A Compendium

of Low Carbon Mobility Solutions for Mumbai City

MOBILISING COMMUNITY SUPPORT FOR LOW CARBON MOBILITY IN MAHARASHTRA'S CITIES

परिसर

Prepared under the project:
MOBILISING COMMUNITY SUPPORT FOR LOW CARBON MOBILITY IN MAHARASHTRA'S CITIES

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Acknowledgement

We would like to extend our heartfelt gratitude and appreciation to all the participants for their active involvement in the workshop, which has now been compiled into a compendium. The contributions from each participant have played an instrumental role in shaping the outcome of the workshop, and this compendium stands as a testament to everyone's collective efforts and commitment to the project.

We are proud to say that this compendium is a result of our collective ownership of the goal of making Low Carbon Mobility a reality. And we would like to express our gratitude to each and every participant for their collaborative effort in the development of this resource. The dedication, insights, and feedback provided by the participants have been invaluable in creating a comprehensive and informative compendium that we can all take pride in.

The level of understanding and insight gained through this process would not have been possible without a sincere dedication to the cause. This compendium is a reflection of our shared commitment to the project and the collective effort we have put forth to achieve our goal of working towards solutions for Low Carbon Mobility in Mumbai. And we believe that this compendium will serve as a valuable resource for all stakeholders and will contribute significantly to the advancement of our project.

Team Parisar

MOBILISING COMMUNITY SUPPORT FOR LOW CARBON MOBILITY IN MAHARASHTRA'S CITIES

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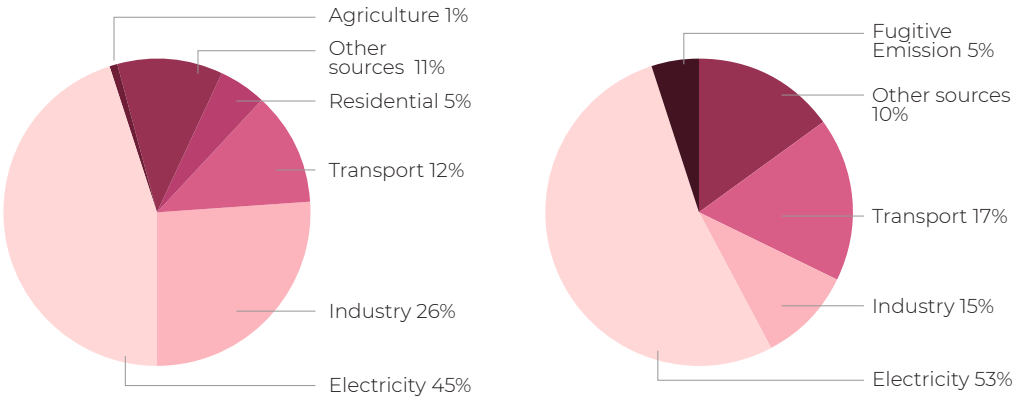
1. INTRODUCTION

Road transport contributes to approximately 90% of the total CO_2 emissions[1] in the transport sector in India. The decarbonisation of the transport sector plays a crucial role in advancing India's climate action goals, taking significant strides toward reducing air pollution and its associated health impacts while also mitigating well-being losses[2]. India has witnessed a 300% increase in passenger vehicle ownership since 2000. Per capita transport emissions, while still low, have increased 184%. If economic growth continues in the absence of sustainable transport, car ownership and emissions will approach high-income country levels. The Prime Minister of India during the 2018 Global Mobility Summit[3] outlined 7Cs of India's mobility pathways: Common, Connected, Convenient, Congestion-free, Charged, Clean, and Cutting-edge mobility espousing ease of living, developing an affordable, accessible and inclusive network of transportation systems.

India has witnessed a **300% increase in passenger vehicle ownership** since 2000. Per capita transport emissions, while still low, have increased 184%.

Burning of fossil fuels such as coal, gas and oil, deforestation and various agricultural practices has resulted in a drastic shift in global temperatures and changes in weather patterns, therefore are considered as instigators of climate change. In 2018, India's total CO_2 emissions[4] were estimated to be at 2455.25 $mtCO_2e$ with electricity holding 45% of the total share, industries 26% and transport sector constituting 13% of the total CO_2 emissions **(figure 1)**. For the same year, Maharashtra state contributed 238.44 $mtCO_2e$ emissions[5] with highest electricity generation followed by transportation.



Carbon Emission - India 2455 Mt CO_2e (2018)

Carbon Emission - Mah 238Mt CO_2e (2018)

Figure 1: Carbon emissions in India (Left) and Maharashtra (Right), *(Source: GHG Platform India, 2018)*

1 Decarbonizing India's Road Transport: A Meta-Analysis of Road Transport Emissions Models, 2022
2 Decarbonising the Indian transport sector pathways and policies, 2020
3 MOVE: Global Mobility Summit, 2018
4 Energy Sector, GHG Platform India, 2018
5 Top 10 States in Energy Emissions, GHG Platform India, 2018

In 2014, TERI published a report[6] on Assessing Climate Change Vulnerability and Adaptation Strategies for Maharashtra which "show that temperature and rainfall are projected to increase all over the state" and that the heat index "may increase human discomfort due to heat stress and also increase the number of days that are conducive to malaria parasite development and transmission. It may also increase the energy demand for cooling in urban areas that are already experiencing the urban heat island effect." Maharashtra[7] is a highly urbanised state with almost 50% of the state's 120 million population living in urban areas. It has 27 cities (population >300,000) and 10 cities with a population of more than one million residents. Fast forward, a decade later, the highlighted concerns stand to be true. Today, the state is witnessing an extreme growth in energy demand and consumption[8], and increase in temperature and annual heat waves[9]. Not only this, but the projections for the change in climatic events cause a greater damage to the natural and human habitats.

This project by Parisar is conceived with the belief that a shift to low carbon mobility in cities requires greater engagement and demand from a wide section of civil society. India has seen national level policies and initiatives such as promoting low carbon mobility[10] and the climate smart cities assessment framework[11].

At the city-level climate concerns are not the drivers of solutions, since urban transport is a state subject, projects and budget allocations are driven locally. Unless there is vocal and demonstrable support from the grassroots for low carbon mobility initiatives, the political economy is likely to pursue vehicle-centric solutions resulting in rapidly increasing urban transport emissions. This project seeks to mobilise support for low carbon mobility by conducting city-specific discussions, widening engagement with civil society, and supporting local advocacy efforts.

6 Assessing Climate Change Vulnerability and Adaptation Strategies for Maharashtra: Maharashtra State Adaptation Action Plan on Climate Change (MSAAPC), 2014

7 Urban India 2011: Evidence (IIHS, 2011)

8 Maharashtra lagging behind in renewable energy transition (The Times of India, 2023)

9 Explained: Why Maharashtra is experiencing a heatwave again (Indian Express, 2023)

10 India Roadmap on Low Carbon and Sustainable Mobility (Decarbonisation of Indian Transport Sector, 2020)

11 Climate Smart Cities Assessment Framework 2.0: Cities Readiness Report, 2021

1.1. Carbon emissions in Mumbai

Mumbai ranks 5th in the **most congested** traffic level cities of the world.

Mumbai is the financial capital of India, the capital city and the largest metropolitan conglomeration of Maharashtra. With an urban population of ~12.4 million people (Census of India, 2011) having population density of 28,426 persons/sq.km. Mumbai's urban expansion is proportional to the vast expansion of commerce and finance in the city. About 60% of Mumbai's population lives in the slum and only 6% of the total population owns the vast majority of the city's land[12]. The development of the New Bombay resulted in the beginning of urban sprawl in the 1960s, with increased in-migration in the city, the demographics shifted.

> *Given the ever-expanding volume of traffic between the city and suburbs it is important to develop efficient and sustainable transport networks that facilitate faster movements at lower social, environmental and economic costs. The option of the metrorail coupled with monorail and underground parking lots is seen as the best option*[13].

Mumbai ranks 5th in the most congested traffic level cities of the world[14] (TomTom Traffic Index, 2021). According to the index, travel times were 53% longer than the normal non-congested conditions. The city emits approximately one-tenth of Maharashtra's GHG emissions. From MCAP[15] (2022), Mumbai's total GHG emissions stand at 23.42 million tonnes of carbon dioxide equivalent ($mtCO_2e$), which translates to an average of 1.8 $mtCO_2e$ GHG emissions per person. Transport sector in Mumbai constitutes about 4.5 $mtCO_2e$ emissions, equivalent to 20% of the total GHG emissions within BMC boundaries. Within the transport sector, 83% comprises on-road transport emission and 17% railways. Total percentage of GHG emissions is given in **figure 2** as:

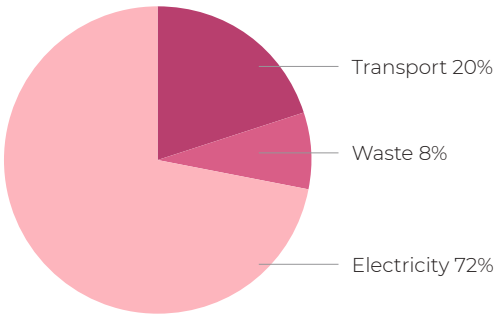


Figure 2: GHG emissions in Mumbai
(Source: MCAP, 2022)

12 Uncovering the myth of urban development in Mumbai
13 Uncovering the myth of urban development in Mumbai
14 TomTom Traffic Index, 2021
15 Mumbai Climate Action Plan (2022)

Transport sector in Mumbai constitutes about 4.5 $mtCO_2e$ emissions, equivalent to 20% of the total GHG emissions within BMC boundaries.

2. CONSULTATIVE WORKSHOP

Decarbonizing the transport sector and transitioning towards low carbon sustainable mobility is a significant approach to mitigate climate change. To compile a city-specific compendium of low carbon mobility initiatives, a participatory and consultative workshop was conducted. This workshop involved civil society organisations, independent individuals and consultants, union representatives, and representatives from other sectors. The aim was to collaboratively identify and document the initiatives that promote low carbon mobility in the city.

2.1. Methodology: ideate-connect-discuss

This compendium comprises a compilation of Mumbai-specific low carbon mobility initiatives. The project extended invitations to civil society organisations, aiming to engage with them on climate change and advocate for the integration of low carbon mobility solutions in urban contexts. These solutions not only contribute to reducing greenhouse gas emissions but also bolster transportation accessibility and affordability for the constituencies these organisations represent or the causes they champion. We are of the opinion that collaborating with these organisations, leveraging their ongoing endeavours within the city, will yield more impactful outcomes than initiating anew and directly engaging with the city's residents. The involvement of city-specific civil society organisations also facilitated the establishment of new networks and coalitions. In Mumbai, we established the Low Carbon Mobility: Mumbai network in collaboration with the participating organisations, thereby offering support for their forthcoming activities geared towards promoting low carbon mobility.

We followed the concept design of **Ideate - Connect - Discuss** to foster collaboration and **meaningful discussions** with the participating organisations.

The city-specific compendium of low carbon mobility initiatives is formulated through an inclusive and consultative process engaging civil society organisations. The objective of the compendium is to identify and furnish comprehensive information on initiatives, encompassing aspects such as scope, feasibility, institutional framework, and integration with other transportation modes.

Throughout this engagement, we adhered to the *Ideate - Connect - Discuss* design concept, fostering collaboration and substantive discussions with the participating organisations.

- **Ideate:**
  to come up with a set of ideas for low carbon mobility initiatives to be adopted by the city
- **Connect:**
  i) to deepen our understanding of the existing incentives to promote low carbon and sustainable mobility solutions,
  ii) to address the gaps between what has already been done, and
  iii) to think upon where we stand in adopting low carbon mobility

- **Discuss:**
  to come up with a list of possible CSO centric solutions/initiatives for a more action-oriented stand, to recognise our role as a civil society on promoting low carbon sustainable mobility in Mumbai.

2.2. Various transport issues

The relevant literature on low carbon and sustainable mobility underscores a shift away from fossil fuels and coal-based energy towards cleaner energy sources and electric vehicles. While electric mobility represents a new trend in the transportation sector and undoubtedly offers a low carbon solution that significantly reduces greenhouse gas emissions, we, as a civil society organisation, question whether electric mobility is a sustainable long-term solution.

While **electric mobility** represents a new trend in the transportation sector, we question whether it is **a sustainable long-term solution?**

The city's approach, predominantly centred around vehicle-centric policies, has led to a proliferation of individual vehicles that fail to effectively address issues such as traffic congestion and road infrastructure challenges. The accessibility of private vehicles to a larger population implies an influx of such vehicles onto roads, ultimately straining the existing infrastructure. However, by reducing the overall number of vehicles in the city, the same road infrastructure could potentially become more effective.

Parisar aims to create an archive focused on achieving low carbon mobility utilising the current transport infrastructure. This calls for prioritising and emphasising public transport, active modes of travel, and shared transportation options. We firmly believe that these alternatives are not only low carbon but also sustainable solutions aligned with long-term goals.

Following Avoid-Shift-Improve (A-S-I) approach[16], the three pillars of sustainable transport, we based our discussion on below mentioned topics of concern for the workshop to find underlying causes, root causes and understand issues related to these modes of transport that promote private vehicles on the road:

A) Walking
B) Cycling
C) Public transport
D) Shared mobility
E) Reduced usage of private vehicles

Later, solutions were derived from the causes and root causes of the problem statement and carried forward with the pre-existing policies, documents, conversations, initiatives, etc.

16 Sustainable Urban Transport: Avoid-Shift-Improve (A-S-I), 2019

2.3. Fishbone Activity 1: approach to finding causes and root causes

The fishbone activity, included as **Appendix 1**, was utilised as a participatory tool during the workshop. To explore the causes and root causes, participants were divided into five groups, each focusing on specific problem statements. Valuable insights were captured on chart paper and subsequently discussed in a group setting.

2.3.1. Causes for (not)-walking in the city

- Mumbai lacks user-friendly footpaths with NMT capacity in the BMC roads department.
- Lack of proper street design with encroachment by street vendors and unregulated vehicle parking throughout the city.
- Crowded city with a lack of pedestrian-friendly spaces, narrow roads, and poorly defined footpaths.
- Excessive fund allocation for private mobility instead of pedestrian infrastructure.
- Walking in Mumbai is time-consuming due to long distances and lack of proper directions.
- Safety concerns for pedestrians due to open drainages, ongoing construction on footpaths, and water logging during the rainy season.
- Unclean footpaths, lack of shades, and pedestrian routes.
- Narrow roads occupied by large vehicles, leaving no space for walking.
- Overall, a poor walking experience in the city with lifestyle and social behaviour influencing the choice of walking.
- Lack of pedestrian coalitions or groups advocating for improved walking infrastructure in the city.

Excessive fund allocation for private mobility instead of pedestrian infrastructure.

Underlying Root causes:

- Infrastructure design and maintenance for walking in the city is unkempt.
- Lack of political will by the city's administrators.
- Governance and land use planning is dictated by vehicle-centric policies.
- Lack of safety-sensitive design and lack of commercialization of walking as a positive social output and personal benefits.
- Lack of awareness and interest in collective action towards a good walking experience in the city.

Walking in the city

2.3.2. Causes for (not)-cycling in the city

- Cycling in the city is often viewed as a recreational activity and a sport, rather than a mode of transportation.
- Lack of awareness about cycling in the city and the need to prioritise everyday cyclists.
- Lack of motivation to cycle and enjoy its health and other benefits.
- Insufficient cycle lanes, cycle-friendly spaces, and supportive environments (such as repair shops and cycling parking spaces) on many roads.
- Lack of well-connected cycling infrastructure.
- Mindset of people plays a role in their decision to cycle or not, influenced by aspirational, behavioural, and social factors.
- Heavy traffic on roads makes cycling difficult, unsafe, and physically demanding.
- Inadequate facilities for longer-distance cycling and last-mile connectivity.
- City planning does not prioritise non-motorized transport (NMT) infrastructure.

Mindset of people plays a role in their decision **to cycle or not, influenced by** aspirational, behavioural, and **social factors.**

Root causes:

- Land Use Planning lacks vision for NMT (non-motorized transport) related infrastructure in the city.
- Lack of prioritisation or apathy towards cycling in the city.
- Cycling is not considered as a mode of transportation.
- Lack of awareness and education on cycling in the city.

Cycling in the city

2.3.3. Using public transport in the city

The causes and root causes primarily revolved around the public transport infrastructure, with a major focus on Mumbai's local train system, BEST buses, metro services, and monorail.

- Public transport in the city lacks proper maintenance, leading to cleanliness issues and insufficient supply to meet the demand.
- The procurement of more AC buses has increased fares, making them unaffordable for daily commuters.
- Using public transport is viewed as a status symbol, resulting in a growing dependency on private vehicles.

Overcrowding in local public transport leads to a lack of personal space, **inconvenient travel, and safety concerns,** particularly for women who often experience daily sexual harassment.

- Overcrowding in local public transport leads to a lack of personal space, inconvenient travel, and safety concerns, particularly for women who often experience daily sexual harassment.
- Buses have long waiting times and infrequent schedules, making them inaccessible and inconvenient. Additionally, there is a significant walking distance to connect with other modes of transport, causing gaps in multimodal integration.

Root causes:

- Less subsidies available for public transport, requiring an increase in the budget allocation.
- Lack of community awareness and responsibility towards public transport.
- Insufficient investment and infrastructure development for public transportation.
- Limited resources dedicated to transportation.
- Non-inclusive policies and inadequate maintenance.
- Flawed system and planning for public transport.
- Anti-people economic policies that favour the car industry.
- Lack of a sense of belongingness and attitude towards public commons.
- Pro-car stance among bureaucrats, politicians, and planners.
- Concerns about safety and security in public transport.

Public transport in the city

2.3.4. Shared mobility in the city

The participants identified the following causes and root causes related to shared mobility, including reasons for its usage, non-usage, and various barriers associated with this mode of transportation.

- Shared taxis/autos are commonly used from railway stations or bus stops but have limited waiting times and reliability issues.
- Three-seater autos on specific routes cause traffic congestion during peak hours.
- Shared OLA/Uber rides can be inconvenient due to different routes for different customers.
- Shared mobility is necessary due to inadequate last-mile connectivity in public transportation.
- Shared mobility is perceived as a comfortable and luxurious option, quickly adaptable, and dominated by private companies that accentuate societal class divisions.

- Private taxis contribute to traffic congestion similar to private cars.
- Safety measures such as route tracking and information on facilities are lacking in shared mobility services.
- Polluting old vehicles are often used for shared mobility, and there is a need to optimise shorter routes. Feedback and complaint facilities are absent.
- Limited space available outside railway stations for shared taxis/autos, making them inaccessible for those unfamiliar with the pickup points.
- Issues such as overcrowding, refusal to travel specific routes, denial of shorter distance rides, lack of gender sensitivity on taxi boards, and occasional driver misbehaviour.
- Shared mobility options are not disability-friendly.
- Auto rickshaws are a cost-effective travel option for narrow streets, but the excessive number of them causes space-related problems.
- Shared bikes require road safety and discipline, and they address logistical differences from pickup to drop-off points.

Shared mobility options are **not disability-friendly.**

Root causes:

- Lack of supporting infrastructure, such as shelters, information displays, and feedback mechanisms, for shared modes of travel.
- Insufficient availability of accurate data on shared modes of transportation.
- Absence of comprehensive surveys or appraisals to assess the effectiveness and usage of shared modes.
- Lack of enforcement and planning regarding the integration of shared modes with other modes of transportation.

Shared mobility in the city

2.3.5. Reducing vehicles in the city

Our exploration on how to decrease the reliance on private motorised vehicles in the city led us to this problem statement. The causes and root causes behind the rising number of private vehicles on the roads can be attributed to the lack of advancements in sustainable alternatives for achieving low carbon mobility. These causes include:

- The government encourages vehicle purchases to boost GDP and employment in the city.
- Administration misunderstands induced demand, assuming that more vehicles necessitate more roads in the city.
- Lack of public consultations on mobility plans, with authorities focusing

more on studying the number of vehicles rather than prioritising the needs of the people (MMRDA's comprehensive survey).

- Absence of efficient connections between multiple pick-up points and different locations through public transport, resulting in a lack of door-to-door convenience.
- Seasonal fixation on AC cars during summer, as private vehicles are seen as time-saving options.
- Lack of appreciation or promotion of public transport, with the mindset that it is primarily for low-income groups and unsafe during certain hours.
- Owning a private vehicle is considered an aspirational symbol, representing status and position in society.
- Marketing campaigns that encourage vehicle ownership by highlighting affordability, raising aspirations and desires to own motor vehicles.
- Inadequate public transport capacity in the city, making walkability dangerous and raising concerns about safety, phobias, old age factors, and scepticism regarding the functionality of the road system.
- People avoid crowded modes of transport, and there is a lack of availability of multimodal or last-mile connectivity in the city.

Absence of efficient connections between multiple pick-up points and different locations **through public transport,** resulting in a **lack of door-to-door convenience.**

Root causes:

- Attitude of government towards the working class with limited political influence.
- Vested interests of builders, contractors, politicians, bureaucrats, etc.
- Preference for personal changes over systemic changes.
- Acceptance of travel practices and social norms that prioritise private vehicle usage.
- Corporations and governance overshadow planning and rules in documents.
- Concentration of commercial spaces in one area, creating commuting challenges.
- Lack of study on population composition and their travel needs.
- Policy driven by the automobile industry, leading to infrastructure projects that favour private vehicles.
- Unsustainable development planning and policies contributing to increased private vehicle usage in the city.

Reducing usage of private vehicles in the city

2.4. Existing policies in Mumbai's mobility and transport

At National Level:

- National Urban Transport Policy[17]. (2006, revised 2014).
- National Transit Oriented Development Policy, TOD[18] (2017).
- Metro Rail Policy[19] (2017).
- Jawaharlal Nehru National Urban Renewal Mission[20] (2005-2014).
- Atal Mission for Rejuvenation and Urban Transformation, AMRUT[21] (launched in 2015).
- National Electric Mobility Mission Plan, NEMMP[22] (2020).
- Heritage City Development and Augmentation Yojana, HRIDAY[23] (2015).
- The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act[24] (2014).
- The Rights of Persons with Disabilities Act[25] (2016).

At State Level:

- Maharashtra State Electric Vehicle Policy[26] (2018).
- RTO regulations
  - » Maharashtra City Taxi Rules[27] (2017) .
  - » Hakim Committee Recommendations for Auto-Taxi Fares[28] (2012).
  - » Fare Structure for Auto-Taxi in Maharashtra State[29] (2017).

At City Level:

- Maharashtra Urban Transport Project[30] (2010).
  - » Improve traffic and transportation situation in MMR and
  - » Institutional development and strengthening
- Pedestrian first - Footpath policy[31] (MCGM, 2014).

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17 National Urban Transport Policy (2006, revised 2014)
18 National Transit Oriented Development Policy, TOD (2017)
19 Metro Rail Policy (2017)
20 Jawaharlal Nehru National Urban Renewal Mission (2005-2014)
21 Atal Mission for Rejuvenation and Urban Transformation, AMRUT (launched in 2015)
22 National Electric Mobility Mission Plan, NEMMP (2020)
23 Heritage City Development and Augmentation Yojana, HRIDAY (2015)
24 The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act (2014)
25 The Rights of Persons with Disabilities Act (2016)
26 Maharashtra State Electric Vehicle Policy (2018)
27 Maharashtra City Taxi Rules (2017)
28 Hakim Committee Recommendations for Auto-Taxi Fares (2012)
29 Fare Structure for Auto-Taxi in Maharashtra State (2017)
30 Mumbai Urban Transport Project
31 Pedestrian first - Footpath policy (MCGM, 2014)

60% of the city's last-mile-connectivity is met with **walking.**

- NMT First Policy[32] (CMP - Greater Mumbai, 2016).
- Development Plan[33] (Street Design Guidelines, 2014).
  - » Regional Plan for MMR mentions pedestrians safety needs to be prioritised + NMT modes need to be strengthened (2021)
- Bicycle sharing system[34] (Yulu Bikes).
- BEST Vogo (Electric Scooter Service) to improve last-mile connectivity[35] (2022).
- Comprehensive Transport Study[36] (updated 2021).
- Introduction of Tejaswini Buses in Navi Mumbai, Thane, Kalyan-Dombivli, Mumbai[37] (these buses are for women and run on green technology).

Citizen-led Initiatives:

- Citizen Matters[38] has initiated several panel discussions on the condition of roads, contributors to traffic, road safety, etc.
- Equal Streets Mumbai Movement[39].
- Cycle Chala City Bacha[40] led by Firoza Suresh.
- Mumbai Mobility Forum[41].
- Ola's '#DoYourShare' Campaign[42].
- "Main Hoon Na - Safe travel campaign for women" led by Akshara Centre[43].

Modal Share for the transport vehicles (passenger carriers) running on the city roads is as follows: Private (two-wheelers; moped/scooters/motorcycles and four-wheelers; cars/jeeps/vans), Public (autos/cabs/taxis, buses, trains). Current modal share estimated by Mumbai Climate Action Plan (2022) is summarised in **figure 3**. More than 80% trips are shared by formal public transport, informal public transport (auto rickshaw, taxi), and walking. 60% of the city's last-mile-connectivity is met with walking. Only 22% of Mumbai's streets are walkable (MCAP, 2022). Public Transport share declined from 88% to 76% from 2008 to 2015, ~40% of the population does not have access to mass transit within 1km in the Greater Mumbai area and 90% of autos/taxis are running on CNG. These figures should be taken into consideration when developing a transport network for the city that meets the infrastructural needs of its people, at the same time a more sustainable, safer, accessible and affordable transport system.

32 NMT First Policy (CMP - Greater Mumbai, 2016)
33 Development Plan (Street Design Guidelines, 2014)
34 Bicycle sharing system (Yulu Bikes)
35 BEST Vogo (Electric Scooter Service)
36 Comprehensive Transport Study (updated 2021)
37 Tejaswini Buses for Women
38 Citizen Matters
39 Equal Streets Mumbai Movement
40 Cycle Chala City Bacha led by Firoza Suresh
41 Mumbai Transport Forum
42 Ola's '#DoYourShare' Campaign
43 "Main Hoon Na - Safe travel campaign for women" led by Akshara Centre

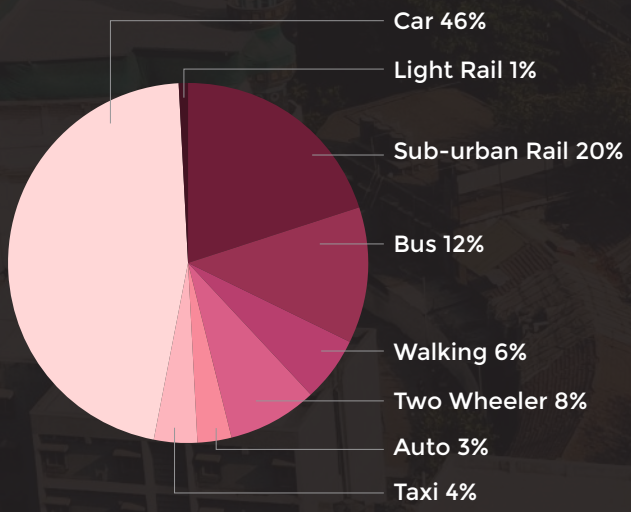
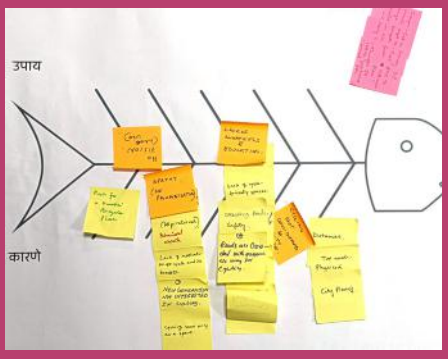


Figure 3: Modal Share of Mumbai (urban), MCAP, 2022

2.5. Fishbone Activity 2: finding potential actionable solutions

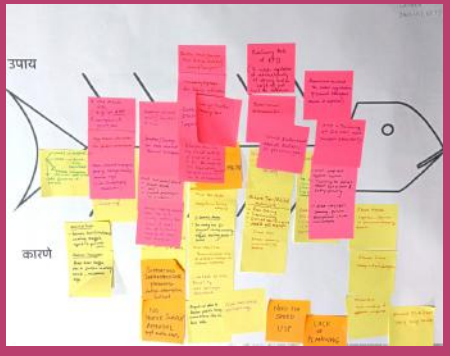
Reducing vehicles in the city

Using public transport in the city



Cycling in the city

Walking in the city



Shared mobility in the city

Fishbone Activity (comprising causes [yellow sticky notes], root causes [pink sticky notes], and solutions [baby pink sticky notes] to the problem statements

The list of initiatives for the low carbon mobility in Mumbai is categorised into following based on the nature of action that could be taken:

2.5.1. Awareness Campaigns and Advocacy Programmes

There is significant potential and opportunity for creating awareness and advocating the importance of public transport usage, sustainable mobility, and the negative environmental and climate impacts of road transport in the city. Taking action through demands, protests, and campaigns can play a crucial role in raising awareness and educating the public about low carbon mobility options as alternatives to private vehicles.

Scope: Advocating for widespread adoption of low carbon mobility in the city.

Feasibility: Engaging in demands, protests, and campaigns to promote the principles of low carbon mobility (LCM).

Initiatives that could be taken/improved:

- Emotionally appealing to the public, highlighting the negative impacts of personal vehicle use on children and the elderly.
- Advocacy for safety mapping in public transportation, specifically targeting women.
- School-level awareness campaigns promoting the need-based use of automobiles.
- Promoting cycling and public transport through awareness and educational programs in colleges and high schools.
- Awareness programs using examples from progressive cities to educate on induced demand and transport-related issues.
- Branding narratives to encourage a shift towards non-motorized transport (NMT) and public transportation, emphasising aspirations and societal benefits.
- Campaigning and raising awareness on the sustainability of renting vehicles.
- Promoting the increased use of public transport for a better environment and sensitising people to the cleanliness of the transportation system.
- Creating and disseminating easily understandable awareness materials about the rules and regulations of shared transport.
- Demanding increased security measures for public transport to ensure safe travel.
- Advocating for transparency through RTI (Right to Information) on the usage of existing funds in the transport sector.
- Calling for public participation and transparency in transportation planning, emphasising a bottom-up approach.
- Media campaign to advertise walking as a positive lifestyle choice, highlighting the health, environmental, and social benefits.
- Organising fun-filled activities centred around walking.
- Presenting data on the rise of personal vehicles in the city through popular media to encourage public awareness and promote the use of public transport.
- Raising public awareness about available resources for public transport and how to access them.

Voicing concerns about road conditions and **demanding timely road repairs.**

- Advocating for the formation of a Mumbai Bicycle Plan through joint letters, petitions, and correct ERs.
- Voicing concerns about road conditions and demanding timely road repairs.

Performing safety audits and mapping for the use of public transportation.

2.5.2. Research and Data Dissemination

Research and analysis form the foundational framework of any structure. To ensure the accuracy and reliability of data, it is crucial to gather relevant facts, information, and keep track of related developments.

Scope: Providing real-time, dependable, and precise information on the city's transport network.

Feasibility: coordinating between civil society organisations and collecting data from various secondary sources, primary surveys, etc.

Initiatives that could be taken/improved:

- Implementing necessary signage on all modes of transportation for public information.
- Conducting route mapping for shared mobility options.
- Conducting research and surveys to gather data on shared transport in the city.
- Performing safety audits and mapping for the use of public transportation.
- Studying the Development Plan and providing suggestions and comments for the Mumbai Bicycle Plan.

2.5.3. CSO engagement: citizens and political leaders

Identifying implementation gaps in policies to provide informed solutions that guide policy and decision makers towards maximising climate action and promoting green mobility in the city. Encouraging public engagement and involvement to spearhead sustainable mobility campaigns.

Scope: Identifying gaps in policy planning and implementation, creating awareness, and advocating for necessary changes and improvements in transportation services.

Feasibility: By reviewing and revising plans, policies, and schemes with an interdisciplinary approach to better understand the problem statements.

Initiatives that could be taken/improved:

- Advocacy organisations should conduct weekly awareness workshops.
- Regularly petitioning and contacting bureaucrats and politicians to demand improved transport infrastructure and address security concerns.
- Government investment in publishing the benefits of using public transport.
- Investing in improving existing road-based public transport systems.
- Collaborating to advocate for more walking spaces.
- Ensuring strict enforcement of passenger safety measures.
- Collaborative efforts to organise cleaning drives for footpaths.

2.5.4. Capacity Building, Education and Training

Scope: To promote awareness, education, and training on low carbon mobility, as well as facilitate effective communication between the city and its residents.

Feasibility: Encouraging individuals and a network of CSOs to adopt and practise low carbon sustainable mobility, promoting awareness and education on the dangers of climate change.

Initiatives that could be taken/improved:

- Implementing better enforcement measures.
- Including employee perks for car-based lifestyle substitutes (CBLS) in public transport company policies, such as providing no-car days once a week or month.
- Collaborating with the education department to incorporate the benefits of non-motorized transport (NMT) in school curricula at an early level.
- Making background checks mandatory for drivers.
- Providing information and training to drivers on gender sensitivity.
- Raising awareness about pedestrian rights and relevant laws.
- Mobilising users (commuters) to form pressure groups and advocate for their needs.
- Establishing a complaint register system and providing driver training on appropriate behaviour and safe driving practices.
- Encouraging personal development initiatives.
- Offering premium-class last-mile connectivity and premium-class Bus Rapid Transit (BRT) services.
- Redefining the role of the Regional Transport Office (RTO) to include vehicle regulation and monitoring driving quality, rather than solely focusing on fee collection.
- Establishing a dedicated traffic planning cell.

Incorporating shared transport considerations in street and station area design.

2.5.5. Demanding Pilot Interventions

Advocating for pilot interventions to raise awareness on a larger scale.

Scope: Conducting pilot interventions to assess the impact before or after implementing the intervention.

Initiatives that could be taken/improved:

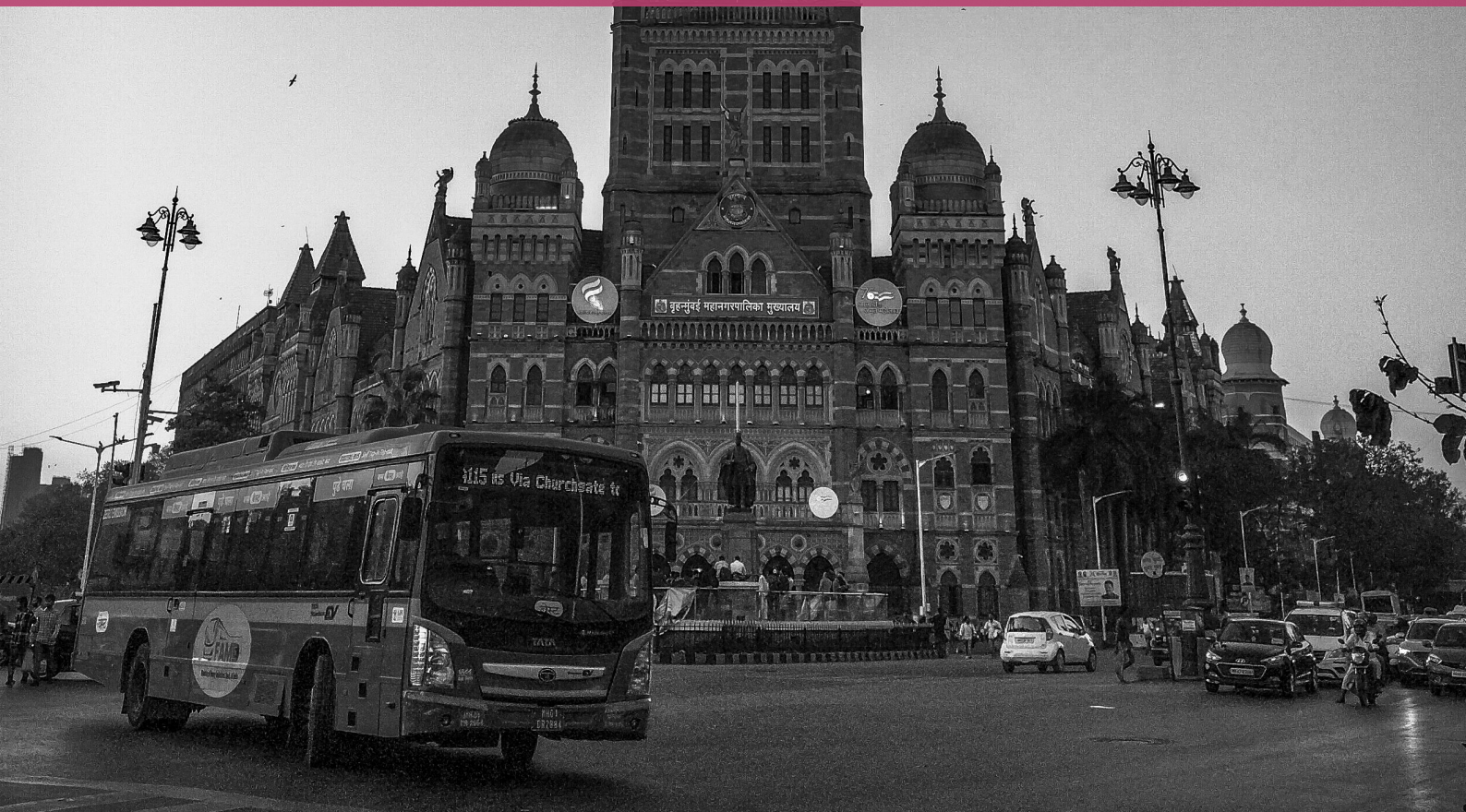
- Implementing a 20% limit on private vehicle usage during periods of high air pollution, similar to the odd-even rule.
- Planning shared mobility infrastructure based on population mapping and available spaces.
- Enhancing last-mile connectivity and convenience for commuters.
- Providing indicators/boards displaying travel routes, fare structures, and passenger capacity for vehicles.
- Incorporating shared transport considerations in street and station area design.
- Promoting congestion taxes and telescopic taxes to discourage car ownership, with increasing rates for owning multiple cars.

- Ensuring well-designed planning for shared mobility, taking into account the specific needs of the people it serves.
- Planning and improving station areas for better integration with transportation systems.
- Advocating for the reopening of closed routes and demanding transparency and accountability in transportation decisions.

2.5.6. Building Digital tools for easy access

- Advocating for the inclusion of shared transport options in transportation service apps, such as Chalo, Yatri, and M-Indicator.
- Working towards the development of a centralised information platform, including features like an in-app complaint portal and app-based public awareness information.

Public Transport share declined from 88% to 76% from 2008 to 2015, ~40% of the population does not have access to mass transit within 1km in the Greater Mumbai area.



ABBREVIATIONS

BMC:	Brihanmumbai Municipal Corporation
CO_2:	Carbon dioxide
CMP:	Comprehensive Mobility Plan
CSO:	Civil Society Organisations
GDP:	Gross Domestic Product
GHG:	Greenhouse Gases
LCM:	Low Carbon Mobility
$mtCO_2e$:	Metric tons of carbon dioxide equivalent
MCAP:	Mumbai Climate Action Plan
MCGM:	Municipal Corporation of Greater Mumbai

MMR:	Mumbai Metropolitan Region
MMRDA:	Mumbai Metropolitan Region Development Authority
NGO:	Non-governmental Organisation
NMT:	Non-motorised Transport
NUTP:	National Urban Transport Policy
PT:	Public Transport
RTO:	Regional Transport Office
TERI:	The Energy and Resources Institute
TOD:	Transit Oriented Development

APPENDIX 1:

FISHBONE ACTIVITY: PARTICIPATORY TOOL

The workshop took place at Ravindra Natya Mandir on 20 January 2023, facilitated by Dr. Avinash Madhale of Centre for Environment Education.

Indian cities are grappling with severe traffic problems, leading to expensive, time-consuming, and stressful daily commutes. The current approach taken by the city authorities only exacerbates the issues and fails to address the concerns of the majority. Moreover, it contributes to increased air pollution and greenhouse gas emissions, further exacerbating climate change and impacting people's lives. We believe that there are better solutions available that are both climate-friendly and people-friendly. However, it requires collective agreement, prioritisation, and joint actions to push forward this agenda.

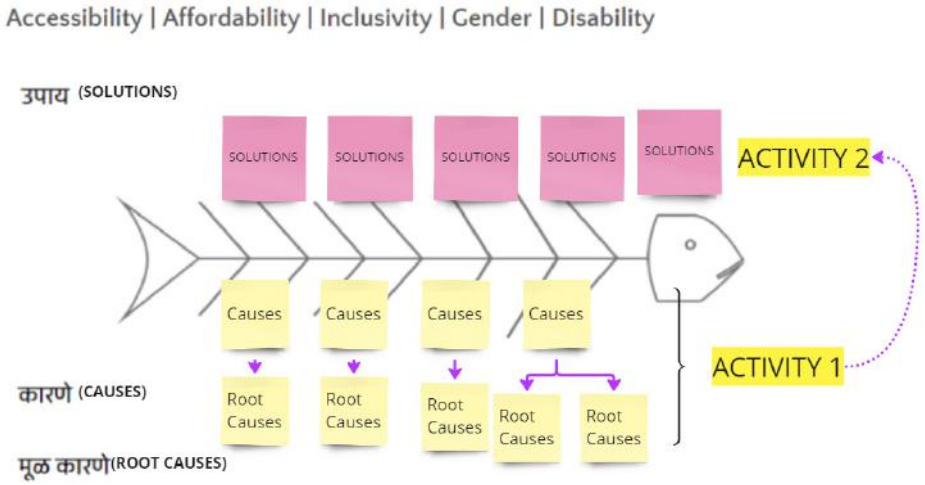
While some organisations are actively working on transportation issues, it is important to recognize that this is a problem affecting us all. Therefore, it is crucial for everyone to be part of the solution.

The focus of our workshop was to create a network of civil society organisations and mobilise support for low carbon mobility (LCM) in the city. The selected cities face their unique challenges in adopting LCM options, often due to limited awareness among citizens. Recognizing the importance of participation in addressing these challenges, we decided to utilise a participatory tool that is engaging and enjoyable for the workshop. We employed the fishbone activity in two phases, modifying the methodology to suit our requirements. Instead of focusing on cause and effect, we used the fishbone as a visual representation to identify causes and root causes related to the problem statements, as well as to brainstorm and find solutions to promote low carbon mobility in the city. This activity provided an equal opportunity for everyone to participate and share their thoughts on chart paper, facilitating an inclusive and collaborative environment.

Activity 1:
(writing down the issues based on the problem statements)

Objective: To write the issues (causes) of the problem statements.

Procedure: The facilitator began by explaining the objectives of the activity to the participants. Next, the participants were divided into four groups, with each group assigned a specific problem statement. Each group was supported by a table facilitator from the Parisar team, who sat with the participants at their respective tables. The participants were given time to write their thoughts on sticky notes, focusing on the causes of the problem statement. These sticky notes were later discussed, and the identified causes were placed on the bottom part of the fishbone diagram on the chart paper. Subsequently, discussions were held to identify the root causes. Each group engaged in internal discussions at their table and then presented their causes and root causes to the larger group. Inputs and feedback from participants at other tables were collected during this presentation phase.



Fishbone Activity Sample

The groups were organised in a manner that ensured participants from the same organisation did not sit together at the same table. This approach was taken to promote diversity in terms of the impact areas represented by the organisations. Additionally, efforts were made to maintain a gender balance at each table. The tables were facilitated as follows:

1. Walking in the city: Paornima Gabhale
2. Cycling in the city: Sharmila Deo
3. Using Public transport: Sandeep Gaikwad
4. Shared mobility: Shweta Vernekar
5. Reducing vehicles in the city: Ranjit Gadgil

Activity 2: (writing down the solutions of the problem statement)

Objective: To identify solutions related to the problem statement based on the issues and root causes discussed in Activity 1.

Procedure: The procedure was similar to Activity 1. The sticky notes containing the solutions were pasted on the top part of the fishbone diagram.

Organisation of tables at the time of Fishbone Activity

APPENDIX 2:

PARTICIPATING ORGANISATIONS

S.No.	Name of the organisation	Impact areas of the organisation	Name of the participant	Gender
01	Akhil Bharatiya Janwadi Mahila Sanghatana Mumbai	Women's Rights and Issues	Sonya Gill	Female
02	All India Democratic Women's Association	Women related issues	Rekha Deshpande	Female
03	Bombay 61	Focused on Participatory design with Communities Dependent on Creek in Mumbai, Urban design focused on climate changes and sustainability.	Yash Ramesh Khadye	Male
			Urmila Gogawale	Female
			Siddhesh Shirke	Male
04	Conservation Action Trust	"Environment and Wildlife Protection and Conservation"	Prasad Khale	Male
05	Fridays For Future Mumbai	Environment, transport.	Yash Agrawal	Male
			Siddharth Godbole	Male
06	GreenLine Mumbai	Environment	Ashwini Jadhav	Female
			Sandra Pereira	
07	Helpage India	Reaching the unreached, free medicine for poor and needy senior citizens. Through a mobile health unit	Salvadore Miranda	Male
08	Individual	-	Sudhir Badami	Male
09	Journalist	-	Vidyadhar Date	Male
10	Maharashtra Hawker federation	Informal workers	Vinita Balekundri	Female
11	Mumbai Environmental social network and Mumbai Mobility Forum	bus lane of high traffic volume highways - already a successful pilot . Mumbai has at least 4 lanes each with more than 100 buses/hr., they will earn even operating surplus. second issue is the reorganisation taxation in favour of buses and week higher rates for pvt cars incl toll (no. for buses and retain for cars)	Ashok Datar	Male
12	Mumbai First	Urban Governance, Climate Change, Mental Health and Education	Revati Pradeep Gokhale	Female
13	Mumbai Mobility Forum, Mumbai Vikas Samiti	Issues related to transport, housing and other infrastructure for Mumbai city	A.V. Shenoy	Male
14	Mumbai Sustainability Centre	Environment	Rishi Aggarwal	Male
15	NAGAR	Ambient Air Quality, Road Space Management, Advocacy	Priyanka Tendolkar	Female
16	Praja foundation	Civic issues, Education, Health	Mahesh	Male
			Nilesh	

S.No.	Name of the organisation	Impact areas of the organisation	Name of the participant	Gender
17	Mumbai Dabbawala union	-	Vishnu Kaldoke	Male
18	The Urban Project	Urbanism, planning, design, architecture etc	Vijayshree Pedneker	Female
19	Transforming M Ward Project, TISS	Community Participatory, and knowledge based advocacy and policy inputs on Environment, Climate Change and Health through action research	Avinash Kaur Bons	Female
			Simpreet	Male
20	Tribovandas Bhimji Zaveri - The original	Women Empowerment and Quality Education	Linsa Elizabeth Sabu	Female
21	United Way Mumbai	United Way Mumbai has distilled five priority areas for interventions i.e, Environment, Health, Education, Public Safety & Livelihood. These areas of focus encompass the most pressing social problems of our communities and the solutions are designed to address their root causes.	Pooja Shinde	Female
22	Waatavaran Foundation	Air quality, Biodiversity, Forests	Shruti Panchal	Female
			Rasika Nachankar	Female

Mobilizing Community Support for Low Carbon Mobility in Mumbai

परिसर

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