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Pune Metro Station Area Management and Dispersal

Kiran Ghorpade *[1], Dr. Satish S. Deshmukh*[2], Gauri Patil*[3], Dr. Sunil Thakare*[4]

*1 Assistant Professor, Civil Engineering Department, KJ's Educational Institute Trinity Academy of Engineering, affiliated to Savitribai Phule University Pune, Maharashtra India.

*2 Professor, Civil Engineering Department, KJ's Educational Institute Trinity Academy of Engineering, affiliated to Savitribai Phule University Pune, Maharashtra India.

*3 Assistant Professor, Civil Engineering Department, KJ's Educational Institute Trinity Academy of Engineering, affiliated to Savitribai Phule University Pune, Maharashtra India.

*4 Professor, Civil Engineering Department, Anantrao Pawar College of Engineering Pune, Maharashtra India.

Mail Id- 1. kiran.h.ghorpade@gmail.com 2. ssdbaramati@gmail.com 3. gauri.patil2310@gmail.com 4. prof_sbthakare@rediffmail.com

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Abstract- Due to increasing traffic congestion on the Pune road network and the high rate of private car usage, planners and implementing agencies have decided to invest in upgrades to the city's transport infrastructure. Transit experts have come to the conclusion that more people need to start using public transit instead of driving their own cars. This has resulted in the issues discussed in this paper, which have led to large, expensive projects that frequently fail to deliver the anticipated benefits and to ignore faster, cheaper alternatives that may be more beneficial. In order to implement integrated, comprehensive, and least-cost planning that takes into account supply and demand side options, urban local bodies need to be reformed in a way that makes them transparent and directly accountable to citizens. If this isn't done, our cities will become increasingly congested and unlivable as large sums of money are invested in projects involving urban transportation. Consequently, this might put an end to the nation's much-touted economic boom tale. Provisions for other current transport systems, such as BRTS, should be established, as well as upgrades to appropriate transit, rather than only relying on metro rail. The aforementioned options may assist alleviate some of the market difficulties now being experienced by the metro. The creation of a multi-modal transportation network is essential. If solutions are supplied and implemented, the problems being experienced by other current metros may be affected, and a speedier integrated system can be accomplished in a shorter length of time. If the subterranean corridor can be used at all, it should be used to its full potential so that the benefits of both choices may be fully realized. The Pune metro rail may be optimized and made more efficient by implementing the aforementioned solutions over the course of the next several years. Supply and demand may be managed with the use of an environmental impact assessment and in-depth socioeconomic surveys of both corridors.

Keywords- Technical Surveys, Infrastructure, Pune Metro, Indian Transportation, Area Management.

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1. INTRODUCTION

Pune has been crowned the "Queen of Deccan" with good reason: the city is stunningly beautiful and rich in natural resources. It is also famous for its religious and historical landmarks. Pune has become well-known all around the globe because to its many prestigious educational, research, and development facilities. The presence of a major military installation also lends significance to the area. Located in western Maharashtra, Pune is the most industrialized region in the state and a major centre for information technology. Pune is representative of the indigenous Marathi culture and spirit, which puts a premium on theatrical performance, artistic expression, and academic achievement. Pune is the cultural centre of Maharashtra. Tukaram, a poet and saint, was born there. Here you may find the homes of legendary liberation heroes like Bal Gangadhar Tila, Agarkar, and Gopal Krishna Gokhale. Jayant Narlikar, a prominent figure in 21st-century science, was born and raised in Pune. Information Pune Metro is a three-line urban Mass Rapid Transit System (MRTS) being built in the city of Pune, Maharashtra, by the Maharashtra Metro Rail Corporation Limited (Maha-Metro) and the Pune Metropolitan Region Development Authority (PMRDA).

1.1 Location

The Pune district is situated between 73019 and 750 10' East Longitude and 170 54' and 100 24' North Latitude. The locale is limited by Ahmadnagar area on the north-east, Solapur region on the south-east, Satara region on south, Raigad locale on the west and Thane area on the north-west. Because the Pune district is part of the tropical monsoon land, it experiences significant seasonal variations in temperature and rainfall. Environment of the western district of Pune is cool while the eastern part is hot and dry.

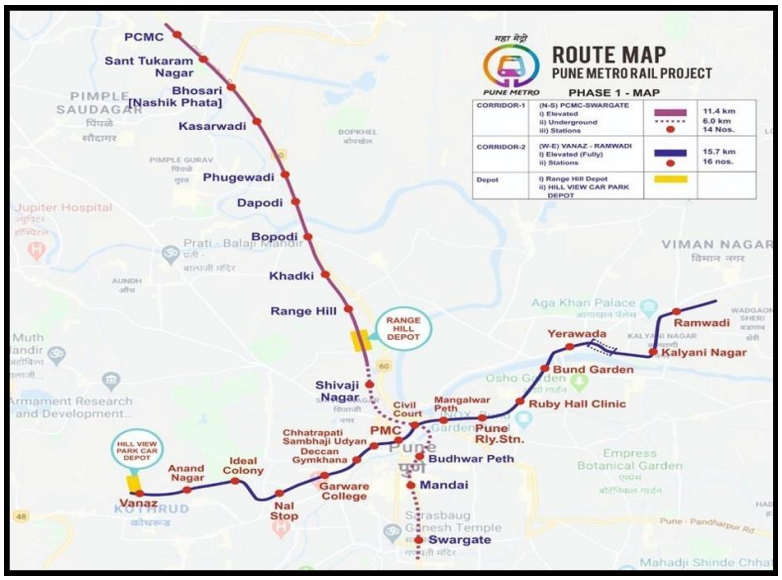


Figure 1.1 Route Profiles

Source: https://themetrorailguy.com/pune-metro-information-map-updates/

1.2 Traffic Demand Forecast

Optimistic forecasts are seldom realised, and the most probable rider ship is thought to only arrive first, according to Delhi Metro's experience. As a consequence, the most likely forecasts are included into all future Metro infrastructure design.

1.3 Need For Metro

The public transportation system conserves space and reduces air and noise pollution. A city's proportion of rail- or road-based public transportation should rise with population. In places like Pune, where roads are too narrow and must accommodate both slow and rapid traffic, the maximum number of passengers that can be transported in one hour in each direction (phpdt) is 8,000.

1.4 System Selection

A. Choice Of Gauge

Evaluation Tool Standard gauge (1435 mm) is universally adopted for metro lines due to its many benefits. Twenty brand-new metro systems have been constructed in cities all around the world in the previous decade. All of these metros have adopted Standard Gauge even though the national gauge for mainline railroads in several of these countries is different from Standard Gauge.

B. Traction System

The rapid pace at which the Metro moves people necessitates stringent measures to ensure everyone's safety. However, the company's ability to provide the finest services to customers must be maximized because to the substantial expenditures in rolling stock and infrastructure.

C. Telecommunication

The telecommunication system is the communication backbone for signalling systems and other systems like SCADA, AFC, and so on, and it offers telecommunication services to suit the operational and administrative needs of the metro network.

D. Automatic Fare Collection

A large number of people may be transported simultaneously using a Mass Rapid Transit System. Tickets and fare collecting are crucial to the system's smooth functioning. A straightforward ticketing system that is also easy on back-end systems is ideal for this purpose. In addition, it should be able to print single or multiple trip tickets, accommodate last-minute pricing adjustments, and use fewer employees overall.

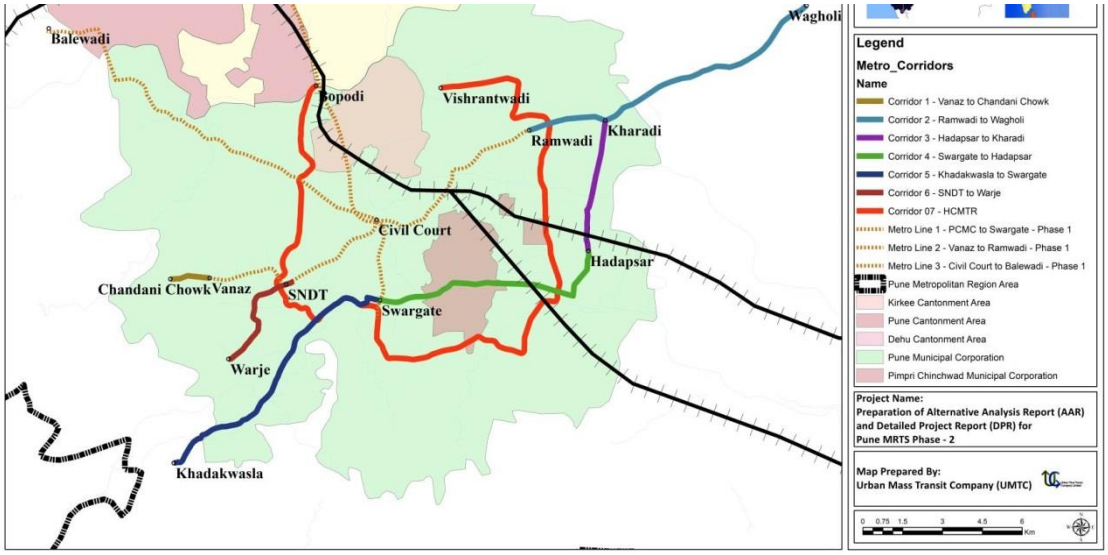


Figure 1.2 - Station Location Characteristics

Public and non-public (technical areas) areas of the stations have been separated. Unpaid and paid areas are further subdivided into the public area. From the beginning, all stations in the paid area have access to escalators.

1.5 Problem Statement

Due to the elevated metro and insufficient road width for today's 6,190 phpd (persons per hour per direction) daily ridership, construction of the metro rail in the excising system is challenging. Since Shivajinagar to Swargate is prone to traffic, an underground route is proposed in phase I (Pimpri to Swargate). In addition, the road width from Shivajinagar to Swargate is sufficient for elevated metro. Insufficient road width poses a challenge for the construction of metro rail pillars in Phase II. Pune's congested roads make it impossible to maintain a continuous flow of traffic. Focusing on the Vanaz to Nal stop area, it connects Warje, Malwadi, Swargate, FC road, MG road, Law college road, and NH 4 highway, among other places.

1.6 Objectives of this paper

1. To plan for effective and secure traffic circulation around tube stops
2. Planning Effective Use of Underground Metro Parking Spaces
3. For the Planning of Pedestrian Traffic at Metro Stations
4. In order to achieve multimodal integration at tube stops
5. To plan for and carry out the construction of parking lots close to Metro Stations.

2. LITERATURE REVIEW

2.1 Research Gap

Pune, Maharashtra, is getting a new urban Mass Rapid Transit System (PMRTS) thanks to the efforts of the Pune Metropolitan Region Development Authority and the Maharashtra Metro Rail Corporation Limited (Maha-Metro). 31.254 miles Phase 1 of the Pune Metro,

which consists of 29 stations and two metro lines, had its Detailed Project Report (DPR) completed and submitted by the Delhi Metro Rail Corporation in July 2009[1].

It was most recently revised in November 2015, having previously been revised in January 2013, August 2014, and November 2015. The State Government gave its blessing to the project in 2012, but the project ran into politics, bureaucracy, and criticism from local NGOs and activists because of its relatively high profile. On December 7, 2016, the Union Government's Cabinet gave the project its final go-ahead [2].

At first, visits to the assigned offices were made to comprehend the city's issues and gain a better perspective on the Pune Metro. In addition to the Pune Metro's proposed development plan, the development plans of DMRC and BMRC were thoroughly examined [3].

The issues that arose during the construction of the Delhi or Bangalore metro were brought up with a number of people associated with those projects. Additionally, the issues that plague the Pune Metro were discussed. Additionally, a number of maps have been used as a point of reference, and the geological issues with the strata have been identified. On the basis of the study, construction issues were sought after, and solutions were provided [4].

The traffic department and Pune's traffic problems were visited, and the Pune metro and the traffic issues it will cause were discussed. PCMC division was additionally visited in regards to the reviews led for the metro and the way to deal with this philosophy was examined with the chief specialist [5].

In addition, land acquisition will be difficult for the proposed phases of the Pune metro, and certain historic landmarks will be hampered by the removal of existing structures. The Pune Metro is estimated to cost close to 10,000 crores, with contributions expected from the World Bank, the central government, the state government, and the municipal corporation. The burden that the public and the government face as a result of civic taxes has also been discussed [6].

Numerous issues with the construction of the Vanaz-Ramwadi corridor have been discussed with officials, and solutions to these issues have been discovered. In addition, a pre-feasibility survey was conducted among households in the PCMC region to determine the necessity of the metro, present the public's perspective in the form of graphs and pie charts, and identify potential solutions [7].

2.2 Literature Survey

[1] The Role of the Concrete Boom Placer in the Efficiency of the Pune Metro

Despite the growth of the construction industry; The majority of construction companies still place a high value on this industry's productivity. The current literature on productivity measurement, with a focus on construction sites in particular, is reviewed in this paper, which then offers suggestions and recommendations for increasing site productivity. Planned/targeted concrete consumption and actual consumption of a concrete boom placer are also shown, with planned machine hours standing in for input and real machine hours for

output. The quantity of concrete placed is used as the only metric by which to measure the boom placer's productivity on the Pune metro rail project. Inadequate shuttering and a shortage of materials are discussed in this research and shown to impede productivity on building sites.

[2] Highway Construction Project: A Case Study in Construction Equipment Fleet Management

On a construction site, a lot of construction equipment is needed. The endeavors of project workers are to continually push machine abilities forward. Construction equipment's careful planning and execution become increasingly important as the range of useful equipment grows. The goal of the project is to forecast the fleet's output rate and adjust the fleet's quantity and size of pieces of equipment accordingly. Equipment costs are included into the optimisation process.

[3] Methods of CIC-Based Quality Control in Urban Metro Construction:

Currently, the rapid expansion of investment in cities and infrastructure is accompanied by frequent urban metro construction accidents in China. Quality control in the building of urban metro systems is notoriously challenging, time-consuming, and chaotic due to a lack of precise product specifications, organisation, and process information. This article creates and deploys a CIC-based system for early warning of quality risks in urban metro development.

[4] Construction In India's Dynamic Economy:

Planning, design, and financing are the first steps in the construction process, which continues until the building is ready for occupancy. Because it opens up investment opportunities in a variety of related fields, India's construction industry is an important indicator of its development. A small number of major companies are involved in all aspects of the construction industry, which is fragmented; companies of a medium size that specialize in a specific industry; and small and medium subcontractors who carry out the work in the field and work as subcontractors.

[5] Emerging Topics in the Study of IT-Based Applications for Managing Safety in Construction:

This paper analyses articles published in Automaton in Construction (AUTCON), an international research journal published by Elsevier, between the years 2000 and March 2014, and provides a summary of the research topics and the institutions around the world conducting research in the field of construction safety engineering and management. Seventy-one publications from this time period were selected for our research because of their emphasis on IT in this sector. Both the underlying research issues and their IT implementations, as well as the current trends in relevant areas of study, are recognised.

[6] Metropolitan Transportation Authority Construction Committee GREEN Construction Policy

The LACMTA Board will adopt the proposed Green Construction Policy, and staff will incorporate its requirements into all subsequent procurement contracts. It doesn't apply backwards. Staff will strongly urge contractors working on ongoing construction projects on LACMTA property or rights-of-way to adhere to this guideline to the greatest degree practicable. Staff will work together to establish a procedure for gradual rollout of this policy in additional jurisdictions that receive or programme LACMTA funds (in whole or in part) for building projects.

[7] The Metro Project Construction Safety Risk Managing System of GMC, Guangwu Liu, FengxiaLuo, Gang Zeng:

Based on the worldwide vulgate safety risk managing theory, the Guangzhou Metro Corporation (GMC) provides a summary of the standard method for safety risk management in a metro rail transportation project. It also includes the MOHURD's (People's Republic of China's Ministry of Housing and Urban-Rural Development) project practise and criteria files for safety risk management projects. The results of the application shown that the use of this method, which has since been implemented in a number of other Chinese cities, increased the degree of safety risk management among project participants while also successfully guaranteeing the safety of workers and projects.

[8] RAIL OPERATIONS & MAINTENANCE PLAN, DRAFT:

Operations, maintenance, security, safety, and Agency monitoring for the CP/EV LRT Project will each have their own organisational structure and projected number of employees. The Maintenance and Storage Facility Preliminary Organisation and Staffing Table may be found in the Preliminary Industrial Engineering Report. As things stand, three Agreement Administrators will be hired and given responsibility for all support and administration of day-to-day operations.

[9] PriyankaChib's Pune Metro Rail Optimisation:

The purpose of this article is to provide a pre-feasibility study directed by completing family evaluations and zeroing in on the shortcomings of the Pune metro (India) to be looked at in the near future based on the available data and providing recommendations for the aforementioned problems. The construction, geological, and financial considerations are all taken into account in this research. The offered recommendations may be utilised as a guide for the Pune metro department in the event of any future infrastructure conflicts or planned growth.

[10] Ritesh Kumar Biswas, Kesavan: A Comprehensive Analysis of Heavy Equipment, Including the Most Recent Developments in the Field and Suggestions for Its Application in a Variety of Metro Projects.

Due to the dramatic growth of vehicle inroads and traffic delays, the advent of Metro Rail has made it possible for a significant number of people to travel in much less time and at a considerably cheaper cost than travelling by own car. In order to compile this report, data on building site machinery was collected by questionnaire and then converted to a Binary Variable for use in Cluster Analysis.

3. RESEARCH METHODOLOGY

1. Parking system provided near Pune Metro station.

Existing:

Proposed:

a. To make it easier for commuters to park their two- or four-wheeled vehicles at Metro stations and use the service, parking lots have been built.

b.The parking garages have been moved to the workers for hire who are exclusively answerable for the wellbeing and security of the relative multitude of vehicles left in parking garage and is obligated to pay in the event of robbery of vehicles or harm to vehicles.

c. Pune Metro ensures that the contractors abide by the terms of their contracts and that the project runs smoothly.

d. The Pune Metro is a shining example of how a Government agency can finish a massive, technically complex infrastructure project on time and within budget. It built a huge network in record time.

2. Multi-utility zone (MUZ) design principle

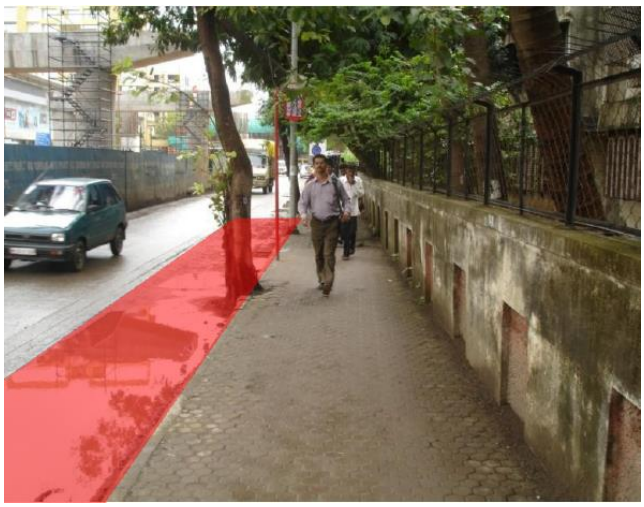
Problem-

1. At the moment, this is unused space that neither pedestrians nor motorists use.

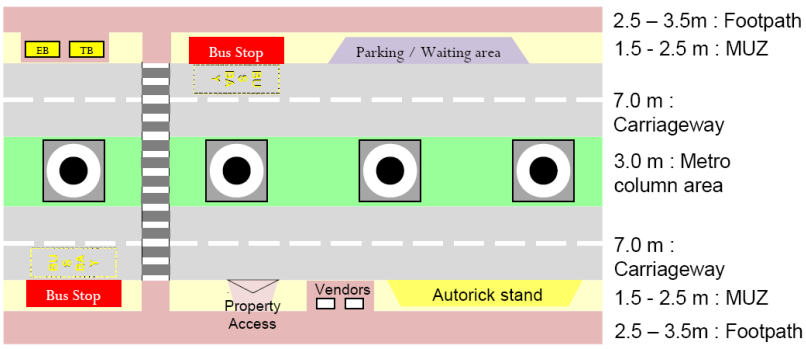
2. It is susceptible to encroachment, sediment accumulation, and other problems if left unused.

Solution-

1. Can be use to oblige fundamental road components like bus stations, auto cart stand , leaving and holding up region, utility boxes And so on.
2. A different surface treatment should be used to make the difference between the buffer area and the footpath easily visible to pedestrians where they are level.



3. The many roadside additions that have been suggested



1. Footpath and carriageway

2. It is the same size across and down. Bus stops, parking/waiting places, auto rickshaw spots, utility boxes, and other amenities should be placed there wherever practical.

4. Not Allowed: Parking, Hawking, or Trespassing on Footpath

4.1 Main Road: "No parking and No hawking" restrictions will be enforced below the station and for a 100-meter stretch on both sides from the station's edge.

4.2 Connector Roads: A 200-meter section on each side of the metro alignment must be left open for the operation of feeder bus routes, IPT (auto/taxi pickup/drop off), and parking for bicycles and two-wheelers;

4.3 The Metro Station Influence Zone must be cleared of encroachments on footpaths.

5. Integration of Bus Stops

5.1 Bus Stops should be within 50 meters of the metro station's entry and exit points;

5.2 Bus stops should be moved wherever it's necessary to make it easier to walk;

5.3 To avoid movement conflicts, maintain a sufficient distance between the bus stop and auto/taxi stands/pickup/drop-off locations.

6. TRAFFIC DISPERSAL (VEHICLE & PEDESTRIANS):

Vehicular Movement:

1. Metro Station Footpath Widening
2. Consistent 2+2 lanes to facilitate traffic movement (at Shivajinagar station).
3. Standardized 3+3 lanes to provide effortless traffic movement between interchanges.

Flow of Foot Traffic:

1. Main and Connector Roads with Clear, Unobstructed Footpaths.
2. Improvements made to preexisting utilities and infrastructure

6. TRAFFIC SIGNALS

a. After the Metro is fully operational, traffic light timing will be standardised.

IPT OPERATIONS: Auto Rickshaw & Taxi

b. Connector Roads are used extensively for auto/taxi pick up and drop off services.

4. MODEL APPLICATIONS, RESULTS AND DISCUSSIONS

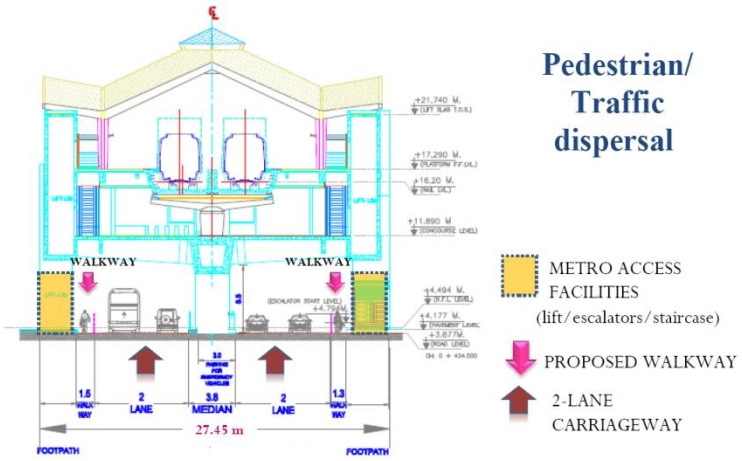


Fig No 5.1 Layout Ramwadi Station

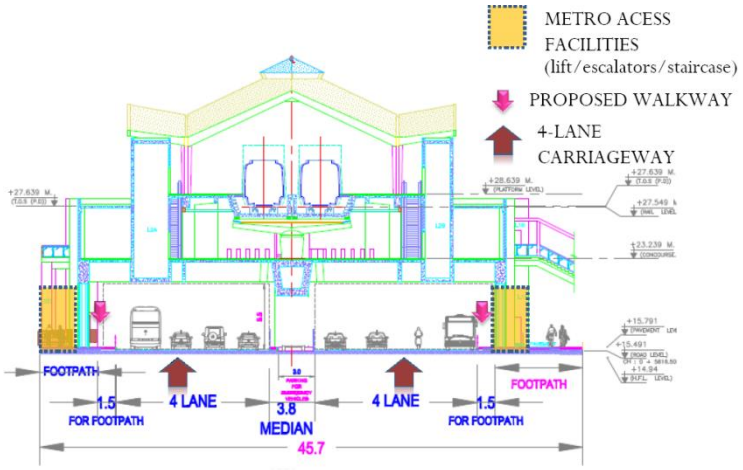


Fig No 5.2 Layout Shivajinagar Sation

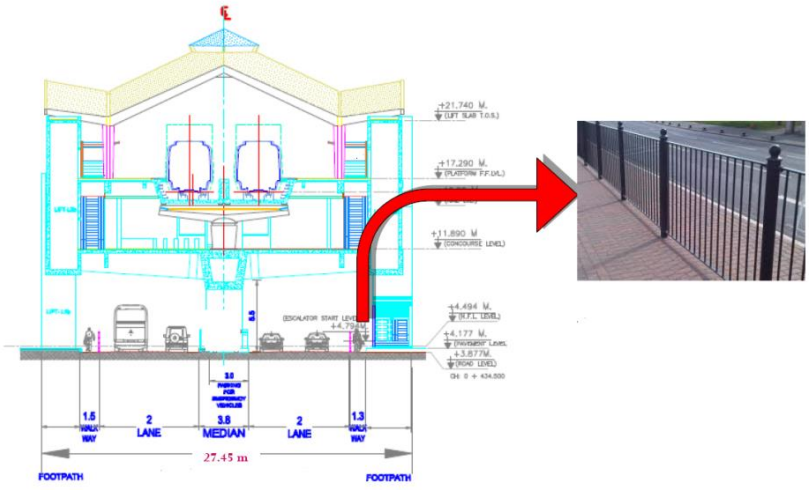


Fig No 5.3 On-Street Two Wheeler Parking Proposed On Connector Road (South)

5.1 Pre-Feasibility Study

Graphs and pie charts depicting survey responses showed that although though most respondents in this sample group now use buses to get about town, they would be willing to switch to the metro rail if it were built. Near PCMC, a preliminary feasibility assessment was conducted. This was done to gauge public interest in and the viability of a metro rail system.

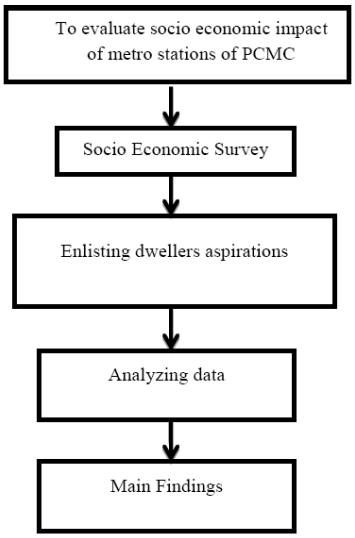


Fig No 5.4 Flow of the system

Stations Dapodi, Kasarwadi, and Chinchwad that are part of PCMC were selected for the first phase of the PCMC-Swargate project.

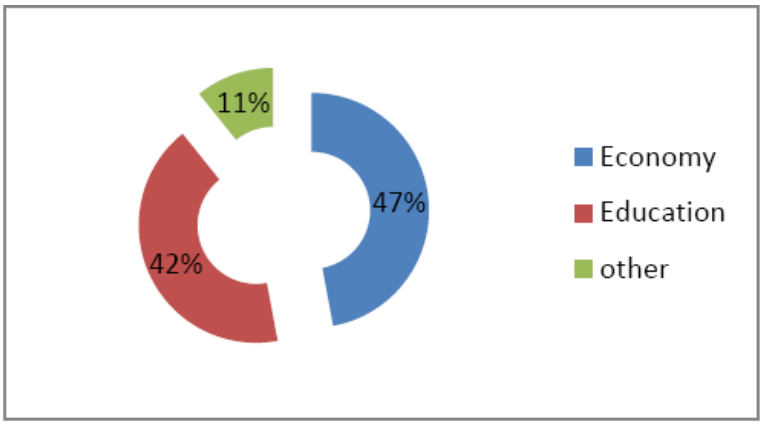


Fig. No 5.5 Purpose of Using metro

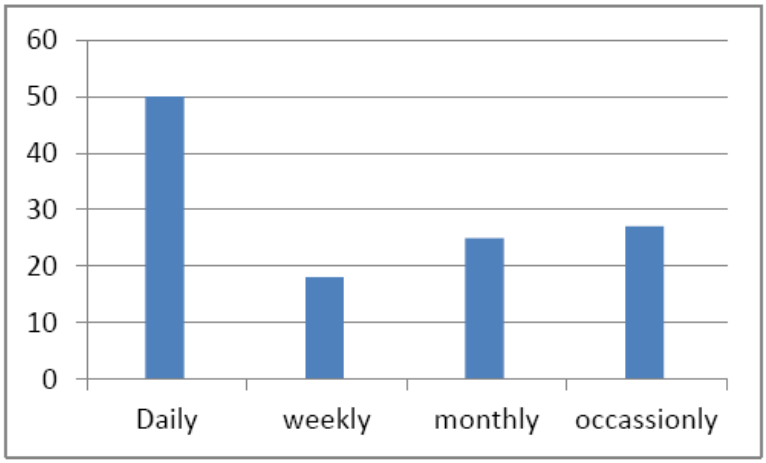


Fig. No 5.6 Frequency of using metro (X axis: Time, Y axis: Percentage)

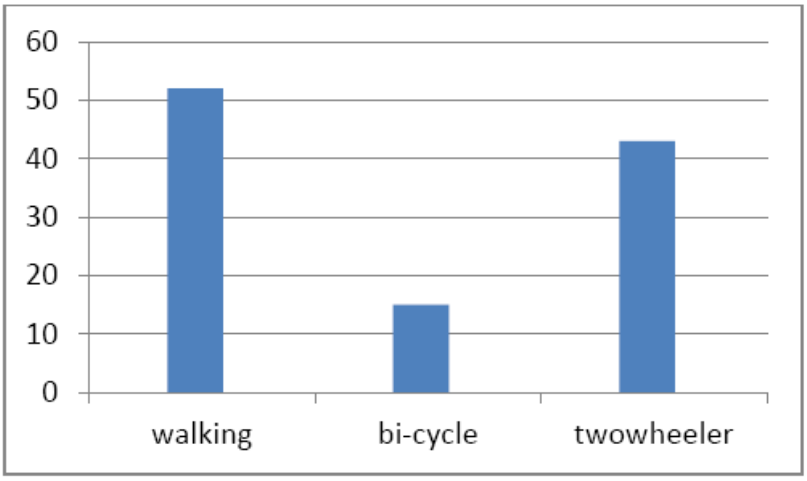


Fig. No 5.7 Means of Communication (X axis: Mode, Y axis: Percentage of dwellers)

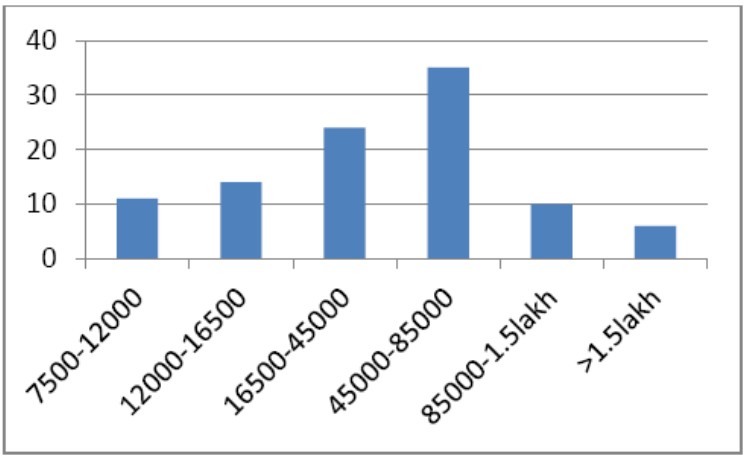


Fig. No 5.8 Dwellers Income (X axis: Income, Y axis: Percentage)

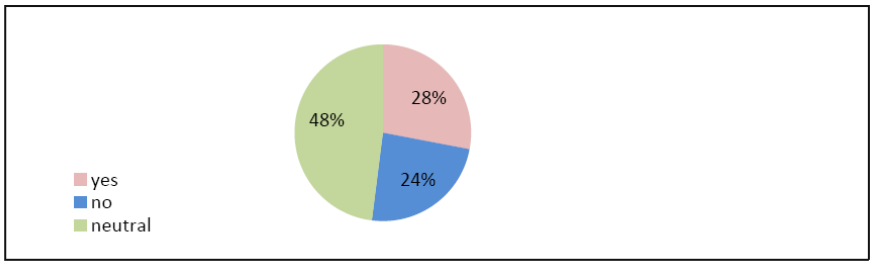


Fig. No 5.9 Chances of Reduction in Transportation Cost

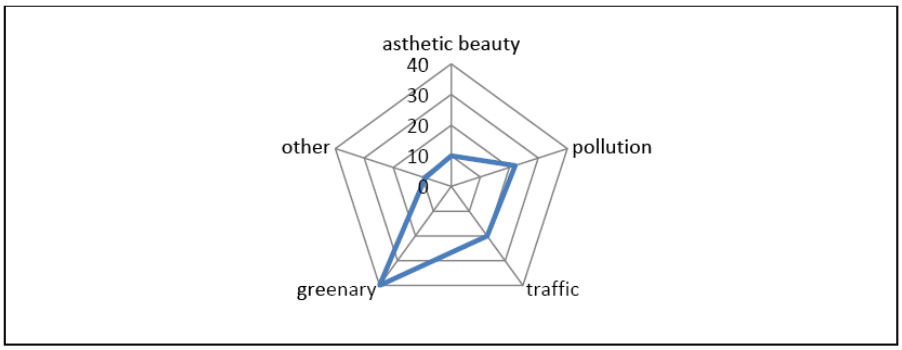


Fig. No 5.10 Drawbacks of Metro Stations

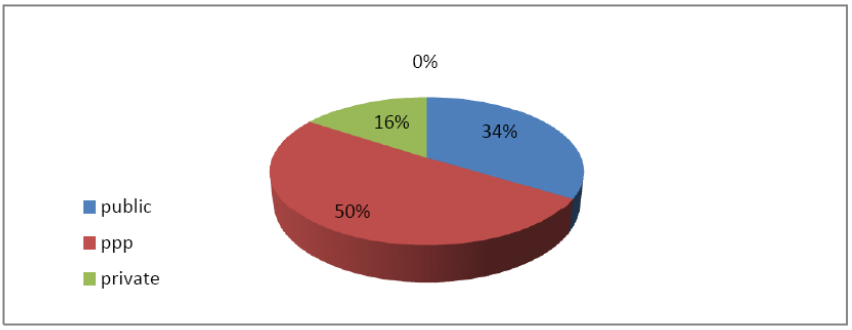


Fig. No 5.11 Governance Options

CONCLUSION

It is estimated that Indian cities would spend over Rs 2 trillion building metro rail systems with the help of DMRC. We found that DMRC's DPR for Pune has multiple major analytical and methodological errors that make the plan extremely questionable. Therefore, it is imperative to reevaluate all planned metro rail projects with extreme urgency and scrutiny. A separate team of specialists should conduct the evaluation based on well-defined, objective criteria. They need to consider everything from their reasoning to their governance to their accountability to their viability to how well it works with other forms. There has to be open discussion on the study's findings. India is quickly urbanising, but the country's infrastructure and ability to regulate growing cities have not kept pace. Large, costly initiatives that typically fail to achieve the projected advantages and disregard quicker, cheaper alternatives that may be more helpful have emerged from these problems, as detailed in this article. In

order to implement integrated, comprehensive, and least-cost planning that takes into account supply and demand side options, urban local bodies need to be reformed in a way that makes them transparent and directly accountable to citizens. If this isn't done, our cities will become increasingly congested and unlivable as large sums of money are invested in projects involving urban transportation. This, in turn, has the potential to halt the nation's much-hyped economic growth story. Provisions for other current transport systems, such as BRTS, should be established, as well as upgrades to appropriate transit, rather than only relying on metro rail.

The aforementioned options may assist alleviate some of the market difficulties now being experienced by the metro. The creation of a multi-modal transportation network is essential. If solutions are supplied and implemented, the problems being experienced by other current metros may be affected, and a speedier integrated system can be accomplished in a shorter length of time. If the subterranean corridor can be used at all, it should be used to its full potential so that the benefits of both choices may be fully realised. In the future, the Pune metro train system may be optimised and made more efficient by implementing the aforementioned ideas. Environmental impact assessments and comprehensive socioeconomic surveys of both corridors may aid in managing supply and demand.

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