bengaluru, Bogota, and London. The levers of supportive leadership, civil society, and sufficient financial and technical capacity were found to be necessary for initiating successful interventions. Additionally, consistent public outreach and a coordinated institutional framework was necessary in sustaining and furthering improvements.

While this is an initial exploration of the key levers approach, more research is needed to understand the interrelationships between the levers and how decisions are made and implemented by the state.
Author Contributions
The authors confirm contribution to the paper as follows: study conception and design: S. Shah; data collection: S. Shah, V. Mohanakumar Jaya; analysis and interpretation of results: S. Shah, V. Mohanakumar Jaya; draft manuscript preparation: S. Shah, V. Mohanakumar Jaya, N. Piludaria. All authors reviewed the results and approved the final version of the manuscript.

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