



# HUDCO

## AWARDS FOR BEST PRACTICES

### TO IMPROVE THE LIVING ENVIRONMENT

A COMPENDIUM OF  
THE AWARD WINNING ENTRIES 2019-20



A HUDCO-HSMI PUBLICATION

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**HOUSING AND URBAN DEVELOPMENT CORPORATION LIMITED**

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# HUDCO AWARDS FOR BEST PRACTICES

to Improve the Living Environment

A compendium of the award winning and other entries

**2019-20**

A HUDCO-HSMI Publication



HOUSING AND URBAN DEVELOPMENT CORPORATION LIMITED  
NEW DELHI – 110 003





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## FOREWORD

India's approach to one of the fastest growing economies is greatly supported by the urban development processes in the country. The development of urban centres is seeing tremendous growth bringing in new innovations; however, the implementations also come with various challenges to maintain a balance between different pillars of social, economic and environmental aspects for the nation's development.



It has become essential to the practitioners, planners and expert managers to cater the challenges and ensure safer environments and urban development. This has made it fundamental to call for ideas to work towards inclusive and sustainable growth in the country, also following up with the global initiatives and develop innovative systems for present and future development patterns of our cities.

HUDCO as a prime organization in housing and urban development sector, is consistently involved in research and implementation of innovative and achievable solutions to promote sustainable urban development. The organization works with a collective approach to provide resources to various practitioners and actors working towards improved solutions for development. With a focus to encourage such initiatives, HUDCO recognizes the good practices at local and national levels that improve the overall living environment of the urban areas in the country.

HSMI, the Training and Research arm of HUDCO, has derived certain areas and parameters to bring in improved and enhanced urban processes, and rewards the practices structured in them through the Best Practices Awards every year since more than a decade. The awards aim to look for initiatives and acknowledge their efforts for sustainable and inclusive development practices. The HUDCO Awards for Best Practices appreciate the efforts of the organizations and compiles them together to be more accessible to promote further excellence in making development approach equitable, sustainable and inclusive.

I commend HUDCO's HSMI for their efforts in bringing out this compendium to document and spread the good practices in continuum, during the difficult times of the pandemic the world is going through. The publication of this compendium will help wide sharing of these best practices.

I extend my heartiest congratulations to all the winners for their achievements. I also appreciate all participants who supported our initiative and sent their entries. I hope that HSMI continues to receive good participation in future as well for these prestigious awards.

**Shri M Nagaraj**  
Director (Corporate Planning), HUDCO



## ACKNOWLEDGEMENTS

The successful and unique compilation of award-winning entries of HUDCO Awards for Best Practices to Improve the Living Environment 2019-20 in a form of compendium has been possible with unparalleled efforts, unconditional support and valuable guidance of many officials at HUDCO.



First and foremost, it is my pleasure and privilege to appreciate the encouragement received from Mr. Kamran Rizvi, Additional Secretary, MoHUA & CMD, HUDCO. I want to express my heartfelt gratitude to him for inspiring all the officials of HSMI. I am also grateful to Shri M Nagaraj, Director (Corporate Planning), HUDCO for his priceless guidance and sincere encouragement shown to the HSMI team towards successfully publishing the compendium. The great support provided by the Regional Offices of HUDCO in disseminating the information on the awards and encouraging agencies to participate is hereby recognized with gratitude. HSMI takes this opportunity to thank all the Regional Chiefs and concerned officers posted at different Regional Offices for their tremendous support to initiate participation and evaluation of entries for the awards.

The great response received from the participating organizations, institutes, NGOs, private sector and other agencies can not be forgotten. The whole process was successful only because they responded to our request for participation and they sent their entries for the awards in time-bound manner. I thank all the officials and heads of organizations from participating organizations.

Special thanks to Prof. Chetan Vaidya and all the eminent jury members of the awards who devoted their valuable time and evaluated all the entries.

I sincerely acknowledge the smooth support from all the concerned officials and departments of HSMI as well as Corporate Office including Administration, Finance, PR, to name a few.

Finally, the hard work and efforts of the Best Practices team of HSMI headed by Dr. Sukanya Ghosh, Senior Fellow, HSMI deserve appreciation, without which it would not have been possible to bring out this unique publication.

A handwritten signature in blue ink, appearing to read 'D. Subrahmanyam', with a stylized flourish at the end.

**Dr. D Subrahmanyam**  
Senior Executive Director, HUDCO's HSMI





## **ABOUT THE HUDCO AWARDS FOR BEST PRACTICES 2019-20**

HUDCO Best Practice Awards “to Improve the Living Environment” has been institutionalized since the year 2011-12 to encourage and acknowledge efforts in these areas and to motivate Government Departments/ Parastatals Agencies/Local Bodies/Authorities/NGO's/Private and Corporate Sector/ Research and Academic Institutions etc. who have demonstrated outstanding initiatives to encourage innovative and sustainable projects.

### **HUDCO gives award under the following 7 themes:-**

1. Urban Governance
2. Housing, Urban Poverty and Infrastructure
3. Urban Transport
4. Environment Management, Energy Conservation and Green Building
5. Sanitation
6. Urban Design & Regional Planning, Inner City Revitalization & Conservation
7. Disaster Preparedness, Mitigation and Rehabilitation

Each Theme had the following sub-themes:

#### **Theme 1- URBAN GOVERNANCE**

Sub-themes: Urban management and administration, E-governance/M-governance, Partnerships with civil society, Participatory budgeting and decision making, Human Resources and leadership development, Decentralization/Devolution of powers, Institutional reform, Transparency and accountability, Empowerment of Women, Innovative methods of collection of property tax/other taxes/bills, Municipal double entry pure accrual accounting & Improved service delivery initiatives.

#### **Theme 2- HOUSING, URBAN POVERTY & INFRASTRUCTURE**

Sub-themes: Affordable housing, Access to housing ,Access to housing finance/credit, Slum and settlement upgrading and improvement, Application of environment friendly building materials, Cost effective urban housing including innovative, emerging and disaster resistant technologies in housing, Access to land/services for urban poor, Provision of basic services, Public-Private partnerships/Public-Private-Community partnerships & Community based capacity building/livelihood generation solutions.

#### **Theme 3- URBAN TRANSPORT**

Sub-themes: Mass public transport, Environmentally friendly public transport, Traffic bottleneck reduction planning, GPS based initiatives for transport improvement, Urban transport planning, Parking solutions, Transit Oriented Development/Transit Corridor development & Last Mile connectivity.

#### **Theme 4- ENVIRONMENTAL MANAGEMENT, ENERGY CONSERVATION & GREEN BUILDING**

Sub-theme: Innovative pollution reduction measures at city level, Urban greening, Application of Environmentally friendly technologies at city/building level, integrated assessment, monitoring and control, and “Green” accounting, Tangible measures for ecological sustainability at city/zone level, Energy conservation practices at building/city level, Appropriate and cost effective building materials and construction technology, Green buildings and Green building indicators & water conservation measures/Rain water harvesting at City/building level.

#### **Theme 5-SANITATION**

Sub-themes: Solid Waste Management, Sewerage management, Cost effective/eco-friendly/Innovative sanitation solutions & Waste to energy solutions.

#### **Theme 6-URBAN DESIGN & REGIONAL PLANNING, INNERCITY REVITALIZATION & CONSERVATION**

Sub-themes: Smart City solutions, Sustainable/inclusive city planning, Innovative Urban design/New township designs, Innovative regional planning approaches, Urban renewal/Heritage conservation or retrofitting, Inner city renewal/revitalization & Accessibility improvement for differently abled/vulnerable groups.

#### **Theme 7-DISASTER PREPAREDNESS, MITIGATION & REHABILITATION**

Sub-themes: Reduction of vulnerability, Civic awareness and preparedness. Contingency planning and early warning systems. Response capacity, Hazard and risk reduction and mitigation, Post disaster rehabilitation/reconstruction, Risk assessment and zoning, Gender specific risks and needs, Building bye-laws for disaster mitigation.

The selection criteria are based on Planning and Implementation Processes, Innovativeness, Stakeholder's Participation, Resource Mobilisation and Impact, Sustainability and Explicability. A jury comprising of eminent professionals with diverse background scrutinise each received entry as per selection criteria.

For this award, HUDCO received 127 entries from states/UT of Andhra Pradesh, Bihar, Chandigarh, Chhatisgarh, Delhi, Gujrat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharastra, Rajasthan, Tamil Nadu, Telengana, Uttarakhand, West Bengal (total 15 no. of states and one UT). A jury of eminent professionals after critical evaluation recommended 10 (ten) no. awards. This Award consists of cash prize of Rupees One lakh each to 10 winning entries along with certificates.

## HUDCO Awards for Best Practices 2019-20

Sl. No.	Theme	Title of the Best Practice	State	Name of the Agency
1	Urban Governance	<b>Innovative Model for Urban Governance</b>	Kerala	Centre for Heritage, Environment and Development (C-HED), Kochi Municipal Corporation
2		<b>Topographic Survey and Cadastral Mapping of Rohtak Town using GIS</b>	Haryana	Municipal Corporation, Rohtak
3	Housing, Urban poverty & Infrastructure	<b>Kollur II - 2 BHK Dignity Housing - GHMC</b>	Telangana	Greater Hyderabad Municipal Corporation
4		<b>Slum Rehabilitation Programme</b>	Chandigarh	Chandigarh Housing Board
5	Urban Transport	<b>Surat Integrated Urban Mass Transit System</b>	Gujarat	Surat Municipal Corporation
6	Environmental Management, Energy conservation and Green Building	<b>LED Based Automated Street Lighting Replacement Project under ESCO Model on Sharing of Cost Saving Basis</b>	Delhi	North Delhi Municipal Corporation
7	Environmental Management, Energy conservation and Green Building	<b>Application of Environmentally Friendly Technologies at City / Building Level</b>	Tamil Nadu	Chennai Metropolitan Water Supply and Sewerage Board
	Disaster Preparedness, Mitigation and Rehabilitation	<b>Increasing City Resilience</b>		
8	Urban Design and regional Planning, Inner city Revitalization and Conservation	<b>Taxi Stand cum Ladies' Retiring Room</b>	Kerala	Perinthalmanna Municipality
9	Sanitation	<b>Utilization of Mangaluru City Sewage Wastewater for Industrial Purpose</b>	Karnataka	Mangaluru City Corporation
10	Sanitation	<b>Waste to Energy Plant</b>	Madhya Pradesh	Jabalpur Municipal Corporation

In addition to the above entries, the Committee recommended the following entries to be considered for appreciation under “HUDCO Award for Best Practices to Improve the Living Environment 2019-20”:

## Certificate of Appreciation under HUDCO Awards for Best Practices 2019-20

Sl. No.	Theme	Title of the Best Practice	State	Name of the Agency
1	Housing, Urban poverty & Infrastructure	<b>Asha Chadhi Parwan – ‘Dream Comes True’</b>	Chhattisgarh	State Urban Development Agency Chhattisgarh
2	Urban Design and regional Planning, Inner city Revitalization and Conservation	<b>Revitalization of Dhal ni Pol</b>	Gujarat	Mahila Housing Trust

**DISCLAIMER :**

*The projects featured in this publication are the compilation of Award winning entries of HUDCO Best practices award 2019-20, and are selected by the awards jury based upon the information provided by the participating agencies for the awards, in form of write-ups and presentations. HUDCO does not take responsibility for the accuracy, technical soundness or completeness of the content of these entries and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use or reliance on the contents of this publication.*

*The contents given in this publication are for general reference only and not intended to replace the need for professional advice in any particular area.*



# INNOVATIVE MODEL FOR URBAN GOVERNANCE

- by the Centre for Heritage, Environment and Development  
of Kochi Municipal Corporation, Kerala

*The Centre for Heritage, Environment and Development (C-HED) was established by the Municipal Corporation of Kochi (KMC) in the year 2002 to provide dedicated technical support to enhance its capacities and functioning. This constitutes a unique and innovative institutional model for technical support to the urban local body. In the past 18 years, C-HED has supported KMC to undertake over thirty infrastructure projects under an initiative called 'Mission Kochi'. It has also helped to implement over fifty initiatives for the improvement of urban infrastructure and service delivery under various Government and externally funded programmes. It has supported evidence-based policymaking, prepared investment plans and equipped KMC to leverage resources and adopt contemporary approaches to sustainable and climate smart development. To achieve this, C-HED has been proactive in reaching out to stakeholders on behalf of KMC and developing dialogue as well as actively encouraging the initiation of projects. These feats have seen C-HED playing an integral role in raising the status and profile of Kochi and its access and exposure to international networks and programmes.*

## BACKGROUND:

KMC has a population of over 650,000 contained within an area of roughly 94.88 square kilometres. Prior to 2000, the role of KMC was mainly confined to sanitation and tax collection and it was yet to expand its role as a local body to address development issues in an integrated and comprehensive manner.

## KEY DATES:

Year	Significance/Achievement
2002-2003	Formal establishment of Centre.
2005	City Development Plan, initiation of Master Plan for Kochi City and World Mayors Conference.
2007	Expansion of mandate and change of name to C-HED.
2012	Mission Clean Kochi.
2014	Kochi Selected for the Smart City Mission after a successful application.
2017	Evolution of the Centre into implementing new ideas for urban development in Kochi.
2018	Smart Sustainable Urban Transport Project.
2020	Presentation made at World Urban Forum 10 – hosted by UN Habitat in Abu Dhabi

## ESTABLISHMENT OF PRIORITIES:

C-HED's main priority is to provide technical support to KMC and help conserve and promote the city's pluralistic cultural, natural and built heritage while also leading it to environmentally sustainable development. To achieve this, it was decided that the organization would undertake research, project development, monitoring and knowledge management and prioritize the development of a vision and strategic plan for the city in a consultative manner. These priorities were established by KMC after having detailed discussions with sectoral experts and members of civil society organizations before the establishment of C-HED with the support and approval of the Government of Kerala.

## MOBILISATION OF RESOURCES:

C-HED helps the city leverage and converge technical and financial resources for development.

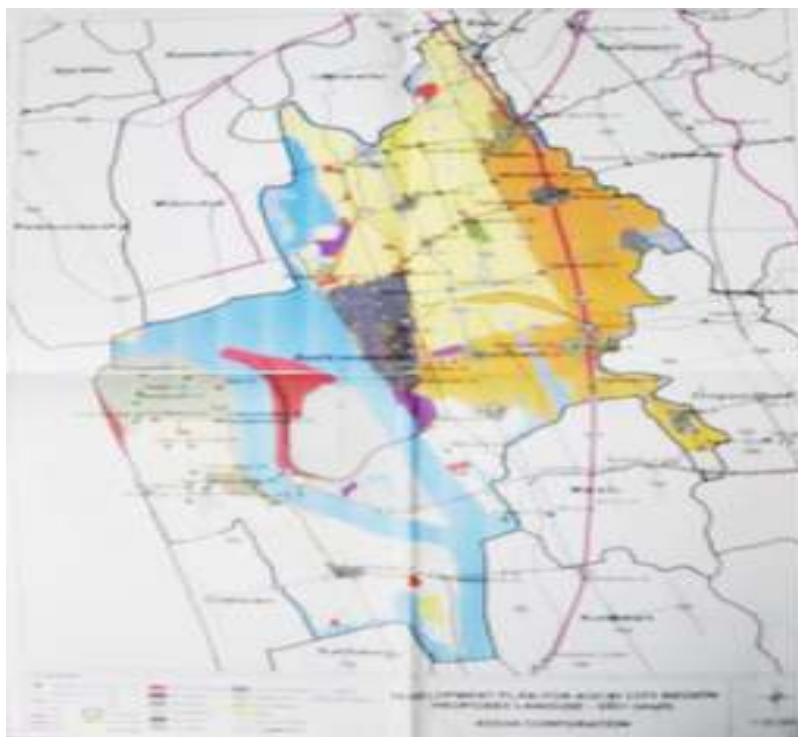
Financial: KMC provides maintenance and establishment support to the C-HED and channels funding for specific activities. The Centre sources CSR funds and donations and facilitates access to grants and investments from Government and International Programmes.

**HR:** The Centre has a core team of 4 professionals and short term experts and interns locally and with the support of national and international organizations.

**Technical:** The Centre has partnerships with local, national and global agencies, city-to-city twinning programmes and networks for technical collaboration in thematic areas.

### PROCESS:

C-HED has been functioning under four consecutive governments of KMC with 5-year terms each. Its challenges were in enabling uptake within KMC for new and innovative concepts and projects as well as alignment with its priorities even as they sought to gain acceptability from each newly elected government and various city, state and national level stakeholders. This was overcome through dialogues and presentations with the Council and establishing confidence through ongoing



*2005 Master Plan Draft - Kochi City*



*"Joining the Dots" Interactive workshop on 'Mobility Grid' to map areas with poor connectivity: Organized by C-HED with support from the University of Michigan, June 2014*



*Mayor of Kochi, Director of C-HED, co-panelists and GIZ support team at the World Urban Forum 'Voices from Cities' event in Abu Dhabi on February 11, 2020*



*Delegation from Kumla Municipality, Sweden in KMC in September 2013*



*"City-to-city twinning" with Lorient (France)- A programme organized to strengthen heritage-based planning in April 2013.*

support i.e. academic, research, knowledge, planning and budgeting, events and outreach programme, facilities management and sectoral interventions. The Centre has provided both proactive and demand-based support. Financial resources remain a challenge and it continues to explore methods to put in place a predictable revenue stream for effective functioning such as state-level accreditation in specific sectors.

The process that established the model successfully includes

- (a) formalized association with the Corporation and State level support and providing proactive and demand-based support to KMC;
- (b) leveraging in investment, technical assistance and grant opportunities for city development;
- (c) ensuring consultation and cooperation from all stakeholders;
- (d) evidence-based policy formulation and programme interventions;
- (e) fostering a framework for collaboration and partnerships – local, national and global;
- (f) outreach to various stakeholders who aspire to contribute to city development;
- (g) accountability to both ruling party and opposition party members in the Council;
- (h) providing exposure to local government leaders to good practices within and outside India and application of the learning;
- (i) promoting city identity and branding;
- (j) media outreach.

The Centre's interventions span the sectors of (i) cultural heritage, art and literature; (ii) development of public spaces; civic amenities and services, water sanitation and solid waste management and mobility solutions; and (iii) environment, biodiversity, climate change and sustainable development. Interventions include infrastructure and service delivery, policy and legislation, guidelines and detailed project reports, research studies, plan document preparation support, information and knowledge management and organization of workshops and consultations. It has developed a formidable repertoire of partnerships with national and global agencies and networks.

## RESULTS ACHIEVED:

- Institutionalized the practice of stakeholder consultations to inform plans and schemes undertaken by KMC conducted over 70 such consultations at area, ward or other levels.
- Evidence-based policymaking and budget preparation support utilising empirical data e.g. preparation of integrated heritage development plan.
- Over 50 environmental, service delivery and infrastructure projects facilitated eg., Waste management plants, Water transport, Redevelopment of Subhash Chandra Bose Park, Uniform Kiosks Programme etc.
- Management of infrastructure investments/grants and technical assistance to Kochi Municipal Corporation.
- Formalized a range of partnerships with local, national and global institutes, both government and non-government and networks and alliances. Examples include National Government Ministries, Universities like CEPT; International Agencies like the European Union, UN Agencies, International agencies like the DFID, GIZ and INGOs like ICLEI and WRI. These have helped converging resources for the integrated development of Kochi e.g., the Sustainable Urban Development-Smart Cities (SUD-SC) project of GIZ India which is aiding the institutional strengthening of C-HED.
- The Centre has steered the development efforts of KMC to include environmental and biodiversity protection and issues relating to climate change. It helps the city make forays into the use of non-conventional energy such as solar city, zero-carbon buildings and e-mobility solutions through interventions, studies, mobilization of resources and outreach.
- Effected a turnaround in the city's cultural life creating a vibrant and creative environment for residents and tourists. It has also helped the local government to develop a cultural policy and to draft by-laws on heritage.
- Redevelopment of public spaces and heritage zones has improved the aesthetic quality of the city as well as the provision of cultural and recreational facilities.





*Stakeholder consultation in Kochi in May 2019 for the Interact Bio Programme of ICLEI*



*"Solutions" project workshop with stakeholders*

The C-HED has helped the city to be an early mover with respect to the development of a vision document in consultation with all key city stakeholders, a city development plan and a draft master plan which now forms the basis of all sectoral project reports and infrastructure and service delivery. In the process Municipal Councilors and officials have been capacitated to redefine urban governance and planning and lead the mainstreaming of the climate change and sustainable development agenda.

## **SUSTAINABILITY:**

Partnerships and collaborations with technical agencies ensure that the 'C-HED Model' remains relevant in providing city level technical support. The partnerships catalyse the adoption of current best practices that help the city become more sustainable. This multilateral cooperation provides a foundation to identify initiatives that can be implemented and to provide solutions through policy to achieve sustainability goals in the following sectors: (i) cultural heritage, art and literature; (ii) environment, biodiversity, climate change and sustainable development; and (iii) urban development including, urban planning and governance, civic amenities and services, built heritage and development of public and mobility solutions.



*Workshop on Unified Metropolitan Transport Authority convened by KMC authorities in March 2015.*

City governments can replicate this model following these steps:

### **1. Role Institutionalization:**

- (i) establishing the mandate and scope of the organization
- (ii) registration of the organization
- (iii) formalizing its role
- (iv) provision of a predictable revenue stream and
- (v) establishing a sound governance system.

### **2. Resource Mobilization:**

- (i) proactively mobilize resources
- (ii) avail technical assistance opportunities



**1**  
Role  
Institutionalization



**2**  
Resource Mobilization



**3**  
Outreach &  
Communication



**4**  
Knowledge  
Management

- (iii) empanel domain experts and interns
- (iv) leverage investments/grants for city development
- (v) crowd source support for facilities management.

### 3. Outreach and Communication:

- (i) function as the 'eyes and ears' of the city government
- (ii) organize outreach programmes and events
- (iii) carry out media outreach
- (iv) identify and nurture partnerships and alliances and
- (v) provide coordination support with key stakeholders.

### 4. Knowledge Management:

- (i) facilitate baseline and monitoring studies
- (ii) facilitate technical studies
- (iii) Maintain a data repository on the city
- (iv) facilitate evidence-based policymaking and plan preparation and
- (v) undertake monitoring, learning and evaluation.

### LESSONS LEARNED:

Key takeaways from the C-HED experience:

- Formalizing the establishment and roles via a Municipal Corporation Council Resolution and a formal Government Order is important for a model of this nature to function successfully.
- Responsiveness to contemporary development challenges in alignment with KMC played a key role in C-HED's effectiveness. Proactive and demand responsive support to KMC and availability of skill sets complementary to that of KMC contributed to the effectiveness of C-HED.



Function convened for Tree naming and Release of a Handbook on the Trees of Subhash Chandra Bose Park by the Mayor in February 2019

- The Centre's ability to leverage technical and financial resources has proven useful to KMC.
- C-HED's semi-autonomous and neutral status allows it to focus on strategic support rather than just day-to-day support to municipal operations.
- The range of partnerships fostered by the Centre have catalysed various development initiatives in the city and equipped KMC to adopt good practices, innovations and new ideas.
- Its outreach and effective communication on KMC initiatives, with a wide range of stakeholders, helped buy-in from citizens thus contributing to their sustainability.
- Partnerships with national and global agencies have helped facilitate a transfer of knowledge through exchange of ideas and experiences with cities around the world.
- Securing a steady revenue stream is critical to the effective functioning of the Centre.
- The role of C-HED was showcased as an institutional innovation by KMC and relevant for Urban Local Governments in the Global South at a side-event in the World Urban Forum, Abu Dhabi February 2020.

### REFERENCES:

1. Draft Report on 'Leveraging Technical Support for Sustainable Urban Development: The Centre for Heritage, Environment and Development Experience in Kochi Municipal Corporation, Kerala, India': TC-SUD-SC. September 2019. (submitted to GIZ SUD-SC)



Press coverage of the Tree Naming Ceremony organised by C-HED in February 2019 in the Times of India



## List of Initiatives undertaken by C-HED from 2005 to 2019

### I. Cultural Heritage, Art and Literature

1. Management of Cultural Institutions
2. National Seminar on Cultural Heritage Management
3. Kochi Carnival
4. NaatakaKaalam (Theatre)
5. Pallath Raman Memorial Cultural Centre
6. Bharath Fest
7. Seminar on Legacy of Matriliny in Kerala
8. Remembering Gandhiji -a tribute to the Father of the Nation
9. Knowing Gandhiji-Awareness initiative for children
10. Non-violent protest war by a group of artists
11. Festival on Classical dance and instrument music in association with Bharat Bhavan
12. International Festival Touring Talkies
13. Kochi International Film Festival
14. Heritage Forum
15. Gandhi Statue Restoration
16. Seminar Series on Renaissance Movement
17. Festival of Visual and Performing Arts
18. Book on Kochi
19. Dakshayagam Kathakali-10 days Kathakali workshop
20. Baul Music Kochi International Film Festival
21. Kochi International Film Festival
22. Heritage by Law
23. Seminar and Exhibition of sketches by Bonny Thomas
24. Libraries maintenance and management
25. Conference on Local and traditional knowledge
26. Augustin Joseph- Book release by KJ Yesudas
27. French Short Film Festival
28. Cuban Film Festival
29. Vernacular Mosques of Kochi City
30. Dutch-Kochi Project Formulation
31. Spice Museum for Kochi
32. M Iqbal Commemoration
33. Commemoration of anniversary of the writer Basheer
34. Sanoo Mash commemoration
35. International Film Festival
36. Workshop on Hortus Malabaricus a treatise on the flora in the Western Ghats
37. Mahakavi Vailopilli Sreedhara Menon – year long programme to commemorate birth anniversary
38. Mayfest -Bharat Gopi Retrospective Film Festival
39. Kochi film Festival
40. Kochi-Muziris Biennale Investors Meet
41. Kalagramam Anniversary Festival of World Cinema
42. Festival of World Cinema

### II. Environment, Biodiversity, Climate Change and Sustainable Development

1. Study of Flora and Fauna
2. South Indian Summer River Camp
3. Tree Census
4. Impact of Development on Backwaters
5. Study on Soil Erosion and Deposition
6. Asian Cities Climate Change Resilience Network (ACCRN)
7. Mangroves conservation in Mangalavanam
8. Solar City
9. Urban Green Growth Strategies
10. Inter Act Bio
11. Urban Pathways 2018
12. Zero Carbon Buildings 2018
13. Cities with Nature
14. Cities 4 Forests

### III. Urban Development

1. Vision document and Strategic Plan
2. Master Plan for Kochi
3. City Development Plan
4. World Mayors Conference
5. Commonwealth Local Government Good Practice Scheme
6. Kochi-Bavaria Cooperation
7. Cooperation with ICLD Swedish Centre for Local Democracy
8. Association with Mayors for Peace
9. Association with Silk Route Mayors' Forum
10. Smart City Challenge
11. Association with City of Menlo Park USA
12. Association with City of Norfolk
13. International Urban Cooperation Project
14. Climate Smart Cities
15. Smart Urban Development-Smart Cities Project

#### IV. Built Heritage and Redevelopment of Public Spaces

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Management of Cultural Institutions</li> <li>2. National Seminar on Cultural Heritage Management</li> <li>3. Kochi Carnival</li> <li>4. NaatakaKaalam (Theatre)</li> <li>5. Pallath Raman Memorial Cultural Centre</li> <li>6. Bharath Fest</li> <li>7. Seminar on Legacy of Matriliny in Kerala</li> <li>8. Remembering Gandhiji -a tribute to the Father of the Nation</li> <li>9. Knowing Gandhiji-Awareness initiative for children</li> <li>10. Non-violent protest war by a group of artists</li> </ol> | <ol style="list-style-type: none"> <li>11. Festival on Classical dance and instrument music in association with Bharat Bhavan</li> <li>12. International Festival Touring Talkies</li> <li>13. Kochi International Film Festival</li> <li>14. Heritage Forum</li> <li>15. Gandhi Statue Restoration</li> <li>16. Seminar Series on Renaissance Movement</li> <li>17. Festival of Visual and Performing Arts</li> <li>18. Book on Kochi</li> <li>19. Dakshayagam Kathakali-10 days Kathakali workshop</li> <li>20. Baul Music Kochi International Film Festival</li> <li>21. Kochi International Film Festival</li> </ol> |
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#### V. Urban Civic Amenities and Services

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|---|---|
| <ol style="list-style-type: none"> <li>1. Cochin Urban Poverty Reduction Programme</li> <li>2. Association with Pyatigorsk</li> <li>3. Animal Birth Control</li> <li>4. Mission Clean Kochi</li> <li>5. Mission Kochi</li> <li>6. Thuruthi Colony Housing Project</li> <li>7. City Sanitation Plan</li> </ol> | <ol style="list-style-type: none"> <li>8. SWM and Septage Management Facilities</li> <li>9. Contribution to SWM Handling Rules</li> <li>10. Quality of Water and Ground Water level</li> <li>11. Waste to Energy Plant and Facilities</li> <li>12. Water Policy</li> <li>13. Indo German Water Partnership Summit</li> <li>14. Dewats in Three Wards</li> </ol> |
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#### VI. Urban Mobility

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Solutions Project</li> <li>2. Support to developing a UMTA</li> <li>3. Urban Water Transport System Water Metro</li> <li>4. Mobilize Your City</li> <li>5. Ecologistics</li> </ol> | <ol style="list-style-type: none"> <li>6. Reimagining Fort Kochi</li> <li>7. Smart and sustainable Urban Transport project</li> <li>8. SA Road Redevelopment Project</li> <li>9. E-Mobility Project</li> </ol> |
|--|--|

The Hindu – “C-HED to participate in World Urban Forum” – 07/02/2020  
<https://www.thehindu.com/news/cities/Kochi/c-hed-to-participate-in-world-urban-forum/article30756523.ece>

New Indian Express – “Going Green! Tree naming ceremony to be held at Subhash Park today” – 06/02/2019  
<https://www.newindianexpress.com/cities/kochi/2019/feb/06/going-green-tree-naming-ceremony-to-be-held-at-subhash-park-today-1934916.html>

The India Express – “A ray of hope for solar city project” – 30/01/2019  
<https://www.newindianexpress.com/cities/kochi/2019/jan/30/a-ray-of-hope-for-the-solar-city-project-1932083.html>

The Times of India – “Kochi corporation eyes zero carbon future” – 08/06/2018  
<https://timesofindia.indiatimes.com/city/kochi/kochi-corporation-eyes-zero-carbon-future/articleshow/64502211.cms>

The Hindu – “Sculptures at Subhash Park to be restored” – 29/11/2017  
<https://www.thehindu.com/news/cities/Kochi/sculptures-in-subhash-park-to-be-restored/article21041576.ece>



# TOPOGRAPHIC SURVEY AND CADASTRAL MAPPING OF ROHTAK TOWN USING GIS

- by Municipal Corporation Rohtak, Haryana

*The project has been executed by the Town Planning Wing of Rohtak Municipal Corporation (MCR). The Government of Haryana has designated Haryana Space Applications Center (HARSAC) as the nodal agency for generation of Geospatial Database using Remote Sensing and GIS State-of-the-Art technology. The project has been executed by the Town Planning Wing of Rohtak Municipal Corporation (MCR) and was supported by (HARSAC). Prior to 2014, the Corporation identified several complexities in ensuring effective implementation of its responsibilities due to a lack of spatial data. The initiative was launched with the establishment of a Geo Lab on the 26th of January 2014. The Geo Lab was set up with the following objectives:*

- To preserve the legacy data, that were in physical form.*
- Electronic storage of data that was in the form of print.*
- To enable easy retrieval of data for the public and user departments by obtaining the drawing of land along with dimensions, area (as on ground and also as per House Tax Survey), other attributes and neighbourhood details.*
- Facilitate prompt updation of digital Property UID. Whenever there is a future updation, the survey can promptly upload the data from the field Survey to the computer.*
- Better resource planning and better monitoring of land encroachments of public/private properties using Geospatial database and Geo-referenced satellite Image.*

## KEY DATES:

Date	Initiative
26th January 2014	Initiation of Geo Lab
	Completion of digitization of revenue data, house & street indexing, digitization of municipal properties
	Launch of property tax portal linked with digitized cadastral map

## BACKGROUND:

The Rohtak district lies in the southeast of Haryana state. It is bound by Jind and Sonipat districts on the north, Jhajjar district on the south, Jhajjar and Sonipat district on the east and Hisar and Bhiwani districts on the west side.

Area & Population- The district is having an area of

1668.47 sq km. The population of the district as per the 2011 census is 1058683. The density of population is 466 per sq km. There are 146 villages and 151 Panchayats in the district. The rural population is 613864 and the urban population is 444819.

As per 2011 census, the rural population constitutes 57.98% of the total population of the district. The economy of the district is primarily agriculture i.e. agrarian economy. About 51.89% of the total workers are engaged in agriculture and allied activities, 7.68% in the cottage & household industries and the rest are engaged in other activities.

After the successful implementation of Rehabilitation Schemes, Town Planning Schemes and Improvement Trust Schemes in Rohtak, it was felt that there was a need

for integration of spatial database into a centralized system. A Geographical Informatics System (GIS) driven initiative was launched in 2014 with the establishment of a Geo Lab.

### ESTABLISHMENT OF PRIORITIES:

All records related to town planning schemes, colonies, controlled area of the Corporation and the plot numbers were stored physically. The utility network drawings and details were kept manually in the department and people interested in real estate had to come to the municipal corporation for search of the sanctioned details of buildings. There was no particular geo-referenced base map of Rohtak Town before the initiative. All budget proposals were monitored on the data available rather than spatially. This was leading to ineffective municipal governance. Thus, the need for more transparency and accountability led to the conceptualization of the GIS initiative. Rohtak Municipal Corporation (MCR) has designed, developed and implemented a GIS database of Cadastral and 30 utility layers of Rohtak Town for better governance, improving operational efficiency and ease of interaction with data.

### PROCESS:

Broadly, the following process was followed to achieve the above mentioned objectives:

Preparation of Geo-Referenced Base Map:

This entailed the following processes:

- Collection of high-resolution Satellite Images and Archive Cadastral Maps.
- Demarcation of administrative boundaries of the Old Town, Municipal Council and Corporation boundaries of Rohtak Town on the satellite maps.
- Superimposing and Geo-Referencing old Mussavis (Village Cadastral Maps) within the boundaries.
- Digitization of the Mussavis to get an exact replica including details such as topography, roads, canals, etc..
- Superimposing the digitized maps over HARSAC's vector map that included roads, railways, water

bodies, greens, locality boundaries, pin codes etc.

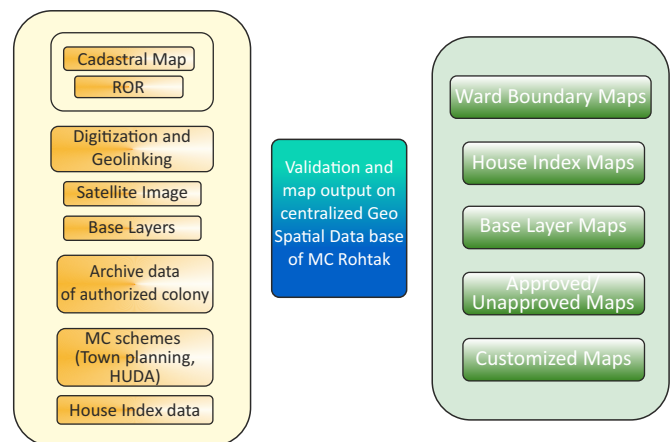
- Demarcation of boundaries of wards, Municipal Corporation schemes and Haryana Urban Development Authority land.

Data Collection and Validation:

- Dedicated teams of 4 people working for the Corporation were involved in field surveys, total station surveys, and property verification.
- Thereafter, property and khasra (land record) details were integrated with the GIS database
- Each plot was linked to House Index Data and assigned a Unique Property Number.

Post the validation, the final map output was generated on the centralized Geo Spatial Database of the MCR that included Ward Boundary Maps, House Index Maps, Base Layer Maps, Approved/Unapproved Maps, Customized Maps.

#### Methodology



Inputs for Spatial Database of Rohtak MC

Geo referenced and integrated utility maps



Land Use Plan of an Unauthorized Colony



In summation, the following steps were followed:

- Step 1: Digitization of Archive Cadastral Maps (2 months)
- Step 2: Data Validation (8 months)
- Step 3: Digitization + geo-referencing (9 months)
- Step 4: Coding + testing for GIS data correction and property tax software (2 years)
- Step 5: Testing of the software and hands-on training to the employees of MCR

The total project cost for the above-mentioned steps was about Rs. 80 lacs. This was budgeted from MCR revenue itself and the State government was not directly involved in the process.

## CHALLENGES

**1. Digitization of Archive Data:** Cadastral Maps (Mussavis) of villages was produced from the Municipal Corporation of Rohtak. The process of digitization involved generating the Murrabas and Kilas using dimensions for each Mussvi. All internal features and village boundaries were digitized using the dimensions mentioned in the Mussavi. Each map was digitized for providing the Murabba grid and number, Killa grid and number, roads, canals etc. using ArcGIS. This has ensured that the digitized Mussavi is an exact replica of the existing map. The topology of the digitized features was built such that the attributes of the spatial features could be linked. The conversion of hard copy maps to digital forms and linking the data was a time-consuming process.

**2. Damaged Mussavi Drawings :** Since many of the Village maps were old and damaged, many of the khasra numbers were not found in the Mussavi and Sajra Plans. Many of the Urban Numbers were also repeated in the Sajra Plans. Such areas proved difficult for digitization.

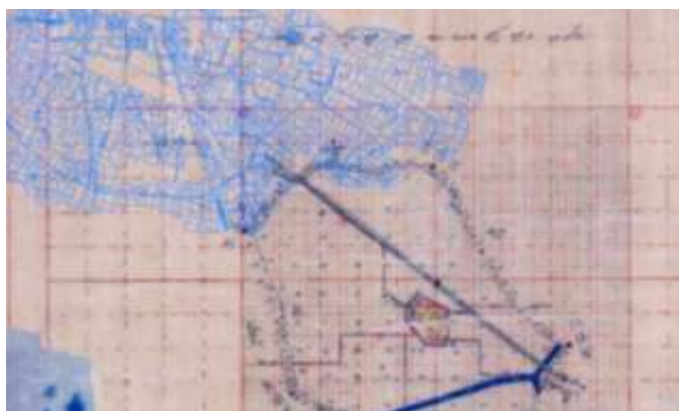
3. The digitization and the linking of the tax data attributes with the building footprints, required special skill and manpower for such a large data.

## RESULT ACHIEVED:

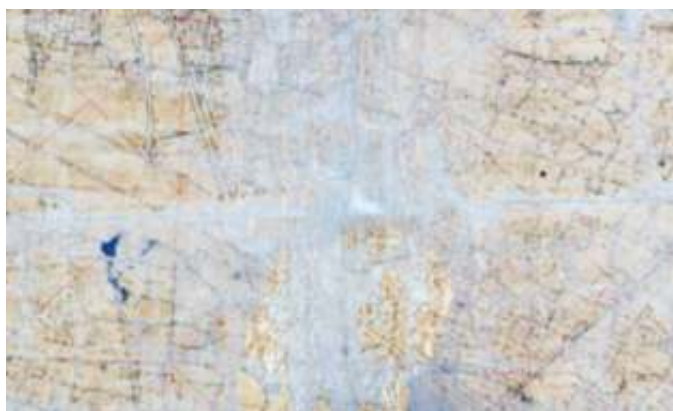
The initiative has achieved the following successes for the Municipal Corporation Rohtak as well as the Town.

### I. Centralized Database of multiple layers of information:

The current GIS database has 30 layers of information that include Lal Dora, 1954 Old Town Boundary, 2001 Municipal Council Boundary, Municipal Corporation Boundary, Controlled Area Boundary, Ward Boundary , Town Planning Scheme Boundary, Rehabilitation Colonies Boundary, Industrial Colonies Boundary, Colonies related other Departments Boundary, 2004 Approved Colonies Boundary, 2013 Approved Colonies Boundary, All MC Area Colonies Boundary, HUDA Sectors Boundary, Improvement Trust Colonies Boundary, MC Land with Killa/Khasra Number, Parks, Major Locations, Canal Network, Drain Network, Roads, Railway Line

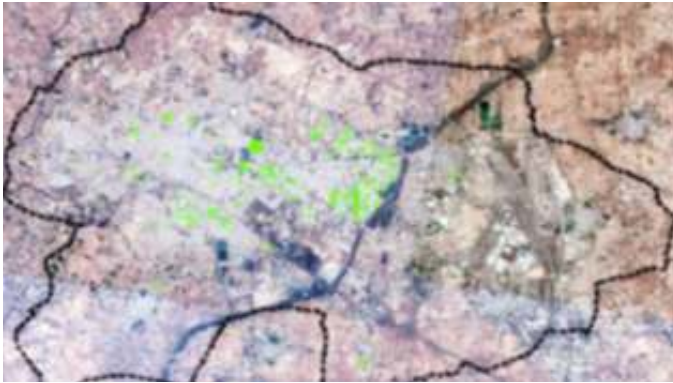


*Digitization of Mussavi data using existing grids*



*Damaged Maps*

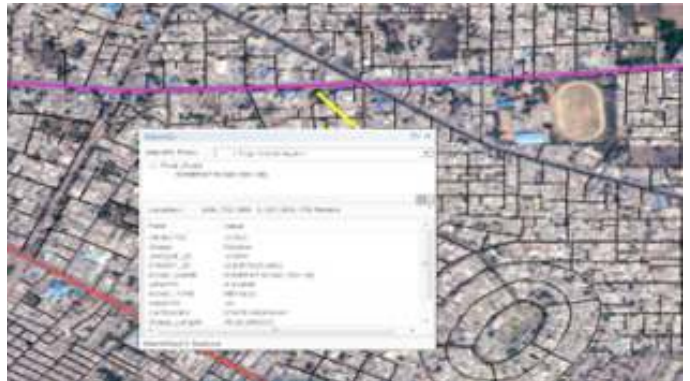




*Parks and Roads of Municipal Corporation*



*Detailed Information of Community Centre with*



*Detailed Information of Roads with UID Number Khasra Number*

## II. Property Tax Collection:

Mapping of individual properties and their integration with the property tax system, along with availability of information like owner name, usage, property type, assessment value, outstanding tax amount etc. has improved the property tax recovery. One of the key factors is the GIS-based property tax monitoring and the easy availability of information on pending recovery amounts. The property recovery has risen from Rs. 7 crores to 32 crores in a period of 4 years.



*Property Details with unique id and details of owner*

## III. Efficient planning and decision making:

The preparation of master plans has become easier. Approximately 1.79 lacs properties are linked spatially to the data including the name of the owner, plot area etc. Utility layers like sewage networks have also been added and can be used to plan future projects in a better-informed manner.



*Water Pipe Line and Boosting Station Location*



Preparation Map of Rohtak Assembly Constituency 62



Prime Minister Rally Site Plan at Sampla, Rohtak



The work presented in Lal Bahadur Shastri National Academy of Administration, Mussoorie

11. 2004 Approved Colonies Boundary
12. 2013 Approved Colonies Boundary
13. All MC Area Colonies Boundary
14. HUDA Sectors Boundary
15. Improvement Trust Colonies Boundary
16. MC Land with Killa/Khasra Number
17. Parks
18. Major Locations
19. Canal Network
20. Drain Network
21. Roads
22. Railway Line
23. Water Pipeline
24. Boosting Station
25. Disposal Site
26. Sewer Pipe Line
27. Urban Number
28. Killa and Murraba Details of All Village falls in MC Limits.
29. All Colonies Landuse details i.e. Builtup, Open/ Vacant Plot and Commercial and Industrial.
30. Detailed report of Unauthorized Colonies of MC Rohtak.

## IV. Ease of access to data:

All the departments of MCR can now easily access the centralized GIS database through the Geo Lab.

## V. Detail of the All utility Layers

1. Lal Dora
2. 1954 Old Town Boundary
3. 2001 Municipal Council Boundary
4. Municipal Corporation Boundary
5. Controlled Area Boundary
6. Ward Boundary
7. Town Planning Scheme Boundary
8. Rehabilitation Colonies Boundary
9. Industrial Colonies Boundary
10. Colonies related other dept. Boundary

## TRANSFERABILITY AND LESSON LEARNED

This project has set a benchmark in displaying initiative and achievement of successes for Municipal Corporation Rohtak as well as the Town towards managing centralized database of multiple layers of information and mapping of individual properties and their integration with the property tax system. Other cities/towns might replicate this which would facilitate them in preparation of master plans and their respective departments to easily access the centralized GIS database through the Geo Lab towards Efficient planning and decision making.



# KOLLUR II - 2 BHK DIGNITY HOUSING - GHMC

- by Greater Hyderabad Municipal Corporation, Telangana

*Having an aim to offer EWS people equal opportunity in the society, Government of Telangana had taken up decent 2BHK permanent pucca house in Greater Hyderabad Municipal Corporation area with complete subsidy. Financial assistance was obtained from the Pradhan Mantri Awas Yojana - Housing for All scheme of the Ministry of Housing and Urban Poverty Alleviation, Government of India. To meet the housing demand due to rapid urbanization, GHMC was entrusted with the task of preparing strategies to identify beneficiaries and also locations in which the 2 BHK scheme of the State Government could be implemented. This scheme was carried out in a phased manner with the total number of 1,00,000 dwelling units proposed in and around the GHMC area. Kollur II is one of the sites in GHMC area having 15,660 number of Houses on 124.07 acres of land to accommodate a population of 70,470. The site is situated about 12.40 km from Lingampally Railway station and 10 km from Financial District Gachibowli. The site has all supporting Physical and Social infrastructure.*

## BACKGROUND:

Hyderabad is the capital of the newly formed Telangana state. According to the Census 2011 data, Hyderabad is ranked as the fourth most populous city in the country and the sixth-most populous urban agglomeration. The population of Greater Hyderabad Municipal Corporation (GHMC) having an area of 650 sq km is 68,09,970 as per the Census 2011. The population of urban agglomeration for the year 2011 is 77,49,334. The population density is reported as 18,480 persons per sq km.

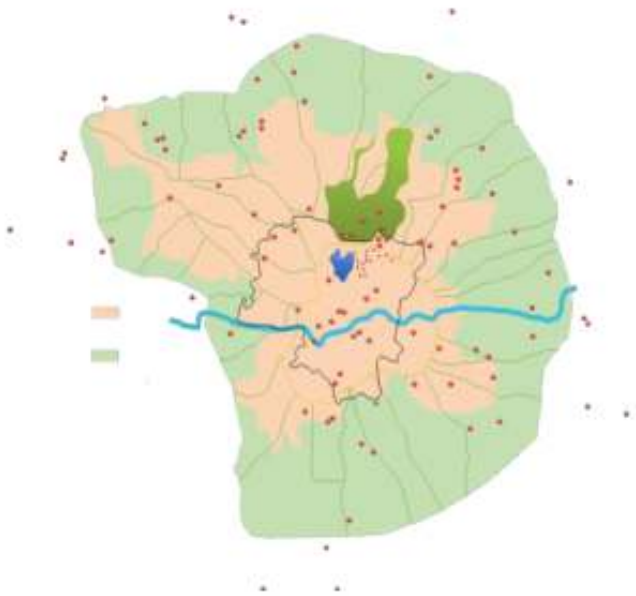
GHMC had worked proactively for identification of beneficiaries and also for identification of locations in which the 2 BHK scheme of the State Government could be implemented. Identification and selection of sites had been taken up after the District Collector invited application for the eligible households for availing the benefits under PMAY - HFA scheme of GoI. The applications received by the District Collector were verified for their eligibility with reference to the Samaikhya Kutumba Survey - 2014 data (State Govt. Household Survey). After scrutiny of the applications, it was observed that the total demand for housing was 4,57,436 for the city.

## KEY DATES:

DATES (Days-moth-year)	Significance / Achievement
22-02-2018	Commencement of work
14-03-2018	First Footing laid
07-05-2018	First slab laid
04-10-2019	Last slab laid
31-03-2020	All 117 Housing Towers completed
30-06-2020	Planned completion date



Telangana Govt. Committed to Provide Decent Accommodation to the EWS of the Society Under Full Subsidy



*Location of 2 BHK Colony in GHMC*



*Before construction of 2 BHK Colony in GHMC*

## ESTABLISHMENT OF PRIORITIES:

To provide high quality affordable housing within the stipulated time frame to meet the supply of high demand of housing for EWS of the society, GHMC planned the largest housing project of India with following strategies:

- Assigned land of about 95 acre was acquired by paying a total compensation of Rs. 30 crores by GHMC for this mega-Housing project abutting financial district which houses major IT firms like Amazon, Infosys, Tech-Mahindra etc.
- Land of about 29 acres was having huge burrow pits which were utilized for the formation of Outer Ring Road. The land was reclaimed for providing parks,

open air theater and green cover to the layout. Site was designed scientifically with non-monotonous blocks

- Work was carried out 24/7 with electronic surveillance and without any compromise in quality
- Environment-friendly construction practices were taken up minimizing carbon footprint
- Physical and Social Infrastructure were provided as per URDPFI standards
- Efficient architectural design was done to provide maximum ventilation and duly following the Vastu Shastra for upholding the sentiments of EWS people. The Kollur II project is a blend of ancient and modern architectural sciences resulting in the best utilization of the space
- Integration of services with other departments was done to cater to all the needs of the beneficiaries
- Commercial spaces are incorporated in the layout for making the operation and maintenance aspect of the Housing project a self-sustainable one.

## PROCESS:

The GHMC was entrusted with the task of preparing strategies for meeting the housing demand. GHMC invited proposals for development of a Housing colony with a deep understanding of technologies to complete the project within a strict time frame through a transparent tendering process and the project commenced in Feb 2018.

The project was proposed at Kollur Village on a plot of an area of 124.07 acre, in the vicinity of the Financial District Gachibowli. The project comprises of 117 blocks having 14 types of structural designs in S+9, S+10, S+11 pattern. There are 15,660 flats in total, having 12 nos. of flats per floor in Linear & U-Shaped blocks, 13 nos. of flats per floor in L-Shaped blocks & 16 no. of flats per floor in O-Shaped Blocks. Each flat has a carpet area of 406.9 sq ft, plinth area of 470 sq ft and floor area (including common area) of 560 sq ft. Total-built-up area is 88,23,102 sq ft (8,19,693 sq m). The project also includes development of all associated infrastructure for a housing project and

three commercial complexes. After completion of the project, the houses are allotted in the name of female spouse as per the Aadhar cards and below poverty line (BPL) cards of Economic Weaker sections (EWS) of the society.

Many Government departments have come forward to provide supporting infrastructure to the housing colony for people who could not afford their own houses. Some of the infrastructure facilities and departments providing them are shown below:

#### Physical Infrastructure:

S.No.	Name of the Department	Infrastructure facilities provided
1	TSSPDCL	Electric supply to 2 BHK Housing colonies
2	HMWS & SB	Protected water supply under “Urban Mission Bagiratha” Sewerage disposal connectivity to city sewer network
3	TSRTC	Bus stations / bus stops and integrating with existing TSRTC network
4	IT, E & C Department	Internet connectivity through T fiber grid network and MeeSeva Centers
5	Disaster Response & Fire Services Department.	Fire stations
6	Sports Authority of Telangana State	Sport facilities / open air gymnasium / sports complexes
7	SLBC - State Bank of India	Banks / ATMs
8	Commissioner of Police, Hyderabad/ Cyberabad/ Rachakonda.	Police stations / police outposts, installation of CC cameras
9	TSMDC	Supply of sand

#### Social infrastructure:

S.No.	Name of the Department	Infrastructure facilities provided
1	School Education	School buildings
2	Health, Medical & Family welfare department.	Primary health centers / area hospitals
3	Women Development & Child Welfare Department	Anganwadi centers
4	Civil Supplies Department.	Public distribution system centers
5	Society for Elimination of Rural Poverty (SERP), Rural Development Department	Dwcra buildings
6	Collector & District Magistrate	Providing Markets, burial grounds, cremation centers, plantation of trees under Harithaharam.

Guiding Documents for providing infrastructure facilities

**PHYSICAL INFRASTRUCTURE**  
Water Supply, Sewerage (STP), Drainage, Roads etc.

**CPHEEO/ MoRTH/ IRC etc.**

Guiding Documents for providing infrastructure facilities

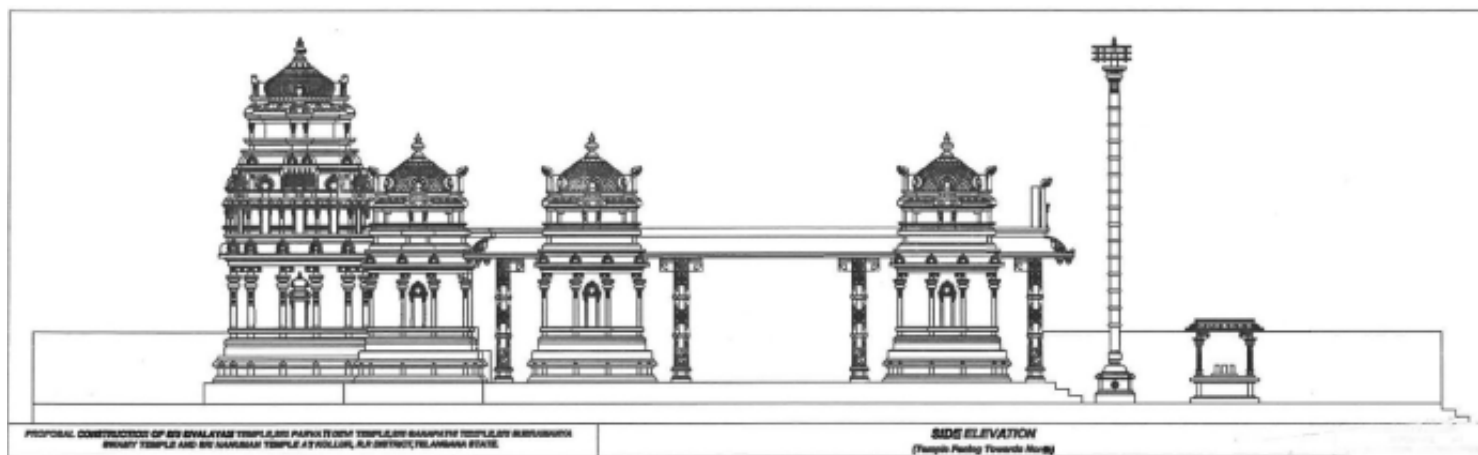
**SOCIAL INFRASTRUCTURE**  
Education, Health Centres, Police Stations, Fire Stations, Community Halls, Markets/ Commercial Centres, Postal etc

**NBC 2016 and URDPFI 2015**

Housing, drinking water and sanitation services were provided to the construction workers during construction period with all safety concerns.

5 small temples were displaced for accommodating the approved layout. The local people were negotiated for

shifting these temples by duly constructing a good temple complex afresh under Corporate Social Responsibility. Spaces are earmarked for construction of places of worship for all other religions.



5 Small Temple were Displaced for Accommodating the Approved Layout



## MOBILISATION OF RESOURCES:

### Financial Resources:

As per the commitment of the Government of Telangana, the 2 BHK scheme is fully subsidized for the economically weaker section of the society. The Government of Telangana aims at bringing out the economically weaker section of the society from the debt trap by providing 2 BHK Houses free of cost, with no beneficiary contribution. The cost for each Dwelling Unit (DU) is Rs. 8.65 Lakhs including infrastructure cost, being financed by the following sources:

- GoI under PMAY HFA – Rs. 1.50 Lakhs per DU
- State Government of Telangana for Housing – Rs. 5.50 Lakhs per DU
- Greater Hyderabad Municipal Corporation – Rs. 0.90 Lakhs per DU
- State Government of Telangana for Infrastructure – Rs. 0.75 Lakhs per DU

### Technical Resources:

Considering the Scope of work to be completed in the proposed time, several techniques were adapted to enable rapid execution.

- 2 Nos. of RMC plants of with capacity 60 cu m/hr each
- 9 Nos. of Lines pumps of and 2 Nos. of Boomer Pumps for concreting works
- 2 Nos. of automated brick plants of and 4 Nos. of semi-automated brick plants which can produce 1,80,000 bricks per day
- Tower cranes and 9 Nos. of Mobile Tower cranes
- Quality control setup
- Fire fighting and safety measures

### Human Resources:

More than 2250 nos. local skilled labour were hired to tackle local unemployment and create economic growth within their community.

The contracting agency had to adopt modern techniques and process to carry out project implementation smoothly. The GHMC Officials carried out daily monitoring and updating of progress of works.

#### Contracting Agency

Project Manager	2
Senior Engineers	30
Junior Engineers	100
Foreman	30
Masons	800
Bar Benders	490
Carpenters	800
Workers	2500
<b>Total</b>	<b>4,752 Nos</b>

#### Public Works Department (One Exclusive Division)

Executive Engineer  
Deputy Executive Engineers – 2 Nos  
Assistant Engineers – 2 Nos  
NAC Engineers – 6 Nos

## RESULT ACHIEVED:

Housing colony was designed to accommodate about 15,660 houses with open spaces around the building blocks duly following building bye-laws and other statutory regulations resulting in improving the quality of life of people living in it which eventually leading to social security with own houses.

Only 15% of the total 124 Acres is used for construction of 15,660 DUs and remaining area of about 104.14 acre is used for developing various infrastructural facilities and green cover. The Colony is provided with all sorts of supporting infrastructure from CC roads of 9 m to 36 m width, Supply of potable water to all houses and connectivity of sewerage network, storm water drains, treatment and reuse of treated sewage effluent, 9 MLD capacity STP with enhanced MBBR Technology. Social

infrastructure facilities are also provided with approach to parks, play grounds, gymnasium, multipurpose ground and open-air auditorium, commercial complex, community centers, schools, primary health centers, anganwadi centers, civil supplies center, markets, burial

grounds, cremation centers (Vaikunta Dhamam), plantation of trees under Harithaharam. Other eco-friendly measures are underground electrical wiring, solar panel arrangement on terrace, rain water harvesting techniques for improvement of groundwater.

#### Area of Proposed Layout

	Area in Acres.	Percentage
Residential (Proposed Blocks)	19.85	15.99%
Parks & Play Ground	1342	10.82%
Amenities	27.89	22.48%
Green & Open Areas	21.77	17.55%
Roads	32.56	26.25%
Public Building Area	06.26	05.05%
Open Parking	02.32	01.87%
<b>Total site area</b>	<b>124.07</b>	<b>100%</b>

11 Floors	SECTORS							
Type of Block	1	2	3	8	TOTAL	Flats/Floor	No. of Floors	Total no. of Flats
UNEAR	10	5	2	5	22	12	11	2904
U-TYPE	4	0	0	2	6	12	11	792
O-TYPE	5	3	0	4	12	16	11	2112
L-TYPE	6	3	2	4	15	13	11	2145
<b>Total</b>	<b>25</b>	<b>11</b>	<b>4</b>	<b>15</b>	<b>55</b>			<b>7953</b>

10 Floors	SECTORS							
Type of Block	3				TOTAL	Flats/Floor	No. of Floors	Total no. of Flats
UNEAR	8				8	12	10	960
U-TYPE	4				4	12	10	480
O-TYPE	6				6	16	10	960
L-TYPE	6				6	13	10	780
<b>Total</b>	<b>24</b>				<b>24</b>			<b>3180</b>

9 Floors	SECTORS							
Type of Block	4	5	6		TOTAL	Flats/Floor	No. of Floors	Total no. of Flats
UNEAR	11	4	0		15	12	9	1620
U-TYPE	2	0	4		6	12	9	648
O-TYPE	5	1	4		10	16	9	1440
L-TYPE	3	2	2		7	13	9	819
<b>Total</b>	<b>21</b>	<b>7</b>	<b>10</b>		<b>38</b>			<b>4527</b>
<b>Total no. of Flats</b>								<b>15660</b>

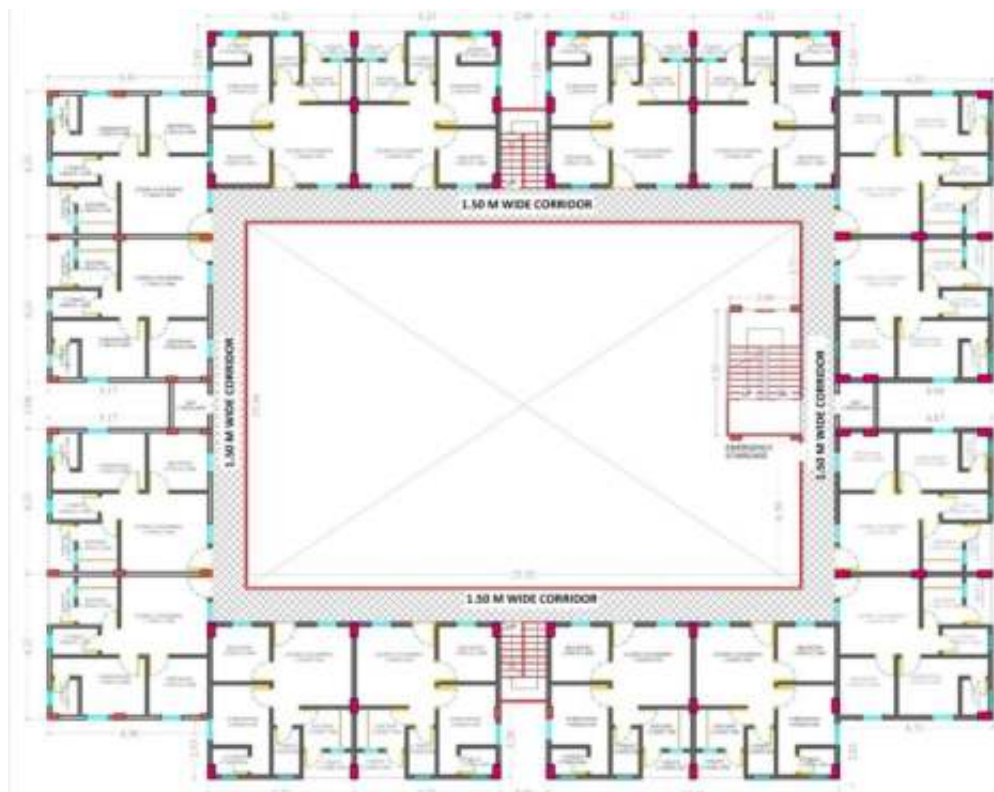




The building blocks are designed in four different layouts:

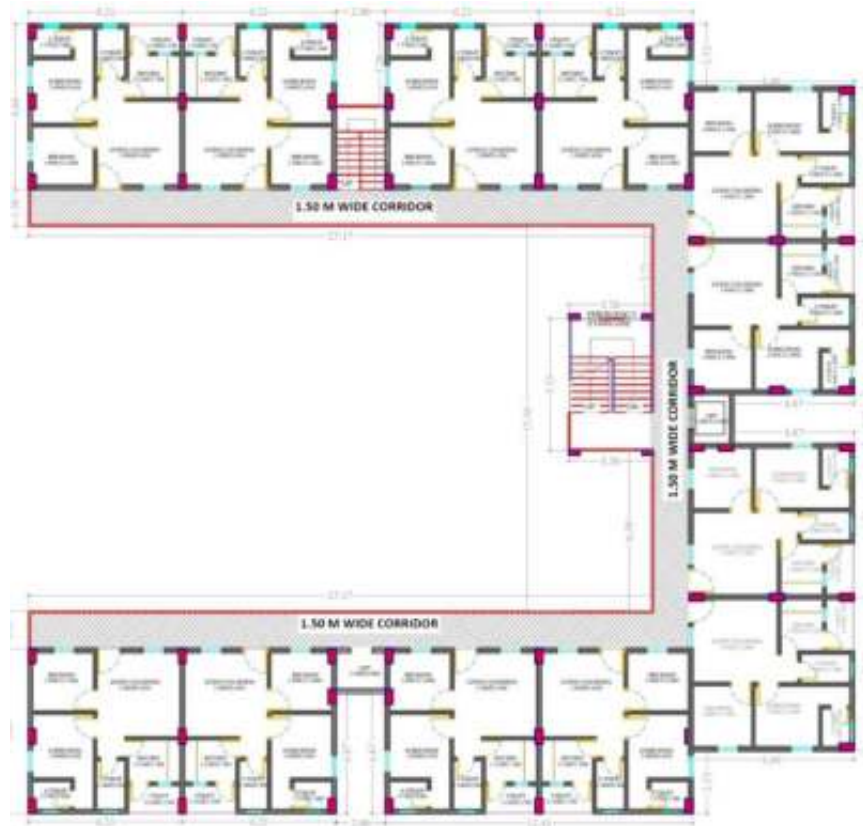


Linear Block - Building Plan (12 DUs per Floor) Total Ground Cover: 1297.28 sq ft - (677.94 sq m)

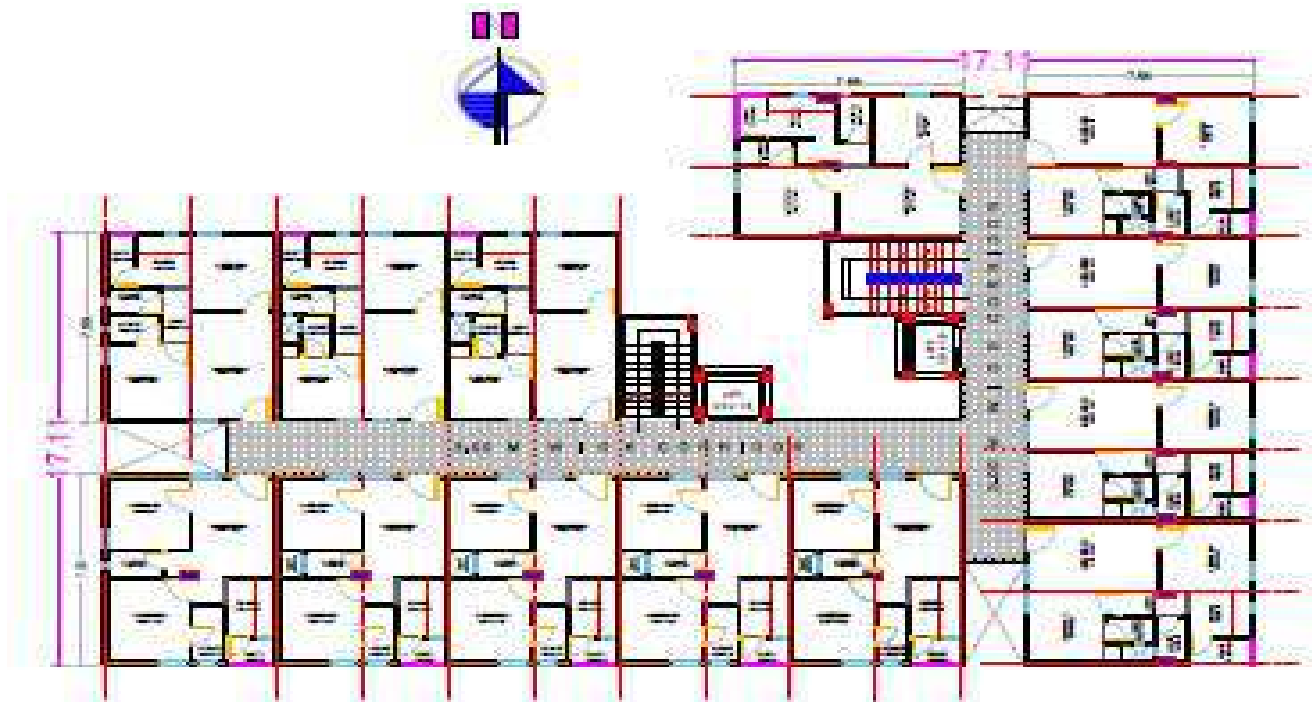


"O" Type Block - Building Plan (16 DUs per Floor) Total Ground Cover: 6810 sq ft





*"U" Type Block - Building Plan (12 DUs per Floor) Total Ground Cover: 6712 sq ft*



*"L" Type Block - Building Plan (13 DUs per Floor) Total Ground Cover: 6681.96 sq ft*

**SUSTAINABILITY:****Financial –**

Various strategies are taken for proper operation and maintenance (O&M) of the assets, created after handing over of the township to the beneficiaries, so as to make the township a successful self-sustaining model. One such module is described below.



*Commercial Complex*

The anticipated monthly maintenance expenditure of the entire Kollur II Township is quantified and details are tabulated below:

Statement Showing Anticipated Monthly Maintenance Expenditure of Kollur II Township			
S. No.	EXPENDITURE	AMOUNT (in Rs.)	REMARKS
1)	Water charges	4,500,000	Rs. 15/ KL for daily overall water requirement of 10 ML (15*10*1000*30 days)
2)	STP maintenance	20,00,000	As per tender quotation
3)	Lift maintenance	24,00,000	Total for 234 lifts, Rs. 3000/- for power consumption and Rs. 7,000/-for monthly maintenance for each lift {234*10000}
4)	Watch and ward	38,00,000	Rs. 16,000/- per month for 2 no watchman, Total for 117 watchmen {117*2*16000}
5)	Pump Operators	4,00,000	Rs. 16,000/- per month for 1 no operator, Total 24 operators for 12 no of sumps {24*16000}
6)	Water pumping charges	4,50,000	75 KW/hr, for lifting 10 ML for 24 Hrs for 30 days, {(75*24*30*5)/0.6}
7)	Street lights	3,50,000	Total for about 950 numbers of street light points (950*0.2*12*5*30) {Each of capacity 200 Watts}
8)	Road Sweeping Charges	8,00,000	Considering 2 sweepers for every km length of road and @ Rs. 20,000/ month {Rs. 16,000 towards salary+ Rs. 4,000 for clothes, brooms, etc} for about 20 km length {20000*2*20}
9)	MISCELLANEOUS EXPENDITURE	12,80,000	Considered 10% of sub total amount towards maintenance - civil, plumbing, electrical etc.
<b>Total Anticipated Monthly Maintenance</b>		<b>1,59,80,000</b>	

## Revenue Generation

In this module, the amount required for monthly maintenance of Kollur II township can be generated from the rents received from 3 Nos. of commercial complexes, royalties from various service providers and by giving the rest of the land earmarked in the layout on lease/for development.

### Sources of Revenue & Amounts

S. No.	SOURCE OF REVENUE	AMOUNT (in Rs.)	REMARKS
1)	Commercial complexes	10,68,000	Considering an anticipated rent of about Rs. 20 per sq ft for total area of about 53,403 sq ft of all the planned 3 number of commercial complexes {Including rent from community hall and shops}{53403*20}
2)	Available commercial space of about 4,58,580 sft (within 124 acres layout){42619 sqm}	91,71,600	Spaces earmarked for various commercial activities in the layout. Considering FSI as 200% and 50% land owner share and @ of Rs. 20 per sq ft {458580*2*.5*20}
3)	Royalties from Cable providers, Cell phone towers, piped gas supply, internet etc. for entire township	18,16,000	Considering Rs. 100 per house from cable, internet, gas etc. Providers for total of 15,660 houses and 5 number of cell phone towers @ Rs. 50,000 per tower per month
4)	Available commercial space of 6,09,840 sft	1,21,96,800	Land to an extent of about 14 acres available from the 20 acres (in addition to 124 Acres) of recently handed over by the revenue dept. for development purpose, the same can be used for revenue generation activity. (Rs. 20 per sq ft) Considering FSI as 200% and 50% land owner share and @ of Rs. 20 per sq ft {6,09,840*2*0.5*20}
<b>TOTAL EXPECTED MONTHLY REVENUE</b>		<b>2,42,52,400</b>	

As per the above, revenue of about Rs. 2,42,52,400 can be generated and the same can be utilized for meeting the anticipated monthly expenditure of about Rs. 1,59,80,000.

### Social and Economic –

The housing colonies provided people sense of ownership and social inclusiveness to the residents. Economic growth is also initiated by designing livelihood centers with establishment of small-scale enterprises.

### Environmental –

- The layout is prepared by providing ample open and green spaces for providing social & recreational facilities for developing healthy & peaceful living environment.
- The Grid Roads are being provided with avenue plantation in three rows in medians and also on either sides; the internal sub-roads are being provided with shrubbery plantation; the open spaces earmarked for green areas are being provided with a mix of avenue plantations, shrubbery plantation and grass lawns.
- Fly Ash from thermal power plants and oil refineries was used for building bricks and blocks at the Kollur II 2BHK site. Approximately 3.71 crore Fly Ash Bricks of various sizes were used for construction.
- Pozzolana Portland Cement was used for the entire project duly reducing carbon footprint.
- Rainwater harvesting pits (about 30 nos.) and injection bore wells (about 10 nos.) are



constructed at the site so as to conserve water.

- Water through treated effluent from the sewage treatment plant is being used for gardening and washing purposes.
- Manufactured sand was used in place of natural river sand thereby reducing the environmental degradation.

### TRANSFERABILITY:

Hyderabad is one of the dynamic cities of India where day to day opportunities are increasing leading to rapid urbanization where most of the poor dwellers migrate for a better quality of life and employment. This results in

people staying back in unhygienic conditions in small katcha houses. Providing them with affordable houses that too with full subsidy has helped the economic growth of the EWS of society.

In spite of using conventional construction technology, the largest housing colony of India under this project was constructed in record time without compromising the quality. The practices adopted for faster completion of large scale Government housing colonies is the first of its kind in India. This was achieved by intense planning, prompt execution, timely review and assessment. Replication of this work, may lead to construct mass housing in less time period.



*Paver Block Manufacturing Unit*



Fly Ash Brick Plant at Site (Capacity -1.0 Lakh Bricks/Day)

## LESSON LEARNED:

In present times, land being the major hurdle for providing affordable housing in urban areas, use of this precious land is very important for providing housing. Vertical development as in present case can help provide housing within the city limit. Providing housing within the fixed time frame with quality output was the major motivation and accordingly the construction techniques were adopted. Within a fixed financial resource, the project provided many improved specifications like pre-painted steel windows, textured color finish, all infrastructure facilities, commercial complexes, elevators, lightning arrestors, generator sets for power backup, underground external cabling, etc. by using the conventional method of construction.

Effective coordination and Integration with other departments helped to provide the supporting infrastructure, leading to planned growth of the city. This Model of construction can also be transferred to other states; not only in metro cities but other cities also for the growth of the city catering to all classes of people.

## Telangana: Kollur 2BHK project by March

The project, being developed in 525 acres, will have 15,466 double bedroom houses with all facilities for the beneficiaries.



**Hyderabad:** The state's biggest housing project, which is a part of the state government's flagship 2BHK housing scheme, coming up at Kollur in Sangareddy will be completed by March 2020.

The project, being developed in 525 acres, will have 15,466 double-bedroom houses with all facilities for the beneficiaries. It is being executed by the Greater Hyderabad Municipal Corporation (GHMC) and the Telangana Housing Department.

<https://telanganatoday.com/telangana-kollur-2bkh-project-march>

Title: Telangana: Kollur 2BHK project by March

Newspaper: Telangana Today  
Published on 20th Jul 2019

<https://www.thehindu.com/news/national/telangana/2bkh-houses-at-kollur-will-be-model-for-nation-kt/article29780389.ece>

Title: 2BHK houses at Kollur will be model for Nation: KTR

Newspaper: The Hindu

Author:

Published on 23rd Oct 2019

## 2BHK houses at Kollur will be model for nation: KTR



**Houses being built with best quality material**

Minister for Housing, Urban Development and Infrastructure Technology K. T. R. Lakshmaiah said that the double bedroom houses being constructed at Kollur will be a model for the nation in providing houses to the poor.

Addressing a gathering after inaugurating the ongoing construction of double bedroom houses at Kollur, he said that the government is committed to providing houses to the poor and that the houses being built at Kollur will be a model for the nation in providing houses to the poor.

While addressing the gathering, he said that the government is committed to providing houses to the poor and that the houses being built at Kollur will be a model for the nation in providing houses to the poor.





*Kollur II - 2BHK Housing*





# SLUM REHABILITATION PROGRAMME

- by Chandigarh Housing Board

*Slum Rehabilitation Programme is being implemented by the Chandigarh Housing Board (CHB) under the aegis of Chandigarh Administration under 'Chandigarh Small Flats Scheme —2006' notified by the Chandigarh Administration during 2006. The project aims at providing a hygienic and better living to 23841 biometrically identified slum dwellers spread over 18 notified slums in the city. The two Sub Schemes namely 'Construction of 6368 Small Flats Phase-I' and 'Construction of 19360 Small Flats Phase-II' approved by the Government of India under Jawaharlal Nehru National Urban Renewal Mission (JnNURM). Three revised DPRs for Phase I (6368 Flats), Phase II (10016 Flats) & Phase III (9344 Flats) amounting to Rs. 1021.48 Crore were submitted with the concerned Ministry of Government of India and the same were approved by the 'Central Sanctioning and Monitoring Committee' of Ministry of HUPA in its meeting held on 28th February 2012. The scheme under JnNURM (BSUP) was implemented to provide affordable housing, services for urban poor, slum settlement and improved services delivery initiative.*

*Due to non-availability of all the identified beneficiaries under survey in 2006, at present, the project has been curtailed to the construction of 17696 flats with a proportioned cost of Rs. 657.47 Crores and against this grant Rs. 554.17 Crores has been received by CHB.*

*CHB completed the construction of 12736 small flats under Phase-I & II till 2013. CHB took the work of Phase-III at Maloya-II for the construction of 4960 small flats on a chunk of land 160 acre for the approved project cost of Rs. 250 crores. The project includes one-time settlement of residents residing in the slums which are not covered under Phase-I & II.*

## KEY DATES:

- Two Schemes for seeking Central Assistance in respect of the construction of 25728 Small Flats were approved on 27th December 2006 & 22nd December 2006.
- Three revised DPRs for Phase I, Phase II & Phase III amounting to Rs. 1021.48 crore were submitted with the concerned Ministry of GOI and the same were approved by the 'Central Sanctioning and Monitoring Committee' of Ministry of HUPA in its meeting held on 28th February, 2012. Administrative Approval has been received from GoI MoHUPA on 15th October 2012 for Phase-II and on 28th December, 2012 for Phase-I & III.
- CHB commenced the construction of 4960 small flats in 2014 after inviting tender and allotting the work to the agencies.
- The Governor of Punjab and Administrator U.T. Chandigarh handed over the allotment of small flats to the beneficiaries and the physical possession of the flats was handed over in the month of July 2019.

## BACKGROUND:

The Chandigarh Administration, recognizing the fact that many citizens are condemned to unhygienic living circumstances in these peri-urban centers undertook several rehabilitation programmes to provide better living conditions to the bulk of the slum population. During the year 1970, a survey was conducted to determine the extent of jhuggies. As a result, the number of jhuggies was placed at 4454. This number increased to 8003 by 1974. For the first time in the year 1975, Chandigarh Administration, through a notification dated 01.04.1975, promulgated a scheme to rehabilitate these slum dwellers

by offering them alternative sites and tenements. One Room Tenements were constructed in Sector 26, Sector 29, Sector 30, Sector 32 and Sector 38 to rehabilitate these slum dwellers.

On the constitution of the Chandigarh Housing Board in the year 1976, Chandigarh Administration entrusted the task of rehabilitating the slum dwellers to the Board. Chandigarh Housing Board's first important scheme of 2712 Sites & Services in Village Dadumajra & Karsan won the 1st National Prize from HUDCO in the year 1979. The Chandigarh Housing Board has been taking up rehabilitation programmes from time to time and has catered to the needs of about 36000 families by providing EWS units, One Room Tenements and Sites & Services before the commencement of the comprehensive slum rehabilitation project taken under JnNURM.

#### **ESTABLISHMENT OF PRIORITIES:**

All previous attempts to address the problem had mixed results. With the increasing cost of land, infrastructure and construction, the houses were becoming costlier and unaffordable. The houses constructed under the earlier rehabilitation programmes were provided to the slum dwellers at highly subsidized prices which command a premium in the market. This had mainly three implications: firstly, a large number of people thronged the city with the expectation of getting a cheap house. Secondly, many beneficiaries sold the houses in the market at a premium and went back to the slums. Thirdly, all these houses were given as site and services or independent one room dwelling units which were altered with large-scale unauthorized and unapproved construction. Thus, a course correction was felt necessary in the existing Slum Rehabilitation Programme.

For providing decent and dignified living conditions at affordable cost and to avoid pitfalls of the earlier rehabilitation programmes, Chandigarh Administration decided to provide accommodation, in the form of one room flat, on a license fee basis to the slum dwellers. Based on the socio-economic survey conducted by IDFC, the paying capacity of slum dwellers has been estimated at Rs. 1,000/- p.m. In order to ensure that there is no future encroachment on Govt. land, it has been decided that any family which has not been included in the biometric

survey, shall not be eligible to get a housing unit under this programme. With these aims in view, the 'Chandigarh Small Flats Scheme- 2006' was notified by the Chandigarh Administration in the year 2006.

#### **MOBILISATION OF RESOURCES:**

The Chandigarh Administration has designated the Chandigarh Housing Board as the nodal agency for implementation of the Chandigarh Small Flats Scheme for construction of 25728 Small Flats.

CHB, a Statutory Body constituted under Haryana Housing Board Act, 1971, as extended to UT of Chandigarh is an Engineering Organization engaged in construction of houses under its General Housing Schemes. Besides its mandate for housing implementation, CHB is also engaged in the process of developing various assignments of the Chandigarh Administration such as booths for Rehri markets, booths/shops for motor mechanics, project Kalagram, Dr. Ambedkar Bhawan, Post Master General Building, NAC Building etc.

The Engineering Wing of CHB is headed by the Chief Engineer and supported by SEs, EEs, Architect, SDEs and AEs/JEs besides other technical/ground staff for supervision of works. Thus all related works pertaining to implementation of the scheme right from preparation of DPRs, tender documents, cost estimates, processing of tenders, designing of the flats and its layout etc. were undertaken in-house. The works under the scheme are being implemented through a transparent tendering process. As far as the management of the financial resources is concerned, Rs. 436.30 crores of the project cost is being provided by Govt. of India as Central Assistance under JnNURM and the rest Rs. 585.18 crores share is being provided by the Chandigarh Administration as State Share. Due to non-availability of all the identified beneficiaries under survey in 2006, the project has been curtailed to construction of 17696 flats with a proportioned cost of Rs. 657.47 crores and against this grant of Rs. 554.17 crores has been received by CHB. Now under the scheme, project cost of Rs. 292.32 crores has been provided by Govt. of India as Central Assistance under JnNURM and the rest Rs. 365.15 crores share is



being provided by the Chandigarh Administration as State Share.

## PROCESS:

Some of the greatest challenges for the Administration had been to make the slum dwellers adapt to a new lifestyle which primarily included paying the rent regularly, not misusing the premises for commercial activities or sub-letting or reselling and motivating them for paying the electricity / Water bills which they were accustomed of availing free-of-cost in slums through illegal means. The processes adopted are:

- In the allotment of these dwelling units, care has been taken to make both husband and wife joint owners of the unit
- Underground cabling for electricity supply to prevent any pilferage
- Lockable water supply meters
- Close monitoring
- Use of biometric identification for collection of license fee
- Depicting a photograph of the allottee and Aadhar number on the allotment letter and possession slip on the flat.
- Ensuring demolition of huts by the allottee. The demolished huts were checked by the official from Estate Office after three days of handing over the physical possession.

These practices have been accepted and are being followed by the residents knowing fully well that any digression from these could make them losing the accommodation which they can own only after 20 years of occupation.

The Best Practices followed in the implementation process:

### Change in Mode of Allotment-

Earlier all units were allotted on a hire-purchase basis and were highly subsidized. A large number of people thronged the city in the expectation of getting a cheap

house. Many rehabilitators encashed the subsidy by selling off the unit they went back to slums. Every allotment is now being done on an affordable monthly license fee basis with the option of owning the house after twenty years.

### Deploying of IT for Effective Management-

Detailed biometric survey of the 18 notified slum colonies helped ascertaining exact number of families living there, which included a digital photograph of the family and electronically captured thumb and finger impressions of the head of the family. This put to rest all possible claims and counterclaims regarding eligibility.

Development of a comprehensive software SRISHTI helped in reducing processing time for an application from 6 months to 2 hours, workflow-based automation, no chance of skipping of the queue as regards allotment process, digital photograph and fingerprint of the allottee captured and printed on the allotment letter/ possession slip, digitized databases of voter list of 2006-10 and other years under which eligibility was checked, integration with Aadhar number and printing of Aadhar on the allotment letters.

### Simplification of Procedures

Allotment was done on-the-spot through a camp at site that helped reduce time, money and efforts, which was further facilitated through the presence of all officials involved from:

Chandigarh Housing Board -for handing over of allotment letter and possession slip  
Estate Office Chandigarh -for redressing issues relating to eligibility  
Municipal Corporation, Chandigarh -for providing water supply meter connection  
Engineering Department, Chandigarh---for providing electricity meter connection  
Notary public -for attestation of license deed and etc.

### Simplification of Forms

- A simple one page application form devised with no attachments, enclosures or proofs
- Single page allotment letter, possession slip, and license deed simplified the process time

**Relocation plan**

i) Scientifically prepared detailed relocation plan prepared to minimize dislocation and intimated well in advance to eliminate any element of surprise

ii) Land freed from slums secured and put to optimal use.

**RESULTS ACHIEVED:**

The objective was to construct over 25,728 dwelling units to accommodate all eligible families from 18 colonies that were identified through a Biometric survey. The surplus units as well as the temporary transit camps constructed at the moment would accommodate future migrations. The total number of eligible beneficiaries identified by the Estate office has been reduced and accordingly construction of 17696 small flats has been undertaken and completed. The city would be able to cleanse and get rid of slums and create a better eco-system for the residents of Chandigarh.

About 60,000 persons have already been shifted till year 2015 at Dhanas, Sector 49, Sector 38 (W), Ram Darbar and Mauli Jagran. In the year 2019, further around 12000 persons have been shifted at Maloya-I from Colony No.4 Industrial Area, Phase-I.

Thus, Slum Rehabilitation scheme being implemented by CHB fulfills the requirement of Affordable housing, Services for the urban poor, improved service delivery initiatives, providing education and health in the integrated developed township at Dhanas and also providing the same in the integrated township for slum dwellers at Maloya-I, Like community center, govt. school, janj ghar etc.

By shifting these beneficiaries at Maloya-I from Colony No.4, about 40 Acres of land worth Rs. 500 crore got free from encroachments, part of the land so vacated is industrial land and part of the land pertains to the forest department as per the Master Plan of Chandigarh.

**Slum Rehabilitation Programme- Key Features**

- ✓ One time solution to the existing problem of squatters and slum settlements
- ✓ Allotment initially on license fee basis (Rs 800/-

per Month), providing ownership rights after twenty years so as to ensure that beneficiaries do not sell their flats & again go for encroachment

- ✓ Recognizing the community oriented life style to which the beneficiaries are normally accustomed, the layout adopts the street interface approach with a common front courtyard
- ✓ The policy recognizes the need to minimize the extent of geographical dislocation. Therefore wherever possible, the families are being rehabilitated on land near their present habitations
- ✓ The unit consists of two rooms, bath, WC, balcony and kitchen alcove area. The design of the dwelling unit developed in a way so that there is no incidental space, leaving no scope or possibility of violation and/or unauthorized occupation of government land
- ✓ Each dwelling unit to have individual water and electricity connection
- ✓ Allotment on joint-name of both husband and wife for social security
- ✓ Open play grounds and parks
- ✓ Green cover
- ✓ 4960 Small flats at Maloya-I developed as integrated township with all requisite social infrastructure such as, Anganwaris, elementary schools, high schools, facility of dispensary and shopping complex, junj ghar, community centre, police post, bus queue shelter, green belt, parks with playing equipments, 11 KV substation, water boosting stations and STP etc. etc.
- ✓ Solar energy has been tapped by installation of SPV Panels on the roof top of buildings at Maloya-I such as Schools, 11 KV Sub Station, Water Boosting Station, Community Centre, Janj Ghar etc.
- ✓ Long-term plans for maintaining the provided social infrastructure have also been worked out.

## SUSTAINABILITY:

It has been well said that “The city, as both site and symbol of the rapid pace of social change in many societies, has come to represent a critical problem in development discourse and practice. The tensions between economic growth, social equity and political legitimacy are manifest in cities around the world. These tensions must find some resolution if urban development is to be not only sustainable but humane.” Thus, in the context of inclusive habitat, the term 'Social Sector' refers to the factors which contribute to human capital formation and human development.

Since human development and improvement in the quality of life is the ultimate objective of all planning programmes leading to higher economic and social development. The concept of social infrastructure being very broad covers various aspects of government service delivery. The cost of delivering social benefits is very high and constitutes a major proportion of the State Budget.

The existence of adequate social infrastructure plays a very important role in the life of a normal man lacking facilities. The economy cannot be looked at in isolation without considering the basic needs of the people. The government needs to proactively develop strategies aimed at benefiting people living in urban areas and improve its service delivery mechanisms. Pertinently since the reorganization of the States of Punjab, Haryana and Himachal Pradesh and the declaration of Chandigarh as Union Territory in the year 1966, there had been a tremendous influx of migratory labours who were engaged in the development of the city.

The Chandigarh Administration in the last 35 years has framed a number of policies for rehabilitation of the slum dwellers and Chandigarh Housing Board has alone undertaken construction of 40834 dwelling units for slum dwellers and economically weaker section including Sites & Services. Out of total of 67565 dwelling units constructed by Chandigarh Housing Board since its inception in the year 1976, its contribution towards the low-income strata and the rehabilitation of slum dwellers contribution amounts to 60.43% of the total housing stock created by Chandigarh Housing Board.

## TRANSFERABILITY:

CHB has not adopted any of the practices followed by

other States and rather evolved its own system of implementation as well as its own system for transfer of benefit to the beneficiaries under the scheme.

CHB is the only organization where the property rights are initiated to be transferred to the beneficiaries after 20 years of continuous occupation of the property as compared to other states where the property rights have been transferred to the beneficiaries at the first stage leading to large scale underhand sale of the property.

The scheme envisages the allotment of the dwelling unit to the beneficiaries on a license fee model that has been appreciated by Govt. of India.

CHB is not aware of any replication/adoption of the practices of CHB by other States.

## LESSONS LEARNED:

For the families that have shifted to their new homes in various parts of the city, it is time to rejoice and relax. No more leaking roofs or smelly filth for them and unhygienic squalor outside the door. It is a journey from Jhuggi to joyful living for every family, that has found new dignity and self-confidence in their new community, having an inexplicable deep impact on their lives and the lives of their families, particularly the children.

The transition from slums to small homes has also translated into better employment opportunities, more community participation, better education for children and better health.



*Colony No. 4 Industrial Area Phase-I, land vacated from encroachers after allotment of Small Flats at Maloya Housing Complex*





*Integrated Township at Maloya Housing Complex*



*School*



*Porta Cabin as Service Shops, Benches and Open Gyms in Parks*





Tree Plantation



100' wide v4 central road



A Grand Transformation



#### Social Infrastructure Developed at integrated township at Malviya-1

##### IT IS A NEW BEGINNING



Dev Raj works as a gardener in private homes and 3 years in 1994 that he left his home in Badli, UP to search for jobs. His wife joined him in 1996, and spent his life in struggle as Kharid Lohari and later in Sector 25 colony. "Living with his two daughters, he is happy to be in this new house. He has fixed this and a black marble floor in the kitchen he smoke tobacco for his wife, who enjoys her cooking, while earlier she had to sit down and cook on the floor. Their daughter, Raksha, is studying in 6th class in the Government school nearby. "I want to be a government officer," she proudly announces.

Ambika, a daily wage, came to Chandigarh 18 years ago from Patna in UP, and lived in Colony No. 8. Now father of four, is happy to be here in his "own house".



"We had to bathe outside and fetch water from public tap, but now every thing is right within my home," his wife adds. His son Rajesh studying in 9th class wants to pursue further studies and is now proud to give his address to his class fellows which he shared earlier. "I used to keep mum to tell my friends that we lived in Juggi. It is different now."



Eighty years old Sarda Devi owns the house and lives with her son and daughter-in-law, and two grand children. Her husband works as a private company and was very happy to be living in his own house. She, along with her daughter-in-law, who shifted to Chandigarh in 1990 and had been living in Colony No. 8. "I used to remain sick and since the house we have shifted in this new house, I have not fallen sick even once," the old lady said.

Ramkishan actually says that life has in the last seven years with his husband Chanderprasad Singh who works in the market. "It is a much better life here than what we used to have in the slum where lots of alcoholics and thieves used to roam around." I am so happy that at least now I have a house of my own," she adds.



For Phool Singh, it had been a long arduous journey of 30 years spent in Juggis and Khattis of Colony No. 8. Having from Patna in UP, he used to run a service area in the colony, and is very happy having come out of the slum and mud. "We are indeed grateful to the government for having given the poor people like us a house to live in."



# ASHA CHADHI PARWAN - "DREAM COMES TRUE"

- by State Urban Development Agency, Chhattisgarh

**L**eprosy is a disease which incapacitates a person, and when there is a community affected by it, rehabilitation of them itself is a challenge. In Rajnandgaon, Chhattisgarh there were 61 families suffering from leprosy, unable to arrange meals to eat and thinking about a house was a distant dream while residing in precarious condition in a locality named Asha Nagar. Every year in inclement weather conditions, they faced extreme inconveniences. Under PMAY, they were selected as beneficiaries and through convergence with multiple state & central government schemes, the process of constructing pucca houses was initiated. They were selected not only to provide a pucca house but also to bring them to main stream, raise their socio-economic standard, inculcate faith in government policies & provide a livelihood.

"Asha Chadhi Parwan" - "Dream Comes True" was the motto while implementing this project. Respectable life, with self-earning, education to children, meals without pleading and a pucca house which was the wildest dream of Leprosy affected community in Asha Nagar, had to be successfully converted into reality. While making housing as a driving force, benefits of varied Central and State Government schemes were provided to the destitute residing in this locality through convergence, which also aided in achieving the targets of Sustainable Development Goals, New Urban Agenda and WHO's "Global leprosy strategy 2016– 2020". Through this project, the overall habitat of these people has been upgraded along with socio-economic upliftment.

## BACKGROUND:

Urbanization is the process by which cities and towns grow and develop, it has provoked its fair share of 'by-products'. One of the most 'persistent' among them happens to be the pockets of poverty and neighborhood decay, famously known as 'slums'. Currently, almost 1.1 billion individuals reside in slums which is almost a third of the world's urban population, which could shoot up to approx 3 billion in the coming 3 decades. The 11th Sustainable Development Goal (SDG) focuses on the urge to mitigate the



challenges in urbanization and aims to 'make cities and human settlements inclusive, safe, resilient, and sustainable', wherein its first target quests to 'ensure access for all, to adequate, safe and affordable housing and basic services, and upgrade slums'.

Hence, the time was ripe when the government should focus on addressing issues of urban poor and slum dwellers and find options which works in improving the living conditions without hampering their livelihood. State Urban Development Agency (SUDA) and Municipal Corporation Rajnandgaon had combinedly taken steps to address the need of the hour of providing sustainable housing for the leprosy affected community residing in the Asha Nagar area in Rajnandgaon, Chhattisgarh.

Leprosy, one of the neglected tropical diseases, is generally associated with poverty, overcrowding, thereby affecting the most undeserved population of the country. The visible deformities of the hand and foot and the accompanying sensory loss contribute significantly to the stigma faced by leprosy patients. This, stigma and ostracization of patients severely affect the social existence of the patients (affecting marriage, employment etc.) and contribute to the spread of disease away from public glare by reducing health-seeking behavior among the community for leprosy. The global prevalence of leprosy according to Global Leprosy Update 2017 is 0.25 per 10,000 population. The total number of new cases diagnosed in 2017 in India were 1,26,164 (approximately 60% of the world's new leprosy cases), wherein, the highest prevalence of leprosy was seen in Chhattisgarh (2.25/10,000 population).

Asha Nagar is encompassing an area of approx. 1.46 hectare in ward 22 of Rajnandgaon Municipal Corporation. A total of 61 families suffering from leprosy and physical disabilities were staying in this area since 1984, with a total population of 289 which includes 91 males, 110 females and 88 children. Leprosy is a disease which incapacitates a person, and when there is an entire community affected by it, rehabilitation becomes a challenge. Most of them would beg for their daily needs, some did casual labour work while a few ferried commuters on cycle rickshaws. The social stigma associated with the disease left them with no permanent

source of income. Unable to afford regular meals, thinking about owning a house was a distant dream for these residents.

### KEY DATES:

DATES (day-month-year)	Significance/Achievement
25/02/2018	Conceptualization
27/02/2018	First community meeting with beneficiaries
03/03/2018	Survey & measurement of the kutch House for DPR preparation.
20/03/2018	Applying for patta renewal for DPR preparation
27/03/2018	Approval for temporary patta & distribution of a copy of temporary patta for DPR preparation
30/06/2018	DPR sanction
04/08/2018	Distribution of permanent patta by HCM of Chhattisgarh, State
15 /08/2018	First foundation geo-tagged in Asha Nagar
31/01/2019	First house completion
11/09/2019	50% of houses are completed & occupied in Asha Nagar
23/10/2019	Community garden completion
09/01/2020	Houses are completed & occupied in Asha Nagar

### ESTABLISHMENT OF PRIORITIES:

State Urban Development Agency (SUDA) and Municipal Corporation Rajnandgaon had taken a gallant step for the leprosy affected community by providing them land ownership documents and selecting them as beneficiaries in Beneficiary Led Construction (BLC) under Pradhan Mantri Awas Yojana – Housing for All (PMAY-HFA). They were provided with all kinds of facilities such as electricity, water and toilet, while construction of the garden, road, street light, sewerage line and water supply were executed through various central and state government funded schemes, they were also provided with jobs as per their capabilities.

### MOBILISATION OF RESOURCES:

- The total financial assistance provided for the successful implementation of the project till date has

been Rs. 91.50 lakhs as Central Share & Rs. 42.17 lakhs as State Share.

- The overall manpower deployed for design, planning, execution, and monitoring of the project has been 194 personnel, bifurcated as follows:

#### Bifurcation of Personnel

Sr. No	Agency	Manpower Deployed	Roles & Responsibilities
1.	ULB	3	Approving authority for the works being implemented, fund disbursement, overall planning of the activities.
2.	Technical Experts	3	Field coordination, review & monitoring of work being carried out.
3.	Project Monitoring Consultancy	3	Preparation of the DPR, design of the project, monitoring the implementation activities.
4.	Construction Agency	185	Construction as per the approved design and specifications.
		<b>194</b>	

- For the construction of the houses, materials required were purchased in bulk so that the cost of housing could be reduced.
- Raw material received after dismantling the rag houses were reused for construction of new houses.
- The houses were constructed in pairs so that a common wall can be used between two beneficiaries which could again reduce the housing cost and hence the beneficiary contribution becomes negligible.

#### PROCESS:

The process followed for implementation is as follows: -

- As these people did not have any land document of the place where they resided since 1984, Municipal Corporation Rajnandgaon had decided to first provide them land-ownership document as Aabadi patta for land admeasuring 1000 sq ft to each beneficiary with the help of Collector.
- As the process of land document started at the collectorate level, ULB initiated the process of DPR preparation for state and central sanctioning.

- After sanctioning of the project, people residing there were explained about the project and the way this will enhance their livelihood.
- At first convincing them for making their houses was a difficult task, as years of ignorance and treatment as untouchable had created feelings of being neglected in their heart.
- However, with motivation, participatory involvement in decision making created a positive atmosphere and helped in ice-breaking.
- Considering the condition of these families and based on the response and inputs with respect to their basic needs, an appropriate design of their houses was made and submitted for approval from ULB.
- Toilets for these beneficiaries were constructed through Swachh Bharat Mission and layouts of houses were made such that the toilet comes under or near the house, so that the beneficiaries do not face any issue is using them.
- Electricity connection was provided free of cost to the beneficiaries.
- These houses were started in a bunch and materials required for construction were purchased collectively so that the cost of construction gets reduced and the contribution (beneficiary share) of people of Asha Nagar becomes negligible.
- The houses were constructed in pairs so that a common wall can be used between two units which will again reduce the housing cost.
- For fresh drinking water, metered waterline connection is proposed through AMRUT Mission, currently they are provided water connection through Bhagirathi Nal Jal Yojana.
- Gas connection has been provided to the beneficiaries through Ujjawala Yojana.
- For enhancing the slum condition and upgrading the locality, a garden was proposed under Pushp Vatika Yojana.
- Ordinary street light was converted into LED lights; bituminous road construction and for cleanliness, good quality sewerage system are being implemented by ULB.

- With the help of Khadya Gram Udyog and Chhattisgarh State Skill Development Authority (CSSDA) a Government handloom business has been setup for them, along with the handloom, for residents who have lost body parts and cannot do laborious works, Silk & Forest Department has allotted 10 Acres of land for Kosa Silk Worm Breeding and according to the Collectorate Man-Day Rate the workers are provided a daily wage of Rs 341 per head. All such activities have been taken care of by the Self-Help Group (SHG) of that area.
- At least one member from each household, preferably

a woman, has been brought under this Self-Help Group network. This group serves as a support system to meet their financial and social needs.

To achieve the aim of Pradhan Mantri Awaas Yojana of providing Housing for All, State Government of Chhattisgarh took various measures for these neglected people and provided financial assistance to the urban poor families living in dilapidated and kutchha houses for construction of a house and also provided land to the landless poor along with various other services through convergence of several Central & State sponsored schemes as mentioned below: -

### Convergence of Central & State Sponsored Schemes

Sr. No.	Name of Scheme	Service/ Infrastructure Provided	Socio-economic Benefits	Reduction in Beneficiary Share
1.	Amrut Mission	Water Supply, Potable Water Tap	Better health, time saving	Rs. 5000 Approx.
2.	Swachh Bharat Mission	Toilet	Cleanliness, sanitation	Rs. 11000 Approx.
3.	Saubhagya Yojna	Electricity	Improved quality of life	Rs. 1500 Approx.
4.	Ujjawala Yojana	Gas Connection	Better health, time saving, reduced indoor air pollution	
5.	Pushp Vatika Yojana	Garden	Good environment, clean air, environmental up-gradation	
6.	Training Via NULM And Employment in Khadya Gram Udyog and Chhattisgarh State Skill Development Authority (CSSDA)	Handloom Business	Employment, empowerment, economic up-gradation	
7.	Aanganwadi	Free Education and Medicinal Facilities	Better health, nutrition, education, improved quality of life	
8.	Jan Dhan Yojana	Bank Account		
9.	Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)	Government-Backed Life Insurance Scheme		
10.	Pradhan Mantri Suraksha Bima Yojana (PMSBY)	Government-Backed Accident Insurance Scheme		



Sr. No.	Name of Scheme	Service/ Infrastructure Provided	Socio-economic Benefits	Reduction in Beneficiary Share
11.	Social Security Pension Scheme	Rs. 350 Per Month (State Scheme)	To assure a respectful life, financial assistance is provided to the BPL, PWD's (Persons With Disabilities) and the dwarf Persons.	
12.	Atal Pension Yojna		Old age income security	
13.	Indira Gandhi National Widow Pension	Rs. 350 Per Month (Central Contribution - Rs. 300, State Contribution - Rs. 50)	To assure a respectful life, financial assistance is provided to the widows who are BPL.	
14.	Indira Gandhi National Disabled Pension	Rs. 500 Per Month (Central Contribution - Rs. 300, State Contribution - Rs. 200)	To assure a respectful life, financial assistance is provided to the severe and multi-disabled persons who are BPL	
15.	Rashtriya Poshan Mission		Improve nutritional status of children up to 6 years, adolescent girls, pregnant women and lactating mothers	
16.	Indira Gandhi National Old Age Pension	# Age Group 60 To 79 Year - Rs. 350 Per Month (Central Contribution - Rs. 200, State Contribution - Rs. 150) # Age Group 80 Years Or Above - Rs. 650 Per Month (Central Contribution - Rs. 500, State Contribution - Rs. 150)	To assure a respectful life, financial assistance is provided to the BPL aged persons	
17.	Mukhya Mantri Cycle SahaytaYojna		Distribution of free cycle/ tricycle	

"Education is the key to unlock the golden door of freedom." this line was written by George Washington Carver in a letter to Booker T. Washington (April 12, 1896); for good education, a good clean environment is needed. To fulfill this need, the government has not only provided them with houses with all amenities but also constructed gardens, Aanganwadi, open spaces and

recreational areas, so that the future generation of this community can concentrate on their education and uplift socio- economic standards to lead a better life.

### RESULT ACHIEVED:

The benefits of the project implemented are as follows: -

- Constructing houses for people who were neglected by

society and were suffering from a terrible disease is a great success for the State team.

- With this project, the aim to convert a slum into a society with all facilities is being fulfilled. The design of these EWS houses were made identical to give an exterior view similar to row houses of a well-developed colony.
- People of Asha Nagar are excited, as before this project they were living their lives in a slum and now they are going to live the rest of their lives in a clean society.
- People have got a respectable job in the handloom industry, Silk Worm Breeding and have a permanent source of income.
- Through education and medicinal facilities available in Aanganwadi, the children are learning new things along with being disease free.
- Following are the indirect benefits which the community has achieved:

- o The number of patients with Grade 2 Deformation (G2D) has not increased
- o No New case both in children and adults
- o Family income has quadrupled, (Previous – Rs. 3000/month, Current – Rs. 8000/month)
- o Societal acceptance has increased
- o Conversion from being beggars to bread earners
- o Increase in the happiness index

The Asha Nagar project is not only addressing the need of the hour but is also focusing on making the development sustainable by achieving the targets as set by the Sustainable Development Goals (SDGs), New Urban Agenda (NUA), along it, this project is also addressing the target set by WHO in “Global Leprosy Strategy 2016–2020’.

List of targets as set by United Nations Sustainable Development Goals which are being achieved by the Asha Nagar Project: -

### Sustainable Development Goals being Achieved by the Project

Goal		Targets being achieved by Asha Nagar Project
Goal 1	<b>No poverty</b> - “ <i>End poverty in all its forms everywhere.</i> ”	<p>1.1 - By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day</p> <p>1.2 - By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions</p> <p>1.4 - By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance</p> <p>1.5 - By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters</p>

Goal		Targets being achieved by Asha Nagar Project
Goal 2	<b>Zero hunger</b> - <i>“End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.”</i>	<p>2.1 - By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round</p> <p>2.2 - By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons</p>
Goal 3	<b>Good health and well-being for people</b> – <i>“Ensure healthy lives and promote well-being for all at all ages.”</i>	<p>3.3 - By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases</p>
Goal 4	<b>Quality education</b> - <i>“Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.”</i>	<p>4.1 - By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes</p> <p>4.2 - By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education</p>
Goal 5	<b>Gender equality</b> - <i>“Achieve gender equality and empower all women and girls.”</i>	<p>5.1 - End all forms of discrimination against all women and girls everywhere</p> <p>5.2 - Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws</p>
Goal 6	<b>Clean water and sanitation</b> - <i>“Ensure availability and sustainable management of water and sanitation for all”.</i>	<p>6.1 - By 2030, achieve universal and equitable access to safe and affordable drinking water for all</p> <p>6.2 - By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.</p>
Goal 8	<b>Decent work and economic growth</b> - <i>“Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.”</i>	<p>8.5 - By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value</p>

Goal		Targets being achieved by Asha Nagar Project
Goal 10	<b>Reducing inequalities -</b> <i>“Reduce income inequality within and among countries.”</i>	10.2 - By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or another status
Goal 11	<b>Sustainable cities and communities –</b> <i>“Make cities and human settlements inclusive, safe, resilient, and sustainable.”</i>	11.1 - By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums 11.2 - By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons 11.3 - By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries 11.7 - By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
Goal 16	<b>Peace, justice and strong institutions -</b> <i>“Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.”</i>	16.6 - Develop effective, accountable and transparent institutions at all levels 16.7 - Ensure responsive, inclusive, participatory and representative decision-making at all levels

(Nation's, 2020)

## SUSTAINABILITY :

### • Financial-

For minimizing the beneficiary share, various initiatives had been taken, like reusing of the dismantled material, construction in pairs, convergence with multiple schemes, livelihood options, resulting in which the houses were constructed with practically no beneficiary share, making it financially sustainable.

### • Social & Economic-

With the help of Khadya Gram Udyog and Chhattisgarh State Skill Development Authority (CSSDA) a Government handloom business has been setup for the leprosy affected families, for residents who have lost body parts and cannot do laborious works, Silk & Forest Department has allotted 10 Acres of land for Kosa Silk Worm Breeding and according to the Collectorate Man-Day Rate the workers are provided a daily wage of Rs.



341 per head and all such activities have been taken care by the Self-Help Group (SHG) of that area. At least one member from each household, preferably a woman, has been brought under this Self-Help Group network. This group serves as a support system to meet their financial and social needs. As a result of these activities, the average income/family has increased manifold and have uplifted the socio-economic standards of this family along with acceptability in the society.

- **Cultural-**

Leprosy had not only impacted the physical strength of these people but had tattered their will and zeal to survive. Fights they had to put up against all odds, for their daily needs were harsh and cumbersome. With this project of Asha Nagar, there has been a paradigm shift in the way these people now lead their life, resulting in bringing back the cultural, emotional and social values in their life. This project has made an immense impact on the behavioral patterns of its residents and has resulted in bringing smiles, enthusiasm and excitement back into their life.

- **Environmental-**

For construction of the houses, materials required were purchased in bulk, raw material received after dismantling the rag houses were reused for the construction of new house, the houses were constructed in pairs so that a common wall can be used between two units which could again reduce the consumption. With the measures taken the project is in a way "Existenz minimum" wherein the design approach aimed at maximizing both quality and functionality of the domestic layout, while minimizing its dimensions, resulting in minimal impact on the environment.

- **Institutional –**

The practices followed during implementation of this project can be replicated at various levels wherein the projects focusing on a particular group/faction/gender can be implemented by utilizing the benefits available under multiple government schemes.

### **TRANSFERABILITY:**

This project has easy transferability. Any project which focuses on addressing the housing needs of a particular

group/faction/gender residing in the same locality can be implemented by following what has been successfully executed in this project. By selecting such a group of individuals as beneficiaries in the PMAY and converging the benefits of multiple schemes, aided by wholistic planning of project implementation can yield far-fetched results which are beneficial not only for the citizens, but also for the implementing agencies and the society at large.

Multiple projects in a similar line are being implemented in the State of Chhattisgarh in a similar fashion, which are as follows: -

### **Projects in a Similar Line in Chhattisgarh State**

Sr. No.	Location	Community Benefitted
1	Gandai	Rehabilitation of Commercial Sex Workers Community.
2	Kanker	Rehabilitation of Community Affected by Left Wing Extremism.
3	Bodla	Rehabilitation of Baiga a Tribal Community Facing Extinction of their Culture And Tradition.

### **LESSON LEARNED:**

State government with its past experience of implementing various schemes and of benefits available under such schemes, had chalked out a plan through which the maximum benefits can be provided to these communities living a miserable and deplorable life. The convergence mechanism adopted in implementing this project along with detailed planning of addressing each and every minute need of the needy, resulted in a phenomenal outcome where houses have been successfully completed and the beneficiaries are living a composed and poised life in a locality which was a distant dream.

This model can be easily replicated and adopted by any municipality/ State Government or Parastatal agency, but the paramount focus should be on the outcome which they wish to achieve. With a clear path, meticulous planning and thorough implementation, any project, though perceived to be tricky and tenacious, can be completed with great ease.



*Employment Options*



*Before*





After







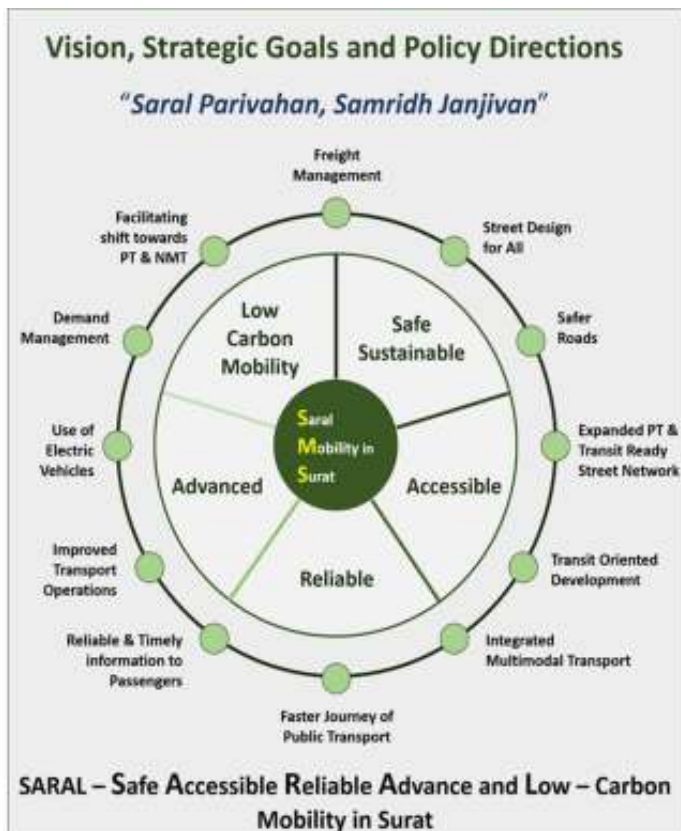
# SURAT INTEGRATED URBAN MASS TRANSIT SYSTEM

- by Surat Municipal Corporation, Gujarat

Until recently, 16.7 lakh vehicles were added in the last 10 years in Surat. With this huge addition of private vehicles, the city faced issues like congestion, accidents, pollution and increase in travel time, etc. Recognizing the futility of this in resolving mobility issues, the city reinvented itself by initiating an integrated transport system development. The city defines the mobility vision as 'SARAL' which stands for Safe, Accessible, Reliable, Advanced and Low-carbon mobility in Surat. SARAL also means SIMPLE in Indian languages and it states that 'Saral Parivahan – Sumrudh Janjeevan' meaning 'Simple Transport towards ensuring Prosperous and Enriching Quality of Life for people of Surat'. The initiatives included integrated land use-transport planning, promotion of public transport and Non-Motorised Transportation, use of technology for sharing information and for management, financial and institutional reforms. Along with this, the city developed an integrated public transport system consisting of:

- 'One City One Card - Digitalization for cashless travel by integration of Automatic Fare Collection System with Surat Money Card.
- Surat Bicycle sharing scheme ( 600 Bicycles at 40 locations) for last mile connectivity and for short trips at Central Zone & Athwa-gate to ONGC Colony.
- Surat Municipal Corporation has formed its own subsidiary company "Surat Sitalink Limited" to govern the administration and operations of the Surat Public Transport system (BRTS, City Bus and HMC).
- BRTS over a network of 110 km (102 km as a closed system).
- A City Bus System with amenities and facility over 352 km of network.
- High Mobility Corridor over 15 km of network (on Ring Road).
- Pink Auto rickshaw System driven by women as last-mile connectivity system

In general, integration implies the opportunity to use the entire public transport system within SMC or SUDA area independently of transport modes, tariffs, fares, schedules, ticket systems, etc. The main tools used by the municipal corporation is to integrate public transport system are network integration and



Vision, Strategic Goals and Policy Directions

tariff integration. The city provides an efficient public transport system to its citizens with “one network, one timetable, one ticket, one fare.

### KEY DATES:

Surat BRTS was inaugurated on 26th January 2014 and a Surat City bus service was inaugurated on 25th November 2016. Since its inauguration, there has been a remarkable increase in services, ridership and revenue. Below are some of the highlights in terms of achievement, performance and acknowledgement

### BACKGROUND:

Surat continues to experience a high population growth rate for the last four decades, placing itself at the 8th position in terms of population size countrywide as per Census 2011. Parallel to industrial expansion, Surat emerged as a major centre for trade and commerce in the region. It is estimated that Surat would be having 8-9 million residents by 2031. City mobility plays a crucial role in helping a city meet its socio-economic needs. A city requires efficient mobility for meeting the needs of business, commerce, services and education as well as to improve its environmental health. Shared auto-rickshaws have taken a deep root as a significant mode of transport because of the insufficient public transportation in the past. The number of private vehicles and para-transit options are creating congestion on city roads. Initially, flyover was considered as a solution to decrease congestion. But with time, it was realized that flyovers are a short-term solution and a need was felt for a long-term sustainable solution in the form of good public transport.

The highlights of existing transport situations are presented below:

- Population estimated (2016) – 5.9 million
- Total street network – 2578 km
- Major Road network – 664 km
- Total vehicles registered (2018) – 3.0 million
- Average Travel speeds: Two-wheeler: 30 kmph, Three wheeler: 25 kmph, Public Transport: 20 kmph

- Public Transport network Coverage: 95%

### Concerns and effects on the social group:

- Increase independence on private vehicles
- On-street parking and loading–unloading activities had an impact on vehicle travel speed near the market and industrial areas
- Low-income group are forced to use bicycles even in lengthy trips. This results in encroachments at various places (especially by migrant population – to stay near workplace avoiding lengthy trips)
- In absence of adequate and efficient public transport in past, a large number of private and para-transit modes have entered into the market to meet the travel demand
- Women's safety during night hours and in shared auto service is one of the major concerns.

### Impacts:

- Acute traffic congestion resulting in inordinate delays
- High rate of road accidents - Pedestrians are the main victims
- Decrease in average speed and increase in vehicle operating cost
- Intense pollution of the environment
- Poor air quality (Average PM10 - 98µg/m3)

### ESTABLISHMENT OF PRIORITIES:

The city had a negligible mass transit system and relied majorly on the local mode of Public Transport (auto & rickshaws) before 2014 when Bus Rapid Transit System was implemented. BRTS service is expanded to 110 km (102 km closed network) on 12 routes with 207 buses on road. It is notable that of the 102 km, 30 km of network received part funding (up to 50%) from national and state governments with a balance borne by Surat Municipal Corporation. The remaining of full BRTS was initiated and built by SMC with its own funds (Cost per km – US \$ 2.5 MI). BRTS is operational with 5 to 12 minutes' peak

headway with an average daily ridership of 1,35,000. The city bus service was inaugurated on 25th November 2016 which acts as a feeder service and also provides service to remote areas. The city bus service is mainly a supply-based service, which has generated the public transport demand in the area wherever city bus service is supplied.

City bus service is expanded to 352 km in SMC and SUDA area and a High Mobility Corridor of 15 km. Currently, 44 city bus routes are operational with 432 buses on road. The average daily ridership is 1,40,000 in

25%, senior citizens at 25% and those citizen who do not fall in any of these categories would be given a flat 10% discount.

### MOBILISATION OF RESOURCES:

Surat city bus service project was envisaged with different components. The project included components like city buses, depots, city bus stops, ITMS system, AFCS system, etc. The table below shows the detailed list of all components with estimated and actual cost and contribution from centre, state and ULB.

### Components with Estimated and Actual Cost

(Rs. in crore)

S. No	Components	Estimated Cost	Actual Expenditure	Contribution		
				Centre	State	ULB
1	BRTS (phase 1, 2, 2E)	933.88	805.1	210.7	355.94	238.46
2	Bus Chassis	89.21	84.52	0	10.17	74.35
3	Bus body building	57.75	55	0	4.5	50.5
4	City bus stops	0	21.04	0	0	21.04
5	Depot	0	28.94	0	13.61	15.33
6	ITMS	48.99	24.13	12.07	6.03	6.03
7	AFCS	80.22	42.00	21.00	10.50	10.50
<b>Total</b>		<b>1210.05</b>	<b>1060.73</b>	<b>243.77</b>	<b>400.75</b>	<b>416.21</b>

city bus services. The coverage of public transport network within SMC is 95%. The High mobility corridor was inaugurated on 20th May 2018 with 12 buses and 10 minutes peak hour headway.

Towards last mile connectivity, the city has introduced a Bicycle sharing scheme & 'Pink Auto Rickshaws' too. These ensure a safe and secure journey for women and children. Physical integration of the above modes/systems has been ensured by the efficient design of bus stations, terminals and buses too. City and HMC buses enter and exit at pre-designated places to enable interchange between systems.

The city is also aiming to reduce air pollution by encouraging more citizens to leave their private vehicles and opt for public transport. For this purpose, city has started Surat Money Card in June 2018. This card has a discount for divyangs at 40%, students at 40%, women at

### PROCESS:

#### Transforming Constraints into Opportunities- BRTS Canal Corridor:

Out of the 20 km to be operational within the end of 2014, 12 km is the first waterfront BRTS to be implemented in India. The bus stations are planned along the existing canal. Recreational facilities like kiosks, gardens, and children's play area, seating, etc. are also planned along both sides of the canal. Partially, there were no roads along the canal, with encroachments, degenerating conditions prevailed along canal. Due to continuous water flow in the canal, the construction activity was taken up during the 14-day clearance received from the Irrigation Department. At present BRTS Canal corridor is well planned with good landscape and ridership is also high on this corridor.

### **Removing encroachments for the widening of carriageway:**

The city has prepared 110 km (102 km as a closed system) of BRTS network which connects major transport traffic area such as industrial area, recreational area, textile and commercial market, institutions, hospitals, etc. But there are some areas where road side properties encroached on the road margin from long time. Surat Municipal Corporation started anti-encroachment drive to remove illegal structures on roads and government plots which include pan shops, houses, extensions of residential properties, religious structures, etc.

### **Opposition from auto rickshaw drivers/union:**

During the phase when there were no public transport facilities in Surat, auto rickshaws were the major mode of transportation in the city. Initially, private stakeholders got involved in the public transport sector in 2007. Thereafter, observing the growth and travel pattern of the city, the Municipal Corporation decided to commence the planning and designing of the BRTS project along with the city bus service as a feeder system. Due to this, auto-rickshaws became the feeder mode for both BRTS and city buses across the city. There was a high percentage of modal shift from auto rickshaws to public transport system due to which there was opposition from auto-rickshaw drivers/union about city buses eating their livelihood. However, auto rickshaws are acting as the feeder system for both BRTS and city buses currently.

### **Stake Holder Consultations:**

Two rounds of stakeholder consultation were carried out as part of the Comprehensive Mobility Plan. The first one was in the form of an online survey initiated through the Corporation website and on social media in June 2017 and the second round was in the form of a city workshop on 22nd January 2018. The online survey questionnaire was designed to understand the most pressing issues that people face and their expectations from the plan. Along with this respondents were also asked to provide a vision that would convey their expectations.

As per the analyzed results, traffic congestion, accident and safety along with inadequate public transport emerged as the most important issues faced by citizens.

Surat Municipal Corporation hence came up with an efficient public transportation system with city buses feeding to major BRTS trunk routes.

### **RESULT ACHIEVED:**

The city has started the public transport system in 2014 with one BRTS corridor and city bus service in 2016. At present, BRTS service is operational on 12 routes with 207 buses on road and average of 1,35,000 daily ridership. City bus service is operational on 44 routes with 432 on road buses and an average of 1,40,000 daily ridership. The ridership is increasing day by day due to efficient, affordable and reliable service by authorities. SMC has set an example of the integrated way to use ITMS in the field of urban transport and changed the way urban mobility used to work in past. The state of art system is beneficial to all the stakeholders. ITMS has strengthened the operation management inefficiently. It is the first ITMS project implemented in all transit vehicles as well as in department and emergency vehicles.

Surat Sitalink Ltd and public transit users enjoy the following benefits by implementing project:

- Single established system across operators
- Real-time information to the public transit users
- Increased reliability
- Increased user satisfaction from 8.9 to 9.2
- Driver assessment program to incentivize or penalize a driver
- Close monitoring on any incident through the control centre
- Transit violations monitoring such as speed violation, missed stop violations and route deviation.
- Availability of transit database with each minor detail
- Central message publication to all transit vehicles in case of any event
- Mobile ticketing and real-time information at any time through the mobile application.

Administrative control centre established to effectively monitor any incident, violations with minor details on real-time basis to efficient delivery of all civic services.

Surat is taking up the challenge of moving from no public transport system towards a quality public transport system. With this step, Surat Municipal Corporation is



moving gradually towards giving smart solutions to provide a reliable public transport system to the citizens of Surat. Integration of services is not possible without technology. Hence, Integrated Transit Management System (ITMS) and Automatic Fare Collection System (AFCS) help towards developing an integrated Mass Transportation system.

All buses and stations are equipped with Passenger Information for announcements about arrival departure times and dissemination of relevant information. Mobile Applications for a user interface have been developed. GPS devices are installed to track the vehicles in real time. A command-and-control centre has been established and live-monitoring and management of operations are done to ensure the quality of service. An optimized fare structure has been developed to ensure affordability. The minimum fare is Rs. 4 and the maximum fare is Rs. 22. To enable modal integration, the same fare structure is adopted for all sub-systems of Public Transport. Fare collection is operated using AFCS and passengers need to take a single ticket for journey from any bus stop/station to any other with a single ticket involving multiple modes.

## i. Improved ridership

The combined ridership (BRTS, City bus services and HMC) has increased from 25 thousand passengers in November 2016 to 275 thousand passengers currently. The increase in ridership trend indicates that users have found this system affordable, convenient and attractive.

## ii. Improved Accessibility

Around 95% of the area within SMC is covered with a Public Transport network. The aim is to increase the coverage to 100%.



Public Transport Network Map

## iii. Increased Modal share

The majority of the commuters travelling in city bus have shifted from auto rickshaws for safe, affordable, convenient and comfortable journey. According to a user satisfaction survey, it was seen that almost 75% of the commuters have shifted from auto-rickshaws and 21% from two-wheeler.



Surat Money Card below

## iv. Improved User satisfaction

User satisfaction surveys were done to understand the perceptions and suggestions of the users using Public Transport services (BRTS, City bus and HMC). The survey also helped to capture the details like occupation distribution, frequency of travel, purpose of the trip, modal shift, access and egress mode with a total journey time of the city bus users. A total of 6000 user satisfaction surveys were conducted throughout the operational hours emphasizing morning and evening peak hours. Sampling was done on the basis of the ridership of each route. More than 21% of the commuters rated the public transport services as 10 out of 10 followed by 54% giving 9 ratings and 17% giving 8 ratings. The average commuter rating was 9 which shows the service is quite good.

## SUSTAINABILITY:

### 1. Economic Benefit:

Surat BRTS and City bus service have encouraged high-density development alongwith the transit network which has encouraged new business and mixed-use development. Also Land value along the PT network has increased. The modal shift from auto rickshaw is 80% and from private vehicles is 10%-12% which reduces the congestion, vehicle kilometer travelled and vehicle



*Passenger Information Systems at Buses*



*Turnstiles and Surat Money Card*

operating cost for individuals. Surat transport system offers job creation possibility in services, construction, design, operations & maintenance, manufacture, education and research.

## 2. Social Benefit

The integrated transport system provides faster, safer, healthier and less stressful journeys compared to private mode. According to user satisfaction survey, 70% - 80% of commuters are walking and 5% users are using bicycle as access and egress mode to public transport. Also, the city has developed a complete right of way along the BRTS corridor which provides wide and good quality footpaths and segregated cycle tracks which attract more walk and cycle trips for shorter distances and improve the health of people. Recently the city has developed a model smart road with pedestrian islands, landscape, street furniture, cycle track and wide footpath which attract more people to use walk and cycle. People living in remote areas are getting connectivity to public transport at an affordable price and access their employment location and recreational area easily. The system is highly affordable for the people of Surat, with minimum fare of Rs. 4 and maximum fare of Rs. 22.

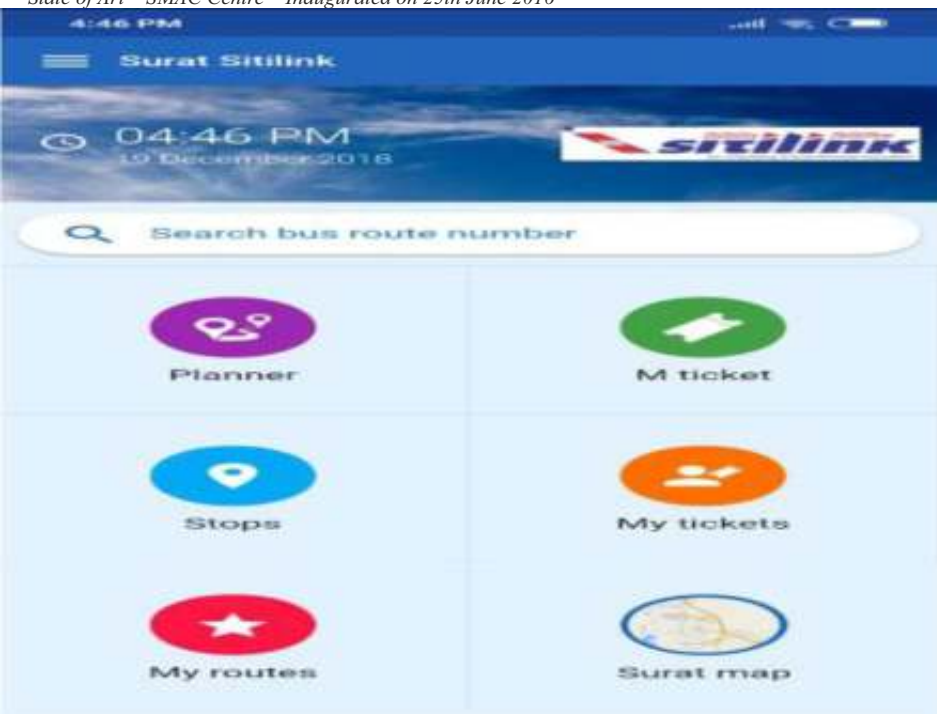
## 3. Environmental Benefit

According to user satisfaction survey, there is modal shift in favour of public transport. 75% of BRTS users have shifted from 3-wheelers (shared auto-rickshaws). Petroleum use in private vehicles and growth in vehicle miles travelled are among the main drivers of the growth in energy usage in Surat. Public transportation encourages energy conservation, as the average number of passengers on a transit vehicle far exceeds that of a private automobile. Even as a single transit vehicle consumes more energy than a private vehicle, the average amount of energy utilized per passenger is far less. Congestion relief through the use of transit also saves fuel as vehicles stuck in gridlock waste fuel and generate emissions. Surat transport system, moving more people with fewer vehicles reduces greenhouse gas as it reduces the emission generated by private vehicles. Surat transport system also reduces greenhouse gas emissions by facilitating compact development, which conserves land and decreases the distances people need to travel to reach destinations. Moreover, by reducing congestion, transit reduces emissions from cars stuck in traffic. SMC has introduced Common Card which is used at public





State of Art – SMAC Centre – Inaugurated on 25th June 2016



Mobile Application



Smart Card

transport, SMC facilities such as Tax, Swimming pool, GYM, Library, etc. and the same reduces the use of paper tickets.

### TRANSFERABILITY:

Surat is the only city in India to have all types of integration in transport system i.e. physical, fare, institutional, technological integration. Besides, Surat has various ongoing projects that are under the implementation stage under the smart city mission. The project regarding Mobility has also driven several Delegates within the country and on an international scale. The Delegates from various cities from India have understood the importance of various integration required in the public transport system from Surat. Hence, the public transport system of Surat city is taken up as a case study for different cities and towns.

### LESSON LEARNED:

This project has set a benchmark in displaying the capacity to transform the public transport market from negligible to remarkable growth within a short time frame. The city has planned integrated public transport with integrated planning, infrastructure and operation to

provide a convenient and affordable transport system to people. The city has developed interchanges and terminals to connect people to their destination with less waiting time. Government regulated services have outperformed the private bus transit market with efforts to ensure service levels and an aim to make public transport a preferred choice to commute.

The project has brought about a revolutionary change in the standard of living of the people living in the area through easy access to health and urban facilities. Because of affordable fares, commuters can save a lot of money. The labour can easily move to the nearby cities to work for their livelihood.

This project has given an opportunity for the citizens of the city to travel safely, conveniently and comfortably to their destinations which were not the case before city bus system and BRTS system got operated in the city.

Impacts include relief from congestion, improved safety, affordable city mobility options for economically weaker section. Also, the project provides opportunities for transit-oriented development/promote the compact city, and enable integration with other modes.







Gujarat Samachar Date: 23/12/2017



Gujarat Mitra Date: 22/12/2017

Journey of Surat Public Transport System



The Times of India Date: 20th July 2019



The Times of India Date: 24th November 2019



Sandesh Date: 2/1/2018



Dainik Jaagran Date: 2/1/2018



# પાલિકાએ બજાવેલી 'સુરત સિટીલીંક' મોબાઇલ એપનો પ્રયોગ સફળ થયો

## સિટી બસ ક્યાં છે અને ક્યારે આવશે તેની જાણકારી હવે મોબાઇલ એપ પર

સુરતના મુખ્યમંત્રી મુશાફર રો. ખોતાનું કાર્ડ લોકેશન, નંબર અને બસનો સમય જણાવી શકશે

સુરત, ૨૬

રેફરેન્સ: સુરતના મુખ્યમંત્રી મુશાફર રો. ખોતાએ સિટીલીંક એપનો પ્રયોગ સફળ થયો. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે.

સુરતના મુખ્યમંત્રી મુશાફર રો. ખોતાએ સિટીલીંક એપનો પ્રયોગ સફળ થયો. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે.

Gujarat Samachar Date: 26/10/2017

# Mass transit push spikes ridership by lakhs

Surat: The efforts of the civic authorities in the past 30 months to make mass transport popular in the Diamond City seem to be paying off with over 2.30 lakh passengers now boarding daily on BRTS and city buses.

The civic authorities had set a target of 15 lakh passengers per day 30 months ago, which was far from realistic. The rate at which passenger traffic is increasing is more encouraging. The figure of 2.30 lakh passengers is likely to be exceeded next year.

At present, BRTS carries over 1.2 lakh passengers per day and city buses over 1.1 lakh passengers per day. The rate at which passenger traffic is increasing is more encouraging. The figure of 2.30 lakh passengers is likely to be exceeded next year.

"The Diamond City has been the focus of public transport. The recent mass transit push has been a success. The rate at which passenger traffic is increasing is more encouraging. The figure of 2.30 lakh passengers is likely to be exceeded next year."

The Times of India Date: 14th December 2019

# સાલ કે પહેલે હી દિન બના રિકૉર્ડ

પરક દિન મેં ૧.૮૨૩ લાખ સે વધારા યાત્રીયો ને કિયા સિટી ઝીર કીઝરટીસ

સુરત, ૨૬

સુરતના મુખ્યમંત્રી મુશાફર રો. ખોતાએ સિટીલીંક એપનો પ્રયોગ સફળ થયો. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે. આ એપનો ઉપયોગ કરીને બસની સ્થિતિ જાણી શકાશે.

Divya Bhaskar Date: 5/1/2018

# Surat: Bicycle sharing project gets 10,000 registrations

MURBT: The bicycle sharing project under non-motorized transport system of Surat Municipal Corporation (SMC) has recently started receiving positive response from the people. In the past 10 days, over 10,000 registrations for bicycles have been received from 42 booking stations set up across the city.

Official records said responses among the residents for using the bicycles is tremendous and that demands are coming in from all over the city. The project is being implemented in phases. The first phase is to set up 100 bicycles at 10 stations. The second phase is to set up 200 bicycles at 20 stations. The third phase is to set up 300 bicycles at 30 stations.

Municipal commissioner (Surat) Pankaj Patel said, "We have received a lot of response from the people. They have started using the bicycles as a mode of transport. This is a good sign for the project. We will continue to expand the project in the coming months."

The Times of India Date: 8th September 2019



# LED BASED AUTOMATED STREET LIGHTING REPLACEMENT PROJECT UNDER ESCO MODEL ON SHARING OF COST SAVING BASIS

- by North Delhi Municipal Corporation

*Section 42 of the Delhi Municipal Corporation Act states that public lighting is one of the responsibilities of the Municipal Corporation and accordingly North DMC is maintaining close to 2 lacs street lights installed in its jurisdiction comprising, spread over approx. 600 sq. km. of six zones namely Rohini, Narela, Civil Lines, Keshavpuram, Karol Bagh, City and Sadar Paharganj. Before taking up this initiative, these conventional streets lights/Semi High Mast Lights under North DMC were maintained through respective power distribution companies of Delhi namely TPDDL, BSES Yamuna and BSES Rajdhani Power Limited.*

*North DMC planned to improve the overall energy efficiency by saving energy in public lighting under its jurisdiction through up-gradation of conventional Streetlight/semi-High Mast Lights by LED Light fixtures attached with Central Control and Monitoring System (CCMS) under annuity service contract/ESCO model in which sharing of cost savings on account of street lighting was involved.*

## BACKGROUND:

North DMC is providing various civic amenities to approximately 62 lakh (Census 2011) people. Street lighting, one of its obligatory functions, comprised mainly of conventional lights. This setup was good but for energy efficiency and automation. So, there was always scope for improvement in terms of upgradation to energy efficient LED lighting with automation control. This initiative was planned to give benefit to all social groups upon implementation.

## KEY DATES:

Dates (day-month-year)	Significance/Achievement
17-10-2017	Start of Project
17-10-2017	Replacement of streetlights started Phase-I
03-11-2017	Actual replacement Survey Completed Phase-I
30-11-2018	Replacement of streetlights Completed Phase-I
15-12-2018	Testing & Commissioning of System Phase-I
02-11-2017	Replacement of streetlights started Phase-II
28-03-2018	Actual replacement Survey Completed Phase-II
25-05-2019	Replacement of streetlights Completed Phase-II
10-06-2019	Testing & Commissioning of System Phase-II

## ESTABLISHMENT OF PRIORITIES:

The basic issue was not only to provide more efficient automated lighting but also to have improved overall lighting levels/experience. The priorities revolved around giving a whole some experience by way of trouble-free system having lighting fixtures



matching best standards i.e. requiring less maintenance and having desired uninterrupted service life, automation control and above all systematic and dedicated complaint redressal mechanism. The challenge was more since the existing system had to switch over to a new one without disturbing the comfort of people and hence planning had to be perfect to ensure seamless transition. For this, a transition setup of manpower and machinery, to be monitored periodically, was planned independent of team responsible for executing the project.

## PROCESS:

The key hurdle in the beginning of initiative was to identify the agency who will be willing to share the savings in an ESCO model project and at the same time ensure seamless transformation. This hurdle was overcome by framing the eligible bidder criteria wherein the bidder has to be manufacturer of light fittings as well as having experience of maintenance of street lights or JV of two criteria independently matching agencies. This procedure took care of financial resource aspects as well as seamless transformation aspects.

Pan India open tenders were invited with press publicity for implementation of this project in two phases. After completion of the bidding process, project was awarded to consortium of M/s Havells India Ltd. and M/s Tata Power DDL. While one of the agencies is one of the largest and renowned manufacturers of LED fixtures, whereas the other one has the expertise of successful maintenance and operation of street light for more than a decade.

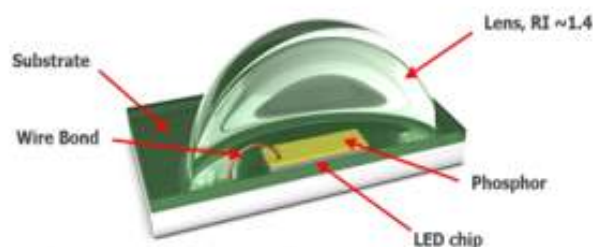
The constituents of both execution as well as transition team required different skill set and hence their participation was properly briefed. In addition, training was imparted to the unskilled and semi-skilled manpower specific to the project related to work ethics and safety. Only those clearing the test followed by training were allowed to participate. The weather condition was harsh particularly in summer and hence they were given motivation from time to time. The challenges faced by them in field was discussed and resolved to keep their morale high.

The executing agency used scientific planning tools but considering field challenges/uncertainties the bench

marks were modified. The bench marks were related to quality of product, quality & quantity of execution, measurement of performance parameters, quantum of energy saving, awareness about complaint redressal mechanism etc.

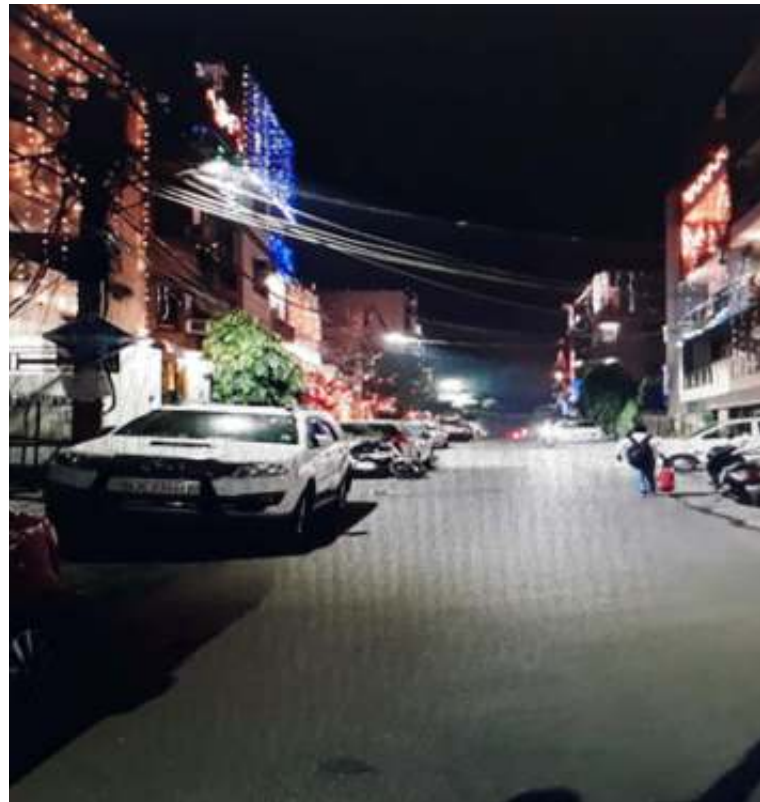
Assessment of the performance bench mark related to quality of fixtures was ensured through NABL accredited third party labs from time to time from various lots of supply. This was in addition to test report compliance by the manufacturer. The quantum of executed inventory is under verification by Bureau of Energy Efficiency (BEE), Ministry of Power certified third party independent agency National Productivity Council (NPC). During the contract period of seven years annual reconciliation of quantum of energy saving is to be done by the same agency based on which the quantum of annuity payment would be modified. The awareness of complaint redressal mechanism through dedicated helpline numbers 18004199744 & 19124 was ensured through advertisement in leading newspapers on regular intervals. The numbers were advertised on street light poles as well.

North DMC is ensuring to have all checks and balances in place to ensure assessment of performance through benchmarks set for the project. Every such aspect is reviewed on monthly basis for delivering quality service to the people of Delhi residing in North DMC jurisdiction. Not only this, the benchmarks pertaining to executing agency is also reviewed and monitored at various levels from time to time. In between, if any specific aspect is to be discussed in order to improve the performance, the same is taken up immediately by North DMC with the agency.



Typical lighting class LED pack





Traditional Street Lights vs. LED Luminaries

## **MOBILISATION OF RESOURCES:**

The project was planned on a new model probably first time in India wherein sharing of savings was involved with basics of an ESCO model. So financial resources required were taken care of by the selected agency that have enough liquidity/resources to handle the project as well as its contingencies.

Technical resources from both North DMC as well as selected agency was involved right from the stage of deciding specifications for the system components to finalizing the prototype to testing of parameters at accredited labs for conformity to configuration of system installed followed by its testing & commissioning.

Human angle was the most critical component in terms of resources as this included unskilled, semi-skilled, skilled and specialised skill human resources. Their roles were specifically defined right from concept to commissioning. The entire resource its mobilisation and subsequent utilization was regularly monitored by North DMC.

## **RESULT ACHIEVED:**

- The saving to North DMC started much before North DMC started paying the monthly annuity payment.
- The minimum anticipated reduction in electricity consumption per annum is close to the tune of 9 crore electricity units.
- Guaranteed minimum energy savings of 64.4% as committed by awarded agency.
- Systematic & dedicated complaint redressal mechanism by way of CCM System and dedicated helpline for street lighting.
- Sharing of energy savings @ 21 % to North DMC, throughout the contract period of seven years.
- No separate maintenance cost during execution as well as during currency of contract period of 7 years.
- The financial benefit to North DMC will be remaining 21% of the quantum of energy savings to the tune of Rs. 14 Crores per annum plus recurring maintenance charges i.e. close to the tune of Rs. 24 crores per annum (already being paid to DISCOMS on monthly

basis) plus Rs. 7 crores per annum required on account of maintenance of semi high mast lights plus Rs. 3 crores per annum required on account of capital replacement cost of semi high mast light fittings/system, maintenance of helpline setup, CMS & misc. setup i.e., Rs. 1 crore.

During execution of this work, North DMC has already achieved savings of approx. Rs. 33 Crores on account of maintenance cost and approx. Rs. 24 Crores on account of reduced energy charges as annuity started only after completion. Complete saving/virtual revenue generation for the project will be close to the tune of Rs. 400 crores.

Apart from the financial achievement, execution of this work has resulted in environmental protection by 64.4 % reduction in energy consumption on street lighting in North DMC. This reduction in power consumption will indirectly contribute for equivalent amount of capacity addition in terms of power generation and directly contribute for significant reduction in Carbon footprint on our planet.

## **SUSTAINABILITY:**

The initiative will achieve energy savings to the tune of 64.40% throughout the contract period of 7 years. 79% of the quantum of energy saving cost is to be shared with these agencies as annuity payment, but only from the date of completion. The financial benefit to North DMC has been cost saving on account of maintenance during the execution period of two phases and complete saving on account of reduced energy consumption during execution. In addition, after completion, the remaining 21% of the quantum of energy savings for North DMC continues for next 7 years. Subsequent to that 100% of energy savings would be credited to North DMC without any liability towards annuity payment.

This practice has helped to achieve enhanced lighting comfort and the same is environment friendly as well due to significant carbon reduction. The initiative has also helped North DMC in a big way in overcoming its financial crisis in the long run.

## **TRANSFERABILITY:**

Prior to adopting the best practice for implementation, the RESCO model was quite prevalent in which the entire



saving was retained by the agency executing the project. In this case, North DMC devised the model in which they were earning virtual revenue by way of saving from day one i.e. the start of project.

Many government agencies have adopted this methodology used for this best practice for their similar nature of projects. Even one of the premier agencies involved in energy efficiency i.e. EESL has tendered on the model of North DMC or states like Odisha and others.

So, this methodology adopted for this practice is probably first one in India, which has easy transferability in addition to the proven results.

### LESSON LEARNED:

North DMC is one of the largest municipalities serving a population of more than 50 lakh that too in capital of the country i.e., Delhi. So, it has to be the trend setter in terms of implementing energy efficiency projects. Huge potential, not only for protecting environment but also for energy saving in street lighting, was the real motivation behind this work. Additional positive aspects such as enhanced visual comfort, safety of women and restoration of faith of common man in government system etc. are also remarkable.

Some of the municipalities in India have already taken up similar energy efficiency initiative and North DMC went through some of those project details and devised its contract conditions and strategies accordingly by analysing pros and cons learnt from those examples. North DMC went one step further by bringing in value additions like virtual revenue generation from day one, which was quite unlike the existing models of that time. Advice of North DMC for others who opt to follow the model was to analyse existing setup so as to have clear idea beforehand about the savings and other outcomes.

In nutshell, without investing a single penny, just by sheer planning and meticulous execution, regular virtual revenue generation can be ensured for a long run for financially constrained public utilities.

### REFERENCES:

S.No.	PUBLICATION SOURCE	DATE OF PUBLICATION
1	DAINIK JAGRAN (HINDI)	01.03.2017
2	TOP STORY (ENGLISH)	01.03.2017
3	HINDUSTAN (HINDI)	22.07.2017
4	NAVABHARAT TIMES (HINDI)	22.07.2017
5	HINDU (ENGLISH)	22.07.2017
6	PIONEER (ENGLISH)	22.07.2017
7	STATESMAN (ENGLISH)	22.07.2017
8	TIMES OF INDIA (ENGLISH)	19.10.2017
9	ASIAN AGE (ENGLISH)	19.10.2017
10	HINDUSTAN (HINDI)	19.10.2017





दैनिक जागरण / 01-03-2017

## एलईडी लाइट लगा प्रतिवर्ष 42 करोड़ रुपये बिजली बिल बचाएगा निगम

जलमल रोडवर्क, नई दिल्ली: नुबने दिल्ली की संसदीय विधानसभा क्षेत्र में बिजली बिल को घटाने के लिए एलईडी लाइटों का उपयोग किया जा रहा है। एलईडी लाइटों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी। एलईडी लाइटों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी।

एलईडी लाइटों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी। एलईडी लाइटों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी। एलईडी लाइटों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी।

हिन्दुस्तान / 22-07-2017

## उत्तरी निगम स्ट्रीट लाइट पर एलईडी बल्ब लगाएगा

नई दिल्ली / जगमग

उत्तरी निगम क्षेत्र में 42 करोड़ रुपये की लागत से एलईडी बल्बों का विद्युत प्रकाश व्यवस्था में बदलाव किया जाएगा। एलईडी बल्बों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी।

एलईडी बल्बों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी। एलईडी बल्बों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी।

HINDU / 22-07-2017

## North corporation to install LED streetlights



Enhanced visibility of LED streetlights under the city, which is a contract has been awarded for LED lighting fixtures.

Move to check the problem of dark spots, says Mayor

North Delhi Municipal Corporation (NDMC) is planning to install LED streetlights to overcome the problem of dark spots. The project is expected to be completed by the end of the year.

Replacement process

The NDMC is planning to replace the existing streetlights with LED lights. The project is expected to be completed by the end of the year. The NDMC is planning to replace the existing streetlights with LED lights. The project is expected to be completed by the end of the year.

हिन्दुस्तान / 19-10-17

## स्ट्रीट लाइट एलईडी से जगमग हुई

नई दिल्ली (का.सं.)। उत्तरी निगम क्षेत्र में स्ट्रीट लाइट से सोडियम बल्बों का स्थान एलईडी बल्बों का ले लिया गया है। एलईडी बल्बों का उपयोग करने से बिजली बिल में 42 करोड़ रुपये की बचत होगी।

PIONEER / 22-07-2017

## Will replace 2 L conventional street lights with LEDs: NMC



North Delhi Municipal Corporation (NDMC) is planning to replace the existing streetlights with LED lights. The project is expected to be completed by the end of the year. The NDMC is planning to replace the existing streetlights with LED lights. The project is expected to be completed by the end of the year.

## NDMC earmark ₹ 240 cr for LED street lights

Staff Reporter New Delhi 7:58 PM  
Converting street lights into LEDs would bring down the cost of streetlights by 54 percent for the North Delhi Municipal Corporation (NDMC), a budgetary proposal worth Rs 240 crore has been earmarked in this financial year.

Leader of house in North Delhi Municipal Corporation Vijay Prakash Pandey said that functioning cost of street lights, semi high mast lights and park lights would be reduced by 54 percent in its jurisdiction by converting them into LEDs.

Pandey said that budget of Rs 240 crore has been earmarked for street light in this financial year. He said that cost of street lighting would come down by 53.61 percent after converting them into LEDs as per unit cost would be reduced to Rs 3.66 per unit to be paid to power discoms.

He further said that converting the street lights into LEDs would lead to saving of



Cost of street lighting would down by 53.61 percent after converting them into LEDs as per unit cost would be reduced to Rs 3.66 per unit to be paid to power discoms - Vijay Prakash Pandey, Leader of house

about 10 crore unit and Rs. 42.50 crore annually. Pandey informed that open tenders are being invited for 7 years for installation and maintenance of LED bulb light fixtures. He said that the entire cost of the project would be borne out of saving from the payment to discoms and hence no additional expenditure for North DM.

He said that apart from saving cost and energy, the project would also help reduce carbon footprint.

PIONEER / 22-07-2017

## Will replace 2 L conventional street lights with LEDs: NMC

Vijay Prakash Pandey

North Delhi Municipal Corporation (NDMC) on Friday announced to replace over two lakh conventional street lights by LED street lighting system within nine months.

The move is expected to save ₹50 crore annually along with cut in expenditure on maintenance charges. Besides energy saving, the move would also bring down the cost of streetlights by 54 percent for the North Delhi Municipal Corporation (NDMC).

Franses Gupta, Commissioner of NDMC said, "The work for replacing 2 L lakh lights will begin in October and November from Sunday. Contract has been awarded for ₹1.25 lakh light fixtures in the parks of the larger areas - Bahadur and Panchsheel and the



containing 40,000 will be in the City, Civil Lines, Badli, Panchsheel and Karol Bagh areas," said Gupta. "The tenders of the same have been received and scrutinized. The project is likely to be completed quite early from the schedule. Also there is provision to impose fine in case of any delay in achieving target as per the schedule. Almost 20,000 lighting fixtures per week would be available for installation. The entire conventional lighting system, semi high mast lights and lights in parks of its jurisdiction will be replaced with LEDs," he said.

A senior Corporation official said that the manufacturer especially designed the product to meet the specifications including minimum seven years life span. "The LEDs will be fitted with sensors so that they go on and off automatically as per requirements. The entire LED lighting system will be watched through a central control and monitoring centre so that timely repairs and replacements could be done," he said.

It took 2.5 months to develop the product. The project will ensure proper maintenance and operation of the street lighting system.

# APPLICATION OF ENVIRONMENTAL FRIENDLY TECHNOLOGIES AT CITY / BUILDING LEVEL

- by Chennai Metropolitan Water Supply and Sewerage Board, Tamil Nadu

*The Sewerage System for Chennai city was installed in 1917 and has been divided into 5 drainage zones. These zones of macrosystems covering the entire city have independent zonal collections, conveyance, treatment and safe disposal facilities. Chennai city has 12 Sewage Treatment plants at 4 locations with a total installed capacity of 727 MLD. Around 530 MLD of Secondary Treated Effluent is discharged into the waterways. Chennai has a dense industrial cluster and ensuring an uninterrupted water supply is vital for their viability. In order to supply water to various Industries at the Northern part of Chennai and SIPCOT industries in southwest part of Chennai city, CMWSS Board has constructed 2 Tertiary Treatment Reverse Osmosis (TTRO) Plants of 45 MLD capacity each expandable to 60 MLD at Koyambedu and Kodungaiyur, including laying conveying pipeline to supply product water to the SIPCOT Industries in Irungattukottai, Sriperumbudur and Oragadam and Industries in Manali-Ennore Corridor & Manali-Minjur Corridor, North Chennai. A total of 540 industries from both Industrial corridors including thermal power plants are the beneficiaries of this technological intervention. This ensures assured treated water supply and reduces the freshwater supply-demand to the industries.*

## BACKGROUND:

Chennai is a metropolitan city and capital of Tamil Nadu. It has an area of 426 sq km and a population of 7.5 million. While the water sources have remained constant, the demand has been steadily rising. The demand-supply gap is 300 to 400 MLD per day and hunting for drinking water was the challenge for the citizens of the city.

The industrial demand is around 100 MLD per day which is presently met from surface water and desalination. Around 530 MLD of Secondary Treated Effluent is discharged into the waterways every day. By recycling and reuse of waste water, which otherwise would have been discharged into the waterways, an additional source of water is being generated. The establishment of TTRO Plants has not only reduced the demand of freshwater

supply to the industries but also the letting of secondary treated sewage in the waterways.

## KEY DATES:

Dates	Significance /Achievement
01.10.2019	Commissioning of TTRO Plant at Kodungaiyur
29.11.2019	Commissioning of TTRO Plant at Koyambedu

## ESTABLISHMENT OF PRIORITIES:

- Uninterrupted supply of treated waste water to the industries, thereby facilitating industrial growth and employment.
- Introduction of Reduce – Recycle – Reuse (RRR) concept for sustainability.
- Reduced contamination of waterways due to reduced discharge of waste water.

- Conservation of water bodies and prevention of groundwater depletion by industries.
- To drought-proof Chennai during failure of monsoon.
- Reducing the stress arising due to vagaries of monsoons.

CMWSSB also embarked on a unique initiative of setting up the largest Tertiary Treatment plants in the last two years which have been commissioned and supplies 90 MLD of potable quality reuse water to the industries in the city every day . Chennai will become the first Indian city to recycle and reuse 20% of its sewage, which will be the highest performance of any Indian city in that matter. 30 MLD of secondary treated sewage is being supplied to the industries from the year 1993. On the whole, 120 MLD of freshwater supply to the industries is saved which will reduce the demand-supply gap.

#### **PROCESS:**

Recycle and reuse of wastewater by Tertiary Treatment Reverse Osmosis is a technology-driven intervention to ensure uninterrupted supply of water to the industries. Adoption of state-of-the-art technology to address the water security of the city has been the key feature of this project.

The Sewerage System for Chennai city was installed in 1917 and has been divided into 5 sewerage zones. These zones of macrosystems covering the entire city have independent zonal collections, conveyance, treatment and safe disposal facilities.

Koyambedu area falls under Zone III, covering an area of 34.2 sq km with a population of 9.5 lakhs (as per the 2011 census). There are three treatment plants of 34 MLD, 60 MLD and 120 MLD capacity totalling 214 MLD exist at Koyambedu for treating the sewage generated in the Central Chennai & West Chennai city area and adjacent urbanised areas of Ambattur (Part) and Mogappair. The present generation of sewage from Zone III and adjacent urbanized areas is about 120 MLD. Out of the 120 MLD, 65 MLD of wastewater shall be treated up to the tertiary level to get the product water of 45 MLD through Reverse Osmosis and distributed to Industries.

Kodungaiyur area falls under Zone I & II, covering an area of 86.14 sq. km. with a population of 16.5 lakhs (as per 2011 census). There are three treatment plants of 80 MLD, 80 MLD and 110 MLD capacity, totalling 270 MLD existing at Kodungaiyur for treating the sewage generated in the North Chennai & part of Central Chennai city area and adjacent urbanised areas of Madhavaram and Kathivakkam. The present generation of sewage from Zone I & II and adjacent urbanized areas is about 220 MLD per day. Out of the 220 MLD, 65 MLD of wastewater shall be treated up to the tertiary level to get the product water of 45 MLD through Reverse Osmosis and distributed to Industries.

During the execution of the project, an extensive awareness campaign was undertaken on the importance of recycling and reusing. Market linkages were established upfront with all industrial stakeholders by holding repeated meetings and visits to the plant to allay all concerns about the safety and quality of reuse water. The product water was christened as “TRU water” (Tertiary Reusable Water) in the lines of Singapore's 'NEW water' for branding. Also, Resident Welfare Associations were actively invited for advocacy workshops to explain the novel concept that was being adopted.

#### **MOBILISATION OF RESOURCES:**

The TTRO Plant at Koyambedu was established at a cost of Rs. 486.21 crores. Rs. 231.50 crore has been received as Grant from GoTN under TNIPP Phase I, Rs.208.82 crore has been sanctioned as a grant from the Government of India and Government of Tamil Nadu under AMRUT and Rs. 30.00 crore as a grant from GoTN under CMCDM. Similarly, the TTRO Plant at Kodungaiyur was established at a cost of Rs. 348 crore. Rs. 229.50 crore of which Rs. 153.00 crore as loan and Rs. 76.50 crore as a grant has been received from TNSUDP under World Bank funds and Rs. 118.67 crore has been sanctioned as grant from Government of India and Government of Tamil Nadu under AMRUT. The technical and human resources contributed by the Engineers & employees of CMWSSB, TWIC and the contractors M/s. BGR Energy Systems Limited, Chennai and M/s. Wabag & IDE



consortium, Chennai was the success in implementing these projects.

Public awareness in utilizing the use of recycled water in their day-to-day usage, other than drinking purposes has been generated by an extensive campaign involving stakeholders like industries & IT companies, Resident Welfare associations, Gated communities, NGOs etc. Advocacy campaign on the safety and quality of reuse water was done on a large scale.

### **RESULT ACHIEVED:**

A total of 130 ML of Secondary Treated Effluent Water (STEW) from the existing STPs at Koyambedu and Kodungaiyur is being used as feed water for the TTRO plants at the above locations which generate 90 MLD of TTRO water which is supplied through long pipelines of 60 km and 25 km respectively to around 540 industries which are located in the western and northern parts of the city.

CMWSSB has made greywater recycling mandatory for special buildings and multi-storied buildings for effecting new water and sewer connections.

Results achieved are:

- Improvement in the availability of water for city supply by 90 MLD due to swapping of present freshwater sources for industries with recycled wastewater.
- Uninterrupted supply of water to the industries, thereby facilitating industrial growth and employment.
- Reducing the stress arising due to vagaries of monsoons.
- Water recycling offers resource and financial savings. It is a revenue-generating activity as the entire product water is sold to industries.
- Reduced contamination of waterways due to reduced discharge of wastewater.
- Conservation of water bodies and prevention of groundwater depletion by industries.

### **SUSTAINABILITY:**

Water recycling offers resources and financial savings. This is a classic case of Waste to Wealth intervention and illustration of the circular economy of water. Around 530 MLD of secondary treated effluent is generated in a day in Chennai city. The industrial demand is around 100 MLD which is presently met from surface water and desalination. By recycling and reuse of wastewater, which otherwise would have been discharged into the waterways, an additional source of water is being generated. The production cost is lesser by around Rs. 26/KL than desalination, but then it serves to be environment friendly compared to the latter. The total cost inclusive of capex would be around Rs. 36/ KL. Also, this TTRO water is meant for industrial use for which the tariff is Rs. 80/ KL. This ensures better cost recovery, rather is a revenue-generating activity. At current rates, the breakeven period is estimated to be just five years.

Conservation of the water bodies reduces the stress arising due to the vagaries of monsoons. Even the worst drought situation can be managed with the available water sources.

### **TRANSFERABILITY:**

Most of the urban local bodies in the country have an underground Sewerage System and a Sewage Treatment plant or a Faecal Sludge Treatment Plant. Wastewater recycling and reuse system through TTRO can be successfully implemented in any state with the coordination of the Government and with the cooperation of the public with proper designing of structures according to the soil conditions and creating awareness sustainably as done by the CMWSSB. The product water can be earmarked for industrial use or agricultural use. In times of water scarcity, it may even be used as a source of drinking water as it is completely devoid of any physical, chemical or biological contaminants. The TDS level is less than 70 mg/L which is much less than that of conventional tap water which is around 250 mg/L.

### **LESSON LEARNED:**

The expansion of the city coupled with the failure of

monsoons has thrown up lots of challenges for CMWSSB. Chennai with 7.5 million population and home to many big IT companies was reeling under a severe water crisis. In order to fight against drought and provide a permanent and sustainable solution to the water crisis, the CMWSSB had to explore the possibility of augmenting the supply from both conventional and non-conventional sources.

The project is perfect illustration of a closed-loop water supply system, wherein water is effectively recycled and

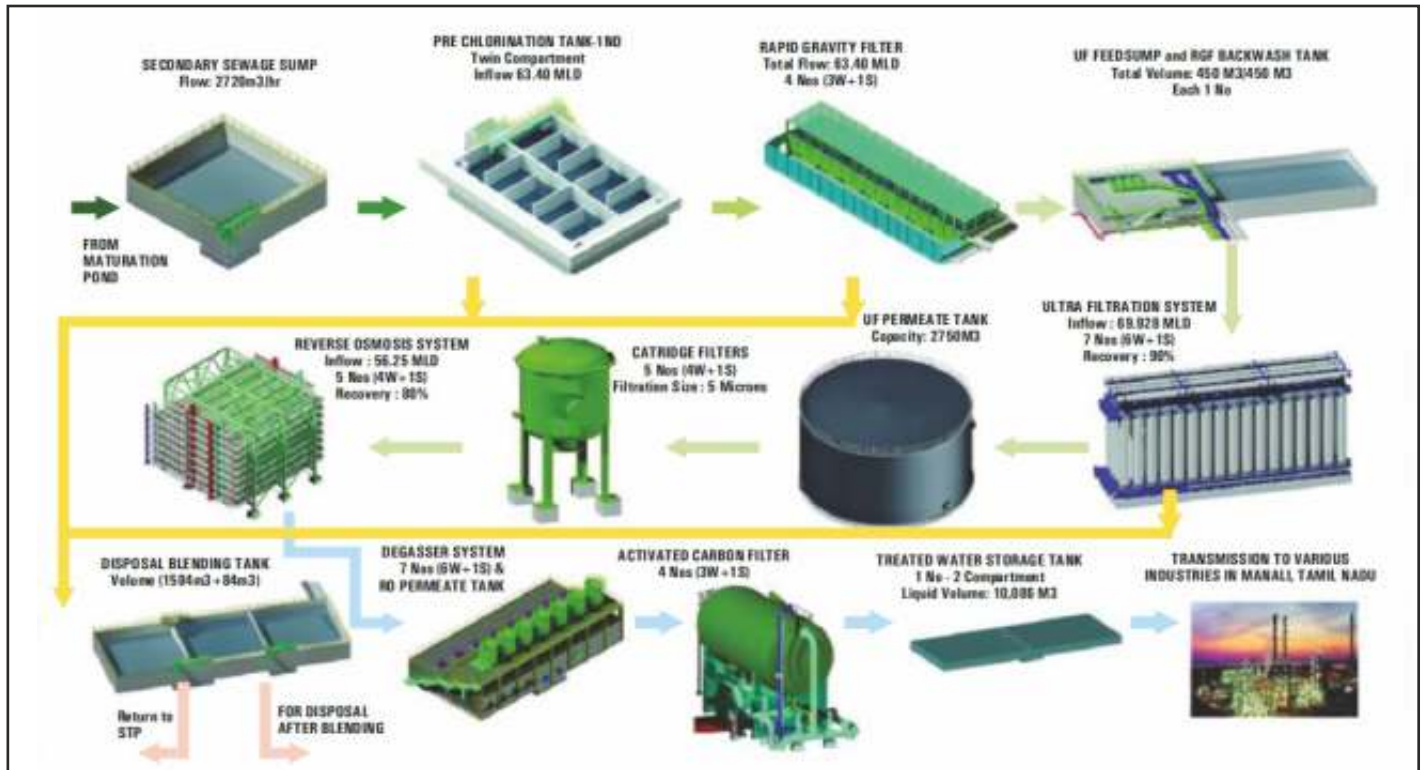
reused. It also helps in swapping the present source of supply to industries which is a combination of surface water from the city reservoirs, desalination plants and groundwater with TTRO water. All these ensure high water use efficiency.

The use of waterways as water storage in urban areas leads to additional resource of water. Using the treated wastewater to recharge water bodies will prevent the encroachment of dry river/lake beds during non-monsoon period.



*SAF Games Village - Koyambedu.*





Grey water recycling



Grey water reuse – Apartment complexes



# INCREASING CITY RESILIENCE

- by Chennai Metropolitan Water Supply and Sewerage Board, Tamil Nadu

*Water shortages and droughts have always been a part of Chennai's water history and the city water supply is impacted by the poor North-East monsoon and the dwindling storage of its reservoirs. The city does not have any perennial water source and the city's four main reservoirs are primarily rain-fed and are affected by the vagaries of the monsoon. The other two important water sources viz. Telugu Ganga Project (Krishna water from Andhra Pradesh) and Veeranam lake (Cauvery Water) are not only dependent on rainfall but also affected by political issues. As part of the drought contingency measure, Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) had to explore the possibility of augmenting the supply from both conventional and non-conventional sources.*

*Source diversification is imperative to address the scarcity of the need. Establishing desalination plants, converting abandoned quarries as water reservoirs, promoting wastewater reuse by establishing Tertiary Treatment Reverse Osmosis (TTRO) Plants, conversion of abandoned wells and bore wells into rain water harvesting structures are the few alternatives CMWSSB adopted to minimise the water demand-supply gap.*

## BACKGROUND:

Chennai is a metropolitan city and the capital of Tamil Nadu. It has an area of 426 sq km and a population of 7.5 million. Chennai has a dense industrial cluster and ensuring an uninterrupted water supply is vital for their viability. While the water sources remained constant, the demand has been steadily rising. It is increasingly becoming difficult for the water managers to cater to the growing water demand with the existing water sources alone. The demand-supply gap is 300 to 400 MLD and hunting for drinking water was a challenge to the citizens of the city.

## KEY DATES:

Dates (day-month-year)	Significance Achievement
25.07.2010	Commissioning of Desalination Plant at Minjur
22.02.2013	Commissioning of Desalination Plant at Nemmeli
01.10.2019	Commissioning of TTRO Plant at Kodungaiyur
29.11.2019	Commissioning of TTRO Plant at Koyembedu

## ESTABLISHMENT OF PRIORITIES:

- Making Chennai a drought proof city during failure of monsoon
- Augmentation of additional water source
- Introduction of Reduce – Recycle – Reuse (RRR) concept for sustainability
- Uninterrupted supply of treated wastewater to the industries, thereby facilitating industrial growth and employment
- Reducing over-exploitation of groundwater and avoid sea water intrusion into groundwater aquifers
- Reducing the stress arising due to vagaries of monsoons.

CMWSSB is supplying potable water to Chennai city from its water treatment plants having a total capacity of 1494 MLD which are located at Kilpauk, Redhills, Chembarambakkam, Surapattu and Vadakuthu and the

desalination plants located at Minjur and Nemmeli. During the normal season about 830 MLD of water will be supplied to Chennai city.

The year 2016 has faced the worst rainfall in the last 140 years in Tamil Nadu. The performance of North East Monsoon in 2016 was far from the expected lines. Owing to the rise in water demand and looming climate change, recent years have witnessed much focus on drought scenarios. Considering the constraints in creating new large water storage reservoirs for augmenting the city water supply and meeting the ever-growing demand, CMWSSB in its effort to decentralize and identify additional sources for city water supply, found an opportunity and made a never before attempted effort to convert the abandoned mining quarries in the vicinity of Chennai city into water reservoirs. Abandoned stone quarries not only offer promise for expanding the available reservoirs for drinking water supply system but also provides hope for acting as new reservoirs if implemented across the country.

CMWSSB also embarked on a unique initiative of setting up the largest tertiary treatment plants in the last two years which have been commissioned and supplying 90 MLD of potable quality reuse water to the industries in the city. Chennai will become the first Indian city to recycle and reuse 20% of its sewage, which will be the highest performance of any Indian city in that matter. 30 MLD of secondary treated sewage is being supplied to the industries from the year 1993. On the whole, 120 MLD of freshwater supply to the industries is saved which will reduce the demand-supply gap.

Due to the depleting storage of Veeranam lake, it was considered necessary to identify additional sources to compensate for the quantity reduction in lake drawl. Accordingly, an additional 30 MLD of water was drawn from Wallajah lake directly which was conveyed through 400 mm HDPE pipeline to Vadakuthu WTP for treatment. The work was executed within a short period of 10 days at a total cost of Rs. 70.14 Lakhs. The pumping operations were commenced on 20.08.2019 and a total of 220 ML of water was drawn by this arrangement till 29.08.2019.

Transportation of water from Jolarpetto Chennai through rail wagons was estimated with a total cost for transportation of 10 MLD of water for a period of 6 months as Rs. 66 Crore. At Jolarpet Railway Station, water has been filled in 50 Wagons each having a capacity of 55 KL and thus transporting 2.75 ML per trip and by making 2 trips in a day and 5.50 ML of water is being brought daily to meet the drinking water needs of Chennai city. By this arrangement, CMWSSB has received a total of 159 trips amounting to the quantity of 438 ML of water from Jolarpet to Chennai through railway wagons.

### PROCESS:

Converting the abandoned mining quarries into water reservoirs taken up as a drought contingency measure is first of its kind and does not have any previous engineering references to rely upon. Initially, the possibilities of using the stored water left stagnant in the abandoned quarries at Sikkarayapuram, Malayambakkam, Pammal, Thiruneermalai, Pallavaram and Nanmangalam were explored and twenty-five quarries at Sikkarayapuram and Malayambakkam were taken up for study and implementation in 2017, due to their proximity to Chembarambakkam Water Treatment plant. On ascertaining a quantity above 3000 ML from the surveys and quality of the stored water within treatable limits, it was proposed to transfer the water for further treatment at the 530MLD treatment plant at Chembarambakkam which is about 3 km away.

The water evacuation operation both for inter-basin transfer and transmission to WTP has to be carried out in treacherous terrain. The short period and large quantity to be evacuated considering evaporation loss pose challenges in the ready availability of materials, machines and mobilization of required capacities immediately at the site. As a result, a total of 400 mcft or 11.32 mcm storage capacity was added to the city in a short period of time and around 3000 million litres of water was supplied during an acute water shortage situation. Subsequently, they have been systematically interlinked and connected to the centralised water distribution system. Again in 2019, nearly 4500 ml of water was supplied to the city

during the acute shortfall of storage from March to November.

Recycle and reuse of wastewater by Tertiary Treatment Reverse Osmosis is a technology-driven intervention to ensure uninterrupted supply of water to the industries. Adoption of state-of-the-art technology to address the water security of the city has been the key feature of this project.

The sewage generated in the Central Chennai and West Chennai City area and adjacent urbanised areas of Ambattur (Part) and Mogappair is conveyed to Koyambedu STP for treatment and disposal. The present generation of sewage is about 120 MLD. Out of the 120 MLD, 65 MLD of wastewater shall be treated up to the tertiary level to get the product water of 45 MLD through Reverse Osmosis and distributed to SIPCOT Industries in Irungattukottai, Sriperumbudur and Oragadam in south-west part of Chennai city.

Similarly, the sewage generated in the North Chennai and part of Central Chennai City area and adjacent urbanised areas of Madhavaram and Kathivakkam is treated in Kodungaiyur STP. The present generation of sewage is about 220 MLD. Out of the 220 MLD, 65 MLD of wastewater shall be treated up to the tertiary level to get the product water of 45 MLD through reverse osmosis and distributed to industries in Manali–Ennore Corridor and Manali–Minjur Corridor, North Chennai.

During execution of the project, an extensive awareness campaign was undertaken on the importance of recycling and reuse. Market linkages were established upfront with all industrial stakeholders by holding repeated meetings and visits to the plant to allay all concerns about the safety and quality of reuse water. The product water was christened as “TRU water” (Tertiary Reusable Water) in the lines of Singapore's 'NEW water' for branding. Also, Resident Welfare Associations were actively invited for advocacy workshops to explain the noble concept that was being adopted.

### **MOBILISATION OF RESOURCES:**

Chennai city is mainly depending on the rainfall during monsoon for the water storage. Whenever monsoon fails,

it leads to an acute shortage in the reservoir level and thereby affects water supply to the residents of Chennai. The first desalination plant of 100 MLD capacity on Design, Build, Own, Operate and Transfer Basis (DBOOT) was established at Minjur in the year 2010 and subsequently, another plant of 100 MLD capacity at Nemmeli, with full financial assistance from the Government of India in the year 2013 are currently operational and playing a major role in fulfilling the water supply requirements of Chennai city.

The establishment of another 150 MLD capacity desalination plant is under progress with grants under AMRUT scheme and financial assistance from KfW, the German funding agency at an estimated cost of Rs. 1259.38 Crores. One more desalination plant of 400 MLD capacity is to be implemented at Perur along the East Coast Road in South Chennai with financial assistance for an approximate value of Rs. 4267.70 crores from Japan International Co-Operation Agency (JICA). The balance amount Rs. 1810.70 crores will be met out by Tamil Nadu Infrastructure Development Board (TNIDB) fund and Government of Tamil Nadu (GoTN).

The TTRO Plant at Koyambedu was established at a cost of Rs. 486.21 crores. Rs. 231.50 crores has been received as Grant from GoTN under Tamil Nadu Investment Promotion Programme (TNIPP) Phase- I, Rs. 208.82 crores has been sanctioned as grant from Government of India and GoTN under AMRUT and Rs. 30.00 crores as grant from GoTN under Chennai Mega City Development Mission (CMCDM). Similarly the TTRO Plant at Kodungaiyur was established at a cost of Rs. 348 crores. Rs. 153.00 crores as loan and Rs. 76.50 crores as a grant has been received from Tamil Nadu Sustainable Urban Development Project (TNSUDP) under World Bank funds and Rs. 118.67 crores has been sanctioned as grant from the Government of India and GoTN under AMRUT. The technical and human resources contributed by the Engineers & employees of CMWSSB, TWIC and the contractors M/s. BGR Energy Systems Limited, Chennai and M/s. Wabag & IDE consortium, Chennai was the success in implementing these projects.





*Conversion of quarries into the water reservoir*



The possibilities of using the stored water left stagnant in the quarries were explored. The quantity and quality of the available Water in stone quarries were carried out and 54 parameters were tested for compliance with IS-10500-1991 standards. Detailed bathymetric and topographic studies were undertaken for quantity availability and designing the engineering system. Based on this, a solution for the drinking water supply for Chennai city was proposed and successfully implemented with public acceptance. The proposal was designed, engineered, completed and commissioned in 45 days.



*Transportation of water from Jolarpet to Chennai through rail*

## RESULT ACHIEVED:

CMWSSB is the pioneer in using stagnant water in the abandoned quarries for drinking purposes after necessary

treatment. 30 ML of water was drawn daily from quarries. Result achieved are as follows:-

- Augmentation of storage capacity of the city by at least 1000 mcft.
- Availability of water supply to the city. Around 5000 Million litres of water could easily be tapped in a year for city water supply.
- New reservoirs with nil socio- economic and environmental costs.
- During water shortages, they serve as an effective backup option. During 2019, around 30 MLD was drawn for more than 6 months which was around 6% of the total water supplied daily, the quarries get filled up by the rainwater and excess flows from surface runoffs.
- Water recycling offers resource and financial savings. It is a revenue generating activity as the entire product water is sold to industries.
- Improvement in the availability of water for city supply by 90 MLD due to swapping of present freshwater sources for industries with recycled wastewater.
- Uninterrupted supply of water to the industries, thereby facilitating industrial growth and employment.

## SUSTAINABILITY:

Chennai is in a state of supply-demand mismatch and water is drawn from multiple sources – surface water reservoirs, well fields, desalination, wastewater reuse and inter basin water transfer. Most of these options are expensive and have their associated socio-economic and environmental impacts. In the case of quarries, water stored in the abandoned quarries which were hitherto unutilised has been used for water supply. It is a cost-effective and most environmental friendly intervention with nearly nil cost for establishing compared to all other expensive options. The water is drawn from the quarries and is transmitted to the nearest Chembarambakkam Water Treatment plant which is 3 km away for conventional treatment. The treatment cost is only Rs. 7.00 per Kilolitre. The only cost is the capital cost of



*Desalination Plant at Minjur*

putting up the pumping infrastructure and the recurring cost of pumping for transmission, which is a very short distance compared to cases of river basin transfer which transport water from more than 250 km from Krishna and Cauvery basins.

## TRANSFERABILITY:

The use of quarries as a concept is easily replicable across the country especially in areas where mining activity is over and active. In fact, the lessons learnt from the conversion of quarries by CMWSSB in 2017 have been transmitted to other local bodies of Tamil Nadu. Works were carried out to tap nearby quarries as water sources in Pallavaram and Pammal municipalities and were successfully implemented by the local bodies in 2019.

Most of the urban local bodies in the country have an underground sewerage system and a sewage treatment plant or a faecal sludge treatment plant. Waste water recycling and reuse system through TTRO can be successfully implemented in any state with coordination of the government and with cooperation of the public with

proper designing of structures according to the soil conditions and creating awareness sustainably as done by the CMWSSB. The product water can be earmarked for industrial use or agricultural use. In times of water scarcity, it may even be used as a source of drinking water as it is completely devoid of any physical, chemical or biological contaminants. The TDS level is less than 70 mg/L which is much less than that of conventional tap water which is around 250 mg/L.

## LESSON LEARNED:

Chennai along with its adjoining districts is one of the most rapidly urbanising areas of the country and does not have scope for developing new large reservoirs for rainwater. Conversion of abandoned quarries as water reservoirs was not attempted in any part of the world given the unique challenges associated with it, mostly perceived. Use of quarries as reservoir has been a game changer in Chennai's water supply, given that it is among the most cost-effective with nil environmental impact and high efficiency option. It is due to the following factors –

**Reduced evaporation loss** – Unlike conventional reservoirs, these quarries are very deep and can thereby store a large quantity of water even if spread over a smaller surface area, thereby causing minimal evaporation loss.

**Reduced seepage loss and flood mitigation carriers** – Given the rocky nature of the reservoirs, there are minimal loss due to seepage, they also offer scope for storage of excess water due to intense short spells and mitigating storage scope during floods.

The quarrying sites are free of habitations and other permanent structures and are also not easy to encroach upon, due to which rainwater in the catchment areas of the quarries can be harnessed efficiently with minimal surface runoff.

Waste water reuse is the perfect illustration of a closed-loop water supply system, wherein water is effectively recycled and reused. It also helps in swapping the present source of supply to industries which is a combination of surface water from the city reservoirs, desalination plants and groundwater with TTRO water. All these ensure high water use efficiency.



# TAXI STAND CUM LADIES' RETIRING ROOM

- by Perinthalmanna Municipality, Kerala

*The project aims at establishing a modern refreshment and retiring place exclusively for women in Perinthalmanna Municipality in Malappuram District. Perinthalmanna Municipality is the headquarters town of the revenue division and taluk. The proposed location is near the central junction where passengers are waiting on the road itself for long route buses having no waiting shed to depend upon. Moreover, it is home to 16+ hospitals and it is popularly known as "Hospital City" and has an approximate floating population of 20000 per day. The land under the ownership of the Municipality is used for construction of the project. The building also has 12 number of taxi parking spaces in the ground floor. The total cost of the project is Rs. 94.75 lakh which is raised by the Municipality. The Municipality planned to meet this expenditure from its own funds and HUDCO grant. The design of the facility was carried out by engaging private consultants and the construction supervision and quality assurance has been undertaken by the LSG Engineering Department. The operations & maintenance part also is being taken care of by the LSG Engineering Department. The project offers many societal benefits in a cost-effective manner.*

## BACKGROUND:

With a total area of 34.41 sq km, Perinthalmanna town accounts for 0.97 % of the geographical area of the district. As per the Census 2011, the total population of the Municipality is 49723 which is approximately 1.44 % of the district's population. The population of the town has been steadily increasing over a period of time. The proposal was to construct modern refreshment and retiring place exclusively for ladies near the central junction in front of the jail compound where a private temporary taxi stand was functioning and was one of the busiest locations in the town. The location is about 100m away from the central junction and is beside Kozhikode – Palakkad NH, the commercial centre of the town. Besides, the KSRTC bus stand, the government higher secondary school, municipal town hall, a mosque and municipal stadium are located in close proximity. In addition to this traffic attracting land uses, there are a number of shops and other commercial establishments around the place. Here passengers used to wait on the road

itself for long route buses having no waiting shed to depend upon. There was no place to take rest or toilet facilities for ladies in the town. Moreover, the project also benefits for cloakroom facility, baby feeding, refreshment and waiting rooms. The temporary shed for parking private taxi has been converted into a two-storey building, maintaining the parking facility in the ground floor. The location is very near to the main junction (one of the important traffic junctions in the town) and the area is very congested. The proposed location is near the central junction where passengers are waiting on the road itself for long route buses having no waiting shed to depend upon.

## KEY DATES:

Dates	Significance/Achievement
30-11-2019	PROJECT COMPLETION

## ESTABLISHMENT OF PRIORITIES:

The goals developed in order to achieve the development

vision for the town inter alia include

- To develop urban amenities required to cater to surrounding institutional centers.
- To develop the town as a sub-regional service centre.
- To enhance the quality of life of the citizens at all levels.

The following objectives were developed based on the above-stated goals

- Facilitating sanitary & toilet facilities for ladies
- Providing refreshment and retiring rooms for ladies
- Providing baby feeding space & restrooms for ladies
- Providing cloakroom facility for ladies
- Providing improved vehicle parking facilities
- Providing better social infrastructure facilities
- Women security

### PROCESS:

It was difficult to replace the existing taxi parking for construction purposes and to find a suitable replacement area for them until the work was completed. But the temporary parking system was put in place. The construction was difficult as the site was located in the heart of the city, with the busy subway and the small plot. No-objection certificates required from various authorities were delayed. However, being a female-friendly project and a model project within the state, it has received overwhelming support from the public.

### MOBILISATION OF RESOURCES:

It is an innovative project to create sanitation facilities for public, especially for women and a resting place for the latter. The project was built with the financial support of HUDCO.

On the ground floor, there is parking and toilets for men and on the first floor, there are women's restrooms and toilets. It is equipped with air-conditioning, Wi-Fi, TV, CCTV, book corner, tea corner, feeding corner and restrooms. The total plinth area of this building is 235.90 sq.mt.



*Images of old taxi stand*

The total project cost of Rs. 77,51,888/- was granted technical clearance. HUDCO's special financial assistance of Rs. 68,28,087/- has been allocated for the project. The balance amount has been met from the Municipality's own resources. The work has been executed and completed through the process of e-tendering.

### RESULT ACHIEVED:

- Improved of the living conditions of the community
- Developed urban amenities required to cater to surrounding institutional centres
- Developed the town as a sub-regional service centre
- Enhanced the quality of life of the citizens at all levels
- Facilitated sanitary and toilet facilities for ladies
- Provided baby feeding space and restroom for ladies
- Provided cloakroom facilities for ladies.
- Provided improved vehicle parking facilities

- Provided better social infrastructure facilities.
- Provided employment for 4 families through Kudumbashree for the project's operation.

Perinthalmanna Town is an important center of Kerala. It's called the City of Hospitals. Thousands of people come to the town every day. Earlier, there were no sanitary and other amenities for those who used to visit the Perinthalmanna Municipality. Therefore, the Taxi Stand Cum Ladies Retiring rooms have been designed with special priority for women. The ground floor of the building has a taxi parking area and men's toilets. On the first floor, there are toilets for women and 50-seat women rest area. In the process, the Municipality provides adequate sanitation facilities and a safe place for women and environmental protection which finally contributes to the cleanliness of the Municipality.

The project covers issues such as women's safety, hygiene, environmental protection and authorized taxi parking. The area is now free from open defecation. Thus it helped building confidence in the community and changed behavioral attitude.

### SUSTAINABILITY:

The project has been taken up with financial support from HUDCO and own funding by the Perinthalmanna Municipality. The Engineering Wing of the Municipality

is responsible for operations & maintenance of the created asset. The rental income from the shopping areas is collected directly by the Municipality. The user fee received in the process helps the Municipality towards sustenance of the project.

### TRANSFERABILITY:

This project is a model project of Perinthalmanna Municipality. This project can be replicated in order to ensure women's security and safety and sustainable development of the town by ensuring the sanitation facility.

### LESSON LEARNED:

The Site is situated in Calicut-Palakkad Road near Perinthalmanna Police station. The project was constructed by demolishing existing taxi stand shed. The main hurdles faced during its construction area were

- Heavy traffic
- Relocation of the existing taxi parking
- Essential clearances from different authorities and acquiring technical sanctions for the proposed estimates.

These matters were resolved through regular follow-up



View of Taxi Stand





investigations. It was very difficult to do the construction works. For the purpose, a proper construction chart was prepared and completed in a time bound manner.

Taxi stand cum ladies' retiring room project is the dream project of Perinthalmanna Municipal Council of 2015-

2020. This project is also a part of the silver jubilee mission project of the Municipality among the 25 other projects. The project has been implemented as per recommendation received through various seminars conducted by the municipality towards sustainable and modern development of Perinthalmanna Municipality.



*Interior Views*



*Feeding Room and Toilet with Sanitary Pad Incinerator*



*Wash Area and Rest Room*





*Inauguration Ceremony*



*Interior Views*

# REVITALIZATION OF A HERITAGE PRECINCT

- by Mahila Housing Trust, Gujarat

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*A*hmedabad became the first Indian city to be inscribed as UNESCO's 'World Heritage City' in 2017, owing to the rich heritage imbibed in its traditional architecture and urban fabric called 'Pols'. The Pols area's traditional form of densely packed neighborhoods made of wooden courtyard houses called pol houses and havelis, opening on the streets and chowks lined by 'otlas' and enriched by traditional elements such as 'Bird Feeders', Wells etc.

*Over time, these pols have been impacted by old decaying infrastructure, deteriorating structures, uneven pavements, unorganized public areas etc. This has resulted in diminished quality-of-life, diminished 'community pride' and diminishing interest in conservation and maintenance of the beautiful structures and the public areas.*

*This project takes up the heritage precinct of Dhal ni Pol as a 'Pilot Project' to improve and revitalize it through a participatory design and execution process, closely involving the community and empowering women. Through this, it aims to increase awareness and reinstate the community pride and interest in the collective heritage. The project, carried out in support of Ahmedabad Municipal Corporation (AMC) is expected to become a model for improving other pols and heritage precincts throughout the core walled city.*

## BACKGROUND

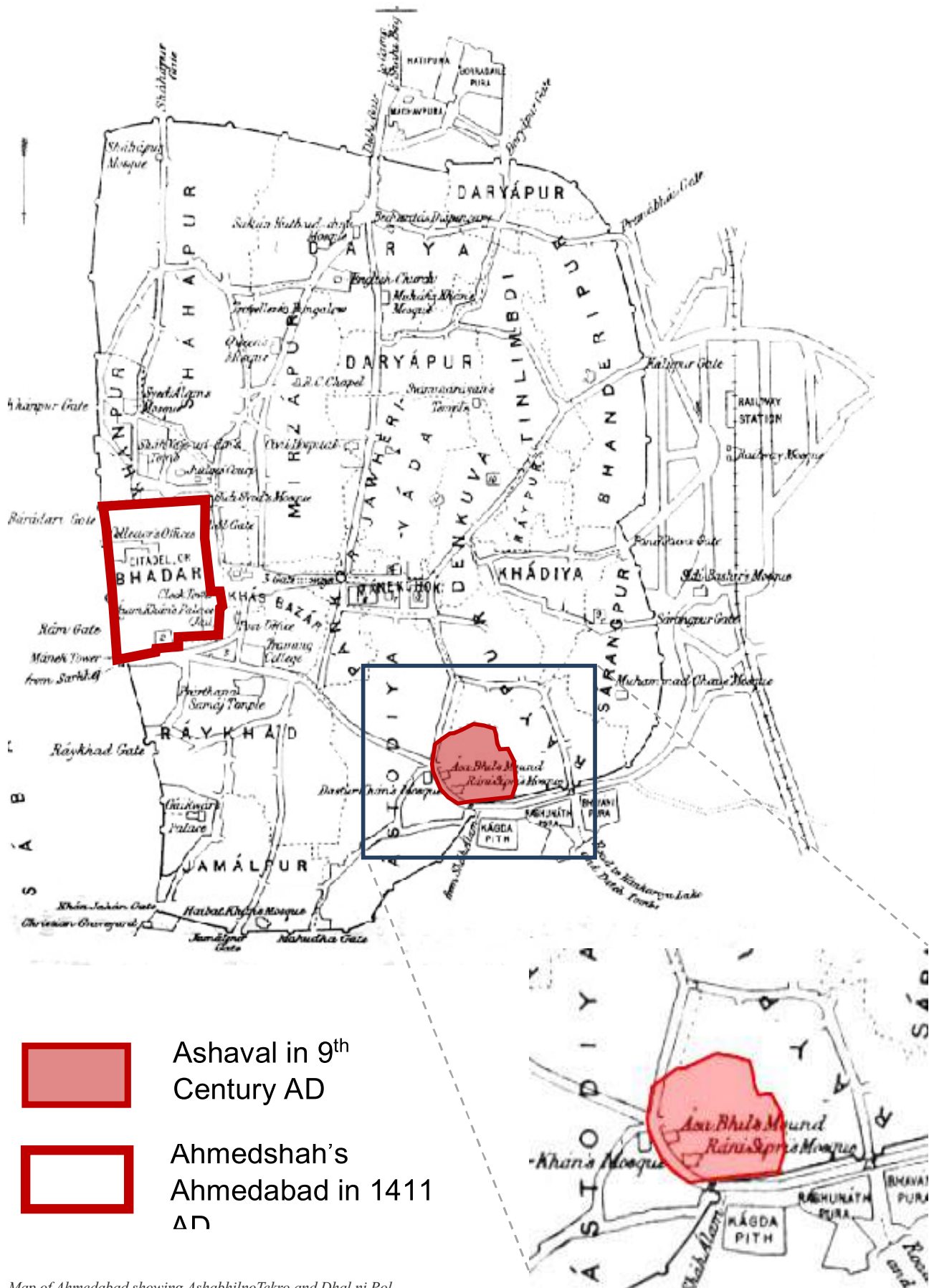
Dhal ni Pol, is historically significant as it is located on a mound that is considered the genesis point of Ahmedabad, originally populated by Bhil community in the 9th century AD. Dhal ni Pol is spread over an area of 6.8 ha, housing over 10,000 no. of residents. As part of the initial stage, Mahila Housing Trust (MHT) conducted many community workshops and surveys that identified issues such as old and decaying infrastructure, uneven road surfaces, inconsistent street lighting, unorganized parking, restricted mobility and lack of fire safety provisions. Apart from this, the visual clutter of signages, hanging cables, telephone and electricity boxes, broken

paving etc. were identified as impediments tarnishing the heritage character. These workshops highlighted a dire need to improve the Pol's public areas, its old infrastructure along repair and restoration of houses by individual owners. However, with 84% of the households having a monthly income of less than Rs. 15000/-, the members of the community lacked the financial resources.

## ESTABLISHMENT OF PRIORITIES

Considering the deteriorating infrastructure, lack of maintenance, lack of awareness, diminishing sense of pride and monetary resources, priorities for project implementation were emphasized on the following:







Grade II A: Highest



Grade II B: High



Grade III: Moderate

*Heritage Listed Structures*

- Improving public areas of the Pol, that would uplift the pride and spirit of the community
- Encouraging community engagement and women empowerment through their participation in the project
- Improving infrastructure, with support from AMC, to improve quality of life for people of the Pol
- Retaining and enhancing the heritage character including the tangible and intangible aspects of the Pol
- Ensuring sustainability by encouraging people to stay in the Pols instead of moving far out suburbs, which would otherwise result in consumption of additional farmland, infrastructure provision, increasing vehicular travels and related environmental impacts
- Improving sustainability provisions for rainwater harvesting and ground water recharge

- Ensuring economic benefits from enhanced property values



*Existing Condition of Dhal ni Pol*





*Engagement Workshops*



*Design Workshops*

## MOBILIZATION OF RESOURCES

MHT has signed the Declaration of Cooperation with AMC on 23rd August 2018, wherein AMC agreed to support and partner in Dhal ni Pol project. The project funding is provided by SELCO Foundation and HT Parekh foundation. The design and planning were carried out under the technical and strategic guidance of experts from CEPT University. The execution team was comprised of one MHT team, contractors appointed by MHT, the engineering team of the AMC for water and sewage network and service providers for electrical, TV cable and telecommunication. In addition, a team of expert sub-consultants were hired for detailed infrastructure and engineering design. The Community Action Group (CAG) of women of Dhal ni Pol provided monitoring and feedback on day to day basis which helped strategic decision making.

## PROCESS

**Inception and Community Engagement:** Four years ago, MHT encouraged the active participation of women in the process of community engagement through a series of workshops to generate awareness and identify issues for the improvement and revitalization of Dhal ni Pol. The objective was to conduct an open public platform where the residents, shop owners and vendors could put forth their views and perspectives. Engagement workshops were organized even after the conceptual design stage to discuss final changes to be incorporated in the detailed design.

**Existing Situation Analysis:** The activities were mapped and analyzed to gather qualitative as well as quantitative data of the delineated site and to understand various aspects of the Pol, for the public area improvement plan.



**Survey and Mapping:** A detailed survey was carried out for the delineated area through surveys and technical help for mapping of buildings, streets, movement patterns, activities and physical infrastructure. This helped to identify potential activities and revitalization that can be proposed in the area. A survey was also conducted for the 112 households in the study area of the Pol with the objective to understand the socio-economic background of the community as well as the perception of the residents. It was conducted by the adolescent girls trained for the purpose of surveying on mobile application called “Social cops”. The use of the application was done to obtain accurate data minimizing the errors.

**Design (Concept and Detail):** A series of design workshops were carried out to engage the community in decision making for conceptual design. In collaboration with planning and urban design experts from CEPT University, MHT developed a conceptual and schematic design for Dhal ni Pol, based on the inputs received from the engagement workshops. These concepts and ideas were again shared and discussed with the community to form the basis for the final detailed design. A special team of expert sub-consultants were engaged in preparing the detailed infrastructure and engineering designs for the delineated area.

**Collaboration with AMC and other agencies:** MHT signed a Declaration of Cooperation with the AMC for implementation of the pilot project in the 250 m stretch of Dhal ni Pol. It worked very closely with the Heritage Department of AMC and jointly received CSR funding from private organizations. For addressing the infrastructure issue, other departments and private agencies and like Fire Safety, Water & Sewage, Electricity, Traffic, Police, Street Light and Telecommunications were appointed to assist MHT. Special contractors were hired to execute the implementation of underground works since specific technology and materials were needed to create a heritage character.

**Execution:** At the beginning of the project implementation, the residents were informed about the work plan and phasing such as alternative routes and arrangements for pedestrian and vehicular movements.

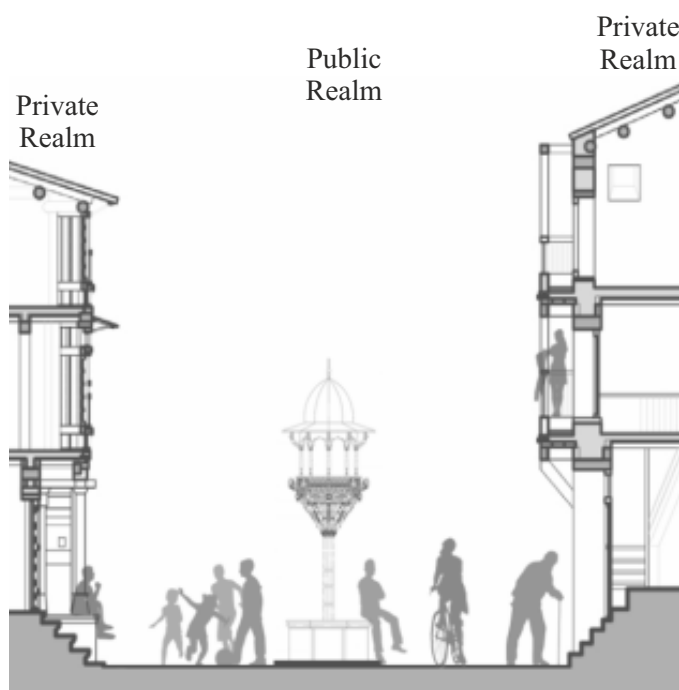
The implementation for the project is an ongoing process and is divided into stages.



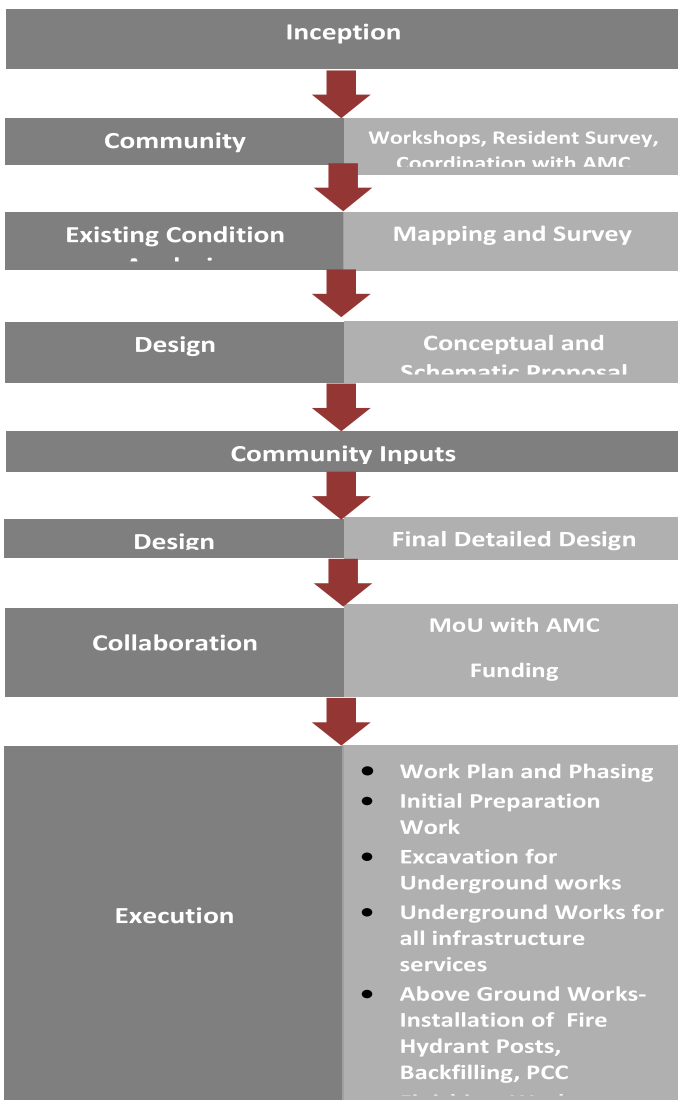
*Schematic Proposal*



*Execution Stretches*



*Typical Section of Pols*



### Challenges

- Lack of record for existing underground infrastructure posed a challenge to assess, manage and execute infrastructure changes
- Coordination between multiple executing teams for complex layering and phasing of more than 9 different infrastructure systems
- Ensuring consistency with the heritage character through high quality work
- MHT was not able to depend on the AMC funding for the project as the current S.O.R could not ensure high quality output. This required MHT to seek funding from other sources for the pilot project.



*Selection of Pavement Material*



*Fire Hydrant System*

### RESULT ACHIEVED

#### Improved Physical environment and Infrastructure:

Infrastructure is refurbished with better parking management, better aesthetic sense with the overhead cables going down and painted facades, better safety measures due to the installation of streetlights, underground firefighting systems and clear surfacing, activation of storm water recharge bores, conservation of heritage elements like Chabutara (birdfeeder), Kuvo (well) etc.



## Conceptual Sketches

### Existing



### Proposed







*Process for surface work and pavement*

**Better Quality of Life:** There are about 257 households adjacent to the pilot area, which are directly being benefited from the improved environment. Approximately 10,000 people in the Pol are getting the benefit of the recreation area, the sanitation system and the fire management system.

**Community Satisfaction:** The project received positive feedback from the community. The nearby areas are already awaiting implementation of a similar transformation in their areas.

**Awareness and Capacity Building:** The workshops conducted with the community informed and educated the residents about the importance of heritage conservation and upgrading the public realm and also influenced them to introduce new initiatives like the heritage walk and various community programmes. As part of the project implementation, the women of the community are being empowered and trained to ensure day-to-day cleanliness and maintenance by formulating

their own corpus and also trained to liaise with the municipal corporation to ensure maintenance of the larger area.

**Influence:** MHT's efforts in the revitalization of Dhal ni Pol have influenced many other NGOs to launch initiatives and programmes for heritage conservation in the area and host events for larger participation from the city residents in addressing the issues of the old city.

### **SUSTAINABILITY**

**Economic:** The improvement in the area has led to improved monetary values of heritage structures and Pol houses and has helped decrease the operations and maintenance cost.

**Social and Cultural:** Improved streetscape, street lighting and street furniture has facilitated safer movement for people of all ages and also increased the safety and security of women. The access to better infrastructure and improved aesthetic experience has reinstated the pride in the community.

**Environmental:** The project encourages people to

continue staying in the Pols instead of moving to the suburbs. This helps in curbing the additional development on greenfield land and thereby saving energy consumption of infrastructure provision, increasing vehicular travels and related environmental impacts. MHT has also implemented rainwater harvesting and groundwater recharge system. The old lights have been replaced with new LED lights which consume less energy.

**Institutional:** This project is very strategic since the policy of AMC so far, has largely concentrated on the restoration of monuments only, vis-a-vis public area development. Hence it provides a platform to streamline the internal process at AMC for improving conservation and civil works in the old city area

## TRANSFERABILITY

The pilot project for Public Area Improvement Plan is a first of its kind not only in Ahmedabad, but also in India, and is expected to be a learning for other heritage cities. It is expected that the municipal corporation of Ahmedabad will infuse at least Rs. 60,0000,000/- to further develop the area, based on the success of the pilot project. The self-respect and self-image of the residents are boosted tremendously since the project showcased to all international/national visitors in all the tourism awards, applied by the AMC. This is encouraging them further to manage and maintain the Pol as a heritage precinct.

Currently, as the Pols are narrow areas, AMC, has a very rudimentary set of building bye-laws for the pols. Experiences from the pilot project will be utilized to further develop bye-laws for the heritage Pols. The programme is also expected to influence the policies at the Smart Cities Mission of the Government of India, for similar other initiatives, since all heritage conservation by AMC is carried out under the purview of the Smart Cities Mission of India.

## LESSON LEARNED

- Through this project, MHT has successfully carved a new path for collaborative and participatory planning to retain the heritage areas of Ahmedabad city.
- In order to ensure a sustainable model, community participation becomes an inevitable aspect of the process. It was only because of their concerns and remarks such as the need for fire safety and lowering of the street surface that MHT was able to address and deliver the project efficiently.
- It was extremely important to pay attention to the existing needs, since Dhal ni Pol is a living heritage, before imposing the designer's views on to the community.
- Multi-stakeholder approach with support from local agencies and private entities is necessary for execution of this type of project.



*Before and After of streets in Dhal ni Pol*





*Dhal ni Pol*



# UTILIZATION OF MANGALURU CITY SEWAGE WASTEWATER FOR INDUSTRIAL PURPOSE

- by Mangaluru City Corporation, Karnataka

*Mangaluru is the second-largest city in Karnataka in terms of economy. Mangaluru's economy is dominated by the industrial, commercial, agricultural processing and port-related activities. It is one of the largest SEZs in India. MCC took up the development of wastewater management system (sewerage system) in Mangaluru city for reduction in the dependency on natural water resources and financial burden on Mangalore City Corporation (MCC) for operation and maintenance of sewage treatment plant. The project has helped in avoiding disposal of secondary treated sewage in natural river body thereby minimization of pollution loads on freshwater sources and improving environmental quality besides generation of employment.*

## BACKGROUND:

Mangaluru is the chief port city of the Karnataka state located about 352 kms (220 mi) west of the state capital, Bengaluru between the Arabian Sea and the Western Ghat mountain ranges. It is the administrative headquarters of the Dakshina Kannada district. Its status of being the only city in the state to be accessible via all forms of transport - air, road, rail and sea makes it a unique location for commercial investments and activities. Today, the Mangaluru region is a nationally known higher education hub with a flourishing service sector, particularly in medical services, a small but growing IT regional hub, and a booming real estate and banking industry.

- Mangaluru City Corporation had a facility of 154 km stretch old underground drainage network throughout the city for a collection of sewage wastewater from all the commercial and residential areas.
- Mangaluru City Corporation had provided with 2 numbers of Sewage Treatment Plant which was covered only for the main city area and the remaining area was let out to the drain.
- There was no treatment for the sewage water collected on the outskirts of Mangaluru City limits.

## KEY DATES:

DATES	Significance/Achievement
29th January 2007	Mangalore City Corporation passed a resolution for forming SPV
10th January 2008	Memorandum of Agreement was entered between Mangalore SEZ Ltd and Mangalore City Corporation (MCC)
11th March 2008	Received approval from Government of Karnataka
16th February 2009	Appointed Company Secretary for formation of SPV
24th March 2011	Incorporation of the SPV (Mangalore STP limited) done by the Company Secretary
2013	Commissioning of the Tertiary Treatment Plant

## ESTABLISHMENT OF PRIORITIES:

- Reduction in the dependency on natural water resources
- Reduction of financial burden on Mangalore City Corporation for O&M of STP
- Avoiding disposal of secondary treated sewage in natural river body thereby minimization of pollution loads on freshwater sources & improving environmental quality
- Employment generation

## MOBILISATION OF RESOURCES:

With the aid of the Asian Development Bank, MCC took up the development of wastewater management system (sewerage system) in Mangaluru city.

## PROCESS:

Initiatives and Implementation Strategies are as below:

- Mangalore City Corporation passed a resolution for forming SPV on 29th January 2007
- Memorandum of Agreement entered between Mangalore SEZ Ltd and Mangalore City Corporation on 10th January 2008
- Government of Karnataka approval received vide letter dated 11th March 2008
- Company Secretary appointed for formation of SPV on 16th February 2009
- Incorporation of the SPV (Mangalore STP limited) by the company secretary on 24.03.2011
- Operation and Maintenance of three Sewage Treatment Plants (Kavoor, Surathkal and Bajal) and connected wet wells/ Pumping stations from Wet wells to STP) in Mangaluru
- Cost Sharing of O&M by MSEZL and MCC by the ratio of 70:30
- Shareholding by MSEZL and MCC to be in the ratio of 70:30
- Authorized share Capital shall be Rs. 5 lakhs
- Total 5 directors for SPV
- Chairman and Managing Director to be from MSEZL and other two directors each from MSEZL and MCC
- SPV shall be responsible for selecting the O&M contractor
- O&M Fund to be created. Initial contribution in the ratio of 70:30
- Subsequent years, the amount on contribution would be worked out by December 1st of the preceding financial year and contribution to be made by 1st Week of April

- The MSTPL to approve manpower, each activity, budget, and schedule, the appointment of consultants and experts
- To check the O&M contractor performance and certification for payment as per TOR between O&M Contractor and SPV
- Release of Payments to the O&M Contractor & Employees/agencies after Board Approval
- MCC to provide necessary land free of cost within STP Premises for setting up infrastructure required for MSEZL
- MSEZL to lift the water free of charges.

## Various Parameters

Parameter	Tolerance Limit	STP Inlet Parameter	STP Outlet Parameter/ Inlet to TTP
<b>pH</b>	7.0 to 7.5	6.0 to 6.8	6.5 to 7.5
<b>BOD at 20°C</b>	Not more than 20mg/L	150-200	16 to 20
<b>COD</b>	Not more than 100mg/L	400-450	75-100
<b>Total Suspended Solids</b>	Not more than 30mg/L	150-250	30
<b>Total Phosphate</b>	Less than 5 mg/L	6 - 7	6-7
<b>Total Nitrogen</b>	Less than 50mg/L	25-30	23-25

The broad development is as follows:

- Development of 4 STPs :
  - Kavoor (43.5 MLD/9.5 MGD)
  - Bajal (20 MLD/4.40 MGD)
  - Surathkal (16.5 MLD/3.63 MGD)
  - Pachanady (8.75 MLD/1.92 MGD)
- 22 Nos. of wet wells
- 363 Km development of trunk mains & UGD collection network.
  - The system was designed in such a way that the treated effluent to be discharged into nallah which leads to sea at 20 BOD & 30 TSS.

- To meet the water requirements of units coming up inside Mangalore SEZ, Mangalore SEZ Ltd (MSEZL) was provided with the wastewater from 3 STPs as one of the sources. Since the Netravathi river is being utilized for drinking purposes, drawing of additional water was not allowed from the river hence the MSEZL had to settle with the wastewater from 3 STPs as one of the Sources.
- Several meetings were carried out with MSEZL and formed SPV-Mangalore STP Limited for reusing the secondary treated sewage water.

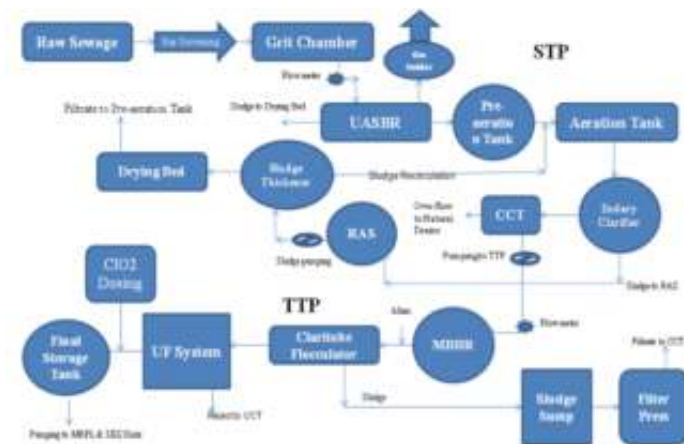
Mangaluru City Corporation has provided the below mentioned civil & mechanical structures and handed over to SPV.

1. Inlet Chamber
2. Screen Removal
3. Grit Chamber
4. Parshall Flume
5. UASB
6. Preaeration
7. Aeration
8. Clarifier
9. CCT- Let off natural drains
10. Thickener & Sludge Recirculation
11. Drying Bed

The treatment Process Involves:

## Tertiary Treatment Plant

- MSEZL has taken up the construction of 5 MGD (22.7MLD) Tertiary Treatment Plant (TTP) using



STP and TTP Flowchart

state-of-the-art GE Membrane Technology (ultra filtration) for re-use of Secondary Treated Sewage Water from Kavoor STP during the year of 2011.

- State-of-the-art plant with process automation and the plant is being controlled and monitored through PLC-based SCADA system.
- Plant is commissioned and MSEZL is supplying treated water to MRPL/MSEZL from November 2012.
- Tertiary Treatment Plant is mainly designed for removal of TSS, turbidity and for further reduction of BOD & COD from secondary treated sewage water.
- The designed parameter of TTP is given in the table below.

## Parameter of TTP

Sl. No.	Parameter	Unit	Inlet	Outlet
1.	pH	-	6.5-7.5	7.0-7.5
2.	TSS	mg/l	30	< 1
3.	BOD5 at 20° C	mg/l	20	<2
4.	COD	mg/l	100	< 30
5.	Nitrogen	mg/l	15 (Total Nitrogen)	< 5 (Ammonical Nitrogen)
6.	Fecal Coliform	MPN	-	<1/100ml
7.	Turbidity	NTU	-	<0.5

## Advantage of TTP water reuse

- Reduction in the dependency on natural water resources.
- Reduction of financial burden on Mangalore City Corporation for O&M of STP.
- Avoiding disposal of secondary treated sewage in natural river body thereby minimization of pollution loads on freshwater sources and improving Environmental quality.
- Employment generation.

## Tertiary Treatment process:

- Biological treatment comprising of Aerobic Treatment in Moving Bed Bio-Reactor (MBBR)



followed by Flocculation-Clarification in Claritube Flocculator (CTF).

- Filtration by Membrane-based Ultrafiltration system.
- Disinfection using ClO<sub>2</sub> with onsite ClO<sub>2</sub> unit.
- Sludge handling Filter Press Unit.
- The tertiary treated sewage is then stored in a tank, from where it is pumped to SEZ area.

#### **Stilling Chamber:**

The treated sewage outlet from the existing STP is raw water for Stilling Chamber (SC), where the turbulence is reduced. The sewage pumped to Stilling Chamber with 1162m<sup>3</sup>/hr to the downstream units.

#### **Moving Bed Biological Reactor (MBBR):**

- The main pollutants in the treated sewage are represented in the form of Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD).
- The bio-reactions are carried out in the controlled environment in the Moving Bed Bio-Reactor (MBBR). The bioreactor comprises of a tank, fitted with an aeration grid. The bacterial activity needs dissolved oxygen, to synthesize the organic matter. This is supplied by passing air in form of small bubbles.
- The air is passed at the bottom of the tank so that the complete volume of the tank is utilized. Dissolved oxygen can be used by the bacteria.
- The bacterial population is present on the media, which forms an integral part of the reactor system. The media is made of small plastic elements. Millions of such pieces are present in the reactor.
- A very large surface area is available for the bacterial population to grow. The bacteria grow on the plastic media by using the organic content in the raw sewage and the dissolved oxygen available. Due to constant aeration, the media is set in whirling motion so that continuous mixing takes place.
- The bacterial layer growth on the media surface increases to a certain extent and then gets sloughed off after a specific period.
- Around 60% to 70% of the BOD is further reduced in

the Moving Bed Biological Reactor.

#### **Claritube Flocculator (CTF):**

- The Sewage from MBBR flows to the Claritube Flocculator. At the inlet of CTF alum is dosed in the flash mixer. The solids separated here are settled and the sludge formed is withdrawn from the Claritube Flocculator which is taken to the sludge sump.
- The Claritube Settler comprises of Tube settler formed by specially designed Tube Modules. In tube settler the effective surface area required for the separation of suspended solids is provided in relatively much less volume compared to conventional clarifiers.

The Tube settler is divided into four zones.

- Distribution zone
- Inlet zone
- Settling zone
- Discharge zone

#### **Ultra filtration:**

- The clear overflow from CTF gravitates through the UFC channel to UFMT. ZW-1000 UF Membrane system is used for treating the clarifier outlet water. The basic purpose of the UF system is to remove the fine colloidal impurities and thereby removes BOD.
- The complete UF system is automated and processes are typically operated in the following modes.
  - Permeation
  - Backwash
  - Maintenance Clean (MC)
  - Recovery Clean (RC)
  - Stand-by
  - Shutdown

#### **Disinfection System:**

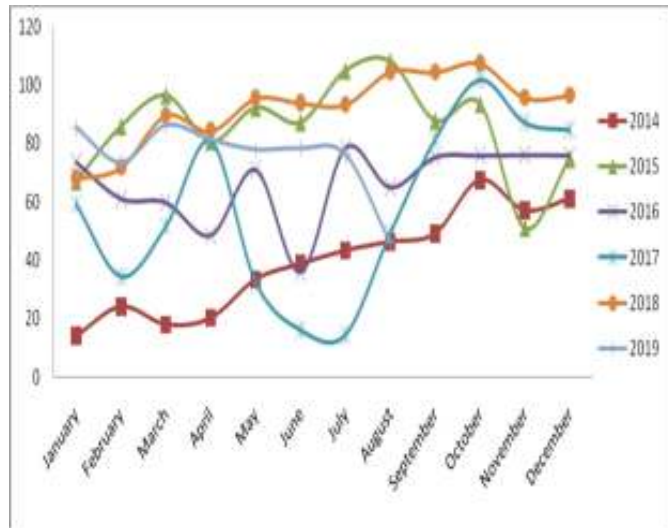
- The treated filtered sewage is then added with ClO<sub>2</sub> for Disinfection. Chlorine Dioxide is generated using Acid Chlorite technology.

#### **Sludge handling:**

- The sludge from the Claritube Flocculator (CTF) flows to Sludge Sump (SC) and then it is pumped to Filter Press (PS) for Solid Liquid Separation.
- The dewatered sludge is further used for Green Belt development.

#### **Final Storage Tank:**

The treated sewage water after disinfection is stored in the final storage tank and then it will be pumped to MRPL & MSEZL units (through 13.3KM DI Pipeline).



Quantity of treated water pumped to MSEZ since 2013 till August 2019

## RESULTS ACHIEVED:

### Coverage of the targeted population

The project has covered entire Mangaluru City Corporation area of 132.45 Sq km consisting of 60 wards and having a population of 4,99,489 (as per 2011 Census).

### Cost-effectiveness of the project

- The total cost of development is Rs. 21680 crores. Out of which Rs.16620 crores is a loan from ADB and Rs. 5060 crores is a grant from Government of Karnataka.
- The entire system was developed by KUDCEM and to be handed over to Mangalore City Corporation for Operation & Maintenance.
- As estimated by KUDCEM in the year 2011, MCC to

spend the following expenditure on O&M for wastewater management system per annum:

- The same is updated to revised rates which come to Rs



Present and proposed landuse pattern for TTP with existing STP Kavoor

16.00 crores per annum

O&M UGD scheme	Rs . 8.37 crores per annum
O&M of STPs	Rs.4.50 crores per annum
<b>Total</b>	<b>Rs. 12.87 crores per annum</b>

## TRANSFERABILITY

Initiative taken by MCC for the development of wastewater management system in Mangaluru city for reduction in the dependency on natural water resources and financial burden for operation and maintenance of sewage treatment plant can be replicated in other parts of the country. It is expected that the future projects will help in avoiding disposal of secondary treated sewage and minimize pollution loads and improve environmental quality.



Expansion of Tertiary Treatment Plant (5MGD)

# WASTE TO ENERGY PLANT

- by Jabalpur Municipal Corporation, Madhya Pradesh

*The project incorporates a highly proven concept for generation of electricity from MSW which allows efficient power generation, efficient waste disposal and low environmental impact. Jabalpur Municipal Corporation had leased out the land for development of project at nominal lease rent for the period of 20 years and PPA agreement between Essel Jabalpur MSW Pvt. Ltd and Madhya Pradesh Power Management Company Ltd. was executed. Plant has been running successfully since 16th May 2016 and processing approximately 600 Tons of Municipal Solids old and fresh waste of Jabalpur daily.*

## BACKGROUND & ESTABLISHMENT OF PRIORITIES:

Towards efficient waste disposal, a smart waste to energy plant was set up in Jabalpur with 600 TPD, MSW disposal incinerator and 11.5 MW turbine Generator having a technology that has no requirement of waste segregation for disposal. The Technology adopted for this project is Hitachi Zosen INOVA controlled combustion technology for mixed MSW. Hitachi Zosen grate combustion system has 80 years excellent environmental track record. The technology has been adopted is in compliance with MSW rules and the most modern flue gas cleaning technologies. The furnace temperature is in excess of 850°C with 2 second residence time. Swirl stabilized secondary combustion and tangential secondary air injection for optimized burnout of flue gas has been provided. The technology complies with present SWM rules-2016.

Salient features are:

- The PPA agreement between Essel Jabalpur MSW Pvt. Ltd and Madhya Pradesh Power management company Ltd. was executed
- Tariff as per the MPERC tariff order dated 1/10/2013 is Rs. 6.39/KWH for the project life of 20 years.
- JMC had leased out the land for the development of the

project at nominal lease rent for the period of 20 years.

- The concession was granted for collection and transport of waste for a term of ten years.
- The Tipping fee of C&T of waste is 1620.68/M.T.

## KEY DATES:

DATES	Significance/Achievement
11th May-2016	Plant synchronized with grid (MPPCTL) after successful erection & commissioning
12th April-2018	Golden Peacock Award: Rank 2nd Best Project in the integrated MSW to Energy Category in India

## PROCESS:

Waste-to-Energy (WTE) uses trash as a fuel for generating power based on the 'mass burning concept' and all kinds of municipal waste. Trash is the fuel for this plant just like conventional power plants use coal, oil, or natural gas. The burning fuel heats water into steam that drives a turbine to create electricity. The process reduces a community's landfill volume by up to 90 percent, and prevent one ton of carbon dioxide released for every ton of waste burned.

Generating electricity in a waste-to-energy plant encompasses five steps:

- Garbage trucks dump the waste into a pit.

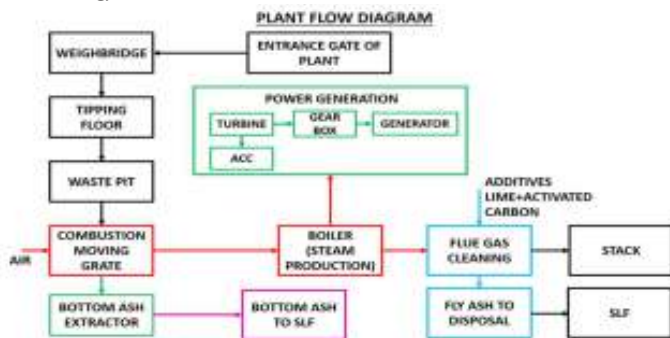
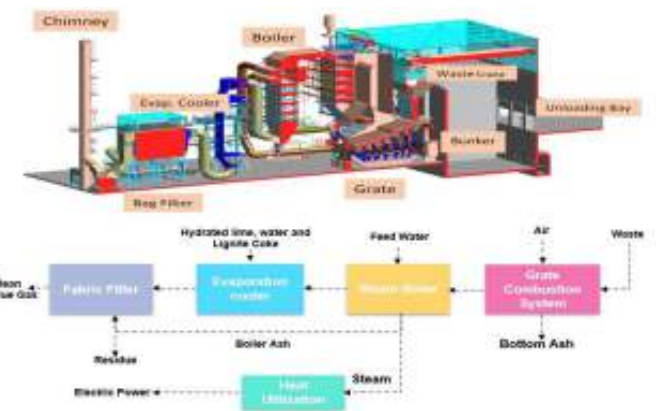


## SANITATION

- A crane picks up the waste and dumps it into a combustion chamber.
- The waste is burned, generating heat.
- The heat turns the water in the attached boiler into steam.
- The high-pressure steam forces a turbine to spin, producing electricity.



Technology



### Emission regulations and Jabalpur emission Levels

In mg/Nm <sup>3</sup>	European Directive 2000/76/EC	India: Municipal Solid Wastes-2016	Jabalpur Plant Emission Levels
Dust	10	50	09
CO	50	100	40
NO <sub>x</sub>	200	400	20
HCl	30	50	24
SO <sub>2</sub>	50	200	28

All emissions values corrected to 11% Oxygen on a dry basis as per MSW Rules 2016.

## Specifications of the Plant

S. No.	Parameter	Details
<b>Plant Capacity</b>		
1.	Power Generating Capacity	11.5 MW
2.	Waste processing Capacity	600 TPD
<b>Technical Detail</b>		
3.	Land Area of main plant	10 Acres
4.	Land Area of Scientific land fill (Acres)	NA
5.	Technology Used for segregation of waste	NA but Trommel used for old SLF waste segregation, since it is a mass burning facility.
6.	Technology used for energy generation	Controlled combustion system
7.	Specifications of Boiler	Hitachi make single drum water tube boiler 56.4tph, 46 bar, 408°C, with forward moving reciprocating grate.
8.	Specifications of Turbine	Siemens make 1 x 11.5MW (12.3MW VWO), Model SST300 – C1S/ V36UB Bleeding cum Condensing Steam Turbine.
9.	Detail of BTG suppliers	TDPS make generator, frame TC 150, 15437.5KVA, 12.35MW, 11000 Volts, 810 amperes,
10.	Detail of EPC contractor	Consortium of Hitachi and Isgec John Thomson (IJT).
11.	Cooling Technology	Air Cooled Condenser, C Doctor make
12.	Power Evacuation Voltage Level	132 KV
13.	Plant Maintenance Schedule (Shutdown instances and reason thereof)	Once after 8000 hours of operation.

## Impacts- Post Implementation

- After running successfully since last 3 years, there is no single small heap of waste in Jabalpur and the city is free from MSW
  - Improved physical health of citizens
  - Recovery and Recycling
  - Reduction of greenhouse gases
  - Generation of clean energy
  - Reduction of carbon emissions

## RESULT ACHIEVED:

- Essel Infraprojects is the first company to introduce Hitachi Zosen's thermal waste processing solution in India.
- 11.5 MW energy generated; equivalent to providing electricity to 18,000 households.

- Reduction of approximately 37,000 tons of carbon emission in Jabalpur.
- 4.4 hectares of land can be saved by processing 2,19,000 tons of solid waste per year.
- This technology saves in operating costs.
- Preheating of combustion air to high temperature allows combustion without using any auxiliary fossil fuel.
- Improved efficiency due to preheating with turbine bleed steam.
- Based on the heat value of the waste, a by-pass system is provided for air pre-heaters to control primary air temperature.

## Recommendations – Action Plan for Improvement

Recommendations at Central, state and municipal levels may be as below:

## Central Government

- o Establish an Authority or Mission on Solid Waste
- o Set up a Special technical cell under the Authority that guide states on appropriate technologies of processing and disposal of waste in consultation with CPCB
- o Allocate funds to states/ ULBs for improving MSW systems and setting up waste treatment and disposal facilities.
- o Support programmes of training and capacity building
- o Central and State Governments may consider giving tax holidays /incentives to waste processing and recycling industries for at least 10 years
- o Central and State Governments may promote the use of compost or energy from waste

## State Government

All the states may have a solid waste management authority with experts on various aspects of MSW, including contracting and financial management. This authority may be made responsible for the following: -

- o Document the status of MSW and create a mechanism for continuous updation of the status.
- o Assess the correct situation of MSW in the municipal areas in the state and identify the gaps that need to be bridged.
- o Prepare norms for assessing the requirement of tools, equipment, vehicle, manpower for collection and transportation of waste and for setting up processing and disposal facilities as per guidance outlined in this report.

## Policy& Regulatory Framework

- o 74th Constitutional Amendment
- o MSW (Management and Handling) Rules 2000
- o National Environment Policy, 2006

- o The Plastic Waste (Management and Handling) Rules 2011
- o National Urban Policy, 2011
- o Frame of MSW Rules, 2013

## Municipal Level

- o All municipal corporations may have an MSW Management Department and other municipal authorities may have an MSW Management Cell and minimum technical and supervisory staff as per the yardstick prescribed by the State MSW Authority to ensure efficient MSW service delivery.
- o Implement the integrated MSW management system recommended by the Task Force which consists of four streams of waste collection for all classes of cities.
- o Municipal authority may make serious efforts to educate the waste generators to minimize the waste and segregate the waste at the source. It may make separate arrangements for the collection, transportation of domestic, trade, institutional and market wastes and ensure that such waste is directly delivered at the waste processing facility meant for biodegradable and recyclable waste.

## SUSTAINABILITY:

### • Financial

Essel Infrastructure Projects Limited has invested Rs. 178 crores approximately to establish a mass burning waste to energy facility with the capacity of 11.5 MW per hour. Moreover, Essel infrastructure project limited has a power purchase agreement (PPA) with Madhya Pradesh Electricity Board to provide generated electricity @ Rs. 6.39 per unit.

### • Social and Economic

A waste-to-energy firm that recycles organic waste with energy recovery, performs two environmentally beneficial functions: it diverts waste from landfills and produces renewable energy. At the same time, the waste-to-energy firm serves and collects revenue from two types



of customers: waste generators who pay for waste disposal services and electricity consumers who buy energy. Given the process characteristics of the waste-to-energy operation, the market characteristics for waste disposal and energy, and the mechanisms regulators use to encourage the production of renewable energy.

- **Cultural**

The WTE plant and the activities associated with it have brought a lot of change in the daily lives of the people; with 'Door to Door collection and transportation' people are segregating their household waste. Due to the formation of WTE, electricity could be provided to places in the city where there was no supply of electricity earlier. Apart from this, the landfill site of the waste could be eliminated, thereby risk of infection was reduced. Due to all these reasons, people in the city have undergone behavioral change.

- **Environmental**

The Jabalpur MSW Plant can process up to 600 tons of waste per day. The Grate Combustion System deployed is

the best waste treatment technology in the world with regards to environmental friendliness, operating reliability, flexibility and cost-effectiveness. The other salient features include flue gas treatment and water and ash treatment, which ensures that all the wastes generated as part of the processes are also treated before emission. The emissions are at par with European Standards which are more environmental friendly as compared to SWM Rule Book 2016 consumption patterns.

### **TRANSFERABILITY:**

It is the only plant of its kind in South Asia. These types of plants are proposed in Pallawapuram at Andhra Pradesh, Ranchi at Jharkhand and Amritsar at Punjab.

### **LESSON LEARNED:**

Environmental responsibility is vital for protecting mankind. At Jabalpur MSW creates energy from waste which would otherwise be sent to landfills. Further, a more number of reasons are there than just satisfying environmental objectives.

## Contact Details Award Winning Organisations

<p><b>Centre for Heritage, Environment and Development (C-HED), Kochi Municipal Corporation</b>  The Director,  31/4040 A, Corporation C-HED Building  Kacherippady, Ernakulam (District)  City/Town: Ernakulam  State: Kerala  Pin Code: 682 018,  Phone: +91 484 2391 766 ; +91 484 2391 766  Email: c.hedcochin@gmail.com  Website: www.c-hed.org</p>	<p><b>Municipal Corporation, Rohtak</b>  The Chief Town Planner,  Municipal Corporation, Rohtak  State : Haryana  Phone: 9416059202, 8295900905  Email : commissionermc@gmail.com,  kkvbhw@gmail.com  Website: mcrohtak.gov.in</p>
<p><b>Greater Hyderabad Municipal Corporation</b>  The Commissioner,  Greater Hyderabad Municipal Corporation  CC Complex, Tank Bund Rd, Lower Tank Bund,  Adarsh Nagar, Hyderabad  State: Telegana  Pin Code: 500003  Phone: 6309062595  Email: ee5housing.ghmc@gmail.com</p>	<p><b>Chandigarh Housing Board</b>  The Chief Engineer,  Chandigarh Housing Board  8, Jan Marg, Sector 9-D  Chandigarh  Phone: 0172-4601700  Email : as-jnnurm@nic.in  Website: chbonline.in</p>
<p><b>State urban development agency Chhattisgarh</b>  The Secretary, Urban Administration &amp; Development,  Finance and Chief Executive Officer, SUDA  Govt. of Chhattisgarh.  Room No. S0-3 Mantralaya Mahanadi Bhawan,  Nava Raipur Atal Nagar  State: Chhattisgarh  Pin code - 492002  Phone: 0771-2222409  Email:sudamission@gmail.com, osd.suda@yahoo.com  Website : uad.cg.gov.in</p>	<p><b>Surat Municipal Corporation</b>  The Municipal Commissioner,  Surat Municipal Corporation.  Muglisara Main Road, Surat  State: Gujarat Pin code- 395003  Phone: 0261-2423750 to 56 (PABX -2001)  Email: dmc.rjp@suratmunicipal.org  Website: www.suratmunicipal.org</p>
<p><b>North Delhi Municipal Corporation</b>  The Commissioner,  North Delhi Municipal Corporation  Area - 4th Floor, E-1 Block,  Dr. SPM Civic Chattisgarh Centre,  JLN Marg, Minto Road,  New Delhi - 110002.  State: Delhi  Pin code - 110008  Phone No - 011-23225901, 23225401.  Email : Se-Electrical-Ndmc@mcd.gov.in  Website: mcdonline.nic.in/ndmcportal</p>	<p><b>Chennai Metropolitan Water Supply and Sewerage Board</b>  The Managing Director  Chennai Metropolitan Water Supply and Sewerage Board  No.1 Pumping Station Road, Chintadripet, Chennai  State: Tamil nadu  Pin Code : 600002  Phone: 040 2845 1300 (20 lines)  Email ID : md@cmwssb.in ; exedir@cmwssb.in  Website :chennaietrowater.tn.gov.in</p>

<p><b>Perinthalmanna Municipality</b>  The Secretary,  Perinthalmanna Municipality  State : Kerala  Pin code: 679322  Phone: 04933 229757  Email: sajeemsakona@gmail.com  pmnamlty@gmail.com  Website: perinthalmannamunicipality.lsgkerala.gov.in</p>	<p><b>Mahila Housing Trust</b>  Ms. Bijal Brahmbhatt  Mahila Housing Trust  Area/Region: 7th floor, 701 702, Sakar 4,  Ellisbridge, Ahmadabad  State: Gujarat  Pin code - 380009  Phone: 079 2658 7725  Email: bijalb@mahilahsg.org  Website: www.mahilahousingtrust.org</p>
<p><b>Mangaluru City Corporation</b>  The Commissioner,  Mangaluru City Corporation  Lalbagh, MG Road, Mangaluru  State – Karnataka  Pin Code – 575003  Phone:0824-2220310  Email: commissioner.mcc@gmail.com  Website: mangalurucity.mrc.gov.in</p>	<p><b>Jabalpur municipal corporation</b>  The Commissioner, Municipal Corporation Jabalpur  Area – Near Samdariya Green City Kathonda,  Teen Patti Squawer, Jabalpur  State: Madhya Pradesh  Pin Code - 482002  Phone: 18002335522  Email: commjabalpur@mpurban.gov.in  Website: jabalpur.nic.in/en/public-utility/nagar-nigam-jabalpur</p>



