

Physical Infrastructure

in the Mumbai Metropolitan Region



BOMBAY
Time

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Coverage of this presentation

- Vision statement
- The problems
- Why organizations are required
- The challenges

Strategy Paper - Transportation Mumbai Metropolitan Region

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Coverage of this presentation

Vision

The problems

Why strategy

The challenges

Initiatives

Aim

Process

Implementation Strategies

Vision – Transportation in Mumbai

“To enable smooth mass movement of commuters, limit time and distance for commuting and make efficient modes of transport available to all citizens of Mumbai”

What is to be addressed?

- Mass transportation modes are highly overloaded
- Current modes lack capacity to cope with future commuter population growth
- Mass movement of commuters along linear routes from northern to southern part of island city
- Insufficient shift of commercial and business centres from island city to mainland suburbs
- Projects are not complementary to each other and do not feed into the overall transportation plan of the city
- Projects highly delayed – particularly in implementation stages
- Projects implementation by multiple agencies – accountability issues
- Project structure and implementation model undergo changes at implementation stage
- Lack of transparency and accountability in project implementation
- Unequal funding and implementation capacity of various government agencies within the city

Why do we need strategy for transportation

- Population of MMR 21 million with a growth rate of 2.7%
 - Likely population of 28 million by 2020
 - Number of cars owned may increase by 35%
 - Over 6 million daily commuter trips may be added by 2020 to the load on existing suburban rail system
- Rapid growth of suburban areas, as compared to Greater Mumbai, leading to demand for transportation systems in newer areas
 - Population growth of Greater Mumbai is 1.8%; regional growth of 2.7% indicating high growth rates in suburbs
- Economic growth likely to be focused in new areas due to space requirement
 - Planned SEZs and industrial developments likely to lead to population growth as well as improved standard of living for existing population
 - ✓ May lead to car purchases and increased private road traffic in absence of suitable mass transport systems

What challenges are to be addressed

Conceptualisation

- Limited drill-down of transportation plan
- The transportation plan is not binding on the planning agency after acceptance
- Deviations from the plan in subsequent years
- In summary – institutionalising the development/ transportation plan to ensure cohesive approach by planning agency

Implementation

- Project plan undergoes changes based on operational hurdles - changing the nature of the project
- Planning and implementing agency are often the same, leading to conflict of interest
- Changes in implementing agency may lead to change in perceived risk for the project
- Non-uniform process for bidding out of projects across agencies
- Lack of adequate transparency in selection process for private developers and contractors

O&M

- Responsibility for O&M frequently transferred by developing agency, leading to difference in quality of service
- O&M service levels not reviewed in light of change in traffic levels and patterns – unforeseen issues not addressed.

What challenges are to be addressed

Conceptualisation

- Distinction between financially viable projects and those with low viability but bringing socio-economic benefits is not made while determining project financing and implementation model
- Lack of clarity in revenue-sharing between operators of different component of an integrated transportation project (for example, a customer may board from one station of Line 1 of metro but may go to a station on Line 2)

Implementation

- Risks of statutory clearances and rehabilitation shifted to private developer/contractor – despite implementing agency being in better position to resolve such issues
- Limited co-ordination between agencies (E.g. fare of AC buses may be more than fare of Metro – despite high capital cost and profitability constraints of the latter)

O&M

- Limited monitoring of service levels leading to slippage
- Citizen feedback system not rigorously implemented
- Retain the focus of implementing agencies on the O&M of existing projects without compromising on the need for identification of new projects

Key initiatives – Mumbai has covered some distance

Conceptualisation

- The Unified Mumbai Metropolitan Transportation Authority (UMMTA) conceived to co-ordinate planning and monitoring activities for transportation throughout the region
- The Mumbai Metropolitan Region Development Authority (MMRDA) established as the authority for planning of infrastructure, including transportation, which impacts and passes through areas under the purview of multiple Urban Local Bodies (ULBs)

Implementation

- Public-private partnership being attempted as a model of implementation – reduces dependency on a) expertise and, b) funds available with government agencies
- Monitoring of projects through Mumbai Transformation Support Unit
- Attempt to address implementation issues through meeting of empowered committee with inter-departmental and multi-organisation representation

O&M

- Public-private partnership being attempted as a model for O&M – expected to increase accountability for service levels
- Concession agreements with private firms leading to increased professionalism in approach to operation of assets
- Revenue models to improve financial feasibility of projects may lead to greater long-term sustainability and lower dependence on government grants in future operations

Key initiatives – Mumbai has covered some distance

Project

Western Freeway Sea Link

- Bandra-Worli stretch
 - o Four lanes in operation; others likely to be in operation by the end of 2009
 - o The project has seen significant delays and cost escalation
 - o Design changes and rehabilitation issues lead to delays
- Worli-Haji AN stretch
 - o Underbidding process
 - o A key issues experienced has been the requirement for the Concessionaire to pay the cost of the Bandra-Worli sea link
 - o Utility of the project and traffic volume is highly dependent upon the completion of the third phase
- Worli Nariman point
 - o Design stage
 - o Model for implementation under review

Key initiatives – Mumbai has covered some distance

Project	Status
Mumbai Trans-Harbor Link	<ul style="list-style-type: none">● In planning stage● Witnessed revisions in implementation model● Execution on EPC contract failed to attract bidder interest<ul style="list-style-type: none">○ Assurance on resources for payment - a key issue● Key learning - activities to be completed prior to project promotion<ul style="list-style-type: none">○ Responsibility of dispersal on either side to be decided in advance○ Linkage to highways to be planned○ Land and waterfront access for the casting yard to be identified○ Project cost to be all-encompassing and should be agreed in advance in order to assure the base for VGF○ Capacity building to be undertaken to manage project issues related to:<ul style="list-style-type: none">■ Limited resources with the agency■ Multiple projects being executed by the same agency○ Basis for accepting cost escalation due to unforeseen technical reasons may be specified upfront○ Responsibility for intersection of road and rail lines to be decided

Key initiatives – Mumbai has covered some distance

Project	Status
Metro Rail	<ul style="list-style-type: none">● Line 1 under construction<ul style="list-style-type: none">○ Start of construction work for all lines has been delayed from the planned start dates○ Need for traffic diversion in congested areas has led to citizen issues and roadblocks○ Shifting of underground utilities has been a time-consuming process○ Litigation over plot to be used as parking shed for rakes also resulted in delays in construction○ Delays in regulatory clearances have impacted project timelines● Line 2 awarded to the preferred bidder● Line 3 in planning stage

Key initiatives – Mumbai has covered some distance

Project	Status
Mumbai Urban Infrastructure Project	<ul style="list-style-type: none">● Road signages and marking provided● 13 out of 18 road widening corridors completed● 3 out of 11 planned flyovers are completed● Key reasons for delays - learning for future:<ul style="list-style-type: none">○ Co-ordination issues○ Existing structures in planned project areas○ Limited capacity to manage work on multiple stretches simultaneously○ Rehabilitation and resettlement issues● Quality of implementation is a key issue - frequent repairs required lead to blockage on roads and poor travel experience for commuters

Key initiatives Mumbai has covered some distance

Project	Status
Mumbai Urban Transport Project	<ul style="list-style-type: none">● Projects been delayed at the implementation phase<ul style="list-style-type: none">○ Jogeshwari-Vikhroli Link Road delayed by over 2 years (62% completed)○ Santacruz-Chembur link road delayed by 2.5 years (28% completed)○ Virar-Dahanu lines, pedestrian subways and Kurla-Thane road 5th & 6th lane projects are ongoing● 101 Nine Car EMU rakes are currently being added in phases to the suburban railway system● Delay in land acquisition● Issues regarding shifting of utilities● Hurdles in road widening● Coordination issues● Rehabilitation and resettlement issues leading to suspension of World Bank financial assistance - delays due to funding issues

Key initiatives – Metro Rail

Rationale

- Potential mode for connectivity throughout MMR
- Facilitate development of new CBDs and dispersal of population
- Planned development and traffic movement
- Need for east-west connectivity
- Internationally accepted alternate to road transportation – Reduction in road congestion

Issues addressed

- Need for comfortable, affordable and efficient transportation options for mass transport within Mumbai
- Augmentation of transport capacity – currently provided solely by suburban railways
- Extremely slow development of new CBDs
- Unidirectional flow of traffic
- Congested road infrastructure

Criticality

- High

Key initiatives – Eastern/ Western Freeway and Mumbai Trans-harbor Link

Rationale

- Need for high-speed ring road around Mumbai for rapid transportation of commuters
- Potential for development on PPP
- Feeder links to facilitate intermittent development
- Unexploited long sea line of Mumbai
- Potential for having high capacity - can accommodate BRTS with limited connectivity
- Development of MTHL to facilitate commercial/residential development on either side – a distant possibility with the current connectivity

Issues addressed

- High-speed travel should be facilitated independent of local traffic within the city
- Easing congestion on the existing route
- No issues of land acquisition (though the same would be required at either end)
- Development without traffic disruption
- Reduction in commuting time, leading to improved demand for new residential areas in distant suburbs

Criticality

- High
- While the Bandra Worli Sea Link has eased congestion at Mahim causeway, the congestion at each end of the sea link continues to be a concern – future sea links to be conceptualised in totality to avoid such problems

Key initiatives – MUIP (rail - addition of rakes)

Rationale

- Most popular and equally congested mode of transport – congestion in existing sub-urban trains being highest in the world
- Need to improve commuter comfort
- Fastest mode of transport between suburbs and CBD (Nariman Point)
- Cost competitive
- Land acquisition issue – a bottleneck in laying more lines – addition of rakes to address the problem (in limited manner)

Issues addressed

- Reduce overcrowding in existing trains
- Need to modernise old transport infrastructure
- Increased demand for this facility with increased population

However,

- Sub-urban is rail under purview of Indian Railways – efficient coordination needed between State Implementing agencies and Indian Railways for development plans alongside sub-urban railways and other associated transport plan

Criticality

- High

Key initiatives – MUIP (Parking spaces)

Rationale

- Decongest roads through reduction of roadside parking
- Improve revenue from user charges
- Facilitator to large scale project (example – a parking lot at the Nariman Point end of WFSL to facilitate reduction in congestion at the end of WFSL)

However,

- Trade-off required for development of parking spaces should and reduction in road congestion – substantial increase in parking rates required

Issues addressed

- Reduce parking on road
- Addressing congestion issues on either side of mega projects
- Restrict entry into already congested areas like Nariman point
- Development at strategic locations like railway stations to encourage multi-modal transportation

Criticality

- Medium

Key initiatives – Mono Rail

Rationale

- Suitable mode at places where right-of-way is very expensive and density is very high
- Limited disruption in traffic
- Occupies low road space – a key factor in Mumbai
- Fast construction time
- Low noise and eco-friendly

Issues addressed

- Facilitate traffic between specified points
- Could be complimentary mode to Metro
- Development with minimum traffic disruption

However,

- Train capacity of 568 passenger (train with 4 cars) – relatively low to address the mass transportation problem of MMR
- An example of deviation from the transportation plan

Criticality

- Medium

Key initiatives – Passenger Water Transport

Rationale

- Usage of unexplored coast of Mumbai
- Leisure travel
- Potential for PPP
- Pollution free mode of travel from sub-urban areas to CBDs

Issues addressed

- **Limited impact on Mass transportation**
- Number of passengers carried in a peak hours may be low as compared to passengers carried by sub-urban rail/metro
- Suitable for high-end mode of travel but may not play a significant role in addressing the mass transportation problems to Mumbai

Criticality

- Low

Key initiatives – Improved Bus Transport

Rationale

- BRTS**
 - Supplement linkage of areas through railway network etc.
 - Grade-separated high speed connectivity along arterial roads in new areas
- City bus service**
 - Connectivity to other forms of transport such as metro and suburban rail
 - Wider coverage of areas through mass transport

Issues addressed

- BRTS**
 - Complementary to suburban rail and metro
 - Comfortable road transport for long distances
 - Connectivity to new areas along arterial roads with relatively lower investment
- City bus service**
 - Alternative to private car, taxi and auto rickshaws
 - Smart card system for ticketing – may be possible to integrate ticketing with other modes

Criticality

- Medium – system is fairly efficient at present and only needs to be periodically upgraded to keep pace with growth in passenger traffic

Key initiatives – Improved Intermediate Public Transport

Rationale

- Reduction of pollution due to large number of taxis and auto rickshaws
- Improvement of passenger comfort
- Reduction of irregularities in meter charges for travelers

Issues addressed

- Pollution reduced through use of CNG and requirement to replace older vehicles
- Viable alternative to private car ownership – may be used as a supplement to mass transport
- Implementation of electronic metering
- **May form competition to mass transport systems – need to review pricing in order to limit usage to occasional use for short distances**

Criticality

- Medium

What we should aim to achieve

Short Term

- Addition to existing suburban rail capacity
- Improvement of commuter comfort in mass transport systems
- East-west connectivity through metro rail
- Increase in paid parking facilities – movement from roadside parking to dedicated multi-level car parks

Medium Term

- High-speed connectivity to CBD – Nariman Point on eastern and western routes
- High-speed road and rail connectivity to Navi Mumbai and surrounding mainland
- Metro rail connectivity to upcoming business areas
- Complementary development of transportation infrastructure
- User charges on private road transport to shift users to convenient public transport

Long Term

- Development of alternative urban hubs on the mainland
- Metro rail linkages through Mumbai Metropolitan Region
- Zoning of new developments to enhance commercial space along key routes

How do we achieve our aim

International city development strategies and applicability for Mumbai

Strategy	Applicability for Mumbai
<p>Commercial/ residential development following transportation (Planned transportation system for cities with commercial zoning along transport corridors)</p>	<p>This concept is applicable to new areas being developed in Mumbai Metropolitan region.</p> <p>As areas on the mainland are developed into commercial and residential hubs, a relook at existing zoning laws and a planned approach would limit the need for residents and employees in the new areas to commute long distances and would limit additional stress on transportation systems in the region.</p>
<p>Congestion charges in the Central Business District</p>	<p>This concept is applicable in the certain congested areas of Mumbai (like Nariman Point).</p> <p>However, the implementation of the concept would depend on the availability of alternate (and convenient) forms of transportation, including Metro rail and bus services.</p> <p>The revenue earned from such charges may be used to create a fund for continuous improvement and maintenance of mass transportation systems in Mumbai.</p>

How do we achieve our aim

International city development strategies and applicability for Mumbai

Strategy	Applicability for Mumbai
Restructuring of local authorities to streamline project planning and implementation	<p>The concept is applicable to Mumbai as the roles of agencies such as MMRDA, UMMTA and ULBs within the Metropolitan Region are to be refined.</p> <p>The MMRDA currently plays both planning and implementation roles, leading to conflict in independent monitoring of adherence to plans at the implementation stage. The structure of MMRDA, UMMTA and ULBs raise issues regarding mechanisms to transfer power, responsibility and accountability for projects.</p>
PPP in transportation systems	<p>This is applicable to Mumbai as a typical issue impacting project success is the mechanisms for private participation.</p> <p>Currently, various structures are being proposed for different projects, with varying degrees of success. A concerted effort to identify the key project features and map its suitability to a particular structure may be carried out to avoid issues such as lack of bidder interest.</p> <p>A transparent mechanism to involve prospective bidders in the project structuring process may prove to be beneficial to the project's success</p>

How do we achieve our aim

How others have achieved

Problem	Applicability for Mumbai	Actions taken	Learning for Mumbai
Implementation: London Congestion Charges			
Excessive congestion due to private car traffic in the CBD	Congestion experienced at Nariman Point due to car usage	Congestion charges implemented with the support of an elected mayor	Support from stakeholders, particularly elected representatives
Road widening was not feasible due to existing buildings	Road widening not feasible due to existing buildings	Charges were limited to the critical areas, billing and collection was automated and penalties were enforced for defaulters	Scope of implementation may be limited to critical areas, or a pilot project may be undertaken
		Revenue from the charges was specifically allocated towards improvement of alternate mass transport systems	Benefits of implementation should be shared with bearers of costs, and service quality delivered should be in keeping with user charges

How do we achieve our aim

How others have achieved

Problem	Applicability for Mumbai	Actions taken	Learning for Mumbai
O&M: London Underground			
<p>Service levels were suffering due to lack of government funds</p> <p>Delays and lack of carrying capacity were key issues</p>	<p>Limited funds available with local government bodies - impacting maintenance of projects</p> <p>Long term sources of funds required to maintain efficient operations and undertake timely maintenance as well as improvement activities</p>	<p>Two infrastructure companies were formed under PPP model</p> <p>Funds contributed by the government, private developers and revenues from ticketing and retail</p> <p>Single Government agency responsible for coordination</p> <p>Service levels fixed with regard to availability of systems</p> <p>Contract to be re-priced every 7.5 years</p>	<p>Establishing unified planning agency for transportation</p> <p>Clear delineation responsibility for planning and execution</p> <p>Financing to be undertaken in a shared manner</p> <p>O&M concessions to be granted with strict performance norms</p> <p>Pricing to be reviewed as system matures and traffic pattern changes</p>

How do we achieve our aim

Mumbai - learnings from the past

Problem	Actions taken	Learning for Mumbai
Space limitation within Greater Mumbai leading to overcrowding	<p>Conceptualisation of Navi Mumbai overcrowding</p> <p>Responsibility for planning and development assigned to a single agency - CIDCO</p> <p>Connectivity to Greater Mumbai initially restricted to road - plan to develop Navi Mumbai as an independent town</p> <p>Suburban rail connectivity introduced subsequently due to low demand for the township and limited employment opportunities</p>	<p>Mass transport to be developed at initial stage of development of new areas - to act as driver of new growth</p> <p>Need to establish variety of business and employment opportunities within new areas to reduce need for long-distance commute</p> <p>Public transport to be viewed as social necessity rather than business activity - economic/financial viability to be considered to decide the type/ mode of development</p>

How do we achieve our aim

Mumbai - learnings from the past

Problem	Actions taken	Learning for Mumbai
<p>Linkage between Mumbai island city and mainland in order to expand city size and facilitate commuting</p>	<p>Suburban rail network extended to broader metropolitan region</p> <p>Road linkages between Island city and mainland were developed at the northern end of the island city, away from the commercial hub - thus significantly increasing the commuting time</p> <p>Trans-harbour link planned to connect central portion of eastern side of island to mainland - yet to be implemented</p>	<p>MTHL to have been developed on priority basis</p> <p>Limited development on mainland side of planned trans-harbour link adversely affecting the financial viability of link</p> <p>High project cost- government Viability Gap Funding may be necessary in order to reap socio-economic benefits to the planned suburbs</p> <p>Need to consider rail linkage along with planned trans-harbour link in order to serve mass of commuters - high capacity of mass transport to enhance the residential development on mainland</p>

How do we achieve our aim

Some international case studies

Strategy	Mumbai	Singapore	London	Shanghai
Implementation of Mass Rapid Transit System (Metro Rail) for mass commuter traffic	Implemented on PPP mode Pricing as per existing suburban rail	Implemented through corporatised government entities	Constructed and owned by government entity Operated and maintained through PPP	Constructed and owned by government entity

- Metro to be considered a social necessity and economic viability to be a key criteria for development of metro
- Issues regarding land, right of way, casting yard to be addressed upfront to reduce development timeframe
- Government to support the project as owner - with focus on development of overall city

How do we achieve our aim

Some international case studies

Strategy	Mumbai	Singapore	London	Shanghai
Developing Complementary modes of transport	Bus and commuter trains competing along similar routes Total capacity of each mode insufficient to cater to all commuters along a route	Bus routes supplement connectivity to long city roads, while metro is used for long-distance travel to key areas	Limited implementation Underground (metro) and commuter rail used as long-distance mode of transport Buses used for local travel	Limited implementation Bus service extremely extensive Metro service being developed as a long-distance alternative
Congestion pricing in central business district	Not implemented	Electronic road pricing	Implemented in central London	Not implemented

- Integrated transport planning a key requirement
- Congestion pricing may be implemented subject to availability of convenient mode of public transport

How do we achieve our aim

Some international case studies

Strategy	Mumbai	Singapore	London	Shanghai
Development of new business hubs	<p>Development of Navi Mumbai</p> <p>Substantial commuter traffic between island city and suburbs, indicating limited business and commercial opportunities in the latter</p> <p>Heterogeneous profile of commercial activity</p>	<p>Port-based, logistics and other industries located in outer areas of city</p>	<p>Limited development - mainly expansion of business areas in central part of the city</p> <p>Highly homogenous profile - approximately 85% of commercial activity comprises of the service industry (tertiary sector)</p>	<p>Numerous economic and technological development zones established, including Hongquiao, Jinqiao and Pudong</p>

Focused approach can facilitate development of new CBD - development needs to be planned in a holistic manner - institutionalizing the planned development would be the key

How do we achieve our aim

Some international case studies

Strategy	Mumbai	Singapore	London	Shanghai
Ownership and operation of various modes of transport by single entity	Not implemented	SBS Transit and SMRT Corporation operate bus as well as Metro services along specific routes	Transport for London is the integrated body responsible for all modes of transport	Ownership and operation by various bodies under umbrella of Shanghai local government
		Smart card payment implemented across all modes of local transport	Smart card payment implemented across all modes of local transport	Smart card payment implemented across all modes of local transport

To be a world class city, we need to move in direction of world-class cities.

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Mass transport over long distances to be rail - based (Metro)	<p>Inability to increase road width in developed areas</p> <p>Reduction in average commuting time</p> <p>Provision of comfortable alternative to private car transport</p>	<p>Reduction in overcrowding in competing mass transport systems</p> <p>Reduction in road traffic</p> <p>Reduction in commuting time</p>	<p>Movement of car owners from private to public transport</p> <p>Development of commercial hubs around metro stations</p> <p>Reduction in commuting time</p> <p>Enhance the viability of rail based mass transport systems</p> <p>Reduction in number of new cars added to the city</p> <p>Pollution due to vehicular traffic reduced</p> <p>Improved tourism</p>

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Bus system to complement rail transport	Access to metro stations to be facilitated	Increase in usage of metro system due to enhanced access	Movement of car owners to bus services in order to access metro
	Limit impact of metro on existing bus services	Reduction of congestion on arterial roads due to reduction in long-distance bus transport - bus mainly being feeder to metro/sub-urban rail	<p>Ability to raise rates for luxury bus services as demand increases, thereby improving revenues</p> <p>Complimentary mode of transport</p> <p>Improvement of bus services, leading to added attractiveness for commuters</p> <p>Reduction in new car transport to city</p>

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Congestion pricing in central business district	Inability to increase road width in developed areas	Controlled vehicular movement	Movement of car owners from private to public transport
	Reduction of new addition of fleet of cars	Increased awareness of alternate modes of transport	Reduced journey time
	Creation of road fund to facilitate improvement of road infrastructure		Lower fuel consumption. Reduced accidents Reduction in number of new cars added to the city Better environment Road infrastructure fund for maintenance of city roads Increased business efficiency by speeding up the movement of goods and people.

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Development of new business hubs	<p>Population dispersal</p> <p>Linear commuting pattern into and out of commercial hub at southern end of island</p>	Limited impact on overcrowding in mass transport	<p>Residential development around business hubs leading to reduced commuting time and distance</p> <p>Reduced crowding in mass transport systems and road traffic</p> <p>Increased viability of transportation systems in suburban areas</p> <p>Reduced need for measures such as congestion pricing and high parking rates in current business district</p>

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Capacity building of implementing agencies - shift in focus to service levels and total cost of ownership	Need for regular repairs and maintenance leading to high operating cost Repeated bid processes for works contractors	Effort and time investment in evaluating long-term cost for proposals submitted Increased usage of new technologies May lead to slightly higher capital cost - but the same is to be viewed against economic benefits and reduced maintenance cost	Reduced O&M costs Reduced inconvenience to commuters due to ongoing works Longer life of assets leading to reduced need for replacement Improved capacity of implementing agencies leading to selection of right technologies and faster and efficient implementation of projects

Implementation Strategies

Short term strategies

- **Conceptualisation**
 - Proritise the identified projects high priority to projects that address the problem of mass transportation
- **Implementation**
 - Drilling down of business plan to regional level and institutionalizing the same
 - Set accountability for priority projects
 - Citizen awareness programs for priority projects communication on need for projects and benefits to the affected citizens
 - Maintenance, improvement and optimisation of existing transportation infrastructure
- **Operation**
 - Enforcement of service quality norms for construction projects
 - Enquiry into lack of service in previous projects and initiation of proceedings to penalise defaulting parties
 - Enhancement of activities of specialised bodies such as UMMTA

Implementation Strategies

Long term strategies

- **Conceptualisation**

- Planning activity to include future needs such as environmental improvement through low emission transport
- New areas to be developed as self-sustaining townships, with minimum daily commuting required between them
 - 🕒 Coordinated development of transport and commercial/ residential areas
- Review and update of transportation plan to reflect needs of the region inclusion of newly developing areas in plan
- End-to-end planning of high priority projects
 - 🕒 Provision of road/ rail linkages on either sides, time
 - 🕒 Land bank to be created for casting yards
 - 🕒 Time bound commitment for obtaining clearances for various projects
 - 🕒 Time bound commitment for shifting of utilities
 - 🕒 Project cost to be frozen prior to issue to bid documents all critical project components may be included to ensure comprehensive of the cost
 - 🕒 Consultation with private players prior to release of bid documents

Implementation Strategies

Long term strategies

• Conceptualisation

- Coordinated planning for all forms of transportation
 - 🕒 Accountability to be established between planning and implementing agency (including ULBs)
- Establishment of guidelines for planning and approval of projects
 - 🕒 Adherence to overall plan
 - 🕒 Indication of funding sources
 - 🕒 Commitment to project responsibilities by single government agency
- Development of model documents and prescribed process for bidding out of projects
 - 🕒 To be done after appropriate consultation with private players
 - 🕒 Separate documents for EPC and PPP projects
 - 🕒 Documents to have adequate flexibility to incorporate the dynamics of the projects
 - 🕒 Public views to be obtained prior to finalisation of documents
- Zoning and planning regulations to be reviewed in light of future development

Implementation Strategies

Long term strategies

• Implementation

- Task force to be formed for each priority project to with sole agenda of implementing the identified project through PPP/ EPC. The task force may obtain all clearances for the project and should not be dismantled till the time of project commencement
- Enhancement of implementation capability at the ULB level
- Transportation/ urban development fund to be established for implementation of transportation projects in developing and less developed areas as well as viability gap funding of mega-projects
- Mechanism to be established for consultation with potential private bidders prior to finalisation of project packaging and development model
- Technology selection for projects to consider total cost of ownership rather than initial project implementation cost
- Increased FSI at Metro stations for commercial spaces
 - ⌚ To enhance viability
 - ⌚ Reduce viability gap funding
 - ⌚ Motivate use of metro reduced reliance on road transport

Implementation Strategies

Long term strategies

- **Operation**

- Single entity responsible for operation of all modes of transport. Annual performance report of the agency to be made public
- Fund to be established for funding of initial stage of operations for projects (in case of insufficient revenue generation to cover operating costs) fund may be replenished through contribution from revenue at later stages of operation
- Centralised review of projects implemented by various agencies and corrective actions to be taken

Financing Strategies

- Focus on private participation
 - **Assessment of options for PPP structuring based on merits of the project**
 - **Amount and disbursement mechanism for viability gap funding to be pre-defined**
- Focus on utilisation of funds from local development to finance infrastructure projects
 - **Funds collected through betterment levies, impact fees and development charges to be allocated to dedicated infrastructure development fund**
 - **Fund may be administered by a dedicated state-level or local entity**
 - **Funding of projects may be carried out on the basis of strategic requirement of the project as well as likely economic, social and financial returns**
 - **Establishment of dedicated project account for major developments with identified sources of funds to the account**
- Establishment of cell for assistance to local bodies in conceptualisation, planning and development of documentation for accessing funds from international agencies and lenders
- Development of financing through municipal bonds in the long term
 - **Credit rating of municipalities within MMR fairly good ranging from AA to A-**
 - **Purpose of raising funds through bonds required to be defined upfront to increase attractiveness**
- Pooled financing by multiple local bodies distributes risk across projects implemented by more and less developed municipalities increased attractiveness for lenders and investors
 - **May be particularly suitable for large multi-ULB projects and programmes**

Quick Wins

- Traffic engineering to improve utilisation of existing transportation infrastructure
- Improvement of suburban railway stations and bus terminus
 - Guided passenger flow
 - Signages
 - Integrated ticketing through smart card
 - Maintenance and improvement of passenger amenities
 - Cleanliness and beautification
- Refurbishment of existing buses and local trains
- Checking of metering in taxis and auto rickshaws and penalisation for faulty meters citizen awareness on process for complaints regarding faulty/ tampered meters
- Citizen awareness program on ongoing improvement and development efforts
 - Involvement of citizens through response centres to report issues, queries and suggestions
- Enforcement of strict quality norms in road projects
- Enhancing scope of activities of planning and co-ordinating agencies such as UMMTA
- Development of model documents and prescribed process for bidding out of projects
- Assignment of ownership of the regional transportation plan and defining responsibility for tracking implementation of the projects as per the plan

Long-Term Resolutions

- Co-ordinated planning for all forms of transport multi-modal approach to be followed
- Establishment of guidelines for planning and approval of projects
- Establishment of timelines for land banking and regulatory approvals for planned projects to be included in project planning
- Zoning and planning regulations to be reviewed in light of future development
- Task force to be established for large and strategically significant projects
- Establishment of transportation/ urban development fund for financing of projects as well as use of other financing sources
- Institution of mechanism for agreement on project cost and components in consultation with concerned stakeholders
- Change of approach for private developer selection from "capital cost" to "cost of construction"
- Movement towards an integrated approach for management of all modes of transport

Coverage of this presentation

Vision

The Challenge

Why it matters

The Strategy

Implementation

Ann

Strategy Paper -Water Supply Mumbai Metropolitan Region

DISCUSSION

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Coverage of this presentation

Vision

The problems

Why strategy

The challenges

Initiatives

Aim

Process

Implementation Strategies

Vision Water Supply in Mumbai

☒ ensure water supply of adequate quantity and quality to every resident of Mumbai Metropolitan Region, to develop water resources to address future long term needs and to recover charges from users according to their ability to pay, in order to develop a sustainable water system within the region.

The problems

Source

- Limitation on existing sources of water need for augmentation of dams and reservoirs around the region
- Dependence on rainfall to generate source water

Transmission

- Contamination of water during transmission
- High level of unaccounted-for water (UFW)
- Variable supply to various areas in Mumbai Metropolitan Region

Distribution

- Contamination of water due to leakages in pipeline
- Pipelines requiring replacement, especially in older areas of city
- Lack of records on detailed distribution network, especially with regard to older portions of the network
- High level of unaccounted-for water (UFW) due to leakage and pilferage
- Limited ability to serve newer areas developing within the city
- Non-uniform quantity supplied in various areas of Mumbai Metropolitan Region

Metering, billing and collection

- Metering implemented in limited areas within the city
- Penalties for non-payment not imposed strictly
- User rates low in comparison to likely ability to pay

Why do we need strategy

- Sources of water currently adequate but may not suffice for future development
 - Water demand is currently 4200 MLD while supply is 3350 MLD, a shortfall of 650 MLD
 - The Middle Vaitarna project is planned to augment supply by 450 MLD, leading to supply of 3800 MLD
 - The water demand is likely to exceed 5600 MLD by 2020, leading to a shortfall of 1800 MLD
 - The planned Pinjal project may augment water supply capacity by 1475 MLD, leading to reduction in shortfall to 300 MLD
- Water sources are highly dependent on rainfall; need to shift towards perennial options and innovative solutions
- Capacity of pipelines would require to be enhanced in order to meet the requirements of new developments
- Planning systems appropriately may reduce operating costs in new areas
- Improvement of service quality, increase in revenues from user charges and encouraging water-saving measures through pricing mechanisms

The challenges

Conceptualisation

- Limited sources available in and around Mumbai Metropolitan Region, with rapidly growing population
- Planning distributed across various agencies including Maharashtra Water Supply and Sewerage Board, Municipal Corporation of Greater Mumbai and the state Irrigation Department
- Source development projects are long-term high risk of changing demographics within the region

Implementation

- Source development projects require huge investment funding to be committed upfront with adequate provision for delays in implementation due to inherent political risks
- Difficulty in executing on PPP basis due to concerns regarding control of an essential good
- Source and transmission projects serve multiple localities, therefore are subject to varying and occasionally conflicting demands
- Upgrading of legacy systems faces numerous issues due to existing structures and lack of information on network

O&M

- Revenue from O&M limited due to constraints on pricing of water
- Billing and collection from residential users perceived as risky by private developers, leading to lack of interest in projects
- Information gaps regarding older networks limits ability to maintain infrastructure

Key initiatives

Conceptualisation

- Regional and city development plans have reviewed water requirements and identified projects to be taken up on priority basis
- Large-scale projects such as Middle Vaitarna source development have been detailed and assigned to various government bodies

Implementation

- Middle Vaitarna Project has been taken up by the Municipal Corporation of Greater Mumbai with partial funding from central and state governments through the JNNURM
- PPP approach being considered for projects including bulk water transmission and treatment, as well as 24x7 distribution E.g. Bhiwandi water supply

O&M

- PPP project at Bhiwandi
- Increased consumer awareness on water conservation
- Increased thrust on metering

Key initiatives the distance covered

Project	Status
Middle Vaitarna water supply project for Mumbai	<p>Project is currently in progress</p> <p>Delays caused due to issues in obtaining environmental clearance</p> <p>Implementation of new treatment plant delayed by 4 years</p> <p>Pipelines and pumping plants are being implemented</p> <p>Dam construction is scheduled to be completed by 2012</p>
Enhancement of distribution system through underground tunnels	<p>Malabar Hill to SK Patil Udyan section completed - total up to Cross Maidan to be completed by 2011</p> <p>Marol-Maroshi in Andheri (E) to Ruparel College in Matunga (W) to be commissioned by October 2010</p>

Key initiatives the distance covered

Project	Status
Mumbai Sewage Disposal Project	<p>Stage II of Component II of the project is currently in progress, though delayed</p> <p>Delay due to environmental concerns regarding destruction of mangroves</p> <p>Coastal Regulatory Zone and Environmental Impact Assessment clearances were other factors which led to increase in timeline for the project</p> <p>Land acquisition for project components was an issue which has been cleared</p> <p>Funding has been approved for Phase III as well</p> <p>58 works out of 61 have commenced and 40% of allocated funds have been utilised</p>
Additional 110 MLD water supply for Thane	<p>Delay due to cost overruns and protest by citizens on laying of pipelines</p> <p>Issues have been resolved and the project has been completed</p> <p>Reduction in losses of 10 MLD per day at treatment plant</p> <p>Expected cost saving of Rs. 8 crore per annum - cost recovery estimated within 12 years</p>

Key initiatives the distance covered

Project	Status
Gargai and Pinjal dam project	Both projects have been put on the fast track Work on Pinjal (1475 MLD) expected to commence after the Middle Vaitarna project is over (2011) After work on Pinjal is over, Gargai (227 MLD) project is expected to commence (2017)

What we should aim to achieve

Short Term

- Completion of ongoing distribution and sewerage projects leading to improved efficiency
- Improvement of billing and collection efficiency for currently existing metered connections
- Enforcement of penalties for non-payment of user charges
- Raising of citizen awareness regarding water wastage and conservation

Medium Term

- Study of water supply network and mapping of pipelines
- Replacement of outdated components within the network
- Rehabilitation of treatment plants to reduce losses and improve efficiency
- Expansion of distribution capacity to newer areas of the region
- Increased metering and billing
- Implementation of water conservation and rain water harvesting measures regulatory framework to ensure compliance in new constructions
- Implementation of 24x7 water supply with defined service levels possibility of private participation

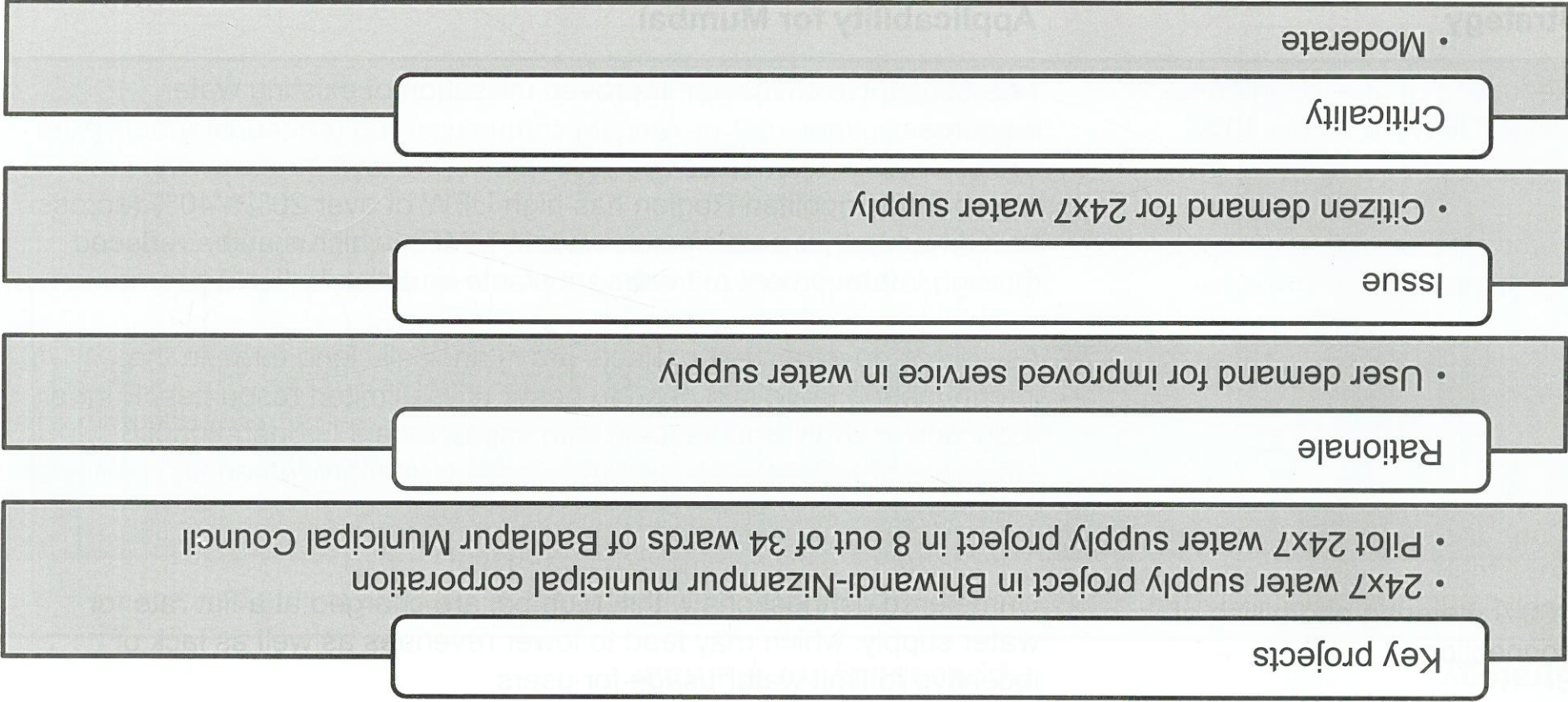
Long Term

- Identification of perennial sources of water and planning for related projects
- Study of technological options, including desalination (for industries) and waste water recycling as sources of water
- Establishment of regulatory and monitoring authority for urban water sector

How do we achieve our aim Projects for achieving the objectives

Key projects	Enhancement of distribution through underground tunnels in Greater Mumbai 110 MLD capacity addition in Thane Planned Ullhasnagar water supply distribution system 150 MLD water supply scheme of Kalyan Dombivli Municipal Corporation
Rationale	Expanding geographic area as well as population growth within existing areas leading to demand for enhanced distribution capacity
Issue	Augmentation of distribution network to facilitate growth in the out-growth areas and new commercial/ residential developments
Criticality	High

How do we achieve our aim Projects for achieving the objectives



How do we achieve our aim International concepts & Mumbai

Strategy Applicability for Mumbai

<p>Reduction of unaccounted-for water (UFW) to below 10%</p>	<p>This concept is critical for improved utilisation of existing water resources.</p> <p>Mumbai Metropolitan Region has high UFW of over 20% - 40% (across MCGM and other municipalities within MMR), which may be reduced through improvement of treatment plants and distribution systems.</p> <p>As source development projects are intrinsically long term, in the interim period there is a need to better utilise limited resources. Further, reduction in UFW is in keeping with improvement in operational efficiency of water supply systems, leading to improvement in viability of the project.</p>
<p>100% metering and billing of connections</p>	<p>Unmetered connections within Mumbai are charged at a flat rate for water supply, which may lead to lower revenues as well as lack of incentive to limit water usage for users.</p> <p>Metering of connections to monitor usage is a key requirement, while billing may be carried out on the basis of ability to pay.</p>

How do we achieve our aim

How others have implemented the concepts

Problem	Applicability for Mumbai	Actions taken	Learning for Mumbai
Conceptualisation	Singapore		
Long term water security	Demand and supply gap	Examined supply sources in their totality	Requirement of schemes for reuse of waste water, storm water, desalination, etc.
Demand and supply problems	Concern over quality of water	Supply management <ul style="list-style-type: none"> • Expanded available sources by desalination and reuse of wastewater and storm water 	Metering to ensure charges proportionate to level of use
Maintain quantity as well as quality of water		Demand management <ul style="list-style-type: none"> • Block tariffs - increasing tariffs with higher usage • Water conservation tax for higher water usage • Water body provided additional powers to collect tariffs independent of local elected bodies 	Encouragement of water conservation Establishment of separate agency responsible for collection of water charges

How do we achieve our aim

How others have implemented the concepts

Problem	Applicability for Mumbai	Actions taken	Learning for Mumbai
O&M Amman, Jordan			
Need to improve quality standards of raw water sources, drinking water, and wastewater effluent	Need to reduce UFW and achieve constant supply throughout the year	Performance-based management contract	Water supply and sewerage to be planned for in sync
Need to reduce UFW and achieve constancy of supply during peak and nonpeak seasons	Need for (well functioning) meters	Joint venture between private firm and government entity	O&M contracts suitable when recovery of capital investment is not feasible
Malfunctioning meters	Limited capability for leak and breakdown management	Rising-block structure for charges	Sharing of project risks
Need for leak detection and repair program - high response time for leak repairs	Collection issues for user charges	Wastewater management tariff implemented	Performance - based measures and incentivisation
Water facility breakdowns	Lack of GIS-based information about distribution network	Installment payment of charges permitted for economically backward households	Need to fix user charges based on average ability to pay
		Capital investment funded through International Funding Agencies	
		Revenues cover only O&M costs	User charges to cover wastewater management
		Private operator receives fixed fee and performance incentive - pays penalty for not achieving targets	

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Water source development	Supply constraint along with population growth	None	<p>Increasing supply with development of each source</p> <p>Bridging of demand supply gap while considering the demand rise by the time supply is augmented</p> <p>Development of desalination and waste water treatment facilities to reduce dependency on rainfall</p>
Enhancement of distribution network	<ul style="list-style-type: none"> • Capacity constraint • Avoid pilferage and leakage • Lower maintenance costs 	<p>Higher supply due to lower UFW</p> <p>Reduced cost of water to connection-holders previously augmenting supply through tankers</p>	<p>Lower unit cost of water due to lower maintenance costs</p> <p>Planning for extension of network to facilitate accommodation of higher demand in future</p>

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Establishment of tariff blocks water	Wastage of water	Lower demand supply gap	Life of existing supply sources could be increased by reducing wastage
Citizen awareness drive			Reduced wastage leading to lower per capita demand and reduces size of new projects for fixed number of people - large cost savings, especially on source development projects
Consumption audit			

How do we achieve our aim

Strategies for Mumbai

Strategy	Challenge addressed	Impact	
		Short Term	Long Term
Regulation of tariffs	<p>Low revenues from water user charges</p> <p>Lack of incentive to reduce water consumption</p>	Incentive for saving water	<p>Financial strengthening of ULB</p> <p>Self-sustaining operations</p>

Implementation Strategies

Short term strategies

- **Conceptualisation**

- Mapping of legacy water distribution network and identification of rehabilitation needs
- Leak detection study may be conducted to assess the loss of water. Based on the findings of the leak detection study, it may be necessary to take up corrective actions to rectify the system and stop the leakages. Further, mapping of the control valves may also be undertaken.
- Detailing of identified projects and establishment of timelines for implementation of the same
- Commitment of funds
- Revalidation of demand in consultation with agencies responsible for housing, commercial and industrial development

- **Implementation**

- Drilling down of business plan to regional level and institutionalizing the same
- Set accountability for priority projects
- Citizen awareness programs for water conservation

Implementation Strategies

Short term strategies

- **Implementation**

- Reduction in losses within existing systems through improved operation and maintenance
- Scientific hydraulic performance analysis of the existing distribution system may be done and detailed drawing may be prepared, highlighting the pipe diameters, pipeline section lengths, water pressures, carrying capacities, location of valves etc. This may be used to appropriately plan the distribution network.

- **Operation**

- Water quantity and quality at all existing and new sources should be regularly monitored and appropriate records be maintained to conduct periodic assessment of quantity and quality
- A well defined and planned water metering system with emphasis on water supply on volumetric basis may be undertaken
- Improving the infrastructure with performance based management contract

Implementation Strategies

Short term strategies

• Operation

- Detailed technical study shall be undertaken to assess the ability of the existing pipelines to handle additional pressure due to increased population
- An appropriate cost based tariff mechanism may be designed with adequate consideration on ability to pay. Further, a policy of revision for revision in tariff shall also be designed to avoid revenue-expenditure mismatch
- Periodic maintenance as per the standard maintenance manuals for different systems may be undertaken.
- Establishment of a customer service centre for requests, suggestions and complaints

Long term strategies

• Conceptualisation

- Prioritising projects
 - 🕒 Treatment
 - 🕒 Distribution enhancement
 - 🕒 Identification of alternate sources

Implementation Strategies

Long term strategies

- **Conceptualisation**

- Focus on long-term source development
- Increased project readiness through ready acquisition of land
- Establishment of tariff setting authority

- **Implementation**

- Increased thrust on making water supply a self sustaining operation
- Development of model documents for PPP with flexibility to modify the documents as per the merits of the project
- Focus on total cost of ownership, quality and efficiency parameters during technology and private partner selection

- **Operation**


- Development of separate network utilising recycled wastewater for areas with high non-potable use
- Institutionalising periodic consumption and leakage detection process to ensure sustainability of efficient operations
- Ground water may be regulated and the users having exclusive bore wells shall be brought within the regulatory purview of the service provider
- Periodic performance reviews and undertake corrective actions

Quick Wins

- Completion of ongoing projects on priority basis
- Initiation of study to map existing network and identify causes for UfW
- Raising citizen awareness and creating buy-in through communication
 - **Awareness drive regarding need for water conservation and methods to be followed**
 - **Establishment of citizen response centre for queries, issues and suggestions**
- Establishment of accountability for private projects and regular updates in the public domain
- Collection drive for outstanding water bills
- Reduction of leakage at public standposts and sanitary facilities
- Review of tariffs and establishment of guidelines for tariff-setting in consultation with stakeholders
- Development of model documents for PPP in water supply
- Institutionalisation of inspection of leakage and consumption levels to maintain efficient operations

Long-Term Resolutions

- Focus on long-term issues such as source development, reuse of wastewater, rainwater harvesting and innovative techniques in water management
- Development of shelf of projects in water sector and prioritisation of the same over the long term
- Establishment of dedicated regulating and monitoring agency for urban water supply and sewerage
- Establishment of urban development fund for financing of projects requiring viability gap funding
- Improved process for establishing project readiness prior to bidding land acquisition and statutory clearances to be in place
- Development and enforcement of limitations on use of ground water
- Movement of approach in selection of private player from lowest capital cost of project to reduced cost of ownership and improved service delivery
- Development of capacity within local bodies to evaluate, implement and manage technologically complex projects



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