Infrastructure Advisory

CRISIL
An S&P Global Company

City Development Plan for

Panvel Municipal Corporation



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पनवेल महानगरपालिका



Infrastructure
Advisory



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Abbreviations

AICTE	All India Council for Technical Education
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APMC	Agricultural Product Market Committee
ARV	Annual Rateable Value
ASI	Archaeological Survey of India
BEST	Brihanmumbai Electricity Supply and Transport
BHP	Break Horse Power
BOD	Biochemical Oxygen Demand
BPL	Below Poverty Line
BPR	Business Process Reengineering
BRTS	Bus Rapid Transit System
CAA	Constitutional Amendment Act
CAGR	Compounded Annual Growth Rate
CBD	Central Business District
CDP	City Development Plan
CFC	Citizen Facility Centre
CIDCO	City and Industrial Development Corporation of Maharashtra
CIP	Capital Investment Plan
CMP	Comprehensive Mobility Plan
CNG	Compressed Natural Gas
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CRIS	CRISIL Risk & Infrastructure Solutions
CRZ	Coastal Regulation Zone
CSIR	Council for Scientific and Industrial Research
CSMT	Chhatrapati Shivaji Maharaj Terminals
CVB	Capital value based
DCB	Demand Collection Balance
DCP	Dry Chemical Powder (tender)
DCPR	Development Control Provisions Regulation
DMP	Disaster Management Plan
DPR	Detail Project Report

DRP	Disaster recovery plan
DSCR	Debt service coverage ratio
ECS	Equivalent Car Space
EESL	Energy Efficiency Services Limited
EMU	Electric Multiple Unit
ERP	Enterprise Resource Planning
ESR	Elevated Storage Reservoir
EWS	Economically Weaker Section
FAR	Floor Area Index
FOP	Financial Operating Plan
FSI	Floor Space Index
FSMPT	Full-school management with private partner teachers
FSS	Full school support
GDP	Gross Domestic Product
GIS	Geographic Information System
GSR	Ground Storage Reservoir
HDPE	High-density polyethylene
HIG	High Income Group
HSR	High Storage Reservoir
ICMR	Indian Council for Medical
IEC	Information Education & Communication
IHHL	Individual household latrines
IPHS	Indian Public Health Standards
IPT	Intermediate Public Transport
JMD	Joint Managing Director
JNPT	Jawaharlal Neharu Port Trust
KDMT	Kalyan Dombivali Municipal Transport
KMT	Khopoli Municipal Transport
LBT	Local Body Tax
LED	Light Emitting Diodes
LIG	Lower Income Group
LPCD	Litres per capita per day
LPS	Litters per second
LRTS	Light Rail Transit System
MBR	Master Balancing Reservoir
MESDCL	Maharashtra State Electricity Distribution Company Limited
MIDC	Maharashtra Industrial Development Corporation

MIG	Middle Income Group
MIS	Management Information System
MJP	Maharashtra Jeevan Pradhikaran
MLD	Million Litres per day
MMC	Maharashtra Municipal Corporation Act
MMR	Mumbai Metropolitan Region
MMRDA	Mumbai Metropolitan Region Development Authority
MOEFCC	The Ministry of Environment, Forest and Climate Change
MPCB	Maharashtra Pollution Control Board
MPL	Municipal
MPN	Most probable number
MRSAC	Maharashtra Remote Sensing Application Centre
MRVC	The Ministry of Environment, Forest and Climate Change
MSEB	Maharashtra State Electricity Board
MSEDCL	Maharashtra state electricity distribution company limited
MSME	Micro, Small & Medium Enterprises
MSW	Municipal Solid Waste
MTHL	Mumbai Trans Harbour Link
MTNL	Mahanagar Telephone Nigam Limited
NAINA	Navi Mumbai Airport Influence Notified Area
NGO	Non-Profit Organisation
NMAM	National Municipal Accounts Manual
NMIA	Navi Mumbai International Airport
NMMC	Navi Mumbai Municipal Corporation
NMMT	Navi Mumbai Municipal Transport
NMT	Non-Motorised Transport
NOC	No Objection Certificate
NRW	Non-Revenue Water
NUHM	National Urban Health Mission
NULM	National Urban Livelihood Mission
OPAC	Online Public Access Catalogue
PMAY	Pradhan Mantri Awas Yojana
PMC	Panvel Municipal Corporation
PPP	Public Private Partnership
PSC	Pre Stressed Concrete
PVC	Poly Vinyl Chloride
PWD	Public Works Department

QRT	Quarter
RCC	Reinforced Cement Concrete
RDF	Refused Derived Fuel
ROB	Road Over Bridge
RRRLF	Raja Ram Mohan Roy Library Foundation
RTE	Right To Education
RTO	Regional Transport Office
SAP	System Application Product
SBM	Swach Bharat Manual
SBR	Sequencing Batch Reactor
SCADA	Supervisory control and data acquisition
SEZ	Special Economic Zone
SFAC	Standing Fire Advisory Council
SLB	Service Level Benchmarking
SPV	Special Purpose Vehicle
SSP	Specific service partnerships
STP	Sewerage treatment plant
SWD	Strom Water Drain
SWM	Solid Waste Management
SWOT	Strength Weakness Opportunities Threats
TCM	Traffic calming measures
TDM	Travel Demand Management
TMT	Thane Municipal Transport
TOD	Transit Oriented Development
TPD	Tonnes Per Day
TSS	Total Suspended Soils
UGC	University Grants Commission
UGD	Underground drain
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban Local Body
URDPFI	Urban and Regional Development Plans Formulation and Implementation
VVMT	Vasai Virar Municipal Transport
WBM	Water Bound Macadam
WHO	World Health Organisation
WTP	Water Treatment Plant



1.

Project background

1.1 Objective of the assignment

A city development plan (CDP) aims to identify an integrated solution to the challenges faced by any city. It recognises the economic growth strategy as well as the actions that would be required by various agencies to ensure the city's sustainable development. A CDP is an urban local body's (ULB) strategy that presents the vision of a desired future for the city and the mission statements on how the ULB, along with other stakeholders, intends to work towards achieving this long-term vision.

The CDP encompasses:

- Profiling the current status of the city, giving an in-depth analysis of its demographic, economic, financial, infrastructure, physical, environmental, and institutional aspects
- Based on the above analysis, a perspective and a vision for the city is developed, in consultation with its relevant stakeholders. To achieve the vision, a formulation strategy for bridging the gap between where the city is at present and where it wishes to reach needs to be prepared
- The CDP should provide for a city investment plan (CIP), based on which the ULB concerned will be able to access funds under central/state government schemes as well as from own and other sources based on priority actions and projects identified in the CDP
- The document should also provide a financial operating plan (FOP) to direct the ULBs for mobilising various financial resources to implement the identified projects. Inter and intra-sectoral issues need to be addressed by the CDP
- The preparation of the CDP will comprise city-development strategies that will emerge out of a structured consultative process. The process will enable elected representatives, key staff of departments of municipal corporation/municipal council, parastatal agencies and other institutions, policy makers, and the citizens to participate and plan for spatial, social and economic development of the city

The Panvel Municipal Corporation (PMC) was formed on October 1, 2016 after merging the erstwhile Panvel Municipal Council and 29 revenue villages of the Panvel *taluka*. With this amalgamation, the area under jurisdiction of the PMC has increased to 110 sq. km. Hence, planning for infrastructure will be required with regard to the increased area. Moreover, with several key infrastructure projects proposed in and around Panvel, the city is likely to witness tremendous growth in the coming years. In this context, the PMC intends to prepare a CDP to assess the existing infrastructure services and the future requirements, as well as determine the investments required for meeting future infrastructure creation and provisions. CRIS (CRISIL Risk and Infrastructure Solutions Limited) has been appointed as the consultant by the PMC to prepare the CDP.

1.2 Need for a CDP for Panvel

From just being a sleepy town at the tri-junction of the roads that connect Mumbai, Goa and Pune, Panvel is fast transforming into a real estate hotspot. The city has witnessed tremendous growth in the past few years. The population of the PMC region, which was ~5 lakh in 2011[1], is expected to have crossed 13 lakh in 2017[2].

The population under the PMC region is likely to increase manifold, with several upcoming key infrastructure projects which are likely to have a huge bearing on the development of Panvel city.

[1] Source: 2011 Census
[2] Source: Detailed Project Report for Solid Waste Management –Panvel Municipal Corporation

Figure 1: Key upcoming projects in and around Panvel



The key future projects in PMC region are listed below:

1. **Navi Mumbai International Airport (NMIA)** – The proposed Navi Mumbai International Airport is the second international airport in the Mumbai Metropolitan Region (MMR) and PMC limits will fall within the sphere of influence of the new airport. NMIA is planned to handle 1 crore passengers per annum in its first phase and is expected to be operational in 2021. The proposed airport encompasses an area of 1,160 hectare, while the total cost of NMIA is estimated as Rs 16,000 crore.

2. **NAINA (Navi Mumbai Airport Influence Notified Area) –** A 500 sq. km city, the Navi Mumbai Airport Influence Notified Area (NAINA region), is also in the pipeline. It comprises several villages of Panvel *taluka*, along with Thane, Uran, Karjat, and Khalapur. NAINA will contain the hubs for agro-farming, education, information technology, and healthcare facilities.

3. **Virar–Alibaug Multimodal Corridor (MMC) –** This corridor covers some key locations in the MMR. PMC also falls in the sphere of influence of this corridor and a lot of development is expected as a result.

4. **Multi-product Special Economic Zone (SEZ**) – Jawaharlal Nehru Port Trust (JNPT), which is only ~26 km from Panvel, is planning to develop a port-based multi-product special economic zone (SEZ). This industrial infrastructure project is to be established on 277 hectares, with a total public and private investment of ~Rs 4,000

crore. This is being planned as a self-sustainable integrated development project with the potential of generating over 1.5 lakh direct and indirect jobs.

5. **Mumbai Trans-Harbour Link (MTHL**) – MTHL is a proposed 22km sea link between Nhava Sheva and Sewri. The sea link will have six lanes and will be completed in three packages. This will significantly boost the connectivity between Panvel and Mumbai's mainland. The connectivity from Panvel to MTHL will be through the Chirle village near Nhava Sheva.
6. **Proposed elevated railway corridor** – The Mumbai Railway Vikas Corporation (MRVC) has proposed a corridor between Panvel and Chatrapati Shivaji Maharaj Terminus. This is expected to reduce travel time between Panvel and CSMT. The corridor, which will also connect Panvel to Lokmanya Tilak Terminus and the upcoming NMIA, is expected to attract more tenants from the increasingly crowded Mumbai.
7. **Proposed Navi Mumbai Metro** – The construction of the first phase of Navi Mumbai metro, which will run from Belapur to Taloja, is in progress and is expected to be completed by November 2019. The metro line mostly lies under the PMC's area passing through Kharghar and Taloja. CIDCO, which is the development authority, has plans to develop the second phase of the metro from Khandeshwar to Taloja, both of which lie within the PMC limits.

With such major developments lined up, Panvel city is likely to experience a spurt in population growth. Hence, there is a consequent demand for basic infrastructure services. Therein lies the need for the PMC to be ready with a strategy for attaining its future development vision, taking into account the investment requirement for the implementation of proposed projects in different sectors. Hence, a CDP is required for Panvel city.

1.3 Approach and methodology

1.3.1 Approach

The approach to the assignment is based on consultative and analytical assessment of the existing situation in the PMC region. Inputs from stakeholders have been used to prioritise areas of development and formulate strategies to make the CDP an implementable document. The approach adopted is presented in Figure 2

Figure 2: Approach for CDP



The CDP for the PMC has been prepared with the next 21 years i.e., till 2041, in view. It is a forward-looking programme that outlines the path with respect to the following aspects:

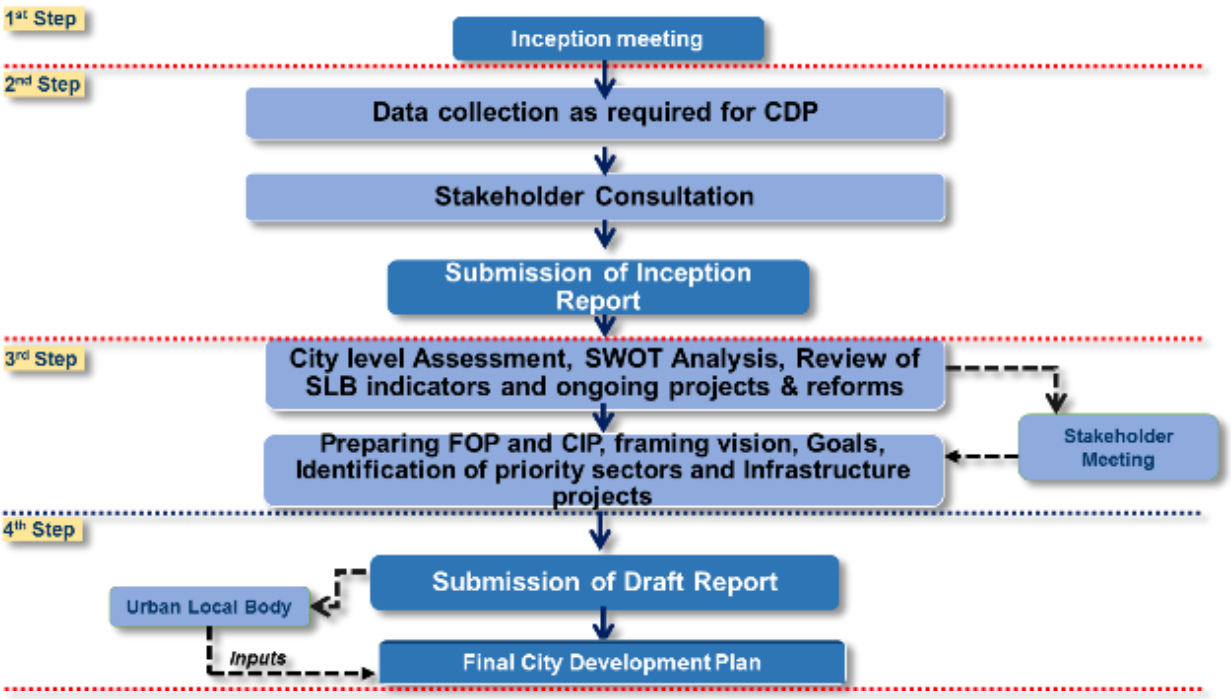
- **Infrastructure development** – Assessment, gap analysis, arriving at the investment requirement (for both the short and long term), and prioritisation of various services provided by the PMC, i.e., water supply, sewerage, storm water drainage, roads, traffic and transportation, street-lighting, solid waste management, firefighting, education, and health
- **Economic development** – The CDP focuses on tapping the existing potential and identifying key economic development opportunities for Panvel city
- **Social development** – The CDP takes into account the social-development needs, such as hospitals, education institutions, and recreational centres
- **Institutional development** – Assessment of capacity-building required for the PMC to undertake the city's development
- **Financial sustainability** – The CDP has assessed the revenue sources, expenditure areas, and current and future investment requirement of the city. Based on this, a sustainable investment capacity has been arrived at and measures have been suggested for improving revenue

Moreover, the approach is based on the philosophy of developing workable solutions.

1.3.2 Methodology

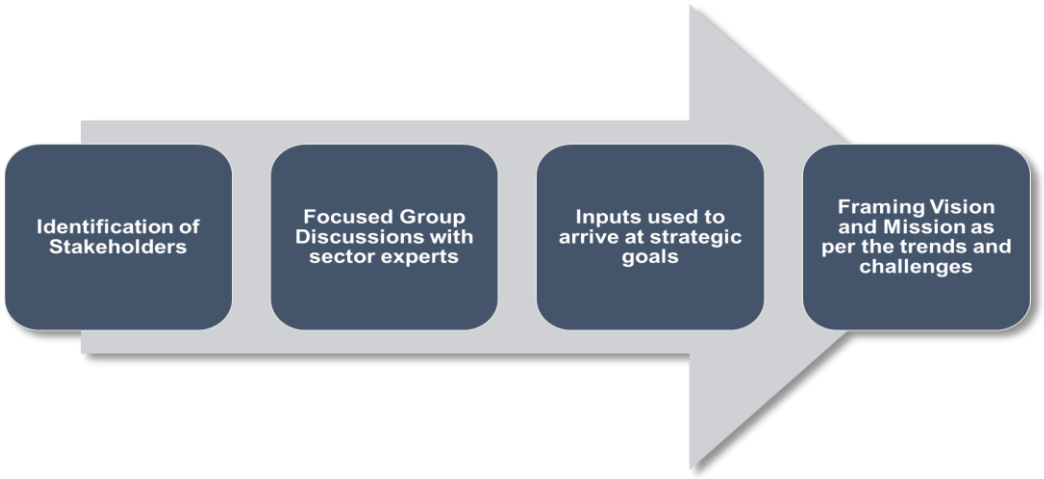
The methodology for undertaking the work of preparing the CDP is described in Figure 3 below. Broadly, four sequential steps have been undertaken.

Figure 3: Methodology for the CDP



Stakeholder consultation is an important aspect for achieving a long-term vision for the city. The municipal corporation of Panvel would have to work with other stakeholders. Figure 4 gives an overview of the stakeholder consultation process followed in preparing the CDP for PMC:

Figure 4: Stakeholder consultation process



The mapping of significant stakeholders was carried out in discussion with the PMC and a broad spectrum of citizens were identified. These include officials, elected representatives, non-governmental organisations (NGOs), representatives of trade and industry, educationists, prominent and senior citizens, etc. They were invited for discussions on city-level issues and to understand the citizens' aspirations on the city's development. Based on a review of the existing situation, stakeholder consultations, and inputs from sector experts, major issues were identified. Sector-specific strategies were formulated based on these and short-term goals framed to achieve the vision.

1.3.3 Teaming strategy

The structure and composition of the team was proposed in line with the requirements of the project to meet the objectives of the assignment effectively and in a timely manner. The following team was proposed for the assignment:

1. **Team leader:** The central person for all aspects of client coordination and responsible for meeting the timeline and objectives of the assignment.
2. **Deputy team leader/infrastructure expert:** Responsible for infrastructure assessment and planning.
3. **Municipal finance expert:** Responsible for assessing finance, preparation of the financial operating plan, and suggesting strategies for revenue enhancement.

Each of the key experts have applied their domain expertise in assessing the city and interacted with other experts for developing a strategic action plan for the project.

Support staff: Apart from the above team of experts, a team of three support staff members, comprising urban planners, engineers and MBAs and possessing requisite experience in the urban sector, were stationed at the PMC.

Table 1: Role of experts against each of the key discipline area

S no	Main disciplines of the assignment	Key experts	Support staff
1	Overall city assessment – physical and social infrastructure, economy, land use, regional developments	Led by a team leader in consultation with other team members.	On-site support staff to carry out all data collection and preliminary data analysis under the supervision of the team leader and experts.
2	Infrastructure assessment and planning	Led by an infrastructure expert, in consultation with other team members.	
3	Municipal finance assessment, financial operating plan, capital investment plan, revenue enhancement strategies	Led by the municipal finance expert, in consultation with other team members.	

1.4 Key process undertaken for preparation of the CDP

The PMC intends to prepare a CDP to assess existing infrastructure services and future requirements for the PMC region and determine the investments required for meeting future infrastructure creation and provisions. CRIS was appointed as consultant by the PMC for carrying out this task.

1.4.1 List of key meetings

The list of the meetings conducted at various stages while preparing the CDP for the PMC have been summarised in the table below.

Table 2: List of key meetings held during the CDP preparation

S No.	Meeting	Date and Venue	Participants
1	Kick-off meeting	October 5, 2018, PMC office	Hon. Commissioner PMC, HODs and officials of PMC and CRIS team
2	Meeting with CIDCO Chairman	October 20, 2018, PMC office	CIDCO Chairman, Panvel Mayor, Representatives from the PMC and CRIS team
3	Introductory meeting with CIDCO JMD	October 23, 2018, PMC office	JMD CIDCO, Commissioner PMC, Officials from CIDCO and PMC, CRIS team
4	First city-level stakeholder discussions	December 12-15, 2018, Vasudev Balwant Phadke Natyagriha	NGOs, Associations of doctors, teachers, lawyers, industrialists, traders, PMC officials, elected representatives of Panvel and Panvel Mayor

In addition to the above, meetings were also held with CIDCO and PMC officials for procuring data and for discussions.

1.4.2 Key takeaway from the kick-off meeting

A kick-off meeting with PMC officials was held on October 5, 2018 to finalise the approach and methodology for the assignment.

The meeting was chaired by Ganesh Deshmukh, Hon. Municipal Commissioner-PMC, and was attended by heads of departments and other key officials who would be involved in the preparation of the CDP and also provide necessary information and support.

- The agenda of the meeting was to give a brief about CRIS's approach on preparing the CDP, gather the initial views of ULB officials, and provide a way forward for the project
- The CRIS team made a presentation on the following aspects
  - CRIS's experience in preparing CDPs
  - Details of the assignment coverage
  - Approach and methodology
- The meeting also discussed how a CDP is different from a development plan (DP) and the need for preparing a CDP for a city
- While preparation of the DP for the PMC is under process, discussions were held on how the CDP and DP should be in sync
- The CRIS team presented a SWOT analysis of Panvel city and emphasised how upcoming infrastructure projects, such as the Navi Mumbai airport, metro, etc., would increase the population. This would resulting in

considerable infrastructure requirements, making it necessary for Panvel to prepare a CDP and be equipped with a strategy

- The CRIS team also described the methodology for executing the assignment, highlighting the goals and strategies identified in the CDP will be outlined for the near (seven years), medium (14 years) and long term (21 years)
- The team invited comments from office-bearers and other internal stakeholders. The Hon. Municipal Commissioner suggested CRIS include NGOs and senior citizen and other local groups during the proposed stakeholder consultations

The above kick-off meeting was followed by a meeting of the CRIS team and key PMC officials with CIDCO Chairman, Prashant Thakur, on October 20, 2018 to seek support from CIDCO for the necessary data.

These meetings helped clarify the municipal body's expectations with respect to the scope and output of the assignment, which was used to customise the approach and methodology to meet the PMC's requirements.

1.4.3 Preliminary site visit

A site visit was undertaken to have a better understanding of Panvel region. The sites identified covered the old city, CIDCO colonies, the core Panvel city area, prominent market regions and industrial pockets, the solid waste treatment plant, the proposed Navi Mumbai metro line, and the recently added villages to ensure that the final CDP is connected to the city's on-the-ground requirements.

The prominent sites covered during the visit were:

- Jetty / *bandar* area: near BP Marine Academy
- Slum rehabilitation site: Old Panvel court
- Market areas: *Mirchi galli* and APMC market
- Core /old city area: *Sarafa bazaar* and *tapal naka* (flood prone area)
- Water bodies: *Kalundre* river and lakeside development in front of Kalpataru society
- CIDCO nodes: New Panvel and Kharghar
- Industrial area: Taloje MIDC
- Infrastructure facilities: Solid waste management plant, proposed Navi Mumbai airport site, Navi Mumbai metro site
- Rural areas: villages such as Ghot, Koyna Velhe, Tembodhe, Valavali, Pale Khurd, Nagzari, etc
- Panvel railway station
- Green spaces / natural resources such as central park, golf course, Kharghar Hill

Figure 5: Jetty area at Panvel Bandar road near BP Marine Academy



Figure 6: Solid waste processing and disposal facility at Ghot



Figure 7: Proposed Navi Mumbai airport site



It was observed during the visit:

- Several trucks (carrying containers) en route to the JNPT or other destinations are often parked along the city roads and open spaces, leading to congestion. These trucks are also one of the major causes of accidents in the municipal area. The same needs to be addressed at the earliest to reduce congestion and traffic-related incidents
- Construction of the Navi Mumbai airport would affect the direction of the Kalundre river. The level of the river bank is low in the PMC area as compared with the other side, i.e., Karanjade area. Hence, the airport's construction would also raise the water level of the river and possibly affect low-lying regions in the PMC area. Hence, an impact assessment study needs to be undertaken

1.4.4 Data collection

The primary objective of the assignment was to assess the existing infrastructure in the PMC region and its future requirements, along with determining the investments required for meeting future infrastructure creation. Hence, it was important to understand the gaps faced by the PMC in developing, financing and implementing these additional facilities in key sectors. This gap analysis would be critical in identifying and prioritising projects for sustaining the pressure created by the increased population in the future.

Since assessing the gaps required collecting data from the PMC, the list of the information required was presented in form of questionnaires so that data collection could be conducted smoothly. As the PMC has only been recently incorporated and the handover from CIDCO is still in process, data was also required from CIDCO. Hence, the adapted questionnaires were shared with CIDCO.

Secondary data on various sectors was collected from respective departments, including PMC, CIDCO, etc. Further, the CRIS team also carried out consultations with various stakeholders of the city and engaged in city-level assessment and SWOT analysis.

Certain challenges were faced while collecting some primary data, which was required to assess gaps in the existing infrastructure. Challenges were also faced as the data required was being maintained in a separate format.

As the corporation has been recently formed, the process of handover and related data collection is still ongoing at the corporation level. However, in such cases, references were taken from Census figures for the region (2011) and brought to the 2018 level based on growth rates prevailing with regard to the sector. The inputs of key experts of the CRIS team and the views of PMC officials were also considered for mitigating the gaps arising in critical infrastructure data.

The table below gives an overview of the data gaps in the CDP along with its relevance.

Table 3: Data gaps

S No	Section	Data Gaps	Remarks	Criticality of Information
1	Physical setting	Geology	The information on geology is not available for whole PMC region	Low relevance
2	Economic profile of the city	Contribution of primary, secondary and tertiary sectors to the GDP	The information is not available at the city level.	Low relevance
3	Heritage and tourism	Heritage	Information on details of structures with historic significance is not available.	Medium relevance
		Tourism data	Information on tourism inflow is not available	Medium relevance

S No	Section	Data Gaps	Remarks	Criticality of Information
4	Water supply	Infrastructure in villages	Detailed information on the infrastructure in villages is not available	Medium relevance
5	Sewerage	Outlet parameters of sewerage in CIDCO	Information on outlet parameters of treated sewerage is not available	Low relevance
		Sanitation	Information on the number of urinals in public toilets is not available	Medium relevance
6	Traffic& transportation	Existing road infrastructure	Information on road widths in CIDCO nodes and villages is not available	Medium relevance
		Parking facilities	The information on road, off-road and parking plazas for the PMC region is not available	Medium relevance
7	Storm water drainage	Infrastructure in villages	Detailed information on village infrastructure is partially available	Medium relevance
8	Urban environment	Air, water and noise pollution	The information on air, water and noise pollution for the entire PMC region is not available	Medium relevance
9	Social infrastructure	Green space	The information on the area and number of gardens for the entire PMC region is not available	Medium relevance

1.4.5 Stakeholder consultations

A consultative process is the key for planning for any city. As the PMC was formed in 2016, the CDP is being prepared for the first time. Earlier, the Panvel Municipal Council had prepared a CDP which was limited to the core council area.

Hence, in line with the objectives of the preparation of a fresh CDP for the PMC and to ensure a participatory and inclusive development process, the CRIS team carried out wide range of stakeholder consultations and focus group discussions with the key stakeholders of the PMC region.

The exercise involved mapping of the significant stakeholders, followed by discussions on city-level issues. To carry out sectoral demand and gap assessment precisely, stakeholders of diverse backgrounds were identified and invited for focus group discussions.

The stakeholders comprised associations of doctors, teachers, industrialists, and organisations working in social aspects along with the Mayor, Commissioner, Corporators and all department officials of the PMC who play a major role in planning, implementation and management.

1.4.5.1 Key stakeholder discussions

In line with the preparation of a fresh CDP for the PMC, separate workshops were organised with the identified key stakeholders of the region from December 12-15, 2018.

Table 4: Schedule of stakeholder discussions

S no	Focus group	Date
1	Teachers	December 12, 2018
2	Lawyers and their respective associations	December 12, 2018
3	Doctors and their respective associations	December 12, 2018
4	Industrialists, business community and their respective associations	December 13, 2018

S no	Focus group	Date
5	Senior citizens' associations	December 13, 2018
6	Social clubs	December 14, 2018
7	NGO	December 14, 2018
8	Vendors, street hawkers, rickshaw drivers	December 15, 2018
9	Elected political representatives such as Mayor, local Corporators, Leader of the House and Leader of the Opposition	December 15, 2018

The primary objectives of the discussion was:

- To apprise stakeholders on the key principles and background of preparation of the CDP
- Based on the reconnaissance study carried out, appraise stakeholders on the current situation and challenges across various aspects of city development
- To understand aspirations of the citizens and understand the major issues and challenges they perceive

To make the consultation more interactive, a power point presentation was prepared and the citizens were encouraged to speak on various aspects of the city's development. Post the presentation, the stakeholders interacted with the CRISIL team and provided their views on the key challenges and opportunities for the development of Panvel.

An email id cdppanvel@gmail.com was made available on the PMC's website so that citizens could share their views on the city's development and define their vision for the city.





2.

Panvel city profile

2.1 Introduction

Panvel is the first municipal corporation in the Raigad district of Maharashtra. It was formed after amalgamating Panvel old council area and 29 revenues villages encompassing CIDCO nodes, i.e., Kharghar, Kalamboli, Kamothe, Taloja, New Panvel, Navade, Kalundre, and 11 previously governed Mumbai Metropolitan Region Development Authority (MMRDA) villages. The history of Panvel dates back 300 years, having been ruled by different groups such as the Mughals, Marathas, Portuguese, and British. The place became an important trade centre under the Mughal Empire due to the availability of both land and sea. Traditional buildings such as *wadas* and other structures were constructed during the *Peshwahi* and post-*Peshwahi* period due to largescale trading in the area. Originally, the city was called Pavanpalli, from which the recent name of Panvel originated

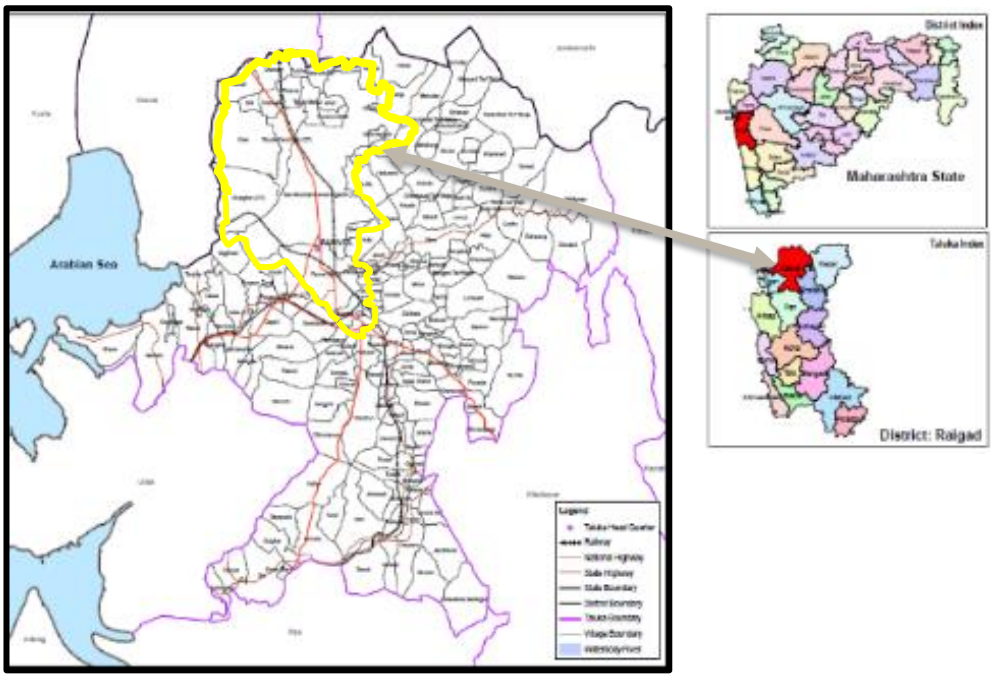
The jurisdiction of the newly formed Panvel Municipal Corporation spans ~110 sq km. As per the 2011 census, the population of this region was 509,901. The population is estimated to have crossed 13 lakh in 2017[3].

2.2 Regional setting

The city of Panvel is located in the north-western part of Panvel taluka in Raigarh district. Thane district lies to the north-west, with Navi Mumbai sharing its boundary with the PMC. Villages under the NAINA area form the eastern and southern boundaries.

Panvel forms a part of the MMR and is one of nine corporations located therein. Being the first corporation in Raigad district, the city occupies a unique position in the region. The city is an important satellite township and lies approximately 40 km east of Greater Mumbai within the MMR.

Figure 8: Regional setting of Panvel Municipal Corporation



Source: CRIS analysis using MRSAC[4] map

[3] Source: Detailed Project Report for Solid Waste Management –Panvel Municipal Corporation
[4] *Maharashtra Remote Sensing Applications Centre*

Panvel is one of the fastest-growing urban centres in the MMR. Panvel can be termed as a city of opportunity given the fact that it comprises both developed areas of CIDCO, the old council area and an abundance of greenfield area in villages for future development. The presence of water bodies, hills and large open spaces makes Panvel a sought-after destination.

Panvel also benefits from its strategic location, being close to both Pune and Mumbai. Given the upcoming international airport coming in its vicinity, Panvel has the capacity to become an international hub. It is very well connected to all the major cities via railways and roads. The upcoming metro, elevated railway line, Mumbai trans harbour link, and multimodal corridor will further enhance the city's connectivity. With such major developments lined up, Panvel city is likely to experience a growth spurt, making it stand out on a regional level. These infrastructure projects will empower people with opportunities to carry out business, trade and commerce. Education and health facilities will also make Panvel an epicentre for future growth.

2.3 Administrative boundary

Panvel was the first municipal council in India, established in 1852 under subsection (2) read with subsection (2A) of Section 3 of Maharashtra Municipal Corporation Act, 1949. The Government of Maharashtra declared Panvel a municipal corporation with effect from October 1, 2016. The area under the old municipal council and 29 revenue villages has been merged to form the PMC.

Table 5: Areas under the PMC

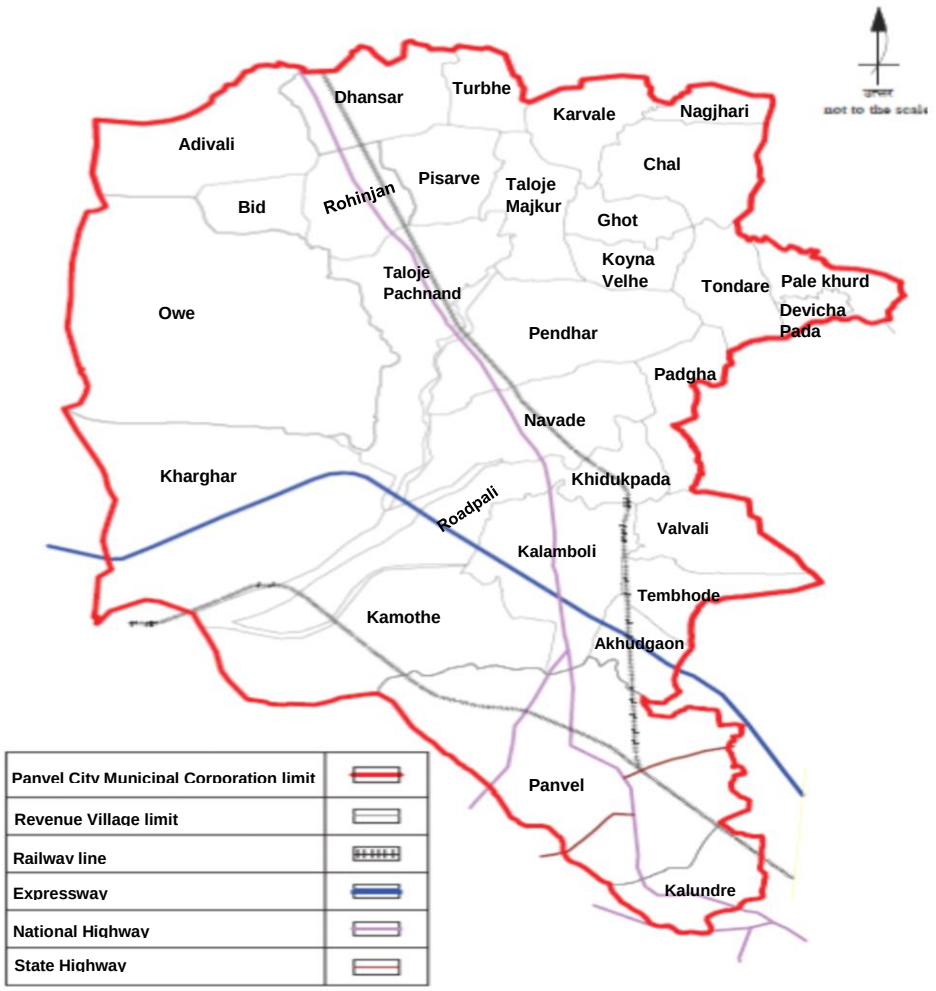
Sr. No	Previously under	Village/Area name	Area in Ha	Population, 2011
1	Panvel municipal council/ CIDCO	Old municipal council	1217.00	180020
2	CIDCO	Taloje Panchnad	520.00	14318
3		Kalundre	260.00	6626
4		Khargar	1104.00	80612
5		Owe	1367.90	9746
6		Devichapada	77.56	5574
7		Kamothe		69666
8		Chal		559
9		Navde		6447
10		Tondhare		5339
11		Pendhar		9488
12		Kalamboli		67235
13		Roadpali	4190.00	12160
14		Khidukpada		3569
15		Padge		4656
16		Walavi		2757
17		Pale khurd		2389
18		Tembhode		2250
19		Asudgaon		8858
20	MMRDA	Bid	113.61	118
21		Adivali	412.44	771

Sr. No	Previously under	Village/Area name	Area in Ha	Population, 2011
22		Rohinjan	198.66	4020
23		Dhansar	332.00	1881
24		Pisarve	216.08	1179
25		Turbhe	145.35	673
26		Nagzari	87.00	883
27		Taloje Majkur	239.86	2026
28		Ghot	131.00	3341
29		Koyana Velhe	187.48	1337
30		Karavel Bk	206.80	1403
		Total	**11006.74**	**509901**

Source: Proposal for PMC formation, PMC

The area which was previously under CIDCO forms as much as 68% of the PMC's area. Villages under the MMRDA form 21% of the total PMC area, with old Panvel Council (including CIDCO area) forming 11%.

Figure 9: Map of the PMC area



Source: PMC

2.4 Connectivity

Rail network: The PMC region has seven railway stations. Panvel station is a major junction which connects Panvel with other cities in India as well as the MMR region. There are two major railway lines, first being Harbour Line covering four stations, i.e., Panvel, Khandeshwar, Mansarovar and Kharghar. The other line is part of the Diva Roha railway line which comprises Panvel, Kalamboli, Navade road, and Taloja.

Road network: Highways such as national highways 48 and 66[5], State highway 54, Mumbai-Pune Expressway and Sion-Panvel Expressway connect Panvel with all major Indian cities.

Bus service: The road-based public transport system in the PMC region is mainly served by government undertakings such as BEST, NMMT, TMT, KDMT, VVMT, KMT, etc. There are two main bus stands in the area. i.e., the state transport (ST) stand and an NMMT stand. The Panvel ST stand provides connectivity to all cities within the state via Maharashtra State Road Transport Corporation buses.

Airport: The domestic and international airport located in Mumbai is at the distance of ~40 km from Panvel. However, the upcoming Navi Mumbai International Airport will be situated near Panvel, with the influence area of the airport sharing its boundary with the PMC.

2.5 Physical setting

2.5.1 Geology

The rock formations in the region are derived mainly from Deccan basalt and also from granites, gneisses and laterite. The gently sloping coastal lowlands are observed in patches and are covered with moderately shallow to deep soils, mostly lateritic in nature, sometimes oxidised to yellow murrum. The soils of this region are highly saline in the vicinity of creeks and non-saline at other places[6].

2.5.2 Climate

The climate of Panvel is tropical. The weather is generally sunny with heavy rains during the monsoon. The average temperature is 27°C with average annual rainfall of 3,267 mm. May is the warmest month, with the temperature reaching 34°C. January is the coolest month with temperature touching a low of 18°C. Panvel usually witnesses rainfall from July-September, with the highest precipitation in July

Table 6: Climate of Panvel

Particular	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg high °C	29.2	30	32	33.5	34.2	32.4	29.9	29.8	30.2	32.3	32.1	30.7
Avg low °C	17.7	18.4	21.5	24.2	26.4	26.1	25	24.6	24.4	23.6	21	18.6
Precipitation mm	0	0	0	1	14	593	1276	831	438	103	9	2

Source: https://en.climate-data.org/asia/india/maharashtra/panvel-47677/

[5] *Formerly called National Highway 17*
[6] *Source: CIDCO website*

2.5.3 Natural resources

Panvel area is blessed with vast natural resources such as lakes, gardens, forests, and hills. The PMC's Central Park in Kharghar is spread across 80 hectares. The park virtually creates a green link between the hills dotting Kharghar and the Panvel creek, while a natural channel runs from the hills to the creek with fully grown trees and vegetation in sporadic locations. Further, the PMC has a 103-hectare golf course with a large tract of open green land. Taloja, Kasardi, Kalundre, and Gadi rivers are the major rivers which pass through Panvel.

2.5.4 Agriculture, mineral, forest, and industry

Traces of iron ore are found in the laterite rocks in Raigad. Jambha stones are also available for construction work. Moreover, plenty of sand is available in the rivers and beaches of the district. Raigad is fairly rich in forest areas. The *Sahyadr*i hills and valleys are full of rainforest. The area of the forest is ~149,000 hectares. Teakwood, bamboo and medicinal plants are the main produces of the forest. (Ministry of MSME, 2016-17)

The major crops grown are rice, finger millets, and small millets during the *kharif* season and cow pea, red gram, green gram, horse gram, and dolichus dean in the *rabi* season. Mango, cashew, coconut, and areca nut are also grown. Dairy, poultry, goat rearing, and fishery are the main pillars of secondary agriculture in the district.

The Raigad district has various prominent industrial areas which include 12 major MIDC areas and co-operative industrial estates and scattered industrial development.





3.

Demography and socio-economic profile

3.1 Population

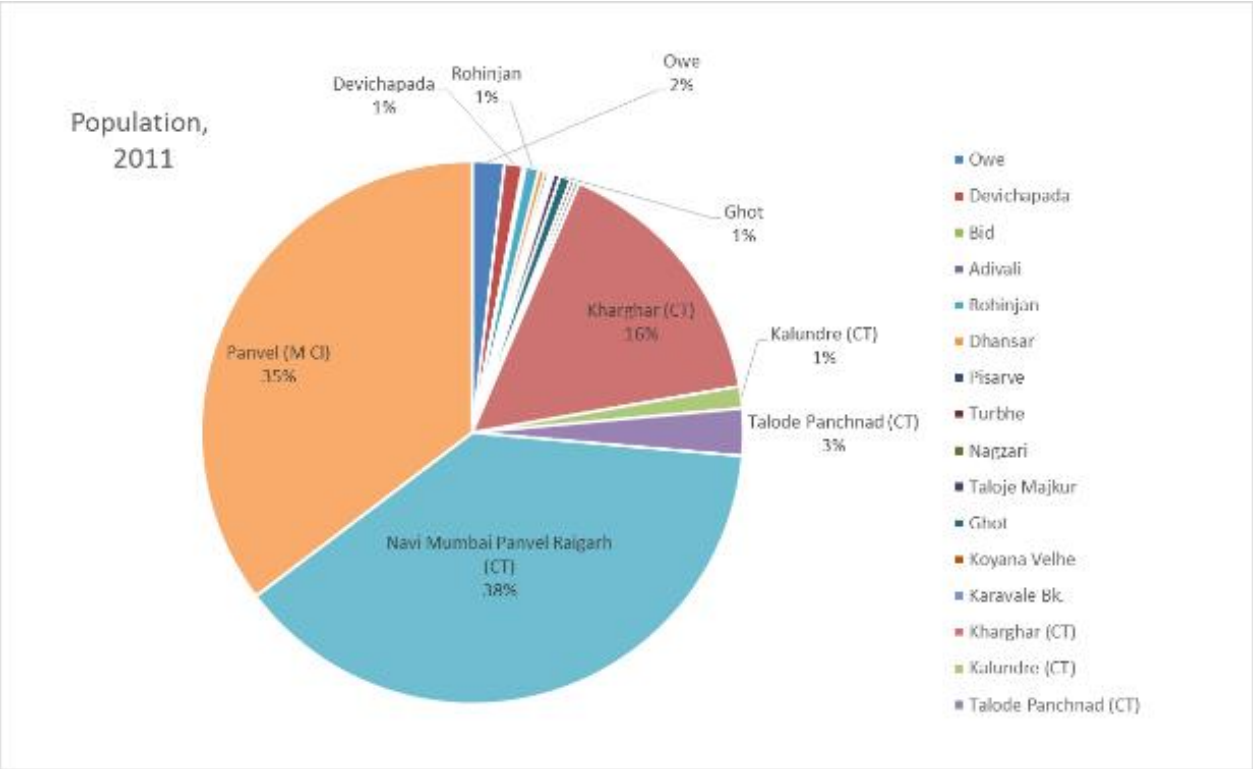
The PMC was formed in 2016 after merging old Panvel council and 29 revenue villages. Its population as per census 2011 is 5.09 lakh, comprising 77% of Panvel taluka's population. As per census 2011, 13 villages, four census towns, and one council area were merged to form the PMC.

Table 7: Demographic details of the PMC area

S no	Name of village/City	Population 2001	Population 2011	% of total population, 2011	% growth over 2001	Area in HA	Density (Population/HA) 2011
1	Owe	6084	9746	1.9%	60%	1367.90	7.1
2	Devichapada	3129	5574	1.1%	78%	77.56	71.9
3	Bid	81	118	0.0%	46%	113.61	1.0
4	Adivali	768	771	0.2%	0.4%	412.44	1.9
5	Rohinjan	2308	4020	0.8%	74%	198.66	20.2
6	Dhansar	2025	1881	0.4%	-7%	332	5.7
7	Pisarve	1220	1179	0.2%	-3%	216.08	5.5
8	Turbhe	692	673	0.1%	-3%	145.35	4.6
9	Nagzari	556	883	0.2%	59%	87	10.1
10	Taloje Majkur	1763	2026	0.4%	15%	239.86	8.4
11	Ghot	1943	3341	0.7%	72%	131.00	25.5
12	Koyana Velhe	1242	1337	0.3%	8%	187.48	7.1
13	Karavel Bk	1219	1403	0.3%	15%	206.8	6.8
14	Khargar(CT)	5993	80612	15.8%	1245%	1104	73.0
15	Kalundre(CT)	7584	6626	1.3%	-13%	260	25.5
16	Taloje Panchnad (CT)	10839	14318	2.8%	32%	520	27.5
17	Navi Mumbai Panvel Raigad (CT)	81855	195373	38.3%	139%	4190	46.6
18	Panvel municipal council	104058	180020	35.3%	73%	1217	147.9
	Total	**233359**	509901	100%	119%	11006.74	46.3

Source: Census 2011 and 2001

Figure 10: Population distribution, 2011



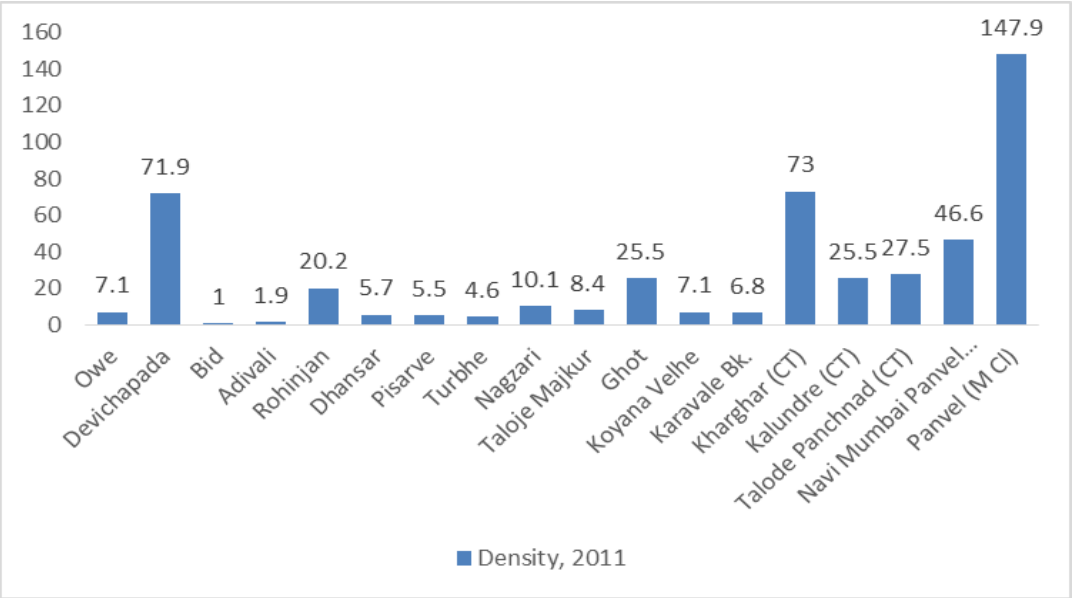
Source: Census 2011

As per the 2011 census, 13 villages contributed 6.5% of the total population, while the four census towns have the major share, i.e., 58.2% of the total population of PMC. Navi Mumbai Panvel Raigad (CT) contributes the maximum population (38%), as it consist of CIDCO-developed areas such as Kalamboli and Kamothe. Old Panvel council comprises 35% of the population.

The population has grown 119% from 2001 to 2011, with most areas showing positive growth rate. Khargar has grown at a phenomenal rate of 1245%, followed by Navi Mumbai, Panvel, Raigad (139%). This increased growth rate can be attributed to the huge population influx due to the growth in infrastructure, existing connectivity to Pune and Mumbai, and spurt in employment opportunities. On the other hand, the growth rate of four areas, namely Dhansar, Pisarve, Turbhe, and Kalundre, have turned negative.

The population density varies across areas, ranging from 1 person per hectare to 147 persons per hectare, showing vast diversity in a 110 sq km area. Old Panvel council is the most densely populated area, with 147 persons per hectare, followed by Kharghar with 73 persons per hectare. Devichapada has highest density among the villages, at 72 persons per hectare.

Figure 11: Density distribution, 2011



Source: Census 2011

3.2 Literacy

As per census 2011, Panvel has a literacy rate of 91.2%, which is greater than Panvel taluka (87.77%), Raigad district (83.14%), and Maharashtra (82.34%). A wide variation in the literacy rate is observed, with Nagzari having 52.9%, while Old Panvel council region having 93.9%. The literacy rate increased from 85.4% in 2001 to 91.2% in 2011. The literacy rate of males and females as per census 2011 is 93.8% and 88.1%, an improvement over 90.9% and 78.7%, respectively, as per census 2001.

Table 8: Literacy rates of Panvel in 2001 and 2011

S no	Area	Literacy rates					
		Persons		Male		Female	
		2001	2011	2001	2011	2001	2011
1	Owe	73.7%	80.5%	82.9%	85.5%	64.1%	74.1%
2	Devichapada	76.4%	90.1%	86.3%	93.8%	57.0%	83.5%
3	Bid	57.6%	79.4%	58.8%	83.7%	56.0%	75.0%
4	Adivali	72.3%	82.0%	80.8%	88.8%	60.7%	72.9%
5	Rohinjan	84.8%	88.8%	94.1%	93.0%	74.8%	84.0%
6	Dhansar	80.6%	84.5%	91.3%	91.4%	68.7%	77.2%
7	Pisarve	69.4%	84.6%	78.3%	92.4%	61.0%	77.6%
8	Turbhe	56.8%	84.4%	69.1%	88.4%	42.2%	79.8%
9	Nagzari	45.0%	52.9%	54.4%	60.2%	34.8%	45.1%
10	Taloje Majkur	80.3%	82.9%	92.7%	89.7%	67.9%	75.3%
11	Ghot	75.8%	80.1%	85.1%	85.4%	62.5%	72.3%
12	Koyana Velhe	84.2%	91.9%	93.2%	94.5%	74.4%	89.2%

S no	Area	Literacy rates					
		Persons		Male		Female	
		2001	2011	2001	2011	2001	2011
13	Karavale Bk.	71.5%	81.6%	85.7%	90.2%	55.8%	73.1%
14	Kharghar (CT)	81.3%	93.6%	89.5%	95.2%	72.1%	91.8%
15	Kalundre (CT)	91.4%	87.7%	95.6%	90.9%	86.8%	84.1%
16	Taloje Panchnad (CT)	82.3%	87.9%	87.9%	91.3%	75.4%	84.0%
17	Navi Mumbai (Panvel, Raigarh) (CT)	83.3%	89.1%	89.9%	92.5%	74.6%	84.9%
18	Panvel (M Cl)	89.1%	93.9%	92.9%	96.0%	84.8%	91.7%
	Total	**85.4%**	**91.2%**	**90.9%**	**93.8%**	**78.7%**	**88.1%**

Source: Census 2011 and 2001

3.3 Sex ratio

As per 2011 census, the sex ratio in the PMC area is 879 females per 1,000 males, which is lower than taluka (889), district (959), and state (929). However, the sex ratio as per census 2001 was 843, thus indicating an improvement in the sex ratio from 2001 to 2011.

Table 9: Sex ratio in Panvel from 2001 to 2011

S no	Area	Females per 1,000 males, 2001	Females per 1,000 males, 2011
1	Owe	938	815
2	Devichapada	569	599
3	Bid	884	1070
4	Adivali	753	752
5	Rohinjan	920	880
6	Dhansar	934	921
7	Pisarve	1089	1065
8	Turbhe	886	859
9	Nagzari	951	915
10	Taloje Majkur	965	899
11	Ghot	723	712
12	Koyana Velhe	911	932
13	Karavale Bk.	954	957
14	Kharghar (CT)	889	919
15	Kalundre (CT)	931	885
16	Taloje Panchnad (CT)	836	867
17	Navi Mumbai (Panvel, Raigarh) (CT)	771	820
18	Panvel (M Cl)	893	946
	Total	843	879

Source: Census 2011 and 2001

The area-wise sex ratio analysis shows the highest sex ratio is in Pisarve (1,065) and lowest in Devachipada (599) as per census 2011. Further, the sex ratio has deteriorated mostly in villages, with nine villages having a lower sex ratio in 2011 as compared with 2001.

3.4 Scheduled Caste and Scheduled Tribe population

As per census 2011, the Scheduled Caste (SC) population in the city is about 0.37 lakh and Scheduled Tribe (ST) population is 0.12 lakh. The SC and ST population constitutes ~7.43 % and 2.49% of the total population of the city. There has been a sharp growth in the SC population from 2001, marking a growth rate of 347%. The ST population has increased substantially during the period 2001-11 and registered a growth rate of 69%.

Table 10: Growth rate of SC & ST population in PMC region from 2001 to 2011

Category	2001	2011	Growth
SC	8490	37923	347 %
ST	7527	12727	69 %

Source: Census 2001 & 2011

Further, the SC and ST population in city is compared with that at district, to understand the share of respective population to that of the total population. As per census 2011, in Raigad district, the SC population accounts for 5% of the total population and ST accounts for 12% of the total district population.

Table 11: Comparison of SC and ST population with district

Year	Schedule Caste population		Schedule Tribe population	
	Panvel	Raigad	Panvel	Raigad
2001	8490	53667	7527	269124
2011	37923	134952	12727	305125

Source: Census 2011

3.5 Population projection

Projections are conditional statements about the future. They refer mostly to the exercises of extrapolation of past trends into the future. The population projections plays a vital role in the assessment of future needs for the city. The projected population would assist in estimating the demand for water supply, sewerage, solid waste management, and social infrastructure facilities such as schools, hospital and parks, etc., for the design years. Table 12 summarises the results obtained through the different projection methods such as arithmetic increase, incremental increase, geometrical progression, etc., based on the census data for 1991, 2001 and 2011 and tries to determine population for future years, notably 2021, 2031 and 2041.

Table 12: Population projection as per census figures

Year	Polynomial (Second degree)	Arithmetic increase	Incremental increase	Geometric progression	Other methods		
					Exponential method	Power method	Log method
2021	9,64,298	6,97,521	8,75,366	9,85,109	9,54,516	6,33,006	5,45,221
2031	15,96,535	8,85140	14,18,675	19,03,192	18,57,347	8,21,263	6,16,651

Year	Polynomial (Second degree)	Arithmetic increase	Incremental increase	Geometric progression	Other methods		
					Exponential method	Power method	Log method
2041	24,06,618	10,72,760	21,39,830	36,76,892	36,14,122	10,15,946	6,75,014

Source: CRIS Analysis

For better understanding of the population growth, population trends of various cities in the MMR region as well as the state of Maharashtra at different levels have been studied and presented in Table 13.

Table 13: Comparison of growth trends in Maharashtra

(All figures in lakh)

S no	Particular	1971	1981	1991	2001	2011	Growth rate 1971-1981	Growth rate 1981-1991	Growth rate 1991-2001	Growth rate 2001-2011
1	Maharashtra total	504.1	627.8	789.4	968.8	1123.7	25%	26%	23%	16%
2	Maharashtra urban	157.1	219.9	305.4	411	508.2	40%	39%	35%	24%
3	Mumbai Metropolitan Region(MMR)	77.9	110.9	145.3	188.2	228	42%	31%	30%	21%
4	MMR urban	68.3	101.2	135.2	181.8	213.8	48%	34%	34%	18%
5	Municipal Corporation of Greater Mumbai	59.7	82.4	99.3	119.8	124.4	38%	21%	21%	4%
6	Thane Municipal Corporation	1.7	4.7	8	12.6	18.4	176%	70%	58%	46%
7	Kalyan Dombivali Municipal Corporation	1.5	5.8	8.2	11.9	12.5	287%	41%	45%	5%
8	Ulhasnagar Municipal Corporation	1.7	2.7	3.7	4.7	5.1	59%	37%	27%	9%
9	Navi Mumbai Municipal Morporation	-	-	3.9	7	11.2	-	-	79%	60%
10	Mira-Bhayandar Municipal Corporation	-	-	1.8	5.2	8.1	-	-	189%	56%
11	Total Greater Mumbai Urban agglomeration (Sr 5 to 11)	64.9	95.7	124.8	161.3	179.7	47%	30%	29%	11%
12	Bhiwandi Nizampur Municipal Corporation	0.8	1.2	3.8	6.0	7.1	50%	217%	58%	18%
13	Vasai -Virar Municipal Corporation	0.3	0.4	2.2	4.7	12.2	33%	450%	114%	160%
14	Panvel Municipal Corporation	-	-	1.34	2.33	5.09	-	-	74%	118%

Source: NAINA DP

From the above table it is clear the population growth rate has slowed down in the MMR region, especially after 1991. In the 1980s, the suburbs of Greater Mumbai along with the cities of Kalyan, Thane and Navi Mumbai witnessed a growth spurt along with an escalated shift of population outside the Island City of Greater Mumbai. In the 1990s, Mumbai's extended suburbs along the Western rail corridor, Vasai and Mira-Bhayander saw increased growth along with Navi Mumbai, which grew rapidly after suburban rail connectivity with Greater Mumbai was established. In the 2001-2011 decade, regions showing high growth include areas distant from Mumbai such as Kulgaon-Badlapur and Panvel, Vasai-Virar and Navi Mumbai, which continued to record high growth rates, and Mira Bhayander and Thane which got further consolidated. The population distribution and dynamics within the MMR during 1971-2011 indicate a predominant increase in the share of other corporations near the Municipal Corporation of Greater Mumbai (MMRDA regional plan, 2016).

Thus, comparing growth trends of above mentioned cities and considering the present and planned infrastructure development projects in and around Panvel, the population projections in Table 12 for year 2021, seem to be on lower side. A survey conducted by CIDCO and PMC in 2017 has estimated the city population to be ~13,71,000 people, based on watewr supply connection data.

Given the strategical location of Panvel, relatively affordable housing stock, decent industrial base and considering the population growth at 118 % in previous decade, a population of 13,71,000 people for 2017 seems reasonable.

Table 14: Population projections

Year	Projected Population
2018	14,80,667
2021	18,65,116
2025	20,95,843
2031	24,41,934
2032	24,99,616
2035	26,72,661
2041	30,18,752

Source: CRIS analysis

For population projection, 13,71,000 people have been considered as the base population. The city is likely to sustain the increased growth rates till 2021, growing in a geometrical fashion. Till 2025, the planned infrastructure projects in and around Panvel are likely to be completed and the population growth is expected to stabilise. Considering this, the population is likely to grow in an arithmetic fashion during the 2031-41 decade.

3.6 Socio-economic profilew

3.6.1 Raigad district

Raigad is one of the few districts in Maharashtra which is rich in mineral resources and forest areas. The district encompasses 12 major industrial and cooperative industrial estates of which only one industrial area and two cooperative industrial estates fall under the PMC's jurisdiction. The district is dominated by manufacturing enterprises, with 3,026 units as compared with 588 service enterprises. There are organisations of micro, small, medium and large sectors contributing to an employment generation of 89,137[7]. Majority of the industries present in Raigad are engaged in are salt manufacturing, Ganesh idol manufacturing, paper and pulp, coated fabric and

[7] *As of September 2015*

chemicals, RCC pipes, petrochemicals, pharmaceuticals, grinding wheels, segments stones and sticks, etc. The agro based-industries are rice, barley food and yeast powder. The major items which are exported from the district are chemicals, iron ore, steel*, ayurvedic* medicines, pharmaceuticals, rice, and cashew nut.

As per the Maharashtra Economic survey of fiscal 2018, Raigad had Rs 29,576 crore gross district value added which has increased to Rs. 51,568 crore in fiscal 2017. It ranks 10th in terms of gross district value among 34 districts of Maharashtra and is behind Mumbai, Pune, Thane, Nagpur, Nashik, Aurangabad, Kolhapur, Solapur, and Ahmednagar.

Per capita gross district value added by Raigad has seen an increase from Rs 1,11,566 in fiscal 2012 to Rs 1,84,215 in fiscal 2017, a 65% growth in five years.

3.6.2 City economic profile

The economy plays an important role in the development of any area. The PMC region has several industries in steel, marble, and chemical sectors in and around the city. In addition, the retail and wholesale trading of commodities is also thriving, thereby contributing to the region's economy. The industrial estate of the PMC region comprises MIDC's Taloja industrial estate and two co-operatives industrial estates, i.e., Jawahar Co-operative Industrial Estate Limited and Panvel Industrial Co-operative Estate Limited. Further, CIDCO has also developed a steel market complex and several warehouses in Kalamboli. A part of Navi Mumbai SEZ also falls within the PMC's jurisdiction.

Table 15- Industrial profile of Panvel

Sr No	Industrial estate	Area	No. of plots	No. of plots allotted	No. of units in production
1	Taloja industrial estate	863.19 Ha	436	423	326
2	Jawahar Co-operative industrial Estate	57 Acre 15 Gunta	249	249	96
3	Panvel Industrial Co-operative Estate Ltd	12 Ha 31 R	103	103	85

Source: Brief Industrial Profile of Raigad District, MSME

3.6.2.1 Real estate and construction

Panvel has excellent rail and road connectivity with the MMR as well as other major cities of country. Also, there are number of upcoming mega infrastructure projects in the region which are likely to encourage further economic development as well as improve the daily commute. In addition to this, the availability of land parcels has transformed Panvel into upcoming real estate hot-spot of Mumbai's peripheral areas.

3.6.2.2 Retail and commercial

Unprecedented growth in the housing market in Panvel has led to the development of commercial and retail space to cater to the demand of the growing population. The presence of people in the city with high disposable income and an escalating propensity to spend has prompted the development of an organised retail market in Panvel. In recent years, several malls and shopping plazas have come up in and around Panvel.

3.6.2.3 Education sector

With the increasing demand for the availability of good quality education, many private schools and colleges have come up in the city (notably in Kharghar), offering education of various levels and standards in Panvel.

3.6.2.4 Other services

The phenomenal growth in Panvel's population coupled with an increased demand for retail and educational developments can open up gateways for other services such as the finance, banking, insurance, personal service sector, etc. The service sector has the potential to become the new growth engine in the city.

3.6.3 Workforce participation rate

As per the 2011 census, the work force participation ratio in Panvel is 38:62 (working population: non-working population), which has increased from 35:65 in 2001. Male workers contribute approximately 80% to the total working population. The share of main workers is 89.5 % in the total workforce, while the marginal workers form the rest.

As per census, the main and marginal workers are further classified into four categories and their distribution is given below:

Table 16: Census categorisation of workforce of Panvel city

S no	Occupation category	Population, 2001	% of total working population	Population,2011	% of total working population
Main Workers		**73845**	**89.4%**	**173755**	**89.5%**
1	Cultivator	1845	2.2 %	2372	1.2%
2	Agriculture labours	1179	1.4%	1113	0.6%
3	Household industry workers	1401	1.7%	3560	1.8%
4	Others	69420	84.1%	166710	85.8%
Marginal workers		**8747**	**11.8%**	**20452**	**10.5%**
1	Cultivator	1113	1.3%	856	0.4%
2	Agriculture labours	935	1.1%	418	0.2%
3	Household industry workers	744	0.9%	906	0.5%
4	Others	5955	7.2%	18272	9.4%

Source: Census 2011 & 2001

The above table clearly indicates that a majority of workers (main+marginal) fall in the others category. The share of others workers has seen an increase from 91.3% in 2001 to 95.2% in 2011 in the total workforce. Other workers fall in the tertiary sector category which comprises service sector, trade and commerce and informal business activity etc. Tertiary sector has been the major contributor to the workforce in Panvel.

The share of workers (main+marginal) in the household industry category has decreased slightly from 2.6% in 2001 to 2.3% in 2011. This could be due to the slow growth of industries in the area. Household industry workers falls in secondary category, which comprises workers involved in the manufacturing and household industries.

The cultivators and agriculture labour, i.e., the primary sector category, has seen a sharp decline from 6.1% in 2001 to 2.5 % in 2011.


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4.

Existing city infrastructure

4.1 Water supply

Water supply is one of the key focus areas of the PMC. This section gives a brief of the existing water supply system in Panvel, including details of the water source, transmission of water, water treatment, storage capacities and distribution to end-users. The section also highlights the key issues in the sector with demand-gap analysis of the infrastructure required in future.

4.1.1 Existing water supply situation

The water supply system in the PMC region comprises:

1. Water supply system in Panvel Old Council area
2. Water supply system in CIDCO nodes
3. Water supply system in villages

Multiple authorities are involved in sourcing and distribution of water supply in each area such as CIDCO, PMC, MJP, MIDC and NMMC.

Water is supplied to Panvel Old Council area through five distribution zones, viz Zone1, Zone 2, Zone 3A & 3B, and Zone 4. Water supply in CIDCO area has been divided into 7 zones based on its node. All the villages have been clubbed into one single zone.

Table 17: Water distribution in PMC

Sr No	Water distribution zone	Areas included
1	Zone 1	1.Hariom Nagar, Ashok Bag, Janvekar Wada, Yashomangal Society 2. Hariom Nagar to Anil Restaurant to Pioneer Society to Valmiki Nagar 3.Hariom Nagar to HOC Colony to Thane Road elevated storage reservoir (ESR) 4.Thane Naka Road ESR to Pada Mohalla, Patkar Wada and total Thane Naka Road 5. Entire Sai Nagar area 6.52 Bungalow(part), Adarsh Society (part)
2	Zone 2	Distribution from behind ST stand new ESR 1.Lokmanya Nagar, Orion Mall, Shivaji Nagar Zopadpatti, Maldhakka Zopadpatti 2.Narmada Complex to K Mall to Godrej Moraj Society 3.Moraj Society to Takka smashan bhoomi, national park, national paradise 4.Kasturi Society, A,B,C,D,AA,BB,EFG and Takka Gaon 5.Entire middle class area
3	Zone 3A	Water supply from behind ST stand old ESR 1.ESR to Kohinoor Technical to Tapal Naka 2. Entire stretch of Shivaji Road, Gurukrupa Training School to Adarsh Lodge to Virupaksha Mandir to Jabharat Naka to Kapad Galli to Mirchi Galli 3.ESR to Gurukrupa Training School to Gaondevi Pada to Sawakar Chowk to Pardeshi ali to Thane Naka Road 4. Agri Samaj Hall to Nadkarni Hospital to Prince Paradise 5.Gaondevi Mandir to Ghate ali, Adarsh Lodge 6.Dhoot Papshwar to Virupaksha Mandir Bhaji market ESR 1.ESR to Shani Mandir, Momin Pada, Panchratna Hotel 2.Shani Mandir to Mirchi Galli 3.Shani Mandir to entire Rohidas Wada, etc

Sr No	Water distribution zone	Areas included
4	Zone 3B	Patel Mohalla ESR 1.ESR to Patel Mohalla, Bharatnagar Zopadpatti, Koliwada, Waniali Dhobi ali to Mirchi Galli 2.ESR to Bhusar Mohalla, Kumbhar Wada, Muslim Naka, Kacchi Mohalla 3.Bundar Road employment office area 52 bungla (part) other society (part) etc.
5	Zone 4	Direct supply 1.Motha Khanda Dhakta Khanda, Podi 2.Entire stretch of Uran Road, fish market to Panchratna Hotel to vVsrali Naka 3.Entire market yard, Gurusharman Society, Saipratik Society
6	Kharghar node	Belpada, Kopara, Kharghar, Owe, Parshipada, Rohinjan, Rajanpada, Heddurwadi, Papadichapada, Taloja, Kutumbh Bhandhan, Morbi, Dhamole, CIDCO Kharghar area
7	Taloja node	Pendhar, Boeparpada, Pethali, Majkur, CIDCO Taloja area
8	Kalamboli node	Kalamboli Gaon, Jadhavwadi and Katkar Wadi, CIDCO Kalamboli area
9	Kamothe node	Kamothe Gaon, Jui Goan, CIDCO Kamothe area
10	New Panvel node	Panvel, Chota Khanda, Motha Khanda(west), Bhonshet Podi old),CIDCO Panvel area
11	Kalundre node	CIDCO Kalundre area
12	Navade node	CIDCO Navade area
13	Villages	All remaining villages

Source: PMC and CIDCO

4.1.2 Source of water supply

Multiple water supply sources cater to the water supply needs of citizens in the PMC. The Panvel Old Council area's water supply needs are fulfilled by the PMC-owned Dehrang dam and treated water received from MJP, MIDC and CIDCO. Similarly, CIDCO node's water supply needs are fulfilled by the CIDCO-owned Hetawane dam and treated water received from MJP, NMMC and MIDC. The water supply needs of villages are met by MIDC, PMC and CIDCO. Thus, with a total supply of 210.31 MLD and estimated present population of 14.80 lakh, per capita supply of water is 142 LPCD at the distribution level.

The following table gives a brief overview of water supply sources, areas served, tapping points, quantity of water supplied and water rates across the PMC region.

Table 18: Source of water supply and areas served

Sr No	Area	Source	Tapping point	Water supplied (MLD)	Water rate (Rs/Kl)
1	Panvel Old Council area	PMC - Dehrang dam (own source)	-	16.00	-
		MJP - Patalganga	A. Podi 200 mm dia	3.50	Rs 10.90
			B. Vadghar 200 mm dia	1.00	Rs 10.90
			C. Fire station 300 mm dia	0.00	Rs 10.90
		MIDC - Patalganga	A. Near Shree Dutta Hotel 300 mm dia	4.75	Rs 8.50
			B. Dhakata Khanda 100 mm	0.35	Rs 8.50
			C. Motha Khanda100 mm dia	0.30	Rs 8.50
			D. Takka yard 80 mm dia	0.45	Rs 8.50

Sr No	Area	Source	Tapping point	Water supplied (MLD)	Water rate (Rs/Kl)
		CIDCO - Hetawane	A. Dhakata Khanda100 dia	0.25	Rs 7.00
			B. Motha Khanda100 mm dia	0.16	Rs 7.00
			C. Podi No 2.5 150 mm di	0.35	Rs 7.00
		Total water supplied in Panvel Old Council area		**27.11**	
2	CIDCO node - Panvel (E&W)	MJP - Patalganga	A.300 mmm dia - Podi, Sector 15, New Panvel (E)	36.00	Rs 8.80
			B. 300 mm dia - Matheran Road near sector 1, New Panvel (E)		Rs 8.80
			C. 300 mm dia - Khanda tapping, New Panvel (W)		Rs 8.80
			D. 300 mm dia - Asudgaon, New Panvel (W)		Rs 8.80
3	CIDCO node - Kalamboli	MJP - Patalganga	A. 300 mm dia - Behind kalamboli police station	27.00	Rs 8.80
		MIDC - Patalganga	A. 150 mm dia - Near Khidukpada Village steel market, Kalamboli		Rs 10.25
4	CIDCO node - Kamothe	NMMC - Morbe	A. 500 mm dia - NMMC tapping point near Hotel Vyankatesh (Kalamboli)	36.00	Rs 9.00
		MIDC - Patalganga	A.150 mm dia - MIDC tapping point near NH04 Khanda Colony		Rs 10.25
5	CIDCO node- Kharghar	CIDCO - Hetawane	A.800 mm dia - Near PCB, Retibunder, CBD Belapur	65.00	Rs 9.00
		NMMC - Morbe	A.300 mm dia - Near sector 11, Kharghar MBR		Rs 9.00
6	CIDCO node - Taloja	CIDCO - Hetawane	A.800 mm dia - Near PCB, Retibunder, CBD Belapur	5.50	-
		MIDC - Barvi	A.150 mm dia - Taloja MIDC		Rs 10.25
7	CIDCO node - Navade	MIDC - Barvi	NA	1.00	Rs 10.25
8	CIDCO node - Kalundre	MJP - Patalganga	NA	0.70	Rs 8.80
		Total water supplied in CIDCO nodes		**171.2**	
9	Remaining villages	MIDC CIDCO PMC	NA	12.00	-
		Total water supply across PMC		**210.31**	

Source: Data collected and discussions with PMC and CIDCO

4.1.3 Treatment and storage

Panvel Old Council area

Raw water from *Dehrang* dam is drawn via an intake well with a diameter of 2.5 m and 15 m height, through three pipes of 350 mm diameter, placed at different levels. Raw water is conveyed to a water treatment plant (WTP) by 16 km-long, 500 mm diameter PSC pipes. The raw water is then treated at a 16 MLD water treatment plant (conventional type) which was constructed in 2001 near the ST stand. The water treatment plant has units such as an aeration fountain, mixing channel, clarifier, rapid sand filter and chlorination system. The aeration fountain is of the cascade type, with a diameter of 4.5 m. The mixing channel has a detention period of 30 seconds and is 9 m long. The clarifier has a detention period of 1.5 hours and total diameter of 28.6 m. The rate of filtration of the rapid sand filter is 5,000 litres/square metre/hour. A sump of 200,000 litres is located near the WTP and is used to store pure water.

Treated water from the plant is then sent to the ESR/ground water sumps and distributed throughout the Panvel Old Council area through distribution pipelines by the PMC. Further, treated water is directly received from MJP, CIDCO and MIDC which is tapped at various locations and supplied to the city. Water is supplied for 1.5 hours per day.

The Dehrang dam supplies water once in two days during summer, resulting in substantial water cuts in the Panvel Old Council Area. One of the reasons for reduced water supply from Dehrang dam has been the deposition of heavy silt with time, which has reduced its storage capacity.

The total storage capacity of Panvel Old Council area is 4.25 ML. Out of the total storage available, elevated storage reservoirs can hold 3.6 ML, whereas ground water reservoirs store 0.65 ML.

Table 19: ESR/GSR in Panvel Old Council area

Sr No	Zone	Name and location	Type (ESR/GSR)	Capacity (ML)
1	Zone 1	Thane Naka	ESR	0.8
2	Zone 2	Behind ST stand (new)	ESR	0.625
3	Zone 3(A)	Behind ST stand (new)	ESR	0.650
4		Hutatma Smarakh	ESR	0.9
5		Behind ST stand (old)	GSR	0.650
6	Zone 3(B)	Patel Mohalla	ESR	0.625
		Total		**4.25**

Source: Data collected and discussions with PMC

Table 20: Transmission lines in Panvel Old Council area

Sr No	Type	From - to-	Pipeline description
1	PW rising main – 1	PW sump to Hari Om Nagar ESR	DI, 350 mm dia, length- 1 km
2	PW rising main – 2	PW sump to new ESR @ WTP	DI, 350 mm dia, length 30 m
3	PW rising main – 3 (B)	PW sump to old ESR @ WTP	DI, 350 mm dia, length -30 m
4	PW rising main – 3 (A)	PW sump to Patel Mohalla	DI, 350 mm dia, length- 3 km

Source: Panvel City Sanitation Plan, 2014

CIDCO nodes

All WTPs that serve treated water to various CIDCO nodes (falling under PMC jurisdiction) are located outside the boundary of PMC.

The treated water received is stored in various storage facilities and distributed throughout the nodes by CIDCO. The total storage capacity of ESRs/GSRs/HSRs/MBRs present in CIDCO nodes is 123.95 ML. Out of the total storage available, MBRs can hold 26 ML, GSRs can store 25.3 ML, ESRs can store 18.65 ML, whereas HSRs can hold 54 ML. The HSR present in Sector 30 and ESR present in Sector 14 of Kharghar are abandoned/not working. No storage facilities are available in Taloja, Kalundre and Navade nodes.

Table 21: MBR/ESR/GSR/HSR/pumps in CIDCO nodes

Sr No	Node	Sector	MBR (ML)	GSR (ML)	ESR (ML)	HSR (ML)	Pumps
1	Kharghar	5	-	-	2.5	-	-
		6	-	-	2.5	-	-
		14	-	-	2.0 (Abandoned)	-	-
		18	-	-	2.0	-	-
		31	-	-	2.5	-	-
		11	-	-	2.0	-	-
		11	2 No (5 ML each)	-	-	-	2 X 160 HP 2 X 200 HP
		26	5.00	-	-	-	2 X 60 HP 2 X 200 HP
		30	-	-	-	24.0 (not in use)	-
			-	-	-	15.0 (not in use)	-
			-	-	-	15.0 (not in use)	-
	Total		15	-	13.5	54	
		Total 82.50 ML (12 structure) [In use- 8 structure with 26.5 ML capacity]					
2	Kalamboli	2	-	2 No. (1.2 ML each)	0.65	-	4 X 60 HP 1 X 50 HP
		2E	-	2 No. (1.3 ML each)	-	-	4 X 60 HP
		2E	6.0	-	-	-	4 X 177 HP
		6E	-	2.0	2.0	-	4 X 50 HP
		10	-	-	-	-	-
		14	-	-	-	-	-
		KWC	-	1.4	-	-	2 X 35 HP
		Total	6	8.4	2.65		
							Total 17.05 ML (9 structure)
3	Kamothe	8	5.0	-	-	-	4 X 75 HP 1 X 15 HP
							Total 5 ML (1 structure)

Sr No	Node	Sector	MBR (ML)	GSR (ML)	ESR (ML)	HSR (ML)	Pumps
4A	Panvel (E)	5	-	4.0	2.5	-	5 X 50 HP 1 No. of booster pumps of 100 HP
		3	-	2 No (1.3 ML each)	-	-	5 X 50 HP 3 X 25 HP 1 booster pump of 50 HP
		12	-	2 No (1.3 ML each)	-	-	5 X 60 HP 2 X 15 HP
		15A	-	2 No (1.3 ML each)	-	-	4 X 60 HP 1 X 50 HP
4B	Panvel (W)	11	-	1.1	-	-	3 X 50 HP
		6	-	4.0	-	-	3 X 50 HP
	Total			16.9	2.5		
							Total 19.4 ML (10 structure)
5	Kalundre	-	-	-	-	-	-
6	Navade	-	-	-	-	-	-
7	Taloja	-	-	-	-	-	-
	Total 123.95 ML storage facilities in all CIDCO nodes						

Source: Water supply booklet of CIDCO, PMC

Combined storage of Panvel Old Council area and CIDCO nodes

The current storage capacity in the Panvel Old Council area and CIDCO works out to 128.2 ML. Out of that, ESRs can hold 22.25 ML, HSRs can store 54 ML, whereas GSRs and MBRs can hold 51.95 ML. Storage reservoirs in villages have been considered as nil.

4.1.4 Distribution network in PMC

The Panvel Old Council area is divided into five zones with a total distribution network length of 62.98 km. The CIDCO nodes have a total distribution network of 275.65 km. The total distribution network available in PMC is 338.63 km.

Table 22: Distribution network in Panvel Old Council area and CIDCO

Sr No	Area	Zone/Node	Length in km
1	Panvel old council area	Zone 1	14.03
		Zone 2	11.64
		Zone 3 (A)	19.70
		Zone 3 (B)	7.41
		Zone 4	10.20
		Total	**62.98**
2	CIDCO nodes	Panvel (E)	48.92
		Panvel (W)	25.90
		Kalundre	3.75

Sr No	Area	Zone/Node	Length in km
		Kalamboli	58.21
		Navade	2.53
		Kamothe	14.37
		Kharghar	98.00
		Taloja	23.95
		Total	**275.65**
3	Villages	NA	NA
	Total distribution length		**338.63**

Source: PMC and water supply booklet of CIDCO

4.1.5 Water supply connections

4.1.5.1 Panvel Old Council area

There are total 9,344 water supply connections in the Panvel Old Council area. Individual connections account for the largest share (69.0%), followed by bulk connections (13.4%), slums (9.9%) and commercial connections (7.7%). Out of the total 9,344 water supply connections, 8,623 are domestic and the remaining are non-domestic connections. Domestic connections include connections to individual households, slums, connections to apartments (bulk supply). In case of domestic connections, 74.7% of the connections are individual connections, 14.5% are for bulk supply and 10.8% are for slums.

Figure 12: Category-wise break-up of water supply connections

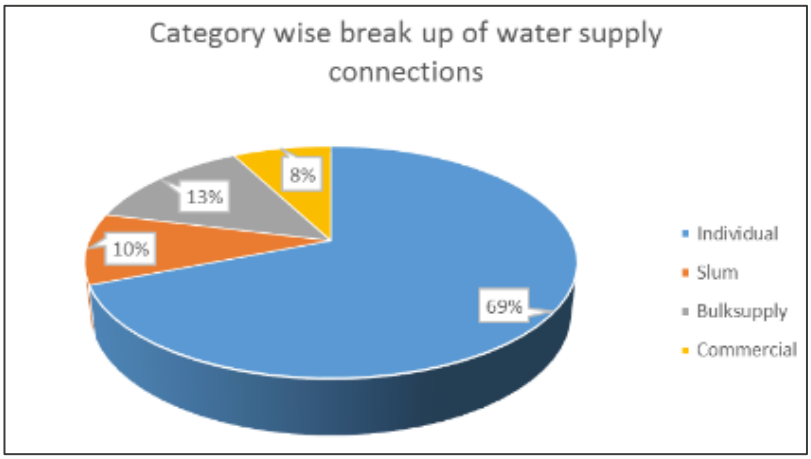


Table 23: Water supply connections in the Panvel Old Council area

Sr No	Category	FY15	FY16	FY17	FY18
1	**Residential**				
A	Metered	916	1061	1340	1479
B	Unmetered	4964	4964	4964	4964
C	Slum connections	680	743	865	927
2	**Bulk supply**				
A	Metered	297	324	398	426

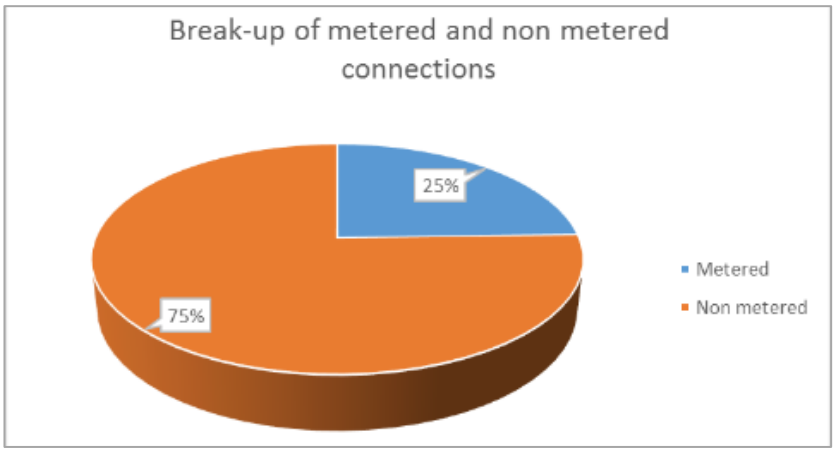
Sr No	Category	FY15	FY16	FY17	FY18
B	Unmetered	827	827	827	827
3	**Commercial**				
A	Metered	250	271	328	382
B	Unmetered	339	339	339	339
	TOTAL	8273	8529	9061	9344

Source: PMC

Metering status

The Panvel Old Council area has both metered and non-metered connections. Out of the total 9,344 connections, only 2,287 connections are metered (24.5%), whereas 7,057 are unmetered connections (75.5%). In the case of domestic connections, 22% of the connections are metered and the rest are non-metered. Among non-domestic connections, 53% are metered and the rest are unmetered.

Figure 13: Break-up of metered and non-metered connections



4.1.5.2 CIDCO nodes

There are 22,662 connections in CIDCO nodes, of which, 18.5% are for societies, 20.1% are for shops, 10.2% are for bungalows, and 51.2% are for organisations, villages, railway/hospitals, temporary and unmetered connections.

Figure 14: Category-wise break-up of water supply connections in CIDCO nodes

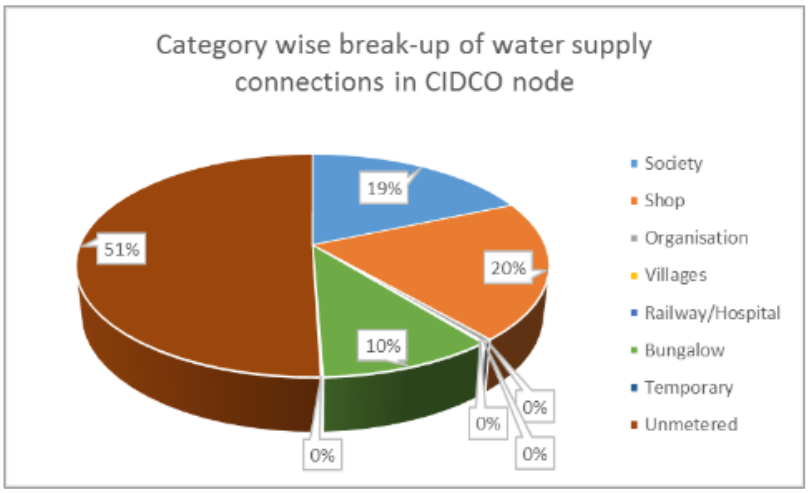


Table 24: Water supply connections in CIDCO nodes

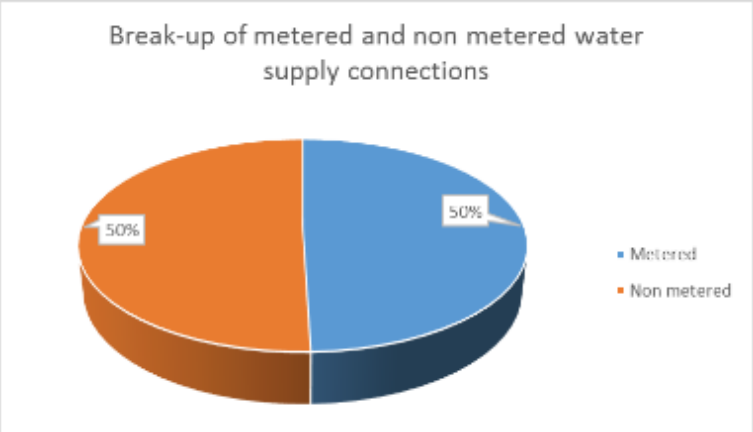
Sr No	Nodes	Society	Shops	Organisations	Villages	Bungalows	Railway/ hospitals	Temporary connections	Unmetered connections	Total
1	New Panvel	1,049	665	39	4	1343	2	-	5,573	8,675
2	Kharghar	1,414	1,293	52	17	964	2	-		3,742
3	Kalundre	48	15	-	-	-	-			63
4	Taloja	266	206		4	-	-	25		501
5	Kalamboli	522	1246	12	3	-	-	-	5,866	7,649
6	Kamothe	901	1,126	3	2	-	-	-		2,032
7	Navade	-	-	-	-	-	-	-		NA
	Total	**4,200**	**4,551**	**106**	**30**	**2,307**	**4**	**25**	**11,439**	**22,662**

Source: Joint inspection booklet, CIDCO

Metering status

CIDCO also has both metered and non-metered connections. Out of 22,662 connections, only 11,223 connections are metered (49.5 %) and 11,439 connections (50.5%) are unmetered.

Figure 15: Break-up of metered and non-metered supply connections



Combined metering status of Panvel Old Council area and CIDCO nodes

There are total 32,006 water supply connections in the Panvel Old Council area and CIDCO nodes. Out of the total connections, 13,510 connections are metered, which accounts for 42.2%, whereas 18,496 connections[8] (57.8%) are unmetered.

4.1.6 Water supply tariffs

Both, PMC and CIDCO levy volumetric/telescopic charges and flat rate charges for metered and non-metered connections, respectively. CIDCO follows a telescopic method for charging water supply in its node. The rates of CIDCO for the highest residential category (i.e. Rs 7 for water supply beyond 27 KL/month) are lower than the rates levied by PMC (i.e. Rs 9/KL/month).

[8] *The water supply connection details of villages are not available*

Table 25: Monthly volumetric tariff for PMC and CIDCO

Sr No	Category	Rs per KL	
		PMC	CIDCO
1	Residential	9	-
	Up to 20 KL per month	-	4.75
	Up to 27 KL per month (i.e. between 20 KL to 27 KL per month)	-	6
	Above 27 KL per month	-	7
2	Commercial	35	35
3	Industrial	-	-
4	Institutional, religious/ social organisation	35	14
5	Slum	9	-

Source: PMC and water supply booklet of CIDCO

Furthermore, for non-metered connections, the PMC charges rates as per the water supply connection size, whereas CIDCO charges rates as per the area of the buildings.

Table 26: Flat rate annual tariff for PMC and CIDCO

Sr No	Category	Annual water rate (Rs)	Building area (sq m)	Annual water rate (Rs)
	PMC		CIDCO	
1	**Residential**			
A	15 mm (½ inch)	1,500	Upto 25	900
B	20 mm (¾ inch)	1,800	25-40	984
C	25 mm (1 inch)	4,800	40-50	1,188
2	**Non-residential**			
A	15 mm (½ inch)	5,000	50-60	1,440
B	20 mm (¾ inch)	12,875	60-70	1,500
C	25 mm (1 inch)	27,530	70-80	1,500

Source: PMC and CIDCO

There is an urgent need to prepare a *comprehensive user charges policy* across the PMC, given the fact that the PMC and CIDCO have different methodologies for levying water supply charges.

4.1.7 Demand and collection of water supply charges

The collection efficiency of water supply charges is one of the most important aspects in recovering the cost incurred on operation and maintenance of water supply in the PMC. PMC's collection efficiency has declined sharply from 85.4% in fiscal 2017 to 62.8% in fiscal 2018.

Table 27: Demand collection balance (DCB) of water charges for Panvel Old Council area (Rs lakh)

Year	Current demand	Current collection	Current collection efficiency
FY**17**	535.43	457.03	85.4 %
FY**18**	542.40	340.54	62.8 %

Source: PMC

Table 28: DCB of water supply charges for CIDCO area (Rs lakh)

Year	Current demand	Current collection	Current collection efficiency
FY**16**	4,445.00	4,227.41	95.1 %

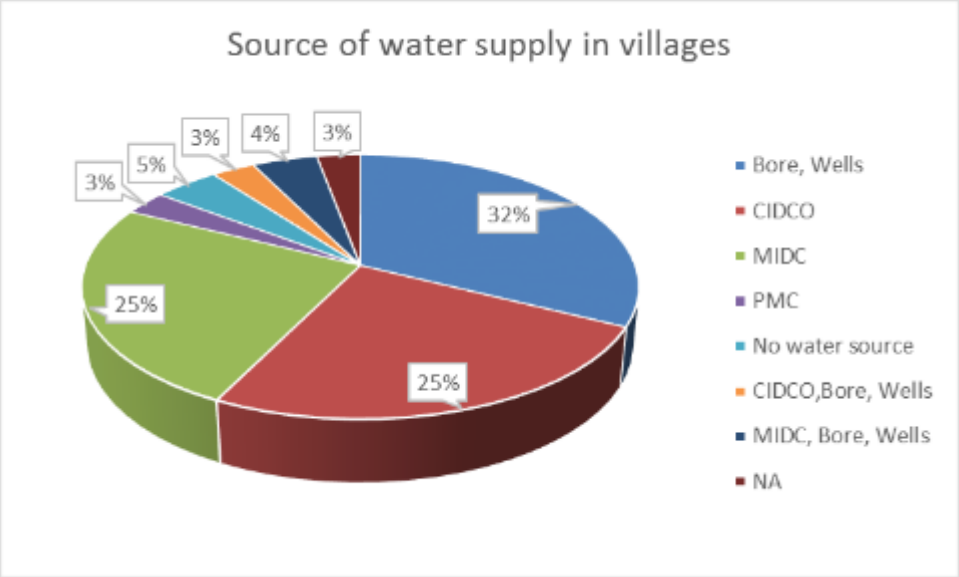
Source: Water supply booklet of CIDCO

4.1.8 Water supply status in villages under the PMC

Source of water supply

Water supply services in villages are far below the levels in the Panvel Old Council area and CIDCO nodes. Vast variations in water supply have been observed even across villages. About 32% of villages exclusively depend on borewell and open wells for fulfilling their water supply needs, whereas 7% depend upon bore wells, open wells, MIDC and CIDCO. There are 5% villages that do not have any source of water supply and depend on neighbouring villages for water supply. The remaining 53% of the villages depend on MIDC, CIDCO and PMC for fulfilling their water supply needs.[9]

Figure 16: Water supply source for villages

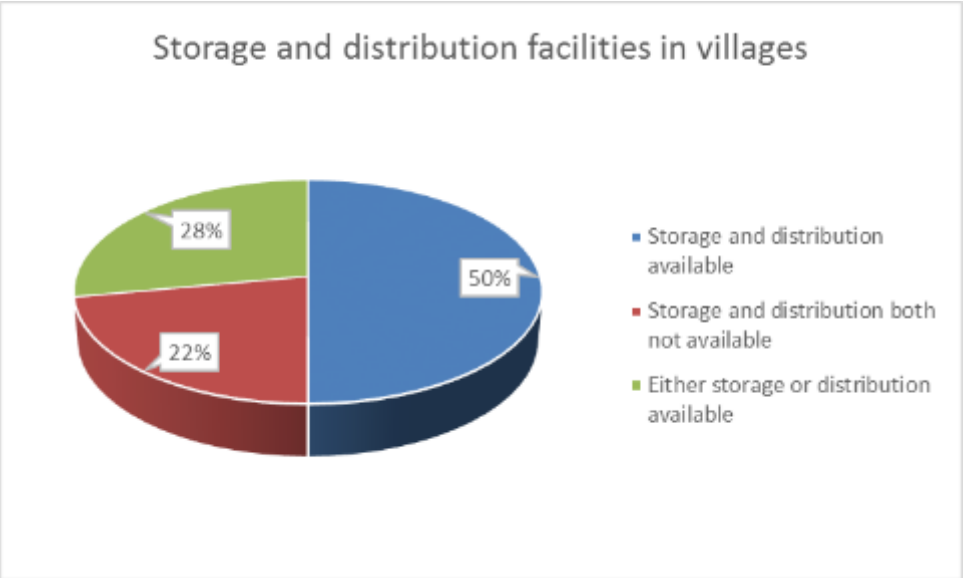


Storage and distribution

There has been a vast variation in the availability of storage and distribution facilities in villages under the PMC. While 50% of the villages have both storage and distribution network available, the condition of them is poor. 22% of the villages lack both storage and distribution network. The remaining 28% villages either have storage or distribution facilities. Many villages have temporary arrangements with PVC and Sintex tanks for storage.

[9] *Data for 3% villages is not available*

Figure 17: Storage and distribution facilities in villages



4.1.9 Water supply cost recovery

The cost recovery of water supply is one of the most important aspects, which needs to be analysed in order to create a self-sustained water supply system. The cost recovery in fiscal 2017 was 57.8%, which declined to 36.3% in fiscal 2018 due to lower recovery of water charges and higher operation and maintenance expenditure.

Table 29: Cost recovery in water supply services for Panvel Old Council area (Rs lakh)

Sr No	Particulars	FY17	FY18
A	**Operating expenses**		
1	Establishment expenses	79.8	59.2
2	Operation and maintenance expenses	724.5	926.7
	Total operating expenses	**804.4**	**986.0**
B	**Operation revenues**		
1	Water charges	447.4	335.5
2	Other income	17.15	22.61
	Total operating income	**464.5**	**358.2**
C	**Cost recovery**	**57.8 %**	**36.3 %**

Source: PMC budget

Furthermore, CIDCO has provided a brief of O&M cost and water charges collected for providing water supply services to nodes that now form a part of PMC. Cost recovery for fiscal 2016 stood at 79.12%.

Table 30: Cost recovery in water supply services for CIDCO nodes (Rs lakh)

Sr No	Particulars	FY16 (Actuals)
A	**Operating expenses**	
1	Annual operation, repairs and maintenance	615.00
2	Annual energy charges	391.00

Sr No	Particulars	FY16 (Actuals)
3	Water procurement charges	4,337.03
	Total operating expenses	5,343.03
B	**Operation revenues**	
1	Water charges	4,227.41
	Total operation revenues	4,227.41
C	**Cost recovery***	79.12 %

** Cost recovery excluding establishment expenditure*

4.1.10 Future demand of water

Future per capita water demand has been estimated on the basis of the following formula:

Per capita water supply of demand (135 LPCD) + Average water supply losses + floating population + uses such as gardening, upcoming projects, etc.

Accordingly, per capita water demand has been considered as 180 LPCD. Water demand for future years has been forecast on the basis of per capita water supply demand and population projections finalised in the demography section. Accordingly, the city will require 377 MLD by 2025, 450 MLD by 2032 and 543 MLD by 2041.

Table 31: Present and Future water demand

Sr No	Year	Water demand in MLD
1	2018	267
2	2025	377
3	2032	450
4	2041	543

Given the current supply of 210.31 MLD, the PMC had a demand-supply gap of 57 MLD for 2018. The PMC has to either augment current sources or identify new sources, make cost-effective arrangements with concerned authorities involved in water supply in the area.

Furthermore, area-wise analysis of future water requirement was also undertaken. Ultimate and current water demand were used as a tool to determine future water needs, while simultaneously considering the population projections made in the demography section.

Table 32: Area-wise future water demand

Area/ Node	2025 (in MLD)	2032 (in MLD)	2041 (in MLD)
New Panvel	52	55	59
Kharghar	97	110	128
Kalundre	3	4	5
Taloja	19	28	39
Kalamboli	39	39	39
Kamothe	65	77	94
Navade	10	16	25

Area/ Node	2025 (in MLD)	2032 (in MLD)	2041 (in MLD)
Panvel Old Council area	41	46	53
Villages	32	40	49
MMRDA rental housing*	19	34	52
Total	377	450	543

** Water requirement for MMRDA's rental housing scheme may change as per the approval and construction of DUs*

4.1.11 Assessment of additional infrastructure requirement

The assessment of future infrastructure requirement for the water supply sector i.e. source augmentation/new source development, elevated storage capacity and water supply distribution network has been undertaken. This assessment has been done for three time periods i.e. short term (2025), medium term (2032) and long term (2041).

4.1.11.1 Water supply

The water supply demand gap assessment for future years have been presented in table below

Table 33: Water-supply gap assessment (in MLD)

	Current			2025		2032		2041	
Area	Water supply	Water demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
PMC	210.31	267	57	377	167	450	240	543	333

4.1.11.2 Distribution network

As per the area/node-wise demand-gap assessment of the distribution network, gaps have been observed in the Kamothe node of CIDCO along with the Panvel Old Council area and villages[10].

Table 34: Water supply distribution network gap assessment (based on road length)

	Current			2025		2032		2041	
Area/ node	**Water distribution network length (in KM)**	**Road length (in km)**	**Gap**	**Demand**	**Cumulative gap**	**Demand**	**Cumulative gap**	**Demand**	**Cumulative gap**
New Panvel	74.8	62.0	-	567	229	677	338	817	479
Kharghar	98	94.0	-						
Kalundre	3.76	1.81	-						
Taloja	23.9	21.3	-						
Kalamboli	58.2	30.4	-						
Kamothe	14.37	29.8	15.4						
Navade	2.54	1.9	-						
Panvel Old Council area	62.98	48.0	32.2						
Villages	0	64.5	115						
Total	338.64	353.84	-						

[10] *Gaps for Panvel Old Council area and villages are based on DPR prepared under AMRUT*

4.1.11.3 Elevated storage capacity

As per the node/ area-wise demand-gap assessment for elevated storage capacity, the storage required in future is as follows:

Table 35: Storage requirement (In ML)

	Current			2025		2032		2041	
Area/ node	**Current storage (ESR+GSR)**	**Storage required**	**Gap**	**Storage required**	**Gap**	**Storage required**	**Gap**	**Storage required**	**Gap**
New Panvel	15.4	14	1.4	17	1.6	18	2.6	19	3.6
Kharghar	11.5[11]	25	13.5	32	20.5	36	24.5	42	30.5
Kalundre	0	0.4	0.4	1	1.0	1	1.0	2	2.0
Taloja	0	3	3.0	6	6.0	9	9.0	13	13.0
Kalamboli	8.65	12	3.4	13	4.4	13	4.4	13	4.4
Kamothe	5	15	10.0	21	16.0	25	20.0	31	26.0
Navade	0	1	1.0	3	3.0	5	5.0	8	8.0
Panvel Old Council area	4.25	11	6.8	14	9.8	15	10.8	18	13.8
Villages	0	7	7.0	11	11.0	13	13.0	16	16,0
MMRDA rental housing	0	1	1.0	6	6.0	11	11.0	17	17.0
Total	46.25	89	44.7	124	78	148	101	179	133

4.1.12 Key issues

The key issues regarding water supply in the city are as follows:

- **Demand-supply gap and dependence on external source**

  As per our analysis, current demand is 257 MLD, whereas current water supply is 210 MLD, a gap of 57 MLD. The PMC-owned Dehrang dam supplies water once in two days during the summer, resulting in substantial water cuts in the Panvel Old Council area. One of the reasons for the drop in water supply from the dam is heavy deposition of silt with time that has led to reduced storage capacity. PMC totally depends on external agencies such as MIDC, CIDCO, MJP and NMMC for 92.4% of its water supply requirement.

- **Inadequate metering**

  There are only 42.2 % metered connections in Panvel Old Council area and CIDCO nodes. Majority of the villages are also expected to have unmetered water supply connections, leading to non-judicious use of water. The resultant low revenue collection has adverse implications for the water supply department. Further, estimation of NRW is difficult as PMC lacks 100% metering of water supply connections. It is of utmost importance to undertake metering of all connections so that volumetric and eventually telescopic tariff can be introduced for water supply consumption throughout the city, water audit can be conducted and there can be effective control on use of water by consumers.

[11] *MBR and HSR which are not in use have not been considered*

- **Inadequate water supply infrastructure in villages**

  The water supply infrastructure in villages is not up to the mark in the PMC Old Council area and CIDCO nodes. Hence, water supply in villages is not good enough. Majority of the villages depend upon borewells and open wells for fulfilling their water necessities. Diversities exist in water distribution and storage infrastructure across villages as well. Moreover, the distribution network as well as ESRs in the villages are either non-existent or in a poor state.

- **Inadequate storage capacity and distribution network**

  PMC has lack of water storage capacities in most of its areas. Storage facilities are not available in Taloja, Kalundre and Navade nodes. Similarly, the distribution network needs to be enhanced in lines with the development that have taken place. Further, ageing transmission and distribution network may result in huge water supply losses

- **Lack of zoning**

  Lack of water command zones results in administrative and operative inefficiencies. Hydraulic modelling involving updating network maps on GIS need to be done, zones served by ESR need to be identified and boundaries need to be marked.

4.1.13 PMC initiatives (Under AMRUT scheme)

The following projects have been proposed or are in progress, which will improve the water supply system in the city:

1. The PMC has proposed a Rs 108 crore project for construction of feeder main, MBR, ESR, GSR, pump house, distribution network for 29 villages under the AMRUT scheme with MJP as the project management consultant.

Sr No	Name of sub work
1	Working survey
2	Feeder mains from tapping point to ESRs of 100 mm to 700 mm dia and 54 km length in 29 villages
3	40 ESRs in 29 villages of total 11 ML capacity and 1 MBR of 1.3 ML capacity
4A	12 GSRs in 29 villages of total 1.875 ML capacity
4B	Providing and constructing overhead pump house - 11
5	Distribution network (including meters and property connections) from 110 mm to 400 mm dia, length of 115 km
6	Feeder main from tapping point to ESR in Panvel and Kalamboli node
7	5 ESRs in New Panvel and 4 ESRs in Kalamboli node of 9.5 ML and 7 ML capacity, respectively
8	Pumping machinery works at MBR and ESR
9	SCADA, automation of MBRs and ESRs
10	Electricity supply arrangements at MBR and ESR
11	Trial runs

2. PMC's Rs 25 crore project for construction of pure water leading main, pure water sumps, pure water pumping machinery, pure water rising main, ESR, distribution network, dismantling of ESR and GSR under the AMRUT scheme with MJP as the project management consultant. This project is in progress with a completion period of 18 months.

Sr No	Name of sub work
1	Pure water leading main 250 to 400 mm dia DI k7, length 2.75 km
2	Construction of 3 pure water sumps at different locations

Sr No	Name of sub work
3	7 pure water pumping machinery at various locations
4	Pure water rising main 400mm to 250mm dia DI k9, length 4.09 km
5	5 ESRs of total 6.9 ML capacity at different locations
6	Distribution network 350 mm to 100mm DI k7 and HDPE PE-100, length 32.27 km
7	Dismantling of 2 RCC ESRs and 1 stone masonry GSR
8	Railway crossing for 250 mm dia DI k7 pure water leading main
9	Miscellaneous work like MSEB charges, railway crossing permission charges, etc

3. Rs 364.11 crore water supply scheme of 228 MLD to be executed by MJP with 153 MLD reserved for the PMC area (20 MLD - Old Panvel, 80 MLD - CIDCO nodes, i.e., Kalamboli, New Panvel, and 53 MLD for rental housing scheme in villages) with a completion period of 30 months has been approved and tenders will be invited.

Sr No	Name of sub work
1	Construction of K.T. Weir at Lohap L - 130 M
2	Construction of head works (Jackwell with overhead pump house of size 17.3 X 20 m and intake pipe)
3	Raw water rising main (Dia - 1,950 mm, Type - MS pipe 16 mm, length - 5,600 m)
4A	Raw water pumping machinery (VT pump BHP - 885, Dia-1,164 LPS, H-42 M, total-5 No with 2 No as Standby)
4B	Construction of meter room for indoor substation at Vayal
5	Construction conventional W.T.P. of cap - 168 MLD
6A	Pure water pumping machinery (V.T. Pump BHP-885, Dia-1,123 LPS, H-41 M, Total-5 No with 2No Standby)
6B	Construction of meter room for indoor substation at Bhokarpada
7	Pure water connecting main filter to sump (Dia-1,700 mm, Type – M.S. Pipe, TK-14.2mm, Length - 600M)
8	Pure water rising main (Dia-1,700 mm, Type – M.S. Pipe, Tk – 14.2 mm, Length - 550M)
9	Construction of MBR Cap. 12 ML at Bhokarpada
10	Pure water transmission main MBP to Palaspe Y point (Dia – 1,650 mm, Type - M.S. Pipe, tk - 14.2 mm, Total L - 10,260 M)
11	Pure water trans main Y point Palaspe to Kalamboli (Dia - 1524, 1219 & 1168 mm, Type - M.S. Pipe, tk - 14.2-8.8 mm, Total L - 9,000 M)
12A	Pure water trans main Kalamboli to Rohinjan (Dia - 965, 610 & 559 mm, Type M.S. pipe 8.0-5.6 m tk, Total -9,500 M)
12B	Construction of steel bridge for Pipeline across river from Kalamboli to Rohinjan
13	Pure water trans main NH4B to Vadghar (Dia - 660mm, Type - M.S. pipe 6.4 mm tk, Length - 1,000 M)
14	Repair works - strengthening and renovating existing headworks at Vayal and existing WTP at Bhokarpada, etc.
15	SCADA and automation

Sr No	Name of sub work
16	Express feeder arrangement from Bhokarpada receiving station to MJP's Vayal substation and shifting of existing poles, load enhancement augmentation
17	Miscellaneous works Working survey, raw water lifting charges, control room and staff quarters, provision for structural audit and data required for design of various works, land acquisition provision…
18	Provision for running the scheme after trial run period



4.2 Sewerage and sanitation

Sewerage and sanitation is one of the key areas of concern for PMC. This section gives a brief of the existing sewerage and sanitation system in Panvel which includes sewage generation, collection, treatment, disposal of wastewater, and the existing institutional arrangement. The sections also highlights the key issues in the sector with a demand-gap analysis of the infrastructure required in future.

4.2.1 Existing sewerage system

4.2.1.1 Panvel Old Council area

In the past, the wastewater generated in the Panvel Old Council area was collected through *kuchha* drains. It was directly disposed into water bodies without any treatment. In 2010, construction of the sewage treatment plant and underground drainage lines was initiated under the central government's Urban Infrastructure Development Scheme for Small and Medium Town (UIDSSMT). A 37.71 km of underground drainage and a sewage treatment plant of 14 MLD based on the Sequencing Batch Reactor (SBR) technology was constructed under the scheme.

Total 11.5 MLD wastewater is generated from various establishments in Panvel. This is transferred through underground drainage by gravity and treated at the sewage treatment plant located near old court and then disposed into the Panvel creek. At present, treated wastewater is not reused.

There are ~30 septic tanks as of date, which are connected to community and public toilets. PMC has one suction machine of 3,000 litres capacity, which is used for emptying these tanks.

Table 36: Overview of sewerage system in Panvel Old Council area

Component	Unit	Details
Area	sq km	3.63
Sewerage length	Km	37.71
Manholes	No.	1183
Pumping station	No.	Nil
Sewage treatment plant	MLD	14
Disposal	Type	Water body(Creek)

Source: PMC

Approximately 78.5% of roads under the Panvel Old Council area have a proper drainage system, the exceptions being *Patel mohalla, Wani ali* and *Mirchi galli* which were not approved under UIDSSMT.

Samples collected across various locations to measure the parameters of the wastewater generated from establishments indicate the Biological Oxygen Demand (BOD) level in wastewater ranges from 119-190 mg/l with

Chemical Oxygen Demand (COD) ranging from 385 to 615 mg/l (as per ESR[12] report 2013-14). Post treatment, the BOD level of wastewater reaches below 10 mg/l, and is then disposed into the creek.

4.2.1.2 CIDCO nodes

CIDCO has developed a sewage collection, conveyance and treatment system for all the nodes which now form a part of the PMC region. Details of the sewerage network developed by CIDCO are as follows:

- Approximately 180 km of distribution sewerage network
- 7 pumping stations
- 6 STP plants with total capacity of 264 MLD

Sewage generation

The present water supply to CIDCO node is 171.2 MLD. As per the CPHEEO manual, 80% of water supply may be expected to reach the sewer. Hence, in this case, the approximate sewage generated will be 136.96 MLD. This sewage is collected from all the properties that have direct sewerage connections.

Underground sewerage network

The length of sewerage network in CIDCO nodes is 180.32 km and encompasses ~74.5% of its total road length, along with 4,671 manholes.

Table 37: Sewerage length in CIDCO nodes

Sr No	Node	Length of sewerage line(Km)
1	Kharghar	63.59
2	Kamothe	27.57
3	Kalamboli	23.37
4	Taloja-I	9.63
	Taloja-II	7.86
5	Kalundre	1.68
6	Navade	2.11
7	Panvel east	31.25
8	Panvel west	13.22
	Total	**180.32**

Source: PMC

As per a recent survey carried out by PMC, most of the sewer manholes are silted and flooded during peak hours. Huge desilting works for sewerage and manholes have to be carried out in all the CIDCO nodes for proper functioning of the sewerage network.

CIDCO nodes consist of 7 sewage pumping stations (SPSs) and 6 sewage treatment plants (STPs). Only 2 zones have both SPSs and STPs. Wastewater generated from Kamothe, Taloja, Kalundre and Navade node flows by gravity and reaches the existing STPs.

[12] *Environmental Status Report*

Table 38: Brief of sewage pumping station and sewage treatment plant

Sr No	Node	No. of sewerage pumping stations	No. of sewerage treatment plants
1	Kharghar	3	2
2	Kamothe	Nil	1
3	Kalamboli	1	1
4	Taloja	Nil	1
5	Kalundre	Nil	1
6	Navade	Nil	Nil
7	Panvel east	2	Nil
8	Panvel west	1	Nil
	Total	7	6

Source: PMC

Pumping station

All nodes except Kamothe, Taloja, Kalundre and Navade have sewage pumping stations. The profile of all the six pumping stations (PS) are briefed below.

Pumping Station 1 and pumping station 3 at Panvel east

The catchment area of PS1 and PS3 is the Panvel east node. The water is collected and transmitted to Kamothe STP for treatment.

Table 39: PS1 near D-mart

Sr No	Particular			
1	Pump Type	Submersible	Horizontal Centrifugal	Horizontal Centrifugal
2	Pump No	2	2	2
3	Pump Capacity(HP)	NA	37.5	80
4	Discharge (LPS)	NA	90	168.98

Source: PMC

Table 40: PS3 at Vijay Marg

Sr No	Particular		
1	Pump Type	Horizontal Centrifugal	Horizontal Centrifugal
2	Pump No	2	2
3	Pump Capacity(HP)	25	42.14
4	Discharge (LPS)	53.61	108

Source: PMC

Pumping station 2 at Panvel west

The catchment area of PS2 is Khanda Colony. Wastewater is collected and transmitted to the Kamothe STP for treatment.

Table 41: PS2 near Khandeshwar Garden, Khanda Colony

Sr No	Particular		
1	Pump Type	Submersible	Horizontal Centrifugal
2	Pump No	3	3
3	Pump Capacity(HP)	75	150
4	Discharge (M3/Hr)	NA	NA

Source: PMC

Pumping station 1 at Kalamboli

The catchment area of PS2 is in the Kalamboli node. Wastewater is transmitted to Kalamboli STP for treatment. During peak hours, wastewater overflows in the low-lying areas. A sump has been constructed to collect extra water coming from this chamber and pump the sewage to the nearest *khadi*.

Table 42: PS 1 near Shiv Mandir, Kalamboli

Sr No	Particular				
1	Pump type	Submersible	Horizontal Centrifugal	Horizontal Centrifugal	Horizontal Centrifugal
2	Pump no.	2	1	1	1
3	Pump capacity(HP)	NA	NA	29.33	1.02
4	Discharge (M3/Hr)	NA	NA	522	NA

Source: PMC

Pumping station 1, pumping station 2 and pumping station 3 at Kharghar

The catchment area of PS1, 2 and 3 is the Kharghar node. PS1 collects sewage from the vicinity and transfers it to PS2. PS2 collects sewage from the vicinity and from PS1. PS3 collects sewage from the vicinity along with sewage from PS1 and PS2 and transmits it to two STPs in Kharghar.

Table 43: PS1 at Sector 7, Kharghar

Sr No	Particular	
1	Pump Type	Submersible
2	Pump No	2
3	Pump Capacity(HP)	15
4	Discharge (M3/Hr)	NA

Source: PMC

Table 44: PS2 at Sector 11, Kharghar

Sr No	Particular				
1	Pump Type	Submersible	Submersible	Submersible	Submersible
2	Pump No	1	1	1	1
3	Pump Capacity(HP)	75	60	30	20
4	Discharge (M3/Hr)	NA	NA	NA	NA

Source: PMC

Table 45: PS3 at Sector 17, Kharghar

Sr No	Particular				
1	Pump Type	Submersible	Horizontal Centrifugal	Horizontal Centrifugal	Horizontal Centrifugal
2	Pump No	2	2	3	1
3	Pump Capacity(HP)	75	75	150	150
4	Discharge (M3/Hr)	NA	NA	NA	NA

Source: PMC

Sewerage treatment plant

CIDCO nodes have 6 STPs with total treatment capacity of 264 MLD. Navade, New Panvel (East and West) are the only CIDCO nodes that do not have a sewage treatment plant. Sewage from New Panvel is transferred to Kamothe STP for treatment. Sewage from Navade is directly disposed into Kasarwadi river without any treatment.

Table 46: Details of sewerage treatment plants in CIDCO nodes

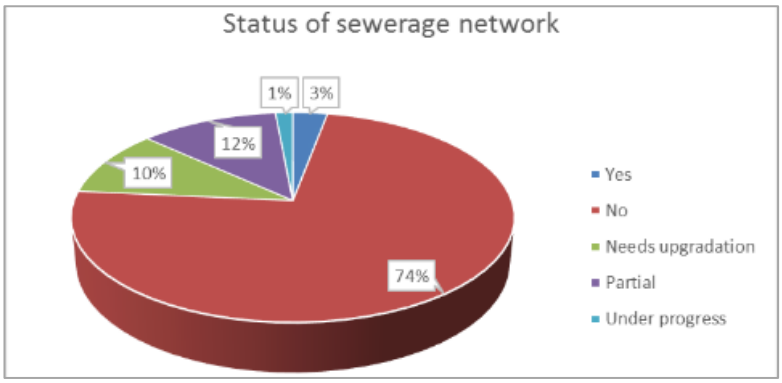
Sr No	Node	Capacity	Technology used
1	Kharghar	25 MLD	C-Tech
		70 MLD	C-Tech
2	Kamothe	85 MLD	C-Tech
3	Kalamboli	50 MLD	C-Tech
4	Taloja	32 MLD	C-Tech
5	Kalundre	2 MLD	C-Tech
6	Navade	Nil	
7	Panvel east	Nil	
8	Panvel west	Nil	
	Total		**264 MLD**

Source: PMC

4.2.1.3 Status of sewerage in villages

Sewerage services in villages are far below the levels in the Panvel Old Council area and CIDCO nodes. 74% of the villages do not have an underground drainage system. They depend on either soak pit, septic tank or directly dispose wastewater into nearby water bodies. 10% of the villages already have a sewerage network but require major upgradation. About 12% of the villages have a partial sewerage network available.

Figure 18: Status of sewerage system in villages



4.2.1.4 Coverage of sewerage network of PMC

Geographically speaking, the sewerage network is spread across 61.61% of the PMC region with a total length of 218.03 km.

Table 47: Coverage of sewerage network

Sr. No	Node	Coverage against available road length
1	CIDCO nodes	74.7 %
2	Panvel Old Council area	78.5 %
3	Villages	Nil

Source: CRIS analysis

4.2.1.5 Extent of reuse and recycling

The total treatment capacity of PMC is 278 MLD. Treated water from the PMC-owned 14 MLD STP is directly disposed into a creek without any recycling or reuse. A small portion of the treated water from CIDCO STPs is used for gardening in Central Park and the golf course.

4.2.2 Sanitation

As per the data collected under the recent *swachh survekshan* conducted in the PMC region, there are 31 public toilets with 281 seats and 248 community toilets with 1,430 seats located near slums, municipal schools, railway station etc. These toilets are connected with soak pits and septic tanks. There are 49 CTs/PTs which are at the proposal stage under the *Swachh Bharat Mission*. The city has fixed a target of 4,500 individual household latrines, (IHHL) of which, 4,148 have been constructed and 418 are under construction.

Further, CIDCO has handed over some of the toilets that fall under the erstwhile CIDCO nodes (now a part of the PMC region) while handover of the rest of the toilets is awaited[13].

Table 48: Toilets in CIDCO nodes

Sr No	Node	No
1	New Panvel	5 in sector 1(S), 2 in Panvel (E) and 12 in Sector 13 (W)
2	Taloja	In Sectors 5 & 9
3	Kalundre	Data not available
4	Kalamboli	Data not available
5	Kharghar	Data not available

Source: CIDCO Board Resolution, 2017

4.2.3 Cost recovery

Cost recovery of sewerage services is one of the most important aspect which needs to be understood in order to create a self-sustaining sewerage system.

The PMC has provisions to levy sewerage tax and sewerage benefit tax as 7% and 3% of the rateable value, respectively, as a part of property tax. Currently, only sewerage tax (part of property tax) is being levied resulting in cost recovery of 13% in fiscal 2017 and 27% in fiscal 2018.

[13] *Exact number of toilets handed over not available*

Table 49: Cost recovery in sewerage services

Sr No	Particulars	FY17 (Actuals)	FY18 (Actuals)
A	**Operating expenses**		
1	Establishment expenses	57.88	53.57
2	Operation and maintenance expenses	1021.35	315.08
3	Toilet maintenance	94.48	79.74
	Total operating expenses	1173.71	448.39
B	**Operation income**		
1	Sewerage tax, sewerage benefit tax	143.11	118.51
2	Sewerage connection charges	3.17	2.59
3	Sale of recycled water	0.19	0
4	Toilet rent	3.5	0.08
	Total operating income	149.97	121.18
C	**Cost recovery**	13%	27%

Source: CRIS analysis

4.2.4 Future sewage generation

As per the CPHEEO manual, it is assumed that sewage generated is 80% of the water supplied.

Table 50: Estimated sewage generation

Year	Estimated sewage generation (in MLD)
2025	302
2032	360
2041	435

Source: CRIS analysis

Furthermore, area-wise analysis of future sewage generation was also carried out on the basis of water requirement estimated in the previous section. Details of area-wise sewage generation are as follows:

Table 51: Area/Node-wise estimated sewage generation (in MLD)

Area/Node	2025	2032	2041
New Panvel	42	44	47
Kharghar	78	88	102
Kalundre	2	3	4
Taloja	16	23	32
Kalamboli	31.2	31.4	32
Kamothe	52	62	75
Navade	8	13	20
Panvel Old Council	33	37	43
Villages	26	32	39
MMRDA rental housing	15	27	42
Total	**302**	**360**	**435**

Source: CRIS analysis

4.2.5 Assessment of additional infrastructure requirement

The assessment of infrastructure requirement for the sewerage and sanitation sector i.e. underground drainage network, sewage treatment plant and public toilets has been undertaken below. This assessment has been done for three time periods i.e. short term (2025), medium term (2032) and long term (2041).

4.2.5.1 Underground sewerage network

The area/node-wise gap analysis for underground sewerage network has been carried out on the basis of road length. As per service level benchmarks, 100% of the road length available in the city should have an underground sewerage network. The sewerage network in villages has been considered as zero.

Table 52: Area-wise sewerage network gap

	Current (In km)		
Area/Node	**Road length**	**Sewerage network**	**Gap**
Kharghar	94	63.30	30.40
Kamothe	29.8	27.58	2.22
Kalamboli	30.44	23.38	7.06
Taloja	21.35	17.50	3.85
Kalundre	1.81	1.68	0.13
Navade	1.91	2.12	0
New Panvel	62	44.47	17.53
Panvel Old Council area	48	37.71	10.29
Villages	64.53	0	64.53

Source: CRIS analysis

The PMC has also conducted a survey for gap assessment of the sewerage network for CIDCO node and villages.

Table 53: Area-wise sewerage network gap as per PMC

Area/Node	Gap(in km)
Kharghar	24.15
Kamothe	7.91
Kalamboli	34.25
Taloja	1.41
Kalundre	0.48
Navade	0.99
New Panvel	23.22
Panvel Old Council area	-
Villages	100.62

Source: PMC

In order to arrive at the final gap, the higher value amongst CRIS' estimated gap and PMC's gap estimate has been considered.

Table 54 : Additional infrastructure requirement

	Current		2025		2032		2041	
Area/Node	**Distribution network**	**Gap**	**Demand**	**Gap**	**Demand**	**Gap**	**Demand**	**Gap**
Kharghar	63.30	30.40	567.38	349.35	676.68	458.65	817.22	599.19
Kamothe	27.58	7.91						
Kalamboli	23.38	34.25						
Taloja	17.50	3.85						
Kalundre	1.68	0.48						
Navade	2.12	0.99						
New Panvel	44.47	23.22						
Panvel Old Council area	37.71	10.29						
Villages	-	100.62						
Total	218.03	212.01						

Source: CRIS analysis

From the above table, it is clear that amongst all CIDCO nodes, Kalamboli has the highest gap in the sewerage network, followed by Kharghar and New Panvel. The Panvel Old Council area also lacks a sewerage network, notably at Patel mohalla, Wani ali *and* Mirchi galli areas. The sewerage system levels in villages are far below the levels of the Panvel Old Council area and CIDCO and lack a proper collection mechanism

4.2.5.2 Sewage treatment capacity

The node/ area-wise gap analysis for PMC's sewage treatment capacity has been carried out. The following table gives the brief of current gap with requirement of treatment capacity for 2025, 2032 and 2041.

Table 55: Area-wise treatment capacity gap *(in MLD)*

	Current			2025		2032		2041	
Area/Node	**STP capacity**	**Requirement of STP as per current estimated sewage generated**	**Gap**	**Demand**	**Gap**	**Demand**	**Gap**	**Demand**	**Gap**
New Panvel	85	58	0	93	8	106	21	122	37
Kamothe									
Kharghar	95	52	0	78	0	88	0	102	7
Kalundre	2	1	0	2	0	3	1	4	2
Taloja	32	4	0	16	0	23	0	32	0
Kalamboli	50	22	0	31	0	31	0	32	0
Navade	0	1	1	8	8	13	13	20	20
Panvel Old Council area	14	22	0[14]	33	19[15]	37	23	43	29
Villages	0	10	10	26	26	32	32	39	39

[14] *Current gap is considered zero as 11.4 MLD is the sewerage generated and treated as per data provided by the PMC*
[15] *Subject to change is there may be variation in sewage generation*

Area/Node	Current			2025		2032		2041	
	STP capacity	Requirement of STP as per current estimated sewage generated	Gap	Demand	Gap	Demand	Gap	Demand	Gap
MMRDA rental scheme area	0	0	0	15	15	27	27	42	42
Total	278	168	11	302	76	360	117	435	176

Source: CRIS analysis

From above table, it is clear that one CIDCO node i.e Navade and the villages in PMC region lack proper sewage treatment capacity. The sewage generated in these areas is directly disposed into the creek / river.

4.2.5.3 Public toilet

The requirement of public toilets in the PMC region has been assessed as per the guidelines of *Swachh Bharat Mission*. The following table indicates additional requirement of public toilet seats and urinals in short, medium and long term, considering floating population (5% of total population as per SBM guidelines).

Table 56: Requirement of public toilets

Particulars	Current			2025		2032		2041	
	Existing	Requirement	Gap	Demand	Gap	Demand	Gap	Demand	Gap
Water closet	281	296	15	419	138	499	218	603	322
Urinals	Not available	1481	NA	2096	NA	2500	NA	3019	NA

Source: CRIS analysis

4.2.6 Key issues

Following are the major issues the sewerage infrastructure in the city faces:

- **Inadequate sewerage infrastructure**

  Sewerage network covers only 61.6% of the region that comes under the PMC. As seen in the demand-supply gap section, the network partially covers the CIDCO nodes, areas that come under Panvel's old municipal council and the villages. All the unserved areas need to be immediately connected. In case of the villages, proper collection and disposal mechanism – a mix of onsite and offsite treatment facilities – needs to be put in place as per the requirement.

  Further in Panvel's old municipal council area, though the water supply is 27 MLD, the sewerage generated is only 11.5 MLD. This may be due to either poor efficiency of sewerage collection network or loss of water resulting in low per-capita water supply and thus lesser sewerage generation.

- **Lack of treatment plant**

  Overall, the PMC may seem to have adequate treatment capacity but areas such as Navade and villages still lack proper treatment infrastructure. Sewerage generated from these areas is directly disposed into creeks and rivers, which is hazardous to health.

- **Silting issues in CIDCO network**

  As per a recent survey carried out by the PMC, most of the sewer manholes are silted and flooded during the peak hours. For the network to function properly, huge desilting work has to be carried out in all the CIDCO nodes. The survey estimated the expenditure for this at Rs 324 crore.

- **Lack of recycle and reuse of water**

  The recycling and reuse of waste water in Panvel much below the potential. As of now, treated water is used only in Kharghar for gardening of central park and watering the golf course. The PMC should take steps to increase the use of treated waste water.

4.2.7 PMC initiatives

The PMC recently assessed the existing infrastructure such as sewerage and storm water drainage in all its villages. A proposal has been prepared to enhance the sewerage system in the villages by grouping them under three sets. Different collection, treatment and disposal mechanisms have been proposed for these groups. The project will include laying of 100.32 km of sewerage network. It is expected to meet the sewerage needs of the villages until 2050.

4.3 Storm water drainage

Storm water drainage (SWD) is one of the most important aspects of any city's sanitation network. The objective of such a drainage system is to dispose of surface runoff generated immediately after a heavy rain. An improper and unplanned SWD network leads to water logging in cities in the monsoon season, which is hazardous to health.

Panvel is located at 6.7 m above sea level, i.e. 21.97 feet[16]. It receives a significant amount of rainfall – about 2,400 mm on average – every year, most of it during June-September.

4.3.1 Details of existing SWD facilities in the PMC

The following areas in the PMC have the SWD system:

i. Areas that come under Panvel's old municipal council
ii. Erstwhile CIDCO nodes that are now in the PMC region
iii. The villages

All the three areas have been separately analysed in the following sections.

4.3.1.1 Existing storm water drainage facilities in Panvel old council area

Following are the details of the storm water drainage network in the Panvel old council area:

i. Total length of drain on one side of road is 15.41 km
ii. Total length of drain on both sides of the road is 8.58 km
iii. The maximum and minimum depth of the drain is 3.30m and 0.30m, respectively.
iv. The maximum and minimum width of the drain is 8.0m and 0.20m, respectively

The drains carry the rain water, which ultimately flow through the *nallah* into the Gadhi River.

There are 14 *nallahs* including eight major *nallahs* in the Panvel old council area. They carry the waste water mixed with the storm water drainage. Following are the major areas where water logging has been reported in the past:[17]

i. Opposite taluka police station
ii. Opposite Raigad Bank
iii. Tapal Naka (Ramnil Mill)
iv. Near telephone exchange

[16] *Source: City Sanitation Plan-Panvel Municipal Council 2014*
[17] *City Sanitation Plan for Panvel Municipal Corporation, 2014*

v. Maharashtra Bank
vi. Middle Class Housing Society
vii. Uran road circle

As per the Urban and Regional Development Plans formulation and implementation guidelines (URDPFI) guidelines and the service level benchmark (SLB) issued by the Ministry of Urban Development[18] (MoUD), coverage of SWD network is measured as a percent of road length it covers. The minimum stipulated coverage of the SWD network in a city is 100%. It can go up to 130-150% (assuming at some places roads will have drains on both sides).

As per the above gauge, the coverage in the Panvel old council area is around 50%[19]. Table 57 provides an overview of the SWD coverage in the area.

Table 57: SWD network in the Panvel old council area

Length of storm water drains (km)	Length of roads (km)	Coverage (in %)
23.99	48	49.97%

Source: City Sanitation Plan for Panvel Municipal Corporation, 2014

4.3.1.2 Existing storm water drainage facilities in erstwhile CIDCO nodes

Table 58 provides details of the area-wise break-up of the SWD network in the erstwhile CIDCO nodes, which now form part of Panvel Municipal Corporation region.

Table 58: Storm water drain network in CIDCO nodes

Node	Storm water drains (Km)	Roads (Km)	Coverage (in %)
New Panvel	75.7	62	122.09
Taloja	33.50[20]	21.3	157.28
Kalundre	2.78	1.81	153.59
Kalamboli	55.75	30.44	183.14
Navade	3.85	1.91	201.59
Kharghar	68.50	94	72.87
Kamothe	50.00	29.80	167.78

Source: CIDCO board resolution 2017

Table 58 shows the coverage of the SWD network in the CIDCO nodes, except Kharghar, almost equals or exceeds the benchmark range of 130-150%. In Kharghar, however, it is around 72%.

In addition to the above, the CIDCO nodes also have holding ponds. A holding pond means a detention basin adjacent to the rivers to temporarily store water as a protection against flooding. During high rainfall or high tides, the drainage is prone to flooding. Such ponds store water during high tide / high rainfall, thereby avoiding water logging. They serve as retention basins in normal conditions. Capacity should be sufficient to hold water during the entire duration of a high tide.

[18] *Now Ministry of Housing and Urban Affairs*
[19] *As per MoUD SLB, storm water drainage coverage is defined as % of road length the network covers*
[20] *17.38 km in phase-I and 16.12 km in phase-II*

The Table 59 provides details of the holding ponds in the CIDCO nodes, which now fall under the jurisdiction of PMC.

Table 59: Holding ponds in CIDCO nodes[21]

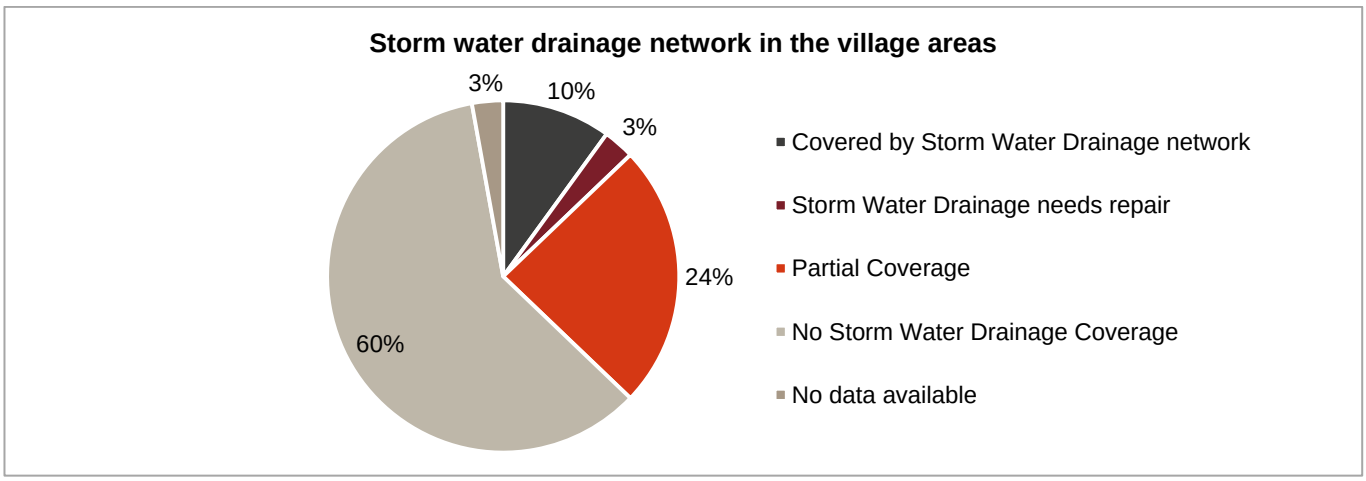
Node	Location	Size
New Panvel (3)	Sector 8(E)	11500 sq.m
	Sector 14(E)	43600 sq.m
	Sector 17(W)	64250 sq.m
Taloja (1)	NA	29700 sq.m

Source: CIDCO board resolution 2017

4.3.1.3 Existing storm water drainage facilities in villages under the PMC

Recently the PMC carried out an assessment of the road length, sewerage system coverage, storm water drains coverage, etc. in villages. Figure 19 gives an overview of the SWD network in the villages.

Figure 19: Overview of the SWD network in the PMC villages



Source: Survey of villages conducted by the PMC

The key findings of the PMC's study are:

i. A majority of the villages under the PMC – 42 out of 70 to be exact – do not have a storm water drainage system in place.
ii. Eighteen of the villages are covered partially.
iii. In three, the drainage network needs repair.

Based on the above findings, it can be deduced that nearly two-thirds of the villages do not have storm water drains and one-fourth are only partially covered. Hence, for the purpose of our analysis, the present storm water drain coverage for these villages is assumed to be **nil**.

[21] Source: CIDCO board resolution 2017

4.3.2 Gap assessment

The Table 60 assesses the storm water drain requirements for the PMC region.

Table 60: Assessment of Panvel SWD as per URDPFI guidelines and MoUD SLB

	Existing service level (2018)	Desired service level as per MoUD SLB	Desired level in 2018 (km)	Existing level in 2018 (km)	Existing gap - 2018 (km)
% Road Length with SWD	81.57%	130%[22]	521.09	326.98[23]	194.11

Source: CRIS analysis

It can be deduced from the above table that approximately 20% area under the PMC still doesn't have a SWD system.

The length roads in the areas under the PMC is approximately 400.8 km[24] while the total length of storm water drain is around 327 Km. Thus, the coverage is approximately 81%.

It can be seen the Panvel old council area and villages lack adequate SWD network. All the unserved areas need to be provided proper drainage network.

4.3.3 Assessment of additional infrastructure requirement

Table 61 assesses the SWD requirements in the PMC region based on the SLB of the MoUD[25].

The requirements have been estimated for the short term (2025), medium term (2032) and long term (2041).

Table 61: Future demand and gap assessment of SWD for the PMC region[26]

	2018		2025 (short term)		2032 (medium term)		2041 (long term)	
	Desired level	Gap	Desired level	Cummulative gap	Desired level	Cummulative gap	Desired level	Cummulative gap
Storm water drains (in km)	521.09	194.11	737.59	410.61	879.69	552.71	1062.39	735.41

Source: CRIS analysis

The above table shows the SWD network in the PMC region should cover an additional 410.61 km in the short term and 735.41 km in the long term.

4.3.4 Key issues

Following are the critical issues the SWD system in the PMC region faces:

- **Disparity in the SWD network across the PMC region**

  The SWD coverage in the PMC region is approximately 81%. It can be construed from Table 57 and Table 58 that a major chunk of the system is in the urban regions of erstwhile CIDCO nodes, while the Panvel old council area and the villages are lack a proper drain network.

- **Blockages in Storm water drains**

[22] *Assuming some of the road length would be having drains on both sides*
[23] *Includes the storm water drain network in old Panvel council area and erstwhile CIDCO nodes*
[24] *This includes 47 Km of State and National Highways*
[25] *Now Ministry of Housing and Urban Affairs (MoHUA)*
[26] *As per MoUD SLB for storm water drainage*

Often garbage is dumped in the drains leading to their choking.

- **No separate expenditure head for SWD**

  There is no separate head for either capital expenditure or operation and maintenance expenditure for SWD. The PMC treats spending for SWD and sewerage as the same. This makes it difficult to exactly assess how much is spent on maintenance of SWD. In fiscal 2017, the expenditure on SWD and sewerage stood at Rs 110 lakh. In fiscal 2018, there were no expenses at all.

4.3.5 PMC initiatives

- The PMC recently conducted an assessment of the existing sanitation infrastructure in all villages under it. It gauged the SWD network to find out the villages that are not covered by the network and also evaluated the repair and rehabilitation requirements in the villages that are covered.
- The PMC now intends to lay approximately 65.16 km of SWD network in the villages. This shall include laying of new drains and repair / rehabilitation of the existing ones. The project shall cost approximately Rs 151 crore.
- The PMC is also developing four villages – Dhansar, Roadpali, Koynavele and Karavale – as smart villages, using their own funds. The project shall include laying SWD, sewer lines and roads with cable ducts.
- The PMC has issued work order for upgrading 38 km road stretch, which shall include work on SWD.



4.4 Solid waste management

This section presents an overview of the status of PMC's solid waste management (SWM). Surge in population, increasing urbanisation, changes in consumption habits and lifestyle brought about by globalisation and higher incomes have increased the volume of waste generated within the city. The PMC plays an important role in the collection, transportation, treatment and disposal of solid waste generated by households, commercial institutions such as shops and malls, industries, hospitals and schools. SWM is one of the most crucial functions performed by the PMC as it is intricately linked to the quality of life, standard of living and public health of the citizens and also the sustainability of the city as a whole.

In the PMC, waste collection is decentralised. The collection system was developed and made operational in 2018 after the corporation conducted ground surveys and waste tests. The collection happens daily once in all the 20 wards of the PMC. After the collection, the waste is transported to the disposal site. The PMC has appointed a private operator for the collection and transportation of the waste. All the waste generated from the city is transported to the waste processing facility at Ghot. The site is spread across 14 hectares and has facilities for segregation, composting, and recycling. It also has a scientific landfill. The PMC is currently paying Rs 777 per tonne as tipping fee for the collection and transportation.

The sanitary department of the corporation works in accordance with the Municipal Solid Waste Rules 2016 and the Maharashtra Municipal Corporation Act. It is responsible for the collection, transportation, treatment and disposal of solid waste and sweeping and maintaining the cleanliness of roads within the city. However, the PMC does not handle bio-medical waste, industrial waste, construction and demolition waste and e-waste.

4.4.1 Existing setup of waste management in the PMC

4.4.1.1 Solid waste generation

As important projects such as airport and metro are coming up, Panvel is growing rapidly with a strong trade and commerce-based economy. As per the PMC, its population surpassed 13 lakh in 2017, with total floating population (in the entire area under it) likely to be 28,000 per day[27].

The area under the PMC is divided into two: *1)* Already developed, including eight CIDCO nodes and the areas that were under the old Panvel council, constituting 77% of the total area; and *2)* the underdeveloped, which includes 11 villages taken from the MMRDA.

The PMC generates about 470.8 tonne waste per day. Its break-up is given in the table below.

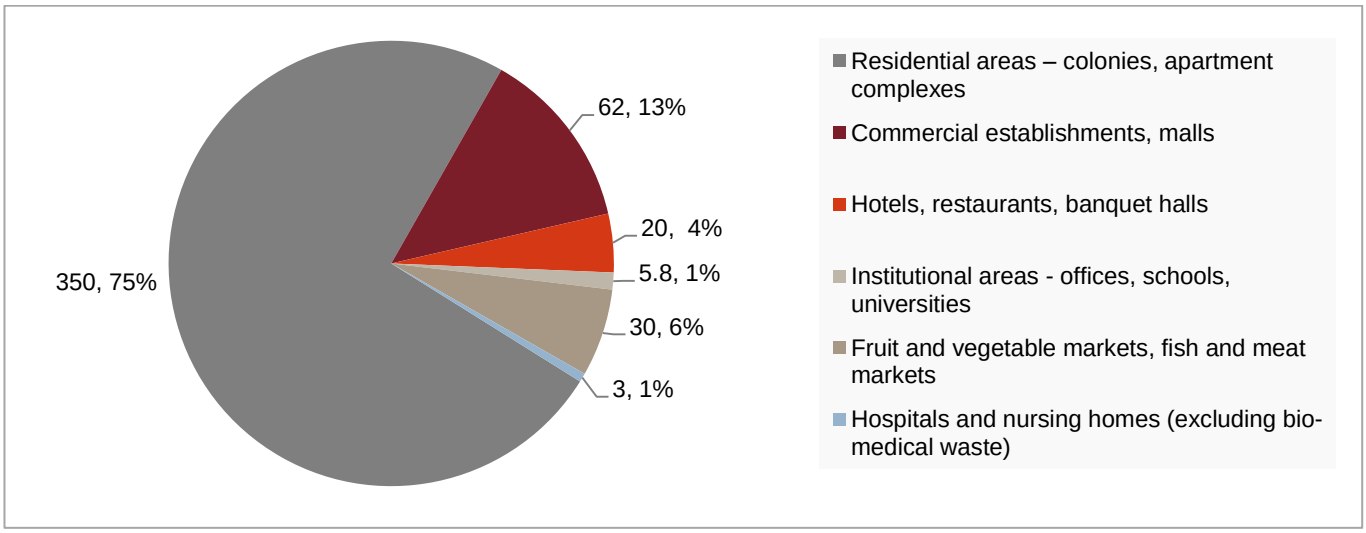
Table 62: Source-wise distribution of solid waste

S no.	Waste generation sources	Waste (in TPD)
1	Residential areas – colonies, apartment complexes	350
2	Commercial establishments, malls	62
3	Hotels, restaurants, banquet halls	20
4	Institutions - offices, schools, universities	5.8
5	Fruit and vegetable markets, fish and meat markets	30
6	Hospitals and nursing homes (excluding bio-medical waste)	3
	Total	**470.8**

Source: PMC

The table above shows that residential properties contribute ~74% of the waste.

Figure 20: Waste generation from different sources in TPD, percentage.



[27] *DPR of solid waste management in PMC'2018*

4.4.1.2 The collection and transportation system

The PMC has 20 wards. SWM operations include daily collection at the household level, street sweeping, drain cleaning and redressal of complaints from the residents or shops. Transportation of solid waste to the dumping ground is directly done by the private operator appointed by the PMC. The solid waste sources such as markets, main roads and commercial establishment (hotels and eateries) are covered by the direct collection and cleaning activities of the sanitation department of the PMC.

The PMC has 100% coverage of door-to-door waste collection for all the waste generated in the city, except hospital and construction and demolition (C&D) waste.

Table 63: Break-up of solid waste collection based on sources

Sr. No.	Type of property	Number of properties in 2017	Door to door collection
1	Residential	274200	100%
2	Hotels/restaurants/*dhabas*	1328	100%
3	Guesthouses / hotels	25	100%
4	Banquet halls	40	100%
5	Hospitals	150	0%
6	Vegetable markets (fish and meat markets)	40	100%
7	Major commercial markets in the city	10	100%

Source: PMC

Storage

Storage of the waste, at source is the first and most essential component of solid waste management. Storage of the waste at places of generation such as households, shops, commercial establishments and institutions is called the primary storage of waste. Community waste storage bins, placed at various locations, serve as the secondary storage of waste. At present, there are roughly 274 dustbins placed across the city.

Table 64: Details of waste storage in the PMC

Sr. No.	Description	Details
1	Number of dustbins/twin bins	77
2	Average capacity per bin	20 kg
3	Number of community bins	274
4	Average capacity per bin	200 kg
5	Frequency of waste collection for commercial area	Twice a day
6	Frequency of waste collection for residential area	Once a day

Source: The PMC

Street sweeping

Street sweeping is an important function of the sanitation department. It is essential not only to help keep the streets clean by clearing debris such as plastic, metals, leaves, dust etc. but also to improve the cleanliness and appearance of the city as a whole. Main roads, sub-roads, streets, by-lanes and footpaths are all swept clean. In total, 354 km of road is cleaned every day. The cleaning is done in two shifts – some of the roads get cleaned in the day and others in the night. The PMC also carries out sweeping twice a day in public places such as commercial hubs and markets.

Door-to-door waste collection

The PMC does door-to-door collection of the solid waste from households within its jurisdiction**.** The waste is collected from households using vehicles called *ghanta gaadis* which are of different sizes depending on the area and the population there. Hence all the waste from different areas is directly taken to the waste processing unit at Ghot. Garbage collection is entirely carried out by a private operator. The PMC has procured and provided different vehicles to private operators for transporting waste. Their capacity are 1-3 tonne for *ghanta gaadi*s and 7-14 Cum for refused compactor. In total, there are 71 vehicles that collect and transport the waste.

Table 65: List of vehicles used by the PMC

Sr. No.	Particulars	Capacity	Number of Vehicles
1	Truck/ *ghanta gaadi*	1 Tonne	22
2	Truck/ *ghanta gaadi*	3 Tonne	24
3	Refused compactors	7 cum	14
4	Refused compactors	14 cum	11
	Total vehicles	**-**	**71**

Source: The PMC

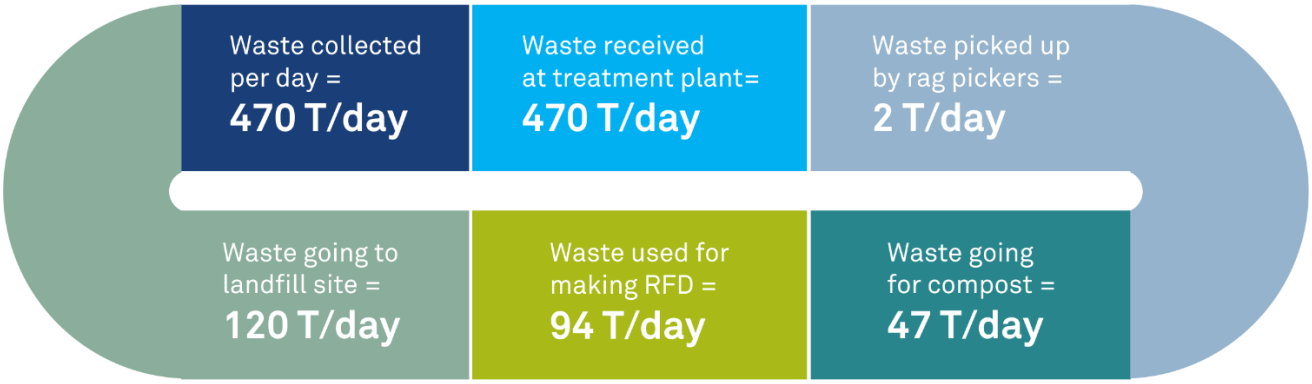
4.4.1.3 Processing and disposal system

Segregation, recycling and landfill

At present, all the waste generated from the city is transported to a waste processing facility at Ghot which is operated by a private operator. The site is spread across 14 hectares and is 17 km from the city core. This site is currently under the CIDCO administration and the PMC is paying a tipping fee of Rs. 799 per tonne for processing. The site is capable of handling 500 TPD of waste and has a weighbridge facility of 20-25 tonne. The site has in total five landfill shells of which three are already scientifically capped. Of the remaining two, one is operational and the other is under construction.

The process of treatment reduces the density and, in turn, weight of the waste by about 44%. After the processing, non-recyclable waste that cannot be used to make refuse derived fuel (RDF) or in compost is taken to landfill. In case of the PMC, about 25.5% of waste goes into the landfill, nearly 0.42% (picked up by rag pickers) goes for recycling, 10% to compost and 20% for making RDF. The following figure shows the distribution of waste while and after treatment of the waste at the disposal facility.

Figure 21: Distribution of the waste and after treatment of the waste at the disposal facility



Source: The PMC

Segregation mechanism of processing plant

There are four steps involved in the processing of the waste.

Step 1: After the waste arrives at the processing plant, it is screened through two lines of 100 mm trommels along with blowers to remove the lightweight materials, such as plastics, papers etc.

Step 2: The waste is screened in the 35mm trommel and sent for composting.

Step 3: The waste is screened through 16 mm trommel and sent for composting

Step 4: The waste is screened through 4 mm trommel and sent for composting.

The composting facility has a capacity of 450 tonne per month. However; the PMC doesn't have facilities for bio-methanisation, vermicomposting, incineration etc.

4.4.2 Projects in pipeline

Following are the proposed projects which will enhance SWM in the city:

- **Landfill site at Khanav**

  As per the PMC officials, the present landfill site will be saturated in the next two years and the local body is in the process of identifying a new site. They also said the proposed site will be near Khanav village with an area of 15.2 ha. The project is currently being executed by CIDCO.

- **Collection and disposal of construction and demolition waste**

  Currently, the PMC does not treat the construction and demolition waste. It has, however, floated a tender for the treatment of such waste in the city. The scope of the project includes collection, transportation and disposal of this waste in the PMC area.

- **Biogas plant at sewerage treatment plants in the PMC**

  Currently, all the sewerage waste collected goes directly to the treatment plant. However, the PMC is planning to setup biogas plants in all its seven sewerage treatment plants (STPs). This will reduce the load on the transportation system as it will cut down wet waste to some extent.

4.4.3 E-waste management

Rapid technological advancement has increased the frequency of replacements of electronic items, which is resulting in huge amount of e-waste generation. Currently, the PMC does not have a policy to treat such waste. In order to avoid e-waste-associated hazards, it is very important to form a policy. This policy should be in line with e-waste rules published by the Central Pollution Control Board under the Ministry of Environment, Forest and Climate Change.

Following are the main responsibilities of urban local bodies specified under e-waste rules manual.

Table 66: Responsibilities of ULBs in e-waste management

S. No.	Duties of Urban local bodies
1	Ensure that e-waste, if found to be mixed with municipal solid waste, is properly segregated, collected and is channelised to authorised dismantler or recycler.
2	Ensure that e-waste pertaining to orphan products is collected and channelised to authorised dismantler or recycler.

Source: E-waste Rules 2016, CPCB, MOEFCC

4.4.4 Main indicators for SWM

S. No.	Indicator	Units	Value
1	Waste generated per capita (2016)	Grams	317.96
2	Waste collected as per the LB's estimate	%	100.0
3	Waste collected as per available capacity	%	100%
4	Households covered by door-to-door collection by private sector	%	100.0
5	Households covered by door-to-door collection by the municipality	%	0.0
6	Total rated capacity of vehicles	Tonnes	297
7	Rated capacity to waste generated	%	63%
8	No. of trips per vehicle/day	Nos.	2-3
9	Average spacing between dustbins	Meters	N/A
11	Mode of disposal		Landfill
12	Average bulk density		0.4533
13	Height of land fill	Meters	N/A

Source: CRIS analysis & the PMC

4.4.5 Cost recovery for SWM

At present, the PMC does not levy any user charge on the public. However, the municipal corporation is planning to start imposing a fee in order to meet a portion of various costs incurred by the SWM department. These charges will vary for various categories of users. Following table gives details of the proposed charges for each category.

Table 67: Details of proposed SWM user charges

Sr. No.	Property type	Category	User charges (Rs/year)
1	Residential	Patra shed	150
2	Residential	RCC structure	400
3	Commercial	Hotels (below 50 sq m)	1,000
4	Commercial	Hotels (50-100 sq m)	5,000
5	Commercial	Hotels (100-200 sq m)	10,000
6	Commercial	Hotels (200 sq m and above)	20,000
7	Commercial	Marriage hall	24,000
8	Commercial	Shops, banks, Path pedhi	3,000

Source: The PMC

There is significant variance in charges proposed. At 150 per year, the levy on *patra* shed will be the lowest. Marriage halls will have to shell out the most – Rs 24,000 per year.

Financial analysis of sanitary department

Given below are the expenses and revenue items of the sanitation department.

Table 68: Financial statements of the sanitation department, the PMC

S. No.	Indicator	FY2017 (in lakh)	Percentage
A	**Operating expenses**		
1	Establishment expense	605.43	52%
2	Operation & maintenance expense	556.13	48%
	Total operating expenses	1161.56	100%
B	**Operating revenue**		
1	Special cleaning tax	0	0%
2	MSW charges	0	0%
	Total operating revenue	0	
C	**Cost recovery**		0 %

Source: The PMC

According to the table above, cost recovery from SWM is nil. This is because the PMC is not levying or collecting SWM taxes and charges.

4.4.6 Future solid waste generation

It is important to estimate how much solid waste is likely to be generated in future in order to form a workable waste management system. Hence, based on the projected population as described in the demography section, an estimate has been made.

Following assumptions have been considered for the estimation:

- Bulk density of the waste is considered as 0.453 tonne per cubic meter
- After mass reduction at the processing stage, only 25.5% of the waste goes into the landfill
- As much as 5% of the total population will be floating

Table 69: Future solid waste generation in the PMC

S. No.	Year	Population	Total waste generated in tonne per day	Yearly waste generated in tonne	Total waste for the landfill disposal in Cum (annually)	Cumulative waste generated in Cum
1	2018	1,480,667	471	1,80,434	1,01,621	1,01,621
2	2025	2,095,843	825	3,01,220	1,69,648	10,85,076
3	2032	2,499,616	1086	3,96,248	2,23,168	24,86,694
4	2041	3,018,752	1487	5,42,812	3,05,713	49,07,933

Source: CRIS analysis

4.4.7 Assessment of additional infrastructure requirement

This section makes an assessment of the additional infrastructure requirement of the PMC to process the waste generated in future. The current waste treatment facility is running under the CIDCO administration and it is capable of treating waste until 2020. The CIDCO is planning to set up another SWM facility in the NAINA region near Khanav village, to meet the future requirement. This will accommodate the waste from the PMC too. However, there is no clarity on the exact amount of the PMC waste that will be treated at this facility. To assess the total landfill area

requirement for the entire PMC region, we have done a gap analysis for short term, medium term and long term with timeframe of seven, 14 and 21 years, respectively.

Table 70: Requirement of landfill in the PMC

Sr. No.	Term	Short term	Medium term	Long term
1	Year	2018-25	2025-32	2032-41
2	Population	20,95,843	24,99,616	30,18,752
3	Cumulative waste generated in Cum	10,85,076	24,86,694	49,07,933
4	Demand for rated capacity of transportation vehicles in MT	786	1034	1416
5	Demand for landfill area in acres	17.9	41	80.9

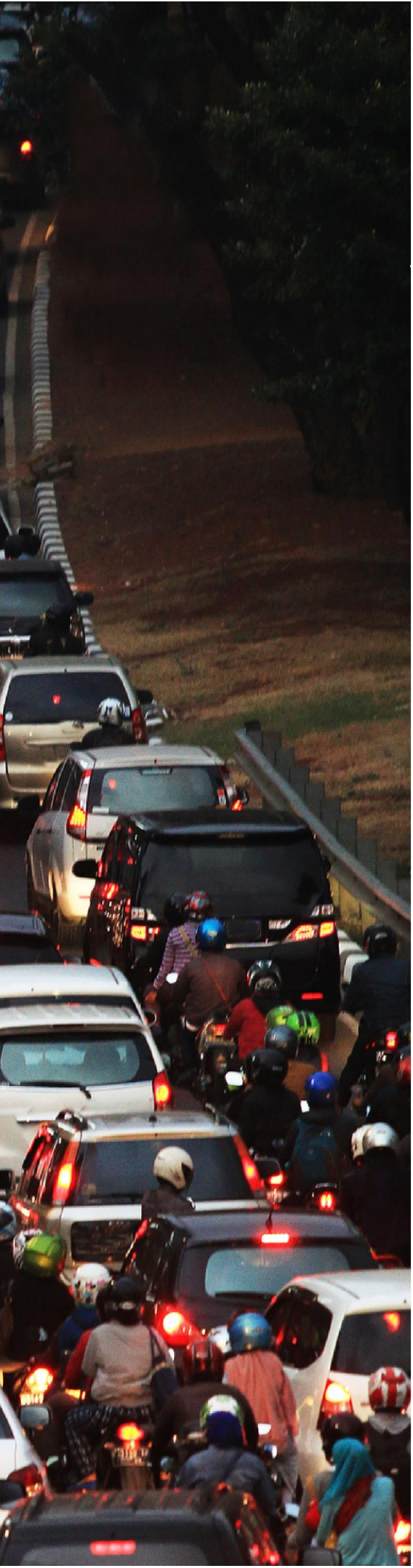
Source: CRIS analysis

4.4.8 Key issues

Following are the key issues in the SWM sector:

- **Lack of manpower**: There is considerable lack of manpower in the sanitary department, which is affecting its productivity. This results in more time being spent on firefighting rather than planning the right tasks.
- **No segregation at source**: There is little or no segregation of waste at the source. This eventually increases the load on the transportation system.
- **Absence of segregation facility at transfer stations:** Current transfer station is not equipped with any mechanism to segregate the waste.
- **No route map for vehicles:** The collection of the waste is done without a proper route map. This reduces the efficiency of the vehicles.
- **No policy for e-waste:** Proper management of the e-waste is a need in the present world. But the PMC doesn't have a policy on it yet. It is important for the PMC to form a policy for e-waste management.





5.

Traffic and transportation

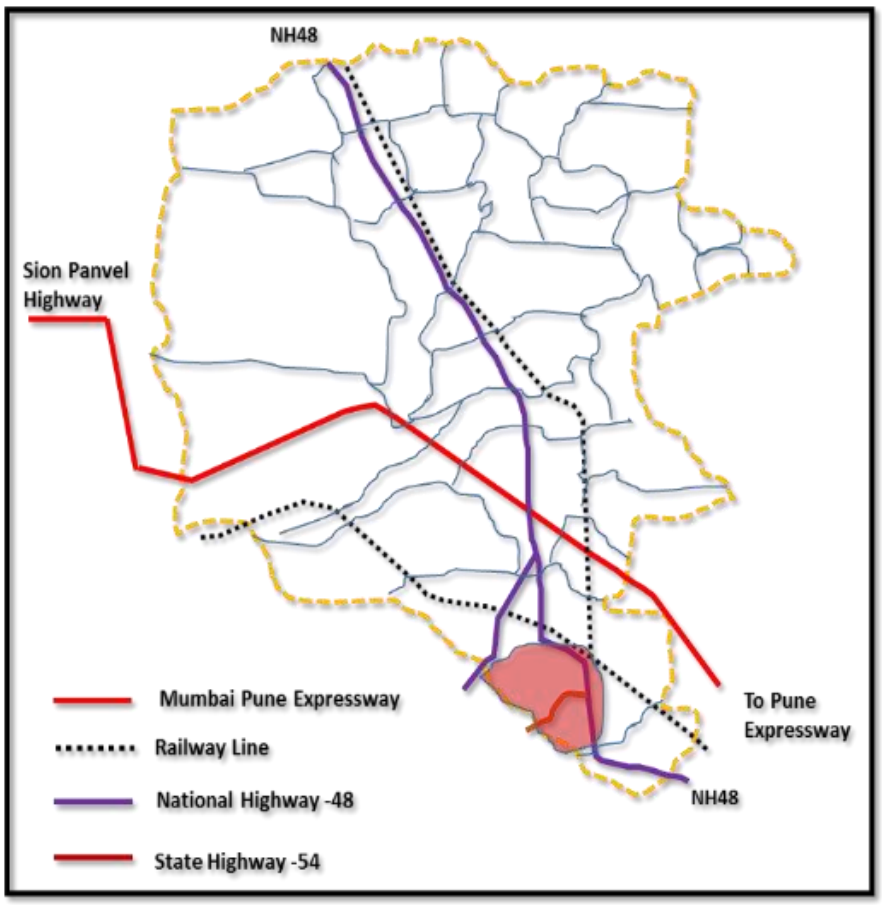
This section is an overview of the PMC's transportation sector. Transport plays an important role in the development and spatial growth of any urban area. Economic growth, which boosts incomes and living standards, is expected to create greater demand for travel for both work and non-work/leisure purposes. Panvel plays a key role in the Mumbai Metropolitan Region (MMR) and thus its network connectivity is vital to the overall development of the region.

5.1 Existing road network

The Panvel city is well connected with all major cities by road. All major highways and railways pass through the city due to which it has become a major trade and transportation centre in the region. The following prominent roads pass through the city.

- National Highway 48[28], connecting Delhi and Chennai and passes through six states traversing various important cities such as Jaipur, Ahmedabad, Mumbai and Pune.
- Pune-Mumbai Expresses way
- State highway 54 connecting Panvel with Uran
- Sion-Panvel highway, connecting Mumbai with Panvel via Navi Mumbai

Figure 22: Map showing various highways and expressways that pass through the PMC



As the PMC has been formed by amalgamating the areas under the old Panvel municipal council, CIDCO nodes and the villages, all these areas have their independent road network system and are not organised.

[28] *Earlier called as NH 4*

5.1.1 Road infrastructure

Prior to the incorporation of the PMC, there were three authorities – old Panvel municipal council, the CIDCO and the *zilla parishad* – taking care of the roads in their respective areas. See Table 71 below for details.

Most of the roads were under the CIDCO, followed by the *zilla parishad* (rural roads) and the old Panvel council. Currently, the PMC has a road network of 400.83 km (Including national and state highways).

Table 71: Summary of roads in the PMC

Sr. No.	Roads	Type of roads	Length (in km)	Proportion (in %)
1	Zilla parishad, villages and non-nodal CIDCO area roads	District and village roads	64.53	16.09
2	CIDCO nodal roads	Internal city roads	241.30	60.20
3	Panvel Municipal Council roads	Internal city roads	48	11.97
4	NH/SH/Express way	NH/SH	47[29]	11.72
	Total		400.83	100%

Source: PMC

5.1.1.1 District and village roads

Before the formation of the PMC, all the district and village roads were developed and maintained by the *zilla parsihad*. These roads were transferred to the PMC and are now being maintained by its Public Works Department.

As many as 35 roads (64.53 km) were transferred from the *zilla parishad* to the PMC. These include 39.8 km of district roads and 24.73 km of village roads. Following table shows the summary of district and village roads under the PMC.

Table 72: District and village roads transferred by the zilla parishad to the PMC

Sr. no.	Area	Length proposed (km)	Completed road (km)	Remaining road (km)	Surface type
1	Total district roads	43.8	39.8	4	Bitumen
2	Total village roads	32.28	24.73	7.55	Bitumen & WBM
	Grand total	76.08	64.53	11.55	-
	Percentage	100 %	84.81 %	15.18 %	

Source: PMC

Construction of 91% of 43.8 km district roads proposed and 77% of 32.28 km village roads proposed are completed. Also, from the overall proposed length of 78.08 km, 84.81% is constructed and 15.18% is remaining.

5.1.1.2 Roads in the CIDCO nodes

The total length of the roads in the CIDCO nodes is 255.73 km. Following is the detailed list of the roads along with their current status:

[29] *The National and State Highways which traverse the Panvel Municipal Corporation region have been included*

Table 73: Details of roads in the CIDCO nodes

Sr.no.	Area	Road type	Length proposed (km)	Completed road (km)	Remaining road (km)	Surface type
1	New Panvel Node	Internal city road	62	62	0	Bitumen
2	Taloja Node Phase I & II	Internal city road	21.35	21.35	0	Bitumen
3	Navade Phase 2	Internal city road	1.91	1.91	0	Bitumen
4	Kalundre Node	Internal city road	1.81	18.14	0	Bitumen
5	Kalamboli Node	Internal city road	30.44	30.44	0	Bitumen
6	Kharghar Node	Internal city road	94	94	0	Bitumen
7	Kamothe Node	Internal City road	29.8	29.8	0	Bitumen
	Total		240.3	240.3	0	Bitumen
	Percentage		100%	100%		

Source: CIDCO board resolution 2017

The CIDCO has completed construction of all the roads under it.

5.1.1.3 Roads in the old Panvel municipal council area

The old Panvel municipal council has constructed 48 km of roads in the city. See Table 74 for details.

Table 74: Roads in the old Panvel municipal council area

Sr. No	Area	Type of road	Length proposed (km)	Completed road (km)	Remaining road (km)	Surface type
1	Panvel old council area	Internal city roads	5.7	5.7	0	Concrete road
2	Panvel old council area	Internal city roads	42.3	42.3	0	Bitumen
	Total		48	48	0	
	Percentage		100%	100%		

Source: PMC

It can be deduced from Table 74 that out of the 48 km of roads in the old council area, 5.7 km is concrete and the rest is bitumen.

5.1.2 Roads other than municipal roads

The PMC is blessed with connectivity to major national, state and express highways. The following table gives a summary.

Table 75: Summary of the national and state highways in the PMC region

Sr. No	Type of road	Length in km
1	National highway	18
2	State highway	26
3	Expressway	3
Total		47

5.1.3 Road infrastructure and its service levels

Performance or the level of service (LoS) in the case of roads is measured in terms of quality of roads, carriageway, and level of street furniture and accessories. However, these details of the PMC roads are not available.

5.2 Mode of transport

There are many factors that determine the preferred mode of transport in a city and the population's choice of trip making. The key factors that are looked into are details of the household, vehicle ownership pattern, the population of the city, its distribution, and its composition in terms of age, sex, number of working members and students. The number of vehicles available per household is also an influencing factor.

5.2.1 Private vehicles

Details of motor vehicles (category wise) in the Panvel region (see the following table) have been compiled from the information published by the motor vehicles department of the Maharashtra government. The period covered is 2012-2017.

Table 76: Growth of vehicles over six years

Sr. No.	Category	2012	2013	2014	2015	2016	2017	CAGR
1	Two-wheelers	40,680	67,264	92,761	1,19,575	1,51,831	1,81,134	35%
	% share	36 %	43 %	46%	47%	49%	50%	
2	Four-wheelers	22,663	35,928	50,283	66,378	82,230	90,617	32%
	% share	20%	23%	25%	26%	27%	25%	
3	Luxury/ tourist taxis	1,434	1,726	2,043	2,825	4,058	8,685	43%
	% share	1%	1%	1%	1%	1%	2%	
4	Auto rikshaws	11,944	11,789	11,166	12,398	13,390	15,148	5%
	% share	11%	7%	6%	5%	4%	4%	
5	Buses	824	927	939	1,177	1,294	1,677	15%
	% share	1%	1%	0.5%	0.5%	0.4%	0.5%	
6	Goods vehicles	18,472	20,774	22,720	27,434	31,115	36,065	14%
	% share	16%	13%	11%	11%	10%	10%	
7	Tractors, trailers	117	282	356	371	373	382	27%
	% share	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	
8	Others	17,007	19,314	20,299	23,248	25,170	27,001	10%
	% share	15%	17%	18%	21%	22%	24%	
	Total	1,13,141	1,58,004	2,00,567	2,53,406	3,09,461	3,60,709	26%
	% share	100 %	100 %	100 %	100 %	100 %	100 %	

Source: RTO website

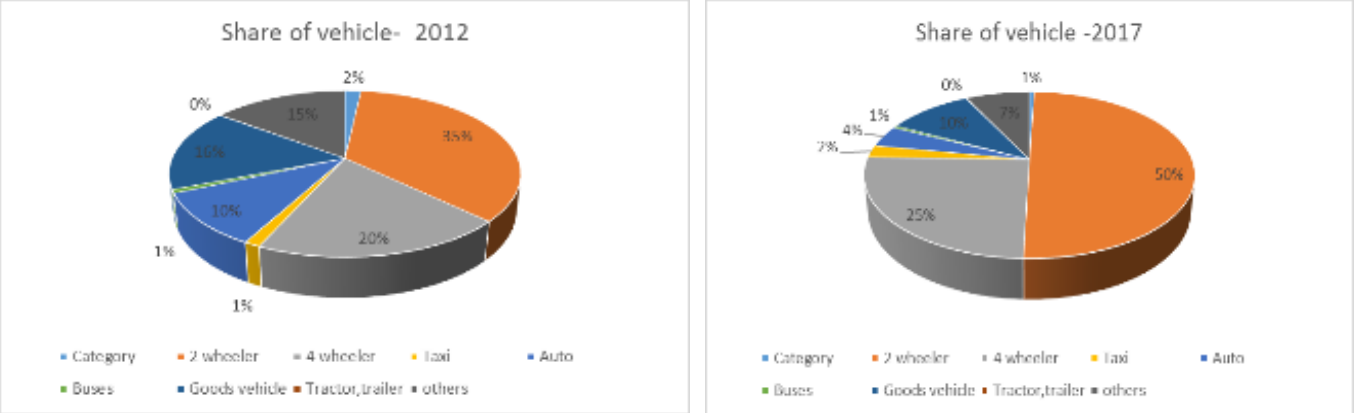
Vehicle registrations in the PMC rose three-fold from 113,141 in 2012 to 360,709 in 2017. Of the total registered vehicles in 2017, two-wheelers constitute approximately 50% and four-wheelers 25%. Both the categories grew 35% and 32%, respectively, over the period.

The overall share of two-wheelers among the vehicles in the PMC has increased from 36% in 2012 to 50% in 2017. The share of four-wheelers, meanwhile, rose from 20% to 25%.

It may be noted the share of auto rickshaws has declined from 11% to 4% and share of buses from 1% to 0.5%. The trend of increasing number of two-wheelers and four-wheelers even as auto rickshaws and buses decline indicates lack of sufficient public transport in the region.

The number of tractor/trailer has increased 27% during the period, which is a sign of improvement in the economic activities.

Figure 23: Share of vehicles in the PMC region over 2012-2017



5.2.2 Public transport and para-transit

Railways

The suburban railways is the dominant mode of transport for people in the PMC and there are seven railway stations in the region. The Panvel station is a major junction which connects the city with other cities in India and the MMR. There are two major railway lines: 1) The harbour line, covering four stations – Panvel , Khandeshwar, Mansarovar and Kharghar – under the PMC; and 2) part of Diva-Roha railway line, which comprises Panvel, Kalamboli, Navade Road & Taloja stations. The following table provides the details of each line.

Table 77: Details of the railway lines in the PMC region

Sr. No.	Line name	Stations in PMC area	Type of trains halt at station	Frequency of trains	Directly Connected cities
1	Diva - Panvel – Roha line	Panvel	Passenger trains, Express trains, Superfast trains, EMU_Fast, EMU_Slow etc	Because of large number of trains frequency Varies between 15 mins to 2 hrs	Mumbai, Delhi, Jaipur Panji, Chennai, Kochi, Ahmedabad, Nasik, Nagpur, Pune, Thane, Kalyan, Vasai etc
		Kalamboli	EMU_Slow, Passanger trains	1 to 2 hrs	Mumbai,Thane, Kalyan,Vasai
		Navade road	EMU_Slow, Passanger trains	1 to 2 hrs	Mumbai,Thane, Kalyan,Vasai
		Taloja	EMU_Slow, Passanger trains	1 to 2 hrs	Mumbai,Thane, Kalyan,Vasai
2	Harbour line	Panvel	EMU_Slow	5 to 15 Mins	Mumbai, Thane, Navi Mumbai
		Khandeshwar	EMU_Slow,	5 to 15 Mins	Mumbai, Thane, Navi Mumbai

Sr. No.	Line name	Stations in PMC area	Type of trains halt at station	Frequency of trains	Directly Connected cities
		Mansarovar	EMU_Slow,	5 to 15 Mins	Mumbai, Thane, Navi Mumbai
		Kharghar	EMU_Slow	5 to 15 Mins	Mumbai, Thane, Navi Mumbai

Source: CRIS analysis

Bus Transportation

Buses are the second preferred mode of transport. In the region, the road-based public transport system is mainly served by government undertakings such as BEST, Navi Mumbai Municipal Transport (NMMT), Thane Municipal Transport (TMT), Kalyan Dombivli Municipal Transport (KDMT), Vasai Virar Municipal Transport (VVMT) and Khopoli Municipal Transport (KMT). They operate in over 20 routes (refer Table 78).

In addition to providing connectivity to far off places in the MMR, such as Thane, Kalyan and Dombivli, the buses also serve as feeder service to the sub-urban railways. There are two main bus stands in the area – one for the state transport (ST) and the other for the NMMT. From the ST stand, Maharashtra State Road Transport Corporation buses provide connectivity to all major cities within the state.

Table 78: Bus services available in the PMC region

Sr. No	Route No.	Operator	Route
1	C53(exp)	BEST	Ghatkopar bus station/Ghatkopar(W) to Kalamboli Bus station
2	AC103	NMMT	Khodadad circle to New Panvel Railway Station (E)
3			Hindmata (Dadar) to New Panvel Railway Station (E)
4	24		Thane Railway Station (W) to Panvel Railway Station
5	30		Kalamboli sec.16/Roadpali to Uran Pensioner park
6	50		Koparkhairane bus terminus to Panvel Railway Station
7	56		Police Commissioner Office to Mansarover Railway Station
8	52		Belapur Railway Station to Pethali Gaon Taloja Phs-I
9	75		Sainagar Panvel to Panvel Railway Station
10	23		CBD Highway / CBD Bus terminus to Ulwe Node Sector 17 (Ramsheth Thakur Stadium)
11	31		Koparkhairane bus terminus to Uran Pensioner park
12	34		Juinagar Railway station to Koproli
13	39		Ghansoli depot to Uran Pensioner park
14	57		Mansarover Railway Station to Vichumbe bridge:New Panvel
15	76		New Panvel Railway Station (E) to Jaysambhav society karanjade sec.6
16	77		New Panvel Railway Station (E) to Mahalaxmi Nagar Nere
17	78		New Panvel Railway Station (E) to Hikal Company / Indian Oil
18	79		Shantivan/Nere to New Panvel Railway Station (E)
19	20	KDMT	Kalyan Railway Station to Panvel Railway Station
20	70		Dombivali Station (W) to Panvel Railway Station
21	ST30	VVMT	Vasai Bus Depot to Panvel Railway Station
22	4	KMT	Khopoli to Vashi
23	7		Khopoli to Panvel

Source: M indicator

The aggregate share of two-wheelers and four-wheelers in the total number of vehicles registered in the PMC increased from 56% in 2012 to 75% in 2017 (see Table 76). Clearly, as the city's population grew, the number of private vehicles grew too. But the same cannot be said about public transport. Without a robust public transport system, private vehicles in the city are likely to swell even further. Consequently, the city's traffic congestion will worsen and so will its air quality.

As the population surges in future, there would be a corresponding increase in transportation. In order to control the number of private vehicles plying on the road, public transport will have to be augmented.

5.2.3 Intermediate public transport

Intermediate public transport (IPT) modes, such as taxis and auto rickshaws, play an important role in meeting unstructured travel demand of users in cities. They are feeders to the main mass transport system (both rail- and road-based) and provide accessible movement in predefined areas. The IPT's service is intermittent in nature and its destination is also flexible as the passengers determine it.

In the PMC, IPT acts as a competent access/ egress mode. It even competes with road-based public transport system, especially in case of short trips. The characteristics of trips by these modes are completely different from those made by other motorised modes. IPT offers high flexibility and mostly even offers services from door to door. In the PMC, the sharing of auto rickshaws is more popular. Most people prefer this option for travelling to the nearest railway/ bus station. This model ensures the last mile connectivity in the urbanised areas of the PMC.

5.3 Parking facilities

Vehicle ownerships are increasing quickly in the PMC due to increased affordability, easy availability of loans, and weakening public transport services.

The two-wheeler and four-wheeler registrations in the PMC has logged a CAGR of 35% and 32%, respectively, over 2012-2017. This has, in turn, led to an increased demand for parking spaces. Parking of vehicles along the kerbs narrows the carriageway, thereby increasing congestion, accidents and delays.

Street parking is rampant in Panvel. During the reconnaissance survey, it was observed in most of the road stretches, on-street parking happens on both sides. This reduces the effective carriageway, thereby causing hindrance in the regular flow of traffic.

In order to control and regulate on-street parking, Panvel needs a comprehensive parking policy, which provides for off-street parking facilities, exclusive parking bays in various commercial areas and near market places and levy of parking fee. It should set parking norms along with standards, devise demand management measures and also incorporate parking/no-parking zones in congested and other areas as required.

5.4 Truck terminals

Shortage of truck terminals is one of the biggest issues causing traffic congestion in the PMC. There is only one truck terminal – at Kalamboli – in the area. A large number of trucks and multi-axle vehicles are usually parked along the NH 48, the Panvel-Sion Highway. This causes difficulty for traffic movement along these roads. In addition to this, there are large number of trucks and multi-axle vehicles parked on vacant plots in the PMC, mainly in the CIDCO notified areas.

5.5 Traffic management

The areas that were under old Panvel municipal council have high density with a mixed land usage. There are markets and commercial centres in these areas which causes a lot of traffic movement here. Also, traffic jams mostly happen near railway stations and ST bus stands, leading to high levels of pollution, delays etc.

Apart from this, the reconnaissance survey revealed that there is heavy vehicle mobility within and around the PMC jurisdiction. Large number of trucks and multi-axle vehicles are parked on major roads. The city needs well-planned truck terminals, which can take care of the huge parking demand during peak hours.

5.6 Assessment of additional infrastructure requirement

5.6.1 Roads

The requirement for more roads in the PMC has been determined for short, medium and long term. For the estimation, the entire roads in the PMC region (including the areas that were under Panvel's old municipal council and CIDCO and the villages) have been considered.

For data that were not available with the department, we did our own research and sourced some of them from the secondary sources, such as the CIDCO and other web sites.

For the analysis, two scenarios have been considered based on the overall cost of the projects and the investment capacity of the PMC.

Scenario 1

Assumptions:

- 5% of total area is constructed as concrete road
- 95% of total area is constructed as bitumen road
- All the new ones are constructed as bitumen or concrete road
- Upgradation of the bitumen roads to concrete will be done only after year 2025
- Current average width of the road (19 m) is considered as the standard for future roads too
- Per-capita road length is considered 0.27 m

Table 79: Scenario 1: Additional Infrastructure requirement

Sr. No.	Type of road	Existing	Current gap 2018		Short-term gap 2025		Medium-term gap 2032		Long-term gap 2041	
Construction of new roads										
			Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
I	Concrete (CC)	10.5	20.0	9.5	28.4	17.9	33.8	23.3	40.9	30.4
II	Black Top (BT)	343.3	380.8	37.5	539	195.7	642.8	299.5	776.4	433.1
	Total	353.8	400.8	47	567.4	213.6	676.7	322.8	817.2	463.5
Upgrading bitumen to concrete roads										
I	Upgrade BT to CC	10.5	0	0	380.8	380.8	539	539	642.8	642.8

Source: CRIS analysis

The total cost required to bridge the gap in road requirement under the first scenario is approximately Rs 2,474 crore – Rs 548.51 crore for construction of new roads and Rs 1,924 crore for upgrading.

Scenario 2

Assumptions:

- All the new roads constructed will be concrete
- 30% of existing bitumen road will be upgraded to concrete after 2019
- Upgrading 50% of existing bitumen road to concrete after 2019
- Upgrading 50% of existing bitumen road to concrete after 2025
- Current average width of roads (19 m) is considered as the standard width for future roads too
- Per capita road length is considered as 0.27 m

Table 80: Scenario 2: Additional infrastructure requirement

Sr. No.	Type of road	Existing	Current gap 2018		Short-term gap 2025		Medium-term gap 2032		Long-term gap 2041	
Construction of new roads										
			Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
I	Concrete (CC)	10.5	57.5	47	224	214	333	323	474	463
II	Black Top (BT)	343	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		354	57.5	47	224	214	333	323	474	463
Upgrading bitumen roads to concrete										
I	Upgrade BT to CC	0.0	0	0	343		343	172	343	69

Source: CRIS analysis

The total cost required to fulfil the gap as per the second scenario is approximately Rs 2,344 crore – Rs 1,493 crore for construction of new roads and Rs 851 core for upgrading.

5.6.2 Road-based public transport

The MoUD's[30] SLB framework for public transport recommends 40 buses per lakh population. As per this norm, the estimate for the number of buses required for the PMC region is given in the table:

Table 81: Estimate of buses required for the PMC region as per the MoUD's benchmark

Particular	2025	2032	2041
Population	2095843	2499616	3018752
No. of buses[31]	838	1000	1208

Source: CRIS Analysis

5.6.3 Assessment of gaps in traffic and transport characteristics

As no details were available about traffic and transport characteristics, a comprehensive mobility planning needs to be undertaken for the PMC region at the earliest.

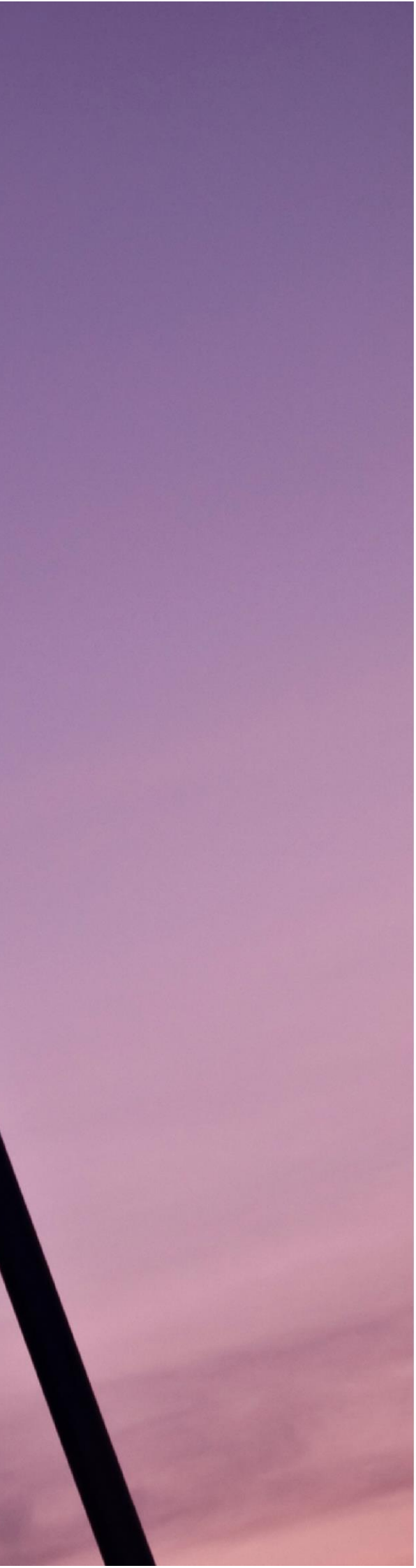
[30] *Now Ministry of Housing and Urban Affairs (MoHUA)*
[31] *40 buses per population of 100000*

5.7 Key issues

Following are the key issues that the PMC's traffic and transportation sector faces:

- Inadequate number of truck terminals resulting in congestion, as large number of trucks and multi-axle vehicles are parked along the roads, creating hindrance for the movement of traffic.
- Absence of footpaths for pedestrians and unregulated pedestrian crossings.
- The initial reconnaissance survey revealed that roads in the inner city areas and markets are narrow and cannot handle the existing traffic volumes, resulting in congestion and delays.
- The traffic on the road is a mix of various types with varying speed as there are no non-motorised transport facilities, such as bike lanes, subways and skywalks. This increases the travel time, reduces carriageway, and results in accidents.
- In the absence of adequate parking facilities, on-street parking is rampant. This reduces the effective carriageway for the traffic.
- Transportation services are provided by three authorities, such as the Indian Railways, Maharashtra State Transport Corporation and Navi Mumbai Municipal Corporation. They largely provide only intercity connectivity. Hence, there is a need for the PMC's own public transport service that can take care of intra-city transport in the region.





6.

Street lighting

The PMC and CIDCO manage public lighting within the corporation limits. The PMC's electricity department manages all the street lights excluding the CIDCO nodes, which are managed by CIDCO. Within the PMC's area, 70% of roads are illuminated. The PMC is installing new poles and energy saving lights as a part of its electrification drive. About 3,000 more poles are estimated to be required to achieve full electrification of the city roads.

6.1 Street light status

The status of street lights in the corporation area is given below:

Table 82: Area-wise status of street lighting in PMC

Sr No.	Description of lamps	PMC area without CIDCO nodes	Kamothe	Taloja	Navade	Kalamboli	New Panvel	Kharghar	Kalundre
1	High mast lamps	91	18	18	0	168	114	670	0
	Tube light	50	0	0	0	0	0	0	0
2	Mercury vapour lamps	50	0	0	0	0	0	0	0
3	Sodium vapour lamps	930	1215	437	82	1367	3674	3546	101
4	LED	3000	146	202	0	7	14	0	0
	% of LED in total	71%	11%	31%	0%	0.5%	0.36%	0%	0%
	Total	4121	1379	657	82	1542	3802	4216	101
5	Installed automatic power on / off switches	100	16	4	1	12	38	N/A	N/A
6	Maintenance frequency of street lights	Annual maintenance contract							

Source: PMC

The PMC is in the process of replacing normal bulbs with LED ones; 71% of lights have been already replaced in the non-nodal PMC area. However, the situation in the CIDCO nodes is different. Some of the nodes - such as Navade, Kharghar, and Kalundre - have not installed LED lights yet, while some - such as Kalamboli and New Panvel - have managed 0.5% to 0.36% of LED share, respectively. Only two CIDCO nodes - Kamothe (11%) and Taloja (31%) – boast a considerable share of LED bulbs. This indicates that most CIDCO nodes need LED replacement.

6.2 Financial analysis

Details of the electricity department's expenses and revenue are maintained by the accounts department. The expenditure for operations and maintenance of street lights in fiscal 2017 is detailed in Table 83.

Table 83: Expenses of the electricity department (fiscal 2017)

Sr.no.	Heads	Amount (Rs lakh)	Share in total spend (%)
1	Permanent establishment	20.68	14
2	Material care and repairs	50.43	35

Sr.no.	Heads	Amount (Rs lakh)	Share in total spend (%)
3	Road light bills	57.04	40
4	Electricity bill (vegetable and fish markets/ grounds/ gardens)	8.72	6
5	Intercom set-up and repairs	1.97	1
6	Air conditioner repairs and care	3.58	2
7	Signal system care and repairs	0.8	1
	Total	143.22	100

Source: PMC's accounts book

As is evident from Table 83, the electricity bill comprises a chunk of the electricity department's expenditure. However, this is likely to reduce once LED bulbs light up all the public areas. The other major expenses include material care and repairs. In fact, the PMC is planning to float a tender for an annual operations and maintenance contract.

6.3 Assessment of additional infrastructure requirement

To reiterate, the PMC manages all the street lights apart from those in CIDCO nodes. But since these street lights will be a part of the PMC in the future, the gap analysis is done for the whole PMC area including CIDCO nodes. The gap is based on three timeframes – short (7 years), medium (14) and long term (21). For the gap analysis, all the data provided from the electricity department is considered as final data and that which was unavailable from the department was obtained from secondary sources such as CIDCO, websites, etc.

For the gap analysis, CRIS has considered three scenarios according to the overall cost of the projects and the investment capacity of the institute.

Scenario 1

Assumptions

- The PMC will bear the cost of all the new LED installations, including wiring and new poles
- LED bulbs will be used for replacing the existing lights as well as for new installation
- Upgradation will be done over 2018-2025
- The fitting and bulb cost of LED lights is assumed with reference to the Public Works Department Handbook, Maharashtra
- Weighted average watt per lamp is assumed at 124
- Maintenance cost is assumed at 5% of the capital cost per year

Table 84: Street lights gap for scenario 1

Sr No	Type of street light	Existing	2018		Short term 2018-2025		Medium term 2025-2032		Long term 2032-2041	
Installation of new street lights as well as replacing all non-LED bulbs with LED										
			Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
1	Upgradation to LED	3,369	12,531	12,531	0	0	0	0	0	0
2	Installation of new LED		5,481	5,481	25,495	7,483	30,407	4,912	36,722	6,315
Total		15,900	18,012		25,495		30,407		36,722	

Sr No	Type of street light	Existing	2018		Short term 2018-2025		Medium term 2025-2032		Long term 2032-2041	
Construction of new street lights polls										
1	High mast LED poles	199	226	26	286	61	341	55	412	70
2	Normal LED poles	12,810	14,512	1,702	18,406	3,895	21,952	3,546	26,511	4,559
Total		13,009	14,737	1,728	18,692	3,955	22,293	3,601	26,923	4,630

Source: CRIS analysis

The total cost required to fulfil the gap in scenario 1 is around Rs. 74.53 crore, including Rs. 32.87 crore of street light installation and replacement cost and Rs. 41.67 crore of pole construction cost. The total cost balloons to Rs. 388 crore if we include the operations and maintenance cost.

Scenario 2

Assumptions

- All the new lights will be installed by the PMC and old lights replaced by Energy Efficiency Services Ltd (EESL) or any other external agency
- All the existing lights will be replaced directly with LED
- LED bulbs are used for all the new installation
- An external agency will bear the installation cost of old LEDs
- The PMC will bear the cost of new installation of LED, including the wiring and polls
- All the exiting non-LED lights will be replaced with LED between years 2018 and 2025
- The fitting cost of LED lights is assumed with reference to the Public Works Department Handbook, Maharashtra
- Weighted average watt per lamp is assumed at 124
- Maintenance cost is assumed at 5% of capital cost per year

Table 85: Street lights gap for scenario 2

Sr No	Type of streetlight	Existing	2018		Short term 2018-2025		Medium term 2025-2032		Long term 2032-2041	
Installation of new street lights as well as replacing all non-LED lights with LED										
			Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
1	Upgradation to LED	3,369	12,531	12531	0	0	0	0	0	0
	Installation of new LED		5,481	5,481	25495	7483	30407	4912	36722	6315
Total		15,900	18,012		25495		30407		36722	
Construction of new street lights polls										
1	High mast LED poles	199	226	26	286	61	341	55	412	70
2	Normal LED poles	12,810	14,512	1,702	18406	3895	21952	3546	26511	4559
Total		13,009	14,737	1,728	18692	3955	22293	3601	26923	4630

Source: CRIS analysis

The total cost required to fulfil the gap in scenario 2 is around Rs. 62.18 crore, including Rs. 20.52 crore of street light installation and replacement cost and Rs. 41.67 crore of pole construction cost. The total cost inflates to Rs. 391 crore if we include the operations and maintenance cost.

Scenario 3

Assumptions

- All the new lights will be installed by an external service provider
- All the existing lights will be directly replaced with LED bulbs
- An external agency will bear the installation cost of LED
- The PMC will bear the cost of poles, wiring, etc.
- All the exiting non-LED lights will be replaced with LED between years 2018 and 2025
- Weighted average watt per lamp is assumed at 124
- Maintenance cost is assumed at 5% of capital cost per year

Table 86: Street lights gap for scenario 3

S.No	Type of street light	Existing	2018		Short term 2018-2025		Medium term 2025-2032		Long term 2032-2041	
Installation of new street lights as well as replacing all non-LED lights with LED										
			Demand	Gap	Demand	Gap	Demand	Gap	Demand	Gap
1	Upgradation to LED	3,369	12531	12531	0	0	0	0	0	0
	Installation of new LED		5481	5481	25495	7483	30407	4912	36722	6315
Total		15900	18012		25,495		30407		36722	
Construction of new street lights polls										
1	High mast LED poles	199	226	26	286	61	341.3	55	412.2	70.88
2	Normal LED poles	12810	14512	1702	18406	3895	21952	3546	26511	4559.15
Total		13009	14,737	1728	18692	3955	22293	3601	26923	4630.03

Source: CRIS analysis

The total cost required to fulfil the gap in scenario 3 is around Rs 41.67 crore, which only includes the pole cost. The total cost swells to Rs 474 crore if we include the operations and maintenance cost, and playout cost of service.


कोकण एज्युकेशन सोसायटीचे
विठोबा खंडाप्पा हायस्कूल व ज्युनिअर कॉलेज.



7.

Social infrastructure

Social infrastructure comprises amenities that are essential for the socio-cultural development of a community. Apart from all the basic services - including water, waste disposal, sanitation and transportation - the rudimentary requirements of education, health facilities, recreational areas, etc. are key as they improve the standard of living of the people and make a city liveable.

The cost of delivering social benefits is high and constitutes a major proportion of an urban local body's budget as the provision of these amenities in a city has to have a regional bearing.

7.1 Healthcare

The PMC's health department provides health care facilities to the inhabitants of the region, supported by public trusts and private hospitals.

7.1.1 Existing infrastructure

The health department receives an annual grant of Rs 1.25 crore under the National Urban Health Mission (NUHM) of the central government[32]. Table 87 gives an overview of the existing health infrastructure in the PMC region.

Table 87: Existing health infrastructure in the PMC region

Health infrastructure	PMC
Hospitals	118
Maternity homes	91
Primary health centres	08
Diagnostic centres	171

Source: PMC's health department

There are 118 private hospitals and 171 private diagnostic centres in Panvel. Although there are no municipal hospitals[33], there are primary health centres (PHCs) that cater to the health care needs of the public. At present, five urban PHCs are maintained by the PMC - two in Panvel and one each in New Panvel, Kalamboli and Kharghar. The urban PHCs in Kalamboli, Kharghar and New Panvel were owned by CIDCO and have been handed over to the PMC.

Table 88: Existing PMC-run health care facilities

Facilities	Number	Location
Microscopy centres for testing and diagnosis of tuberculosis (TB)	2	**Rural Hospital, Panvel, and MGM Hospital, Kamothe**
PHCs in rural region (owned by the state government)	3	**Nere, Vavanje, Kamothe**
Urban PHCs	5	**Two in Panvel, one each in New Panvel, Kalamboli, Kharghar**

Source: PMC's health department

Awareness programs on family planning, immunisation, leprosy, TB, and malaria are being run through these PHCs.

[32] Source: PMC's health department
[33] Source: PMC's health department

As mentioned earlier, the urban PHCs in Kalamboli, Kharghar and New Panvel were earlier owned by CIDCO. It has also identified other plots for setting up health facilities and will be handing them over to the PMC soon. These plots are listed below:[34]

i. Sector 12 in Kharghar
ii. Sector 6 in Kharghar
iii. Sector 36 in Kharghar
iv. Sector 47 in Kamothe
v. Kalundre
vi. Sector 26 in Taloja
vii. Sectors 7E and 1W in New Panvel

In the rural areas, apart from three PHCs in Nere, Vavanje and Kamothe, a 50-bed general hospital is run by the State government. Besides, there are several *Anganwadis*, which are used for providing basic health care facilities. There are six *Anganwadis* in Old Panvel, 29 in Kalamboli and six in Kharghar, which provide basic health care facilities. The PMC recently received a mobile medical unit under the NUHM, which will cover all the 29 villages twice a month.

It is quite evident that the existing government health care infrastructure managed by the PMC is way less compared with private healthcare infrastructure.

7.1.2 Current infrastructure requirement as per URDPFI guidelines

The existing health care infrastructure in the PMC region has been compared with the URDPFI guidelines to assess the current status and identify the gap in health care facilities.

As indicated in **Table 89**, the existing facilities in the city such as dispensaries, maternity centres, polyclinics, and hospitals (except diagnostics' centres) conform to the URDPFI guidelines. However, as per the guidelines, the city lacks veterinary hospitals and dispensary facilities for pets.

Table 89: Current infrastructure requirement as per URDPFI guidelines

Social infrastructure	URDPFI guidelines	Existing (2018)	Demand (2018)	Standard met (2018)
Dispensary	1 for 15,000	08	99	NO
Nursing home, child welfare and maternity centre	1 for 45,000 to 1 lakh	91	33	YES
Polyclinic	1 for 1 lakh	10	15	NO
Intermediate hospital (category B)	1 for 1 lakh	10	15	NO
Intermediate hospital (category A)	1 for 1 lakh	05	15	NO
Multi-speciality hospital (NBC)	1 for 1 lakh	05	15	NO
Specialty hospital (NBC)	1 for 1 lakh	05	15	NO
General hospital (NBC)	1 for 2.5 lakh	05	6	NO
Family welfare centre	1 for 50,000	00	30	NO
Diagnostic centre	1 for 50,000	171	30	YES
Veterinary hospital for pets and animals	1 for 5 lakh	00	3	NO
Dispensary for pet animals and birds	1 for 1 lakh	00	15	NO

Source: PMC's health department

[34] Source: CIDCO board resolution 2017

The above gap analysis clearly shows that there is a significant gap in infrastructure in the PMC region as far as multi-speciality and general hospitals are concerned.

7.1.3 Assessment of additional infrastructure requirements

Table 90 shows the demand assessment for health facilities in the PMC region. This assessment is made on the basis of URDPFI guidelines.

The requirements have been determined for short term (2025), medium term (2032) and long term (2041).

Table 90: Assessment of requirements for health facilities for the PMC region in the future

	2025	2032	2041
Population	20,95,843	24,99,616	30,18,752
Polyclinic	21	25	30
Multi-speciality hospital (NBC)	21	25	30
Speciality hospital (NBC)	21	25	30
General hospital (NBC)	06	10	12
Family welfare centre	42	50	60

Source: CRIS analysis

Table 89 shows that there are 91 nursing homes / child welfare and maternity centers in the PMC region and, hence, there is no need for more such centers. The same holds true for diagnostic centers (171).

7.1.4 Key issues

- As 11 MMRDA villages now form a part of the PMC. In fact, even the urban poor depend on government hospitals.

  Even though there are sufficient health care facilities in Panvel, the economically weaker section prefers to opt for public facilities due to non-affordability of private facilities. A burgeoning population urgently necessitates expansion of government health care facilities in the city.

  The public health care infrastructure needs to be strengthened, and the quality of services and accountability of service providers need to be improved.

- It is extremely important to increase the bed strength of the hospitals in Panvel. The World Health Organisation's (WHO) recommended standard of hospital beds is five beds per 1,000 population[35].

  According to the aforementioned issues and considering that the current population of the PMC region is ~14.80 lakh[36], the area requires at least 7,400 beds. However, the total number of beds in all the hospitals in the PMC region is just ~2,361[37].

- Almost all the staff in the health department is on a contractual basis due to which there may be lack of accountability.

[35] *Source: News articles*
[36] *CRIS Analysis*
[37] *As discussed with the PMC's health department (basis of data of beds of the hospitals which have been registered so far with PMC), the number of beds is likely to be ~3,300 once the registration process is completed*

7.1.5 The PMC's initiatives

Nudged by an increase in population in the region, the PMC is working towards improving the health services available to citizens. Some of the initiatives undertaken towards the same are as follows:

- The PMC plans to set up seven more urban PHCs in the region. It is also carrying out repair and maintenance of the existing urban primary health centres, at a cost of ~Rs 50 lakh.
- It also plans to set up two maternity and children's hospitals of 30 beds each.
- The 50-bed general hospital run by the state government in Panvel is being upgraded to a sub-district hospital with 120 beds.

7.2 Education

The Constitution of India states under Article 45 of the Directive Principles that the State shall endeavour to provide free compulsory education for all children up to the age of 14. This was converted to a fundamental right of every citizen through the 86th Constitution Amendment.

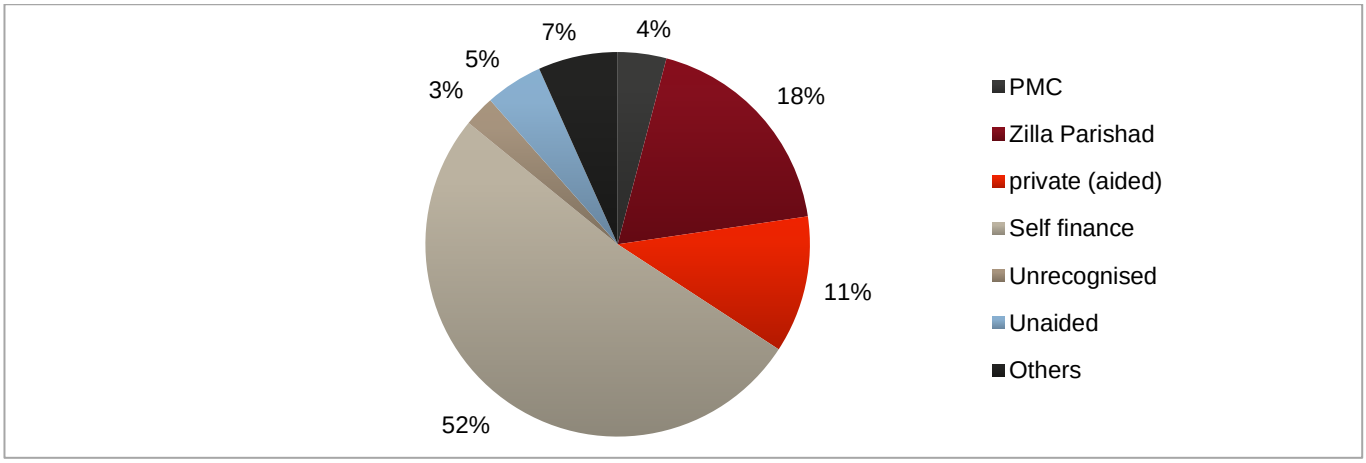
The provision of primary education is an obligatory function of the corporation, whereas secondary education is one of the discretionary functions under the municipal legislation in Maharashtra. The PMC provides education at the primary level, for which the state government provides grants to the extent of 80% of staff salary and the Corporation provides the remaining.

7.2.1 Existing educational facilities in the PMC region

- **Government schools:** Entirely funded and managed by the central, state or local governments - includes Corporation-run and *zilla parishad*-managed schools.
- **Aided schools:** Run by private managements, but funded largely by government grant-in-aid. These schools are called private aided or just aided schools.
- **Private schools:** Run entirely on fee-revenue and have no government intervention in financial or operational matters. Private schools are divided into two types: recognised and unrecognised schools.

There are 269 schools in the PMC region. The corporation runs 11 schools, out of which eight are Marathi medium, two Urdu and one Gujarati. Figure 24 gives the management-wise break-up of the schools in the PMC region.

Figure 24: Management-wise break-up of schools in the PMC area (as of fiscal 2018)



Source: PMC's education department

Out of the 269 schools in the PMC region, the Corporation has 11 schools while 50 come under the *zilla Parishad;* the rest are privately managed. In fiscal 2018, the Corporation-run schools had 1,938 students and 70 teachers.

Table 91: Student enrolment in PMC-run schools in past five years

Years	FY2018	FY2017	FY2016	FY2015	FY2014
Males	928	950	1004	1006	1048
Females	1010	1068	1134	1128	1186
Total	**1938**	**2018**	**2138**	**2134**	**2234**

Source: PMC's education department

Table 91 and Table 92 show that while the ratio of female to male students is high in the PMC-run schools, the enrolment ratio of girls to boys is much lower in the overall PMC region.

Table 92: Student enrolment in schools across Panvel in the past five years

Years	FY2018	FY2017	FY2016	FY2015	FY2014
Male	101269	97048	92273	88197	85039
Female	87956	84668	80438	77004	74377
Total	**189225**	**181716**	**172711**	**165201**	**159416**

Source: PMC's education department

CRIS analysed the data for PMC-run schools to understand the student-teacher ratio. While the number of students enrolled has slightly declined, the teaching staff has been constant. Table 93 gives an overview:

Table 93: Student-teacher ratio in PMC-run schools in the past five years

Years	FY2018	FY2017	FY2016	FY2015	FY2014
Student	1938	2018	2138	2134	2234
Teacher	70	72	73	72	72
Ratio	**27.69**	**28.03**	**29.29**	**29.64**	**31.03**

Source: PMC's education department

Table 93 shows that the number of students has reduced at the PMC-run schools (by ~13% in the past five years).

The student-teacher ratio at the PMC-run schools is 27:69. As per sections 19 and 25 of The Right of Children to Free Education and Compulsory Education Act 2009, the student-teacher ratio at the primary level is 30:1 and not exceeding 40 for admitted students being more than 200. Hence, the student-teacher ratio of PMC-run schools can be considered satisfactory compared with the Right to Education Act standards.

7.2.1.1 Schools in Panvel with infrastructure as per the Right to Education Act

The Right to Education (RTE) Act, which came into force in 2010, made education a fundamental right of every child in the country. It enables children who face disadvantages owing to their social, cultural, economic, geographic, and linguistic background to avail education provided by the government free of cost.

The act stipulates that all schools must comply with certain infrastructure and teacher norms to create an effective learning environment. Listed below is the compliance of the schools in the PMC region with these norms:

Table 94: Schools in the PMC region with infrastructure as per RTE[38]

	Govt. schools	Percentage	Pvt. schools (aided)	Percentage	Pvt. schools (unaided)	Percentage
Water facility	61	100	48	100	153	100
Buildings	61	100	48	100	153	100
Boys toilets	59	96.72	47	97.92	152	99.35
Girls toilets	60	98.36	48	100	153	100
Kitchen sheds	--	--	--	--	--	--
Ramps	59	96.72	38	79.17	71	46.41
Boundary walls	57	93.44	47	97.92	136	88.9
Playgrounds	56	91.80	47	97.92	120	78.43
Electricity	61	100	48	100	153	100
Drinking water	61	100	48	100	153	100
Computer classes	--	--	--	--	--	--
Other facilities						
Health check-ups	61	100	43	89.58	123	80.39
Mid-day meal scheme	61	100	22	45.83	--	--
Books	61	100	48	100	--	--
Uniform	50	81.97	--	--	--	--

Source: PMC's education department

7.2.1.2 Other facilities provided at PMC-run schools

Following are the basic facilities provided to students at the schools managed by the PMC:

- The PMC does not charge fees from students
- Uniforms and books for students are provided by the state government
- From June 2019 onwards, *Akshay Patra Foundation* will provide midday meals to the students at the 11 PMC-run schools as well as the 50 schools under *zilla parishad*

7.2.2 Current assessment of infrastructure requirement as per URDPFI guidelines

The existing education facilities have been compared with the URDPFI guidelines to check the current status of public education facilities and further identify the gap in the services.

Table 95: Existing education facilities' comparison with URDPFI guidelines[39]

Social infrastructure	URDPFI guidelines	Existing (2018)	Demand (2018)	Standard met (2018)
Primary to secondary education				
Primary school	1 for 5,000	153[40]	296	NO

[38] *Government schools include 11 PMC-run schools as well as 50 schools currently under zilla parishad since it will soon be covered under the ambit of the PMC*
[39] *Data excludes colleges as the PMC did not have data for the same*
[40] *There are 27 pre-primary / nursery schools, which have also been combined in the list*

Social infrastructure	URDPFI guidelines	Existing (2018)	Demand (2018)	Standard met (2018)
Senior secondary school	1 for 7,500	89	197	NO
Integrated school (with hostel facility)	1 for 90,000 to 1 lakh	0	16	NO
School for physically challenged	1 for 45,000	0	33	NO
School for mentally challenged	1 for 10 lakh	0	1	NO

Source: PMC's education department and URDPFI guidelines

It can be seen that the city lacks sufficient schools at the primary and pre-primary school levels. Table 95 shows that as per the URDPFI norms, there is a deficit of 143 schools at the primary level and 108 schools at the secondary level.

Further, the city lacks public education facilities such as integrated schools with hostel facilities and schools for the physically and mentally challenged.

7.2.2.1 Assessment of additional infrastructure requirement

Table 96 shows the demand assessment for schools in the PMC region. This assessment is made on the basis of the URDPFI guidelines.

The requirements have been determined for short term (2025), medium term (2032) and long term (2041).

Table 96: Future education facilities' requirements for the PMC region

	2025	2032	2041
Population	2,095,843	2,499,616	3,018,752
Primary school	419	500	604
Senior secondary school	279	333	403
Integrated school (with hostel facility)	23	28	34
School for physically challenged	47	56	67
School for mentally challenged	02	02	03

Source: CRIS analysis

7.2.3 Key issues

The key issues plaguing schools managed by the PMC and *zilla parishad* are as follows:

- **No computer labs**

  Table 94 reveals that the schools managed by the PMC and *zilla parishad* lack computer education facilities.

- **Lack of staff in the PMC-run schools**

  The Corporation-run schools lack administrative staff, thereby putting pressure on teachers to do additional work.

- **Decline in the number of school admissions in the PMC-run schools**

  The number of enrolled students has decreased steadily over the past few years. It fell ~13% from 2,234 in 2014 to 1,938 in 2018.

- **The PMC-run schools have insufficient playgrounds**

  As per URDPFI guidelines, a minimum 18 m x 36 m playfield area should be ensured for effective play. However, playgrounds in the PMC-run schools are not up to this size

- **None of the PMC-run schools are English medium**

  This is likely to make it difficult for students who proceed for secondary education since the Maharashtra State Board follows the “best of five” rule in which English is compulsory.

- **The image of municipal schools is also a major deterrent in the enrolments**

  On improvement in financial conditions, parents would prefer to send their children to a private school (even if under the Economically Weaker Section quota).

7.2.4 The PMC’s initiatives

- The PMC plans to construct three more primary schools for girls. The proposal for it has been approved and is estimated to cost Rs 10.50 crore.

7.3 Recreational facilities

Recreational facilities are spaces created, reserved and developed by urban local bodies to promote an active lifestyle for the welfare of residents of a city. They play an important role in improving the quality of life as well as the sustainability of the city. Such spaces can reduce the sense of alienation faced by residents of a city by encouraging them to interact with one another and create a sense of belongingness. While the benefits of such spaces accrue to women and children, they also accrue to marginalised groups such as poor and elderly who have few other means of recreation within a city.

Recreational facilities provided by the government include open spaces, gardens, playgrounds, sports complexes, swimming pool and stadiums, community centers, and libraries.

Outdoor recreation areas should be well located to serve the needs of a community; have an appropriate design, size and form to meet the needs of people they intend to serve; and provide for future management and maintenance of the site.

7.3.1 Gardens and parks in the PMC region

Attractive, safe and accessible parks and green spaces offer positive social, economic and environmental benefits; improve public health, well-being and quality of life.

Gardens in the Panvel Old Council area were earlier maintained by the garden department of the erstwhile Panvel Municipal Council. After the formation of the PMC, gardens and open spaces in CIDCO nodes as well as 11 MMRDA villages are being managed by the Corporation.

At present, there are seven gardens and two playgrounds in the Panvel Old Council area[41]:

- Gardens
  - Lions Garden
  - Mahatma Gandhi Garden
  - Ashok Bagh
  - Hutatma Smarak
  - Chhatrapati Shivaji Maharaj Garden

[41] *Source: Environmental Status Report of Panvel Municipal Council 2014-15*

  - Ganpati Mandir
  - Rohidas Wada
- Playgrounds
  - Chhatrapati Shambhaji Maharaj Ground
  - Barns school ground

In addition to above, there are 54 gardens in the CIDCO nodes which will be handed over to the PMC (developed by CIDCO) and another 24 gardens under the "12.50% scheme[42]". CIDCO will also hand over 19 open spaces to the Corporation.[43]

7.3.1.1 Demand gap assessment as per URDPFI guidelines

The existing recreation facilities have been compared with the URDPFI guidelines to check the present status of recreation facilities and further identify gaps in the services. As indicated in the table below, the existing area under parks in the city is almost half of the requirement.

Table 97: Comparison of existing area in the PMC region (under parks and gardens) with URDPFI guidelines

Category	URDPFI guidelines		Required area (Ha.)	Existing area (Ha.)	Benchmark met
	Population basis	Area requirement (Ha.)			
Housing area park	1 for 5,000 population	0.50	375	390.75[44]	**NO**
Neighbourhood park	1 for 15,000 population	1	99		
Community park	1 for 100,000 population	5	75		
District park	1 for 500,000 population	25	75		
Sub city park	1 for 1,000,000 population	100	100		
Total			**724**	**390.75**	

Source: PMC, CRIS analysis

In addition to the above, the URDPFI guidelines suggest an overall recreational area of 10 to 12 sq m per person in a city. These facilities would include parks, gardens, zoological, traffic parks, developed tourist spots, amusement parks, ponds, lakes, and water bodies.

As seen in **Table 97**, in the PMC region, the total area under parks and gardens is ~390.75 hectares, which for an estimated population of 14.8 lakh results in per capita area of 2.64 sq m[45], which is much less than the recommended URDPFI guidelines.

[42] *Also called "Saadey Bara Taka" scheme*
[43] *Source: CIDCO Board Resolution 2017*
[44] *This area includes total area under parks and gardens in the Panvel Old Council area as well as the total area under the same in the erstwhile CIDCO nodes (which now form part of the PMC region)*
[45] *The analysis includes total area occupied under gardens and playgrounds, and other recreational spaces in the Panvel Old Council area and the erstwhile CIDCO nodes, details of 11 MMRDA villages not known*

7.3.2 Socio-cultural facilities in the PMC region

Socio-cultural facilities such as community halls, auditoriums, recreational clubs, libraries, etc. help promote an active lifestyle for the city residents' welfare. They play an important role in improving the quality of life as well as the sustainability of the city.

7.3.2.1 Demand gap assessment as per URDPFI guidelines

Requirements for basic socio-cultural facilities such as community rooms and halls, recreational clubs, libraries, etc. have been determined as per the URDPFI standards. Table 98 lists the requirements for the PMC region:

Table 98: Present demand estimation for socio-cultural requirements for the PMC region[46]

Category	Present population	URDPFI guidelines	Land area requirement (sq m)	Requirement (No.)
Community room	1,480,667	1 for 5,000 population	750	296
Community hall / library		1 for 15,000 population	2000	99
Music / dance / drama centre		1 for 100,000 population	1000	15
Recreational clubs		1 for 100,000 population	10,000	15

Source: CRIS analysis

The Panvel Old Council area has one theatre for drama, named after freedom fighter *Vasudeo Balwant Phadke*. There is a library at Dr. Babasaheb Ambedkar Bhavan which consists of an auditorium for students on the first floor and library on the second floor. Both were developed by erstwhile Panvel Municipal Council for the public and inaugurated in 2014.

The PMC region has 30 public libraries, which is less than the requirement as per the URDPFI guidelines.

It may be noted that CIDCO will also allot five community centres and seven plots for proposed community centres to the PMC.

Table 99: The community centre facilities to be handed over by CIDCO to the PMC

S No	Node	Location	Remarks
1	Kharghar	Sector 12	Constructed
2	Kharghar	Sector 4, plot 2A	Plot
3	Kharghar	Sector 10, plot no.2C	Plot
4	Kharghar	Sector 10, plot no.251	Plot
5	Kharghar	Sector 36, plot no.12	Plot
6	Taloja	Sector 21, plot no.2	Plot
7	Kalamboli	Sector 5E	Constructed
8	Kalamboli	Sector 10E, plot no.55	Plot
9	Kamothe	Sector 21	Constructed
10	Kamothe	Sector 6A, plot no.31	Under construction
11	New Panvel (E)	Sector 18E	Constructed
12	New Panvel (W)	Sector 8, plot no.14	Plot

[46] *Exact data of socio-cultural facilities in the PMC region is not available, hence the table lists only demand assessment*

7.3.3 Key issues for gardens and recreational spaces

As seen above, compared with the URDPFI guidelines there is a huge deficit in the area required under parks, playgrounds and other recreational spaces. Identification of land for recreation is a challenge.

In addition to the shortage of area under this category, most of the play areas fall short of the standard space (as specified by the URDPFI guidelines).

7.3.4 The PMC's initiatives

The PMC is preparing a development plan, which will help in reassessing the spaces required under gardens, playgrounds and other recreational spaces. Initiatives taken to ensure sufficient space under gardens, playgrounds, etc. are as follows:

- The PMC has issued work order for beautification of Wadale Talab - one of the oldest lakes in Panvel. An amount of Rs 10.74 crore has been sanctioned for the project, which involves developing two parking slots on either side of the lake along with a food plaza and a promenade[47].
- Under Shatkoti Mission of the state government, the Corporation plans to plant 15,000 saplings.
- Three more gardens will be developed in the PMC region under the AMRUT Mission. Table 100 provides detail of the gardens planned:

Table 100: Gardens to be developed in the PMC region under AMRUT

S No	Respective government resolution (GR)	Area (sq.m)	Cost (Rs crore)
1	AMRUT-2015/P.N.197/UD-33 dtd.13th October'15	976	1.0
2	AMRUT-2016/P.N.187/UD-33 dtd.29th September'18	2550	1.5
3	AMRUT-2016/P.N.187/UD-33 dtd.02nd November'17	2469	2.0

[47] *Source: News articles*


HOTEL
Arthik Icchaa Purti



8.

Housing and urban poverty

This section provides a detailed overview of the existing housing scenario in the city in terms of the present stock and quality of housing. It also deals with the details of slums, and enumerates the programmes undertaken under the slum improvement and rehabilitation schemes and their status.

8.1 Housing scenario in the city

As is evident in the demography section, Panvel is increasingly becoming densely populated. Accordingly, the demand for affordable housing in the city has been rising steadily.

Excellent rail and road connectivity to key parts of the Mumbai Metropolitan Region (MMR) with connection to both the central and western lines of the suburban railway network, the existing Mumbai-Pune Expressway and the Sion-Panvel Highway, which makes commuting to either Mumbai or Pune convenient, have made Panvel a new residential hub.

A spate of mega infrastructure projects such as Mumbai Trans-harbour Link, the Navi Mumbai International Airport, Virar-Alibaug multimodal corridor, metros and CSMT-Panvel fast lane railway linkages, along with expressways and freeways, will result in enhanced connectivity and make the daily commute easier. The planned infrastructure projects and availability of land have made Panvel a real estate hotspot. Many reputed real estate developers have already commenced township projects in the region.

A study by 99 Acres for the October-December 2016 quarter highlights that New Panvel clocked 4% on-quarter increase in average weighted property prices on the back of several infrastructure projects such as the proposed six-lane Trans Harbour Link connecting South Mumbai to Nhava Sheva, the upcoming new international airport in Ulwe, and the under-construction Panvel railway junction. Since the region is positioned as a cost-friendly suburb, the buyer community, who had stalled their purchase decision, opted for localities such as Taloja, Roadpali and Kalamboli for leasing two and three BHK apartments. The localities registered an 11-14% hike in annual rental rates.

Figure 25: Capital and rental market in Panvel



Source: 99 Acres

As per 99 Acres' latest report for the October-December 2018 quarter, Panvel and its surrounding regions (such as Ghansoli) have emerged as an attractive home-buying destination in the December 2018 quarter. This region recorded a 30% uptick in housing demand vis-à-vis the December 2017 quarter. **Table 101** and **102** summarise the changes in capital and rental values, respectively, during 2015 to 2018.

Table 101: Capital values in the PMC region

Locality	Rate per sq ft Oct- Dec 2015	Rate per sq ft Oct-Dec 2018	% change
Kalamboli	6390	7000	10%
Kamothe	6900	7400	7%
Khanda Colony	7583	7450	-2%
Khandeshwar	6800	7850	15%
Kharghar	8650	9150	6%
New Panvel	5500	5810	6%
Panvel	6150	6100	-1 %
Roadpalli	6750	6675	-1%
Taloja	5150	5200	1%
Overall PMC region	**6653**	**6959**	**5 %**

Source: Insite, Quarterly real estate analysis of Mumbai, 99 Acres

Table 102: Rental values in the PMC region

Locality	Rate per sq ft Oct- Dec 2015	Rate per sq ft Oct-Dec 2018	% change
Kalamboli	-	12	-
Kamothe	11	13	18 %
Kharghar	14	17	21 %
New Panvel	12	12	0 %
Panvel	11	12	9 %
Roadpalli	9	11	22 %
Taloja	-	9	-
Overall PMC	**11.4**	**12.2**	**8 %**

Source: Insite, Quarterly real estate analysis of Mumbai, 99 Acres

The above table clearly reveals that majority of areas in Panvel have seen positive growth rate in capital values; Khandeshwar and Kalamboli witnessed the highest growth. Overall, the real estate market in PMC has grown 5% in the past three years. Similarly, the rental market in the PMC has fared quite well with 8% growth over the same period. Kharghar and Roadpalli witnessed the highest growth.

CIDCO housing

CIDCO has prepared an action plan to construct 10,000 houses every year catering to all strata. It has built ~1, 23,577 houses so far, of which 51% are for economically weaker sections (EWS) / lower income groups (LIG), while 26% are reserved for middle income groups (MIG) and 23% for higher income groups (HIG). In January 2014, ValleyShilp a premium Housing Scheme of 1,224 apartments was launched in Sector 36, Kharghar, Navi Mumbai, catering to MIG and HIG. In August 2014, Swapnapurti, an affordable housing scheme of 3,152 tenements was launched in Sector 36, Kharghar, Navi Mumbai. (CIDCO Budget 2018-19)

8.2 Housing scenario as per census

Census 2011 mentions the total number of houses in the Panvel Old Council area, Navi Mumbai Panvel Raigad (CT), Kharghar (CT), Kalundre (CT) and Taloja (CT) as 1.81 lakh[48]; Out of total census houses in Panvel old council area and Navi Mumbai Panvel Raigad (CT), 75% (1.10 lakh houses) are occupied and 25% are vacant.

Table 103: Housing as per census

Area	Type of house (2011)		
	Occupied	Vacant	Total
Panvel old council area	55447	16185	71632
Navi Mumbai Panvel Raigad (CT)	54599	20495	75094
Taloja Panchnad	3334	NA	3334
Kharghar (CT)	29834	NA	29834
Kalundre (CT)	2047	NA	2047
Total	**145261**	**36680**	**181941**

**NA- Data not available for vacant houses*

Source: Census 2011

8.2.1 Typology of census houses

As per Census 2011, the occupied census houses have been categorised into various typology and information is restricted to the Panvel Old Council area and Navi Mumbai Raigad (CT).

Among the occupied census houses, residences form a major chunk (76.78%), followed by shops / offices (10.65%).

Table 104: Typology of census houses (as per 2011 census)

Type of house uses	2011	
	Total*	%
Residence	83,503	76.78 %
Residence cum other use	945	0.87 %
Shop/office	11,585	10.65 %
School/college, etc.	301	0.28 %
Hotel/lodge/guest house, etc.	368	0.34 %
Hospital/ dispensary	547	0.50 %
Factory workshop/workshed	890	0.82 %
Place of worship	331	0.30 %
Other non-residential uses	10,291	9.46 %
Total		**100%**

** Data only for Panvel Old Council area and Navi Mumbai Raigad (CT)*

Source: Census'2011

[48] *The data in 2011 census does not have details of census houses in villages which form a part of the present PMC region*

8.2.2 Condition of census houses

The quality of housing for residential and residential-cum-other uses has been analysed for 2011. As per Census 2011, the Panvel Old Council area and Navi Mumbai Raigad (CT) combined have 0.84 lakh census houses under the residential and residential-cum-other categories. Out of this, 0.69 lakh houses are in good condition, which account for 82.9%, and 0.13 lakh houses are in liveable condition, accounting for 16.4%. About 708 houses are in dilapidated condition (0.83%).

Table 105: Distribution of houses as per condition

Area	Type of house (2011)				Type of house (2001)			
	Good	Liveable	Dilapidated	Total	Good	Liveable	Dilapidated	Total
Panvel old council area	36194	5814	392	42400	15552	4395	941	20888
Proportion of houses	85.4 %	13.7%	0.9 %	100 %	74.5 %	21.0 %	4.5 %	100 %
Navi Mumbai Raigad (CT)	33728	8004	316	42048	NA	NA	NA	NA
Proportion of houses	80.2 %	19.0 %	0.8 %	100 %	NA	NA	NA	NA
Total	**69922**	**13818**	**708**	**84448**	NA	NA	NA	NA
Proportion of houses	**82.8 %**	**16.4 %**	**0.8 %**	**100 %**	NA	NA	NA	NA

Source Census 2001 and 2011

Further, in order to analyse the improvement in housing conditions in Panvel old council area, figures in 2001 have been studied. The share of housing in good condition increased from 74.5% in 2001 to 85.4 % in 2011. Houses in a dilapidated condition dipped from 4.5% in 2001 to 0.9% in 2011.

8.2.3 Distribution as per dwelling units

The distribution of housing stock for households has been analysed for 2001 and 2011. In case of the Panvel Old Council area, most households fall in the bracket of two / three rooms which is fairly good. Demand for one-room houses fell from 30.2% in 2001 to 20.1% in 2011.On the other hand, for two and three rooms it increased over 2001 to 2011.

Navi Mumbai Raigad (CT) has more households with one/two rooms compared with the Panvel Old Council area, which has more three-room houses.

Table 106: Distribution of Households as per dwelling units

Area	Household type (2011)						Household type (2001)					
	No exclusive room	One room	Two rooms	Three rooms	Three plus rooms	Total	No exclusive room	One room	Two rooms	Three rooms	Three plus rooms	Total
Old Panvel	880	8,524	13,979	13,719	5364	42466	213	6,420	6,561	5,812	2225	21231
Proportion as per no. of rooms	2.1 %	20.1 %	32.9 %	32.3 %	12.6 %	100%	1.0 %	30.2 %	30.9 %	27.4 %	10.5 %	100%

Area	Household type (2011)						Household type (2001)					
	No exclusive room	One room	Two rooms	Three rooms	Three plus rooms	Total	No exclusive room	One room	Two rooms	Three rooms	Three plus rooms	Total
Navi Mumbai Raigad (CT)	1,419	16,083	15,200	7,536	1892	42130	NA	NA	NA	NA	NA	NA
Proportion as per no. of rooms	3.4 %	38.2 %	36.1 %	17.9 %	4.5 %	100%	NA	NA	NA	NA	NA	NA
Total	2299	24607	29179	21255	7256	84596	NA	NA	NA	NA	NA	NA
Proportion as per no. of rooms	2.7 %	29.1 %	34.5 %	25.1 %	8.6 %	100 %	NA	NA	NA	NA	NA	NA

Source: Census 2011 and CRIS analysis

8.3 Slums in the PMC

The PMC is implementing the PMAY, a scheme devised by the central government to provide affordable housing for the poor. The PMC has set up a cell for its implementation. As part of the PMAY implementation, a survey of the slums in the city was carried out and Table 107 provides the details. All the slums in PMC area are non-notified.

Table 107: Details of the slums in the PMC area

Sr No	Name of the slum	Total hutments
1	Navnath Nagar	656
2	Panchshil Nagar	608
3	Railway Mal Dhakka	195
4	Podi -1 (More Chal)	51
5	Podi 2.5	47
6	Siddharth Nagar	21
7	Bhim Nagar	102
8	Ganesh Nagar	21
9	Mata Ramai Nagar	139
10	Puranik Wadi	13
11	Jay Sevalal Nagar	95
12	Walmiki Nagar	232
13	Mahakali Nagar	34
14	Indra Nagar	246
15	Laxmi Vasahat	373
16	Ashok Bag	206
17	Takka (Vaidu/Katkar Wadi)	163
18	Kachhi Mohalla	325
19	Patel Mohalla	493

Sr No	Name of the slum	Total hutments
20	Vrishali Talav	18
21	Katker Vadi	36
22	Shivaji Nagar	367
23	Market Yard	20
24	Bhavan Banglow	81
25	Bhaskar Wadi	10
26	Azad Nagar	37
	Total	4589

Source: PMAY cell, PMC

The PMC has submitted two detailed reports to the government – "*In situ slum redevelopment scheme"* and "*Affordable housing in partnership" - and is* awaiting approval. The DPR have been prepared amalgamating both the verticals of PMAY mentioned above. As per one of the reports, 1,483 dwelling units will be constructed[49]. These units will be on the one BHK module with carpet area of 26.53 sq m.

8.3.1 Growth of slums in the PMC region

Prior to the recent slum survey under PMAY, the PMC had conducted two more surveys in 2000 and 2008.

Table 108: Slum growth

Year	2000	2008	Current
Slum hutments	2208	3055	4589
% increase	-	38.3 %	50.21 %

Source: City Sanitation Plan-PMC

The table shows that the present number of slum hutments in the PMC region is twice that in 2000. Slum hutments increased ~38% over 2000 to 2008 and 50% over 2008 to 2018.

8.3.2 Slums as per census

As per census 2011, there were 3,272 slum census houses in the Panvel Old Council area, of which 86.3% were occupied and the rest were vacant. There are 2,062 slum census houses and 2,068 households in residential and residential-cum-other uses category.

8.3.3 Infrastructure facilities in slums

The basic infrastructure facilities available in slums of the Panvel Old Council area are described below[50]:

8.3.3.1 Water supply

There are around 407 tap connections in slums of Panvel. Tankers belonging to the Municipal Council make around 30 trips for water distribution in areas where water supply is insufficient.

[49] *In situ slum redevelopment DPR*
[50] *Source: City Development Plan of Panvel Municipal Council*

8.3.3.2 Sewerage

There are very few slum households with individual toilets. There are 16 community toilets with 78 public seats which cater to the needs of slum dwellers. There is no underground drainage system in slums. All the toilets in slums are connected to septic tanks which are cleaned with the help of one suction machine available with the PMC.

8.3.3.3 Solid waste management

Collection of solid waste is done since door-to-door collection is not possible. Vehicle reaches near the slum establishment and waste is transferred into it.

8.3.3.4 Storm water drainage

There is no storm water drainage present in slums in PMC.

8.3.3.5 Roads

The slums in PMC have approach roads, but these are not paved access ways.

8.3.4 Demand for slum housing

The Table 109 provides a projected number of slum households in the PMC region in the future. The assessment has been done on the basis of slum households in 2011 and population projected in the demography section.

Table 109: Demand for slum housing

Year	2011	2025	2032	2045
Total households	122400	502600	599428	723941
Total slum households	2068	8494	10130	12234

Source: CRIS analysis

8.3.5 Key issues

The key issue in slums is lack of basic infrastructure facilities. There is no proper sewerage and storm water network. There are issues with safe disposal of sewerage. The road available is not paved. The slums also lack social infrastructure facilities such as schools.


पुढे शाळा आहे



9.

Urban environment

Panvel is one of the fastest growing cities in Maharashtra. The pace of urban development in the city has been fast due to the pressures of the urbanisation, infrastructure projects and developmental activities across the region. Urban environment is important for any city's development as it drives growth at each level for all the sectors. It encompasses health and safety aspects for the citizens of the city. Hence, it is essential to assess the current situation of the urban environment and issues related to it.

9.1 Ambient air quality

There are three air monitoring stations in PMC region installed under National Ambient Air Quality Monitoring Programme. They are located at

- CIDCO nodal office, Kharghar
- Water pump house, behind ST stand, Pavel
- MIDC Taloja

Table 110: Air quality parameters in the PMC region

Parameter	Annual average volume (µg/m3)			CPCB standard
	2017	2016	2015	
S02	Kharghar- 21 ST stand- 22 Taloja MIDC-23	Kharghar- 18 ST stand- 19 Taloja MIDC-22	Kharghar- 17 ST stand- 18 Taloja MIDC-20	50
NO2	Kharghar-42 ST stand- 46 Taloja MIDC-47	Kharghar-45 ST stand- 49 Taloja MIDC-49	Kharghar- 41 ST stand- 42 Taloja MIDC-45	40
PM10	Kharghar-90 ST stand- 110 Taloja MIDC-109	Kharghar-112 ST stand- 120 Taloja MIDC-124	Kharghar-108 ST stand- 137 Taloja MIDC-149	60
PM2.5	NA	NA	NA	

Source: CPCB website

SO2 and NO2

The observed concentration of SO2 (covering all stations) varied from 14 to 58 µg/m3 in 2017. The concentration of NO2 was in the range of 25-71 µg/m3.The highest concentration was observed at the Taloja area station among the locations monitored, which may be credited to it being largest industrial area in Panvel. The concentration of S02 was observed to be below the CPCB standards, whereas concentration of NO2 was higher than the standards mentioned by CPCB.

PM10

PM10 concentration varied from 27 µg/m3 to 264 µg/m3 in 2017. The concentration of PM10 was observed to be higher than the standards mentioned by CPCB.

9.2 Noise pollution

Panvel is becoming increasingly crowded, busy and noisy. The leading sources of noise in the city are road traffic, railroads, residents, and construction. The noise levels in the city are monitored in different sectors such as

residential, commercial and industrial areas during day and night intervals. Noise levels are recorded with the help of a noise level meter. It has been observed that noise levels at all the zones (silence, residential, and commercial) exceed the standards in most areas during the day.

Table 111: Average noise levels in Panvel

S No.	Location	Day time noise level (dB)	Night time noise level	Day time noise level limit	Night time noise level limit
1	Near PMC office	71.2	47.4	65	55
2	Patel *Mohalla*	60.2	45.6	55	45
3	Near ST stand	61.7	55.9	65	55
4	Near *Panchmukrti Maruti mandir*	67.8	55.1	65	55
5	Uran naka fish market	66.2	50.6	65	55
6	Rotary circle	62.2	58.9	65	55
7	Kapad bazaar	63.9	45.2	65	55
8	Khanda colony	61.8	51.1	65	55
9	New Panvel bridge	67.1	55.4	65	55
10	Near HOC colony	65.3	44.8	55	45

Source: Environmental Status Report (ESR), 2014-15 of old Panvel Old Council Area

9.3 Water pollution

Panvel has a variety of water bodies such as river, lake, creek, etc. The leading source of water pollution in Panvel is discharge of effluents and toxic substance into water bodies. Water pollution levels in the city are monitored at various locations, including river, lake, well, tap water and *nallah.*

Lakes and wells

There are around eight lakes in and around Panvel old council area - Israyal, Lendale, Devale, Krishnale, Vadale, Khandeshwar, Dundale, and Dhakta Khanda. These lakes are being used for domestic and recreational purposes. The PMC has taken steps to protect these lakes from getting polluted with Lake Beautification projects. As per ESR report 2014-15, the basic water parameters such as BOD, COD, pH and TSS were found to be well within the prescribed limits for all the lakes except Isyaral where BOD level was above the prescribed limit.

There are about 37 public and private wells which supplement the river water. Samples were collected from three wells and water parameters were found well within the prescribed limit.

River

Gadhi is one of the main rivers which passes through Panvel. As per the ESR report, the samples collected at two locations in the river showed that water is highly contaminated, mainly due to sewerage and waste water being released into the river.

Kalundre, Taloja, and Navde are other rivers which pass through Panvel. No monitoring of water quality parameter is carried by MPCB in these rivers[51].

Drinking water

[51] *Source: Environmental status report for MMR region, 2015*

The PMC supplies drinking water through its distribution system. As a part of health concern, water quality monitoring was carried out at various locations under ESR 2014-15. Samples were collected from nine locations from different parts of the city and analysed for drinking water parameters. It was observed that the drinking water is safe chemically and bacteriologically, exception being COD levels which were above the prescribed limit at Hari Om water tank, Koli Wada and Maruti Mandir.

Panvel creek

There is a water quality monitoring station at Panvel creek. Water quality parameters measured here were found to be exceeding the permissible limits, may be due to untreated sewage discharge and the inefficiency of sewerage treatment plants present in the region.[52]

Table 112: Water quality in Panvel creek

Parameters	2010-11	2011-12	2012-13	Permissible limit
BOD	32.7	9.3	27.1	3
Fecal coliform	250	311	168	100/100 ml (MPN)

Source: ESR of MMRs, 2015

[52] *Source: Environmental status report of MMR , 2015*


ST. GEORGE CATHOLIC CHURCH
NEW PANVEL
(DIOCESE OF KALYAN)


पनवेल महानगरपालिका अग्निशमन केंद्र
दुरध्वनी क्रमांक : २७४६१५००
FIRE
TATA
MH·06
J·31



10.

Disaster management, fire-fighting and emergency

Disaster is defined as a catastrophe, calamity or grave occurrence arising from natural or manmade causes, or an accident, or negligence, which results in suffering, or loss of human life, or loss to property, or damage to the environment.

Currently, the PMC does not have a dedicated disaster management cell, with the fire department entrusted with the responsibility.

Based on discussions with PMC officials, the need to augment the corporation's existing firefighting and emergency response facilities have been identified as a priority project.

10.1 Fire safety infrastructure

Fire safety rules and firefighting facilities are crucial to ensure prompt response to accidents. In fact, fire and emergency services are mandatory for urban local bodies under the 12th Schedule of the 74th Constitutional Amendment Act.

In the PMC, villages (comprising many g*authans)* and slums house majority of the inhabitants. Hence, it is of utmost importance for the corporation to have a sound fire response mechanism and effective firefighting infrastructure.

10.2 Existing fire infrastructure

Currently, there is only one fire station under the PMC, which is located at the corporation office (Old Panvel). The PMC will soon have fire stations in New Panvel, Kalamboli and Rohinjan also, which are currently operated by CIDCO.

The fire station under the PMC has:

- One water tender
- One mini water tender
- One utility van
- One jeep

Anthropogenic disasters in PMC region

Unnatural and manmade disasters such as road accidents, industrial accidents, fires, drowning, explosion, etc. can occur because of a technical mistake or manmade changes to the environment.

In 2018, there were 106 fire incidents reported in the Panvel Old Council region. Also, the Old Council region had 79 other accidents during the year.

10.3 Current infrastructure requirements

Sufficiency of the fire services in the PMC region has been assessed, considering the Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines and Standard Fire Advisory Committee (SFAC) norms.

Currently, there are only 32 staff members attached to the fire station under the PMC as against a requirement of 171 personnel as per SFAC recommendations. Of the 32 members, 21 are firemen. Limited manpower and infrastructure restricts the fire department from effectively responding to emergencies.

In fact, with the available equipment, fire services can be provided to buildings of only up to 15 metres in height. In such a scenario, any residential or commercial tower exceeding 15 metres will be difficult to service in the event of a fire. Below table details the gaps in fire service amenities and equipment at Panvel Municipal Corporation:

Table 113: Fire safety services - provisions and current gaps according to URDPFI and SFAC rules[53]

Sr no.	Amenities / infrastructure	Standard	As per standard	Existing - 2018	Gap	Standard met
1	Fire station	1 fire station for 2 lakh population[54]	07	04[55]	03	No
2	Pumping station	Up to 50,000 – 1; up to 3 lakh – 6; Additional 1 lakh – 1	07	00	07	No
3	Fire tender	One fire tender per 50,000 population up to 3 lakh population. One additional fire tender per one lakh population or a fraction thereof *plus* a reserve of 20% of the total water tenders[56]	13	05[57]	08	No
4	Rescue tender	Per 3 to 10 lakh	02	00	02	No
5	Advance emergency rescue tender	One per district (minimum) up to 10 lakh population, and one additional unit for every 10 lakh urban population	02	00	02	No
6	Foam tender	One water tender should be replaced with foam for fire stations in whose jurisdiction there is a small industrial area	01	00	01	No
7	DCP tender	Minimum one per district or one for 8-10 fire stations. Fire stations having an industrial plot area above 1.0-3.0 sq. km, there should be 2	02	00	02	No
8	BA van	One each per district.	01	00	01	No
9	Motorcycle with 2 water mist sets	One each at fire stations serving higher population density or in congested areas with each **QRT**.	01	00	01	No
10	Fire boat	One each at selected fire stations in whose jurisdiction some inhabited area exists near water bodies, such as lake, major river, sea, where firefighting can be better performed through watercourse	01	00	01	No
11	Ambulances	As per need	01	00	01	No

Source: PMC fire department, URDPFI and SFAC guidelines

It is evident from the above that the firefighting facilities at the disposal of the PMC needs to be augmented. Along with recruiting additional staff and deploying more vehicles, the existing fleet also needs to be strengthened with new technology, high-end fire tenders as well as state-of-the-art equipment for rescue missions.

[53] *As per SFAC guidelines, for special vehicles such as turntable ladder, hydraulic platform, etc. wherein number can be decided with the advice of local fire chief, has not been included in the table. HAZMAT van also not required; hence, not included in the table*
[54] *URDPFI guidelines*
[55] *Also includes the three fire stations at Kalamboli, Rohinjan and New Panvel which are currently operated by CIDCO*
[56] *SAFC guidelines*
[57] *Includes three fire tender for which work order has been issued*

10.4 Key issues

Key concerns with regard to disaster management in the PMC region are:

- No disaster management cell or disaster management plan in place
- Lack of adequate number of fire stations and related equipment. There is a need for additional fire stations to reduce the response time
- Lack of sufficient staff to man fire stations.

10.5 PMC initiatives

To resolve issues faced in managing a disaster in the PMC region, the corporation has taken the following initiatives:

- Has planned for a staff of 208 people for the fire department[58]
- Procure additional equipment in fiscal 2019-20:
  - Three fire tenders
  - One turntable ladder
  - One aerial ladder platform
  - Two water browser with tower monitor
  - One rescue tender
  - One BA van

As per discussions with PMC officials, work order has been issued for procuring three fire tenders. Also, an ambulance is being arranged for the fire department.

[58] *To be implemented once PMC gets approval for 1,917 new posts*

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11.

Heritage and tourism

Tourism has immense potential for social, economic and inclusive growth of an area. It also has the capacity to create large-scale employment for the unskilled population. Tourism helps generate foreign exchange as well, stimulate trade, provide income, and spur infrastructure and regional development.

Given the diverse cultural heritage and the abundant natural resources in the region, Panvel has the potential to become a tourist destination. The city and its surrounding region have destinations ranging from gardens, hills, temples, forest, wildlife, hill stations, water bodies, flora and fauna, a golf course, as well as a rich tradition of festivals, art and culture.

11.1 Heritage

Heritage comprises buildings, artefacts, structures, areas and precincts of historic, aesthetic, architectural or cultural significance, and includes natural features within such areas or precincts of environmental significance or scenic beauty, such as sacred groves, hills, hillocks, water bodies (and areas adjoining the same), open areas, wooded areas, etc.

There are 117 monuments protected by the Archaeological Survey of India (ASI) in the Mumbai Circle as monuments of national importance. Out of these, 49 monuments have been identified, listed and protected within Raigad district. However, there are no centrally-protected monuments in the jurisdiction of the PMC. Raigad district also have 2 state-protected monuments with both outside PMC jurisdiction

11.2 Major tourism spots in and around Panvel

Pandavkada falls

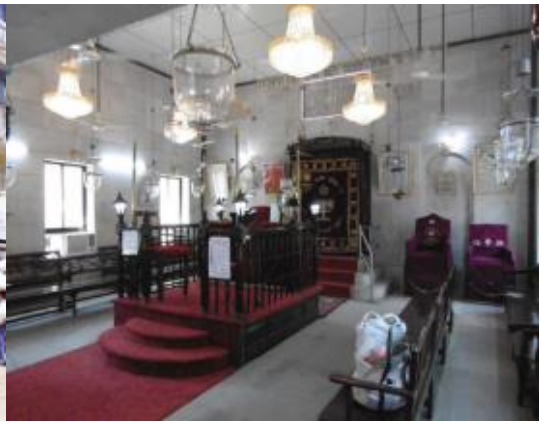
The 350 feet high Pandavkada or Pandavgad waterfall, which is near Kharghar, is a popular tourist spot for residents from Mumbai, Navi Mumbai and Panvel. The high tourist footfall is because of its accessibility via rail as well as road. While there is no infrastructure facility at Pandavkada, there are several hotels, restaurants, food malls in the vicinity.





Synagogue

A small community of Bene-Israel reside in Panvel. The architectural splendour of the synagogue attracts several people from Mumbai and nearby cities.

Central Park and golf course

Central Park in Kharghar can be easily accessed by road. The park is a green link between the hills dotting Kharghar and Panvel creek, while a natural channel runs from the hills to the creek with trees and vegetation in sporadic locations. Kharghar also has a 103-hectare golf course with a large tract of open green land.




Karnala Bird Sanctuary and fort

Karnala Bird Sanctuary is situated along Mumbai-Goa highway, NH-17, about 12 km from Panvel. This is first bird sanctuary in Maharashtra, covering 12.11 sq km. The bird sanctuary is home to 134 resident and 38 migratory bird species, and about 642 plant species.

At a height of 445 metres above sea level, Karnala is also known for its thumb-shaped peak, which is a favourite for professional mountain climbers.

Karnala Fort, also known as Funnel Hill, is a hill fort situated within Karnala Bird Sanctuary.





Balleshwar temple, Pali

Ballaleshwar temple is one of the eight Ashtavinayak temples of Lord Ganesha. It is located at Pali in Sudhagad tahsil, about 70 km from Panvel. The temple is situated between Sarasgad Fort and the Amba River.

Facilities such as toilets, parking and accommodation are available for devotees.




Varadvinayak temple, Mahad

Varadvinayak temple is another Ashtavinayak temple of Lord Ganesha. It is located in Mahad village in Khalapur tahsil, about 45 km from Panvel. This temple is said to be built in 1725 AD.





Prabalmachi

Prabalmachi is a quaint little village situated half-way up a mountain (such a plateau or ledge is called a "Machi" in Marathi) hidden in the hills off the old Mumbai – Pune highway about 15 km from Panvel. Prabalmachi is blessed with rocky cliffs, beautiful hilly terrain, and lush green grasslands. One can experience the magical sun-rise and sun-set view, *Sahyadri* ranges, *Matheran* hill, Gadhi River, Chanderi and Peb forts and the city of Mumbai.It is a popular camping site and act as base camp for *Prabalgad* & *Kalavantin durg* trekking.




Birthplace of Vasudev Balwant Phakde, Shirdhon

The house of Freedom Fighter, Vasudeo Balwant Phadke, situated in Shirdhon, which is 10 km from Panvel, is a major tourist centre.




11.3 Fairs and festivals

Panvel region epitomizes the Marathi culture, which lays emphasis on education, arts and crafts, music, theatre, etc. It can be seen as an example of blending of culture and heritage with modernity. The culture of region is well reflected through its cuisine, people, languages, etc.

Ganesh festival

This is the biggest festival celebrated in the region.

Holi

Holi, also called ‘festival of colours’, is a popular Hindu spring festival. It is celebrated at the end of the winter season on the last full moon day of the lunar month Phalguna, which usually falls in the latter part of February or March.

Narali Pournima

The full moon day of the month of shravan is celebrated with fervour in different parts of region, and is known variously as Narali Pournima, Shravani Pournima, Rakhi Pournima or Raksha Bandhan. 'Naral' means 'coconut', and Narali Pournmia is thus called because offerings of coconuts are made to the sea-god on this day. Narali Pournima also marks the advent of the new fishing season, and fishermen appease the sea-god before sailing out in their decorated boats.

Gudi Padwa

Gudi Padwa marks New Year's Day for Maharashtrians and Hindu Konkanis in India. A *shobha yatra* (procession) is carried out on the roads in Panvel.

Shiv Jayanti

Shivaji Jayanti is the birthday of Chhatrapati Shivaji Maharaj. It is celebrated in Maharashtra, with skits carried out on the streets depicting various stories about the warrior.

Local festivals

Several other festivals of gods and goddesses are celebrated by locals in different parts of the region.

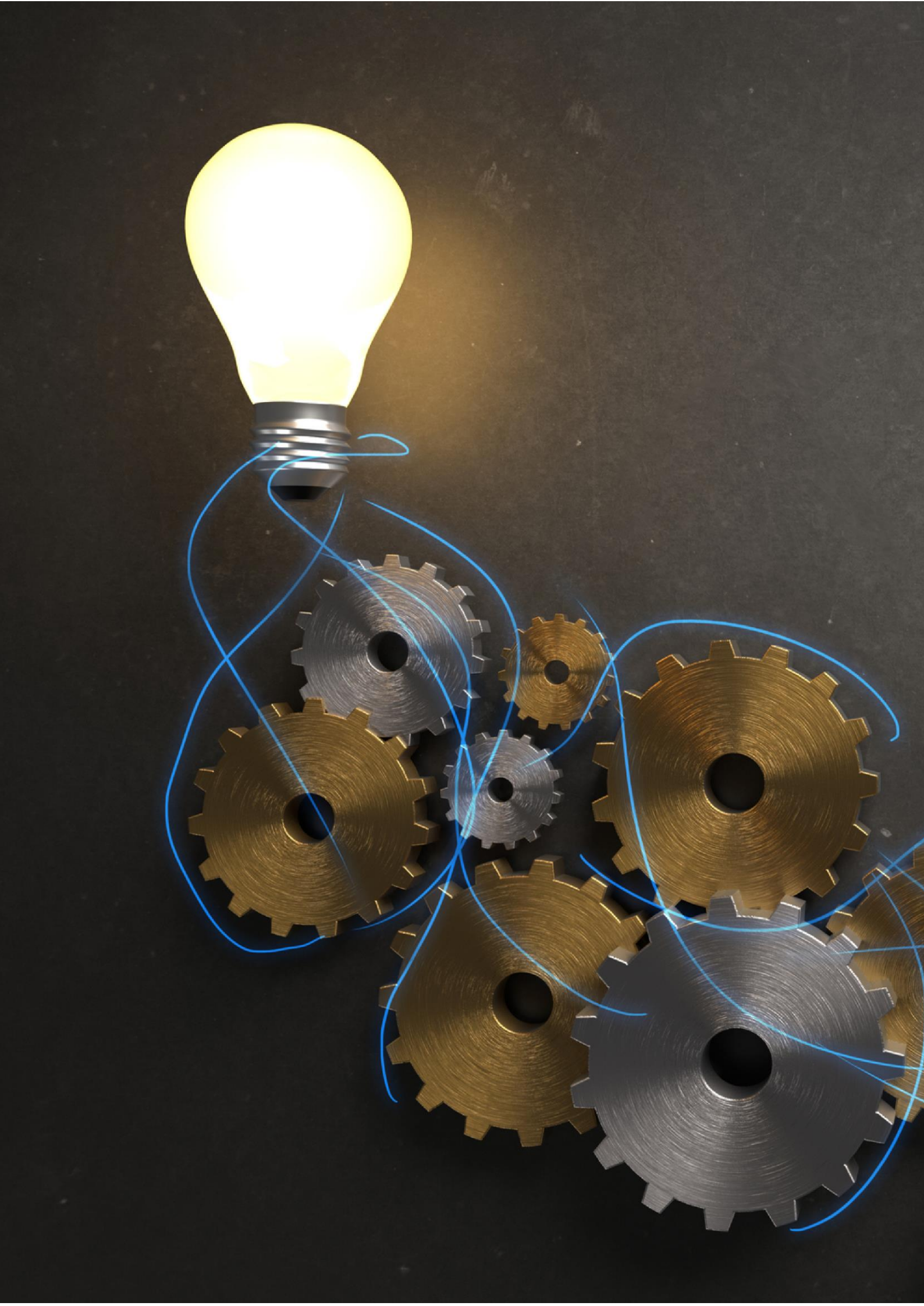


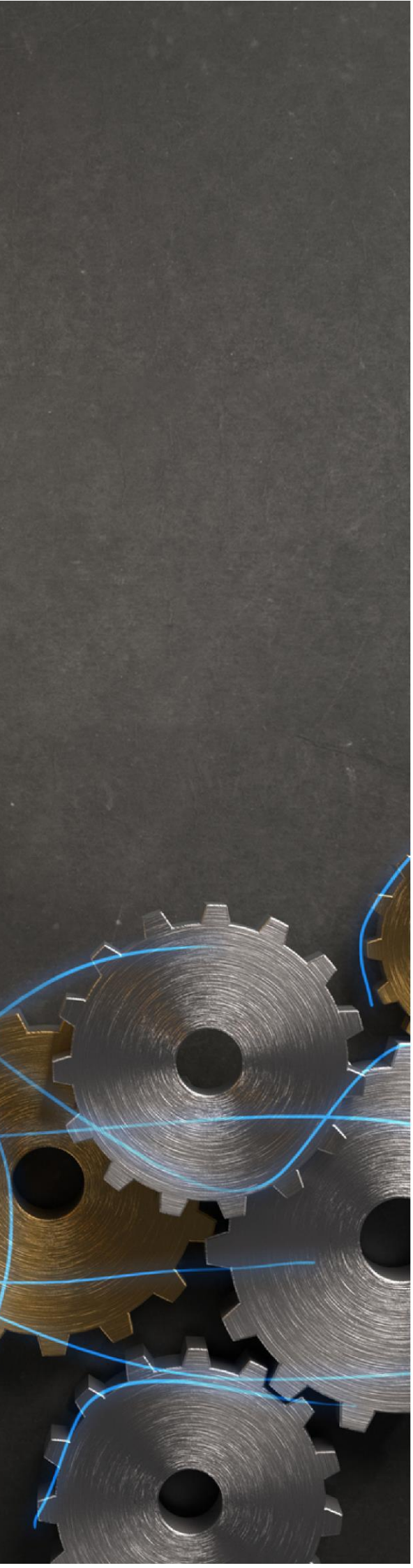
11.4 Key issues

Key issues regarding tourism in the PMC region are:

- Lack of identification, conservation and promotion of the heritage character of Panvel
- Non-listing of structure/sites with historical and heritage importance







12.

Assessment of institutions, systems and capacities

A detailed assessment has been carried on the structure of the organisations involved in the delivery of services, transfer of functions as per the 74th CAA, and implementation of reforms.

12.1 Urban governance system

Urban governance involves agencies with specific set of roles and responsibilities. The PMC is the primary agency responsible for urban governance-related activities in the Panvel region. It is supported by other agencies to carry out specific functions, as per the respective legislations governing them.

The PMC is the urban local body whereas CIDCO is the town development authority for certain areas in the PMC region. MPCB is responsible for monitoring of key pollution levels.

Table 114: Key authorities responsible for provision of services in the PMC region

Sr no.	Agency	Legislation
1	Panvel Municipal Corporation	Maharashtra Municipal corporation Act, 2014
2	CIDCO	Companies Act, 1956
3	MMRDA	MMRDA Act, 1974
4	MPCB	Maharashtra Prevention of Water Pollution Act, 1969 Water (P&CP) Act, 1974 Air (P&CP) Act 1981
5	MJP	Maharashtra Water Supply and Sewerage Board Act, 1976
6	MIDC	Maharashtra Industrial Development Act, 1961

12.1.1 Panvel Municipal Corporation

The PMC is the governing body for Panvel. It was constituted in 1852 as a municipal council, which was upgraded to a municipal corporation in 2016.

PMC is primarily responsible for providing basic services within its jurisdiction, and is governed by the Maharashtra Municipal Corporation (MMC) Act, 2014. Along with the PMC, other parastatal agencies are also involved in the provision of key services within PMC's jurisdiction.

Roles and responsibilities of PMC

As per the MMC Act, 2014, the PMC is responsible for planning, implementation, construction, and O&M of key services such as:

- Water supply, sewerage, sanitation, solid waste management, storm water drainage, roads, street lighting, housing for the poor, health and education, birth and death registration, parking facilities, and basic services to the urban poor people within the PMC limit
- Planning, designing, construction, operation, and maintenance of key services
- Enforcement of various plans and regulating development as per the state bylaws
- Levy and collection of taxes, charges, and fees as per the applicable municipal corporation act
- Framing of polices and plans for sustainable development in the region
- Disclosure of the status of the services and various activities as per the applicable public disclosure law
- Public transport services
- Fire-fighting services

Furthermore, 12th Schedule of 74th Constitutional Amendment Act has assigned a set of 18 functions for ULBs.

Table 115: Functionaries and responsible authority

Sr. no.	Functionary	Authority / departments
1	Urban planning, including town planning	Town planning department
2	Regulation of land use and construction of buildings	Town planning department
3	Planning for economic and social development	PMC
4	Roads and bridges	Public works department
5	Water supply – domestic, industrial and commercial	Water supply department
6	Public health, sanitation, conservancy and solid waste management	Health department, sanitation department
7	Fire services	Fire department
8	Urban forestry, protection of environment and ecology	Environment department
9	Safeguarding interests of weaker sections of society, including handicapped and mentally retarded	Health department
10	Slum improvement and up-gradation	Pradhan Mantri Awas Yojana (PMAY) cell
11	Urban poverty alleviation	PMAY cell
12	Provision of urban amenities and facilities -- Parks, gardens and playgrounds	Garden department, public works department
13	Promotion of cultural, educational and aesthetic aspects	Education department
14	Burials and burial grounds, cremations and cremation grounds, and electric crematoriums	Health department
15	Cattle pounds, prevention of cruelty to animals	Not available
16	Vital statistics including registration of birth and deaths	Birth and death department
17	Public amenities including street lighting, parking lots, bus stops and public conveyances	Electricity department, public works department
18	Regulation of slaughter houses and tanneries	Not available

Also, CIDCO, through a board resolution, has framed a policy with regards to handing over assets, facilities and services in Khargar, Kalamboli, Kamothe, Taloja and New Panvel to the PMC. This policy is along similar lines to the one prepared at the time of handover to the NMMC.

Existing civic infrastructure such as crematoriums, burial grounds and open spaces, including playgrounds, gardens, school playgrounds, other open spaces, plot for health centres and other community facilities, daily bazaar plots, existing health centres, community centres, and built-up premises of markets, will be handed over to the PMC.

Table 116: Overview of handing over of facilities by CIDCO to the PMC

Sr no.	Handing over facility/plot	Policy
A	**Physical infrastructure**	
1	Roads along with utilities therein	On par with NMMC
2	Public utility plot such as water pump house, ESR and GSR, STP, and sewerage pump house	On par with NMMC
3	Public toilet	As per government regulation (GR) for NMMC
4	Street lighting, holding ponds and channel	On par with NMMC
B	**Social infrastructure**	

Sr no.	Handing over facility/plot	Policy
5	Open spaces, garden & playgrounds	As per 1994 GR for NMMC
6	Virangula Kendra in the gardens	Now proposed
7	Sports complex	As per BR 8714 dated 30/4/2003, On par with NMMC and LPDP BR No. 11,375 2015
8	Public purposes such as hospitals, dispensaries and health centres	As per approved pricing policy 2015 vide BR No. 11,375 dated 23/06/2015
9	Stall, market , daily bazar plots	As per approved pricing policy 2015 vide BR No. 11,375 dated 23/06/2015
10	Parking plots	BR No. 11,050 dated 20/05/14, On par with NMMC
11	Plot for offices, and residences such as mayor's bungalow, commissioner's bungalow, and community centres	As per approved pricing policy 2015 vide BR No. 11,375 dated 23/06/2015
12	Fire stations	On a par with NMMC as per BR No. 9551 dated 06/03/2007
13	Composite school	As per approved pricing policy 2015 vide BR No. 11,375 dated 23/06/2015
14	Crematorium/burial ground	As per BR No. 4647 dated 08/03/1989 and BR No. 9265 dated 18/08/2005

Source: CIDCO Board Resolution 2017

12.1.1.1 Administration framework of PMC

Administration of a total area of 110.06 sq km is vested with the PMC. The organisational set-up of the PMC comprises a political wing and an executive wing.

The elected wing consists of candidates from 20 electoral wards in the city, and is headed by the mayor. The administrative wing is headed by a municipal commissioner, who acts on the decisions of the general body and manages the day-to-day functioning of the corporation.

Elected wing

The corporation elects a mayor, who, along with the deputy mayor, heads the corporation. The mayor is responsible for activities that are to be performed by the various committees, such as standing committee, health and sanitation committee, education committee, and water works, public works, public health and market committees.

As per the governing act of the PMC, the standing committee consists of the chairman and a 15-member team who are elected representatives. Under the chairman's guidance, the standing committee:

- Oversees the working of the administrative wing
- Provides approvals and issues work orders
- Conducts general body meetings
- Makes decisions and scrutinises regulations

The standing committee of the PMC conducts weekly meetings, where the members, the municipal commissioner, and the members of other special committees discuss a topic/issue put forward by the municipal commissioner or any other committee. Once the standing committee has given its consent, the same is then taken up at the general body meeting.

Once a month, a general body meeting is called and managed by the municipal secretary of the ULB, which is chaired by the mayor along with the deputy mayor, standing committee chairman, and municipal commissioner. The main

purpose of the general body meeting is to discuss the administrative working of the ULB, and to pass resolutions for any new work, policy and regulation, or give approval for any matter related to the city's development.

Administrative wing

The municipal commissioner is the head of the PMC who is appointed by the state government. The municipal commissioner oversees the administrative and execution works carried out by the various departments of corporation.

The commissioner, on regular basis, calls for meetings with the departments or with all the head of departments to discuss the working of the departments.

In the administrative hierarchy, most of the powers are vested with the commissioner of the PMC, which he delegates to other officers such as the additional commissioner, the deputy municipal commissioner, the assistant commissioner and the head of departments.

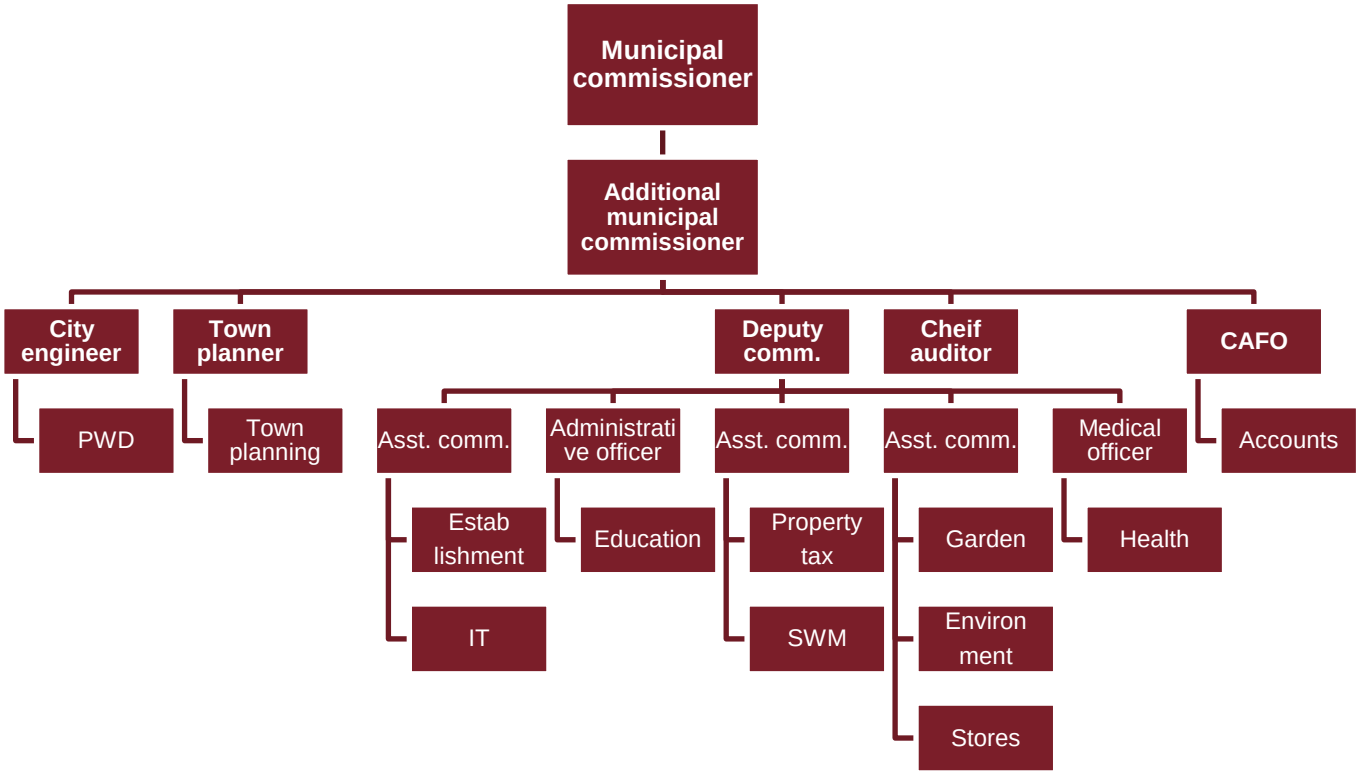
For smooth functioning, the PMC's administrative structure is based on the various functions that the PMC carries out:

- General administration
- Establishment
- Accounts
- Store
- Birth and death registration
- Women welfare
- Public works (sewerage, water supply, sanitation, civil)
- Solid waste management
- Garden
- Environment
- Town planning
- Fire department
- Property tax
- Health

All the departments are headed by the respective heads of department, who report to their respective heads (i.e., city engineer / assistant town planner / deputy commissioner). (*Figure 26 provides a pictorial representation of the organisational structure at the PMC.*)

As per an assessment carried out by the PMC, there is a need to recruit additional staff to cater to the increased population and the area post formation of the corporation. Hence, it has requested the state government for 1,917 posts to be created (this is inclusive of the existing posts, which are approximately 400).

Figure 26: Organisation structure of Panvel Municipal Corporation

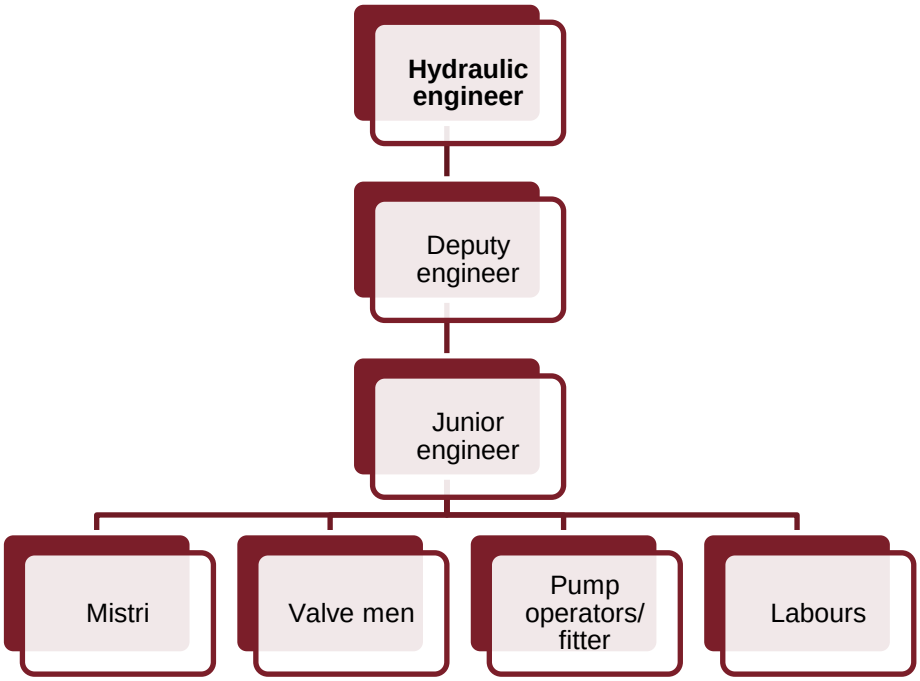


12.2 Department-wise institutional mechanism

12.2.1 Water supply

The water supply department of the PMC is headed by a hydraulic engineer, who is assisted by a deputy engineer and a junior engineer. Retired engineers from CIDCO, NMMC and MJP have also been appointed to support the department.

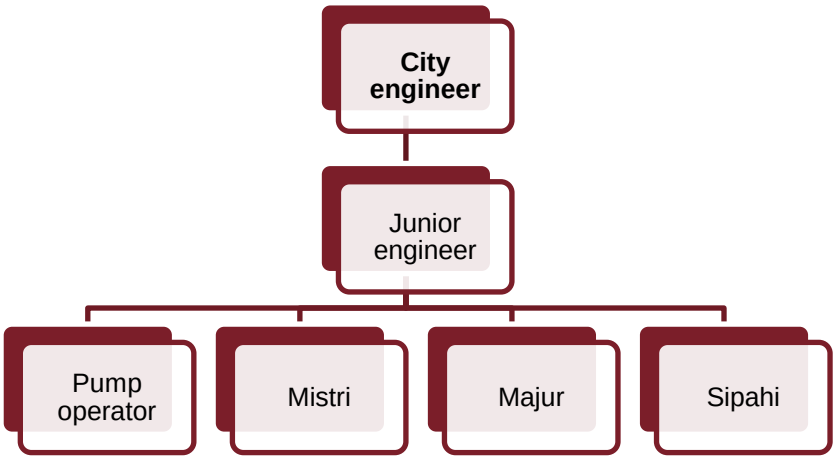
Figure 27: Overview of water supply department structure



12.2.2 Sewerage

Sewerage department of the PMC is responsible for collection, treatment and disposal of sewerage in Panvel. The department is headed by a city engineer, who is assisted by a junior engineer.

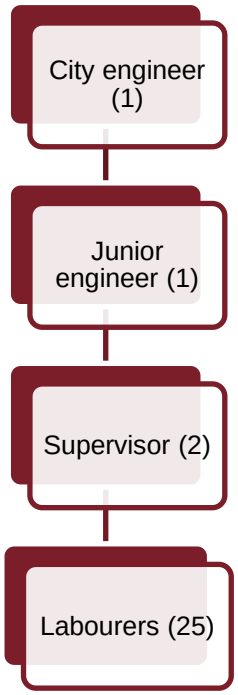
Figure 28: Overview of sewerage department structure



12.2.3 Storm water drainage

The storm water drain department (SWD) of the PMC is responsible for planning, maintenance and improvement, and desilting. In the PMC, the SWD department is under the purview of the public works department, and, hence, is headed by the city engineer.

Figure 29: Overview of storm water drain department structure



12.2.4 Solid waste management

Solid waste management is overseen by the sanitation department of the PMC. The department is headed by a sanitation engineer.

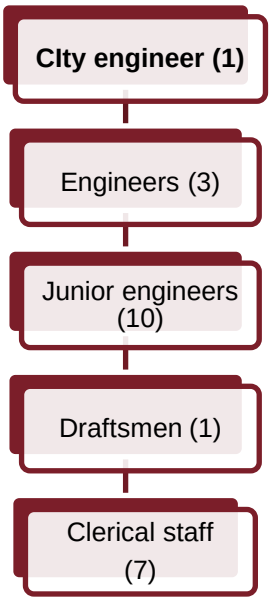
Figure 30: Overview of sanitation department structure



12.2.5 Public works department

Construction and maintenance of roads is overseen by the public works department of the PMC.

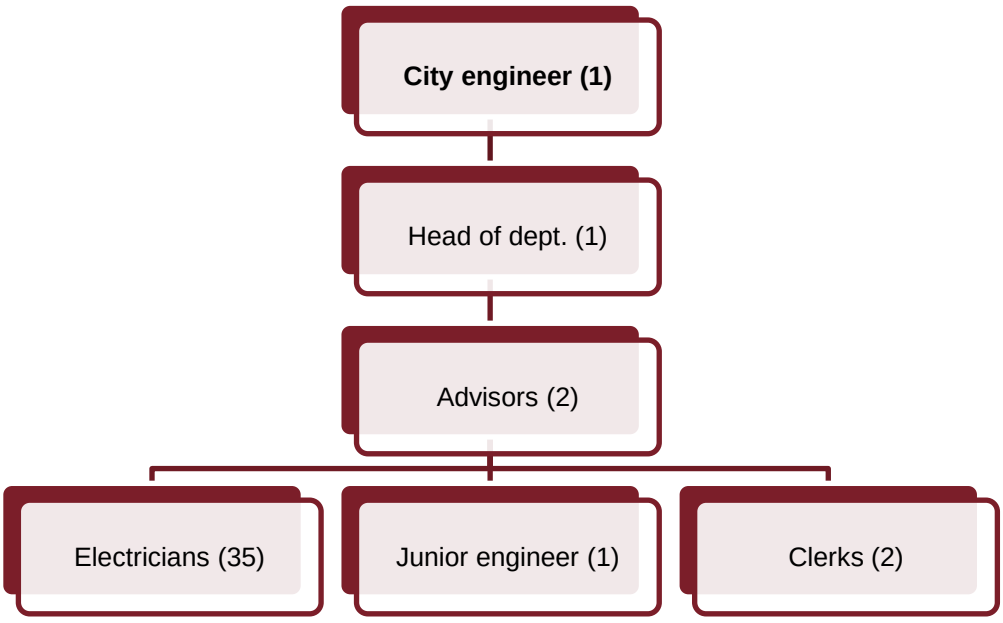
Figure 31: Overview of structure of public works department



12.2.6 Electricity

In PMC, the construction, operation and maintenance of streetlights is overseen by the electrical department. The department is headed by the city engineer. Other staff include electricians, junior engineers and clerks. In addition, there are two retired officers appointed on contractual basis as advisors.

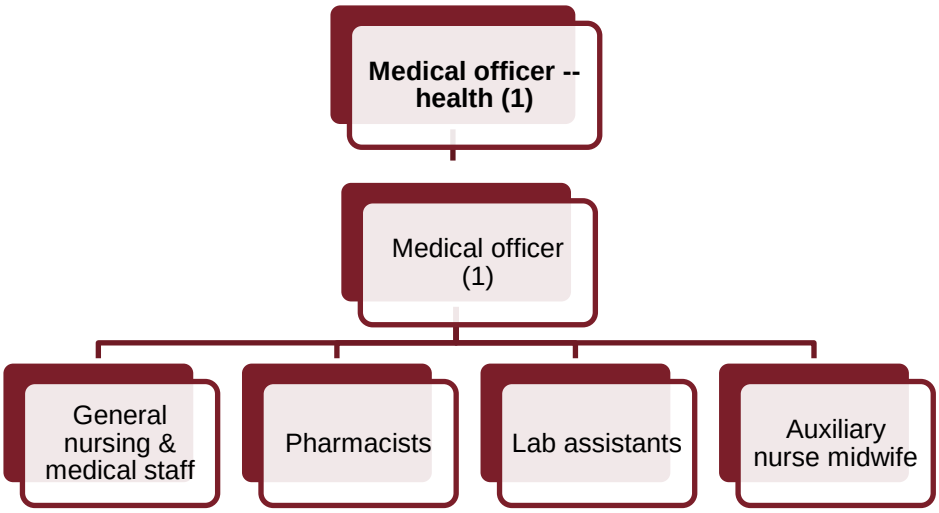
Figure 32: Overview of the electricity department structure



12.2.7 Health

The health department provides health facilities to citizens in the PMC region. The department is headed by a medical officer – health, who is assisted by medical officers and other staff.

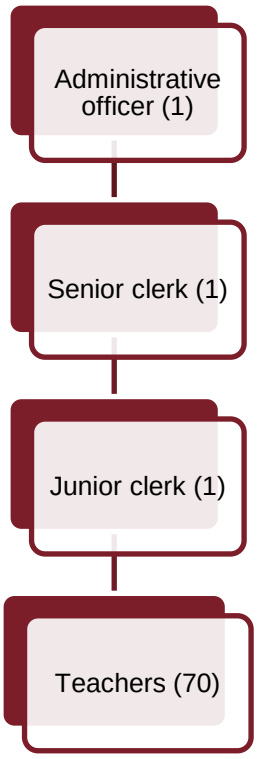
Figure 33: Overview of the structure of the health department



12.2.8 Education

The education department is responsible for education facilities in Panvel. The provision of primary education is an obligatory function of the corporation, whereas secondary education is among the discretionary functions under the municipal legislation of Maharashtra. The education department is headed by an administrative officer.

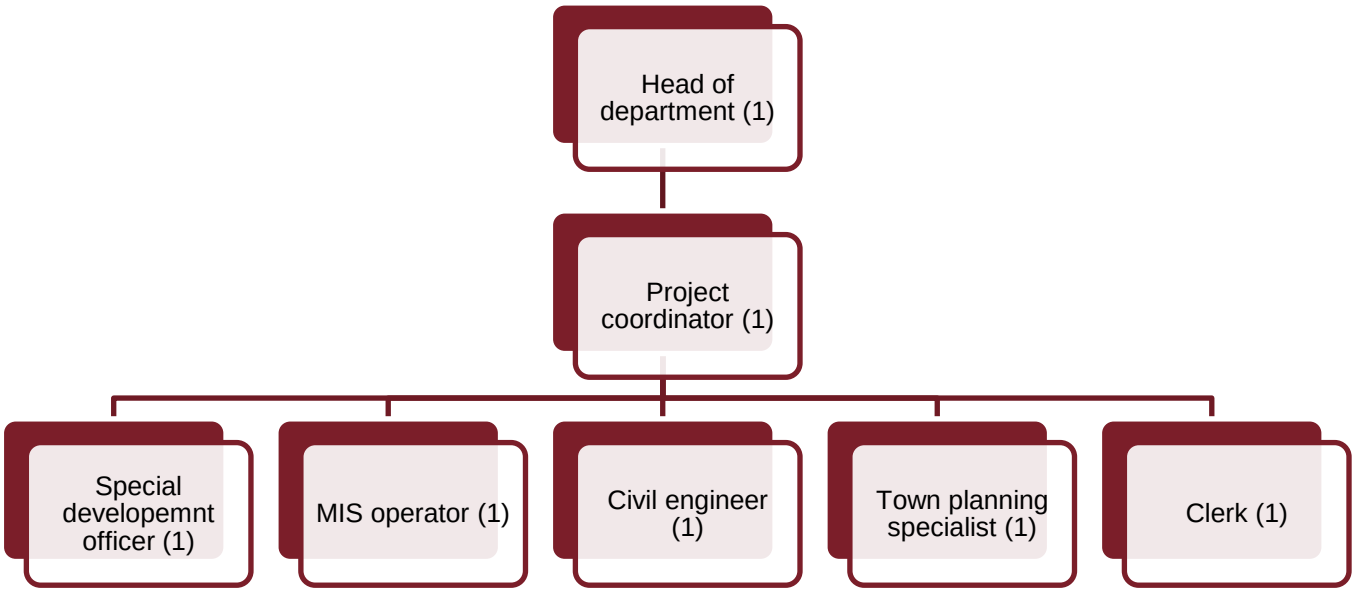
Figure 34: Overview of structure of the education department



12.2.9 Housing

The PMC is implementing PMAY, a central government scheme aimed at providing affordable housing to the poor. The corporation has set up a PMAY cell for its implementation.

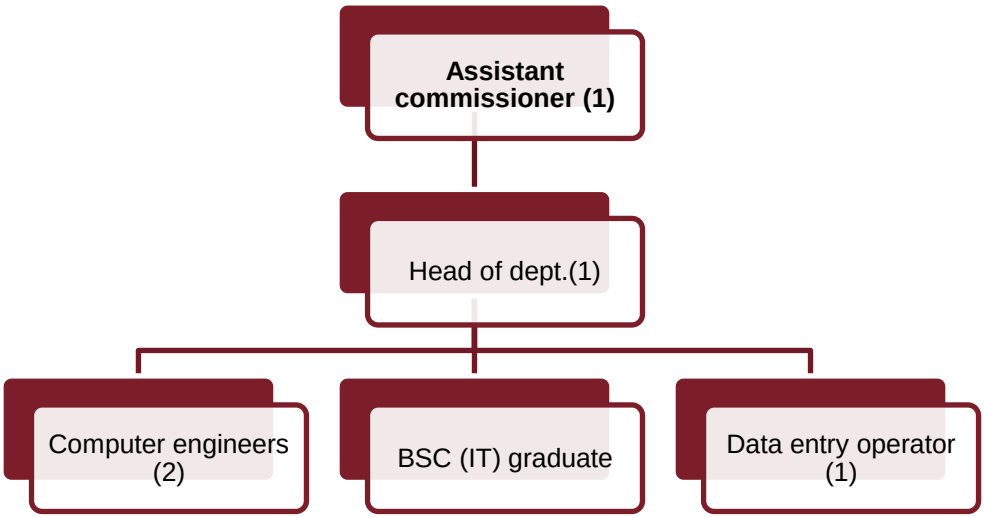
Figure 35: Overview of PMAY cell



12.2.10 E-governance

The IT department is responsible for providing e-governance facilities to citizens of Panvel.

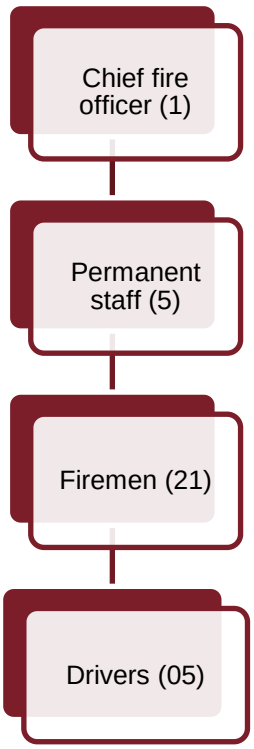
Figure 36: Overview of the structure of the IT department



12.2.11 Fire department

The fire department in the PMC is headed by the chief fire officer. The department has 32 members.

Figure 37: Overview of structure of fire department



Source: PMC fire department

12.3 Reforms

A ULB needs to improve its internal processes for effective and efficient usage of its resources, thereby consequently improving urban governance. This can be achieved if certain sets of reforms are implemented, as suggested in various urban development programmes, such as Jawaharlal Nehru National Urban Renewal Mission, AMRUT, Smart Cities Mission, etc.

Table 117: Status of reforms

Sr. no.	Reform sector	Type	Current status	Remarks
1	**E-governance**	Creation of ULB website		Implemented
		Online birth/ death/ marriage registration and issue of certificate	Birth and death registration tab on website is linked to central government website Currently, registration of marriage certificate is not available	Partially implemented
		Online registration to pay for municipal services / utility charges, e-payment and receipt	Present service of payment of water and property tax is limited to Old Council area	Partially implemented
		Online system of lodging & monitoring grievance (for public)	There are two portals to register grievances: 1.https://aaplesarkar.maharashtra.gov.in 2.https://pgportal.gov.in	Partially implemented

Sr. no.	Reform sector	Type	Current status	Remarks
			Currently, the facility does not cover the entire PMC	
		Online issue of advertisement permits & collection of renewal charges		Not implemented
		Automated employee information system and payroll and pension system	Facilities needs upgradation	Implemented
		Online grievance lodging and monitoring system (for ULB employees)		Not implemented
		E-procurement (e-tendering process, automation of procurement processes from indent to supplier payments)	Online tenders called via Mahatenders	Implemented
		Online assessment of property tax, online payment facility, and e-receipt, payment history reflection	Property tax calculation on website does not work Present service of property tax payment is limited to Old Council area	Partially implemented
		Issuance of licences, online licence status and history		Not implemented
		Online approval of building plan permission with no human interaction, including e-payment and integration with all agencies for various NoCs, provision to view status of building plan, and issue it within 30 days		Not implemented
2	**Double entry accounting**	Migration to double entry accounting system		Not implemented
3	**Improvement and levy of user charges**	• Reduce water losses to less than 20% • At least 90% billing and 90% collection • Having a policy on user charges for individual and institutional assessment in which differential rate is charged for water use	• No study conducted for Non Revenue Water (NRW) • 100% billing restricted to only Old Council area and villages • User charges policy available only for Old Council area	Not implemented
4	**Municipal tax and fee improvement**	• At least 90% coverage and 90% collection, • Periodically revise property tax and other fees / charges • Post demand collection book (DCB) of tax details on the website • Achieve full potential of advertisement revenue by making a policy for destination-specific potential having dynamic pricing module	• Property tax rates have been revised recently • 100% billing restricted to only Old Council area and villages. Collection efficiency is 50-60% • DCB table posted on website is available only till fiscal 2015-16 for Old Council area • Advertisement policy prepared in 2013, which is restricted to Old Council area	Partially implemented
5	**Review of building byelaws**	Having a solar roof top in all buildings having area over 500 sq.m and all public buildings	Need to be incorporated in new development control planning regulations (DCPR)	Not implemented

Sr. no.	Reform sector	Type	Current status	Remarks
6	**Rain water harvesting**	Rain Water Harvesting structures in all commercial / public buildings and new buildings on plots of 300 sq.m and above, Creation of Rain Water Harvesting monitoring cell	Need to be incorporated in new development control planning regulations (DCPR)	Not implemented
7	**Energy and water audit: Incentives for green buildings**	• Energy (street lights) and water audit • Give incentives for green buildings (e.g., rebate in property tax or charges connected to building permission/ development charges)	No study conducted for energy and water audit. No incentives for green building	Not implemented
8	**Encouraging PPP projects**			Not implemented

12.3.1 E-governance

E-governance makes use of information and communication technologies to enhance access and delivery of government services to citizens and employees, and helps in the management of urban local bodies. It helps strengthen the government's drive toward effective governance and increases transparency to better manage social and economic resources.

The PMC should aim to cover the following services under its e-governance platform:

- Basic citizen services: Birth and death registration and health programmes
- Revenue-earning services: Property tax and licences
- Development services: Water supply and other utilities, building plan approval
- Efficiency improvement services: Procurement and monitoring of projects
- Back office improvements: Accounting and personnel management system
- Monitoring: Citizen grievance redressal

Following are the reforms that need to be implemented by the PMC:

- **Online water services across PMC**

  Setting up of an online system for the entire PMC (currently limited to Old Council area) so that citizens can pay their water tax online. Various payment gateways can be provided for ease of transaction. Further, online request for new water connections, NoC and name transfer can also be implemented

- **Online assessment and payment of property tax for across PMC**

  One of the main steps in the property tax module should be setting up a system through which self-assessment of property tax can be carried out. Using GIS, all houses have been plotted on the map, and data entry for the same has been completed. Ground-truthing of all buildings in the PMC has also been carried out. The property tax module should be such that property owners can simply enter their property tax number or name on the payment gateway and pay their property tax. GIS should also been linked to the payment system

Thane has integrated GIS for property tax. The property tax department can generate a picture of the entire city or a particular ward in order to see the status of collection of property tax. This has also assisted the department in undertaking priority management and identifying defaulters.

Figure 38: Property search by property name



Figure 39: Tax collection status at glance

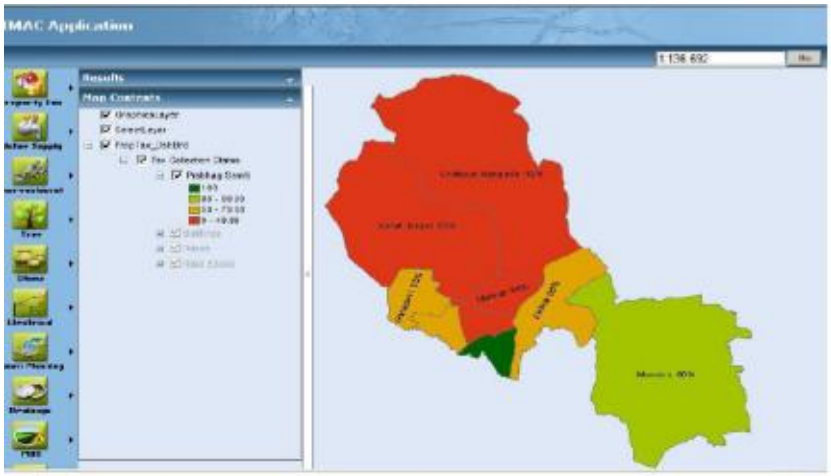
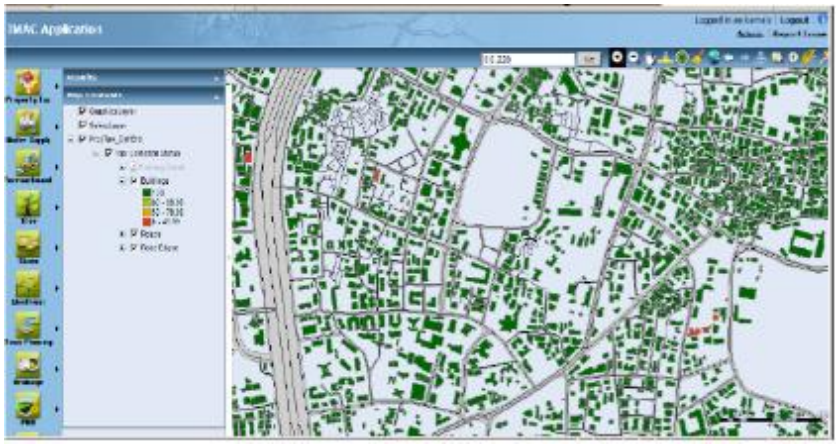


Figure 40: Building-wise tax collection status



- **Town planning services**

  At present, all submissions, scrutiny and approvals of building permission proposals are manual, which is time-consuming. The PMC should work towards streamlining the building approval process, with the broad objective of establishing a simple, transparent and less time-consuming process. Further services such as issuance of building completion certificate, zone certificate and plinth completion certificate can also be made online.

- **ERP**

  An enterprise resource planning system for HR and payroll, inventory management, work management, financial accounting management, estate management, etc. should be introduced.

- **Other online services**

  Online registration of marriage, advertisement permission, renewal of advertisement permission (a new comprehensive advertisement policy for the PMC region[59] needs to be prepared, which considers the Old Council area as well as the erstwhile CIDCO nodes, and newly integrated villages on immediate basis) in open spaces may to be implemented.

- **Solid waste management**

  A module for online tracking of vehicles can be developed to improve solid waste collection efficiency.

12.3.2 Municipal accounting reforms

Based on recommendations of the National Municipal Accounts Manual (NMAM) released by the Ministry of Urban Development[60], the Government of India has introduced an accrual-based double entry system to improve the financial management system of ULBs in India. The goal is to have a modern and updated system of accounting, leading to better financial management, transparency and self-reliance of local bodies.

The accrual-based double entry system, if implemented, is likely to yield the following benefits to an ULB:

- Accurate costing for all urban civic services
- Better control and utilisation of resources
- Better MIS to aid timely decision-making
- Publishing of audited financial statements on timely basis
- Improved financial management, accountability, transparency of management

12.3.2.1 Status at PMC

Currently, the PMC follows a single entry system. The PMC has ‘MaiNet’ software for maintaining its accounts. This software is being used by the PMC since the time it was a municipal council.

12.3.3 User charges reform

Reforms to levy user charges is critical for achieving self-sustainability of services and for improving the financial strength of the ULBs. Its implementation neither requires additional financial expenditure nor legislation amendments. Most cities levy water charges to recover the Operation and maintenance cost but not able to meet the 100% as stipulated for implementation of the reforms.

In most cities, user charges related to solid waste management is collected as a percentage of property tax / conservancy tax, whereas some cities collect separate charges.

As property tax collection is not a buoyant source of revenue, the collection, as a percentage of it, only meets the operating cost.

The objective of making services self-sustainable has been partially achieved. But if the initiatives made by the ULBs are sustained, it may be possible to achieve 100% of the O&M cost.

[59] *There is an advertising policy for the Panvel old council area*
[60] *Now Ministry of Housing and Urban Affairs*

12.3.3.1 Status at PMC

For now, the facility of online payment of user charges in the case of water has been implemented. But the facility is available only to citizens of Panvel Old Council area.

12.3.4 Building bye laws for rainwater harvesting and reuse of wastewater

12.3.4.1 Rainwater harvesting

The main objective of making rainwater harvesting mandatory in all buildings is to recharge groundwater and augment overall water availability. This measure will ensure that the rain falling on all buildings is tapped and directed to recharge groundwater aquifers or stored for direct consumption/ use by occupants of buildings. This is all the more significant as increasing population in urban areas is making it increasingly difficult for municipal bodies and other public agencies to supply water in adequate quantities to citizens. Often, citizens use private tube wells to supplement the municipal supply for their daily needs.

Recharging ground water will raise aquifer levels and will help municipal and other public agencies to have access to larger quantities of groundwater. In alluvial areas, energy saving for one metre rise in ground water level is around 0.40 kilowatt per hour. Recharging aquifers will also reduce the requirement for additional financial resources for augmenting water supply.

Rain water harvesting has to be made compulsory for buildings with more than a certain plot area. Procedure for approval of system before applying for plinth permission and approval of commissioning rainwater harvesting has to be set.[61]

12.3.4.2 Waste water reuse

To meet the water demand for the growing population and to provide for protection against droughts, PMC must make the most efficient use of their water resources. Water recycling and reuse offer cost-effective and ecologically beneficial solutions. Water reuse involves using domestic wastewater from bathroom, kitchen, clothes washing, and toilets a second time around, for an appropriate purpose, after primary, secondary or tertiary treatment. This can be at an individual property level, a group housing level such as apartment complexes, or at the community level.

Rules must be put in place to mandate the waste water reuse for buildings with greater than specified plot areas (4,000 sq m in case of Nashik).

12.3.5 Administrative reforms

PMC is in need of administrative reforms. The following steps, if implemented, may increase the efficiency of the organisation:

- **Rationalisation in staff and human resource management**
  - Draft proposal for changes in staffing policy (prepared by PMC and submitted to state department)
  - Identification of loopholes in the existing staffing
  - Draft proposal for reforms in performance evaluation system
  - Employee consultation
  - Discussion with various ULB departments
- **Staff training**

[61] *Government of State of Maharashtra of has certain rules in place for rain water harvesting*

  - Assessment of training needs
  - Identification of training programmes
  - Finalisation of training curriculum
  - Selection of agencies to provide training
  - Conduct of training
- **Management review system**
  - Periodic review by Mayor & Municipal Commissioner
  - Generation of daily/ weekly/ monthly/ quarterly performance reports on financial, service delivery,
- **Setting up of zonal/nodal offices**
  - Nodal/zonal offices need to be established to enhance service delivery

12.3.6 Encouraging public-private partnership (PPP)

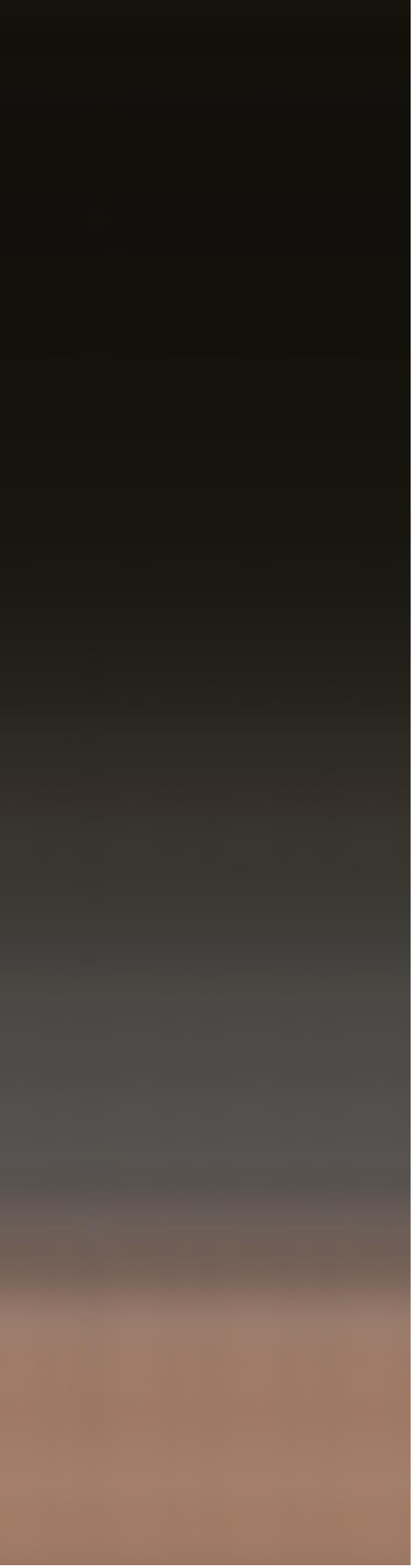
Cities are experiencing increasing pressure to provide accessible and affordable infrastructure and basic services due to rapid urbanisation. At the same time, they are increasingly constrained in mobilising the required financial and technical resources. Many cities do not have administrative capacity to cope with the rising demand for water supply, sewerage, drainage, electricity supply, roads and solid waste management etc. Hence, PPP is considered a viable alternative to overcome the systemic problems and to infuse efficiency into the operation and maintenance of infrastructure, while bringing in much needed capital to supplement public funds.

The collaboration between the public and private sector could take any one of the following forms:

- Public funding with private service delivery and private management
- Public as well as private funding with private service delivery and private management
- Public as well as private funding with public/private service delivery and public/private/joint management

PMC must set up a PPP cell which focusses on identifying, formulating, structuring and implementing PPP projects identified for overall development of the area. The PPP cell can be supported by an agency which will assist in identifying projects, preparing techno-economic feasibility reports for identified projects, and supporting through transaction advisory services for development of such projects under PPP mode.


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13.

Financial assessment

Understanding the financial capacity of PMC is critical for planning for the future of PMC region. This section provides a broad overview of the financials of PMC.

13.1 Assessment of existing municipal finance

The financial analysis of PMC was carried out on the basis of income and expenditure data obtained through budget documents for fiscals 2018 and 2019.

For analysis, CRIS segregated the income and expenditure accounts in the budget into revenue and capital accounts. On the income side, the revenue account captures funding generated through own sources, i.e., tax and non-tax revenue, and revenue grants and contributions, whereas the capital account deals with income generated for capital works through different sources. On the expenditure side, revenue expenditure refers to the day-to-day operation expenditure, while capital expenditure refers to that related to infrastructure development.

13.1.1 Budget preparation at PMC

The accounts department of PMC prepares the annual budget estimate in three parts:

A. General budget
B. Transport budget
C. Water supply and sewerage budget

At the time of budget preparation at PMC, all the departments are asked to share an estimate of the anticipated revenue and expenses of their respective departments for the coming year. The accounts department then works upon these estimates so that the total of all projected receipts equals the likely payments. The budgeted amount is finalised after discussion between all the department heads and the Commissioner. The budget includes capital and revenue heads, which are further divided into revenue income and expenditure, and capital income and expenditure.

Once the estimate is approved by Commissioner, it is presented to the Standing Committee and then to General Body for approval. Along with the Commissioner's budget, both Standing Committee as well as General Body share their own estimates, which are also included in the budget book. The latest budget of PMC contains actual figures for three financial years (fiscals 2016, 2017, and 2018).

13.1.1.1 As-is assessment of municipal financials

This section gives the detailed analysis of municipal finances of PMC from fiscal 2016 to 2018. Table 118 gives an overview of the income-expenditure pattern of the financial statements for the last three financial years

Table 118: Income-expenditure pattern of PMC

Particulars	FY 16	FY17	FY 18
	(Rs lakh)		
Total Revenue income	**7,654**	**10,244**	**18,928**
Total revenue expenditure	**4,815**	**5,238**	**5,763**
Revenue surplus/ (deficit)	**2,840**	**5,006**	**13,164**
Capital income	**1,831**	**1,050**	**1,013**
Capital expenditure	**3,834**	**5,044**	**2,150**
Capital surplus / (deficit)	**(2,002)**	**(3,993)**	**(1,137)**
Total surplus / (deficit)	**837**	**1,013**	**12,027**

Source: CRIS analysis & PMC budget book

It can be observed from the above table that PMC has had a revenue surplus and capital deficit in all three years. A detailed assessment of the revenue and capital income and expenditure components is presented in the following section.

13.1.2 Revenue account - income and expenditure trend

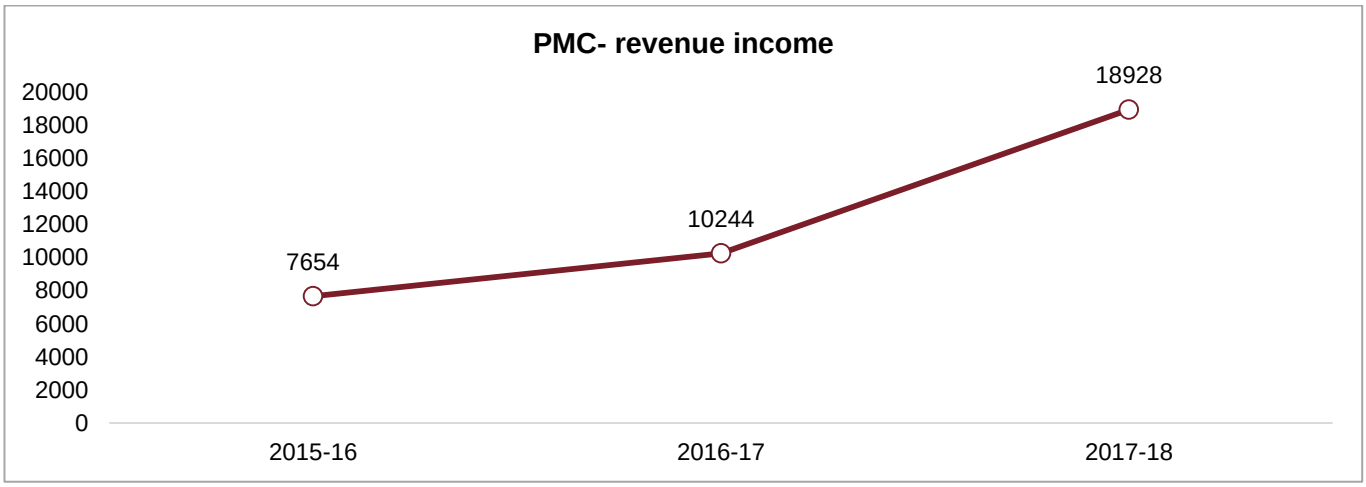
The revenue account comprises revenue income and revenue expenditure. The revenue surplus of PMC has risen from Rs 2,840 lakh in fiscal 2016 to Rs 13,164 lakh in fiscal 2018.

13.1.2.1 Revenue income

Revenue income, in turn, comprises own sources of revenue and revenue grants & contributions (such as those entrusted from the state government). The own sources of revenues can further be classified into tax revenues such as property tax and other taxes, and non-tax revenue such as fees, user charges, etc.

The revenue income of PMC grew from Rs 7,564 lakh to Rs 18,928 lakh, at a CAGR of ~57% CAGR in past three financial years (from 2015-16 to 2017-18). The below figure shows the growth trend of PMC's revenue income:

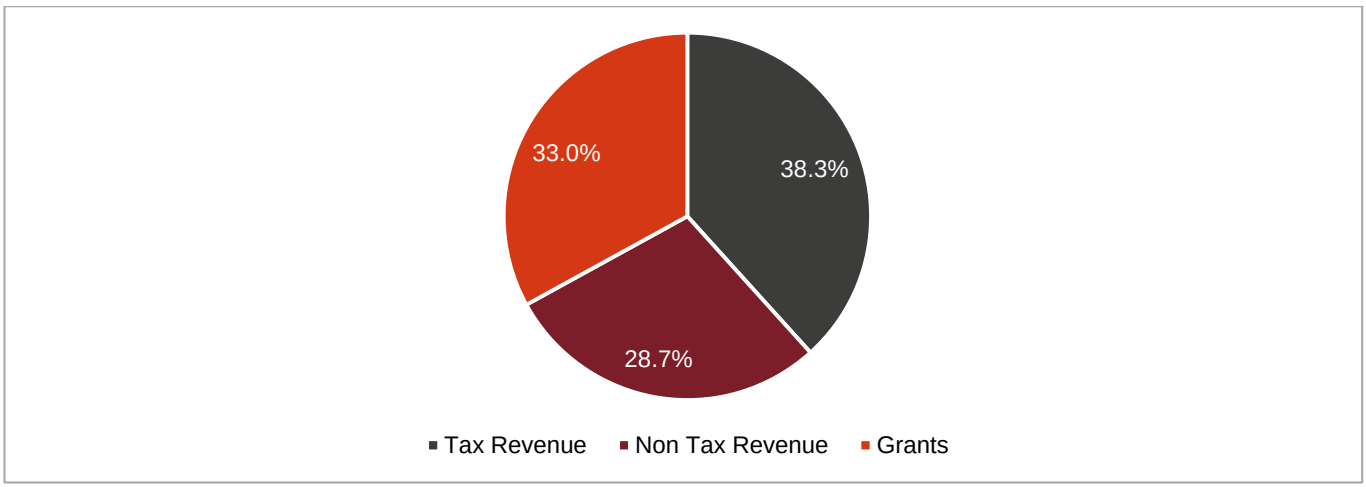
Figure 41: PMC revenue income growth trend (Rs lakh)



Source: PMC and CRIS analysis

The following figure represents the composition of revenue income of PMC in this period.

Figure 42: Revenue income composition



It can be seen that, during the last three years, tax revenue is the major revenue source, having contributed ~38% to total revenue income, followed by grants and non-tax revenue.

PMC's tax revenue encompasses revenue from the following:

- General tax
- Entertainment tax
- Advertisement tax
- Dog tax
- Hawkers' tax
- Tree tax
- Fire tax
- Advance Property tax
- Special education tax
- MPL education cess
- Improvement charge
- Road tax
- Fire tax / NOC
- Water tax
- Cleaning tax
- Sewerage tax
- Water benefit tax
- Sewerage benefit tax
- Special cleaning tax

Table 119: Composition PMC's revenue income (Rs.Lakh)

Particulars	FY16	% share in revenue income	FY17	% share in revenue income	FY18	% share in revenue income	Average
Tax revenue	**936.4**		**3248.4**		**9919.3**		
Property tax	871.7	11.39%	3179.6	31.04%	862.9	4.56%	15.66%
Entertainment & advertisement tax	10.6	0.14%	37.4	0.37%	5.1	0.03%	0.18%
LBT	0.0	0.00%	0.0	0.00%	9002.5	47.56%	15.85%
Tree cess	27.0	0.35%	31.3	0.31%	25.3	0.13%	0.26%
Others	27.0	0.35%	0.0	0.00%	23.6	0.12%	0.16%
Non-tax revenue	**3016.7**		**3023.4**		**4532.3**		
Water charge (and penalty)	390.4	5.10%	462.4	4.51%	351.4	1.86%	3.82%
Development / betterment charges	67.2	0.88%	795.3	7.76%	2230.4	11.78%	6.81%
Buildings permission related fees	332.2	4.34%	176.8	1.73%	193.3	1.02%	2.36%
Premium charges	1222.8	15.97%	324.3	3.17%	562.6	2.97%	7.37%

Particulars	FY16	% share in revenue income	FY17	% share in revenue income	FY18	% share in revenue income	Average
Fire department (NOC, fire brigade charges, etc.)	0.3	0.00%	1.9	0.02%	2.5	0.01%	0.01%
Health revenue	0.2	0.00%	2.2	0.02%	1.3	0.01%	0.01%
Interest revenue	56.0	0.73%	42.4	0.41%	31.3	0.17%	0.44%
Other fees	48.4	0.63%	169.5	1.65%	115.5	0.61%	0.97%
Rent revenue	69.6	0.91%	109.6	1.07%	101.0	0.53%	0.84%
Other revenue	820.0	10.71%	917.9	8.96%	886.9	4.69%	8.12%
Property transfer fees	9.7	0.13%	21.2	0.21%	56.0	0.30%	0.21%
Other sources - grants	**3701.2**		**3972.4**		**4475.9**		
1% surcharge of stamp duty	823.9	10.76%	0.0	0.00%	1339.6	7.08%	5.95%
13th & 14th Finance Commission grants	1141.8	14.92%	2363.9	23.08%	895.4	4.73%	14.24%
General assistance grants	1674.0	21.87%	1558.1	15.21%	2196.9	11.61%	0.00%
Interest on grant accounts	45.5	0.59%	37.0	0.36%	23.1	0.12%	16.23%
Other grants	15.9	0.21%	13.5	0.13%	21.0	0.11%	0.36%
Total revenue income	**7654.3**		**10244.2**		**18927.6**		**100%**

It is evident from the above table that property tax, on average, is among the major contributors of own tax revenue of PMC (except for fiscal 2018).

13.1.2.2 Property tax

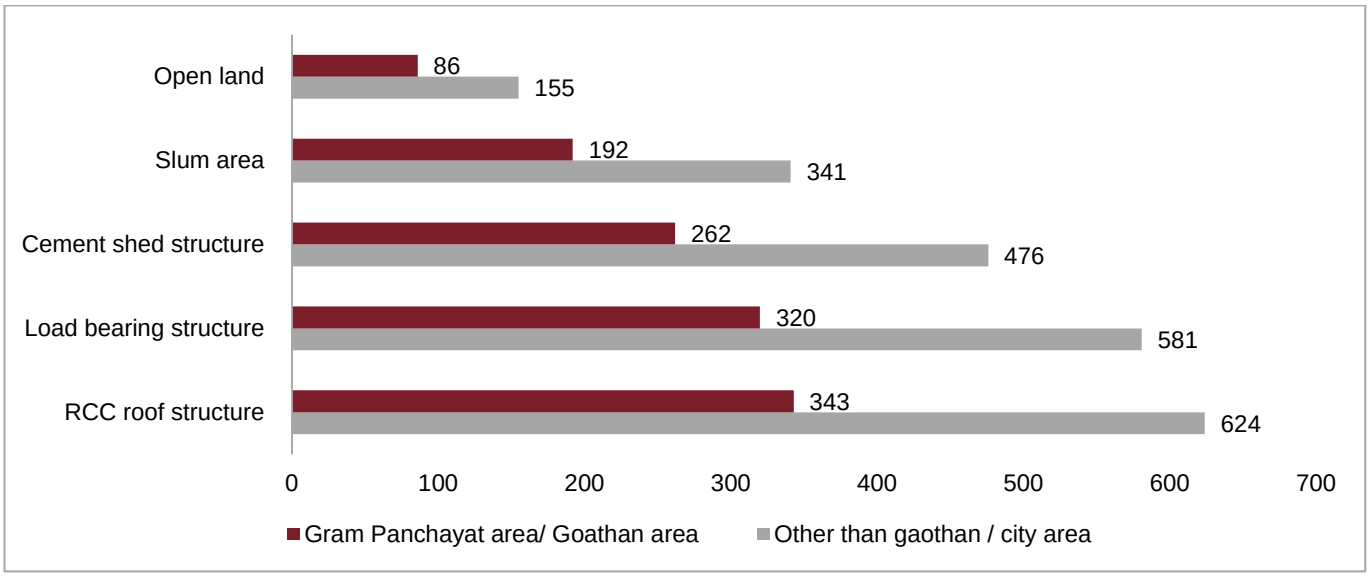
This section gives insights about the property tax system in the PMC. As property tax is a major contributor to PMC's revenue income, assessment of the property tax system is important in order to find out the future revenue potential for PMC. It also highlights the bottlenecks in the system which act as a deterrent to revenue enhancement.

Assessment of property tax

PMC levies property tax on the basis of various sections of the Maharashtra Municipal Corporation (MMC) Act. For assessment purpose, PMC has categorised all properties in five different categories, viz., RCC roof structure, load bearing, cement roof structure, slum, and open land. Currently, PMC follows annual rateable value (ARV) method to calculate property tax. This rateable value is finalised by PMC officials by conducting various surveys in the PMC region.

The following figure shows the current rateable values of each category. These values are finalised by PMC officials by carrying out a survey of actual rent value in the PMC area. Following value are in Rs/sq m of carpet area in the case of constructed property and Rs/sq m of land area in case of open land.

Figure 43: Rateable value in PMC



Source: PMC Property Tax Department

In PMC, the total property tax is 30% of rateable value for residential property and 44.5% for commercial properties. There are totally seven taxes included in the property tax, general tax being the highest at 20% for residential and 30% for commercial. Following are the details of taxes in PMC along with respective percentages.

Table 120: Percentage and legal base of taxes in PMC

Sr no	Name of tax	Sections of legal provision under MMC Act, 1949	Residential (%)	Commercial (%)
1	General tax	129 (C), 132	20	30
2	Special education tax	148 (A)	1	1
3	Water benefit tax	130 (2)	1	1.5
4	Sewerage tax	131	3	4.5
5	Sewerage benefit tax	131	1	1.5
6	Road tax	148 (C)	2	3
7	Development tax	129 (1)	2	3
	Total property tax	**-**	**30**	**44.5**
8	Tree tax	Maharashtra Tree Conservation Act, 1975, Section 18 (1)	1	1
9	Fire tax	129 (C)	1	1.5
Total tax in PMC			**32**	**47**

Source: PMC

Coverage of properties

Presently, PMC has 2,95,335 properties, which are divided into four main areas: Old council area, MIDC area, *gaothan,* and CIDCO nodal area. However, out of these areas, PMC collects tax only from old council and *gaothan* areas; taxes from MIDC and CIDCO nodal areas are not being collected since 2016. The main reason behind this is lack of information of properties in these areas. To overcome this hurdle, PMC has initiated a GIS-based survey of all the properties in PMC area, which will extend the collection of property tax to the whole PMC.

The following table gives information about properties in PMC area and their collection status.

Table 121: Details of properties in PMC region

Sr no	Area in PMC	Number of properties	Share in total properties	Collection status
1	Old council area	34,616	12%	Currently collecting
2	Non nodal PMC area	29,941	10%	Currently collecting
3	CIDCO node	2,30,000	78%	Not yet started
4	MIDC	778	0.3%	Not yet started
	Total	2,95,335	100%	

Source: PMC

Of the total properties, a major proportion (78%) is located in the CIDCO nodal area. This area is a well-developed part of PMC with property density of 55 per hectare. Second largest share of properties are in old council area (12%). It has a property density of 99 per hectare, which is also highest in the whole PMC region. This is because old council area has been established from a long time ago, and houses the main shopping centres for the entire PMC area as well as the nearby villages. Remaining 10% of properties are situated in the non-nodal region of the PMC area, which has a property density of six per hectare.

Billing and collection

Presently, property owners from old council area are required to pay their bills at the main office of PMC and property owners from *gaothan* area are required to pay their bills at old gram panchayat offices. The demand bill in PMC is issued with annual demand and carried out once in a year. The bill is prepared in the month of January and manually distributed in the month of March. The following table gives current figures of demand collection and balance of property tax in PMC.

Table 122: Demand collection and balance statement of PMC

Year	Demand			Collection			Balance amount			Collection efficiency (%)		
	Arrear	Current	Total	Arrear	Current	Total	Arrear	Current	Total	Arrear	Current	Total
FY17	40.64	34.86	75.50	18.08	23.50	41.58	22.46	11.26	33.72	44%	67%	55%
FY18	19.84	34.83	54.67	4.20	11.77	15.97	15.64	8.66	24.30	21%	34%	29%

Source: PMC

Current demand declined 0.08% on-year in fiscal 2018. This was mainly because of a fall in demand from some of the areas in PMC, from the previous years. These areas include: Panvel old council area, Kalamboli, Kalundre, Kamothe, Asudgoan, Rodpali, Valvali, Padaghe, Kharghar, Taloja Machkur, and Turbhe. The demand from these areas have declined the deficit ranges between 0.11 Lakhs to 40 Lakhs.

Collection efficiency of current demand halved from 67% in fiscal 2017 to 34% in fiscal 2018. Similarly, collection efficiency of arrears dropped from 44% to 21%. Two main reasons behind such a low collection were: lack of manpower to effectively collect the property tax, and lack of robust policy to recover arrears.

Capital value and current rateable value in PMC

As seen above, the PMC follows ARV system for calculation of property tax in PMC. This rateable value is different for different types of property. However under Section 129 of Maharashtra Municipal Corporation (MMC) Act, 2014, a municipal corporation can adopt capital value (CV)-based method for calculation of property tax. Under this, the tax base shifts from rental value to capital value. Hence market value guidelines can be used as a basis for the CV method, which are revised annually by the registration and stamps department. This will help improve the buoyancy of property tax and reduce PMC administrative cost for revision of rental value. A similar classification of lands and

buildings with respect to age of the building, type of construction, user category and other factors, as in the ARV method, will have to be considered to assign weightages to different categories. While switching to CV-based method, the property tax increment has to be accepted by the general body of corporation. The tax liability will be calculated based on the following formula:

Property tax (CVB) = R * (CV) * area * C * U * A

Wherein:

R = Rate of different tax

CV = Capital value according to ready reckoner (RR) rates.

Area = Total area of the property

C = Construction category factor

U = User category factor

A = Age category factor

It is evident that there are wide categories of variables covered under CV-based calculation. If PMC wants to switch to the CV system, then the weightages of different factors need to be finalise by PMC. These weightages must be such that, the property tax computed after shifting to CV method must be equal to or close to tax calculated by ARV based calculation. Therefore, it is necessary to first compare the current ARV with the respective CV. The following table gives the percentage of rateable value compared with the median capital values for the area. Please note that while shifting to CV, each property needs to be assessed individually, and respective weights assigned.

Table 123: Comparison of current rateable value and capital values

Type	Residential					Commercial/ industrial/ institutional				
Unit	Rupees per square meter									
Area of property	RCC roof structure	Load bearing structure	Cement shed structure	Slum area	Open land	RCC roof structure	Load bearing structure	Cement shed Structure	Slum area	Open land
Old council area/ other than *gaothan*										
ARV	624	581	476	341	155	936	872	714	512	233
Capital value	48600	48600	48600	48600	13700	63500	63500	63500	63500	13700
% of CV to ARV	1.28%	1.20%	0.98%	0.70%	1.13%	1.47%	1.37%	1.12%	0.81%	1.70%
All *gaothan*										
ARV	343	320	262	192	86	514.5	480	393	288	129
Capital value	3493	3493	3493	3493	3493	34575	34575	34575	34575	3493
% of capital value to ARV	9.82%	9.16%	7.50%	5.50%	2.5%	1.5%	1.4%	1.1%	0.8%	3.7%

Source: CRIS analysis

The capital value percentage for all rateable values differ vastly over the different types of properties lowest being the 0.7% for residential slum property in old council area. And the highest being 9.82% for residential load bearing

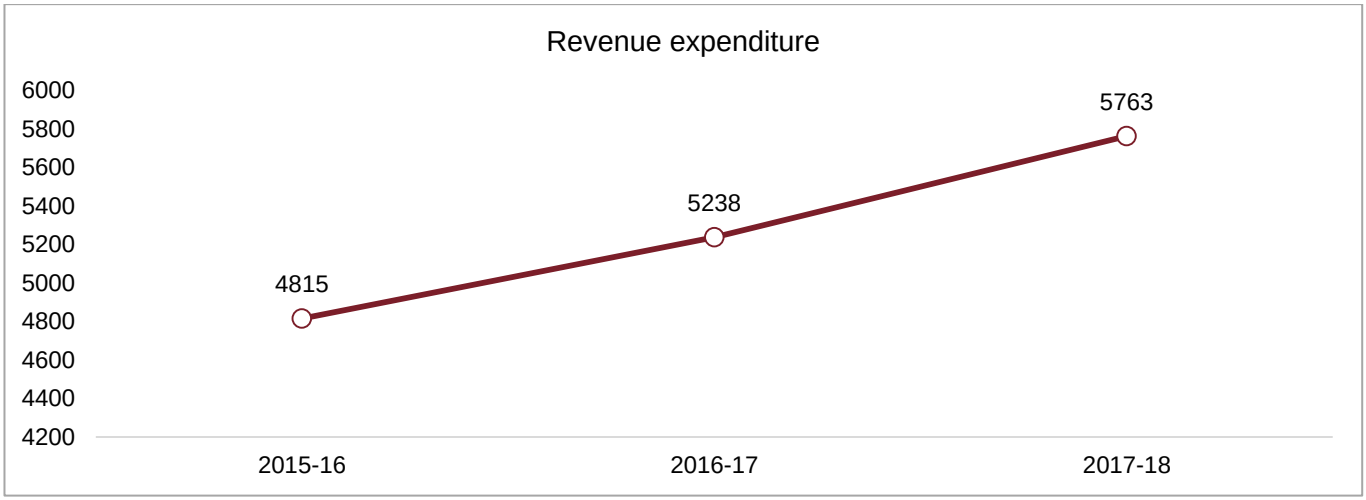
properties in *gaothan* area. Above analysis shows that PMC is not consistent with their rateable values and need to revise their values in order to maintain equality in property tax along PMC.

Among non-tax revenue, development charges, premium charges, other revenues have on an average been steady contributor to PMC's revenue income. This consistency could also be attributed to an increase in real estate developments in PMC region.

13.1.2.3 Revenue expenditure

Revenue expenditure covers the expenditure incurred by PMC in its day-to-day operations. The revenue expenditure of PMC has increased at ~9% CAGR between fiscals 2016 and 2018. The figure below shows the growth trend of PMC's revenue income:

Figure 44: PMC revenue expenditure growth trend (Rs lakh)



Source: PMC and CRIS analysis

The key components are salary and wages, administration and general services, repairs and maintenance, pension, and others (printing, telephone, accounts, and audit).

The table below shows the composition of revenue expenditure of PMC during the period under consideration (fiscals 2016 to 2018).

Table 124: Components of revenue expenditure and their growth

Particulars	FY16	FY17	FY18	CAGR
Salary and wages	1,150.7	12,41.6	1,655.1	**20%**
Pension, grant & contribution	379.6	416.9	178.4	**-31%**
Accounts and audit	3.2	9.8	6.6	43%
Administrative office	118.4	158.8	335.9	68%
City sanitation	415.5	386.7	338.4	-10%
Public works department	389.5	598.1	375.0	-2%
Computer department	21.4	31.2	22.3	2%
Fire department	4.3	28.9	27.2	152%
Main office	12.1	20.0	504.6	545%
Medical, hospital services	45.9	22.5	1.7	-81%

Particulars	FY16	FY17	FY18	CAGR
Others	432.9	451.7	866.6	41%
Property tax department	49.8	9.9	3.8	-72%
Sewerage department	489.1	993.1	315.8	-20%
Street lights	166.2	119.6	204.1	11%
Town planning	0.0	0.0	1.3	0
Water supply	1117.4	724.6	926.8	-9%
Total O&M cost	3265.6	3554.8	3929.9	10%
Debt servicing				
Interest on loans	14.4	24.6	0.0	-100%
Total debt servicing	14.4	24.6	0.0	-100%
Total revenue expenditure	**4814.6**	**5237.8**	**5763.4**	**9%**

Salary and wages mainly comprises administrative expenses incurred by PMC towards the employees. PMC has 25 departments, which accounted for total expenditure of Rs 1,150 lakh, Rs 1,241 lakh and Rs 1,655 lakh in fiscal 2016, 2017, and 2018, respectively. The details of administrative expenditure is given in the table below. These include only expenses incurred on the permanent employed staff of the PMC, and excludes salaries of contractual staff.

Table 125: Salary and wages expenditure PMC

Sr no	Particulars	FY16	FY17	FY18
A	**Salary and wages**		**(Rs lakh)**	
1	Accounts and audit	39.85	37.23	18.42
2	Administrative office	55.69	54.37	667.88
3	City sanitation	545.68	605.43	586.14
4	Civil department	98.85	90.95	78.77
5	Computer department	4.18	4.16	0
6	Fire department	35.46	40.27	35.98
7	Civic facilitation department	23.68	0	0
8	Main office	12.86	30.48	4.92
9	Medical, hospital services	18.31	17.94	7.89
10	Property tax department	51.95	51.76	41.46
11	Sewerage department	60.58	57.88	53.57
12	Street lights	20.06	20.68	10.76
13	Town planning	9.88	51.88	20.86
14	Water supply	82.52	79.84	59.27
15	Others	91.11	98.69	69.18
A	**Total salary and wages**	**1,150.66**	**1,241.56**	**1,655.1**

Source: CRIS analysis & PMC budget book

The consistent increase in revenue expenditure is on account of the increase in salaries and wages (at 20% CAGR). The salaries and wages are likely to increase further in coming years, once the proposal to recruit more staff is approved, which should consequently drive up administrative expenses.

The O&M expenses have also grown at a steady rate (10% CAGR). The quantum of O&M expenses is likely to increase even further in future, as the projects undertaken by the corporation get commissioned. Hence, it becomes essential for PMC to increase its income, so as to be prepared for meeting its future expenses.

Debt servicing

Debt servicing refers to the repayment of loans taken in the past. Repayment is made like any other loan and PMC records the principal and interest payments separately. On average, the expense incurred in debt servicing is 1.2% of total revenue expenditure.The following table gives details of the same in the last three years.

Table 126: Debt servicing PMC

Sr no	Particulars	FY16	FY17	FY18
1	Principal repayment	49.03	101.46	0.82
2	Interest payment	14.41	24.59	0
	Total debt servicing	**63.44**	**126.05**	**0.82**

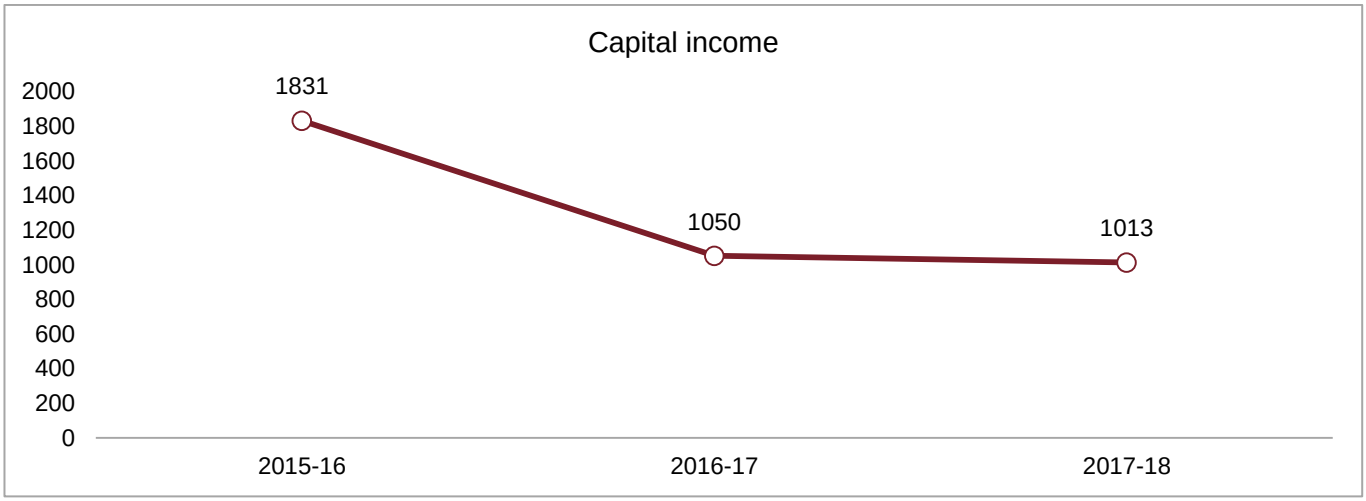
Source: CRIS analysis & PMC budget book

13.1.3 Capital account - income and expenditure trend

13.1.3.1 Capital income

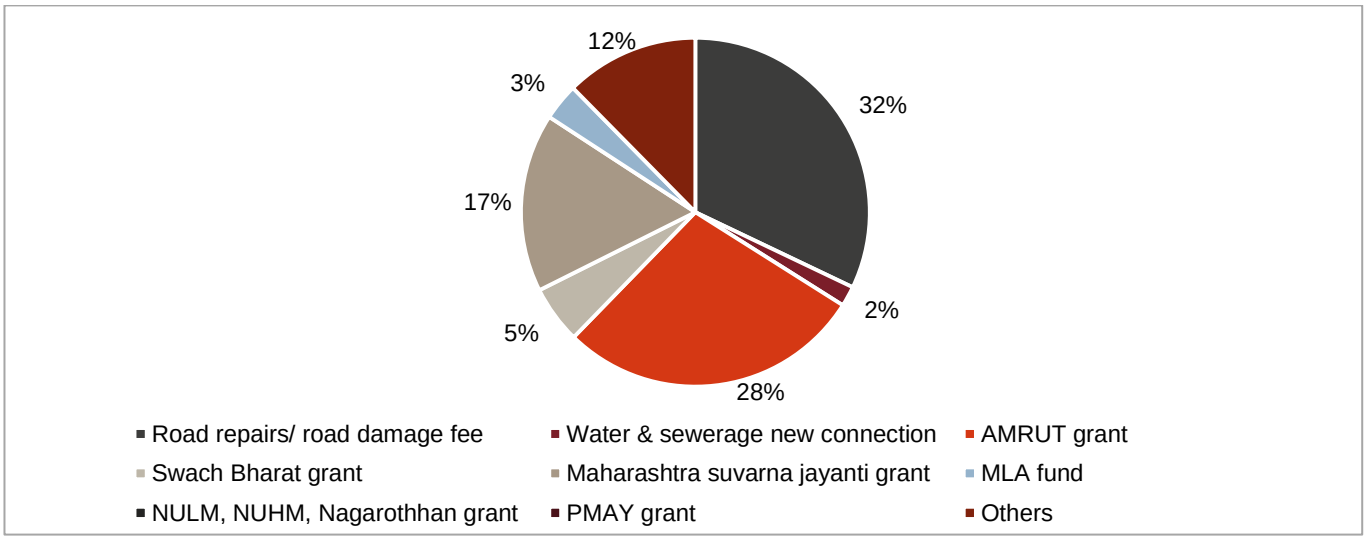
The capital Income of PMC fell from Rs 1,831 lakh in fiscal 2016 to Rs 1,050 lakh in fiscal 2017, and then further to Rs 1,012 lakh in fiscal 2018. The following graph exhibits the capital income trend during the period under consideration.

Figure 45: Capital income of PMC (Rs lakh)



Capital income comprises road repairs/damage fee, charges for new water and sewerage connections, as well as capital grants received by PMC under various missions such as AMRUT, Swachch Bharat Mission, Maharashtra Suvarna Jayanti, etc. The following figure gives an overview of various components of PMC's capital income in the last three years.

Figure 46: PMC capital income components



Source: PMC and CRIS analysis

One of the reasons for a decline in quantum of capital receipts of PMC could be no amount having been received under NULM, NUHM, *Nagarutthan Yojna*, PMAY, etc.

13.1.3.2 Capital expenditure

PMC's capital expenditure rose from Rs 3,834 lakh in fiscal 2016 to Rs 5,044 lakh in fiscal 2017, and then reduced to Rs 2,150 lakh in fiscal 2018.

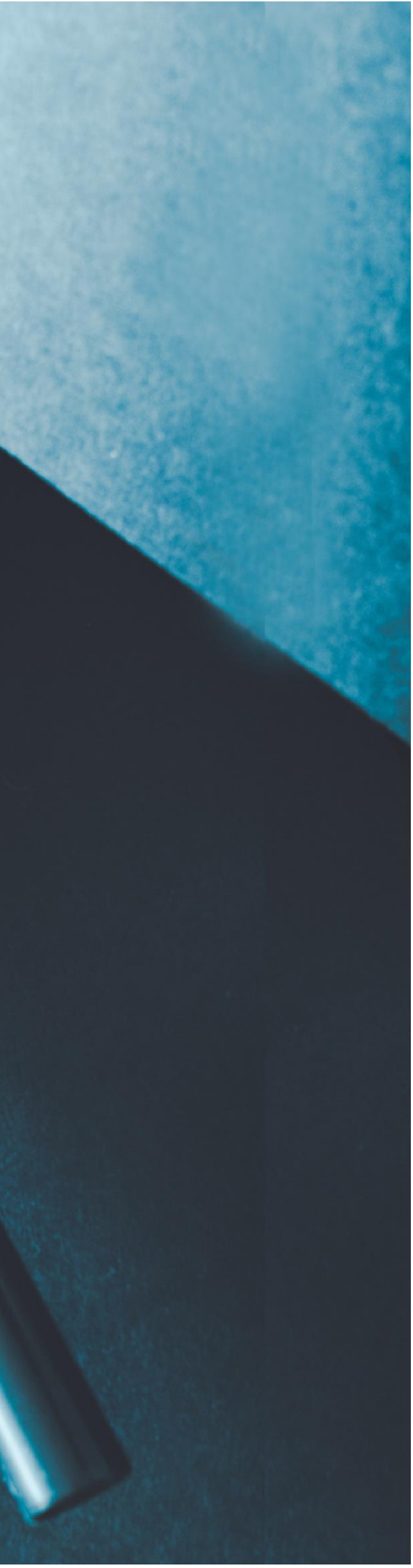
PMC's system of accounts records capital expenditure according to the respective departments. There are totally 21 main heads in the capital expenditure account, with various subheads. Capital expenditure is further divided into two parts - departmental capital expenditure and debt outflow of capital works.

The share of departmental capital expenditure is the largest in total capital expenditure, with debt outflow having miniscule share.

13.1.4 Key issues identified

- PMC currently does not have a robust advertisement policy, hence advertisement tax collected is very low
- Cost recovery of water, sanitation, and sewerage is critically low because charges collected are not sufficient. Moreover, PMC does not collect any charges for solid waste
- No proper maintenance of old account books, which may create difficulty in case any old data is required
- The exact record of contractual staff is not available at PMC, making it very difficult to ascertain the salary and wages expenditure in PMC
- From discussions with the department, it emerged that the software used for accounts keeping is the same as that used by the erstwhile council, which is insufficient considering the present status of PMC
- Some revenue items were found in the capital account and vice versa. In addition, codes were missing in the some of the account heads, pointing to the need for recasting and recoding all the account codes





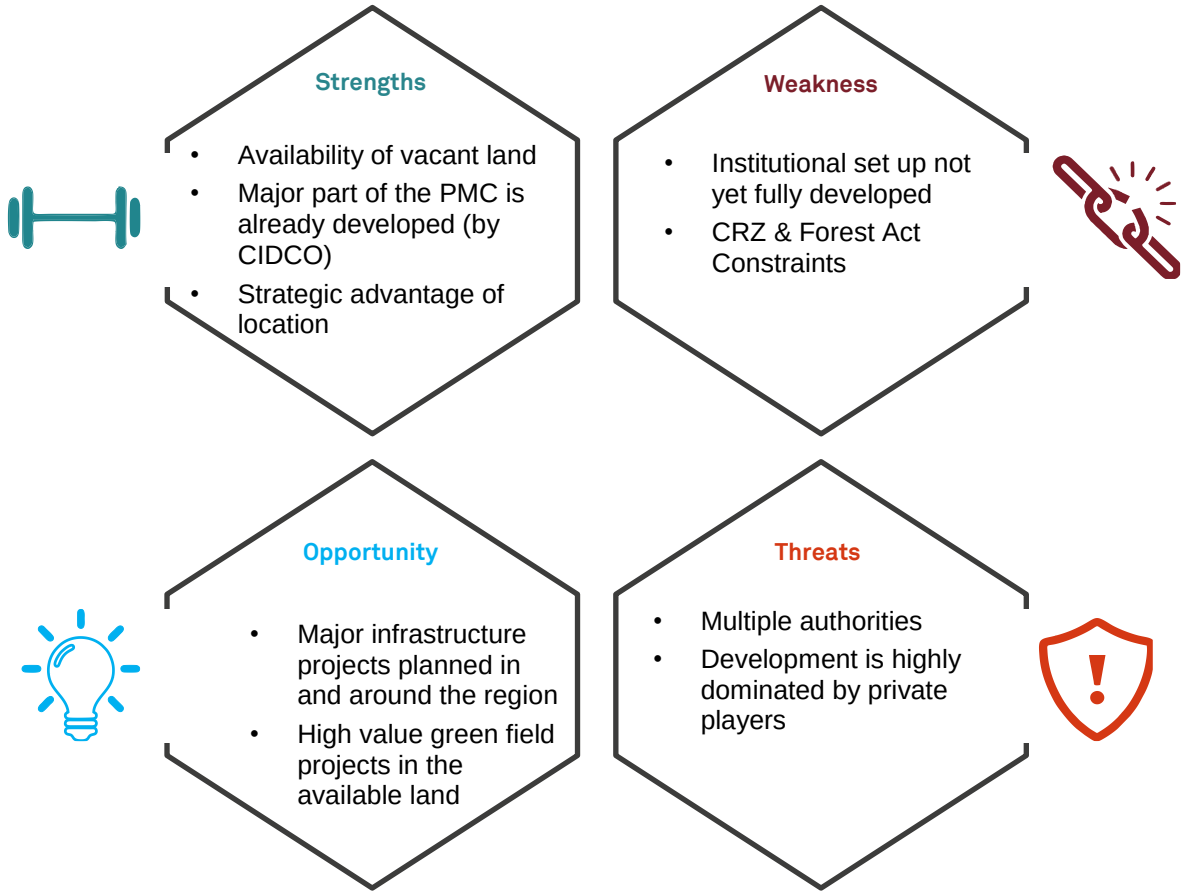
14.

SWOT analysis

14.1 SWOT analysis of Panvel

Based on the reconnaissance survey, assessment of city level infrastructure, and the inputs received during stakeholder consultations, CRIS carried out a SWOT (strengths, weaknesses, opportunities, and threats) analysis for PMC region. The results are presented in figure below.

Figure 47: SWOT analysis of PMC region



Strengths

1. **Availability of vacant land**

   The PMC was formed after amalgamating the Old Panvel council area with 29 revenue villages. Majority of the villages have large chunks of open land available within the PMC, which can be used for the provision of various infrastructure and utilities. Further, the area previously governed by CIDCO also has areas reserved for utility purposes, which can be utilised by the PMC for public purposes and to improve the quality of life of its citizens.

2. **Developed CIDCO area**

   Various CIDCO nodes such as Kamothe, Kharghar, Kalamboli, New Panvel, and Taloje now form a part of the newly aggregated PMC. These nodes have already been developed by CIDCO and possess all basic utilities and infrastructure services. Hence, lower investments would be required to further develop these regions.

3. **Strategic advantage of location**

Panvel is well connected with all major cities in the country through various state and national highways. Several railway lines and highways also pass through the city. Panvel has excellent connectivity with the Mumbai Metropolitan Region (MMR). Being located between Mumbai and Pune also adds to its strategic significance, as it makes commuting to both these convenient by rail or road (Mumbai-Pune expressway).

Apart from the aforementioned, there are a number of upcoming mega infrastructure projects in the PMC region such as the Mumbai trans-harbour link, Virar-Alibaug multimodal corridor, metros, and CSMT-Panvel fast lane railway linkage, which, along with existing expressways, will result in enhanced connectivity making daily commute easier.

Weaknesses

1. **Institutional setup not fully developed yet**

Currently, there are ~400 employees working in various departments of the PMC. The area under the jurisdiction of the newly formed corporation has increased to 110 sq km from 3 sq km earlier. With the increased jurisdiction, the requirements of basic services increase manifold, thereby resulting in excessive work load on the current staff. Hence, adequate staff and a proper institutional setup would be required for the proper functioning of the corporation.

2. **CRZ and Forest Act constraints**

Some portion of the area under the PMC falls under the CRZ, green zones, etc. This leads to development pressure on these areas, often resulting in abandonment of development projects proposed to be undertaken in the city.

Opportunities

1. **Major infrastructure projects planned in and around Panvel**

Several upcoming key infrastructure projects such as the Navi Mumbai airport, Mumbai trans-harbour link, Virar-Alibaug multimodal corridor, metros, CSMT-Panvel fast lane railway linkages, etc., are likely to have a huge bearing on the development of Panvel. With such major developments lined up, Panvel is likely to experience a spurt in employment opportunities.

2. **High-value greenfield project on available land**

As the PMC has a large chunk of open spaces, they can be utilised for high-value greenfield projects such as setting up of corporate parks, recreation and sports facilities, etc.

Threats

1. **Multiple authorities**

Several government authorities are involved in the PMC area, sometimes, for the same service. For example, water supply services are handled by the MIDC, CIDCO, MMRDA, etc. Multiple authorities lead to overlapping of responsibilities, making it difficult to provide and maintain quality services. This is because no single authority is responsible for overall service provision.

2. **Development dominated by private players**

A large number of private players are attracted to Panvel due to the availability of vacant land, proximity to Mumbai and Pune, and major infrastructure projects proposed. A major chunk of the development is being driven by the private sector, which may lead to artificial escalation of land prices as well as lack of sufficient land for provision of basic utility services.

3. New residential townships in PMC periphery

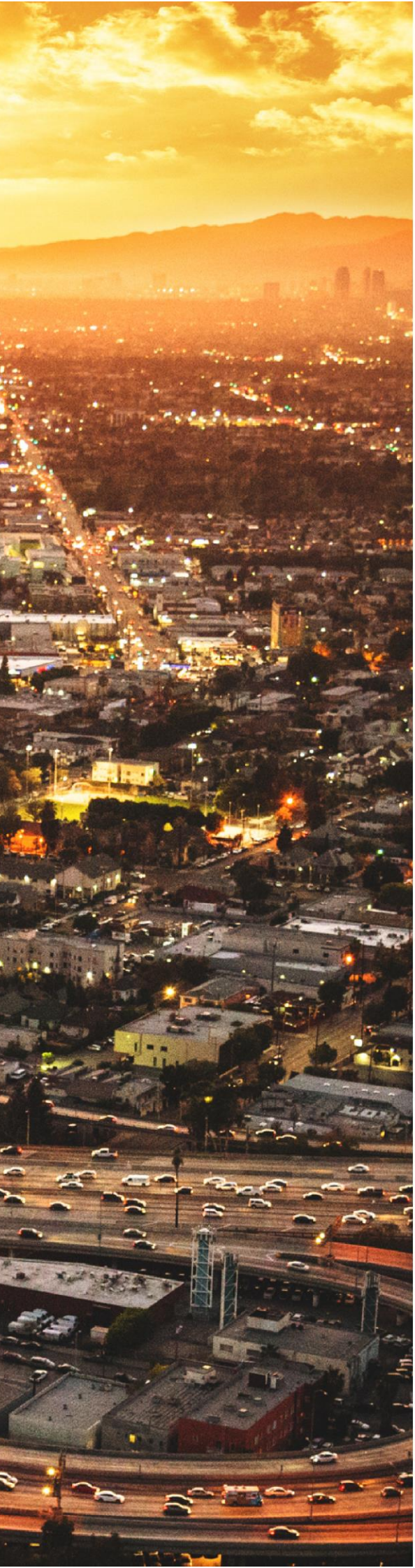
New large-scale townships are coming up near the PMC region. Given the fast track development that is taking place, people and services will be attracted towards these new developments, which may eventually result in deferred growth of the PMC region itself.



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15.

Vision and goals for city development

A consultative process, which takes into account the views of stakeholders about the city's development and sectoral performance, is key to plan and prepare the city development plan (CDP). As the PMC was formed only in 2016, the CDP is being prepared for the first time. A CDP is a vision document for any city outlining strategy for various sectors, formulated on basis of inputs of the citizens and stakeholders of the city.

15.1 Stakeholder consultations

CRIS carried out stakeholder consultations in the PMC region to solicit views and concerns of the stakeholders and understand their priorities and suggestions on possible projects and the need for reforms in various sectors.

The exercise involved mapping of the significant stakeholders, followed by discussions on city level issues. In order to carry out sectoral demand and gap assessment precisely, stakeholders of diverse backgrounds were identified and invited for discussions.

The stakeholders comprised associations of doctors, teachers, industrialists, and social organisations, who were called to discuss with the Mayor, Commissioner, corporators, and all department officials of PMC who play a major role in planning, implementation, and management of the city.

In line with preparation of a fresh CDP for PMC, separate workshops were organised with the identified key stakeholders of the region from December 12-15, 2018. (Please refer to Table 4 for detailed schedule)

15.1.1 Stakeholders' views on key issues across the city

The CRIS team made a detailed presentation to the stakeholders on building an understanding on the CDP, visioning, process of CDP preparation, guidelines, and various aspects under CDP, along with the key initial findings and challenges in developing PMC region.

Post presentation, the stakeholders interacted amongst themselves and with the CRIS team and shared their views on the challenges and opportunities for the region.

Apart from basic requirements of water, sanitation, and electricity, the sectors which invited most suggestions were education, public transport, health and sanitation, lack of open spaces, and playgrounds in PMC region, and overall condition of city infrastructure. The participants spoke of difficulties faced by general public due to lack of poor quality of basic amenities and infrastructure, safety concerns for senior citizen population, and the disparity of infrastructure in different areas in the PMC region. The participants were also encouraged to share their suggestions on how best these issues could be resolved. The suggestions included recommendations which, if implemented, may help in solving the water and electricity issues in PMC region, developing Panvel as a tourist hub, and generating employment opportunities for local citizens.

Table 127 and Table 128 provide a summary of the major issues in the PMC region identified by the stakeholders in the discussions and measures that might be adopted to resolve these.

Table 127: Major issues and challenges in the city – stakeholders' perspectives

Sectors	Issues raised by stakeholders
Education	• Lack of sufficient municipal schools • Lack of basic infrastructure in schools such as water, toilets, furniture etc. • Lack of e-learning schools and multifunctional libraries • Lack of convention centre and incubation centre for the students of the city
Public transportation	• Lack of own robust intra-city transport system and traffic management cell for the city
Health and sanitation	• Lack of municipal hospitals

Sectors	Issues raised by stakeholders
	• Inadequate number of public toilets • Lack of proper system of solid waste management • Hazardous waste site • Pollution issues due to Taloja Industrial Estate
Open spaces and recreation	• Lack of multifunctional sports complex and recreational centres • Dearth of playgrounds, cultural halls, community and convention centres, libraries, open spaces, gardens, sport complexes • Very few recreational places for senior citizens
City infrastructure	• Major deficiency in water supply of the city • Poor quality roads • Absence of sufficient vehicle parking / large multifunctional parking spaces in city • Lack of scrap yards in the city resulting in metallic waste being accumulated in city • Lack of coordination among various government agencies for carrying out infrastructure works resulting in inconveniences for citizens (For e.g., bays were constructed by CIDCO roads department on the pavements at various points to place garbage bins. However, the design was not as per requirement of CIDCO health department. Soon after roads are repaired, MSEDCL/MTNL digs them up for laying cables etc.) • Huge disparity in availability of infrastructure facilities across PMC region
Security of public utilities	• Major public utilities unprotected (water tank, sewage station etc.) • Misuse of space under flyovers • DB boxes are not locked - a safety hazard and open to theft
Basic city requirements	• Lack of adequate number of police stations, passport office, post office, etc. • Few e-governance facilities for citizens • Lack of lucrative jobs and employment opportunities, forcing people to work outside the city • Several container carrying trucks on route to Jawaharlal Nehru Port Trust are often parked along the city roads and highways leading to congestion and traffic related incidents

To tackle the aforementioned challenges, the following suggestions were also put forth (by the stakeholders):

Table 128: Stakeholders' suggestions on countering key Issues of city

Sectors	Suggestions from stakeholders
City infrastructure	• Improvement required in basic infrastructure in industrial areas • FSI can also be increased in the city, especially in the industrial region • Ensuring durable and better quality manhole covers on the roads • Focus on infrastructure creation/upgradation in villages
Water scarcity	• Promotion of waste water reuse like greywater for the gardening purposes, • Rain water harvesting should be made compulsory in societies / households and encouraged by way of incentives, this will help in resolving water issues • Cleaning of the wells and restoration of the ponds in the municipal corporation area
Health and sanitation	• Encouraging PPP in health infrastructure • Encouraging waste segregation, recycling of waste at society / household level by way of incentives • Setting up a community waste treatment and composting facility
City beautification	• Beautification of areas by giving it certain character such as unique color coding, naming patterns for Shop, pathways etc. • Beautification of spaces under bridge by creating gardens, promotion of art paintings etc.

Sectors	Suggestions from stakeholders
	● The street vendors / hawkers should not be allowed on to encroach footpaths and street pavements, instead their respective associations should be given proper land and made responsible for allocating space and managing them and accountable in case norms are flouted ● The drains (*nallah*) to be closed without disturbing the flow of water through them ● A one-time cleaning of all wild shrubs in the city including on private property and fencing of the areas ● Water front development in Panvel Municipal Corporation region to be explored
Reducing pollution	● Promoting tree plantation in the city ● Developing dedicated cycle tracks to encourage non-motorized transport ● Encouraging use of solar energy
Senior citizens	● Build infrastructure catering to needs of specially abled and senior citizens ● Focus on safety and security of senior citizens
Employment and revenue generation	● Develop tourism potential of the city by earmarking spaces for celebrating rural festivals and other cultural events ● Setting up business parks, special economic zones for employment generation
Overall city development	● Designing a framework wherein the NGOs and Citizens in city can be involved more in the city's development An Empowered Civic Action Committee should be formed, comprising of members from PMC as well as other agencies like MESDCL, MTNL, MPCB, NGOs and citizens. This Committee shall be responsible to ensure proper coordination between departments to avoid inconvenience to citizens ● Establishing a Novel civilian technologies department. The focus areas of the function will be to Scout, evaluate, implement and propagate new and state of the art technologies to sustainable civilian usage. The scope not to be limited to Road, Water, Waste management, clean energy but also in communication, financial functions etc. ● Creating awareness among citizens about the various initiatives taken by Authority by way of different modes like TV and radio advertisements, posters etc. ● Educate builders against leaving rubble on roads and pavements and start penalizing them for the same Educating people on prohibiting the use of drains (*nallah*) as garbage bins. ● A "Happiness Quotient" or norm for overall happiness of the citizens should be established (like Bhutan) and this should be monitored to be kept at 90-95% ● An escalation chart should be prepared for all complaints and put up in all the departments along with the contact details of relevant officials

15.2 Vision statement

'Vision' in the context of the CDP is a vivid and idealised description of a desired outcome that inspires, energises, and helps the stakeholders create a future picture of the city with positive changes. It can also be defined as that position which the city aspires to achieve in future.

The city vision has been framed based on the city level assessment carried out by the CRIS team and the consensus reached among the stakeholders during the discussions. Keeping in view the various economic activities in the city, regional setting with neighbouring cities and towns, and the existing infrastructure status in the city, the vision for PMC region has been framed as:

"***Panvel, an effervescent and progressive city providing enhanced quality of life to its citizens through efficient urban services and economic growth opportunities in a sustainable and environment friendly manner***"

15.3 Development goals

Based on the city level assessment, city vision framing, and stakeholder consultation, development goals with specific strategies of the key sectors have been prepared. Sectors such as water supply, sewerage and sanitation, solid water management, storm water drainage, traffic and transportation, urban poverty and slum improvement, local economic development, urban environment, social infrastructure, and heritage management are covered under the development goals. The development goals have been framed on the basis of priority areas, to achieve the common goals for the city and to meet the desired sector-specific service level benchmarks and indicators.

Sector	Vision	Development goals	Action points
Water supply	**"Water for all"**	• Provide water supply to all the citizens of Panvel • The quality of water must meet quality standards as prescribed by CPHEEO • Prepare comprehensive user charge policy and undertake tariff revision to recover 100% O&M cost • Minimise water losses and reduction in energy consumption for operation of water supply	• Augment the existing source/identify new sources to meet the future water demand for the city • Increase the coverage of water supply and ensure equitable water supply to all the areas of PMC • Introduce flow meters and bulk meters to measure water losses in the system • Introduce domestic meters to ensure judicious usage of water • Undertake water quality checks at different levels of the water supply system • Introduce water monitoring systems like supervisory control and data acquisition (SCADA) to monitor the water supply flow and curb water losses • Carry out water and energy audit • Make rainwater harvesting system mandatory for the upcoming developments in the city
Sewerage and sanitation	**"Provide safe and reliable collection, treatment, and reuse/disposal of wastewater towards an environmental friendly city"**	• Develop sewerage collection, treatment and disposal system across the city • Ensure 100% treatment of sewage generated and safe disposal • Explore the reuse and recycled of wastewater to be supplied to the industries • Maximise the cost recovery and collection efficiency • Provide public toilets across the city	• Provide underground (UGD) network in all unserved areas across the city • Ensure every property is connected to sewerage network • Rehabilitate the existing UGD network • Construct adequate STPs to treat the wastewater generated in the city • Implement bye-laws for recycling and reuse of waste water • Ensure 100% treatment of waste water and that treated water discharge into the river meets the quality requirement • Explore opportunities for PPP and potential of revenue generation from sale of by-products (treated waste water sale to nearby industrial areas)
Storm water drainage	**"Provide an effective drainage system"**	• Improve the storm water collection efficiency with proper drainage system • Rejuvenate the existing natural basins in the city • Minimise the water logging and flooding incidences in the city • Regularly maintain the existing drainage network to	• Construct SWD network wherever it is required • Regularly clean the existing system along with de-silting • Channelise and de-silt the major natural drainage course in the city and further provide green belt along the natural courses • Revive natural basins like lakes and rivers

Sector	Vision	Development goals	Action points
		• improve the carrying capacity of the system • Minimise the load on treatment of waste water collected in the SWD network	• Design roads and SWD ensuring adequate slope for proper surface water run-off • Effective implementation of the building bye-laws and development control regulations to avoid constructions along ponds / natural drainage system • Make rainwater harvesting system mandatory for the upcoming developments in the city
Solid waste management	**"Efficient integrated solid waste management system for clean Panvel"**	• 100% door-to-door collection of segregated waste • 100% segregation of mixed waste at ward or node level if mixed waste is collected • 100% transportation of waste which cannot be reused or composted • Handling and disposal mechanism to be in compliance with CPHEEO standards • Maximise recycling and reuse capacity and minimise disposal at landfill	• Augment the existing system to maximise door-to-door collection • Promote segregation of waste (dry and liquid waste) at source • Conduct sensitisation and awareness • Explore the latest and sophisticated technologies for handling waste and treatment • Define and implement user charges for solid waste management in the city
Urban roads, traffic and transportation	**"Make city a transportation node for the region with efficient road network and safe, reliable public transport system"**	• Increase the share of public transport and minimise traffic congestion • Segregated bus & public transport lanes according to URDPFI guidelines • Segregated lanes for cycle/ , bike • Provide footpaths according to URDPFI guidelines • Provide enough parking facilities across the city • Prepare comprehensive traffic and transport plan management • Promote vehicle pooling programs in the city	• Prepare comprehensive traffic and transport plan for travel and transport management across the city including measure like one-way, non-parking zone, and no-vehicle zones in narrow streets area , walkways, bicycle lanes, bus lanes pedestrian facilities, junction studies etc. • Provide necessary parking bays on-street and develop parking complexes at various places across the city • Augment the existing road network • Adopt transit-oriented development (TOD) along the major transit corridors and METRO routes to ensure integration of land use and transport • Introduce city bus services for city-wide mobility • Develop intelligent traffic management system in the city
Social	**"To provide the citizens of PMC region (special focus on EWS), access to education, health, recreation, etc."**	• Ensure that people of economically weaker sections (EWS) also have access to proper health facilities, modern education, as well as recreational amenities	• Renovate existing primary health centres, schools, public gardens • Construct new primary health centres, schools, gardens & playgrounds, libraries in the newly added areas • Identify area for establishing municipal hospital • Identify area for establishing public library • Develop community centres, senior citizen clubs, libraries across the city • Undertake an image makeover exercise showcasing the facilities offered in municipal schools and hospitals

Sector	Vision	Development goals	Action points
Urban poverty	**"Slum-free city"**	• Improve access to physical and social infrastructure for the urban poor • Develop a mechanism to ensure social and land tenure rights to all the urban poor along with the necessary economic welfare programmes	• Affordable and better quality housing for urban poor • 100% coverage of basic urban services in all the slums through provision of individual water supply connections, flush toilets, sewerage connections, and door-to-door collection of waste • Develop *pucca* streets and provide street lights in the slums • Develop training centres for imparting vocational and skill development training to help the urban poor in gaining self-employment
Urban environment	**"Pollution free and sustainable environment to the citizens while preserving natural heritage of the city"**	• Develop green spaces across the city • Rejuvenate lakes and rivers and protecting the bio-diversity • Frame a policy to mitigate the various pollutions and effective use of natural resources in the city • Effective disaster management plan for city	• Develop and maintain green spaces in the city • Prepare project report for rejuvenation of rivers in the city and explore water front development possibilities • Rejuvenate the lakes and make it a place for recreational use by the citizens • Develop a robust monitoring and database management system related to air, noise, and water pollution and ground water extraction in the city • Prepare disaster management plan • Strengthen disaster management fleet with equipment of latest technology
Culture and heritage	**"To elevate the tourism potential of Panvel"**	• Promote local and regional tourism • Preserve and conserve heritage	• Identify structures with historical and heritage significance • Prepare a brochure about heritage and culture within Panvel, design special itineraries, create signposts for various sites, and produce multilingual audio guides for tourists • Develop river front as tourism and recreation space • Organise mangrove trails and heritage walks in and around Panvel • Promote cultural heritage by creating a cultural development strategy that would help the municipal corporation as well as citizens of Panvel create products and services based on their special cultural wealth • Beautify areas under bridges and flyovers • Prepare feasibility report for tourism development in Panvel, which should cover in detail of the action points mentioned above


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16.

Sector plan, strategies and investment plan

The sector goals have been set on the basis of an overall assessment and inputs from stakeholders. The sector-specific plans have been prepared after a SWOT analysis as well as respective sector assessments.

The identified projects will be prioritised based on consultations with relevant officials and city-level stakeholders, with a view towards augmenting infrastructure to meet the demand-supply gap.

The total investment for development in the PMC region has been classified into two categories based on the time horizon – short and long-term. 2018-2025 has been identified as a short-term horizon. The projects have been identified for the projected population for a horizon for all the sectors. For all the projects identified, the design year is 2041 so that they can meet the sectoral demand for 2041.

In order to achieve these goals, an action plan has been formulated under each identified sector.

CIP

A capital investment plan (CIP) in line with the identified vision for the city has been prepared through a comprehensive assessment of gap and through stakeholder consultations. This assessment has also led to the identification of sector-specific strategies and associated reforms on the basis of inputs from stakeholders.

The strategies adopted primarily have three dimensions- improving service delivery via efficiency measures, improving service delivery by creating infrastructure assets, and improving governance aspects. This section summarises the capital investments required to create infrastructure assets and various strategic interventions required in the implementation of such projects.

The need for the CIP is on account of:

- Assessment of city growth and infrastructure needs
- Assigning of priorities within the constraints of available financial resources
- The city investment plan is the multi-year scheduling of identified and prioritised investments. The scheduling or phasing of the plan is based on:
  - Studies of fiscal resources availability (for new investments and O & M)
  - Technical capacity for construction and O & M
  - The choice of specific improvements to be carried out for a period of four to five years

16.1 Institutionalising CIP

The City Investment Plan (CIP) is an important element of and significant in terms of a city's management process and sustainability with regard to the delivery of basic services. The CIP also provides a framework for the annual budget cycle for the future. The CIP defines the roles and responsibilities of various stakeholders in the implementation of projects and also identifies public capital facilities to cater to the demand of the city populace in terms of short and long-term infrastructure needs.

The projects have been identified through demand-gap analysis of the services and inputs received from SWOT consultations.

The projects derived aim at ensuring the optimal and efficient utilisation of existing infrastructure systems and enhancing the capacity of the systems/ services to cater to the demands of future population additions.

Further project prioritisation / phasing of investment is based on the strategies listed out under each service sector.

16.2 Water supply sector improvement plan

A sector plan provides a realistic and time-bound plan for prioritised projects to be implemented in short, medium and long-term time frames. The project identification, sector strategies and action plan have been carried out on the basis of demand-gap analysis and discussions with stakeholders. The identified projects have to be completed in a phased manner within the CDP time frame of 2041.Also, in order to overcome the current deficit and meet the requirement for water supply service delivery by 2025, short-terms goals have been formulated. The sector plan for city water supply improvement is presented below.

<table>
<tr><th colspan="2">Water supply sector</th></tr>
<tr><td>Obligatory duty of water supply utility</td><td>• To supply adequate, affordable, good quality water to consumers, at the desired pressure and at convenient hours.</td></tr>
<tr><td>Sector goals</td><td>• Mitigate water supply demand and supply gap
• Strengthen the water supply distribution infrastructure
• 100% metering
• Identification and reduction in NRW
• 100% O&M recovery.
• Provision for future capital investment</td></tr>
<tr><td>Design parameter</td><td>• Base year- 2018 ,short-term – 2025, medium-term – 2032 and long-term – 2042
• Demand estimation based on the projected population for PMC
• Estimate daily water supply demand - 180 LPCD, calculated on the basis of daily per capita water supply norm 135 LPCD + average water supply losses+ floating population+ uses such as gardening, upcoming projects, etc.
• Quality of water as per CPHEEO standards
• 100% treatment capacity
• Storage capacity at 33% of water demand
• 100 % coverage of water distribution network
• Cost recovery through user charges (100% O&M expenses) plus provision for future capital expenditure</td></tr>
<tr><td>Desired outcomes</td><td>
<table>
<tr><th>Parameter</th><th>2018</th><th>2025</th></tr>
<tr><td>Water supply and demand</td><td>210 MLD / 267 MLD</td><td>Demand 377 MLD</td></tr>
<tr><td>Per capita supply (LPCD)</td><td>135</td><td>135</td></tr>
<tr><td>Distribution network coverage</td><td>84.5 %</td><td>100 %</td></tr>
<tr><td>Quality of water</td><td>-</td><td>100 %</td></tr>
<tr><td>Consumer metering*</td><td>42 %</td><td>100 %</td></tr>
<tr><td>Non-revenue water</td><td>-</td><td>20 %</td></tr>
<tr><td>Cost recovery*</td><td>36.3 %</td><td>100 %</td></tr>
</table>
</td></tr>
<tr><td>Action plan</td><td>Activities</td></tr>
<tr><td>Comprehensive water supply plan</td><td>• This focuses on source augmentation, identification of new source, provision of treatment facilities for future requirement
• Energy and water audit to be carried out as part of comprehensive water supply plan
• Planning for longer hours of water supply, ultimately leading to 24X7 water supply</td></tr>
<tr><td>Water supply transmission, distribution and storage infrastructure</td><td>• Increase coverage of water supply network by laying of lines in uncovered and newly developed areas
• Provision of adequate storage infrastructure and interlinking of storage infrastructure to provide uninterrupted water supply</td></tr>
</table>

Water supply sector	
Quality of water	• Create water sampling points in each zone and collect samples • Installation of water testing laboratory for testing of collected water samples or identification of water testing laboratory (accredited) for analysis of water samples
Consumer metering	• Metering of water supply connections of all consumers
Increase the accountability of water supply (non-revenue water)	• Focus on identification and reduction of NRW • Formation of district metering areas • Installation of bulk flow meters for water audit • Conduct workshops on water supply and other services to educate citizens
Water supply distribution rehabilitation plan	• This focuses on partial or complete refurbishing of the existing water distribution network • The old, defunct, and inadequate piping system needs to be replaced by a proper distribution network
Monitoring of water supply	• Installation of SCADA system and mapping of water supply infrastructure on GIS

**For Panvel old council area*

16.2.1 Capital investment plan

Based on the key requirements in the water supply sector, the capital investment plan for the water supply project has been prepared. The plan is divided into three phases with 2025 being short-term, 2032 being medium-term and 2041 being long term**Mitigation of water supply and demand gap**

The additional infrastructure assessment in The water supply demand gap assessment for future years have been presented in table below

Table 33 of water supply section, describes a requirement of 377 MLD by 2025, 450 MLD by 2032 and 543 MLD by 2041 to cater to the water supply needs of villages, CIDCO nodes and the Panvel old council area.

With regard to meeting short-term water requirements, it is suggested that additional water be procured from existing sources. Capital investment plans such as source augmentation and new source development have been suggested to cater to medium and long-term water needs.

Table 129: Proposed water supply mitigation strategy in short term (In MLD)

Sources	Current water supply	Proposed water supply for 2025	Proposed water supply for 2032
Hetawane	65.7	101	• 377 MLD as previous arrangement • Extra 13 MLD from MJP scheme • Extra 4 MLD from desiltation of Dehrang dam • 56 MLD from Balganga dam
MJP-Patalganga	66.2	130	
MIDC-Patalganga	8.85	18	
NMMC-Morbe	35	55	
MIDC Barvi	6.5	26	
MIDC/MJP/CIDCO for villages	12	1. 12 as previous supply 2. 10 from MJP scheme 3. Extra 10 from MIDC/CIDCO	
Dehrang dam	16	16	
Balganga	-	-	

Sources	Current water supply	Proposed water supply for 2025	Proposed water supply for 2032
Khondhane	-	-	
Chota morbe	-	-	
Usran	-	-	
Owe	-	-	
Total	210.31	377	450

Also, in the short term, de-siltation work of Dehrang dam may be carried out and augmentation of treatment capacity of WTP may be done, if required.

Furthermore, the following projects may be taken to mitigate water supply and demand gap, depending upon feasibility studies and approval of concerned authorities in the medium to long term.

- Source augmentation of 250 MLD Kondhane dam,
- Source development of Usran, Owe and Chota Morbe dams

1. Elevated storage reservoir

The additional infrastructure assessment in Table 35 of water supply section, describes a requirement of additional 117 ML of elevated storage capacity to cater to the needs of villages, CIDCO nodes and Panvel old council area by 2041 (assuming storage facilities required for rental housing scheme will be fulfilled by MMRDA). The following projects needs to be undertaken in order to mitigate the requirement of storage capacity:

Table 130: Proposed elevated storage reservoir

Component	Project	Sub-project	Estimated cost in Rs crore
Elevated storage capacity	Construction of ESR with storage capacity of 117 ML by 2041	Construction of 73 ML ESRs by 2025	73
		Construction of 17 ML ESRs from 2025-2032 (Total 90 MLD by 2032)	17
		Construction of total 27 ML ESRs from 2032- 2041 (Total 117 MLD by 2041)	27
Total investment till 2041			117
Total investment envisaged till 2025			73

Furthermore, area/node wise requirement of elevated storage reservoir will be as follows:

Table 131: Proposed area wise ESR (In ML)

Area/ Node	Requirement FY25	Requirement FY25-FY32	Cumulative Requirement FY32	Requirement FY32-FY41	Cumulative Requirement FY41
New Panvel	1.6	1	2.6	1	3.6
Kharghar	20.5	4	24.5	6	30.5
Kalundre	1.0	0	1.0	1	2.0
Taloja	6.0	3	9.0	4	13.0
Kalamboli	4.4	0	4.4	0	4.4
Kamothe	16.0	4	20.0	6	26.0
Navade	3.0	2	5.0	3	8.0

Area/ Node	Requirement FY25	Requirement FY25-FY32	Cumulative Requirement FY32	Requirement FY32-FY41	Cumulative Requirement FY41
Panvel old council area	9.8	1	10.8	3	13.8
Villages	11.0	1	13	3	16
Total	73	17	90	27	117

It may be noted that PMC have proposed Elevated storage reservoir of 6.9 ML for Panvel old council area, 12.3 ML for villages, 9.5 ML for New Panvel node and 7 ML for Kalamboli under AMRUT scheme.

2. Distribution network

The additional infrastructure assessment in Table 34 of water supply section describes a requirement of an additional 479 km of water supply distribution network to cater to the needs of villages, CIDCO nodes and the Panvel old council area by 2041. The following projects need to be undertaken in order to mitigate the requirement of a distribution network:

Table 132: Proposed water supply distribution network

Component	Project	Sub-project	Estimated cost in Rs crore
Distribution network	Laying of a total 479 km of distribution network by 2041	Laying of distribution network of at least 229 km by 2025	68.70
		Replacement of 135 km of distribution network (40% of existing network) by 2025	40.50
		Laying of 109 km of distribution network from 2025-2032 (Total 338 km by 2032)	32.70
		Replacement of 80 km of distribution network (40% of existing network) by 2032	24.00
		Laying of distribution network of 141 km from 2032-2041 (Total 479 km by 2041)	42.30
		Replacement of 50 km of distribution network (40% of existing network) by 2041	15.00
Total investment till 2041			223.20
Total investment envisaged till 2025			109.20

Currently, Kamothe, Panvel old council area and villages have the least water supply distribution network coverage as against its road length[62]. Thus, these areas should be emphasised in the short term.

It may be noted that distribution network of 115 km for villages and 32.27 km for Panvel old council area have been proposed under AMRUT.

3. Metering/SCADA/NRW

The assessment of metering of water supply in section 4.1.5 reveals that PMC has only 42% metering. Thus, achieving 100 % metering of water supply connections with the following projects should be targeted in the short term.

[62] *As per assessment carried out in water supply sector*

Table 133: Proposed metering of water supply

Component	Project	Sub- project	Estimated cost in Rs crore
Metering, SCADA, energy and water audit	Providing 100 % metering of all water supply connections with SCADA, water & energy audit	Installation of 7057 water meters in Panvel old council area, 11439 water meters in CIDCO nodes and approximately 30000 water meters in villages by 2025.	42.25
		Installation of bulk flow meters at each tapping point and ESRs with installation of SCADA system by 2025.	
		Creation of water supply command zones, hydraulic modeling with water and energy audit by 2025.	
		Progressive expansion thereafter for 2032 and 2041 stages, 20% for each stage	For 2032- 8.45 For 2041- 10.14
	Total investment till 2041		60.80
	Total investment envisaged till 2025		42.25

Other strategy for water supply

1. An agency can be appointed to effectively manage water supply drawls from various sources and its conveyance, treatment and distribution with PMC, CIDCO, MJP and JNPT as members.
2. Creation of water supply zones to enhance administrative and operative functioning and efficiency
3. Water and energy audit of water supply system as mentioned above may be carried out to improve water supply delivery. This will help reduce losses and make the entire water supply system accountable. This study shall involve
    a. Consumer survey
    b. Water balance & audit of transmission system, with bulk flow measurements,
    c. Hydraulic modelling involving updating of network maps on GIS. Identification of zones being served by ESR and defining of the boundaries, calibrate hydraulic model for various scenario including base scenarios and suggestion of improvement needed
    d. Energy audit of electro-mechanical equipment for entire water supply system
4. Condition assessment of all the infrastructure related to water supply needs to be carried out
5. PPP can be explored for enhancement in O& M facilities. Private operators can be involved to handle O& M of the entire water supply system, including billing and collection. This can be implemented via multiple methods, performance based-managements contracts for instance. Similarly, condition assessment, leak detection survey and repairs can also be implemented through performance-based management contracts.

16.2.2 Phasing of investments

The investment identified for 2025 and phasing of yearly investment in water supply section has been presented in table below

Table 134: Phasing of proposed water supply projects(Rs crore)

Component	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
Construction of ESR with storage capacity	73.00	3.65	14.60	14.60	14.60	10.95	10.95	3.65
Laying of distribution network	68.70	3.44	13.74	13.74	13.74	10.31	10.31	3.44
Refurbishment of old distribution network	40.50	2.03	8.10	8.10	8.10	6.08	6.08	2.03
Metering, leak detection and installation of SCADA, energy and water audit	42.25	2.11	10.56	12.67	12.67	4.22	0	0
Total	224.45	11.22	47.00	49.11	49.11	31.55	27.33	9.11

16.3 Sewerage and sanitation sector plan

As discussed above in sewerage sector assessment, the key challenges are lack of distribution network and treatment capacity, leading to contamination of water. In order to address these issues, demand-gap analysis has be carried out to estimate the demand for the 2041.The sector plan for sewerage improvement in the city is presented below:

<table>
<tr><th colspan="3">Sewerage sector</th></tr>
<tr><td>Sector goals</td><td colspan="2">• 100% coverage of underground sewerage network
• 100% treatment of sewage and safe discharge in water body
• 100% Household sewer connections
• Maximise reuse and recycling of treated wastewater
• 100% cost recovery</td></tr>
<tr><td>Design parameter</td><td colspan="2">• Base year as 2018 and design year as 2041
• Demand estimation based on the projected population for PMC
• Sewerage generation- 80 % of water supply
• Sewerage network-100 % of road coverage
• Pumping station- As per system design and topography of town
• Quality of effluent as per prevailing standards
• 100% treatment capacity
• 100 % household coverage of sewer</td></tr>
<tr><td>Desired outcomes</td><td colspan="2"><table><tr><th>Parameter</th><th>2018</th><th>2025</th></tr><tr><td>Distribution network coverage</td><td>61.6 %</td><td>100%</td></tr><tr><td>Treatment capacity</td><td>-</td><td>100 %</td></tr><tr><td>Cost recovery</td><td>27 %</td><td>100 %</td></tr></table></td></tr>
<tr><th>Action plan</th><th colspan="2">Activities</th></tr>
<tr><td>Comprehensive sewerage plan</td><td colspan="2">• Provision of UGD network for 100 % collection of sewerage generated
• 100% Households coverage
• 100 % treatment capacity
• Promotion of reuse and recycling of treated sewerage
• Centralised and decentralised systems for villages</td></tr>
</table>

Safe conveyance and treatment of collected waste ensures safe disposal of wastewater, helping maintain environmental safety and health of citizens. Having access to toilets is the first step of the sanitation value chain.

Safe collection of sewage is important from the human health and hygiene point of view, but safe transportation and disposal of the same is equally important from the viewpoint of environmental health.

To meet the service level benchmark of 100% coverage of waste water network, PMC needs to extend the sewerage network to all the villages and unserved areas. While the number of properties connected with sewerage network is not known, PMC should target to attach all properties with sewerage network, particularly in the areas unserved. For the rural areas, the mechanism of onsite and offsite sewerage collection and disposal should be proposed.

All the public / community toilets available in slums are connected to septic tanks. It is suggested that a study be conducted by PMC to assess the feasibility of connecting these community and public toilets with sewerage network.

Though a majority of urban areas in PMC have STPs for treatment of sewerage, the high population growth anticipated in the future means that the capacity of these STPs needs to be augmented. At present, there is negligible reuse of treated waste water. Currently, the treatment capacity is sufficient to treat the wastewater generated but the quality of wastewater ultimately discharged in the river/creek is not good for aquatic life. There are a large number of industries in the PMC area, which use potable water for industrial use. This not only adds to their cost but also create water scarcity during lean seasons. PMC need to explore avenues to raise funds with regard to establishing tertiary-level treatment facilities and take the initiative in encouraging citizens as well as industries to use recycled water.

There are three main water bodies passing through PMC. These rivers are polluted as wastewater is discharged into them. PMC should prepare a river conservation and protection plan which should involve improving quality of water by upgrading existing STPs, establishing new CETPs/STPs and laying a strong monitoring mechanism to check flow of untreated sewerage and wastewater not meeting norms. The green cover along the rivers can be protected by developing river banks for recreational purposes like cycling, jogging track, parks and garden, afforestation, etc.

16.3.1 Capital investment plan

Based on the above key requirements, the capital investment plan for sewerage has been prepared. The plan is divided into three phases with 2025 as short-term, 2032 as medium-term and 2041 as long-term.

16.3.1.1 Underground sewerage network

An assessment of the sewerage sector pegs an additional requirement of 599.19 km of underground sewerage network by 2041. The following projects need to be undertaken in order to mitigate the demand-supply gaps in underground sewerage network.

Table 135: Proposal for underground sewerage network

Component	Project	Estimated cost in Rs crore
Laying of a total of 599.19 km of underground sewerage network by 2041	Construction of underground sewerage network of 349.95 km by 2025	192.50
	Construction of underground sewerage network of 108.7 km from 2025- 2032 (Total 458.65 KM by 2032)	59.76
	Construction of underground sewerage network of 141.2 km from 2032-2041 (Total 599.19 KM by 2041)	77.30
Total investment till 2041		329.55
Total investment envisaged till 2025		192.50

In the short term, the aim should be to mitigate the existing gap in Panvel old council area, CIDCO nodes and villages on a priority basis. As more roads need to be developed in the 11 MMRDA villages and non-nodal CIDCO villages (Khidukpada, Tembode, Padaghe, Devicha Pada, Pale khurd, Tondare, Chal), the underground sewerage network needs to be developed alongside the roads and the same should be targeted to be completed by 2025.

In the medium and long term, sewerage network of 458.61 km by 2032 and 599.19 km by 2041 will be required to be constructed across PMC, as per planned road construction.

It is to be noted that, a proposal for construction of a 100.32 km sewerage network in villages with allied onsite and offsite sewerage disposal facilities is under consideration by PMC and is planned to be implemented in the short term.

16.3.1.2 Sewerage treatment plant

An assessment of the additional infrastructure required in the sewerage sector pegs the requirement at 134 MLD (assuming sewerage treatment capacity required for rental housing scheme will be fulfilled by MMRDA) of sewerage treatment capacity by 2041. The following projects needs to be undertaken in order to mitigate the demand-supply gaps in treatment capacity.

Table 136: Proposal for sewerage treatment plant

Component	Project	Estimated cost in Rs crore
Augmentation/construction of sewerage treatment capacity	Construction of sewerage treatment capacity of 61 MLD by 2025	158.99
	Construction of sewerage treatment capacity of 29 MLD from 2025-2032 (Total 90 MLD by 2032)	75.58
	Construction of sewerage treatment capacity of 44 MLD from 2032-2041 (Total 134 MLD by 2041)	114.68
	Installation of tertiary level treatment facility of 78 MLD by 2041 (to target 20 % reuse and recycling of waste water)	371.53
Total investment till 2041		720.78
Total investment envisaged till 2025		158.99

Node-wise requirement of treatment capacities is as follows:

Table 137: Area/node wise treatment capacity requirement

Area/Node	Requirement 2025	Requirement 2025-2032	Cumulative Requirement 2032	Requirement 2032-2041	Cumulative Requirement 2041
New panel	8	13	21	16	37
Kamothe					
Kharghar	0	0	0	7	7
Kalundre	0	1	1	1	2
Taloja	0	0	0	0	0
Kalamboli	0	0	0	0	0
Navade	8	5	13	7	20
Panvel old council area	19[63]	4	23	6	29
Villages	26	6	32	7	39
Total	61	29	90	44	134

In the short term, the aim should be to mitigate the current gap in Navade and villages. In the medium and long term, the aim should be to fulfil the requirement in Kamothe, Kalundre, Kharghar, Navade, Panvel old council area and villages.

[63] *Subject to change is there may be variation possible in sewerage generation*

It is to be noted that PMC has prepared a proposal to enhance the sewerage system in villages. As per the proposal, the villages have been bifurcated into three groups and different collection, treatment and disposal mechanisms have been proposed for these groups. This proposal will cater to the needs of a sewerage system for the villages till 2050.

In case of Panvel old council area, current sewerage generation and collection is far below the water supplied. If the same scenario continues, an additional eight MLD treatment capacity would be required in the short term.

16.3.1.3 Public toilets

The demand-supply gap presented above gives a requirement of 322 toilet seats and urinals by 2041. The following projects needs to be undertaken in order to mitigate the demand-supply gaps.

Component	Project	Estimated cost in Rs crore
Construction of public toilets	Construction of 138 toilet seat and urinals by 2025	1.25
	Construction of 80 toilets seats and urinals from 2025-2031 (218 toilet seat and urinals by 2032)	0.72
	Construction of 104 toilet seats and urinals from 2032-2041 (322 toilet seat and urinals by 2041)	0.94
Total investment till 2041		2.91
Total investment envisaged till 2025		1.25

It is to be noted that PMC has prepared a proposal to construct 49 Public toilet/Community toilet under *Swachh Bharat Mission*.

16.3.2 Phasing of investment

The sewerage drainage project components have been divided into various components for implementation purposes. Further, the timeliness and implementing agency have been proposed for each component, and the same have been presented in the table below.

Table 138: Phasing of proposed sewerage projects

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs crore					
Constructing of underground sewerage network	PMC	192.50	9.63	38.50	38.50	38.50	28.88	28.88	9.63
Construction of treatment capacity	PMC	158.99	7.95	31.80	31.80	31.80	23.85	23.85	7.95
Construction of toilet seat and urinals	PMC	1.25	0.6	0.25	0.19	0.19	0.19	0.19	0.19
Total		352.73	17.64	70.55	70.48	70.48	52.91	52.91	17.76

16.4 Storm water drainage sector plan

It is evident that in the storm water drain sector, the major challenge is inadequate network in villages and Panvel old council area. To address these concerns, demand-gap analysis has been carried out to assess demand for both the short-term and long-term. The sector plan for improving storm water drain network in PMC region is below:

<table>
<tr><th colspan="7">Stormwater drain sector</th></tr>
<tr><td>Sector goals</td><td colspan="6">• Improve the stormwater drain coverage in PMC region (with major emphasis on old Panvel council area and village area, particularly those villages wherein storm water drains still do not exist)
• Minimise water logging and flooding in the city
• Regular maintenance of the existing drainage network to improve carrying capacity of the system
• Rejuvenate the existing natural basins in the city</td></tr>
<tr><td>Design parameter</td><td colspan="6">• Base year as 2018 and design year as 2041
• Demand estimation of SWD network based on the projected road length requirement as per estimated PMC population
• Stormwater drains to be on all roads
• Stormwater drains as percentage of road length is considered as 130%
• 100% of the storm water drains as pucca closed
• Holding pond- As per network design and topography of town</td></tr>
<tr><td>Demand Gap Assessment</td><td></td><td colspan="2">2018</td><td>2025 (short-term)</td><td>2032 (medium-term)</td><td>2041 (long-term)</td></tr>
<tr><td></td><td>Desired level</td><td>Existing</td><td>Desired level</td><td>Desired level</td><td>Desired level</td></tr>
<tr><td></td><td>Storm water drain (km)</td><td>521.09</td><td>326.98</td><td>737.59</td><td>879.69</td><td>1062.39</td></tr>
<tr><td>Desired outcomes</td><td colspan="3">Parameter</td><td>2018</td><td colspan="2">2025</td></tr>
<tr><td></td><td colspan="3">SWD network coverage</td><td>81 %</td><td colspan="2">100%</td></tr>
<tr><td>Action plan</td><td colspan="6">Activities</td></tr>
<tr><td></td><td colspan="6">With a view to overcome the current deficit and meet the requirement in PMC region, following action plan will have to be followed to meet the deficit in a specific timeframe:
• Upgrade and extend the road side drains across the PMC region
• Construction of new roads in PMC region to be integrated with drain construction
• Ensuring the drains along the roads and drainage channels are accessible for regular maintenance while designing phase itself
• Linkage of major drainage channels and natural basin and de-silting of basin pre-monsoon on regular basis
• Avoiding unregulated constructions along these channels as they hamper the drainage system, particularly during the monsoon.
• Preparing a GIS mapping of the utilities, water logging area and low-lying areas in PMC region
• Making rain water harvesting mandatory in all houses and offices</td></tr>
</table>

16.4.1 Capital investment plan

As per the above requirements and action plan, the capital investment plan for storm water drain sector has been prepared.

16.4.1.1 Increasing storm water drain network in PMC region

In order to mitigate the demand supply gap in storm water drain network, the projects mentioned in Table 139 need to be taken up.

Table 139: SWD network projects identified for PMC region

	Projects	Estimated cost in Rs crore
Laying of stormwater drain network	Constructing storm water drains of 410.61 km by 2025	**235.63**
	Constructing further drains of 142.10 km from 2025-2032 (Total 552.71 km by 2032)	81.55
	Constructing further drains of 182.7 km from 2032-2041 (Total 735.41 km by 2041)	104.85
Total investment till 2041		422.03[64]
Total investment envisaged till 2025		**235.63**

It is also important to earmark the area where these projects would be needed. Currently, PMC area has approximately 52% of urban area constituting nearly 82% of road length of PMC region. The balance 48% area includes the 11 MMRDA villages as well as a portion of CIDCO notified area which is not a part of any node.

Hence, in the short term, PMC should focus on laying stormwater drains in the Panvel old council area, the newly added MMRDA villages (i.e. Dhansar, Rohinjan, Pisarve, Ghot, Taloja Majkur, Koyna Velhe, Nagzari, Karavale Bh, Turbhe, Adivali, Bid) and non-nodal part of CIDCO notified area (i.e. Khidukpada, Tembode, Padaghe, Devicha Pada, Pale khurda, Tondare, Chal), while in the medium and long-term, emphasis should be on spreading the balance coverage in the PMC region, as per planned road length.

Other strategy

1. If permitted by the stormwater drain network design and topography in PMC region, the corporation may also have a holding pond in Panvel old council area. A holding ponds act as a retention basin in normal condition and as storage during high tide, preventing water logging. This will effectively manage the flood water during high and low tides. As per Table 59, Panvel Municipal Corporation shall get the holding ponds situated in erstwhile CIDCO nodes. The corporation can also renovate / augment the capacity of these holding ponds based on future requirements.

   In addition, footpaths can be constructed around these ponds along with gardens, jogging tracks, etc., while some of the surrounding area may be declared as hawker zones. Hawkers / vendors can be permitted to set up stalls, helping the PMC generate revenue by way of rentals as well as advertising rentals, thus recovering some of the cost involved in upkeep of holding ponds. This will also ensure development of holding ponds with a view to ensuring a water logging-free city as well as a recreational space with the potential to earn revenue.

   Navi Mumbai is located below high tide level and used to experience water logging in low-lying areas during high tides and in the monsoon. The stormwater management of Navi Mumbai has been planned on the lines of Netherlands. A well-planned system for drainage and holding ponds for tidal water ensure swift drainage of water without affecting the normal life and freedom from flooding during monsoons in NMMC area. Holding ponds (like in Nerul) have been developed as recreational centres.

2. If permitted by soil permeability, porous pavements can be explored as an option to recharge ground water levels. Permeable pavements are an emerging technology, wherein low-volume roads and parking lots can be explored as an alternative storm water management practice. Permeable pavements are alternative paving surfaces that capture and temporarily store storm water by filtering runoff through voids in the pavement surface into an underlying stone reservoir. These pavements have the ability to reduce urban runoff and trap pollutants. Also, it

[64] *The cost of SWD drains has been tentatively assumed as Rs.1 Cr per Km, basis of the Cost estimation of storm water drain works to be carried out in villages which comes to approximately Rs.10,000 / m*

provides the opportunity to provide at source treatment and management of storm water. Filtered runoff may be collected and returned to the conveyance system or allowed to partially infiltrate the soil.

Jaipur has India's only porous asphalt parking lot at the Gandhinagar railway station. There is a test section here that even integrates rainwater harvesting. The rainwater that percolates is stored in an underlying open-graded stone bed, which is around 225 mm thick and allows water to percolate gradually into the soil below. The water lost to evaporation is minimal. The water infiltration capacity of these pavements is higher (0.8) than that of regular cropped areas (0.3). The advantage of the design is that the rooftop rainwater harvesting systems of buildings adjacent to the parking lot can be integrated into the porous pavement. The design is useful for parking lots in institutional and residential areas.

16.4.2 Phasing of investments

The storm water drainage project components have been divided into various components for implementation purposes. Further, the timeliness and implementing agency have been proposed for each component, and the same have been presented in the table below:

Table 140: Phasing of the identified projects (in short term)

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
		Rs. (Crs)							
Constructing storm water drains of 410.61 km by 2025	PMC	235.63	11.78	47.13	47.13	47.13	35.35	23.56	23.56



16.5 Solid waste management (SWM) sector plan

As discussed under sectoral assessment, the key challenges with respect to the solid waste management sector are lack of segregation of waste at source and absence of transfer stations. In order to overcome the current deficit and meet the requirement for MSW service delivery for 2041, the following goals have been formulated to be achieved in a specific timeframe.

Table 141: SWM sector plan and strategies

Solid waste management sector									
Sector goals	• 100% door-to-door collection • No bins and 100% waste collection in segregated manner • Handling and disposal mechanism to be in compliance with Solid Waste Management Rules, 2016 • Maximum daily treatment of waste and reduction in pollution due to solid waste in the city • Recycling and reuse to reduce the load on the local environment								
Design parameter	• All the households should be covered with the door-to-door waste collection system • Segregation of waste at source – (ensure 100% of waste would be segregated at the source) • Optimum fleet utilisation (No of trips/ vehicle/ day – average minimum of 2) • Desired SWM treatment capacity – 100% of generated waste • Height of landfill site is assumed as 15 m								
Demand gap assessment		**2018**		**2025 (short-term)**		**2032 (medium-term)**		**2041 (long-term)**	
		Desired level	**Current gap**	**Desired level**	**Gap**	**Desired level**	**Gap**	**Desired level**	**Gap**

Solid waste management sector									
	Construction of transfer stations	10	10	10	10	10	10	10	10
	Vehicle capacity required in tonne	297	0	495	199	652	355	893	596
	Landfill site area in acre	-	-	17.9	17.9	41	41	80.9	80.9
	Processing plant capacity in (TPD)	471	0	786	786	1,033	1,033	1,416	1,416

Desired outcomes	**Year**	**2018**	**2025**	**2032**	**2041**
	Door to door waste collection	100%	100%	100%	100%
	Segregation at source	0%	60%	90%	100%
	Mechanised waste handling	100%	100%	100%	100%
	Waste treatment capacity	100%	100%	100%	100%
	Scientific waste disposal	100%	100%	100%	100%
	Cost recovery of O & M	10%	50%	70%	80%

Action plan	**Activities**
Door-to-door waste collection	• Door-to-door waste collection should be implemented across PMC till 2041 • The taskforce should be appointed for the effective implementation of the program and further to achieve the desired goals
Source segregation and collection of MSW	• The segregation of biodegradable and non-biodegradable wastes should be done at the source level • This segregation of waste would improve the recovery from waste collected since the calorific value of the dry waste is not affected
Composting of organic waste	• Segregated organic waste should be used for making compost • New technology and treatment plant should be in line with the waste generated in the city
Scientific landfill	• A regional landfill site with closure mechanism for inorganic wastes is to be developed in accordance with the CPHEEO norms
IEC &capacity building	• For effective solid waste management in the city, regular awareness campaigns have to be conducted in the city and adoption of 4R strategy (reduces, reuse, recycle, and recover) is recommended • Effective implementation of outreach mechanisms to improve door-to-door collection and segregation at source • Alterations and improvements in the structure of departments dealing with sanitation, i.e. Sanitation department and PWD. The number of staff should be proportional to the population • Defining of roles and responsibilities of technical and non-technical staff • Training and capacity building exercises for technical staff

Source: CRIS analysis

16.5.1 Capital investment plan & project details

The door to door collection coverage is ~100%. However, waste is collected in the mixed form. No segregation is done on the source of waste which indicates absence of robust monitoring and SWM strategy in the city. Currently, PMC does not have its own landfill site and waste treatment facility which is a big drawback. It is important to have its own solid waste treatment facility in order to process waste generated in the future. Hence, based on demand gap analysis and future waste generation till 2041, the investment estimated for SWM sector is given in the table below.

Table 142: SWM capital investment plan

Component		Project description	Investment estimated in Rs crore
A	Construction of MSW treatment facility with scientific landfill	• Construction of compost plant • Waste processing plant with RDF production facility • Construction of scientific landfill	326.3
B	Procurement of MSW transportation and waste handling machineries	• PMC will require augmentation of the existing fleet size to continue 100% coverage and transportation of waste in future • CRIS has also considered the replacement of vehicles after 7 years of operations	78.08
C	Construction of transfer stations	• Construction of 10 transfer stations	10.00
	Total investment required for 2041		414.38
	Total investment envisaged till 2025		107.68

Source: CRIS analysis

16.5.2 Phasing of investment

The SWM project components have been divided into various sub-components for implementation purposes. Further, the timeliness and implementing agency have been proposed for each component, and the same have been presented in the table below.

Table 143: Phasing of investment SWM (Rs crore)

Sector /Components		Implementation agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Construction of MSW treatment facility with land fill site	PMC	78.72	0	0	15.74	24.15	24.15	14.67	0
B	Procurement of MSW transportation and waste handling machineries	PMC	18.96	0	0	0	0	0	0	18.96
C	Construction of transfer stations	PMC	10	10	0	0	0	0	0	0
Total			107.68	10	0	15.74	24.15	24.15	14.67	18.96

Source: CRIS analysis

16.5.3 Strategies for the sector

Currently, PMC is totally dependant on the CIDCO waste processing plant. However, since there will be increased waste because of increased economic activity within PMC area, it is important to form a robust strategy for the sector. This section will provide two main strategies for the sector i.e. strategy for waste processing and strategy for collection and transportation of waste.

16.5.3.1 Strategy to effectively process future waste generation

As we have seen in the gap analysis section, the land requirement to fulfil long-term demand of the PMC is 111.3 acre. However, it is very difficult to have one landfill of this size, considering the share size and complications

associated with landfill projects. Hence, it is important to divide this area into multiple parts with respect to the different terms.

For short-term planning, the required landfill area is 17.88 acre which can be accommodated in the upcoming waste processing plant at Khanav. This facility will have an area of 37 acre from which PMC requirement of 17.88 acre can be fulfilled. This way PMC will fulfil its waste processing requirements till 2025.

For medium and long-term planning, the required landfill area is 23.09 and 39.89 acre, respectively, which, in total, amounts to 62.98 acre of area. For this generated waste, PMC has to build a processing plant and landfill site.

As we know that these waste figures are for all PMC and not for a specific area, for effective transportation of waste there should be two different processing plants in different locations in the PMC. For the location of these processing units, if the upcoming facility at Khanav which will be located in the west side of the PMC is considered, then facilities for medium and long terms should be located at the east and north sides. This is because the current site at Ghot is located at the northern side of PMC which will attain its closure in the next two years and this area will be having a boost in the population in the coming years. In addition, the west side of PMC is already developed but lack of processing facility amounts to more transportation cost.

Table 144: Strategy for landfill in PMC area

Sl. No.	Term	Year	Landfill area gaps in Acres	Strategy to full fill gaps
1	Short-term	2018-25	17.88	CIDCO processing plant at Khanav/ PMC own plant - East
2	Medium-term	2025-32	23.09	PMC own plant – North & West
3	Long-term	2032-41	39.89	PMC own plant- North and West

Source: CRIS analysis

16.5.3.2 Strategy for effective collection and transportation of waste

Currently, PMC collects and transports all the waste produced in the PMC to a processing unit for the treatment of waste & there are no transfer stations involved in the process. Therefore the segregation is done directly at the treatment facility. This process actually let PMC unnecessarily increase the required rated capacity of vehicles by transporting the recyclable and composting waste along with mixed waste.

Currently, PMC operates at 297 metric tonne of vehicles rated capacity and it is projected to increase by 2041 to about 1416 metric tonne. In order to meet this capacity, PMC will need to procure more vehicles but it is very evident from the previous ULB experiences that the maintenance of these vehicles is a major issue for all ULBs. Hence it is required to minimise the waste and it can be done by setting up various transfer stations along the city. These transfer stations will reduce the waste volume by separating recyclable and composting waste from the mixed waste.

In order to effectively transport the remaining waste, it is recommended to have a service contract with an experienced service provider. The arrangement of this contract should be such that if the PMC's current fleet of vehicles is not enough for operations then the service provider should be responsible for arranging additional vehicles and maintaining all vehicles. In this way the hassle of maintaining vehicles will be transferred from the PMC to the service provider.

16.5.4 Possibility of PPP model in SWM

To improvise the existing way of implementing projects related to SWM on PPP basis and to ensure maximum gains to all, the following key suggestions have been made:

- PMC should explore the possibility of a revenue-sharing model

- PMC should incorporate a penalty clause into contracts to ensure performance
- Clause for PMC to intervene in the decision-making process for better project outcomes
- Also, incorporation of clauses in the concession agreement which are linked to the performance of the private operator

Based on past experience and discussions with PMC officials, PMC‟s role in the PPP projects, especially in the SWM sector, is merely limited to monitoring. There are some recommendations for PMC to enhance the level of services:

- On a daily basis, PMC should monitor the SWM activities that are outsourced. Keep check of the records of waste collected, transported and treated
- PMC should form a dedicated team that will monitor the SWM fleet movement and waste handling within the city on a daily basis
- PMC should have robust vigilance system and impose penalty in case of non-adherence to the stipulated standards for all private operators

16.6 Urban roads, traffic and transportation

16.6.1 Traffic management

The efficiency of a road network is highly dependent on the performance of traffic intersections/junctions and bottlenecks. Intersections that have traffic flow more than the design capacity result in a higher degree of congestion. Also, other issues like time delays and unregulated traffic movements will take place. Proper listing and study of the major junction should be undertaken on a priority basis to solve traffic issues in the city.

From the traffic management point of view, it is important to look at the provision of signals at the junctions for better management of traffic flow in different directions. Also, it is important to study the signal cycle at junctions against the traffic volume. High single cycle time for junctions with low traffic unnecessary causes delays and increases travel time. Also, as there are two major railway line passing through Panvel. Construction of ROBs and RUBs at important intersections needs to be studied.

16.6.2 Roads

As discussed in the sectoral assessment for urban roads, traffic & transportation, the city does not have 100% coverage of concrete surface roads. Pedestrian safety, lack of parking and lack of city-exclusive public transportation are the other major concerns. In order to resolve these issues a sector plan is prepared for PMC in the table below.

Table 145: Urban roads, traffic and transportation - Sector plan and strategies

Urban roads and traffic and transportation sector plan and strategies	
Sector goals	• Improve the coverage of public transport and promote use of public transport • Integration of land use and transport sectors through transit-oriented development, promotion of mixed land use, and defused CBDs in PMC area • Implement necessary travel demand management (TDM) strategies to achieve sustainability • To provide necessary infrastructure for Non-Motorized Transport(NMT) mode and promote use of NMT • Improve parking facilities across the city
Design parameter	• Road condition - % municipal roads surfaced (100% - CC surfacing) • Road network – Degree of connectivity in terms of per capita road length (minimum 1.0 m) • Development of non-motorised facilities and sustainable public transportation system

<table>
<tr><th colspan="2">Urban roads and traffic and transportation sector plan and strategies</th></tr>
<tr><td></td><td>
• Minimum 10% of land use to be under roads
• All the new roads will be constructed as a concrete road only
• Upgradation of existing 30% of bitumen road to concrete road will be done after 2019
• Upgradation of existing 50% of bitumen road to concrete road will be done after 2025
• Upgradation of existing 20% of bitumen road to concrete road will be done after 2032
• Current average width of the road is considered for the future projections of the road
• Per capita road is 0.27 m in length
• Average width of existing roads in PMC is 19 m
</td></tr>
<tr><td>Demand Gap Assessment</td><td>
<table>
<tr><th rowspan="2"></th><th colspan="2">2018</th><th colspan="2">2025 (short-term)</th><th colspan="2">2032 (medium-term)</th><th colspan="2">2041 (long-term)</th></tr>
<tr><th>Desired level</th><th>Current gap</th><th>Desired level</th><th>Gap</th><th>Desired level</th><th>Gap</th><th>Desired level</th><th>Gap</th></tr>
<tr><td colspan="9">Construction of new roads</td></tr>
<tr><td>Concrete (CC)</td><td>57.5</td><td>47</td><td>224</td><td>214</td><td>333</td><td>323</td><td>474</td><td>463</td></tr>
<tr><td>Black Top (BT)</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="9">Upgradation of bitumen to concrete roads</td></tr>
<tr><td>Upgrade BT to CC</td><td>343</td><td>103</td><td>343</td><td>0</td><td>343</td><td>172</td><td>343</td><td>69</td></tr>
</table>
</td></tr>
<tr><td>Desired outcomes</td><td>
<table>
<tr><th>Year</th><th>2018</th><th>2025</th><th>2032</th><th>2041</th></tr>
<tr><td>Concrete roads</td><td>3%</td><td>30%</td><td>70%</td><td>100%</td></tr>
<tr><td>Reduction in travel time</td><td>-</td><td>20%</td><td>30%</td><td>50%</td></tr>
</table>
</td></tr>
<tr><td>Action plan</td><td>Activities</td></tr>
<tr><td>Comprehensive mobility plan (CMP)</td><td>
• Dedicated cell for effective implementation of CMP in consultations with various departments concerned in the city
• Need to create a dedicated fund for transport service to ensure regular allocation of the funds for urban transport system
• Setting up of separate unit to operate transport service
</td></tr>
<tr><td>Transit oriented development (TOD)</td><td>
• Development of new transit-oriented development to decongest the existing city by providing access to public transport, and encouraging transit ridership
• TOD can be achieved by changing the land use plans and amending building byelaws by giving higher FAR/FSI around the transit areas
</td></tr>
<tr><td>Development of Traffic and Transport Infrastructure</td><td>
• Widening and upgrading the arterial, sub-arterial and collector roads
• Development of skywalks/subways, pathways, cycle tracks
• Development of freight management hub/truck terminals at nodes on the periphery of the city
• Development of interchange hub/multi modal hub for smooth, convenient interchange of modes and to promote integration of various modes of public transport
• Development of supporting infrastructure like flyovers, bridges, foot-over bridges, subways, etc.
• Development of sustainable public transport system like BRTS and LRTS and integration of the various systems. Also, use of existing bus-based public transport system as feeder system
• Encouraging use of non-motorised transport mode and providing support by developing cycle tracks, pedestrian crossings, walkways in the city
</td></tr>
<tr><td>Reforms/ strategies</td><td>
• To promote levying of fines and penalty along with robust vigilance system to ensure law and order
• To implement parking policy
• To use Traffic Calming Measures (TCM) and Travel Demand Management (TDM) for efficient management of traffic within the cities and between the cities
• Develop monitoring (ITS) and vigilance system to ensure sustainable system and enforcement of law and order
• Regularization of hawking zones and drafting of parking policy
</td></tr>
</table>

Source: CRIS analysis

16.6.3 Capital investment plan

Based on the demand gap analysis, investment required for 2041 has been projected. The project proposals identified and the block estimates are presented in the table below.

Table 146: Projects identified – Urban Roads, traffic and transportation

Component		Project description	Investment estimated in Rs crore
A	Construction of new concrete roads	• Construction of all new roads in concrete	1493.01
B	Upgradation of bitumen roads to concrete roads	• Upgradation of bitumen road to concrete road	850.87
C	Comprehensive traffic and transportation plan for PMC	• Preparation of comprehensive traffic and transportation plan for PMC region	1.00
	Total investment required for 2041		2344.88
	Total investment envisaged till 2025		944.28

Source: CRIS analysis

16.6.4 Phasing of investment

The traffic and transportation project components have been divided into various components for implementation purpose. Further, the timeliness and implementing agency have been proposed for each component, and the same have been presented in the table below.

Table 147: Phasing of investment– Urban roads, traffic and transportation (Rs crore)

Sector /Components		Implementation agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Construction of new concrete roads	PMC	688.01	68.80	103.20	103.20	103.20	103.20	103.20	103.20
B	Upgradation of bitumen roads to concrete roads	PMC	255.26	25.53	38.29	38.29	38.29	38.29	38.29	38.29
C	Comprehensive traffic and transport plan for PMC	PMC	1.00	0	1.00	0	0	0	0	0
Total			944.28	94.33	142.49	141.49	141.49	141.49	141.49	141.49

Source: CRIS analysis

16.6.5 Strategy for the road sector

Currently, in PMC the area under roads is about 6 % of the total area. The overall demand which needs to be fulfilled is around 592 km and PMC already has 354 km of roads; hence, to meet the overall gap, an additional 238 km of roads need to be constructed in the long term.

Strategy to choose the construction material

There are four type of materials used to construct roads i.e. concrete, bitumen, WBM and earthen. Amongst these, only concrete and bitumen is recommended for city roads. These two materials have their own advantages and disadvantages. Choosing a material depends upon many factors, the critical factors being financial capacity of any ULB and overall lifecycle cost of an asset.

It can be seen from the gap analysis table that the costs of two selected scenarios vary significantly (i.e. a difference of Rs129 crore). This is because the first scenario assumes roads being constructed using bitumen and then upgraded to concrete. While in the second scenario, only existing bitumen roads are converted to concrete and all new roads are constructed using concrete only. In the second scenario, there is no need for the upgradation of road. In addition, concrete roads are cheaper to maintain in the long run. Hence, the second scenario would be better suited for the PMC.

Strategy to improve transportation in villages across PMC

Post the formation of the municipal corporation, the area under the jurisdiction of the PMC encompasses a total of 29 villages. All these villages are spread across the PMC and the development status of all the villages vary with respect to their locations i.e. the villages which are close to highways, CIDCO nodes & the old council area are more developed than others. However, the development in villages is not at par with the development in other areas like the old council area or CIDCO nodes. It was observed in the reconnaissance survey that most villages have very narrow roads.

Hence, in order to improve transportation in villages, there is need for wider roads in villages. However, it is very difficult for any government authority to widen existing roads due to resistance from residents whose homes are situated on either side of these roads.

Hence, we recommend that a ring road around all the villages be built which connects all the internal roads to this ring road. This will ensure the access to all pockets of the villages. In addition, instead of widening all roads, there will be one wide road connecting the most frequented places in a village like temples, schools, community centres, etc. This will ensure smooth movement across the main village spots.

Strategy to prioritise the area for improvement of road coverage across PMC

After selecting the most suitable construction material, it is important to prioritise the area where these roads will be constructed. Currently, in total, 52% of PMC area is urbanised and accounts for a total 82% of road length. Hence, there is little scope for increasing road coverage. This area includes all the CIDCO nodes, MIDC area and core council area. The remaining 48% area accommodates the balance 18% of road length. This is constituted by the 11 MMRDA villages having a total area of 32.93 sq. km and some part from CIDCO notified area which does not form part of the nodal plan and has an approximate area of 20.12 sq km.

Table 80 demonstrates that the existing gap in PMC road length is about 47 km while the short-term gap is 166.5 km which totals about 213.5 km. This is the minimum road length which needs to be constructed to fill the short-term gap by 2025.

This gap is for the PMC region as a whole, but as is evident, the deficiency of roads is primarily in the non-urbanised areas of the PMC. Hence in the short term, the PMC should construct roads in the newly-added villages and non-nodal part of CIDCO-notified area. In the medium and long term, the focus should be on creating new roads in the entire PMC area.

Table 148: Strategy for roads in PMC region

Sr. No.	Investment term	Road length in km	Focused area	Villages involved
1	Short-term	213.5	11 villages from MMRDA	Dhansar, Rohinjan, Pisarve, Ghot, Taloja Machkur, Koyna Velhe, Nagzari, Karavale Bh, Turbhe, Adivali, Bid
			Non nodal villages from CIDCO notified area	Khidukpada, Tembode, Padaghe, Devicha Pada, Pale khurd, Tondare, Chal
2	Medium-term	109.31	Entire PMC area	Entire PMC area

Sr. No.	Investment term	Road length in km	Focused area	Villages involved
3	Long-term	140.54	Entire PMC area	Entire PMC area
	Total	463.35		

Source: CRIS analysis

Roads identified to be taken up in the short term

Based on the inputs provided by the PMC officials and other stakeholders, CRIS has identified the priority road projects to be taken up in the immediate term. The identified projects are in sync with the strategy proposed for sector and hence, include construction of new roads as well as upgradation of existing roads.

Following table provides a list of new roads which needs to be constructed. This list also includes the extension of the partly constructed roads which were being managed by other authorities before formation of PMC.

Table 149: Critical new construction road projects

Sr. No.	Identified road for new construction and extension	Length in Km
1	Wavanje road : New Panvel node boundary to Deepak fertilizers	7
2	NH4 to Rohinjan to Pisarve to Siddhi Karavale to Nagzari	8
3	Siddhi Karavale to Taloja Machkur to Pethali to Taloja Machkur phase 1	3
4	Paghade to Koynavelhe to Ghot	4
5	Owe to Owe camp road	0.6
6	Dhansar Nigul road	0.5
7	Turbhe Chakthan road	0.5
8	NH 4 to Taloja Jail	3
9	Chota chal joint road	0.7
10	Nagzari Budhwadi road	0.4
11	Taloje Pachnand joint road	0.45
12	Dharna to Dharna camp joint road	0.4
Total		30.05

Source: CRIS analysis & PMC

In addition to above, there are roads which are essential for the PMC region but need an upgradation. The following table lists these critical roads.

Table 150: Critical road projects for upgradation in PMC region

Sr.no	Area name	Road Number	Road name	Length in Km
1	Old council area	1	Lions garden to Tehsil office to HOC colony	1.00
		2	Lions garden to Panvel court to Panvel jetty	0.85
		3	Swami Narayan road to Mitranand building to Judge residence	0.45
		4	Maharana pratap road, Judge residence to Sawarkar chowk	0.38
		5	Ratnakar Khare marg, Savarkar chowk to amardham crematorium	0.65
		6	V. B .Fadke road	0.35
		7	Uran road to Market yard to Kalpataru society	0.70

Sr.no	Area name	Road Number	Road name	Length in Km
		8	National paradise to Godrej sky garden to Survey no 399 road	1.38
		9	NH 4 to Panvel railway stand	0.55
		10	Survey no 395 to Samrat hotel to NH 4	0.40
		11	Mahatma Gandhi road	1.15
		12	Savarkar Chowk to V. K. High school	0.53
2	Non nodal area excluding Core council area	1	Paghade to Koynavelhe to Ghot	4.60
		2	NH 4 to Taloja Majkur to Karavale to MIDC	9.00
		3	Kharghar Tata Hospital Owe to Taloja NH 4	8.00
		4	Navade Phata to MIDC Uratne To Thane District Boaundary	11.50
		5	Khande Khurda Joint road	0.50
		6	Asudgoan joint road	0.50
		7	NH to Kamothe Jui road	3.10
		8	Kalamboli joint road	0.20
		9	Tembodhe joint road	0.50
		10	Roadpali joint road	0.50
		11	Navade joint road	0.40
		12	Owe to Owe camp road	1.16
		13	NH4 to Roahinjan Bid Road	1.00
		14	Adivali Dhansar Road	2.00
		15	Pendhar Phata to Ghot road	3.47
		16	Pendhar joint road	1.40
		17	Tondhare joint road	1.20
		18	Valavali joint road	0.70
		19	Kiravali Katkariwadi road	0.40
		20	Bhingari joint road	0.50
		21	Khidukpada joint road	0.50
		22	Papadicha pada joint road	0.20
		23	Kharghar Koper pada road	0.20
		24	Roadpali to Jui road	3.00
		25	Gholachi Vadi joint road	2.00
		26	Tondare Harijanvasti road	0.80
3	New Panvel Node	1	Gurudwara road/ Shravan marg (Start under NH548 ROB & ends at junction at Adai goan entrance excluding overbridge)	2.14
		2	Vijay marg (Start under Mumbai Pune expressway ROB go through HDFC circle till smashan bhoomi)	3.47
		3	Panvel Matheran road (Start at HDFC circle go through Sukapur junction till PMC boundary towards Nere village)	1.48
4	Kamothe Node	1	Mansarovar station road (Start at Mansarovar station till Mumbai Pune highway)	1.89
		2	Khandeshwar station road- Mansarovar station road (road connecting Mansarovar station road and Khandeshwar station)	2.33

Sr.no	Area name	Road Number	Road name	Length in Km
5	Kalamboli Node	1	Kalamboli link road to Rodpali road	2.41
		2	Kalamboli bridge to junction at Police chowki to end of the roadRoadpali road	2.43
		3	Neelkanth residency to SSV broadband pvt. Ltd.	0.65
		4	State bank Kalamboli to kinds lnd school road	0.59
6	Kharghar Node	1	Pandav marg	4.12
		2	Taloja road (From Chatrapati shivaji maharaj chowk till NH48)	3.43
		3	Ranilakhamibai Marg	2.36
		4	Central park road	1.87
		5	Shilp chowk to gurukul road to Apeejay road	1.87
		6	Sector 19 to D- Mart road to Neelkanth sweets to end of the road	1.35
		7	Vastu Vihar road	1.68
		8	Pravesh marg	0.61
Total				100.37

Source: CRIS analysis & PMC

16.6.6 Buses

PMC may consider starting a bus service facility to cater to the future requirement of the public in the PMC region. The PMC may either operate this on its own or explore a public-private partnership (PPP) model.

With a view towards meeting the transportation requirements of the increasing population in the PMC region, the following action plan will have to be followed to meet the deficit in a specific timeframe:

- If PMC wishes to start a new entity to provide transport services, an exclusive institution will be required for the same. This could be:
  - A transport undertaking under the Maharashtra Municipal Corporations Act
  - A Special Purpose Vehicle (SPV) under the Companies Act (as a wholly-owned subsidiary of PMC)
- In case of the PMC deciding to explore the possibility of a PPP, it needs to finalise an appropriate model which utilises the strength of the private sector without compromising on service levels. Suggestive models could be:
  - **Gross cost contract:** In this model, the operator is insulated from any demand risk, either fully or partially, and his payment/revenue is fixed and linked with the delivery of services, as stipulated under the contract. Collection of fare from the bus users is the responsibility of authority
  - **Net cost contract:** The operator is responsible for owning and operating the buses and also for collecting the fare from users. Under this model, the operator's revenue is linked to the quantum of passengers he gets. In lieu of revenue collected and anticipated profit, operator offers some license/concession fee
- Alternatively, if the PMC decides to run the services on its own, it needs to explore sources of funding the bus service such as revenue generated through advertisement charges on the buses, commercialisation of bus stops, setting up a separate fund (by establishing dedicated revenue streams for same), etc.
- Initiatives such as providing affordable mini and medi-buses may be explored.

However, PMC first needs to conduct a feasibility study to assess the viability of running a bus service in the region.

16.6.7 Comprehensive mobility planning

A comprehensive city traffic and transportation plan needs to be undertaken for the PMC region on an immediate basis.

- The following details need to be assessed for comprehensive mobility planning of the city:
  - Classification of roads on basis of carriage way width
  - Roads with median/ separator, undivided roads
  - Availability of footpath with width, streetlight poles (with potential for advertising) and railings along footpaths
  - Listing and study of major road junctions including details of signalling
  - All the bridges, flyover and interchange should also be listed and studied
- Primary surveys on following aspects need to be carried out[65]:
  - Road network inventory
  - Classified traffic volume counts
  - Speed and delay study
  - Origin and destination survey
  - Public transport survey
  - Parking area survey
  - Pedestrian survey
  - IPT survey
  - Model split
  - The dedicated cell/department for effective implementation of CMP, in consultation with various relevant departments in the city
- The dedicated cell/department for effective implementation of CMP, in consultation with various relevant departments in the city

16.6.8 Parking

Parking is one of the most important issues in the PMC region. Currently, the data regarding parking facilities is only available for Panvel old council area. Thus, CRIS has analysed the land use pattern of PMC and calculated the current parking requirements for various land uses. The following table gives details about the parking requirements in PMC.

Table 151: Parking requirements in PMC

Land use type	Area in PMC (Ha)	Total built-up	Total floor area'	ECS	built up area (sq m)	floor area (sq m)	Parking requirement in ECS	Built up Parking space for multi-level car park with rafts in sq Km
Residential	2513	4278	3209	2	100		855637	25.67
Commercial	834	1419	1064	3		100	319312	9.58

[65] *The list is not exhaustive and comprises only general aspects*

Land use type	Area in PMC (Ha)	Total built-up	Total floor area'	ECS	built up area (sq m)	floor area (sq m)	Parking requirement in ECS	Built up Parking space for multi-level car park with rafts in sq Km
Social , Public/ semi public	636	1082	812	2		100	162367	4.87
Industry	2483	4227	3170	2		100	634042	19.02
Mixed land use	0	0	0	2	100		0	0.00
TOTAL (eligible for parking)	6465	11007	8255				1971357	59.14

Source: CRIS analysis

Please note that PMC will have to do a proper survey of parking provisions in the PMC in order to calculate a gap in the parking provisions and implement the parking requirements, as assessed in the above table

However, based on the PMC's recommendations & stakeholder's consultation CRIS has identified the critical spots for the parking which needs to be developed in the immediate term.

Table 152: Critical parking spaces in PMC old council area

Sr. No.	Area	Parking spot	Purpose of parking	Development mode
1	Old council area	Near Chatrapati Shivaji Maharaj Chowk	Parking facility for nearby municipal commercial complex along with the commercial space within 300 to 500 meters perimeter	1. It is recommended to develop an integrated parking complex with dedicated commercial space to fulfil the O & M cost of the building 2. It is recommended to provide long term parking option for these parking i.e. parking for one week, month, year etc.
2	Old council area	Near Dr. Babasaheb Ambedkar Statue	Parking facility for nearby vegetable market and act as a parking solution for bus commuters because of nearby state transport depot	
3	Old council area	Near Tapal Naka	Parking facility for nearby fish and Mirchi galli market along with the commercial space within 300 to 500 meter perimeter	

Source: CRIS analysis & PMC

Apart from the spaces listed above there is also a need of parking spaces in the CIDCO nodal area. It is recommended to develop an integrated parking complexes in each CIDCO node. These will serve as a long term parking solution for the nearby residential area as well as a potential marketing space. This will help in reducing the congestion caused due to street parking in the area.

It is recommended that the above parking spots should be finalised only if a space meets following criteria

1. If it is recommended in the comprehensive mobility plan & parking policy of PMC area
2. If provisions of the land required for these parking spaces is made in the development plan
3. If it has come up as a viable option in Techno-Economic feasibility study.

16.6.9 Truck terminal

The PMC region experiences a lot of truck traffic owing to its proximity to JNPT, MIDC area, etc. The indiscriminate parking of trucks on roads encroaches upon the space reserved for pedestrians as well as for moving vehicles.

Trucks need a terminal where they can break or end their journey and prepare for the next trip. Lack of proper truck terminals have resulted in avoidable congestion within the town.

Currently, there is a truck terminal in PMC region (at Kalamboli). However, it is suggested that a new truck terminal be developed so that the congestion resulting due to truck traffic be reduced.

The following factors are generally considered while locating a truck terminal[66]:

- They should be located on main corridor of goods movement.
- Multi-modal connectivity with train corridors and waterways
- They are generally located on fringe of developed lands
- They should have proper linkage with other freight generating activities as well as developed areas
- Consideration for intra-city goods movement pattern in terms of desire of movement, modes used and distances over which movement is made should also be kept in view

16.6.10 Safety measure

All the major junctions need to have traffic signals and should be synchronised with traffic volume. Signages should be installed at a majority of the junctions to manage and guide the traffic movement within the city. Apart from this, there can be a traffic park in the city, which is meant to educate young children about the importance of following traffic rules and driving safely. The traffic park also provides recreational facilities.

16.6.11 Non-motorised transport (NMT)

Non-motorised transport (NMT) includes primarily walking, cycling or commuting by cycle rickshaws. These are green modes of transport and inexpensive compared to motorised transport. As the population in Panvel Municipal Corporation region is witnessing an acceleration, there is likely to be a spurt in the growing upper middle class, thereby making it imperative to address the growing challenges in urban transportation and to develop NMT as a key component in the transport system of the city, either as a main mode or as a last-mile connector to mass transport system.

Strategy to prioritise the area for promoting NMT across PMC region

In order to facilitate NMT development, following recommendations may be considered:

- Collect data of existing NMT usage, existing NMT infrastructure (if any) and number of accidents involving NMT users (including casualties) in order to prepare a proper plan
- Adopt pedestrian and cycling-friendly street design guidelines at selected locations initially, focusing on prioritising NMT users. Infrastructure width requirements are based on vehicle dimensions, volume and clearance requirements of moving vehicles like cycle rickshaws. Exclusive lanes for slow moving vehicles, bicycles and rickshaws and pedestrians along with spaces for street vendors, are also essential. These are to be followed while designing phase
- The street design to include traffic calming measures (to reduce the speed of vehicles) and facilitate pedestrians to remain at ground level with comfortable and safe access and minimum detours
- All pedestrian facilities to be barrier-free and have universal accessibility by providing infrastructure which assists people with special requirements
- A local walking and cycle route map should be prepared and promoted among residents to increase awareness and encourage NMT

[66] *Source: URDPFI guidelines*

16.6.12 Transit-oriented development (TOD)

Transit-oriented development (TOD) is a recent trend in creating vibrant, liveable, compact, walkable communities around or along transit (rail/bus) systems to achieve a higher quality of life by reducing car dependency. TOD is defined as a high-density, mixed-use type of development close to transit services.

The success of TOD will depend on efficiency of public transportation and its connectivity with dedicated corridors, conducive local conditions, development control regulations and proper co-ordination between various stakeholders (transport authorities, urban development authorities and various Parastatals agencies).

As the development plan for Panvel Municipal Corporation region is under preparation, it is suggested that at the planning stage, transportation should be integrated with land use to minimise likely congestion. Also, provision should be made for adequate physical and social infrastructure such as power, water, waste management, communication, etc., along with affordable housing along identified transit corridors.

16.6.13 Possibility of PPP in roads and transportation

In the urban transport sector, projects related to transportation systems can be developed in PPP mode. Various projects that can be implemented through PPP are:

- BRTS, LRTS – PMC can outsource the whole function of provision of public transport for the PMC area to private operator for a specific period (7 -10 years). Under PPP, the scenario can be as follows:
    1. PMC might ask private operator to procure the whole or part of the fleet required
    2. Private operator should design and develop bus shelters in the city along the routes proposed or suggested by PMC
    3. Authority responsible for routes finalisation for public transportation system will be PMC, and private operator can also suggest change or deletion. Also, PMC will have the authority to finalise the fare card based on socio-economic factors for the project
    4. Revenue sharing model should be worked out between PMC and the private operator
- Development of interchange hub, freight management complexes, bus & truck terminals, etc. – Design, construction, and maintenance of buildings like interchange hub, freight management complexes and bus terminals is feasible on a PPP basis.
    1. PMC can provide municipal land on lease to private operator for construction and maintenance of such buildings
    2. Private operator might have to bear all the costs related to the project and towards O&M too. Operator would be given a concession period of 10 to 15 years
    3. Revenue sharing model should be worked out between PMC and the private operator
- Development of flyovers, subways, FoBs - Design, construction, and maintenance of flyovers, subways, FOBs is feasible on a PPP basis. PMC can provide municipal land on lease to private operator for construction and maintenance of flyovers, subways, FOBs
- Private operator might have to bear all the costs related to the project and towards O&M too. Operator would be given a concession period of 20 to 30 years. For recovery of the capital cost and O&M cost of the infrastructure, PMC should levy entry tax/toll tax at city entry points
- Revenue sharing model should be worked out between PMC and the private operator
- Development of parking bays, complexes – Design, construction, and maintenance of parking bays or complexes is feasible on a PPP basis

- PMC can provide municipal land on lease to private operator for construction and maintenance of parking bays or complexes



16.7 Street light

16.7.1 Capital investment plan

Currently, PMC handles the streetlights from the area apart from CIDCO nodes. This area majorly consists of old council area, newly-added MMRDA villages and non-nodal part of CIDCO. PMC has already started laying out the streetlight infrastructure in these areas. As seen in the gap analysis, there is total demand of about 36722 LED lights in the PMC of which only 3369 streetlights are currently installed. This streetlight requirement demands a huge amount of capital as well as O & M cost. For the planning of streetlights, we consider all the costs involved such as LED installation cost, polls construction cost, in addition to which there is a major O & M component including cost of electricity bill and streetlight maintenance cost.

If we look at the cost associated with all the scenarios then the first scenario offers the lowest estimate i.e., Rs 388 crore in terms of overall cost, of which all the cost will be borne by the PMC. However, there is a state notification of the Maharashtra government with notification no 2017/183/NV-20 dated January 12, 2018, which states that all the existing & upcoming streetlights in the corporation should be replaced & installed in the form of LEDs only and work should be done in co-ordination with Energy Efficiency Services Ltd (EESL). With reference to this notification, PMC has entered into an agreement with EESL to replace streetlights with LED. This agreement involved the replacement of about 3262 normal streetlights with LED lights and maintaining them for the next seven years. By this arrangement, PMC has to make an annuity payment to EESL for the next seven years.

Having considered all the above factors, CRIS has finalised the strategy for PMC regarding streetlights. In this strategy, some external agency like EESL will replace all the existing normal lights into LEDs and PMC will install all the new LEDs. The total cost comes to Rs 64.72 crore.

Table 153: Capital investment plan for streetlights in PMC

Sr. No.	Investment Term	Street lights & polls	Preferred authority/ agency	Cost (Rs crore)
1	Current and small term 2018-25	Installation of new LED & poles	PMC	26.47
		Upgradation of old lights to LED	Service provider like EESL	
2	Medium term 2025-32	Installation of new LED	PMC	18.16
3	Long term 2032-41	Installation of new LED	PMC	20.09
	Total investment till 2041			64.72
	Total investment envisaged till 2025			26.27

Source: CRIS analysis

16.7.2 Strategy to improve streetlight coverage

Streetlights are one of the most important elements of any city. For safe and easy movement of traffic, there should be sufficient illumination of city roads. Currently, PMC is converting existing lights to LED with the help of EESL. This process is limited to 11 newly-added MMRDA villages and non-nodal area of PMC since streetlights from CIDCO nodes are yet to be transferred to PMC. As we have seen in both the above scenarios, there is a considerable gap in the overall streetlights coverage in PMC. Hence, the following areas should be a priority for PMC.

Table 154: Strategy to improve overall coverage of streetlights

Sr. No.	Investment Term	Street lights	Focused area	Villages involved
1	Current and small term 2018-25	Installation of new LED	11 villages from MMRDA	Dhansar, Rohinjan, Pisarve, Ghot, Taloja Machkur, Koyna Velhe, Nagzari, Karavale Bh, Turbhe, Adivali, Bid
			Non-nodal villages from CIDCO notified area	Khidukpada, Tembode, Padaghe, Devicha Pada, Pale khurda, Tondare, Chal
		Upgradation of old lights to LED	Nodal-part CIDCO and core council area	Panvel, Kharghar, Kamothe , Taloja, Kalundre , Kalamboli etc.
2	Medium term 2025-32	Installation of new LED	Entire PMC area	Entire PMC area
3	Long term 2032-41	Installation of new LED	Entire PMC area	Entire PMC area

Source: CRIS analysis

16.7.3 Phasing of investment

The phasing of investment for street light sector has been presented in the table below.

Table 155: Phasing of street light project

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs crore					
Installation of polls with LEDs	PMC	26.47	2.65	3.97	3.97	3.97	3.97	3.97	3.97

16.8 Social infrastructure sector plan

16.8.1 Health

As 11 MMRDA villages as well as CIDCO non-nodal villages now form part of the Panvel Municipal Corporation region, there will be an increased rural population requiring healthcare facilities and hence, there will be an increased load on public health facilities.

Even though there are sufficient health facilities in Panvel, the economically weaker section prefers to opt for public facilities due to non-affordability of private facilities and with the population of the city increasing daily, there is an urgent need to expand the government health facilities in the city.

This makes it mandatory to strengthen the public health infrastructure and improve the quality of services and the accountability of service providers to citizens. The following would be the action points:

Health sector	
Sector goals	• To increase the number of health facilities in PMC region • To have a municipal hospital to serve the needs of the economically-weaker sections of PMC region
Design parameter	• Hospitals / primary health center requirements assessed as per URDPFI guidelines
Action plan	**Activities**

Health sector	
	• Renovation of existing primary health centres and construction of new primary health centres in the newly added areas • Identification of area to establish municipal hospital (either one municipal hospital of 180 beds at a central location or two hospitals of 100 beds each) • The PMC can build the hospital and can operate it on its own. Alternatively, it can construct a hospital and in the short term, give the operation and maintenance to any NGO / charitable trust / philanthropist • This would address the critical infrastructure needs of hospitals • An image makeover exercise should be undertaken showcasing the facilities offered in municipal hospitals

- It is recommended that PMC have a municipal hospital to serve the economically weaker section of society. As per the Indian Public Health Standards (IPHS), a district having a population of 10 lakh should have one general hospital. As per the annual rate of admission of 1 per 50 people and average length of stay in a hospital being 5 days, the number of beds required for a district having a population of 10 lakh will be around 300 beds[67].

  PMC is currently working on upgrading a 50 bed hospital to 120 bed so the focus can be on the remaining 180 beds. PMC can have one municipal hospital of 180 beds at a central location or alternatively, two hospitals of 100 beds each based out of two separate areas so that the population in two separate areas have access to general hospitals.

- The PPP option may be explored to run the hospital. The following PPP models may be considered:
  - **Management of contract:** Private partner invited for a period of 10-15 years to invest in equipping the government facility, hiring human resources and managing the facility. The private partner to be reimbursed
  - **Purchasing of services:** Medical/surgical procedures to be identified that the private partner (who is empanelled for 1-3 years) will carry out and who shall be paid for these services
  - **Build, operate and transfer:** The private partner will have the vacant land for thirty years or more and will finance the project. He gets to charge a 'user fee' from patients
  - **Co-location model:** Private partner allowed to set up a separate facility through private investment within an existing government hospital premise for a specific duration (10-15 years) with a renewal option and it will allow the private facility to charge patients

  PMC may consider the "**Build, operate and transfer**" model or "**co-location**" model for the hospitals. It can ask the private partner to keep a certain percentage of beds reserved for below poverty line (BPL) patients of the region for whom the expenses shall be reimbursed by the Corporation while the operator can continue to earn revenue from the other patients.

16.8.1.1 Capital investment plan

In order to mitigate the demand supply gap in health facilities' requirements for Panvel Municipal Corporation region. The projects are mentioned in Table 156

Table 156: Projects identified for PMC region for health sector

	Projects	Estimated cost (Rs crore)
Constructing polyclinics, family welfare centres, specialty / multi-	Building 11 polyclinics, 42 family welfare centres, 16 specialty hospitals,16 multi-specialty & 03 general hospitals by 2025	**152.35**
	Building 04 polyclinics, 08 family welfare centres, 04 specialty hospitals,04 multi-specialty & 02 general hospitals by 2032 (in addition to those constructed till 2025)	**36.32**

[67] *Indian Public Health Standards*

	Projects	Estimated cost (Rs crore)
specialty / general hospitals	Building 05 polyclinics, 10 family welfare centres, 05 speciality hospitals,05 multi-specialty & 02 general hospitals by 2041 (in addition to those constructed till 2032)	**44.96**
Total investment by 2041		**233.62**
Total investment envisaged till 2025		**152.35**

There does not seem to be a need for hospitals per se, but the population to beds ratio for PMC region is high at approximately 7400. Since the total beds in PMC region are likely to be around 3400, to meet the norm, PMC region requires an additional 4000 beds .i.e. eight hospitals with 500 beds each.

Initially, PMC may develop one (or two) municipal hospitals while in long term, the prevailing requirement may be assessed and accordingly it may be decided then only how many further hospitals / health centres more need to be taken up by PMC on its own.

16.8.1.2 Phasing of investments

The health sector projects have been divided into various components. The timelines for executing these have been presented in the table below.

Table 157: Phasing of identified projects (in short term)

Projects	Implementing agency	Total amount	FY20	FY21	FY22	FY23	FY24	FY25	FY26
					Rs crore				
Building 11 polyclinics,42 family welfare centres, 16 specialty hospitals, 16 multi-specialty & 03 general hospitals by 2025	PMC	152.35	15.2	30.5	30.5	30.5	15.2	15.2	15.2

16.8.2 Education

- It is evident from Table 95 that the Panvel Municipal Corporation region lacks adequate number of schools, both primary and secondary. Hence, it is of utmost priority that the number of schools be increased in the region.
- It can be seen that the number of students' enrolled in the PMC-run schools has been declining steadily. One of possible reasons could also be because none of these schools teach in the English medium. Under the Maharashtra State Board, "best of five" rule is followed in board exams, in which the English language is compulsory. As the medium of instruction followed in PMC-managed schools (and also in *Zilla Parishad*-maintained schools) is Marathi, it is difficult for students to catch up with English, once they reach secondary and senior secondary level of education. Hence, it is suggested that PMC should also have some schools, which are in the English medium.
- To meet the future requirements and ensure an improvement in the quality of education imparted in its schools, the PMC will need to keep them updated with modern trends. The following would be the action points for the same:

Education sector	
Sector goals	• To increase the number of schools in the PMC region • To ensure that children of economically weaker sections also have access to education • To ensure that students in municipal schools are aware of the latest innovations
Design parameters	• Schools and playground requirements assessed as per the URDPFI guidelines
Action plan	**Activities**
	• Renovation of existing dilapidated schools and construction of new schools in the newly added areas • Identification of areas for development of new schools (also establishing schools with hostel facilities and schools for specially abled children) • To start English-medium schools also along with vernacular medium • To make sure there is a provision of computer labs in each of the schools, which will ensure children are able to familiarise with the technological innovations • In the short term, PMC may invite NGOs, charitable trusts, companies and philanthropists to adopt the government schools. This would address the critical infrastructure needs of schools and help in bridging the gap with the rest of schools • An image-makeover exercise should be undertaken, showcasing the facilities offered and the benefits of studying in municipal schools

- As mentioned above, the PMC may consider inviting non-government organisations / charitable trusts / companies and philanthropists for adopting some of its schools. This would address the critical infrastructure needs of schools, while the PMC can keep a check on the agencies by conducting yearly audits. The NGOs can help in:
  - Addressing critical infrastructure needs such as constructing classrooms, laboratories and toilets
  - Introducing latest innovations, such as digital education and setting up smart classrooms and digital libraries, language labs by helping the corporation in approaching companies and encouraging them to take initiative as a part of their corporate social responsibility initiatives.
  - Providing books in libraries, uniforms to students, furniture, creating infrastructure for mid-day meals and sports activities.
  - Arranging training facilities for teachers, whose expertise can be later leveraged to enhance the pedagogic and academic capacities of future teachers.

  The following partnership models may be considered:

  - **Full-school management with private partner teachers (FSMPT):** Where a private partner can manage an existing or new PMC school and provide free and high-quality education to children in the neighbourhood, with its own teachers and principal. The staff is to be employed by the partner. Here PMC would pay a basic "cost per child" adjusted to the RTE norm of student-teacher ratio of 30:1 and the teacher, headmaster and staff costs. The partners would bring the balance contribution from philanthropic sources.
  - **Full school support (FSS):** Allows a private partner to "facilitate" an existing PMC school, along with PMC's own teachers, provide teaching-learning materials and methodologies, teacher training/ coaching support, headmaster training/coaching support, managerial and other inputs, for the purpose of improving quality of education. Here, the PMC continues to bear all current costs, while the partner is expected to bring the remaining funding for its support from philanthropic sources.
  - **Specific services partnerships (SSP):** For getting specific services/inputs relevant for improving the quality of both curricular and co-curricular education in PMC schools, such as student competency assessment and teacher training.

– **School input:** Where a private agency may offer input to the school through a onetime donation of materials or services, such as computers, furniture, books, uniforms, one-time capacity building workshop for teachers, one-time training for students.

On the basis of its requirement, the PMC may adopt any of the first two models, i.e., FSMPT or FSS.

The Municipal Corporation of Greater Mumbai (MCGM) has tied up with Naandi foundation, while Thane Municipal Corporation (TMC) has tied up with NGOs such as Pratham and Save the Children. Similarly, the New Delhi Municipal Council (NDMC) has tied up with Khan Academy India.

16.8.2.1 Capital investment plan

To mitigate the demand-supply gap in primary and secondary level education requirements for the PMC region. The projects are mentioned in the below table.

Table 158: Projects identified for the PMC region for the education sector

	Projects	Estimated cost (Rs crore)
Building primary schools, schools for challenged children (physically and mentally)	Building 419 primary schools, 49 schools for challenged children by 2025	**1,074.28**
	Building further 81 primary schools, 9 schools for challenged children by 2032 (in addition to those constructed until 2025)	**206.59**
	Building further 104 primary schools, 12 schools for challenged children by 2041 (in addition to those constructed until 2032)	**266.27**
Total investment until 2041		**1547.14**
Total investment until 2025		**1074.28**

16.8.2.2 Phasing of investments

The implementation plan of identified education sector projects has been presented in the table below.

Table 159: Phasing of identified projects (in the short term)

Projects	Implementing agency	Total	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
			Rs crore						
Building primary schools, schools for challenged children (physically and mentally)	PMC	1074.28	107.4	214.9	214.9	214.9	107.4	107.4	107.4

16.8.3 Recreational facilities

- The garden department should focus on maintaining existing gardens and developing new gardens as per the norms and needs of citizens.
- The plots handed over by CIDCO for developing community centres should be utilised at the earliest.
- The public-private partnership model may be explored to develop gardens and playgrounds.
- The area under villages should also be explored to develop gardens, playgrounds and community centres.

- An auditorium / village hall / assembly hall / community hall plays an important role in improving the quality of life and the sustainability of the city, as it encourages art and culture in the city and creates a sense of belongingness among residents. In the ancient Greece, the open-air venue amphitheatres were used for entertainment, performances and many other cultural activities.

  Currently, the PMC has only one auditorium in "*Vasudev Balwant Phadke Natyagraha,*" which is a state-of-the art auditorium with a seating capacity of about 700, located centrally in old Panvel and used for dance, drama and musical festivals. Hence, it is suggested that the PMC develops an auditorium / community hall.

  - This can also be a closed or an open-air amphitheatre also, which may be used for cultural activities such as music, theatre, poetry reading, regional festivals and art competitions.
  - As per the URDPFI guidelines, an auditorium / community hall should have:
    - Accessible entrances, exits, aisles and main community or public gathering areas
    - Accessible toilet facilities should be nearby
    - Seating for persons with disabilities to be accessible from main entrances and lobbies
    - Various seating/viewing choices to be provided for persons in wheelchairs throughout the main seating area.
    - A minimum of two wheelchair spaces for a seating capacity up to 100 seats and four wheelchair spaces for seating capacity from over 100 and up to 400 seats.
    - Parking space of at least two cars per 100 sqm of the floor area
  - Having another hall is likely to promote and encourage cultural activities further in the PMC region, as it provides the residents another alternative.
  - The facility of booking *Vasudev Balwant Phadke Natyagraha* or any other community hall should be available online, preferably on the PMC website
  - PMC can earn revenue from auditorium by not only hosting cultural events but also by:
    - Organising seminars and conferences for private companies
    - Providing space for private events, such as birthday / banquet parties, exhibitions, corporate and school events
    - Selecting canteen vendor by competitive bidding, basis of highest revenue share / license fee offered to PMC
    - The parking spaces and advertising spaces are additional revenue streams, which can be explored by PMC
  - The PMC region has a present requirement of 15 music/dance/drama centres, with each covering an area of 1000 sqm. As identifying spaces for all of them may be a challenge, it is suggested that the PMC should initially plan a community hall / auditorium in each node. To begin with, a few nodes may be selected in the short term and others may be gradually taken up.
- There are 31 libraries in the PMC region, which fall short of the requirement as per the URDPFI guidelines. Moreover, almost all libraries are privately owned, thereby not being within the access of the economically weaker sections and most importantly out of reach of students belonging to poor families.

  Currently, only one library at Dr. *Babasaheb Ambedkar Bhavan* is maintained by PMC and available for people of all income groups. Hence, it is suggested that PMC set up a public library.

  - As PMC may not be able to meet the gap of libraries on its own, it is suggested that initially two libraries be set up in short term, while in the medium and long term, requirement can be reassessed.

- Areas such as Kharghar, Ghot can be initially targeted for setting up public libraries, so that people of those regions also have access to public libraries.
- PMC should also have at least one, if not both, as a digital library. The corporation can enter into a partnership with any corporate or philanthropic organisation or even bilateral and international agencies for developing the library.
- PMC should also review and assess the status of the existing library at Dr *Babasaheb Ambedkar Bhavan,* as the library is mostly accessed by students and candidates appearing in competitive exams. PMC can work with agencies, such as the University Grants Commission (UGC), All India Council for Technical Education (AICTE), Raja Ram Mohan Roy Library Foundation (RRRLF), Council for Scientific and Industrial Research (CSIR), Indian Council for Medical (ICMR) etc. to address the identified issues.
- The following facilities should be provided to improve the service at PMC public libraries:
  - Library should have the internet facility
  - Online Public Access Catalogue (Web-OPAC) being provided to the users for searching required books and journals on catalogue
  - Books on inter-library borrowing should be provided to on demand
  - Computers of all the libraries on the campus are connected to the central server
  - Library should issue Barcoded Identity Card to all learners, staff and external members of the library
- PMC should also organise book-donation drives in coordination with any NGO, so that it helps developing an inventory for the library

16.8.3.1 Capital Investment Plan

To mitigate the demand-supply gap in gardens and other recreational spaces' requirements for the PMC region. The projects are mentioned in **Table 160**.

Table 160: Projects identified for PMC region for the education sector

	Projects	Estimated cost (Rs crore)
Building community halls /barat ghar/ library, music / dance centre, recreational clubs, old age homes	Building 139 community hall /Barat Ghar/ library, 20 music/dance centre, 20 recreational clubs, 04 old age home by 2025	**420.07**
	Building 27 community hall /Barat Ghar/ library, 05 music/dance centre, 05 recreational clubs, 01 old age home by 2032 (in addition to those constructed till 2025)	**87.23**
	Building 34 community hall /Barat Ghar/ library, 05 music/dance centre, 05 recreational clubs, 01 old age home by 2041 (in addition to those constructed till 2032)	**103.30**
Building housing area parks, neighborhood parks, community parks, district parks, sub-city parks	Building 413 housing area parks, 138 neighbourhood parks, 20 community parks, 4 district parks, 2 sub city parks by 2025	**1,324.48**
	Building 81 housing area parks, 27 neighbourhood parks, 04 community parks, 01 district park by 2032 (in addition to those constructed till 2025)	**259.39**
	building 104 housing area parks, 34 neighbourhood parks, 05 community parks, 01 district park, 01 sub city park by 2041 (in addition to those constructed till 2032)	**332.84**
Total investment until 2041		**2,527.30**
Total investment envisaged until 2025		**1,744.55**

16.8.3.2 Phasing of investments

The implementation plan of identified projects related to gardens and other recreational spaces has been presented in the table below.

Table 161: Phasing of identified projects (in the short term)

Projects	Implementing agency	Total	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
			Rs. (Crs)						
Building community halls /Barat Ghar/ library, music / dance centre, recreational clubs, old age homes	PMC	420.07	42	84	84	84	42	42	42
Building housing area parks, neighborhood parks, community parks, district parks, sub-city parks	PMC	1324.48	132.4	198.7	198.7	198.7	198.7	198.7	198.7
TOTAL		**1744.55**	**174.4**	**282.7**	**282.7**	**282.7**	**240.7**	**240.7**	**240.7**

16.9 Housing for urban poor

Improving access to physical and social infrastructure for the urban poor is of utmost importance. New houses to slum dwellers living in *kutcha* houses and dilapidated structures need to be provided. Individual sewerage connections to all slum households with community toilets in the short term and individual toilets in the long term, door-to-door collection of solid waste and awareness campaigns for segregation at source, paved roads and street lights, along with community centre, need to be developed.

All the slums needs to be surveyed to understand the existing level of services provided in each of slum, with details of population, households, socio-economic background, location and area. On the basis of these surveys, slum integration strategies needs to be planned to improve the services in the slums. In situ slum redevelopment/ upgradation for all the tenable slums should be kept on priority. A suitable financing strategy should be developed to minimise the burden on the beneficiaries. The beneficiaries could be provided access to banks for availing of the long-term housing loans. Further, access to health, education and livelihood facilities also need to be provided.

Various vocational trainings such as motor driving, vehicle repairing and carpentry can help in social and financial upliftment for slum dwellers. Various welfare schemes for women and children, such as attendance allowance for parents of the girls of 1st to 10th standard, scholarships, mid-day meal schemes, assistance for marriages of girls, SHGs, seed money for self-employment should be implemented. NGOs can be roped in to create awareness and social upliftment of slum dwellers.

A separate slum-improvement and social-welfare department needs to be created, which should be entrusted with administration and infrastructure development in slums. This department should be responsible for creation of database for each slum with details of population, households, socio-economic background, and access to various services, such as water, sewerage and SWM. They will have to impart training and bring innovative schemes to help in social upliftment and provide livelihood to the slum dwellers.

The sector plan for slums improvement in city is presented below.

Slum sector	
Sector goals	• Improving access to physical and social infrastructure for the urban poor • Developing mechanism to ensure social rights to all the urban poor with necessary economic welfare program
Design parameter	• Base year as 2018 and design year as 2041 • Demand estimation based on the projected population for PMC • New houses to households living in kutcha houses and dilapidated structures in merged areas • Sewerage – Individual HH connection to all slum HH • Sanitation – Community toilet with individual toilets in long run • Solid waste – Door-to-door collection and awareness campaigns for source segregation at source • Paved roads and street lights, along with the community centre
Action plan	**Activities**
Slum survey	• All the slums need to be surveyed to understand the existing level of services provided in each of slum, with details of population, households, socio-economic background, location and area
Integrated development of slums	• Slum-integration strategies to be adopted to improve the services in the slums • *Pucca* housing with infrastructure facilities to be developed in feasible locations
Construction of houses	• The slums in low-lying areas and along the natural drains could be proposed for relocation • A suitable financing strategy could be developed to minimize the burden on beneficiaries • The beneficiaries could be provided access to banks for availing of the long-term housing loans
Access to health and education	• The health-action plan should control the prevalent diseases and reduce the infant mortality rate • Access to emergency medical services should be provided to the BPL population • The education action plan should involve renovation of existing municipal schools and regular awareness campaigns to limit the dropout rates
Livelihood	• Activity centers to be established for skill-development programmes
Planning, reforms and institutional strengthening	• Creation of separate slum improvement and social welfare department in PMC • Capacity building for the existing staff overlooking slum management • Creation of database for each slum with details of population, households, socio-economic background, access to the various services such as water, sewerage and SWM

16.9.1 Capital investment plan

The projects to be taken up as a part of the CIP is listed below

Component	Project	Estimated cost, Rs crore
Construction of dwelling units and allied infrastructure	Construction of 8494 DU and allied infrastructure by 2025	535.36
	Construction of 1636 DU and allied infrastructure from 2025-2032 (Total 10130 DU and allied infrastructure by 2032)	103.11
	Construction of 2104 DU and allied infrastructure from 2032-2041 (Total 12234 DU and allied infrastructure by 2041)	132.61
Total investment till 2041		771.08
Total investment envisaged till 2025		535.36

It is to be noted that PMC under PMAY have prepared two detailed project reports – *In situ slum redevelopment scheme* and *Affordable housing in partnership* and submitted to the Centre for approval. About 1,483 units have been proposed to be constructed under these DPRs.

16.9.2 Phasing of investment

The phasing of investment for the housing sector have been presented in the table below.

Table 162: Phasing of the housing project

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs crore					
Construction of dwelling units and allied infrastructure	PMC	535.36	26.77	107.07	80.30	80.30	80.30	80.30	80.30

16.10 Urban environment

The lakes and rivers form a major segment of urban environment in Panvel. The quality of water bodies is a major concern in the city. To improve the quality of environment in the city, 100% preservation of water bodies, ground water recharge and rejuvenation of rivers should be achieved. As discussed in the sector assessment, PMC had already initiated conservation and rejuvenation of water bodies.

Urban environment	
Sector goals	• Increase the green cover and buffer zones in the town to mitigate air pollution. • Development of rain-water harvesting pits in schools, urban health centres and government offices • Conservation and rejuvenation of major water bodies in the city • Developing Panvel as a disaster-resilient city
Action plan	**Activities**
Mapping and rejuvenation of water bodies	• Mapping of water bodies to be carried out to assess the physical extent, surrounding land uses, cultural, natural and social values • Preparation of feasibility study for rivers, *nallahs* and lake-front development in Panvel • Rejuvenation of major rivers and water-front development • Rejuvenation of lakes and lake-front development
Construction of rainwater harvesting pits	• Development of rain-water harvesting pits in schools, urban health centres, PMC main and circle offices, parks, reservoirs and play grounds • Making rainwater harvesting compulsory in large establishments, such as shopping complexes, cinema halls and function halls • Identifying apartments and shopping complexes without percolation pits • Motivating apartment owners to install percolation pits
Pollution mitigation strategies	• Urban Forestry and Plantation Schemes for the city to increase green cover within the city • Plantation in dividers to curb dust, pollution and to restore aesthetic looks. Planned plantation with a choice of air/noise pollution-resistant tree species to minimise ambient air/ noise pollution
Impact assessment and monitoring	• Regular monitoring of air quality, water quality (surface and ground), especially in rivers and noise pollution • Increase the use of alternative fuels, such as CNG • Demarcation and protection of existing hills/forest and recreational areas

16.10.1 Capital investment plan

Based on the above key requirements in the urban environment sector, the capital investment plan for urban environment is presented in the below table.

Component	Project	Estimated cost
Feasibility study	Feasibility studies for river, *nallah* and lake-front development in Panvel	1.00
Total investment until 2041		1.00
Total investment envisaged until 2025		1.00

16.10.2 Phasing of investment

The phasing of investment for the environmental sector has been presented in the table below.

Table 163: Phasing of housing project

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs. in Crore					
Feasibility studies for river, *nallah* and lake-front development in Panvel	PMC	1	0.5	0.5	0	0	0	0	0



16.11 Disaster management sector plan

The requirements of the fire services for Panvel Municipal Corporation region has been determined for short term (2025), medium term (2032) and long term (2041), on the basis of the Urban and Regional Development Plans Formulation and Implementation guidelines (URDPFI) and Standard Fire Advisory Committee norms (SFAC).

The Table 164 shows the future requirement of fire stations and pumping stations for PMC region.

Table 164: Fire station and pumping station requirements in the future[68]

	Requirement in 2025	Requirement in 2032	Requirement in 2041
Approximate population of the region	20,95,843	24,99,616	30,18,752
Fire stations	10	13	15
Pumping stations	23	28	33
Fire tenders	21	23	28

Source: CRIS Analysis, URDPFI & SFAC Guidelines

The requirement to enhance the existing infrastructure available at PMC is described in Table 113. To augment the disaster combat fleet, the PMC needs to:

- Set up a disaster management cell. The objectives of disaster management cell are:
  - To ensure adequate preparedness to tackle manmade and natural disasters in the city by ensuring effective coordination among various utility services
  - To take efforts to minimise loss to life and property
  - To ensure a quick response and effectively deploy resources

[68] *It may be noted that the requirement of firefighting equipment and manning staff shall be basis of the SFAC guidelines then applicable and hence have not been assessed here.*

  - To consolidate information in co-ordination with various utilities and establish communication with additional municipal commissioners / municipal commissioner

- To mitigate severe damage to economy, properties and environment, it is essential for any urban-local body to be equipped with a DMP for the city. Currently, the PMC does not possess a DMP and needs to prepare one.

  It is essential for urban-local bodies to be equipped with a DMP to minimise damages to the city. As per Section 31 of the Disaster Management Act, 2005, "There shall be a plan for disaster management for every district of the State", thus making it mandatory for each district authority to have a disaster management plan after consultation with the local authorities.

  A disaster management plan should broadly cover disasters caused due to floods (due to excessive rainfall), fire, earthquake, landslides, cyclones, industrial and chemical accidents, and mitigation measures. The indicative of guidelines to be followed while preparing it is mentioned below:

  - To identify major areas vulnerable to major types of hazards
  - To adopt proactive measures by all the departments to prevent disaster and mitigate its effects
  - To define and allocate specific responsibilities to stakeholders during pre- and post-disaster phases
  - To adopt disaster-resilient construction mechanism by using information / education / communication to make the community aware of the need of disaster resilient future developments
  - To enhance disaster resilience of people by way of capacity building
  - To reduce the loss of public / private properties through proper planning
  - To manage future development to mitigate the effect of natural hazards
  - To set up early-warning systems so as to prepare the community to deal with the disaster
  - To set up a responsive communication system based upon fail-proof technology
  - To also set up a standardised mechanism to respond to disaster situation to manage the disaster efficiently
  - To set up an emergency operations centre to function effectively in search, rescue and response
  - To prepare the response plan based on the guidelines issued in the state disaster management plan to provide prompt relief, rescue and search support in the disaster-affected areas
  - To prepare a rehabilitation plan of the affected people and define reconstruction measures to be taken by different departments
  - To coordinate with the Centre and state agencies concerned for effective and efficient disaster management
  - Comprehensive reviews and revisions of the emergency operations should be conducted and improved to ensure that the plan remains up-to-date

- Strengthen the fleet by acquiring additional staff and augmenting their capability with equipment of the latest technology
- Establishing fully equipped disaster management control rooms at all ward offices
- Have a help line for emergencies such as an earthquake, bomb blast, land slide, house collapse and major accidents so that complaints are registered on this helpline and immediately disseminated to relevant department for a prompt response.
- It is suggested that a web link of disaster operation centre is embedded in PMC website also.

- Train the staff periodically with mock drills to be conducted regularly as a part of capacity building.[69]
- NGOs to be identified as resource groups for involvement in community preparedness measures and be assigned specific roles for undertaking relief work within the overall institutional framework.
- To ensure improvement of access for emergency vehicles such as fire brigades and ambulances. If the accesses of these are obstructed by badly parked vehicles, it could lead to escalation of severity of accidents / delayed medical help.

16.11.1 Capital investment plan

The need to augment the existing firefighting and emergency response facilities have been identified as a priority project. Based on the requirements for enhancing the existing facilities, the investment estimated for the PMC is Rs 686.18 crore until 2041.

Table 165: projects identified for the PMC region with regard to disaster management

	Projects	Estimated cost (Rs crore)
Disaster management	Preparation of Disaster Management Plan for Panvel Municipal Corporation region	**0.40**
	Building additional fire stations & pumping stations	**110.18**
	Strengthening of the existing disaster combat fleet with new technology and high end fire tenders	**575.47**
Total investment until 2041		**686.05**
Total investment until 2025		**463.18**

16.11.2 Phasing of investments

The implementation plan of the identified projects related to fire stations has been presented in the table below.

Table 166: Phasing of identified projects (in the short term)

Projects	Implementing agency	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs crore				
Preparation of Disaster Management Plan for PMC	PMC	0.40	--	--	--	--	--	--
Building 10 fire stations, 23 pumping stations by 2025		3.8	15.2	7.6	15.2	7.6	15.2	11.4
Procuring fire tenders and other equipment by 2025		19.4	77.4	38.7	77.4	38.7	77.4	58.1

16.12 Tourism sector plan

The tourism sector plan aims towards improving the prospects for tourism in Panvel. It also aims to promote local livelihood with minimum disturbance to the environment.

[69] *It may be noted that currently also PMC carries out regular drills every weekend*

Heritage and Tourism sector	
Sector goals	• To elevate the tourism potential of Panvel • Generate local employment and livelihood through tourism
Action plan	• Identification of structure with historical and heritage significance. Preparation of a brochure about heritage and culture within Panvel, design special itineraries, create signposts for various sites, and produce multilingual audio guides for tourists. • Development of river front as a tourism and recreation space • Organise mangrove trails and heritage walks in and around Panvel that will provide information on the culture, history, tradition and natural landscape of the city. • Valorise cultural heritage by creating a cultural development strategy that would help the municipal corporation as well as citizens of Panvel create products and services based on their special cultural wealth. This would strengthen the local economy and inspire further development. Heritage can add value because it is a unique selling point that cannot be imitated by other regions. • Create a visual appealing look for the city by introducing specific DCPR, which will give specific character and sense of similarity to the city. • Introducing of tourist circuits to extend visitors' stay. • Beautification of area under bridges and flyover. • Preparation of feasibility report for tourism development in Panvel, which should cover the details of the action points mentioned above

16.12.1 Capital investment plan

Based on the above key requirements in the tourism sector, the capital investment plan for the sector is presented in the below table.

Component	Project	Estimated cost, Rs crore
Feasibility study	Feasibility study for tourism and heritage in and around PMC	0.3
Total investment until 2041		0.3
Total investment envisaged until 2025		0.3

16.12.2 Phasing of investment

The phasing of investment for the tourism sector has been presented in table below.

Table 167: Phasing of the housing project

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
				Rs. in Crore					
Feasibility study for tourism and heritage in and around PMC	PMC	0.3	0.15	0.15	0	0	0	0	0

16.13 Urban governance

16.13.1 E-governance

The following strategy is adopted to have a comprehensive e-governance platform.

Table 168: Strategy for e-governance

Component	Description
e-governance roadmap/design document	E-governance roadmap should be prepared to bring all the e-governance facilities under single ambit and prepare an integrated system. The strategy should include: • Assessment of current IT environment • Assessment and gap analysis of IT initiatives • Preparation of e-governance strategy • Develop IT architecture • Opportunities for PPP • Preparation of revenue model
Institutional framework	Clearly defined institutional framework should be drawn up at all levels by laying down decision-making processes and responsibilities across departments and at different levels.
Technology infrastructure	Technology infrastructure provides information with respect to applications, databases, infrastructure (IT and physical infrastructure) and connectivity. The following considerations should be kept in mind while dealing with technology infrastructure: • Adaptable and robust application platform to meet the varying requirements of ULBs • Extremely user friendly interface to reduce the impact of change management • Installation and implementation procedures shall be simple, to the extent possible • Scalable IT infrastructure to address future requirements of ULBs • Capable of execution across different platforms • Secure so as to generate confidence among various stakeholders • An appropriate disaster recovery and business continuity plan Maintenance and upgradation should be an integral part of the development of e-governance solutions.
Business Process Reengineering (BPR)	A mere injection of technology into the existing processes will not yield the desired result. It would amount to translation, rather than transformation. It may not also result in enhanced value to the customers or end-users. BPR will involve: • A study of the existing systems, procedures, and organisational, functional and user requirements • Map the processes • Identify those processes that will help in simplifying procedures and in a quick delivery of services This exercise should be the starting point for an e-governance initiative; otherwise, the initiative will result in mere computerisation of existing processes and will likely not result in bringing efficiency in the system.
Delivery mechanism	Delivery mechanism is the way through which services are delivered to customers. The delivery mechanism should be user-friendly and easily accessible to citizens. This can range from Internet, common service centers, call centers, kiosks, etc. and impacts the following: • Technology infrastructure (hardware, software and network) • Business processes and procedures, organisational structure to manage and deliver the services, i.e., skills, roles and PPPs
Information security and privacy	Security and privacy of information is one of the challenges and ways to increase citizen confidence in the system. There should be proper security tools so that fraud and sabotage of systems can be avoided. The mechanisms and responsibilities to access information should be clearly defined and a proper backup of information should be available at any given point of time.
Business continuity plan and DRP	Planning for all types of disruptions in service due to failure of equipment, power cuts, shutting of servers, natural and man-made disasters and ways in which data loss will be prevented and services resumed at the earliest.
Capacity building and change management	To create a dedicated and suitable capacity to prioritise, conceptualise, develop and manage e-governance projects. The PMC should prepare a capacity-building plan, which describes: • Capacity gaps at different levels of functionaries and identification of training needs

Component	Description
	• The training areas and target groups
Public Awareness and Communication	Communicating and creating awareness with stakeholders and the public at large on the benefits of e-governance will help in design and implementation of required solutions.

Citizen facilitation centre (CFC)

The PMC can set up citizen facilitation centres in all its nodal/zonal offices[70]. These centres may be helpful to people who are not tech savvy or not as well versed with online processes. The following services can be provided at the CFCs:

- Issuing of certifications/ licenses;
- Renewing of licenses;
- Collection of water tax and property tax;
- Submissions of applications and forms;
- Issuing of information;
- Tracing of complaints;
- Issuing of birth and death certificates.

Document management system

All the inward/outward movements of documents will be managed through the computer system, enabling online tracking of documents within PMC.

16.13.2 Municipal accounting reform

As a part of financial reforms, the PMC will have to take the following steps for changing its accounting system into double-entry accrual system, which is in accordance with NMAM guidelines:

- Adopt and implement an accrual-based accounting system
- Shift to any updated accounting software such as Tally or to an ERP (such as SAP etc.)
- Appoint accounting professionals for providing handholding support and implementing training programs to put in place a core team of employees to operate the new software and implement the double entry accounting system
- In-depth discussion was held with the members of municipal bodies and aid agencies to create an accounting pattern, on the basis of their experiences and methods of accounting prevalent.
- To carry out preparatory work pertaining to computerization of database program for salary, property taxes, PWD data and a program for tracking of assets and work-in-progress.
- Prepare an inventory of assets and liabilities and finalise the balance sheet
- Reengineer business processes to align with the accrual-based accounting system.
- Institute internal control procedures and appoint an internal auditor and an external auditor
- Carry out parallel runs of both existing and new system of accounting until the latter gets stabilised
- Publish financial statements along with audit reports

[70] *This nodal/zonal offices should also be setup as suggested in administrative reform below*

Municipal accounting reform in Indore Municipal Corporation, Madhya Pradesh

Keeping in view the inefficiencies in the accounting system, Indore Municipal Corporation conceived, initiated and carried out the reform process on its own without any technical or financial assistance from any organisation and took some specific measures towards accounting system reforms during fiscal 2001. The changes with respect to accounting and budgeting systems were in the areas of computerisation of accounting systems and processes, conversion of accounting system from single-entry cash-based to double-entry accrual-based system, and separation of the capital account from the revenue account. Indore Municipal Corporation, with its technical partner, developed a new tailor-made accounting software package to computerise its accounting.

16.13.3 User charges

- To assess the respective operation and maintenance cost of each service (water supply, sewerage, solid waste management and public transport)
- Design a user-charge policy, which defines a proper tariff structure for each service
- Focus on achieving a full recovery of cost

16.13.4 Building bye laws

16.13.4.1 Rain water harvesting

Rain-water harvesting has to be made compulsory for buildings above a certain plot area (such as 300 sq m in the case of Thane). The procedure for approval of system before applying for plinth permission and approval of commissioning rainwater harvesting has to be set.[71].

16.13.4.2 Reuse of waste water

To meet water demand for the growing population and to provide for protection against drought, PMC must make the most-efficient use of its water resources. This can be at an individual property level or at a group housing level, such as apartment complexes or at the community level.

Rules should be in place to mandate the waste-water reuse for building over certain plot areas (such as 4,000 sqm in case of Nashik).

16.13.5 Administrative reform

Administrative reforms should be undertaken for PMC. The following are suggested steps, which if implemented, may increase the efficiency of the organisation.

- **Rationalisation in staff and human resource management**
  - Draft proposal for changes in staffing policy (prepared by the PMC and submitted to the state department)
  - Identification of loopholes in existing staffing
  - Draft proposal for reforms in performance evaluation system
  - Employee consultation

[71] *Govt of State of Maharashtra has certain rules in place for rain water harvesting*

  - Discussion with various ULB departments
- **Staff training**
  - Assessment of training needs
  - Finalisation of training curriculum
  - Selection of agencies to provide training
  - Conduct of training
  - Training programmes identified
- **Management review system**
  - Periodic review by the mayor and municipal commissioner
  - Generation of daily / weekly / monthly and quarterly performance reports on – financial, service delivery and capital project
- **Setting up of zonal/nodal offices**
  - Nodal/zonal offices needs to be establishment to enhance service delivery

16.13.6 Encouraging public-private partnership

Cities are experiencing increasing pressure to provide accessible and affordable infrastructure and basic services due to rapid urbanisation. At the same time, they are increasingly constrained in mobilizing the required financial and technical resources. Many cities do not have the executive capacity to cope up with the rising demand for water supply, sewerage, drainage, electricity supply, roads and solid waste management. Public-private partnership (PPP) is considered a viable alternative to overcome the systemic problems and to infuse efficiency into the operation and maintenance of infrastructure, while bringing in much-needed capital to supplement public funds.

The collaboration between the public and private sector could take any one of the following forms:

- Public funding with private service delivery and private management
- Public as well as private funding with private service delivery and private management
- Public as well as private funding with public/private service delivery and public/private/joint management
- Private funding with private service delivery and private management

The PMC should setup a PPP cell, which should focus on identifying, formulating, structuring and implementing PPP projects identified for overall development of the area. The PPP cell can be supported by an agency that shall assist in identifying projects, preparing techno-economic feasibility reports for identified projects, and supporting through transaction advisory services for development of such projects under the PPP mode.

16.13.7 Capital investment plan

Based on the above key requirements in the municipal reform sector, the capital investment plan is presented in the below table.

Component	Project	Estimated cost
Reforms	Reforms implementation and urban governance/system modernisation	20.00
Total investment until 2041		20.00
Total investment envisaged until 2025		20.00

16.13.8 Phasing of investment

The phasing of investment for reforms have been presented in the table below.

Table 169: Phasing of reforms

Projects	Implementing agency	Total	FY20	FY21	FY22	FY23	FY24	FY25	FY26
					Rs. in Crore				
Reforms implementation and urban governance/ system modernisation	PMC	20.00	1.00	2.00	4.00	4.00	4.00	4.00	1.00

16.14 Summary of capital investment

The total estimated capital investment required for providing efficient services to the current population and future population of the city by 2041 is about Rs 10,486 crore. About Rs 5,881 crore is proposed for investment by 2025 to cater to infrastructure requirement. The table below presents a summary of sector-wise total investment requirement.

Table 170: A summary of sector-wise investment requirement for PMC until 2041

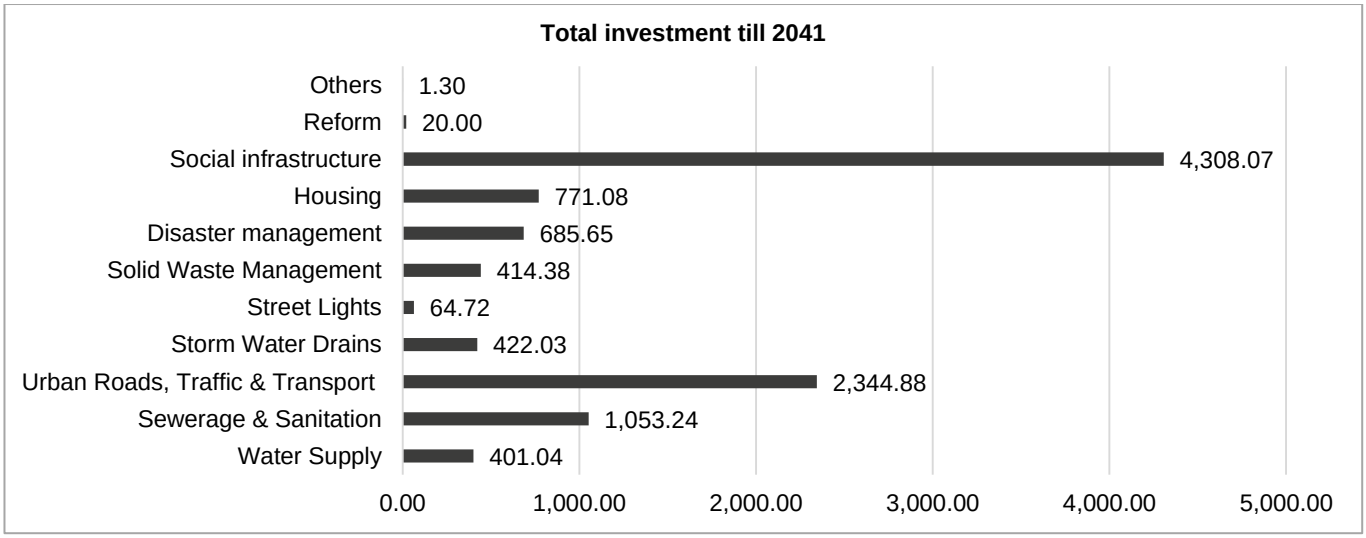
Sr no	Sector	Short term 2025	Medium term 2032	Long term 2041	Total investment
		Rs in crore			
1	Water supply	224.45	82.15	94.44	401.04
2	Sewerage & sanitation	352.73	136.06	564.45	1053.24
3	Urban road, traffic and transportation	944.28	777.62	622.99	2344.88
4	Storm water drainage	235.63	81.55	104.85	422.03
5	Street light	26.47	18.16	20.09	64.72
6	Solid waste management	107.68	128.37	178.33	414.39
7	Disaster management	462.78	128.23	94.64	685.65
8	Housing	535.36	103.11	132.61	771.08
9	Social infrastructure (education, health, garden and recreation space)	2971.18	589.52	747.37	4308.07
10	Reform implementation & urban governance/system modernisation	20.00	-	-	20
11	Others	1.30	-	-	1.3
	Total	**5881.87**	**2044.77**	**2559.75**	**10486.40**

Source: CRIS analysis

Social infrastructure is one of the key priority sectors in Panvel city and 40.97% of investment has been identified towards this sector. About 22.30% of investment has been identified towards road, traffic and transportation in the city. To improve the drainage system in the city, 10.02% of investment has been identified towards sewerage and sanitation in the city. To improve solid waste management, 4.21% of investment has been identified .For improving the storm-water drainage in the city, about 4% of the investment has been identified. For enhancing water-supply delivery in the city, 3.81% of investment has been identified for the sector. The rest of the investment has been

identified towards housing, heritage and tourism development, urban environment, disaster management and urban reforms and governance.

Figure 48: Capital investment plan for 2041 (Rs crore)



16.15 Summary of investment phasing in the short term

The phasing of projects for 2025 has been presented below. While phasing, the timeline for the preparation of detailed project reports and necessary approvals has been considered and, accordingly, phasing has been carried out.

Table 171: Investment phasing in the short term

Sr no	Sector	Short-term investment by PMC (2025)	FY20	FY21	FY22	FY23	FY24	FY25	FY26
		Rs in crore							
1	Water supply	224.45	11.22	47.00	49.11	49.11	31.55	27.33	9.11
2	Sewerage and sanitation	352.73	17.64	70.55	70.48	70.48	52.91	52.91	17.76
3	Urban road, traffic and transportation	944.28	94.33	142.49	141.49	141.49	141.49	141.49	141.49
4	Storm water drainage	235.63	11.78	47.13	47.13	47.13	35.35	23.56	23.56
5	Street lights	26.47	2.65	3.97	3.97	3.97	3.97	3.97	3.97
6	Solid-waste management	107.68	10	0	15.74	24.15	24.15	14.67	18.96
7	Disaster management	462.78	23.14	92.56	46.28	92.56	46.28	92.56	69.42
8	Housing	535.36	26.77	107.07	80.30	80.30	80.30	80.30	80.30
9	Social infrastructure (education, health, garden and recreation space)	2971.18	297.12	528.01	528.01	528.01	363.34	363.34	363.34

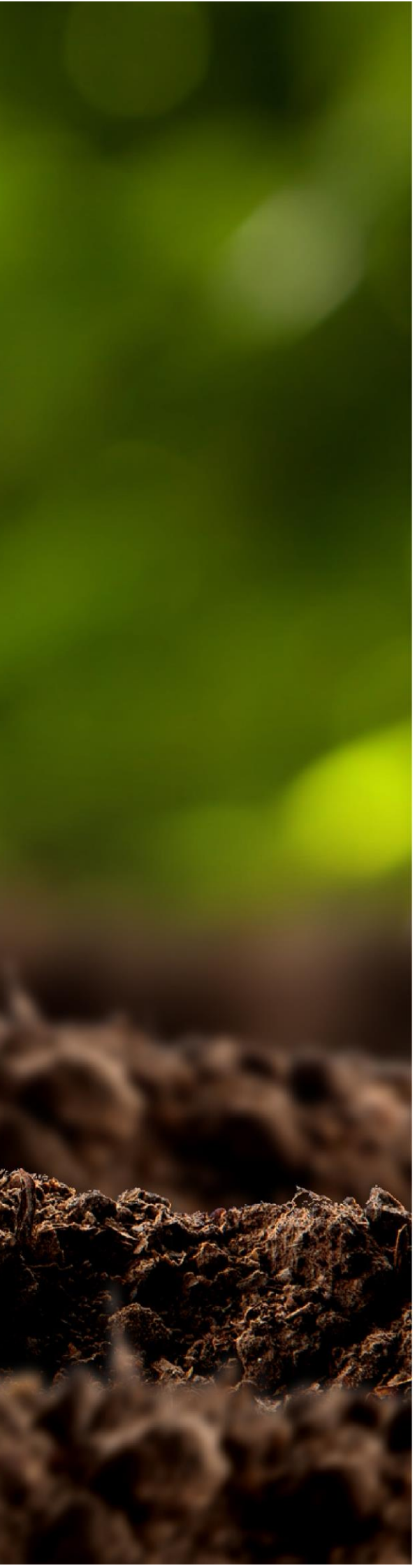
Sr no	Sector	Short-term investment by PMC (2025)	FY20	FY21	FY22	FY23	FY24	FY25	FY26
		Rs in crore							
10	Reform implementation and urban governance/system modernisation	20.00	1.00	2.00	4.00	4.00	4.00	4.00	1.00
11	Others	1.3	0.65	0.65	0	0	0	0	0
	Total	**5881.86**	**496.3**	**1041.43**	**986.51**	**1041.2**	**783.34**	**804.13**	**728.91**



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17.

Financial operating plan

The objective of a financial operating plan (FOP) is to give a multi-year forecast of finances to assess PMC's investment capacity for the set of ongoing and identified projects.

The PMC is responsible for the provision of basic amenities, such as water, sewerage, solid-waste management, storm-water drainage, and roads. Therefore, the 'as-is' financial assessment of PMC in the previous section forms the basis for the analysis. A financial model has been developed to depict the financial position of PMC, for a period of ten years. The model can be used to calculate future surpluses under various scenarios involving combinations of internal revenue improvement and other financing terms.

The budget documents of PMC between fiscals 2018 and 2019 are used as the basis for determining past trends in revenue income and revenue expenditure and arriving at appropriate growth rate assumptions for each of the income and expense heads. After forecasting the revenue account, the capital investments proposed under the CIP are loaded on to FOP. The FOP is generated to assess the investment-sustaining capacity of PMC.

The level of investment that PMC can sustain is determined by studying the overall surpluses/ year-on-year opening balance and debt-service coverage ratio (DSCR). The DSCR is the amount of surplus available to pay interest and to repay principal that is due. If the DSCR falls below 1.6, then the investments are reduced gradually until it meets / exceeds 1.6 in all the years in the forecast period.

The main items of income and expenditure, classified into the revenue account and the capital account, are projected in the FOP under the following categories.

- **Revenue**
  - Income
    - Tax revenue
    - Non tax revenue
    - Grants
  - Expenditure
    - Salary and wages
    - Operation and maintenance
    - Additional Operation and maintenance for new assets created
    - Debt servicing - Existing and new loans
- **Capital**
  - Income
    - Own source
    - Grants
  - Expenditure

17.1 Financial projections under different scenarios

A spreadsheet of FOP has been prepared to depict the financial position of PMC. These projections aim at estimating the surplus that will be available for servicing new debt. The model has been used to calculate future surplus under various scenarios, in line with current growth trends against the identified investment. A part of the surplus after meeting the additional O&M expenses on newly created assets and infrastructure is translated into debt and project size, based on certain assumptions.

As per the existing financial position of PMC, it has been estimated that PMC has to contribute about Rs 10,486 crore to improve the infrastructure for meeting the current gap and future short-term requirement. The standard assumptions, under which the projections are carried out and expenditure is estimated, are below:

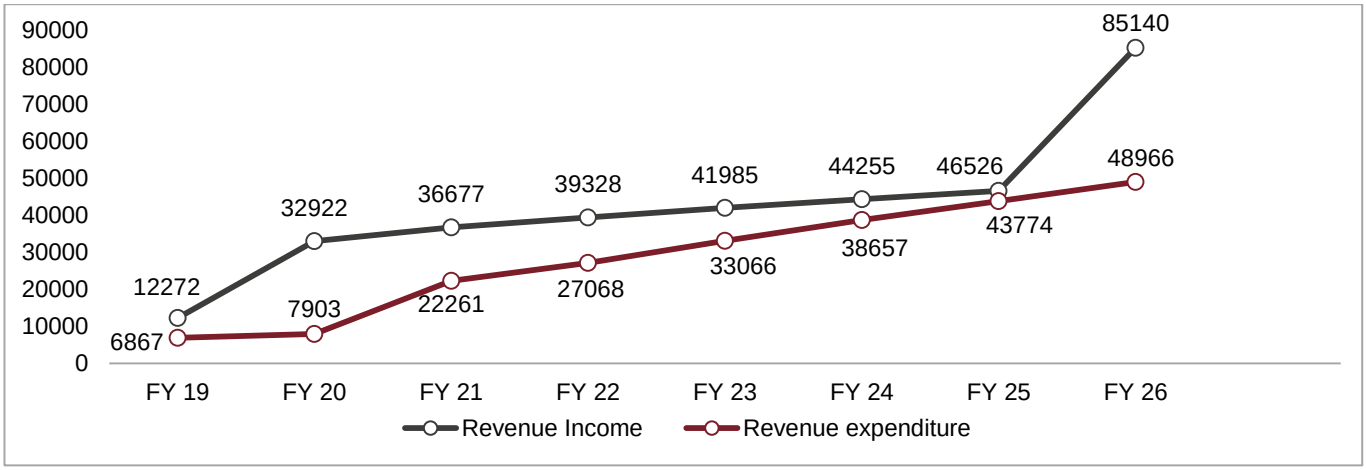
Table 172: Key financial assumptions for FOP projections

Head	Assumption
Guiding factor for assessing the sustaining capacity	
Surplus	Positive surplus – year-on-year basis
DSCR	1.6
Project costing	Project costs are assessed on the basis of cost estimates carried out in DPRs and technical documents. Also, the cost escalation has been considered on an year-on-year basis of cost estimates carried out in the past.
New/Additional O&M **(for the new proposed capital works)**	• Water supply: 3% of capital cost • Sewerage: 3% of capital cost • Roads: 05% of capital cost • Storm water drains: 3% of capital cost • Solid waste management: 10% of capital cost • Others: 1% of capital cost
Growth in expenditure	Regular growth rate of 8% to 10% considered for all the revenue expenditure heads for projections.
Salary revision	Growth rate of 8%
Growth in revenue income	A minimum rate of 4.7% (based on the past five years' inflation of India) and a maximum of 10% (for rental income) In case of an improved case, the growth rate considered is 12%
Property tax	PMC currently charges property tax using the ARV method. The handover of CIDCO nodes and MMRDA villages is pending. In a business-as-usual scenario, it is assumed that PMC will receive tax of properties in these regions from fiscal 2026. In the improved and best-case scenarios, it is assumed that the integration of CIDCO nodes and MMRDA villages shall be completed by fiscal 2021 and PMC should receive tax on properties in these regions from fiscal 2022.
Property tax growth of assessment	In some cases 5.09% is considered (based on growth rate of no. of properties in PMC region)
Property tax collection efficiency	Current collection efficiency: 51% (assumed as 67% in improved case) Arrear collection efficiency: 33% (assumed as 44% in improved case)
Water tariff – demand assessment	Demand for water charges per property has been estimated as Rs 150, based on the data provided by PMC and CIDCO as well as the figures available for water procurement charges. The future demand has been estimated as per the expected growth of properties in the PMC region
Water tariff – collection efficiency	Current collection efficiency: 62.5% Arrears collection efficiency: 20% (targeted to be increased up to 40%) **For improved scenario:** Arrears collection efficiency: 20% (targeted to be increased up to 50%) Current collection efficiency: 80%
Water – assessment of the number of connections	The number of connections have been assessed on the basis of the expected growth in the number of properties in the PMC region.

17.1.1 Financial projections under business-as-usual scenario

Based on the above assumptions; the financial projections of PMC have been done for a period from fiscal 2019 to fiscal 2027. The following figures provide a glimpse of the projected income and expenditure of PMC under the business-as-usual scenario.

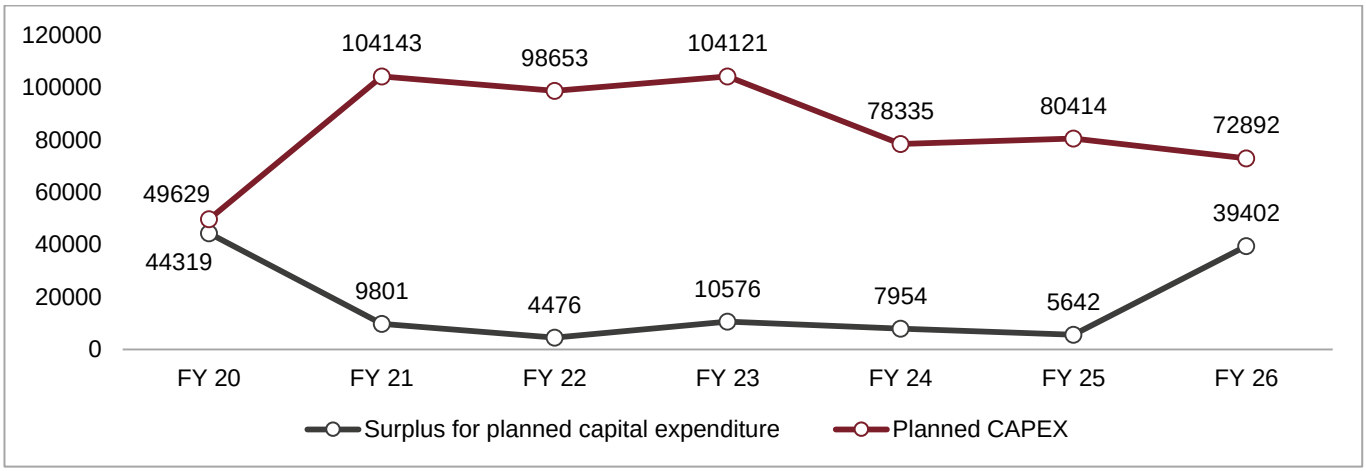
Figure 49: Projection trends of income and expenditure of PMC (business-as-usual scenario)



PMC's revenue income is expected to increase from Rs 12,272 lakh in fiscal 2019 to about Rs 85,140 lakh in fiscal 2026. Revenue expenditure is expected to increase from Rs 6,867 lakh in fiscal 2019 to Rs 48,966 Lakh in fiscal 2026. Overall, the surplus available with the PMC for capital expenditure is expected to increase to about Rs 37,737 lakh in fiscal 2026.

The below figure shows a comparison of revenue surplus of PMC and investment requirements.

Figure 50: Projection trends of revenue surplus and investment requirements of PMC



It is evident that the revenue surplus available with PMC would not be sufficient to match the need of Rs 49,629 lakh. Moreover, even the expected surplus available with PMC (after meeting the on-going capital projects) is likely to be Rs 44,319 lakh in fiscal 2020, which is not sufficient to meet the investment requirement. The PMC will have to raise funds by taking debt against its revenue surplus.

In determining a long-term financial strategy, it has been assumed that the PMC may not receive any grants. The level of investment that PMC can sustain will then be determined by studying the overall surpluses/ year-to-year opening balances and DSCR (considering both existing and proposed debt components).

The following table gives explains the assumptions PMC is considering for the above funding options.

Loan tenure	10 years
Moratorium	02 years
Interest rate	10%
Loan repayment	Equal instalments
Minimum year on year DSCR	1.6

Table 173 gives an overview of projected PMC financials under the business-as-usual scenario:

Table 173: Snapshot of PMC's projected financial capability under business-as-usual scenario

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Opening balance	16,933	20,202	-	-	-	-	-	-
B	Total Revenue Income	12,272	32,922	36,677	39,328	41,985	44,255	46,526	85,140
C	Total Revenue Expenditure	6,867	7,903	22,261	27,068	33,066	38,657	43,774	53,241
(A+B)-C	Revenue surplus	5,404	25,019	14,416	12,260	8,919	5,598	2,752	31,899
D	Capital Income	3,779	6,226	4,307	1,494	1,545	1,597	1,652	1,563
E= (A+B+D)-C	Surplus for Capex	**26,117**	**51,447**	**18,723**	**13,754**	**10,463**	**7,195**	**4,404**	**33,462**

(Figures in Rs Lakh)

The proposed requirement of capital investments for PMC in the short term (i.e. till fiscal 2025) is Rs.588,187 lakh. The below table shows the estimated capital expenditure sustainable by the PMC and the corresponding debt requirement, in business as usual scenario:

Table 174: Estimated capital expenditure which can be sustained by the PMC

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Surplus for Capex	**26,117**	**51,447**	**18,723**	**13,754**	**10,463**	**7,195**	**4,404**	**33,462**
B	Existing capital expenditure	5915	7128	8922	9320				
C	Proposed Capital expenditure		49629	104143	98653	104121	78335	80414	72892
A-(B+C)	Surplus / (Deficit)	20202	(347)	(613)	(5431)	(4530)	(39884)	(41512)	(6629)
	Debt requirement		347	613	5431	4530	39884	41512	6629
	Sustainable Capex		**44666**	**10414**	**9865**	**14993**	**47079**	**45916**	**40091**

(Figures in Rs Lakh)

The sustainable investments have been estimated considering the DSCR (i.e. the amount of surplus available to pay interest and to repay principal) at 1.6. Hence, the following table lists the investments which can be sustained by PMC in short term, during the business as usual scenario.

Capex requirement (short term)	Sustainable investments without debt	Sustainable investments with debt	Debt requirement
588,187	139,449	213,026	98,947

(figures in Rs.Lakh)

In the business as usual scenario, PMC will be having a cumulative surplus of approximately Rs.1,394 crore till fiscal 2026 and hence, shall be able to meet investment of about Rs.1,394 crore from the proposed requirement of Rs.5881.87 crore during the short term.

In case PMC raises debt, it would be able to raise debt of Rs.989 crore which shall enable it to meet the investment requirement of Rs 2,130 crore from the proposed requirement of Rs.5881.87 crore during the short term.

17.1.2 Financial projection under improved scenario

PMC will have to implement reforms that ensure augmentation of revenue, leading to improved overall governance. It is assumed that PMC shall take up reforms in the areas of property tax, water charges, sewerage charges and also revise its advertising policy with a view to utilise its full potential and improve upon the existing collection of advertising tax.

It is assumed that in the improved scenario the integration of CIDCO nodes and MMRDA villages shall be completed by fiscal 2021 and the PMC to receive tax of properties in these regions from fiscal 2022.

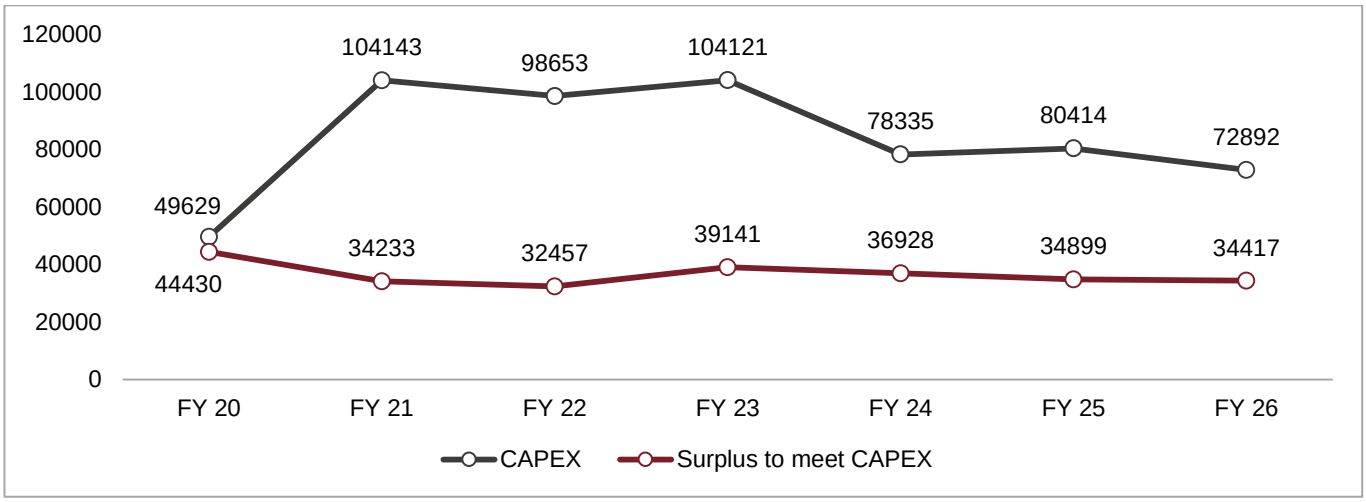
The following are the additional assumptions used for assessing financial projections for PMC in the improved scenario:

- **Property tax**
  - Collection efficiency targeted to reach 90% from 67% currently
  - Arrears collection efficiency targeted to reach 60% from 44% currently
- **Water charges**
  - Collection efficiency of arears targeted to reach 80% from 63% currently
  - Arrears collection efficiency targeted to reach 50% from 20% currently
- **Advertising rates**
  - It is assumed that the PMC shall set new rates for advertising in the PMC region from fiscal 2021, targeting at least Rs 1,00,000 per sq km per year[72]
  - The advertising rates in the PMC region should be revised by 5% after every five years.
- **SWM charges**
  - Currently, the PMC is not charging any fee on collecting solid waste from properties under its jurisdiction. It is suggested that PMC should introduce some charges to collect solid waste from properties under its jurisdiction. PMC can initiate by collecting Re 1 per day per property, which can be increased by 10% after every 5 years.

[72] *NMMC receives approx.Rs.148104 per sq.km per year*

The below figure shows the expected projection of PMC's surplus (to meet CAPEX) and its planned capital investments in future.

Figure 51: Projected trend of PMC surplus (for CAPEX) under improved scenario and proposed investment requirement



The below gives an overview of projected PMC financials in the improved scenario:

Table 175: Snapshot of PMC's projected financial capability in the improved scenario (in Rs lakh)

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Opening balance	16,933	20,189	-	-	-	-	-	-
B	Total Revenue Income	12,272	33,046	61,109	67,637	73,639	79,276	84,068	88,767
C	Total Revenue Expenditure	6,867	7,903	22,261	27,355	36,043	43,958	50,832	55,934
(A+B)-C	Revenue surplus	5,391	25,143	38,848	40,282	37,597	35,318	33,236	32,833
D	Capital Income	3,779	6,226	4,307	1,494	1,545	1,597	1,652	1,563
E= (A+B+D)-C	Surplus for Capex	**26,104**	**51,558**	**43,155**	**41,777**	**39,141**	**36,916**	**34,888**	**34,396**

(Figures in Rs Lakh)

The proposed requirement of capital investments for PMC in the short term (i.e. till fiscal 2025) is Rs.588,187 lakh. The below table shows the estimated capital expenditure sustainable by the PMC and the corresponding debt requirement, in improved scenario:

Table 176: Estimated capital expenditure which can be sustained by the PMC in improved scenario

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Surplus for Capex	**26,104**	**51,558**	**43,155**	**41,777**	**39,141**	**36,916**	**34,888**	**34,396**
B	Existing capital expenditure	5,915	7,128	8,922	9,320				

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
C	Proposed Capital expenditure		49,629	104,143	98,653	104,121	78,335	80,414	72,892
A-(B+C)	Surplus / (Deficit)	20,189	(2,718)	(23,045)	(26,834)	(23,331)	(10,164)	(13,360)	(9,340)
	Debt requirement		(2,718)	(23,045)	(26,834)	(23,331)	(10,164)	(13,360)	(9,340)
	Sustainable Capex		**47,148**	**57,279**	**59,290**	**62,473**	**47,079**	**48,248**	**43,735**

(Figures in Rs Lakh)

The sustainable investments have been estimated considering the DSCR (i.e. the amount of surplus available to pay interest and to repay principal) at 1.6. The following table lists the investments which can be sustained by PMC in short term, during the improved scenario.

Capex requirement (short term)	Sustainable investments without debt	Sustainable investments with debt	Debt requirement
588,187	281,832	365,252	108,791

(figures in Rs.Lakh)

In the improved scenario, PMC will be having a cumulative surplus of approximately Rs.2,818 crore till fiscal 2026 and hence, shall be able to meet investment of about Rs.2,818 crore from the proposed requirement of Rs.5881.87 crore during the short term.

In case PMC raises debt, it would be able to raise debt of Rs 1,087.91 crore which shall enable it to meet the investment requirement of Rs 3,652.52 crore from the proposed requirement of Rs.5881.87 crore during the short term.

17.1.3 Financial projection under best-case scenario

PMC will have to implement reforms that ensure augmentation of revenue, leading to improved overall governance. It is assumed that PMC shall take up reforms in the areas of property tax, water charges, sewerage charges and also revise its advertising policy with a view to utilise its full potential and improve the existing collection of advertising tax.

It is assumed that in the best-case scenario, the integration of CIDCO nodes and MMRDA villages shall be completed by fiscal 2021 and PMC to receive tax of properties in these regions from fiscal 2022.

The following are additional assumptions used for assessing financial projections for PMC in the best-case scenario:

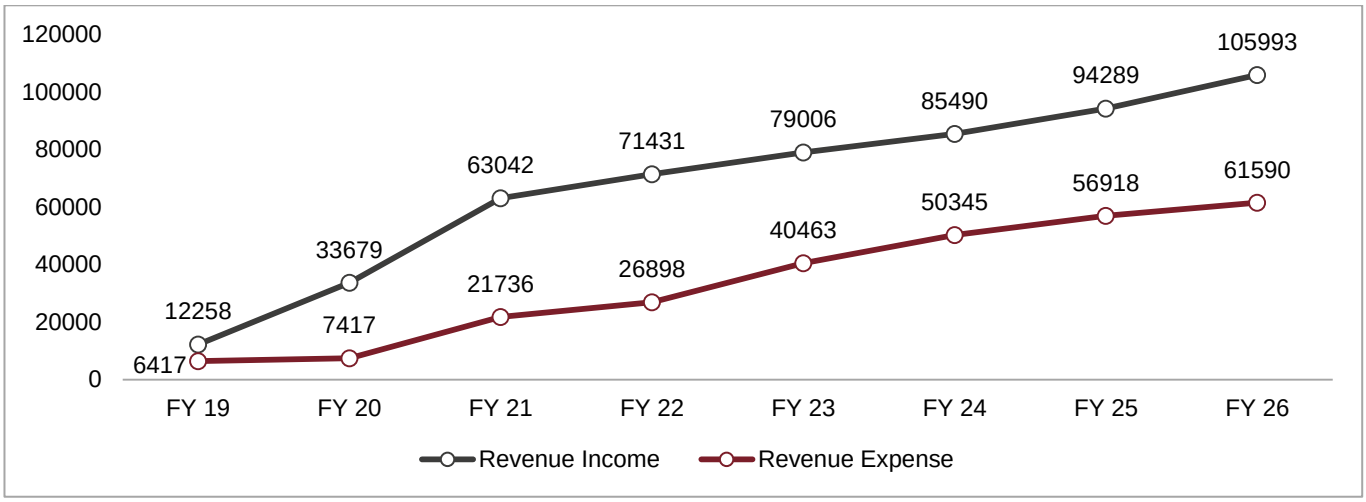
- **Property tax**
  - It is assumed that the PMC will shift from the ARV system to capital-value method by 2026
  - Collection efficiency targeted to reach 90% from 67% currently
  - Arrears collection efficiency targeted to reach 60% from 44% currently
- **Water charges**
  - Collection efficiency of arears targeted to reach 85% from 63% currently
  - Arrear collection efficiency targeted to reach 60% from 20% currently
- **Advertising rates**

- It is assumed that the PMC shall set new rates for advertising in the PMC region from fiscal 2021, targeting at least Rs 1,00,000 per sq km per year[73]
- The advertising rates in the PMC region should be revised 5% after every five years

- **SWM charges**
  - Currently the PMC is not charging any fee on collecting solid waste from properties under its jurisdiction. It is suggested that the PMC should introduce some charges to collect solid waste from properties under its jurisdiction. The PMC can initiate by collecting Re 1 per day per property, which can be increased 10% after every five years.

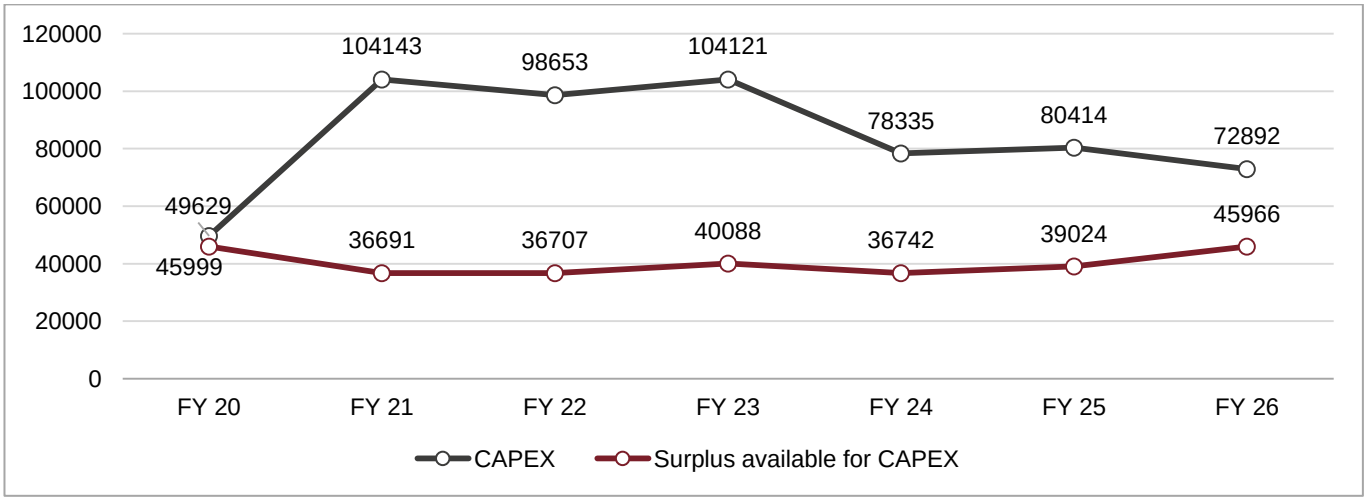
On the basis of the aforementioned reforms, it is expected that the PMC will see a significant boost in its revenue income and surplus. The following figure highlights the same:

Figure 52: PMC's projected revenue income and expenditure in best case scenario



The below figure shows the expected projection of PMC's surplus (to meet capex) and its planned capital investments in future in the best-case scenario.

Figure 53: Projected trend of PMC surplus (for capex) under the best-case scenario and proposed investment requirement



[73] *NMMC receives approx.Rs.148104 per sq.km per year*

The below gives an overview of projected PMC financials in the best case scenario:

Table 177: Snapshot of PMC's projected financial capability in the best case scenario

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Opening balance	16,933	20,639	-	-	-	-	-	-
B	Total Revenue Income	12,272	33,679	63,042	71,431	79,006	85,490	94,289	105,993
C	Total Revenue Expenditure	6,867	7,417	21,736	26,898	40,463	50,345	56,918	61,590
(A+B)-C	Revenue surplus	5,405	26,261	41,306	44,533	38,543	35,145	37,372	44,402
D	Capital Income	3,779	6,226	4,307	1,494	1,545	1,597	1,652	1,563
E= (A+B+D)-C	Surplus for Capex	**26,554**	**53,127**	**45,614**	**46,027**	**40,088**	**36,742**	**39,024**	**45,966**

(Figures in Rs Lakh)

The proposed requirement of capital investments for PMC in the short term (i.e. till fiscal 2025) is Rs.588,187 lakh. The below table shows the estimated capital expenditure sustainable by the PMC and the corresponding debt requirement, in improved scenario:

Table 178: Estimated capital expenditure which can be sustained by the PMC in best case scenario

Sr No.	Particulars	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26
A	Surplus for Capex	**26,554**	**53,127**	**45,614**	**46,027**	**40,088**	**36,742**	**39,024**	**45,966**
B	Existing capital expenditure	5,915	7,128	8,922	9,320				
C	Proposed Capital expenditure		49,629	104,143	98,653	104,121	78,335	80,414	72,892
A-(B+C)	Surplus / (Deficit)	20,639	(3,630)	(63,806)	(47,148)	(27,071)	(13,784)	(12,441)	(1,779)
	Debt requirement		(3,630)	(63,806)	(47,148)	(27,071)	(13,784)	(12,441)	(1,779)
	Sustainable Capex		**49,629**	**100,498**	**83,855**	**67,158**	**50,526**	**51,465**	**47,745**

(Figures in Rs Lakh)

The sustainable investments have been estimated considering the DSCR (i.e. the amount of surplus available to pay interest and to repay principal) at 1.6. Hence, the following table lists the investments which can be sustained by PMC in short term, during the best case scenario.

Capex requirement (short term)	Sustainable investments without debt	Sustainable investments with debt	Debt requirement
588,187	306,587	450,875	169,659

(figures in Rs.Lakh)

In the best case scenario, PMC will be having a cumulative surplus of approximately Rs.3,065.87 crore till fiscal 2026 and hence, shall be able to meet investment of about Rs.3,065.87 crore from the proposed requirement of Rs.5881.87 crore during the short term.

In case PMC raises debt, it would be able to raise debt of Rs.1,696.59 crore which shall enable it to meet the investment requirement of Rs 4508.75 crore from the proposed requirement of Rs.5881.87 crore during the short term.

17.2 Summary of investments sustainable in short term

The following table summarises the above analysis, the amount of investments which PMC can sustain with and without raising debt in short term (i.e. till 2025) in all the three scenarios described above

Table 179: Summary of estimated investments sustainable by PMC in short term under various scenarios

Sustainable Investments	With Debt	Without Debt
Business as usual	213,026	139,449
Improved scenario	365,252	281,832
Best case scenario	450,875	306,587

(Figures in Rs lakh)

- In the **business as usual scenario**, PMC can meet Capex requirement of about **Rs 1,394 crore from its sources**, however **after raising debt** PMC will be able to meet Capex requirement of **Rs 2,130** crore ensuring its DSCR does not fall below 1.6).
- In the **improved scenario**, PMC can meet Capex requirement of about **Rs 2,818 crore from its sources**, however **after raising debt** PMC will be able to meet Capex requirement of **Rs 3,652.52 crore** ensuring its DSCR does not fall below 1.6).
- In the **best case scenario**, PMC can meet Capex requirement of about **Rs 3,065.87 crore from its sources**, however **after raising debt PMC** will be able to meet Capex requirement of **Rs 4,508.75 crore** ensuring its DSCR does not fall below 1.6).

As the proposed requirement of capital investments for PMC in the short term is Rs.5881.87 crore, PMC may not be able to meet all its requirements. Hence, PMC will have to prioritise the identified projects as per consultations with the relevant city-level stakeholders, so that the funds can be utilised optimally.


पनवेल महानगरपालिका
आद्य क्रांतिवीर वासुदेव बळवंत फडके


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