



Avenues for Increased Revenue and Cost Cutting Methods in Metro Rail Systems

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ABOUT MAHA - METRO

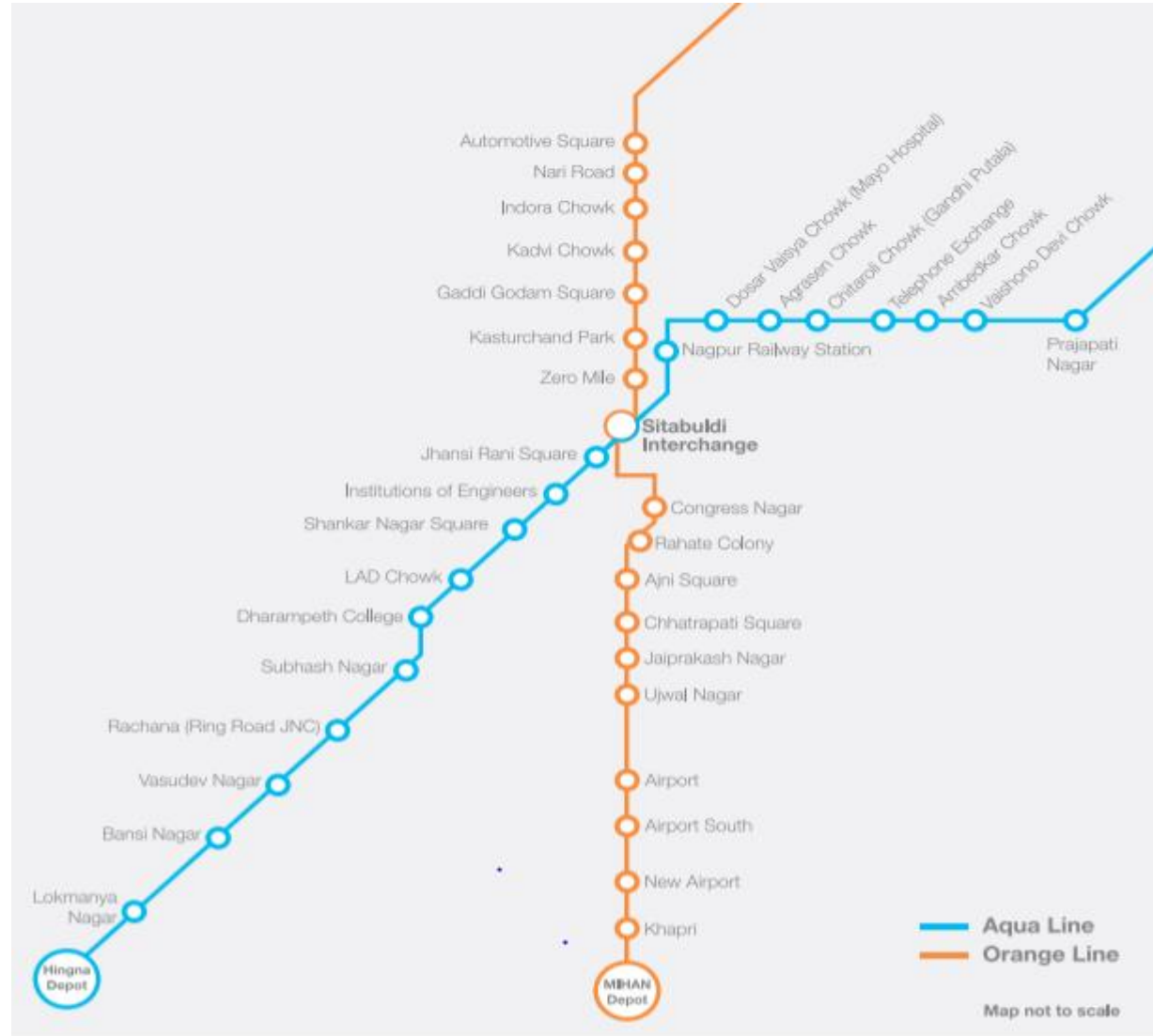
ABOUT MAHA METRO

Maha-Metro is a SPV set-up as a Joint Venture of Govt. of India & Govt. of Maharashtra for undertaking Metro Rail Projects in the state of Maharashtra outside Mumbai metropolitan region.

- The company was incorporated on 18th February 2015 and was given the task of **Nagpur Metro Rail Project** covering a route length of 38 km over 38 stations.
- The company has subsequently been reconstituted as Maharashtra Metro on 23rd January 2017 and given the following additional mandates:
 - **Pune Metro Rail Project**, covering a route length of 31 km over 30 stations
 - **Thane Metro Rail Project**, covering a route length of 29 km over 22 stations (DPR with GoI for approval)
 - **Nashik Mass Rapid Transit System** , covering a route length of 31 km over 30 stations (DPR with GoI for approval)
- In addition to above, Maha Metro is involved in
 - Project Management Consultancy for NHAI, NMC, PWD
 - Property development at various locations

MAHA METRO - NAGPUR METRO RAIL PROJECT

Nagpur Metro Route Map (38 stations, 38.215 Km Viaduct)



Project Funding Pattern

Sr. No	Funding Agency	Amount
1.	Government of India (Equity +SD)	₹ 15.55 Billion USD 222 Million
2	Government of Maharashtra (Equity +SD)	₹ 15.55 Billion USD 222 Million
3.	Bilateral Loan from external funding agencies	₹ 45.21 Billion USD 646 Million
4.	Grant Contribution (ULB)	₹ 8.68 Billion USD 124 Million
5.	Land Cost and State Taxes-GoM (SD for ST)	₹ 1.81 Billion USD 26 Million
Total Project Cost		₹ 86.80 Billion USD 1240 Million

Nagpur Metro is being funded by KfW (Euro 500 Million), Germany & AFD France (Euro 130 Million).

MAHA METRO - PUNE METRO RAIL PROJECT

Pune Metro Route Map (30 stations, 31.254 Km Viaduct)



Project Funding Pattern

Sr. No	Funding Agency	Amount
1.	Government of India (Equity +SD)	₹ 19.54 Billion USD 280 Million
2	Government of Maharashtra (Equity +SD)	₹ 19.54 Billion USD 280 Million
3.	Bilateral Loan from external funding agencies	₹ 58.315 Billion USD 833 Million
4.	Grant Contribution (ULB)	₹ 285 Million USD 4 Million
5.	Land Cost and State Taxes- GoM (SD for ST)	₹ 15.13 Billion USD 216 Million
6.	Interest during Construction	₹ 1.39 Billion USD 20 Million
Total Project Cost		₹ 114.20 Billion USD 1633 Million

AFD (Euro 245 Million) & EIB (Euro 600 million) are providing Loan for Pune project.

INCREASE IN FARE BOX REVENUE

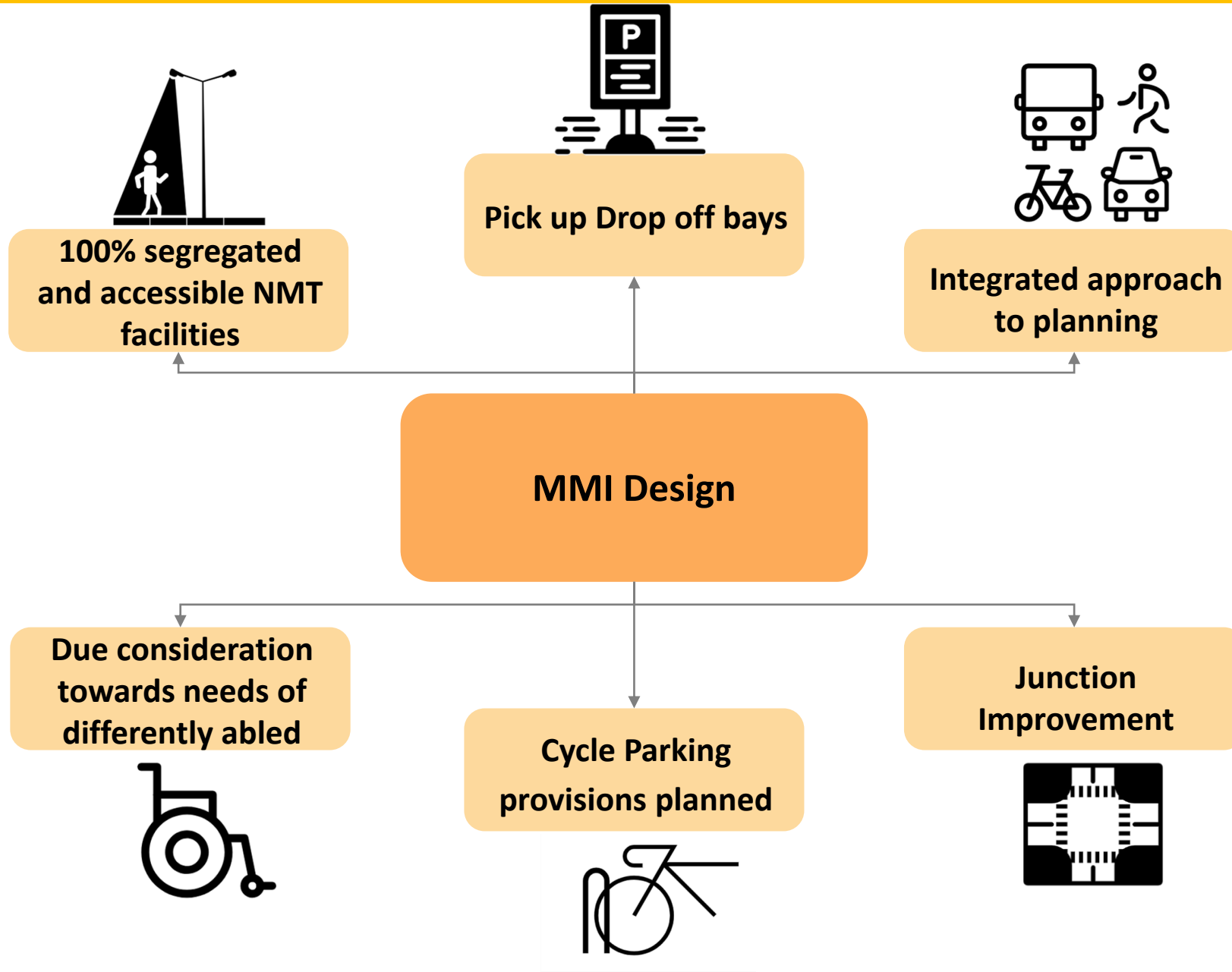
MULTIMODAL INTEGRATION

Maha Metro's approach has been not only to enable to cover its cost on a long term basis but also to ensure affordability and provide efficient and high-quality feeder services to ensure continuous patronage.

It will provide Shared Bicycles, Electric Cycles, Electric Scooters, E-rickshaws and E-vans in Nagpur and Pune.

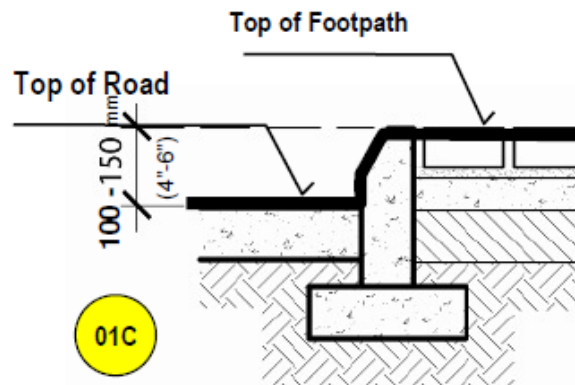
To provide seamless travel, Maha Metro is constructing a Multimodal transport hub at Swargate, Pune to integrate the Metro with PMPML buses, MSRTC buses and other modes of public transport.

DESIGN OF MULTIMODAL INTEGRATION AT METRO STATIONS



Footpath

Minimum clear width of 1.80 mtrs and maximum height of 150mm from the finished road surface.



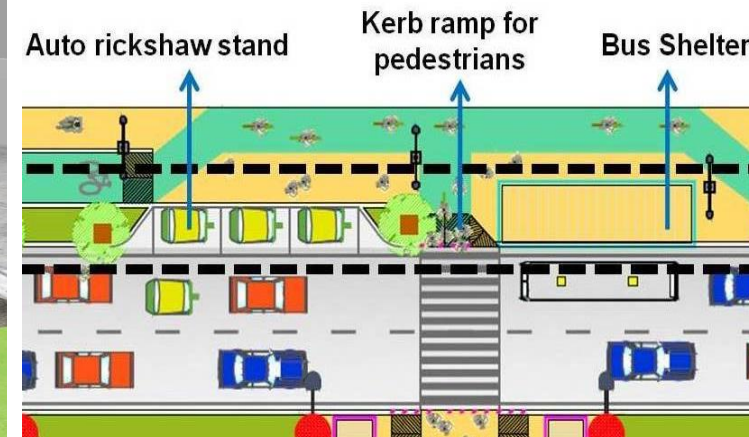
Cycle tracks

As per the projected volume of cyclists and available ROW , the Project area will have a one-way cycle track with minimum width of 1.80 mtrs

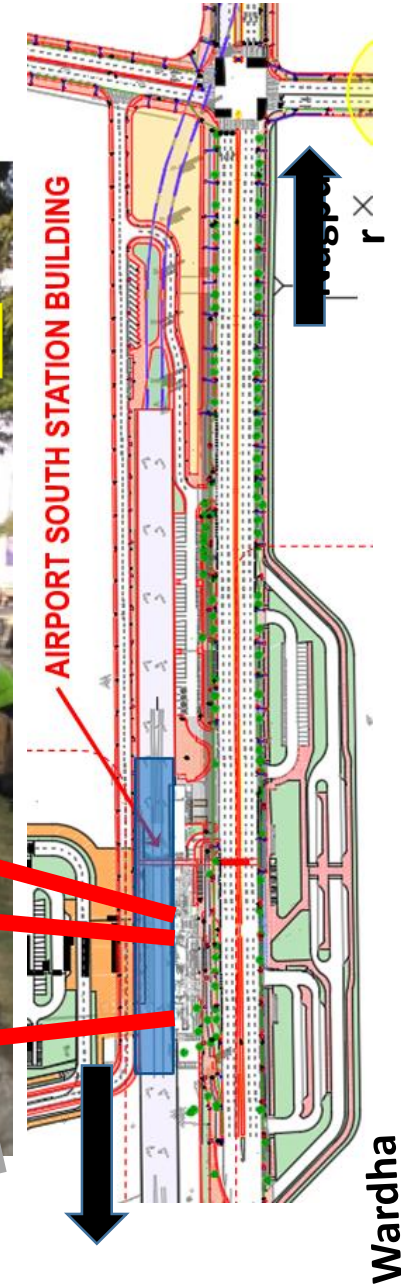
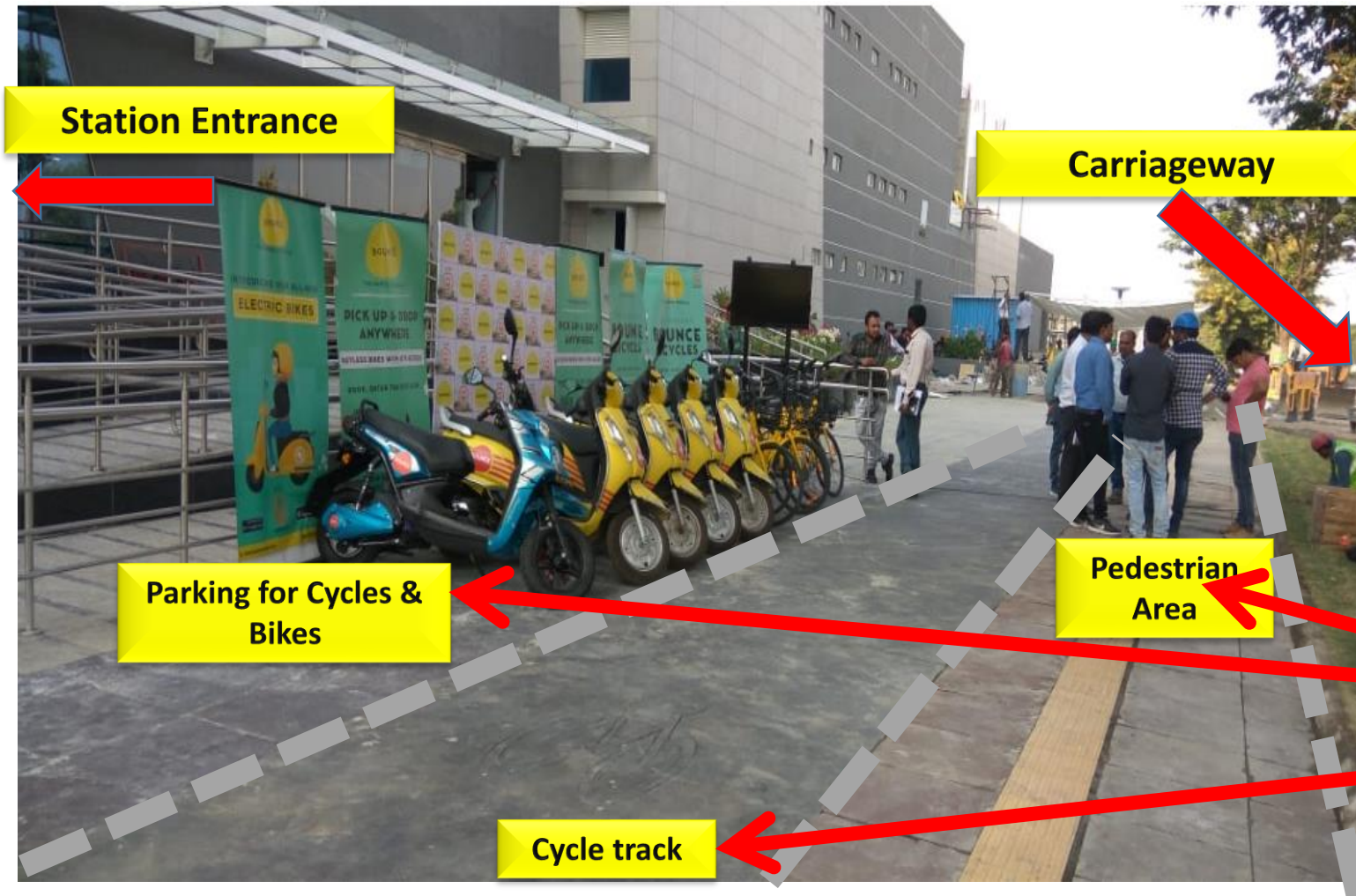


Multi utility zone

Multi Utility Zones (MUZ) to accommodate ancillary street activities will be provided as per the availability of space



AIRPORT SOUTH – IMPLEMENTED PHOTOS



METRO FEEDER SERVICE

38

Metro Feeder Routes



20

**Feeder Routes on E-W
Corridor &**

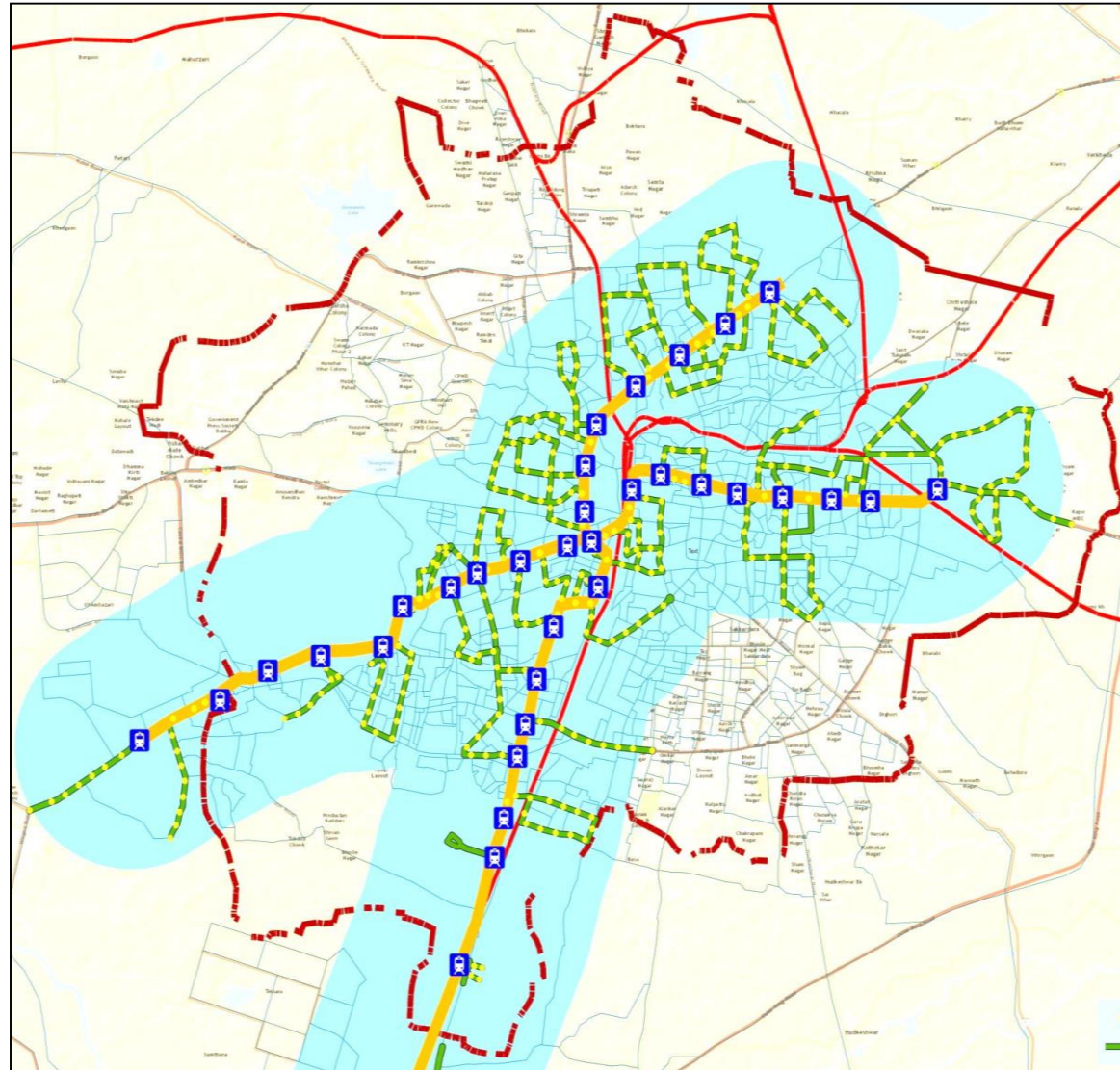
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**Feeder Routes on N-S
Corridor**



**210.17 km Feeder Route
Network with 193 Feeder
Vehicles**

Route Rationalization of city bus services has been done so that the NMC buses to complement Metro and to compete.



METRO SERVICES ON NETWORK OF INDIAN RAILWAYS IN THE VICINITY OF NAGPUR CITY INTEGRATED WITH NAGPUR METRO

- MoU b/w Maha-Metro, Indian Railways & Govt. of Maharashtra for Broad Gauge Metro Feeder Services from to neighboring satellite towns to Nagpur on 16/07/2018.
- This will act as a seamless feeder service to Nagpur Metro because the people from neighboring satellite towns will use these services interdependently by travelling to & fro their place of work/ business and residence and travel within the city using the metro trains with relative ease.



MoU signing ceremony on 16.07.2018



BOOSTING RIDERSHIP ON VACATIONS AND HOLIDAYS

- To augment the ridership on weekends, **Maha Metro is developing**
 - 1 km long Ambazari Lake Viewing Gallery just below the viaduct will motivate the people to travel via metro on weekends admire the captivating view and promote eco-tourism.
 - 400 m long Heritage Walk will connect various places of historical importance and will also include an open air amphitheatre where people from all over the city can come via metro and enjoy themselves.



- 1 'ZERO MILESTONE' MONUMENT
- 2 'SHAHEED GOWARI MEMORIAL'
- 3 'SHAHID SMARAK'
- 4 'ZERO MILE' METRO STATION
- 5 'BRITISH RESIDENCY' BUILDING
- 6 THE 'FORT WALL'
- 7 THE HERITAGE WALK PLAZA
- 8 METRO PLAZA
- 9 PROPOSED ROAD
- 10 SURVEY OF INDIA MUSEUM



ALTERNATE REVENUE SOURCES FOR METRO RAIL PROJECTS



ALTERNATE REVENUE SOURCES FOR METRO RAIL PROJECTS

- In most public utilities, there is a limit to which the service charge can be raised. The revenue from this service charge is not sufficient to recover the cost and even to meet the operational expenditure.
- Therefore, to remain financially viable and sustainable in the long run, these public utilities must look for alternate revenue sources.
- Most of the Metro Rails are making an effort to boost revenues from alternate sources and the success of MTR Hong Kong is noteworthy.

• Transit Oriented Development

- Densification of population along Metro Corridor by increase in Floor Space Index (FSI).
- Premium earned from this increase in FSI serves as an alternate source of revenue.
- The premium will be shared equally between the Municipal Corporation and the Metro Rail implementing agency
- The benefit of increased FSI will also be carried forward to the Property Development done by the Metro Rail Implementation Agency

• Value Capture Financing

- Betterment Levy – Increase in Stamp Duty
- Development Charges
- Transfer of Development Rights
- Joint Property Development

• Advertising – Digital, On site, Train wraps

• Station Naming Rights

• Project Management Consultancy Fees

NON-FARE BOX REVENUE INITIATIVES OF MAHA METRO

NON FARE BOX REVENUE INITIATIVES

- Maha Metro is targeting to achieve **60% of its Revenues from Non Fare Box** avenues.
- Till date Maha Metro has earned **₹ 2.3666 Billion as Non Fare Revenues**. (Out of this ₹ 1.51 Billion were Even before start of Commercial Operation)
- Govt. of Maharashtra on 11th June 2018 appointed Maharashtra Metro Rail Corporation Ltd. to act as a “**Special Planning Authority**”, for Maha Metro owned areas along the Nagpur Metro Rail Alignment. Thus, power of Municipal Corporation for sanction of building plans will be with Maha Metro.
- **Testing Lab** - 5% of revenue shared by M/s Bureau Veritas (State of the Art Material Testing Lab) with Maha Metro.
- **Advertising** – Digital Advertising at stations, inside trains, train wrapping
- **Station Naming** – through Semi Station Naming rights Delhi Metro has been a success story in garnering significant Revenues by auctioning rights.
 - Semi Station Naming Rights for Sitabuldi Interchange Station have been awarded to Goel Ganga Group (INR 9 Lacs pa).
 - Direct skywalk entry from the station to the mall is also being provided for 60 years for which Maha Metro is receiving INR 1.35 crores

NON FARE BOX REVENUE INITIATIVES

INITIATIVES IN NAGPUR

- 1% Additional Surcharge as Stamp Duty on Property transactions in the form of Betterment Tax since October 2016.

FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20 (Till Sep 19)	Total (Till 30.09.2019)
₹ 266.7 Million	₹ 589.4 Million	₹ 640.3 Million	₹ 317.1 Million	₹ 1.813.5 Billion

- In a pioneering initiative, Government of Maharashtra issued TOD notification on 16th June 2017.

Transit Oriented Development along the Nagpur Metro Rail alignment. 50% of the total amount which is accrued due to additional FSI will be given to Maha Metro.

FY 2017-18	FY 2018-19	FY 2019-20 (Till Oct 19)	Total (Till 31.10.2019)
₹ 30.8 Million	₹ 83.8 Million	₹ 283.3 Million	₹ 379.9 Million

- Supervision Fee from execution of Deposit works for NHAI, NMC, PWD etc.

FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20 (Till Oct 19)	Total (Till 31.10.2019)
₹ 37.8 Million	₹ 35.2 Million	₹ 62.9 Million	₹ 37.3 Million	₹173.2 Million

NON FARE BOX REVENUE INITIATIVES

- Property Development along the Maha Metro Corridors

Purpose	Location	Area
Property Business (PB) within station box	Major Commercial Spaces at Zeromile station, Airport station, Jaiprakash nagar station, Ujjwal nagar station, Chhatrapati nagar station, Prajapati Nagar, etc.)	0.2 Million Sq. ft. approx.
	Lease to Mother Dairy in Jaiprakash Nagar, Airport station, Khapri station (Monthly Income of INR. 85000)	1211 Sq. ft.
Property Development (PD)	PD on Maha-Metro's Stand Alone Plots - Major Commercial Pockets at Dhantoli TTMC, Zeromile station, Kasturchand Park, etc.)	6.4 million Sq.ft. approx.
	Joint Development with Nagpur Municipal Corporation on 50:50 profit sharing basis – at Cotton Market (Cotton Market, Santra Market, Khowa Market), Netaji Market, Gaddi Godam Gol Bazar	3.6 million Sq.ft. approx.
	Residential Housing at Hingna Depot, MIHAN Depot & NEERI Ajni	4 million Sq.ft. approx.
	Lease to UBI Bank in Jaiprakash Nagar (Monthly Income of INR. 0.50 million) Lease to ICICI Bank either in Sitabuldi or in Jaiprakash Nagar (Monthly Income of INR. 1 million)	6500 Sq. ft. 12000 Sq. ft.
Total		14.2 Million sq. ft

NON FARE BOX REVENUE INITIATIVES

INITIATIVES IN PUNE

- The initiatives taken in Nagpur, will be carried over in Pune as well.
- The Property Development in Pune will include

Place	Type of Development	Total Saleable Area
MMTH, Swargate	Retail and Commercial	1.75 Million Sq. ft. approx.
Civil Court Station	Commercial – 0.97 million sq. ft Retail – 50000 sq. ft	1.02 Million sq. ft. approx.
Vanaz Depot	Commercial – 1.36 million sq. ft Residential – 0.18 million sq. ft	1.54 Million sq. ft approx.
Range Hill Depot	Commercial office over airspace and workshop – 1.44 million sq. ft Greenfield tower Commercial spaces – 0.23 million sq. ft	1.67 Million sq. ft. approx.
MMTH, Shivajinagar	Commercial	0.34 Million sq. ft. approx.
Total		6.32 Million sq. ft

NON FARE BOX REVENUE INITIATIVES

WORLD CLASS STATIONS WITH COMMERCIAL DEVELOPMENT

- **Stations** have been **designed in a culturally sensitive manner** to provide sense of history and heritage and transforming it to modern architecture.
- Stations are **Universally accessible** by all groups such as children, elderly & differently abled.
- In order for Property Development (PD) to be successful, stations have to effectively **designed with International Standards**.
- Maha Metro has thus appointed **architects from France and Spain** having rich international exposure.
- It has also appointed **renowned architects from India** like Architect Hafeez Contractor.
- Maha Metro is constructing a **20 Storey Metro station** with platform on 5th level at Zero Mile.
- **Sitabuldi Metro Interchange Station** & Metro Transit & Traffic Management Centre will come in the heart of Nagpur at Sitabuldi.

NAGPUR METRO – ZERO MILE STATION



NAGPUR METRO – SITABULDI INTERCHANGE STATION



PUNE METRO - CIVIL COURT INTERCHANGE STATION



PUNE METRO - MULTIMODAL TRANSPORT HUB AT SWARGATE



COST REDUCTION INITIATIVES OF MAHA METRO

Novel Designs and Innovative Strategies

Applying novel designs and innovative construction methodologies & strategies to save cost and time and improve quality and functionality

Civil Infrastructure :

- Viaduct width optimized from 10.3m to 8.5m
- Right of Way for land rationalized from 20 m to 18 m.
- Construction of Viaducts made independent of the stations. Viaducts have been designed in such a way that it allows for commissioning of whole line, even with few functional stations.
- Station Platform length rationalized from 140 m to 75m for 3 coach configuration. Kept scope for future extension.

DEPOTS :

- Maintenance shed in depots: Size reduced to half compared to DPR.
- Stabling lines: Trains are to be maintained in depot once in three days. Only trains requiring maintenance (one third) to be stabled at Depot and remaining trains (two-third) to be stabled at Terminal Stations.
- No roof covering for stabling lines.
- Overall track length of depots reduced to 8km from 10 km.
- Reduction in length of inspection bay lines and repair bay lines to 80m from 166m
- Elimination of procurement of jigs & fixtures for repairs of electronics equip included in AMC of OEM
- Heavy repair shop only in one out of two depots

SIGNALLING REQUIREMENT RATIONALIZED:

- Elimination of sub master clocks and servers thereof at stations.
- Virtualization of Telecom subsystem servers in OCC leading to hardware optimization.
- Elimination of 48 Volts DC supply in the Telecom system design.
- Signalling rooms eliminated from stations not having interlocking.

ROLLING STOCK:

- Rationalization of technical requirements, a new and unique design, liberalization of eligibility criteria – achieving 20% lower rate on technical parity

TRACTION :

- Traction sub stations rationalized from 4 to 2.
- Hollow tubular Portals instead of solid section vertical masts to support OHE

TRACK (P-WAY) :

- 25 m long rail of grade 1080 (HH Rail) procured first time in the country, which will reduce total number of joints to be welded. This will lead to improved safety, riding comfort, maintenance and overall cost reduction

COST REDUCTION IN CONSTRUCTION (Cont. 5/6)

MULTIPLE UTILITIES SHARING THE SAME RIGHT OF WAY

- 3 and 4 layered transport system totaling 9 km is being executed along metro corridors.
- Being done jointly with NHAI on National Highway 44 passing through the city.
- This will result in 15-20% Cost saving.
- Thus achieving Space, Cost and Time efficiency along with better aesthetics & avoiding urban clutter.



INNOVATIVE AND UNIQUE FINANCING MODEL for AFC System on the basis of PPP



MAHA
CARD

- Open loop chip based Contactless Smart Card in compliance with the NCMC mandate of GoI.
- EMV based Common mobility card is being used as payment media for Transit as well as Non-transit transactions.
- One card for Metro, Buses, Parking, Feeders, Parking, Utility and other Retail payment.
- **No CAPEX:** No investment on capital expenditure by MAHA Metro resulting in a saving of Rs. 250-260 Crores. The CAPEX and 10 year OPEX is being done by SBI Consortium. Consortium will get 4% Revenue share on all transit transactions.
- Maha Metro will also get Rs. 30 Crores as royalty.
- AFC system at place in 07 stations.
- Till 31.03.2019 Rs. 2.4 crore of royalty received. Another Rs. 9.6 crore expected in May 2019

The major cost components in O&M :

- **Energy Costs**
- **Manpower/Staff Costs**
- **Maintenance Costs**

SOLAR POWER

Solar power generation right from inception to meet 65% of total energy requirement to capitalize on high solar radiation in Nagpur – Setting a new International Benchmark

Follows RESCO Model
where investment is to
be done by a PPP
service provider

Maha-Metro have
signed PPA for 25
years with the
service providers



Solar Panels on Rooftop, Depot & Boundary walls

SOLAR POWER

- 758 kWp Solar PV system commissioned till 31st October 2019
- Till 31.10.2019 – 7.37 Lakh units generated.
- **This has resulted in cost saving of INR 55.45 Lakh .**

Solar energy will lead to significant saving in O&M cost (>20 %)



Solar Panels at Metro Bhavan



Solar Panels at Airport South Station

Electric Vehicle Charging at Airport Metro Station



COST SAVINGS IN O&M

Energy Cost Savings

- Only LED Lighting on universal basis over entire Metro system including station and administrative buildings.
- Regenerative VVVF drive for Lift and Escalators also saving 20% energy.
- Rolling Stock with unique design and 3 car configuration, 25kV AC Traction and 16T axle load (66.67% powering).
- 35% Regeneration by regenerative braking from 70 Kmph up to 10 kmph has helped in bettering the Specific Energy Consumption (SEC) of train
- Air Conditioning in Rolling Stock with VVVF drive

The energy efficient coaches will result in 15-20% of savings in Total Energy consumption by Rolling Stock.

Maintenance Cost Savings

- 10 years maintenance of Electronic components of Rolling Stock included in tender.
- 10 years Annual Maintenance Contract included in all System Packages

OUTSOURCING OF O&M ACTIVITIES

Maha Metro has rationalized the man-power requirement by :

- a) Outsourcing of operations including train operators, maintenance activities, semiskilled & unskilled components.
- b) Introduction and implementation of Digital Asset Management involving extensive automation.
- c) Optimization and rationalization to reduce maintenance activities involved.
- d) Introduction of Multi-tasking and Multi-skilling.
- e) Long-term partnering with OEM contractors.

As per DPR, the in-house O&M staff requirement is 35 person/RKM which has been optimized to 15.72 persons/RKM. (This includes Control office staff, Station controller, Field Disaster Management, supervisors and officers)

This will lead to considerable savings during O&M phase.

LONG TERM SUSTAINABILITY

Maha Metro has taken several initiatives for

- Cost reduction during the construction and
- Cost reduction in O&M phase
- Increasing Fare and Non-Fare revenue

With the above initiatives, Maha Metro will not only help to recover its cost but also keep the fares affordable for the citizens of Nagpur and Pune.

Better Quality will ensure durability of assets and lower cost of Maintenance.



THANK YOU

Maharashtra Metro Rail Corporation Limited
A Joint Venture of Govt. of India & Govt. of Maharashtra

Nagpur Metro Rail Project
Metro House Bungalow No: 28/2, Maharashtra 440001

