Smart Cities Challenge – MCGM

September 2015

Purpose of the document

Create awareness amongst citizens of Mumbai on the Smart City Mission of Government of India

Present ideas being considered by Municipal Corporation of Greater Mumbai (MCGM) under the Smart City Plan for Mumbai

Solicit citizen participation and feedback while developing the Smart City Plan for Mumbai

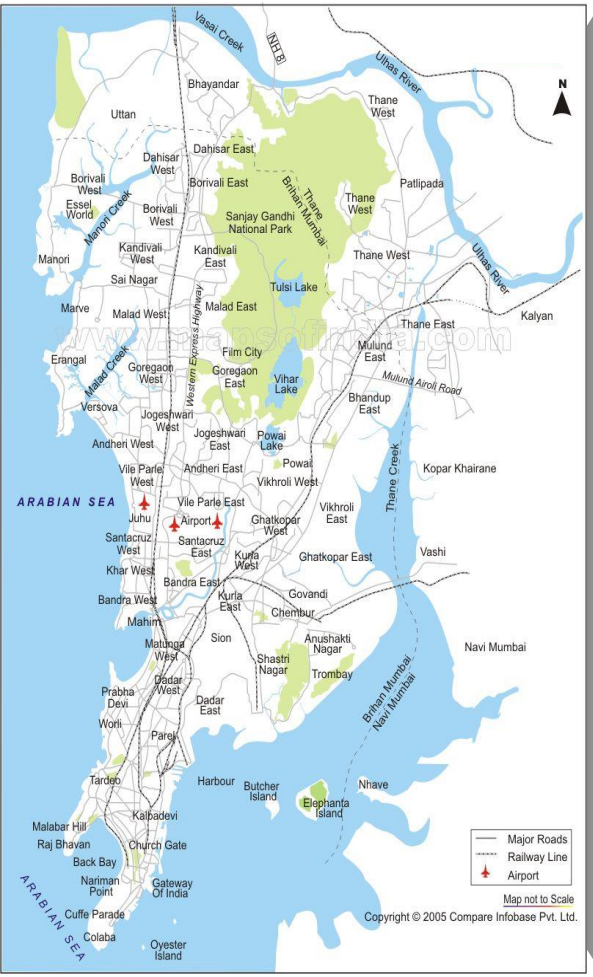
There are two flagships program from MoUD, of which smart city is an immediate priority

	No of cities	Key objectives
Smart City	98	▪ Provide basic infrastructure and quality of life through smart solutions ▪ Set examples to be replicated both within and outside the Smart City and catalyze the creation of similar Smart Cities.
Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	500	▪ The National Priority is to create infrastructure ▪ Improve the quality of life of all especially the poor and the disadvantaged.

Process

- **Stage 1 of the competition: Shortlisting of cities by States** - on the basis of conditions precedent and scoring criteria and in accordance with the total number allocated to it.
- **Stage 2 of the competition: The Challenge round for selection** - each of the potential 100 Smart Cities prepare their proposals for participation in the 'City Challenge'.
- Based on this, **Round 1 smart city** will be selected

Key focus areas for Mumbai as part of smart city development



Specific areas for development 1	Lower Parel – CBD, Andheri West – IT Hub, Malad- Bio diversity tourism, Nariman Point & Kala Ghoda- Commerce & Tourism Development
Mobility/ BEST 2	PIS, VMS and rapid traffic management systems. ATC controlled traffic light for real time traffic monitoring
Public Health 3	Citizen medical record monitoring system. IT enabled services for the 100 dispensary project, e-delivery of services
Solid waste management & Sanitation 4	100% garbage collection and segregation at source leading to significant recycling. construction and demolition waste mgmt. Smart monitoring for sewerage management.
Storm water management 5	Plan for storm water management for railway track flooding.
E-services 6	Superior engagement with citizens, wi-fi zone, enhance mobile led citizen services

Key six areas of focus

Nariman Point and Kala Ghoda

Overview

- Area: ~13 sq.km.
- Population: ~211,000 (Census 2001)
- Roads: Major Roads – 39 Minor Roads: 135
- Garbage generation per day (tonnes): 400 M.T
- Municipal Hospitals: 1
- Private Hospitals & nursing homes: 17

Source: City Development Plan Mumbai

Key issues

Sanitation and Solid Waste Management

- Sewage treatment not as per required norms of 100 CFU (Coliform Forming Unit) per 100 ml
- 30% increase in cost of transportation of garbage to dumping grounds, which are located 30-40 kms away

Transportation and connectivity

- Absence of a multi-level parking facility
- Absence of an elevated road over the congested section, which cuts through Null Bazar, Bhendi Bazaar and Girgaum that are choc-a-bloc with hawkers, cars, old buildings, and narrow carriageways
- PIS signage systems lacking

Tourism infrastructure

- Shortage of budget hotels for tourists
- Absence of kiosks to guide foreign tourists

Other public utilities

- Absence of adequate public toilets
- Not adequate public gardens/parks

Specific Initiatives to be undertaken at NP and KalaGhoda

Efficient Sanitation and Solid Waste Management (SWM) systems

1. 100% commercial complexes to be covered under door to door waste collection system
2. 24X7 water supply with sufficient pressure in each tap (1-1.5 bar)
3. Central monitoring system for management of pumping stations

Improved transportation and connectivity

4. ~36 km 8 lane coastal road from Nariman Point to Kandivali.
5. ~34 km Colaba-Bandra-Seepz Metro to reduce vehicular traffic by 35%
6. Pedestrian friendly footpaths and pedestrian only streets/ zones at Kala Ghoda
7. Smart parking technologies, parking app and parking sensors to enable drivers to find parking spots
8. LED based PIS systems at bus stops

Development of infrastructure for tourism

9. Tourism kiosks to provide important tourist information on hotels, restaurants, shopping and events.
10. Multi lingual tourism app with augmented virtual reality showcasing directions, tourist spots, regional descriptions and pictures.
11. Develop a marina with parking space for ~150 yachts and a theme based at Radio Jetty

Providing other public utilities

12. Installation of separate automated toilets for men and women
13. 1 Mbps Wi-Fi for all museums and art galleries
14. Hi-tech operations centre, which quickly identifies, analyses and disseminates safety responses to technical specialists and the general public on infrastructure failures such as building collapses or flooding.

The street festival

Preliminary ideas

Weekend festivities

- Theme based activities spread across all weekends

- **Food Pride Festival**: Monthly Street food festivals with a unique cuisine theme. Eg: Koli , Konkani, Malvani, Ghati etc.

- **Heritage Walks and cycle tours:** Walks through the entire Kala Ghoda explaining history of the area. Tours starting at CST and ending at Gateway of India.

- **Flea it in style**: Flea markets and stalls to be set up at key parking spot areas. Association with NGOs to set up stalls of their merchandise

- **Children:** Parking space to be converted into Ice skating ring, play area over the weekend. Dedicated roads only for pedestrians over the weekend

- **Theatre:** Association with NGO's and colleges to perform street theatre. Art installations on Rampart gallery on weekends.

- **Workshop:** Drawing and painting workshops for kids. Wine tasting and yoga workshops other allied workshop for adults

Specific Initiatives to be undertaken at Nariman Point and KalaGhoda

Augmented virtual reality	▪ Outdoor guides and explorers: Archival photographs of city superimposed on current view of city landscape as points of interest for people ▪ 3D models: museums to convert 2D objects into 3D models using AR markers and explaining origin and content	
Infrastructure Facilities	▪ Pedestrian only streets/ zones at Kala Ghoda over weekends ▪ Parking app to display eligible parking spaces in the area	
Development of infrastructure for tourism	▪ 1 Mbps Wi-Fi for all museums and art galleries ▪ Legalize street vending and create hawker friendly zones ▪ Develop handicap and pedestrian friendly footpaths	

Andheri (West)

Overview

- Area: ~24 sq.km.
- Population: ~700,000 (Census 2001)
- Road Side SWD (Kms): ~270 km
- Garbage generation per day (tonnes): 600 M.T
- Municipal Hospitals: 1
- Private Hospitals & nursing homes: 110

Key issues

Sanitation and Solid Waste Management

- Clogging of drains with refuse around slum areas
- Poor maintenance of community toilets
- Absence of sewerage connections to build individual toilets at Gilbert and Gaodevi Hill slums
- Only one water connection per 15 families in slum areas

Transportation and connectivity

- Absence of footpaths at Barfiwala Marg.
- Entire stretch from New India quarters to Green court occupied on both sides by vendors resulting in shrunken sidewalks
- Absence of a multi-level parking facility

IT infrastructure

- Absence of free Wi-Fi
- Constant interruption in power supply

Source: City Development Plan Mumbai

Specific Initiatives to be undertaken in Andheri

Efficient Sanitation and Solid Waste Management (SWM) systems

1. Implementation of major waste water treatment facility and new pumping stations
2. 100% door-to-door collection of garbage at every household
3. 24X7 water supply with sufficient pressure in each tap (1-1.5 bar)

Improved transportation and connectivity

4. Integrated transportation system at Andheri station, set up of a separate area for auto rickshaws and taxi parking.
5. Pedestrian friendly footpaths on roads where possible
6. Smart parking technologies such as parking apps on phone and parking sensors to enable drivers to find parking spots

IT Infrastructure

7. 24X7 uninterrupted power supply
8. Cheap, high-speed broadband and Wi-Fi services
9. Science hub for companies, researchers and students to collaborate new business ideas

Providing other public utilities

10. Introduce T-money – rechargeable cards available at airports and convenient stores to pay transport fares, and purchases at retail outlets. Link it with Mumbai card.
11. E-biz platform – a 24X7 portal for all business and investment related clearances and compliances.

Malad

Overview

- Area: ~50 sq.km.
- Population: ~800,000 (Census 2001)
- Roads: Major Roads – 42 Minor Roads – 155
- Road side S.W.D.(Kms): ~160 km.
- Garbage generation per day (tonnes): 370 M.T
- Municipal Hospitals: 2
- Private Hospitals & nursing homes: ~110

Source: Report on Health of Mumbai

Key issues

Sanitation and Solid Waste Management

- Water contamination due to 14 SWD outfalls into Malad creek
- ~3,500 cases of diarrhea due to water contamination
- ~25% shortage of bins for garbage collection
- <50% households covered under door-to-door waste collection systems

Transportation and connectivity

- Major traffic congestion during peak hours from Malad (West) to Goregaon (East)
- Insufficient footpaths for pedestrians

Eco tourism not fully leveraged

- Illegal dumping of construction debris along mangroves
- Increase of slums along the creek
- Average of 5 deaths a year at Aksa beach due to no safety measures
- Themes such as tours for bird watching not fully explored
- Potential for enhanced water sport activities on any of the seven beaches

Specific Initiatives to be undertaken at Malad

Efficient Sanitation and Solid Waste Management (SWM) systems

1. New pumping stations in flood prone areas to neutralize tidal effect
2. 25% more dustbins per sq km to prevent locals and tourists from dumping garbage on beaches and streets
3. Setting up of secondary treatment plant and upgrading of existing sewage plant

Improved transportation and connectivity

4. Flyover to avoid Malad to Goregaon Link road traffic during peak hours
5. Footpath for pedestrians on all roads
6. Smart parking technologies such as parking apps on phone and parking sensors to enable drivers to find parking spots
7. Smart control room for traffic monitoring to reduce traffic congestion at Malad subway, Mith Chowki and Pathan Wadi

Leveraging eco-tourism

8. 7 theme based beaches along the coast
9. Water sport activities at Erangal and Gorai beaches for locals and tourists such as parasailing, snorkelling, canoeing and surfing
10. Budget hotels for tourists at all seven beaches
11. Development of an Ayurveda village with wellness centres at all 7 beaches

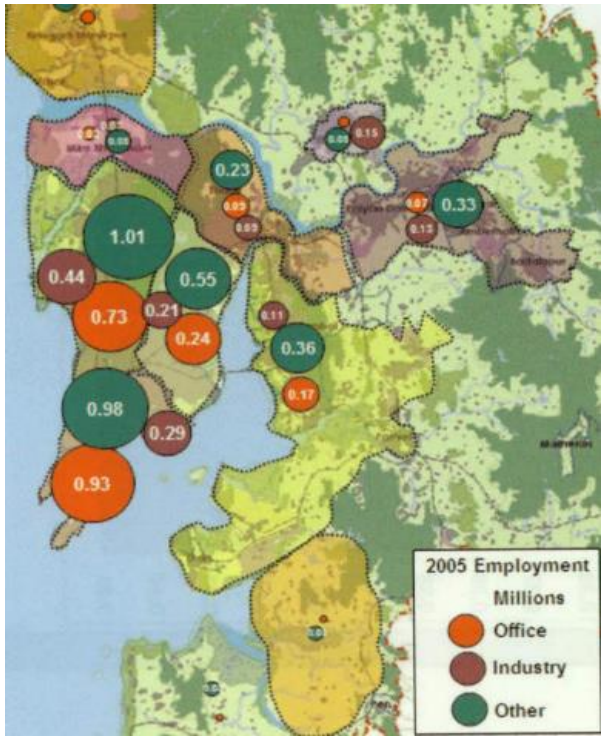
Providing other public utilities

11. Installation of separate automated toilets for men and women
12. **Smart palm stations** that run on solar power to act as info point and complimentary Wi-Fi point

Lower Parel

- Lower Parel is situated in G/S Ward Mumbai,
- Once the abode of mills, the development in the area began with the redevelopment of mill land. The area is now dominated by luxury skyscraper apartments, upscale restaurants and pubs, premium office space, luxury hotels, and boutiques
- According to the comprehensive transportation study of Mumbai, this area offers 0.98 million employment opportunities, Which makes Lower Parel the CBD of Mumbai

Distribution of Office, Industry & Other Employment (2005)



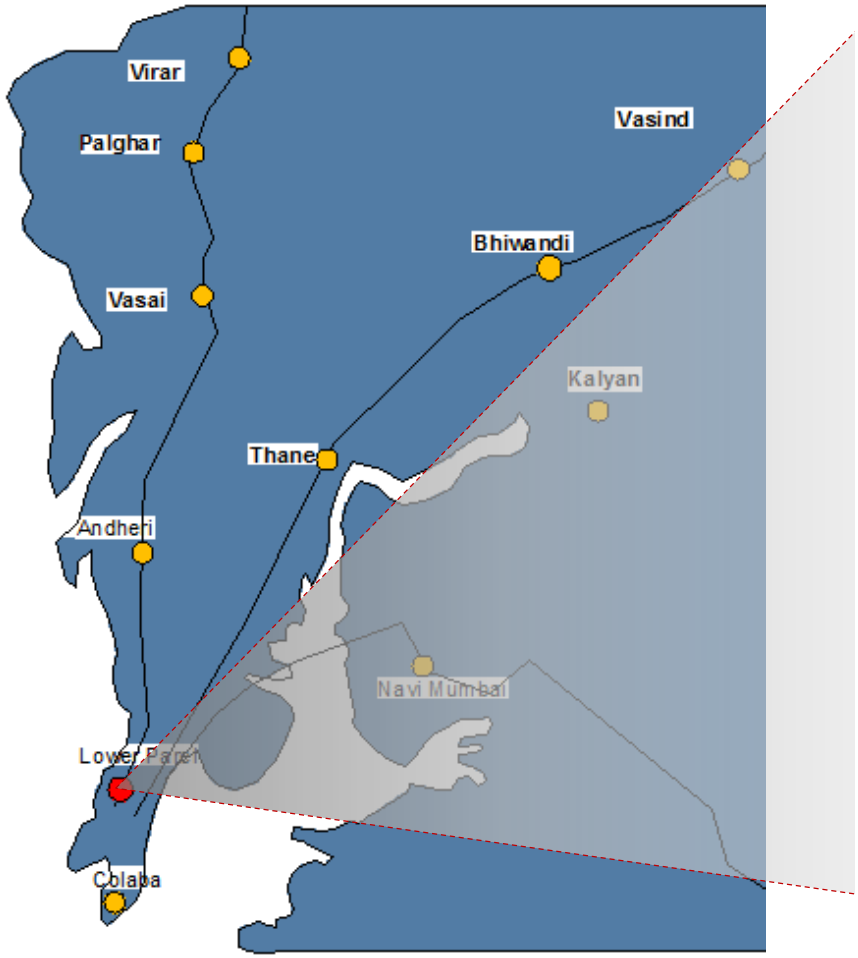
Key Issues in Lower Parel

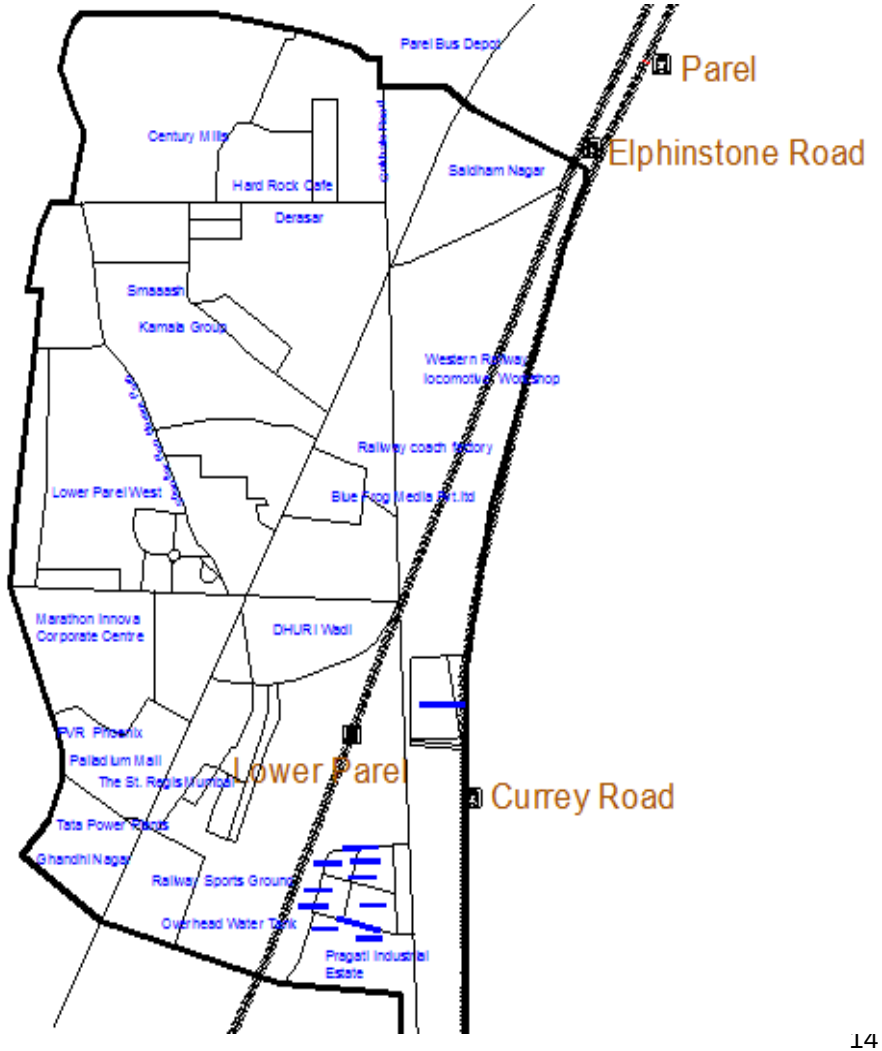
- Mobility
- Traffic
- Parking, footpath encroachments
- Governance
- Public toilet's

Source: DRMMP- MCGM

Lower Parel can be potentially developed into a business hub of global standard

Developing Lower Parel into a CBD (map)





Initiatives for CBD Lower Parel

Smart transportation

1. Smart Road Traffic Management for 4 key roads, especially during peak hours (MM Joshi, Senapati Bapat, Ganpatrao Kadam Pandurang Budhkar marg)
2. Emergency Route Mapping: to reach the nearest hospital during emergency
3. PIS for multiple transport options: Integrated information of buses & local trains
4. 100% Adaptive traffic lights
5. Mobypark: helps to locate free parking slots in the area

Smart water supply/ Energy

6. 24/7 Water Supply for the population within the CBD
7. Smart metering of water connections proportionate to usage
8. Smart energy metering proportionate to usage
9. Solar Panels for upcoming building

Upgrading hard infrastructure

10. Improving east west connectivity between Lower Parel, Chinchpokli and other adjoining areas
11. Widening of roads at the entry of Elphistone bridge to ensure lower wait time
12. Up gradation and broadening of Elphinstone bridge that was created in 1908

Smart utilities

13. 100% Wifi enabled for entire Lower Parel for smarter, faster communication
14. CCTV installation at bus stops and key locations (over 70 places for safety and security
15. Smart Public toilets with make-shift design (Vienna)
16. Install Over 25 MUPI kiosks

Source: Cities referred to Zuidas - Amsterdam, Naga – Philippine, Santa Cruz - California

Initiatives for CBD Lower Parel

Mobypark

1) Need for parking capacity to accommodate over 6,000 vehicles
2) Introduce pay and park scheme in residential complexes for the public
3) Utilize vacant places under flyovers for parking
4) Set a mandate for new buildings to compulsorily provide for public parking – can provide additional FSI as an incentive
5) E-enabled imposition of fines on vehicles parked on roads /no parking zones

Public Toilets

1) Construction of public toilets at railway stations, bus stops and markets
2) Set up of public toilets for women every 0.5 km
3) Set up of eco friendly automated toilets
4) Sufficient deployment of cleaning staff
5) Management of urinals and toilet blocks to be handed over to organisations with financial assistance from the MCGM

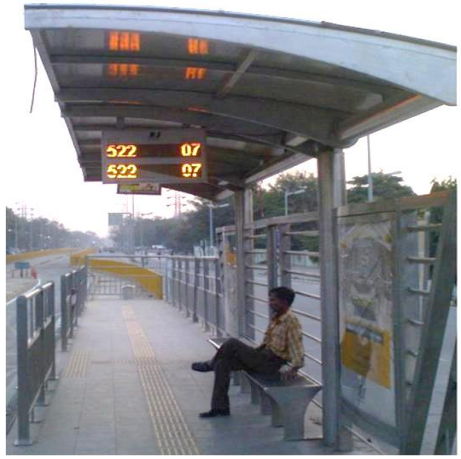
Key six areas of focus

Passenger Information System (PIS) System

Parking indicators

Kiosks at bus stops

GPS enabled stops



PIS with voice system

Central Control Station

On top of the bus

Key initiatives to be taken

Passenger Information System (PIS)

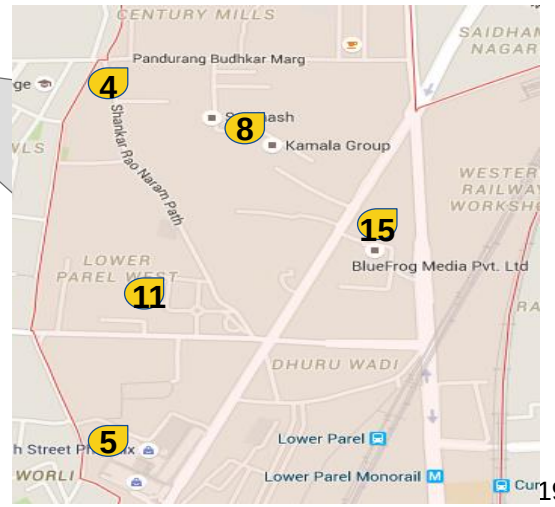
1. **Passenger information at 7,000 stops and in 4,600 buses**. Next bus stop name shall be announced in advance in the bus
2. **GPS based automatic dispatching** of passenger transport vehicles, headway management
3. **Install MUPI** kiosks at 1,000 bus stops provide information about public transport to users.
4. **90% plus Adaptive traffic light** system with state of the art incident management

Smart Parking app

5. Parking app for info on legal parking/nearby open parking space for 780 parking spots.
6. Mobile payment for parking through wallets, and help identify parking spots available
7. Cloud enabled centralized parking information
8. Mobypark application to enable residents to offer parking spaces for fees (dynamic pricing in the fees based on demand)

Static signages

9. Over 6,000 static signages in the entire city to make it citizen friendly

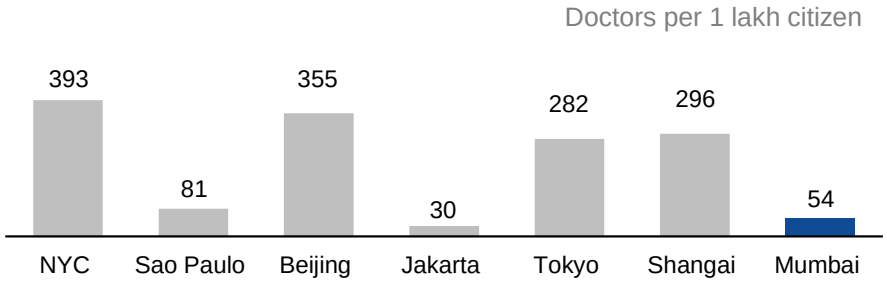


- **Key issues to be addressed**
  - Risk of vandalism
  - Solid structure to withstand different agitations/destructions or any natural calamities
  - Strong monitoring to safeguard against any damages

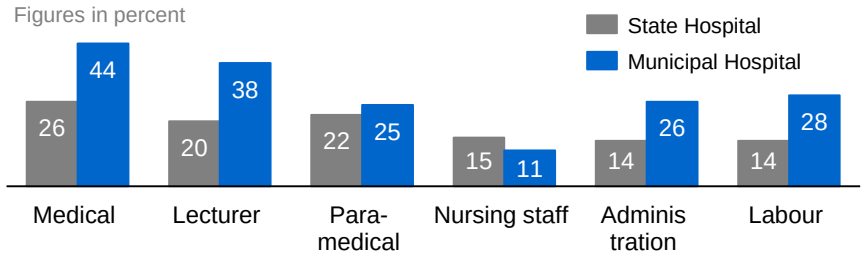
Key six areas of focus

Public health services

Doctor population in global cities



Shortage of staff in public hospitals in Mumbai



Overview

- 3 major general hospitals and 1 dental hospital
- 18 peripheral hospital
- 5 speciality hospital
- 161 dispensaries
- 183 health posts
- 28 maternity homes
- Material management for hospitals done through SAP

Key issues

Inadequate capacity

- Only 20,000 patients can be treated at a time
- 54:100000 doctor patient ratio
- 26% shortage of healthcare workers and nurses
- 44% shortage of doctors in municipal hospitals
- Ratio of private to public hospitals 60:4

Inadequate infrastructure

- Potential for a central HMIS system
- Absence of a system for disease pattern and trend analysis
- Need for data sharing between SBTC and other hospitals
- Manual data collection for ward data of key pointers like mortality, diseases etc
- Absence of GPS trackers for ambulance
- Lack of GIS integration of ambulance for tracking

Public health services – Key initiatives

Key initiatives undertaken

HMIS system

1. Development of Healthcare management information system
2. HMIS system to be centrally hosted and accessible to all government hospitals
3. Seamless management from registration to discharge for each patient
4. All medical records of a patient to be managed online
5. Other support functions like finance, HR also integrated

Over 100 dispensaries planned

Key initiatives recommended

Integration of allied systems

6. Integration of State Blood Transfusion council (SBTC) and HMIS system
7. Integration of HMIS with GIS system to understand disease pattern and perform trend analysis
8. Creation of application to handle infectious diseases
9. Mobile application for directly uploading medical numbers from each ward
10. Automated MIS system for generating reports for 18 National Health Programs

Medical facility

11. GPS trackers to be installed in 100% of ambulances
12. Integration of ambulance with GIS for location and ease of reach
13. Making medical trauma available within 5 minutes of impact
14. Create a network of specialized nurses and doctors to provide at home care for senior citizens & disabled people
15. Setting up an emergency phone number with direct 24 hour contact to nurses for elderly

Key six areas of focus

Solid waste management

Overview of SWM in MCGM

- Current waste generated: **7,500 metric tonnes (MT) per day.**
- Construction debris: 1,200 MT
- Waste generated in Slum: 250 gram per person, buildings: 500 gram per person
- Total budget - Rs 2600 crores

- **Dumping grounds** - Deonar (120 acres), Kanjurmarg (65 acres) and Mulund (21 acres)
- **Transfer stations** - Mahalaxmi (700 MT), Varsova (500 MT), Gorai ((500 MT), Kurla (650 MT)
- **Total staff MCGM payroll** - 28,000, 15,000 on contract through NGOs on daily wages. 2000 supervisors

Key issues in solid waste management

- Scale of waste generated
- Segregation of SW
- Public awareness
- No space for landfill
- Permissions
- Litigation
- Illegal construction on Dumping grounds

Current initiatives of MCGM for better SWM

The following initiatives are currently in place by the MCGM on SWM

- **Advance Locality Management (ALM) for SWM in residential societies**
  - 650 ALMs registered in residential areas
  - Aid in Segregation, composting and circulation of trucks
- **Community Based Organisations (CBO) for SWM in Slum areas.**
- 250 slums managed through 419 CBO's
- Aid in collection, segregation, cleaning of toilets, sweeping, circulation, recycling
- **Parisar Vikas Program with MCGM**:
  - Working with 2,000 women rag pickers in 7 wards of Mumbai A, E, S, T, FN, ME, MW
  - Collection, recycling, composting

PARISAR VIKAS

Smart initiatives by SWM department of MCGM

- Implementation of VTMS system in G South Ward
  - Waste to energy in Deonar and Mulund (EOI asked for the contractor)
- Re-cycling

Specific Initiatives to be undertaken

Expansion of VMTS and added features

1. **Implementing VTMS in all 24 wards** of Mumbai
2. Special bins for dry and wet waste collection at source
3. Managing collection and processing of construction waste
4. Feature of citizen participation - inclusion of areas in tracking system via requests or complaints

Re-engineering dumping grounds towards smart waste management

5. **Redesigning landfill with sensors** to track amount of waste collected
6. **Automatic spraying of anti odour and other chemical** to reduce air pollution
7. **Conversion of waste into energy at dumping ground**
8. Detecting different kind of waste and segregating appropriately

Mass awareness and training on SWM using available resources

9. Awareness campaigns to be conducted for sustainable waste segregation at house hold level **through social media**
10. Training of CBOs and Parisar Bhaginins for formal workshops
11. **Regulation and monitoring of household waste segregation**
12. Mobile app and online platforms for understanding segregation better

Sanitation/sewerage

Overview of sewerage and sanitation in MCGM

- Collects, processes and disposes over 2,500 million litres of effluents per day
- Network of 1,653 km of sewer lines
- 50 pumping stations (43 transit and 7 terminal)
- 7 waste water treatment facilities
- 95% of developed area in connected to sewer lines
- Love grove and Bandra pumping stations are biggest (2,500 MLD discharge capacity)
- As per the sewerage operation deputy chief engineer 60% of sewerage is treated
- 66,000 manholes across the city (all closed)

Key Issues in sanitation and sewerage

- Inadequate of coverage of sanitation and sewerage in slum areas
- Lack of public toilets
- Lack of regulation in industrial and commercial waste left into water sources

Initiatives taken by MCGM on Sewerage

In moving towards smarter sanitation initiatives, the MCGM has taken the following steps: (3-4 steps listed down)

- GIS mapping of sewer lines and manholes
- Treatment plant at 7 locations.
- 95% of developed area in connected to sewer lines
- Implementing SCADA system as to provide control of remote equipment at pumping stations

Specific Initiatives to be undertaken

Smart Upgradation of hard infrastructure

1. Central monitoring system for all **50 pump stations**.
2. Feature **of tracking waste water outlets into main water sources**
3. Installation of **ultrasonic flowmeters at all 7 waste water treatment plant centre** and major pumping stations
4. **Smart mapping of public toilets** to gauge further need, as well as work on **real time repair and maintenance**

Tracking of pollution levels in waste water

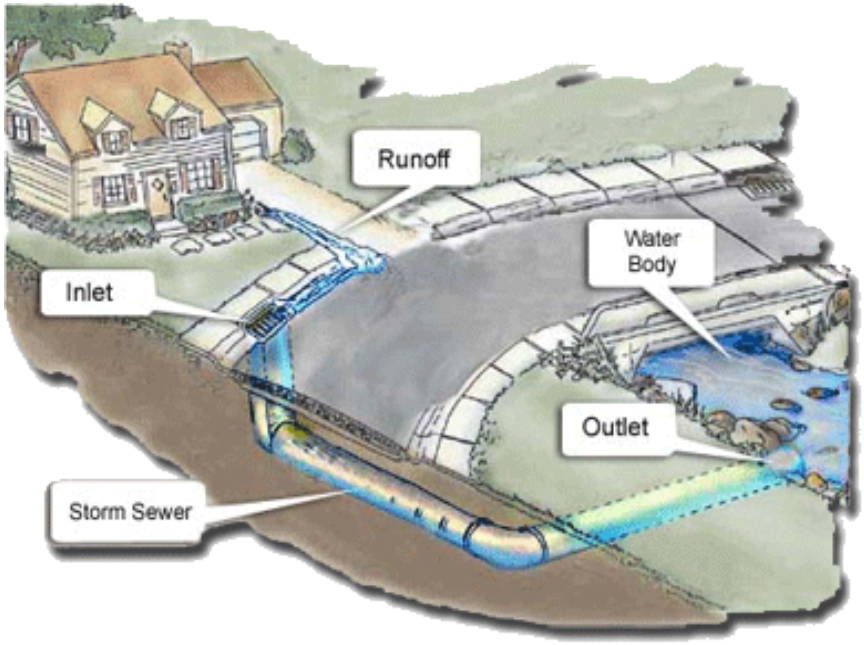
5. **Regulation for industrial effluents** in water sources.
6. Creating systems that analyse the **percentage of toxic material in water and record them**
7. **Pilot sludge to energy system** in the city in 1 ward
8. **Specific SOP** to detect mixing of drinking water and waste water

Special focus on slum mapping, awareness and management of sanitation

9. **Community based demand mapping of Public toilets**
10. SMS based grievance redressal for slum pockets

Key six areas of focus

Storm water management



Overview

- Run off co-efficient 0.5
- 2000 km roadside drains
- 627 km of underground drains and laterals in island city
- 261 km of major nullahs
- 415 km of minor nullahs
- 186 Outfalls
- 41 SWD maintenance equipment with MCGM

Key issues

Inadequate infrastructure

- 100 year old Storm water system
- Handling Capacity 25mm of rain/hour at low tide
- No access roads alongside major nullahs
- Adulteration of storm water in drains by garbage and sewage/sullage infusions
- ~30% poaching of drain space by utility lines
- 672 utility lines obstruction identified in Brimstowad report.
- Only 124 railway culverts for draining water from tracks

Other Issues

- 5 major agencies(MCZMA, NIO, TDR buying, land acquisition and Salt pan pemission) associated with permissions, ownerships of water channels/bodies
- Encroachment alongside drains

Storm water management – Key initiatives

Key initiatives undertaken

For existing SWD channels

1. M40 grade RCC lining for walls of storm water drains
2. Dynamic hydraulic model used for design and analysis of storm water drains
3. Latest GIS map of major nallah system with 0.2m contour interval done by using LIDAR survey
4. 55 of 58 priority works under Brimstowad project completed
5. 60 automatic rain gauges installed in city
6. 8 new pumping station at major flooding areas to neutralize tidal effect
7. Storm water drain master plan layout with new drain networks in place

To avoid Railway tracks flooding

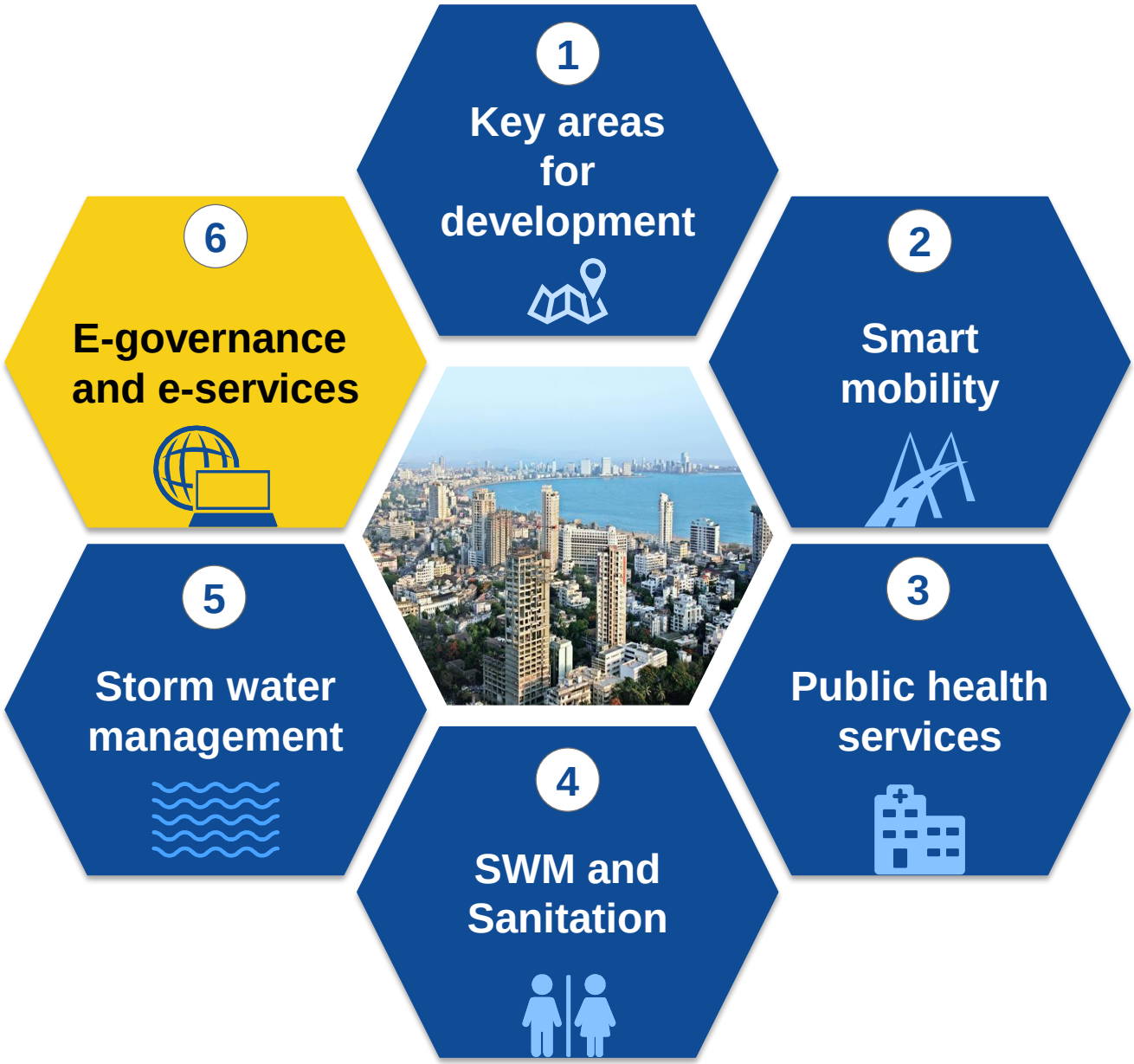
8. Widening and deepening of 29 culverts on priority basis underway
9. Construction of 20 new culverts at key flooding points
10. Rainwater harvesting near railway tracks to reduce run off co efficient from 1 to 0.5

Key initiatives recommended

Steps Ahead

11. GIS map of minor nallahs and roadside drain
12. Level sensors to be installed at all major nallahs for Early Warning system
13. Utility mapping program to map utility services lines running in SWD channels
14. Implementation of separate deep seated sewer lines
15. Rainwater harvesting for 3 months to reduce run off from 1 to 0.75
16. Mobile App for citizen to assist in geo location based tracking of overflow of nallahs

Key six areas of focus



Key initiatives recommended

1. 100% utility bill payments online. Already MCGM app available (payment of water supply charges online)
2. 1 window licensing process for each department
3. Make website compliant (New Guidelines for Indian Government Website (GIGW) website)

G2G initiatives

4. Internal data sharing network linking all departments. Critical for single window clearance
5. Updation of project status, reports and comments on network

G2C initiatives

6. Citizen reward points system
7. Updating citizens about key city events and accomplishments via message alerts
8. Area wise message alerts for disaster management

Mobile app

9. Implementation of module for licensing process for all departments
10. Connecting Disaster management department and other allied department to app
11. Citizen complaints and grievance redressal module to ensure complaint resolution in under 24 Hrs
12. Integrating Health Care HMIS system with app for ease of access of medical records

Mobility, Utility, Payments and Information (MUPI) kiosks at 800 locations in Mumbai

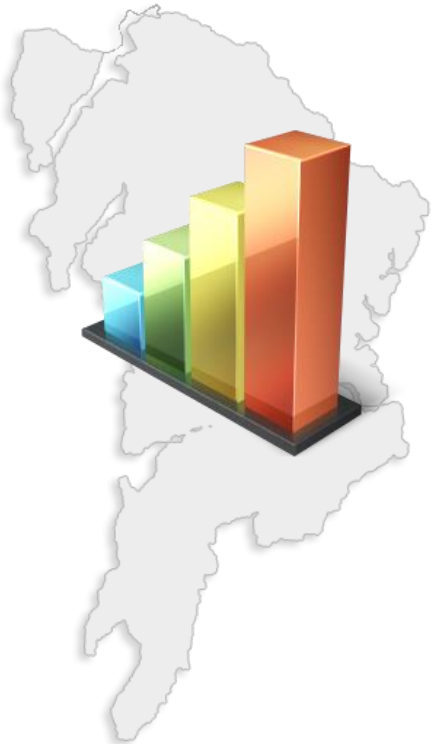
45+	Bus terminals, and
350+	Bus stops
60	Municipal parks/gardens
150	Hospitals including Municipal hospitals
50	Railway stations
100+	Colleges
100+	Malls and other public places

MUPI guide to help citizen solve their day to problem and help experience the charisma of Mumbai

Mumbai Card – towards convenience (on the lines of London's TFL and Singapore's MRT)

Railways

Other Convenience Stores



BEST Bus

Municipal Hospitals

Retail Outlets

Municipal Payments

How to provide input

- MCGM solicits input/feedback from citizens of Mumbai on ideas to make the city smart
- The input/feedback could be on ideas already presented (more details, how to make them successful etc.) or new ideas
- Citizens can provide feedback in the following ways:
  - Send email to **Smartcity.Mumbai@mcgm.gov.in**
  - Leave feedback on MCGM facebook site
  - Provide feedback on the MCGM page of Government of India website www.mygov.in

Thank you