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Reformation & Transformation of Mobility in India's Economic Capital

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Biography

Adwait Bhide is a last year student of Bachelor's in Mechanical Engineering from University of Pune, India. He has worked as an innovator, designer and project manager at number of national level innovation and engineering events. He focuses on developing solutions for smart and sustainable cities.

Abstract

Transportation plays a decisive factor in determining the health of a city. "Reformation and Transformation of Mobility in India's Economic Capital" aims at understanding the evolution of the Mumbai Metropolitan Region and the implications of shift in the transport behaviour on the mobility infrastructure of the city as well at personal, social, and environmental levels. It provides with a brief insight of challenges that are faced by all the stakeholder. This case study primarily focuses on the metro project that is about to become a major engineering achievement for the city. The other aim of this case study is to highlight the importance of timely completion of major infrastructure projects and the economic costs associated with the failure to do so.

Introduction

In 1991, India adopted Liberalization, Globalization and Privatization (LPG). Since then, there has been rapid growth in per capita income.

While opening of the Indian economy was a great boom, it has become a bane in urban areas. Since then, we have been witnessing expeditious growth in per capita income while transportation infrastructure is improving at a crawling pace; causing more congestion and pollution.

Mumbai, the financial capital of India, was first beneficiary of these economic reforms. It started with the expansion of the region under MMR to include adjoining suburbs and formation of Maharashtra Metropolitan Planning Committee (MMPC). The Mumbai Metropolitan Regional Development Authority (MMRDA) was established to lead the infrastructure development in the region.

Mumbai Metropolitan Region (MMR)

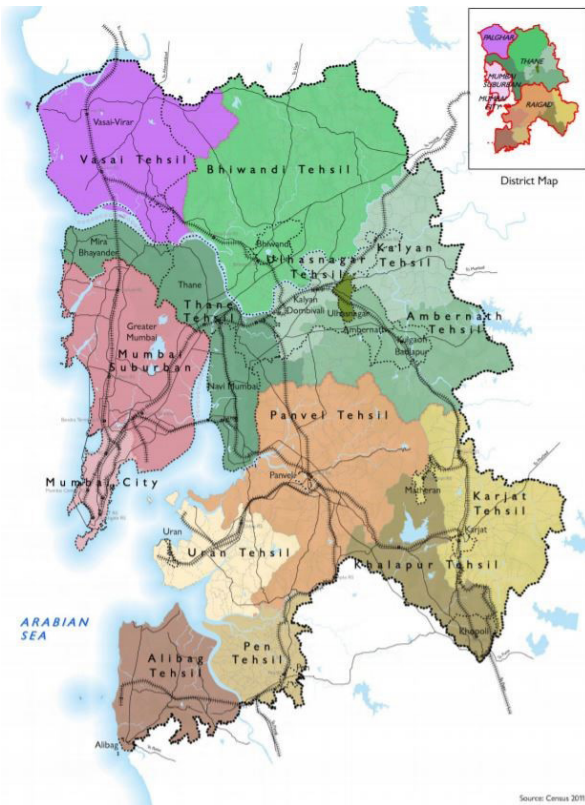


Figure 1: Mumbai Metropolitan Region Map.

Source: Mumbai Metropolitan Regional Development Authority (MMRDA). (2016). Draft Mumbai Metropolitan Regional Plan 2016-36

Located on the western coast of Maharashtra, MMR with population of 2.28 crores is currently the 7th largest Metropolitan Region in the world and projected to be the 6th (in population) by 2030. MMR spreads over 6,355 km² and consists of 9 Municipal Corporations, 15 Municipal Councils and over 1000 villages.

GDP (PPP) for MMR stands at \$368 billion, ~6% of total GDP of India. It is a home to most of the major banks and financial institutions. Workforce participation in Greater Mumbai stands at 40.34% with 95.2% being engaged in urban form of employment. Table 1 shows the share on Mumbai in National GDP.

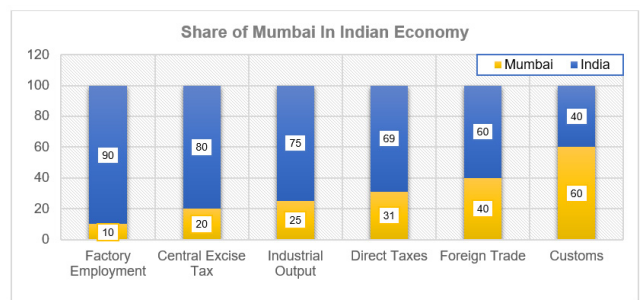


Table 1: Mumbai, Economic Capital of India

Since 1991, population growth in MMR is hovering around 5%, suburban areas are accounting for most of it. The population density varies between 17,024/km² and 5,529/km² in Municipal Corporations and Councils, respectively.

Even though the population is increasing in suburban areas, the jobs and businesses are still located in Municipal Corporation of Greater Mumbai (MCGM). This asymmetrical expansion has led to unidirectional movement of population during peak hours, creating a shift in transport behaviours as shown in **Table 2**.

| Mode | Trips/ Day (2005) | Share (%) | Trips/day (2014) | Share (%) |
|---------------|-------------------|------------|-------------------|------------|
| Car | 757,164 | 7.0 | 1,639,439 | 11.6 |
| Two-Wheeler | 412,959 | 3.8 | 2,083,578 | 14.8 |
| Auto Rickshaw | 426,067 | 4.0 | 816,940 | 5.8 |
| Taxi | 230,290 | 2.1 | 938,670 | 6.6 |
| Bus | 3,541,967 | 32.9 | 3,093,288 | 21.9 |
| Suburban | 5,402,711 | 50.1 | 5,256,019 | 37.2 |
| Metro & Mono | NA | NA | 293,148 | 2.1 |
| Total | 10,774,158 | 100 | 14,121,082 | 100 |
| PV | 1,170,123 | 10.9 | 3,723,017 | 26.4 |
| IPT | 659,357 | 6.1 | 1,755,610 | 12.4 |
| PT | 8,944,678 | 83.0 | 8,642,455 | 61.2 |

Table 2: Change in Mobility Behaviour

Data Source: Mumbai Metro Rail Corporation Limited and RITES, 2011

Suburban Railway Network considered as a backbone of the region, is running at maximum frequency with each train carrying more than the double of the capacity (16 people/ m²). Figure 2 shows examples of overcrowded suburban network. Over last two decades, there has been no considerable progress made in introducing new options or expanding current infrastructure, thus crippling entire mobility system.



Figure 2: Overcrowded suburban network

Requirement of an Integrated Mobility Infrastructure

Lack of integrated planning and constant delays in reformative, regenerative, and transformative projects have led to 'Saturation of Mobility Infrastructure' with the degradation of social as well as personal life.

More Government; Less Governance

Governance issues are not new for India. Current model of extensive consultations has increased the overall complexity of governance structure. In MMR, there are 35 agencies involved in the sphere of transportation.

Over the years, the area of MMR has grown significantly; however, no single agency has clear mandate for preparing affordable, integrated, investment and operations budgets to meet travel demands and policy objectives. The poor definition of roles and responsibilities, and weak interagency coordination have led to considerable delays in the implementation of projects.

The performance of most of the agencies is consistently poor. Organizations have acute shortage of staff with adequate skills in transport planning/ execution/ operations.

MMRDA has failed to appropriately position itself nor has been efficient in exploiting the resources within the agencies to realise the expectations with which it was established.

Policy Volatility

Policy volatility has become a characteristic of the region. The involvement of Central, State and Local Governments and parties with different ideology coming to power in various levels has resulted in policy uncertainty. Infrastructure projects have a horizon of 20-30 years, becoming the first casualty. There are instances where funding of certain projects was withdrawn and reallocated purely because of political biases.

Conservative Finance

Three decades since the LPG reforms, the financing model for public infrastructure has broadly remained the same. Majority of the projects are being financed by the Governments at multiple levels. Over the last decade, new investing patterns like issuance of soft loans have emerged.

There have been instances when fare regulations have become a key issue of contention in PPP projects where private partners demanding the fares to the extent that the project will become financially unviable. Consequently, MMRDA has universally adopted the Engineering, Procurement and Construction (EPC) model where the role of private sector entities has been widely restricted till the construction phase. In major projects, post completion phase, a PPP partner has been involved on Operate, Maintain and Transfer basis (OMT).

Metro Rail Policy (2017) proposed by the Central Government obligates Local or State governments

to switch to PPP model in metro projects to receive funding from the Central Government. MMRDA is expected to continue with the EPC model for all the upcoming projects, compelling it to come up with new revenue models for cashflow management and avoid straining of resources.

Environmental and Economic

“At average trip speeds between 5 to 20 km/hr, the cars pollutant emissions were 4 to 8 times as much as when the average speed was 55 to 70 km/hr. Fuel efficiencies similarly were much worse with traffic congestion”. (Matthew Barth and Kanok Boriboonsomsin (November 2009). Table 3 shows the ‘Air Quality’ at 6 congested areas in the city.

| Sr No | Location | RSPM | SPM | SO ₂ | NO _x | CO |
|-------|-------------------|------|-----|-----------------|-----------------|------|
| 1 | Churchgate | 196 | 351 | 33 | 50 | 2.19 |
| 2 | Grant Road | 161 | 235 | 29 | 38.5 | 2.65 |
| 3 | Mahim | 120 | 321 | 10.3 | 29.0 | 1.05 |
| 4 | Mumbai University | 86 | 236 | 7.0 | 18 | 1.00 |
| 5 | Sahar Road | 130 | 338 | 15 | 41.3 | 1.20 |
| 6 | SPEEZ | 140 | 363 | 16 | 55 | 1.27 |
| NOTE | Permissible | 60 | 100 | 80 | 80 | 4.00 |

Table 3: Air Quality Data of 6 congested areas in MCGM

Data Source: Mumbai Metro Rail Corporation Limited and RITES, 2011

PM 2.5 pollution in urban India is already 40% above the safe limits. It is estimated that, a trip in Mumbai costs ₹6 - ₹60 in additional carbon dioxide.

During peak hours, average speed ranges between 10-20kmph, with average delays of 55 sec/km in morning and 46 sec/km in evening. On an average, 11 days per year are wasted, costing \$5 billion annually, ~1.5% GDP of Mumbai (Mehrotra, 2020). It comes at a time when 50% of the workforce is using non-motorised transportation (Municipal Corporation of Greater Mumbai (MCGM) and Lea Associates South Asia Pvt. Ltd., India, 2016).

Social and Personal Impact

As per World Bank, India spends 7.7% of its GDP (PPP adjusted) on welfare losses due to air pollution. Table 4 shows the exponential rise in air pollution related illnesses in the region.

| | Percentage of People Suffering | |
|----------------------------|--------------------------------|--------------|
| | Year 2004 | Year 2011 |
| Cough | 13.3 | 41.3 |
| Bronchitis | 24.1 | 31.1 |
| Eye Irritation | 14.1 | 38.4 |
| Observed SPM Levels | 381 μ gm/cum | 642 μ gm/cum |

Table 4: Exponential rise in air pollution related illnesses

Traffic congestion also leads to emotional disturbances; mostly stress and aggressiveness causing adverse physical, psychological, and social implications. The quality of life and life satisfaction have been adversely impacted by this. Mumbai is ranked as the 2nd in the list of world’s most burnt out cities (Laura Begley Bloom, 2020), this gives insight as to menace of traffic is a serious social concern for the city.

Measures Taken

As per author’s own survey, 95% of the responders stated that roads, parking infrastructures and the traffic are significant issues in the region. They preferred suburban railways and the major reasons for not using other modes of public transport were a) Punctuality b) Accessibility. Figure 3 shows the responses received.

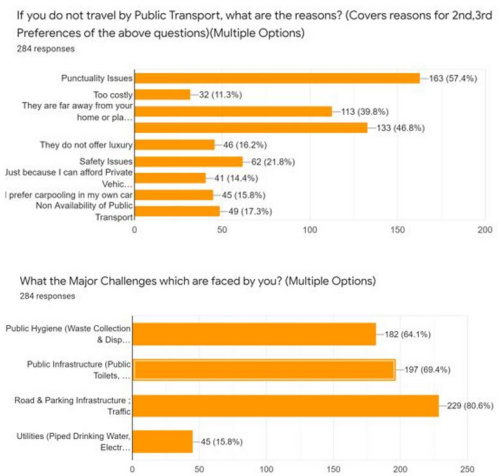


Figure 3: Survey responses

MMRDA and MCGM have come up with ‘Draft Mumbai Metropolitan Regional Plan (MMRP) 2016-36 and ‘Comprehensive Mobility Plan (CMP) 2014-2034’ respectively to improve mobility infrastructure. The major focus is on upgrading mobility infrastructure in MCGM and Thane Municipal Corporation (TMC) while expanding the suburban network in the peripheral areas. Table 4 shows proposed projects 248 km of

| Project Name | Quantity |
|---|----------|
| Metro Project | 8 |
| SATIS (Station Area Traffic Improvement System) | 35 |
| Flyovers | 16 |
| Elevated Roads | 5 |
| Road Over Bridges/ Road under Bridges. | 28 |
| Cycle Tracks (in kms) | 540 |
| Exclusive Bus Lane | 257 |

Table 5: Proposed projects

new suburban railway routes by 2016, and 318km of metro networks by 2021 should have been operational in MMR. However, not even 10% of the target is achieved.

Suburban Network: The Nervous System of MMR

Mumbai Suburban Network spreads over 390km and ferries 7.5 Million passengers daily. In 1999, Mumbai Rail Vikas Corporation (MRVC), a joint venture between Ministry of Railways and Government of Maharashtra was established to deal with the challenge of jurisdictional overlaps. MRVC has been tasked with executing the suburban rail improvement projects under the Mumbai Urban Transport Project (MUTP). For financing Suburban Railway Development, the body aims to commercially develop Rail Land and Airspace in Mumbai. So far, Three Phases under MUTP have been approved.

| Phase | Aim | Status |
|-------|---|------------------------|
| I | Horizontal and Linear Expansion of Network | Completed in 2011 |
| II | <ul style="list-style-type: none"> Segregation of long distance trains from suburban network Increasing capacity per train Improving efficiency | Delayed and ongoing |
| III | <ul style="list-style-type: none"> Improving the commute quality (AC rakes etc) Upgradation of station infrastructure Expansion of network in peripheral areas Improved punctuality | Proposed and initiated |

Table 6 Brief overview about the change in priorities

With the introduction of MUTP III, it has been ascertained that there is no further scope of development of network in the interior of MMR. Here, the focus has now shifted from network expansion to supplying quality commute which has deteriorated drastically while expanding the network in the exterior regions of MMR. All the stakeholders have started projecting metro as an alternative for Mumbai Suburban Network.

Mumbai Metro: The New Backbone of MMR

331km metro network with expected daily ridership of 7 Million is planned and under construction, making it the new backbone of mobility in the region. Metro 1 is the only completed project while Metro III is the costliest and challenging of all. Table 6 gives the details of upcoming metro projects in the region.

| Line | Route | Length | Importance |
|--------------------|---|------------|---|
| 2A | Dahisar – DN Nagar | 18.5 | Alternative for road transport & suburban network |
| 2B | DN Nagar – BKC – Mankhurd | 23.6 | |
| 3 | Colaba – Bandra – SEEPZ | 33.5 | Connects 2 business hubs of city & airports |
| 4, 4A, 11 | Gaimukh – Kasarwadavli – Mulund – Wadala – CSMT | 49.2 | Alternative for road transport, enhanced connectivity |
| 5 | Thane – Bhiwandi – Kalyan | 24.9 | Connectivity with logistics hub |
| 6 | Lokhandwala – Jogeshwari – Kanjurmarg | 14.5 | 2 nd East – West connectivity with interchange for most of the metros. |
| 7, 7A | Dahisar East – Andheri East – CSIA | 18.8 | Alternative to road mobility |
| 8 | Mumbai International Airport (T2) – Navi Mumbai International Airport | 35 | Connectivity between present and new international airport. |
| 9 | Dahisar East – Mira – Bhayander | 13.5 | Alternative to road mobility, fast and improved connectivity. |
| 10 | Gaimukh – Shivaji Chowk Mira Road | 9.2 | |
| 12 | Kalyan – Dombivali – Taloja | 20.7 | Alternative to suburban network & road transport |
| 13 | Mira Bhayander – Virar | 23 | |
| 14 | Kanjurmarg – Badlapur | 45 | Alternative to suburban network |
| TOTAL (kms) | | 331 | |

Table 7: Proposed and upcoming metro projects

Metro Line 1: In 2006, Metro Line 1 became the first metro project in India to be awarded on PPP basis and financed by Indian bank. A Special Purpose Entity – Mumbai Metro One Private Limited (MMOPL) was established. The actual work commenced in 2008, and became operational in 2014.

The delay in initial phase of project was primarily due to the failure on part of MMRDA in land acquisition and in providing the right of way to MMPOL. The unavailability of underground utility maps made the task more difficult.

During the commencement, the project was caught

up in the complex and multiple certifications. It took 6 months for MMOPL to get the Final Approval from Railway Board.

It has effectively addressed the issue of poor East-West connectivity by reducing travel time from 90-120 mins to 21 mins, bypassing 45 signals.



Figure 4: Strategic importance of Metro 1 in tackling traffic congestion

Source: MMRDA, for more details visit – www.mmrda.maharashtra.gov.in

During the operational stage, there has been a long-standing dispute between MMRDA and private partner over the fare rates, with private partner seeking fare rise that will make the project financially unviable.

Issues like PPP, complex Certifications, lack of clear policies etc. became a learning for future projects and most of these have been effectively mitigated.

Mumbai Metro III: It is the most ambitious project. It is the only project which is complete underground and the costliest of all.

- Aim – Reducing 15% congestion from suburban network and 20% vehicular traffic.
- Operational by – Phase 1 – December 2021.

Mumbai Metro Rail Corporation Limited (MMRCL), a special purpose vehicle was established as the nodal agency for development and operations of the line. Metro III is estimated to cost ₹23,136 Cr (Mumbai Metro Rail Corporation Limited and RITES, 2011). Figure 5 shows Financing Structure. Japan International Cooperation Agency (JICA) is the single largest investors with investments coming in the form of soft loans. Detailed ‘Stakeholder Interactions’ have been shown in Appendix 1.

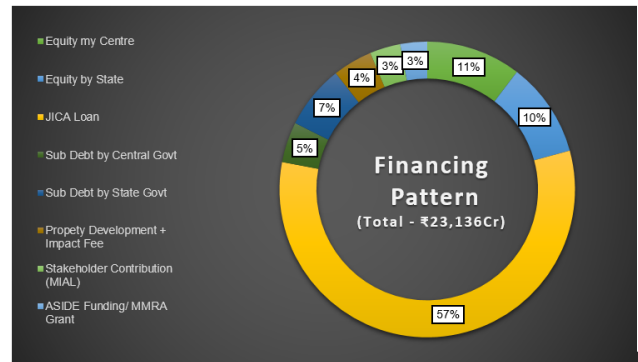


Figure 5: Financing of Mumbai Metro 3

The project is a crucial step towards addressing Air Pollution & Congestion as it is expected to reduce fuel consumptions by 2,95,495 litres/day leading to 8,255 tonnes reduction of CO₂ per year by 2031 (Mumbai Metro Rail Corporation Limited and RITES, 2011).

Primary challenges for MMRCL were building public and political consensus; environmental implications; technical hurdles. Since the beginning of the project, there had been a divide between executing agency, environmental activists, residents, and various political organisations. However, in today, most of the differences have been effectively addressed and consensus has been achieved in almost all spheres.

Political Consensus: The project since its conceptualisation had disagreements between various political parties. Most have reached consensus, the only major disagreement, that exists today, is on the location of ‘Car Depot’.

Social Challenge: First challenge was the rehabilitation of 5,000 residents. 19 buildings in Kalbadevi – Girguam area, which are one of the oldest areas of the city, had to be demolished. MMRCL proposed a ₹700 crores redevelopment plan for the affected 19 buildings. This proposal was accepted by all the stakeholders and smooth consensus was reached in initial stages itself.

Psychological Challenge: The line passes through some of the most densely populated areas and beneath many heritage buildings. Initially people feared that tunnelling below them will make structure unstable. MMRCL has placed, multiple sensors across the route to monitor any such movements. No such case has been reported throughout the project.

Tunnelling & Flooding: A part of the route passes below Mithi River. This was the second time when such attempt was being made in India. The soil under Mithi

is not even, it consists of brecciated and weathered basalt with silty and gravelly weak points, creating a risk of rupture or flooding. Tunnelling Boring Machine (TBM) with Earth Pressure Balance Shield (EPB) was used for tunnelling. New Austrian Tunnelling Method (NATM) has been at many places, like - 152m of BKC station that is located below the river. Mumbai is prone to flooding and was a major concern for Metro 3, but tunnels and stations are made watertight and comply with US standards.



Figure 6: NATM Tunnelling of 152m section of BKC; Seepage of mud and loose soil while tunnel boring; completed tunnel section

Source: Mumbai Metro Rail Corporation Limited; for more details – www.mmrc.com

Car Depot: Three sites were surveyed for the project with “Aarey Colony” being most feasible and financially viable. This selection was opposed by various groups as it required axing of 3000 trees. Out of 35Ha allotted for the site, MMRCL decided to use only 25Ha to protect maximum trees. The decision was challenged across all levels of judiciary and in every case came in favour of the site. As of September 2020, 50% work on the site is completed but has been stayed due to change in state government. The site is now planned to be moved to Kanjurmarg requiring 6km of additional routing. There has been a tussle between Union Government, State Government and various private entities over the Kanjurmarg land which has resulted into legal battle with a complete stay on any activity at the said plot till Feb 2021. The project is expected to be delayed by 2-5 years.

Public Consensus: Public consensus decides the fate of a project. Constructed, 30m below the surface, it was not possible for citizens to witness the development and left huge scope for rumours. MMRCL, is effectively using social media for dissemination of information, answering public queries and grievances, creating a transparency between all stakeholders. It has conducted multiple public hearings, providing an opportunity for citizens’ involvement.

Environmental Concerns: MMRCL has transplanted 65% of disturbed trees and are compensating 3 trees per tree that could not be saved. Moreover, 21,000 trees have been planted at Sanjay Gandhi National Park (SGNP) (Mansi Phadke, 15 October 2018) and this drive has been a success with high survival rate (81%) of all newly planted trees.





Figure 7: Tree Plantation at Aarey and SGNP
 Source: Mumbai Metro Rail Corporation Limited; for more details – www.mmrcl.com

Current Status: The work of tunnelling and stations is going on with full swing. Delay in deployment of Phase 1 is certain, as the work of metro car shed has come to a standstill since last November 2019. There is a looming uncertainty as to when the project will be dedicated to the city and its actual route. Also, the impact of financial escalations due to delays and realignment is yet to be ascertained with some estimates saying a cost escalation by 30% is certain with expected delay of 2-5 years.



Figure 8: Station construction at 3 major stations
 Source: Mumbai Metro Rail Corporation Limited; for more details – www.mmrcl.com

Monorail – Project that Became Minimum in the ‘Maximum City’.

In 2005, MMDRA proposed Monorail, conceptualised as an alternative for bus services and was supposed to function as a feeder transit to metro and suburban railway systems offering affordable, comfortable, safe, and efficient public commute. Monorail projects are 50% cheaper than metro projects.

Corridor passes through some of the most vacant areas on the eastern side of Mumbai, with no shops, offices, or residential blocks. It is very poorly integrated with other modes of transportation with the nearest suburban railway station being 4km away. It is also located away from residential areas. This has led to increased travel time and cost for the passengers. Consequently, it did not conceptualise as expected. This can be termed as a short-term failure.

Since the commencement of monorail, builders have started construction activities on the vacant plots. Monorail can still hit success in long-term scenario, if extended by 2 km in each direction, connecting Metro Line 1 and suburban rail network at Ghatkopar in north and Line 4 at Worli in south, solving the issue of poor integration of public transportation.



Figure 9: Monorail
 Source: MMRDA, for more details visit – www.mmrda.maharashtra.gov.in

With the failure of 1st ever monorail project, there is uncertainty over the future of this concept even though it is more of planning failure than concept failure.

Public Transport – How Things Have Changed?

BEST is the largest public transport operator in MMR. Till 1995, the organization was recipient of awards for “Best productivity (Urban Transport)” but post 1995 the organization has failed to make the mark. BEST can be a case study on “How political ill-will for reformation, excessive political interference in day-to-day affairs and poor management has made the most productive organisation, one of the worst?”

Today, BEST is struggling with losses rising ₹4.5Cr/day. Even after having plots in prime location, organisation has failed to exploit them by building commercial complexes, becoming alternate and stable source of revenue.

In 2008, transport intermediaries like Ola and Uber entered Indian Market and with relaxation in licensing policy, there has been mushrooming of vehicular transport. These intermediaries are not only competing with autos, taxis but also with the BEST. 80% of commuters opt this mode because it offers better travel options. Over the years, due to absence of regulator or policy to reign them, the intermediaries after capturing a decent market share, have introduced ‘Surge Pricing’. Where pricing at times, has been found to be 6x the actual fare. 65% of the respondents found this practice as irritant and exploitative proposition.

Certain national policies and state policies are in the drafting but as of now there is no regulator or tribunal to regulate fares and terms or to investigate grievances. Sole organisations are Regional Transport Offices and Local Traffic Police who are already overburdened with their own duties.

Today, BEST is introducing organizational changes as expenses reduction exercise. It is in the process of introducing ‘Ridlr’ app, procuring minibuses to improve efficiency. It is rationalising fares to woo back commuters lost to autos and taxis due to past fare raises. The fares were such, for shorter distance, BEST had become costlier than autos and taxis.

As part of green initiative, MMRDA has started operating AC e-buses. So far, this has received good response from the public.

Non-Motorized Way – An Experiment

50% of the working force in Mumbai commutes on foot. People who are staying or working within 1.2km from the nearest public transport often walk to their destination. Commuters used autos and taxis up to 5km and this proportion has been rising rapidly. To tackle this challenge, MMRDA and MCGM have planned to introduce cycling tracks. However, so far, no noteworthy progress has been made.

Thane Municipal Corporation (TMC) is one of the first to come up with “ilovecycling” project an app-based cycle sharing concept on PPP basis. The project was receiving good response and network expansion was planned. However, today, the racks are lying vacant and the infrastructure showing signs of decline. The project has been crippled due to lack of maintenance and operations.

Government has planned to increase share of e-mobility. There is lack of public awareness and basic minimum infrastructure in the city, to support such move. Moreover, the power prices in the area are not affordable, discouraging the shift to e-mobility especially for private owners.



Figure 10: (L-R) Newly installed Cycle Rack; condition of Cycle Racks today.

Last Remarks and Conclusion

Urban mobility is not just a mobility issue, but a major environmental and socio-economic issue as well. With every passing day, it is getting increasingly severe. Traditional mobility measures are progressively becoming inefficient due to geographical limitations. Some critical observations can be summarised as follows:

- **Financial Viability Challenge** – Projects in Mumbai have been delayed by average of 5 years and

the period of completion is 30% more than national average. These constant delays in the completion lead to cost escalations, at times, even doubling it.

- **Citizen Involvement** – A collective approach needs to be employed by all stakeholders to get citizens onboard. They are the ultimate consumers; their opinions will directly affect the performance of project.
- **Improved Efficiency** – An attempt to integrate all mobility services was made in 2008, but it failed within couple of years. Today, individual attempts are being made, but unification of all mobility services is still a distant dream.
- **Organisational Restructuring** – The issue of jurisdictional overlaps is still prevalent. MMRDA should function as the umbrella organisation with exclusive authority in certain spheres, while independent, professional and segment specialised organisations and regulators need to be established to plan, implement, regulate, and maintain the infrastructures.
- **Non – Motorised Transportation** – Has made a mark in MMRP, but so far it has not been channelised properly.
- **Policy Immaturity** – Haphazard and last-minute changes to projects for short-term political gains is aggravating the delays in project completions.
- **Information Technology** – ICT and data are going to play a crucial role in efficiently and sustainably addressing the challenges of 21st century. So far limited efforts are being made with AI based traffic signals being piloted at major junctions.

Various reformative and transformative measures have been planned and introduced to mitigate mobility challenges. These projects still lack integration like, majority of Metro stations do not have parking facilities, BRT lanes being planned run parallel to metro network and are competing instead of being feeder for Metro Network.

The rising Standard of Living and degradation of public transport is encouraging residents to opt for private vehicles. Everyday 900 new private vehicles are being registered in the region.

Mobility in Mumbai has reached a tipping point. The delays in operationalising mobility projects is putting tremendous stress on road infrastructure. With every passing day, the costs are rising at even greater magnitude.

Urban Planners and experts need to be given a free hand in execution and implementation of technical, operational, and certain policy decisions wherein the role of political body will be limited to supervisory role rather than an initiative-taking one in post initiation stages.

Illustrate current situation in MMR, it would be most appropriate to quote Former Minister of External Affairs, Late Sushma Swaraj: **“Reforms must begin today; Tomorrow could be too late”**.

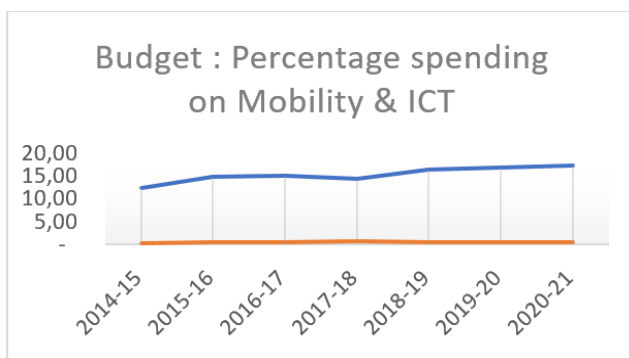
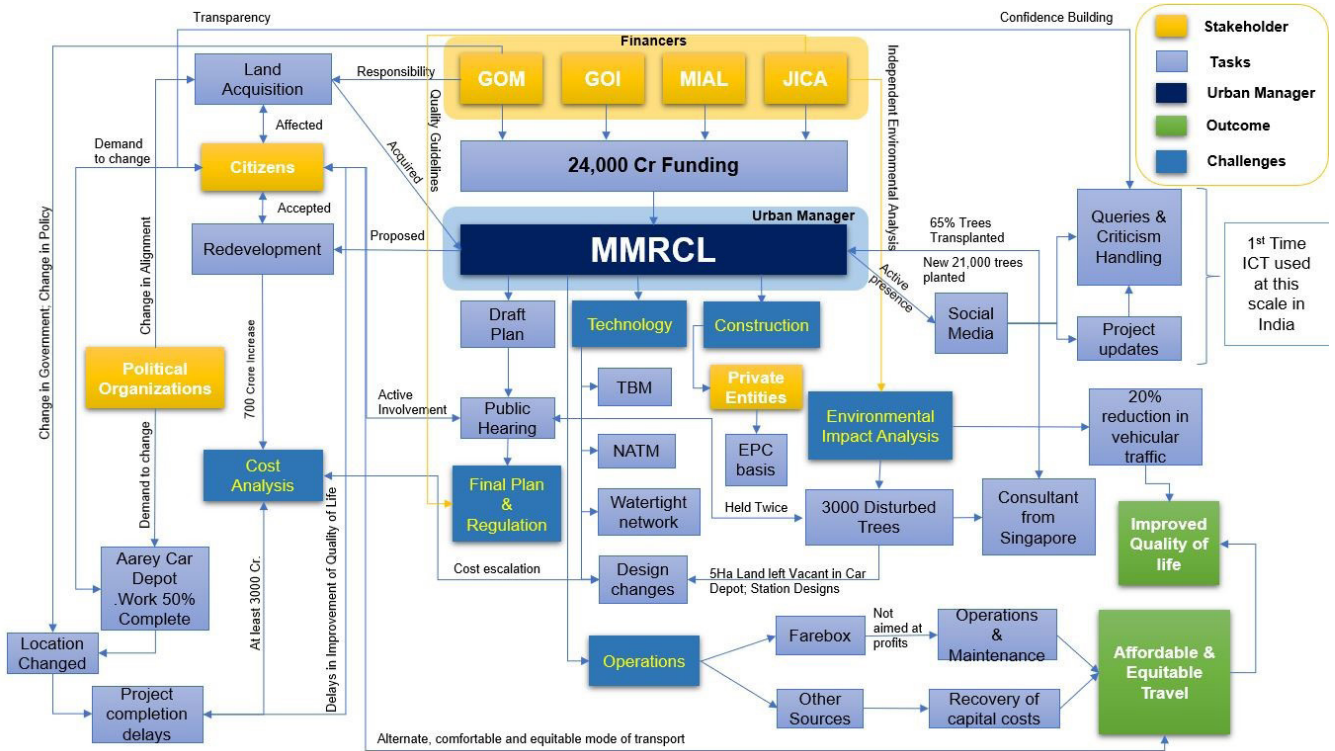


Figure 11: Budgetary spending on Mobility & ICT

Appendix 1: Stakeholder Interaction of Mumbai Metro 3



References

- Adv Shirish V. Deshpande. (2017, July 5). Uber-Ola The Competition Killer or The Competition Trigger? *Research Partnership Platform*. Geneva: UNCTAD.
- Ashwini, B. (2019, September 15). MMRC MD Ashwini Bhide on Metro 3 Project. (A. Khare, Interviewer) *Swarajya Magazine*.
- Directorate of Economic and Statistics. (2019-20). *Economic Survey of Maharashtra*.
- Harsh Vardhan Pachisia and Kadambari Shah. (05 February 2020). *The costs of congestion: A case study of Mumbai*. Mumbai: The Hindustan Times.
- Joint Technical Committee, Government of Maharashtra. (December 2011). *Coastal Road Mumbai*.
- Kamble, G. (10 January 2019). *Failure of Mumbai's Monorail Holds Lessons for Urban Planners Everywhere*. The Wire.
- Karishma Mehrotra. (12 February 2020). *In a year, Mumbaikars spend 11 days in traffic commute time: Uber Data*". The Indian Express.
- Laura Begley Bloom. (2020). *Ranked: The World's 20 Most Stressed-out Cities (The Worst in the US will Surprise you)*. Forbes.
- Mansi Phadke. (01 December 2017). *The failure that is India's first Monorail*. Mumbai: The Print.
- Mansi Phadke. (15 October 2018). *This IAS Officer is trying to change the perception that Mumbai Metro is a 'demonic plan'*. Mumbai: The Print.
- Maple General Consultant. (2017). *Part 1: Updated Environmental Impact Assessment for Mumbai Metro 3 (Colaba-Bandra-SPEEZ)*.
- MMRCL. (NA). Retrieved from Mumbai Metro Rail Corporation Limited: www.mmrcl.com
- Mumbai Metro Rail Corporation Limited and RITES. (2011). Detailed Project Report for through Metro Corridor - Colaba-Bandra-SPEEZ. 7.10; 9.5; 9.15; 16.
- Mumbai Metropolitan Regional Development Authority (MMRDA). (2016). Draft Mumbai Metropolitan Regional Plan 2016-36. 3,11,13,21,22,50, Map 1.
- Municipal Corporation of Greater Mumbai (MCGM) and Lea Associates South Asia Pvt. Ltd., India. (2016). Comprehensive Mobility Plan (CMP) for Greater Mumbai. 2.2; 2.5 to 2.8; 4.6; 4.20; 6.4; 7.1.
- Municipal Corporation of Greater Mumbai. (2013-14 to 2020-21). *Financial Budgets*.
- NITI Aayog. (2018). *Transforming India's Mobility*.
- Paresi Rawal. (May 2019). *By Bailing out BEST buses of financial loss, MCGM ends up being a rich or poor dad*. Observer Research Foundation.
- The Press Trust of India. (07 June 2016). *India Incurs \$21.3 Bn Loss due to road traffic delays*. New Delhi: Business Standard.
- The World Bank. (2010). *P113028*. Retrieved from World Bank: <https://projects.worldbank.org/en/projects-operations/project-detail/P113028>
- The World Bank. (n.d.). *P113028*. Retrieved from World Bank: <https://projects.worldbank.org/en/projects-operations/project-detail/P113028>
- United Nations. (2018). *The World's Cities in 2018*.

Announcements

IGLUS Quarterly

IGLUS Quarterly is an analytical open access journal dedicated to the analysis of Governance, Innovation and Performance in Cities and is edited at EPFL ME, Ras Al Khaimah, U.A.E. IGLUS Quarterly aims to facilitate knowledge and experience sharing among scholars and practitioners who are interested in the improvement of urban system's performance in terms of the service efficiency, sustainability and resilience.

IGLUS Quarterly applies the highest academic standards to analyze real world initiatives that are dealing with today's urban challenges. It bridges the gap between practitioners and scholars. IGLUS Quarterly therefore adopts a multidisciplinary perspective, simultaneously considering political, economic, social and technological dimensions of urban systems, and with a special focus on how governance affects and is affected by the use of technologies in general, and especially the pervasive application of the ICTs.

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IGLUS Executive Master

Our Executive Master in Innovative Governance of Large Urban Systems (IGLUS) responds to today's needs: growing cities evolve into metropolitan areas with their major infrastructures – transport, energy, buildings, water and greens – becoming increasingly interdependent, not the least because of the pervasive nature of the information and communication technologies. Managers and policy-makers concerned with such large urban infrastructure systems not only need to learn how to operate them, but must also become experts in maintaining, planning, and financing them in order to better respond to changing customer demand and evolving citizen needs. In short, the complexity of cities faced with ever more pressing challenges requires skills and expertise that our Executive Master's program offers.

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IGLUS MOOCs

Management of Urban Infrastructures

The MUI MOOC provides an introduction to the principles of urban infrastructures management. In this MOOC, you will receive lessons from practitioners (City of Geneva, Veolia, Boston Consulting Group, CarPostal), experts (The World Bank) and academics (EPFL, CUNY). More information below.

iglus.org/management-of-urban-infrastructures-mooc/

Smart Cities

Smart Cities is a Massive Open Online Course that offers an introduction to the principles of management of smart urban infrastructure systems. It addresses the main challenges in management of Smart Cities during the transition and operation phases in the life-cycle of a Smart City.

iglus.org/smart-cities-mooc/

The “Innovative Governance of Large Urban Systems” is now live !

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