Smart City
MISSION TRANSFORM-NATION

सत्यमेव जयते
Ministry of Housing and Urban Affairs
Government of India

स्वच्छ भारत
एक कदम स्वच्छता की ओर

# SMART CITIES MISSION

## A Compendium of Best Practices

Indore
Chandigarh Tumkuru
Ahemedabad
Pune Jabalpur
Varanasi Pimpri Chinchwad Tirupati
Agra

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# SMART CITIES MISSION

A Compendium of Best Practices


*Riverfront Development, Indore*

Shri Hardeep Singh Puri
Minister of State
Ministry of Housing and Urban Affairs

# MESSAGE FROM HON'BLE MINISTER

Through the Smart Cities Mission - an urban development initiative of the Government of India, launched by the Prime Minister Shri Narendra Modi in 2015 -100 cities have undertaken a pathbreaking journey to transform the way they provide core infrastructure and services, a clean environment and better quality of life to their citizens. In the last six years, the Mission has grown from strength to strength, implementing over 5,100 projects worth around Rs. 2,05,000 crores, that are positively impacting the lives of close to 100 million citizens.

The core commitment of our smart cities to empowering communities, practising cooperative and competitive federalism and using technology as an important medium for city management has never been more evident than in the face of the COVID-19 pandemic this year and the last. Even as the second wave of the deadly virus has brought the lives of our compatriots under a dire threat, India's smart cities have demonstrated outstanding resilience, especially through the use of technology to streamline civic functions as well as in providing urgent support to citizens. Although the learning curve during this period has been steep, the pace of implementation of the Mission has never faltered, and we thank our smart cities for their commitment.

Since the year 2018, we have felicitated the top-performing cities through the India Smart Cities Award Contest. The Contest is an opportunity for smart cities to showcase their most innovative, impactful projects and for us to recognize and learn from their best practices. This year's best proposals range from the use of Integrated Command and Control Centres in governance or in response to COVID-19, enhancing safety and security of citizens, intelligent traffic management, innovative use of open spaces, enhancement of urban environment, innovations in the improvement of urban mobility, smart water management, waste-to-energy generation and many others.

All these best practices have been captured in the 'Smart Cities Mission: A Compendium of Best Practices'. Together these will enable all interested individuals, organizations and stakeholders to learn about the experiences and be a part of the journey of the Mission. I congratulate all smart cities for their sincere efforts towards the Mission in the year 2020 and hope we overcome all our challenges with same momentum this year.

Wish you all a safe and secure year.

**Hardeep S Puri**
Hon'ble Minister of State (Independent Charge) - Housing & Urban Affairs


*Riverfront Flower Park, Ahmedabad*

Shri Durga Shanker Mishra
Secretary
Ministry of Housing and Urban Affairs

# FOREWORD

The Smart Cities Mission has transformed the approach and practice aimed at transforming urban development to effectively tackle the challenges of growing urbanization at scale and speed. The Mission envisaged projects embodying the principles of participation, innovation, sustainable development and harnessing of technology to enhance the ease of living of citizens.

The India Smart Cities Awards Contest (ISAC) was launched to reward the cities, projects and innovative ideas promoting smart development. The current edition of the awards, ISAC 2020 was announced on 25th August 2020. Proposals from all smart cities were invited under different award categories. Cities were asked to showcase a balance of innovation, sustainability, replicability and proven impact of projects across award categories.

Our young nation has been through many difficult periods, but the past year and a half has inflicted more anxiety and grief on the collective consciousness of the nation than any historical event current generations can recall. As the COVID-19 pandemic weighed our systems down, our cities and citizens rose up in small but heroic ways to fight back. Therefore, a special award to recognize exceptional innovation on COVID-19 response was announced for this edition of ISAC 2020. Smart cities that have leveraged innovation in handling the COVID-19 crisis and made a positive impact on citizen support, monitoring, prevention and livelihoods were asked to submit their proposals under this category. Innovation in COVID-19 response through multi-stakeholder partnership models and civic collaborations were given more weightage.

As evident from entries received in the year before and this one, interventions under Smart Cities Mission have contributed to improvement in the physical, institutional, economic and social infrastructure in the Mission cities that are now acting as lighthouses for the whole of urban India. The New Urban Agenda of inclusive and sustainable development has got a boost through these interventions. Mission-mode projects contributing to improved mobility, enhanced walkability and non-motorised transport in cities, provision of adequate housing for economically weaker sections of the society, improved sanitation, water and waste, water management, generation of renewable energy, creation of an environment of innovation and increase in the efficiency of the delivery of urban services through the adoption of smart city solutions, and new innovations to continue managing the COVID-19 crisis, have been undertaken in cities, the impact of which is reaching the common man.

I am happy to share the best practices in the form of project proposals by the Mission cities through the 'Smart Cities Mission: A Compendium of Best Practices'. I congratulate the Mission Director, Smart Cities, Smart City CEOs and each one of you who has contributed to this publication.

I wish for you all safety and good health! Jai Hind!

**Durga Shanker Mishra**
Secretary,
Ministry of Housing & Urban Affairs

*Villivakkam Lake Rejuvenation, Chennai*

Shri Kunal Kumar
Joint Secretary
(Mission Director Smart Cities)
Ministry of Housing and
Urban Affairs

# PREFACE

The projects implemented under the Smart Cities Mission can be broadly categorised under the three core aspects: Liveability, Economicability and Sustainability. These principles are derived from the issues highlighted during citizen engagement exercises. While services like urban mobility, affordable housing, water and waste-water management, sanitation and solid waste management, safety, health, and education respond to 'liveability'; initiatives that enhance investment climate, increase jobs and breed innovation affect the 'economic-ability'; and at the heart is environmental 'sustainability' wherein everyday decisions on technology, infrastructure and investments balance both present and future concerns of society.

For the past several months, we have been living in the danger of a disease that has not only attacked us physically but has infected the unbreakable spirit of our nation. Even amidst the mayhem caused by the second wave of COVID-19 and undeniably through the first, I have been proud to observe that the dedication of smart cities to urban living has played a big role when existing systems were stretched beyond their means.

Since 2018, India Smart Cities Awards Contest is testimony to the innovativeness with which smart cities have stayed true to its guiding principles in the implementation of projects. These systems and infrastructures created under the Smart Cities Mission have the ability to rapidly adapt to the pandemic response. 50+ smart cities have transformed their ICCCs into COVID-19 war rooms to enable collaboration with various government departments dealing with COVID-19 response. A model COVID-19 room was developed in Bengaluru Smart City in just 24 hours. Integrated dashboards were developed in Agra, Bengaluru, Pune, Surat, and Varanasi to enable effective decision-making, monitoring of COVID-19 hotspots and medical infrastructure, tracking movement of goods and services, and managing lockdown. Smart Cities like Agra, Chennai, Nagpur, Pune, and Surat leveraged web-based/mobile applications for contact tracing, tracking and monitoring virus-infected persons.

Smart cities are implementing projects with a strong focus on economic returns. Several cities are creating smart ecosystems where skilled people are getting connected enabling innovation, knowledge, research, ideas and creativity. Smart classrooms in government schools and smart campus interventions in Kakinada, Tumakuru, New Delhi and Jabalpur have helped improve the learning and attendance of students. A number of cities have initiated setting up of skill development centres, incubation centres, vending zones etc., fostering an environment for entrepreneurship, innovation and co-creation. Agra and Tirupati are imparting skills to craftsmen and women to empower them financially.

Functional advancements are enhanced with improvements to the aesthetic, cultural and heritage value in smart cities as demonstrated through projects in Chandigarh, Indore, Tirupati, Gwalior, Vishakhapatnam and so on. The sanctity of the sacred waters of the Assi River in Varanasi has been restored through consistent efforts under our projects. As smart cities restore nature with one hand, they harness their clean energy through solar, wind and bio-methanation projects to power their functioning with the other.

The 'Smart Cities Mission: A Compendium of Best Practices' is a ready reference for inspiration and guidance to city practitioners. It is also our way to thank and acknowledge the remarkable progress smart cities have made through the highs but mostly, lows of the year gone by. I congratulate the Smart City CEOs and their teams, and my officials at the Ministry, the Smart Cities Mission Management Unit team and the team at National Institute of Urban Affairs who helped bring out this useful publication.

I salute the devotion of all of India's smart cities to keep forging ahead and persevering to improve the lives of the citizens, come what may.

**Kunal Kumar**
Joint Secretary & National Mission Director,
Smart Cities Mission, Ministry of Housing & Urban Affairs

*Lakefront Development, Coimbatore*

# Contents



***Note: Some proposals have won in multiple categories. To avoid redundancy, details of such projects have only been captured under one category. Winners can be identified from the maps for each category.***

*Rooftop Solar Plant, Tirupati*

*LED Streetlights, Smart Road, Salem*

# Evaluation Methodology

India Smart Cities Awards Contest (ISAC) was launched to reward the cities, projects and innovative ideas promoting smart development in cities. The current edition of the awards, ISAC 2020 was announced on 25 August 2020.

The purpose and objective of ISAC, various award categories, parameters for evaluating city performance, scoring criteria, mode of application and evaluation process along with important timelines, were shared with cities in a presentation on the 25th of August 2020 and a copy of the presentation was handed over to the cities for ready reference.

There are a total of **five award categories** in ISAC 2020. Winners for three of these five categories were decided through a two-stage submission process.

Stage-I involved an overall assessment of the city's performance. To ensure better participation ISAC 2020 introduced '***Mandatory Compliances***' wherein cities were required to conduct a minimum of 2 SCAF meetings and submit a minimum of 6 photographs/ videos ***(30 sec & 90 sec)*** as part of Photograph/ Video Campaign: **"Building Cities for People**". The online application form for Stage-I was divided into performance across four categories - Project Implementation (40 marks), Fund Utilization (30 marks), SPV Governance (12 marks) and D) Stakeholder Engagement (18 marks). This online application was made available to Smart Cities in the ISAC 2020 portal from 25th August 2020 until 1st October 2020.

Stage I submissions were evaluated by a Technical Support Team and 71 Smart Cities were found to qualify for Stage-II of ISAC 2020. Qualifying cities had between 15th October 2020 until 20th November 2020 to submit their proposals for Stage II.

Stage-II required smart cities to submit their nominations for the following three award categories:

**Award Category-1**: Project Award across ten urban themes (Governance, Built Environment, Social Aspects, Culture, Economy, Urban Environment, Mobility, Sanitation, Water, Sustainable Business model for ICCC) for projects completed until 31st Aug 2020.

**Award Category-2**: Innovation Award to recognize excellence in innovation (in terms of Covid-19 response or other outstanding innovation). 1 award at the national level and 1 each for best performing city among 4 smart city selection rounds for action taken between 25th March 2020 and 25th August 2020.

**City Award** for overall city performance. There is 1 Best Smart City award among all 100 smart cities and awards for best performing cities within each selection round. These were selected from proposals submitted under the first two categories.

346 proposals under Project Award Category and 175 proposals under Innovation Award Category were received ***of which*** 50 proposals were on COVID-19 Response Innovation.

The ISAC 2020 coordinating team screened proposals for each theme (10 themes for Project Awards and 2 under Innovation Award categories) to shortlist 25 proposals for categories where the number of proposals submitted exceeded 25. A panel of 3-4 jury members was identified for each theme to evaluate proposals on 4 parameters – Innovativeness, Measurable Impact/ Envisaged Outcome, Replicability/ Scalability and Sustainability. The evaluation entailed proposal review, objective scoring based on an evaluation rubric (Table on Page 3) and qualitative comments. Shortlisted cities were asked to present their proposals for the benefit of the jury panel's understanding in the 2nd and 3rd week of January 2021. Results from jury evaluations for the three award categories were shared with the coordinating team.

In order to recognize the efforts of the State/UT, a fourth award category, the **Best State/ UT Award**, was announced in January 2021. States/UT performance was adjudged on overall performance and the enabling role played by the State or UT in proactive implementation of the following Smart Cities initiatives.

- Ease of Living/Municipal Performance Indicators
- ClimateSmart Cities Strategy
- India Cycles4Change Challenge
- Streets for People Challenge
- TULIP
- DataSmart Cities Strategy

,in their towns and cities. The evaluation also included whether the State had scaled up by either bringing additional cities into the fold of the Smart Cities Mission initiatives.

The **Smart City Leadership Award** is the final and the fifth award category in ISAC 2020 for cities that played a role beyond their scope to make other smart cities smarter by way of

- Exemplary leadership in Sister City and the 20:20 formula towards performance improvement,
- Prepared action plan for their Sister City, with Vimarsh and Manthan,
- Pioneered implementation of projects that were replicated in other cities,
- The degree of improvement in ranking within the performance period.

The performance period for the Smart City Leadership Award category was from 20th February 2020 until 24th August 2020. An Apex Committee meeting to finalise winners took place on 24th February 2021.

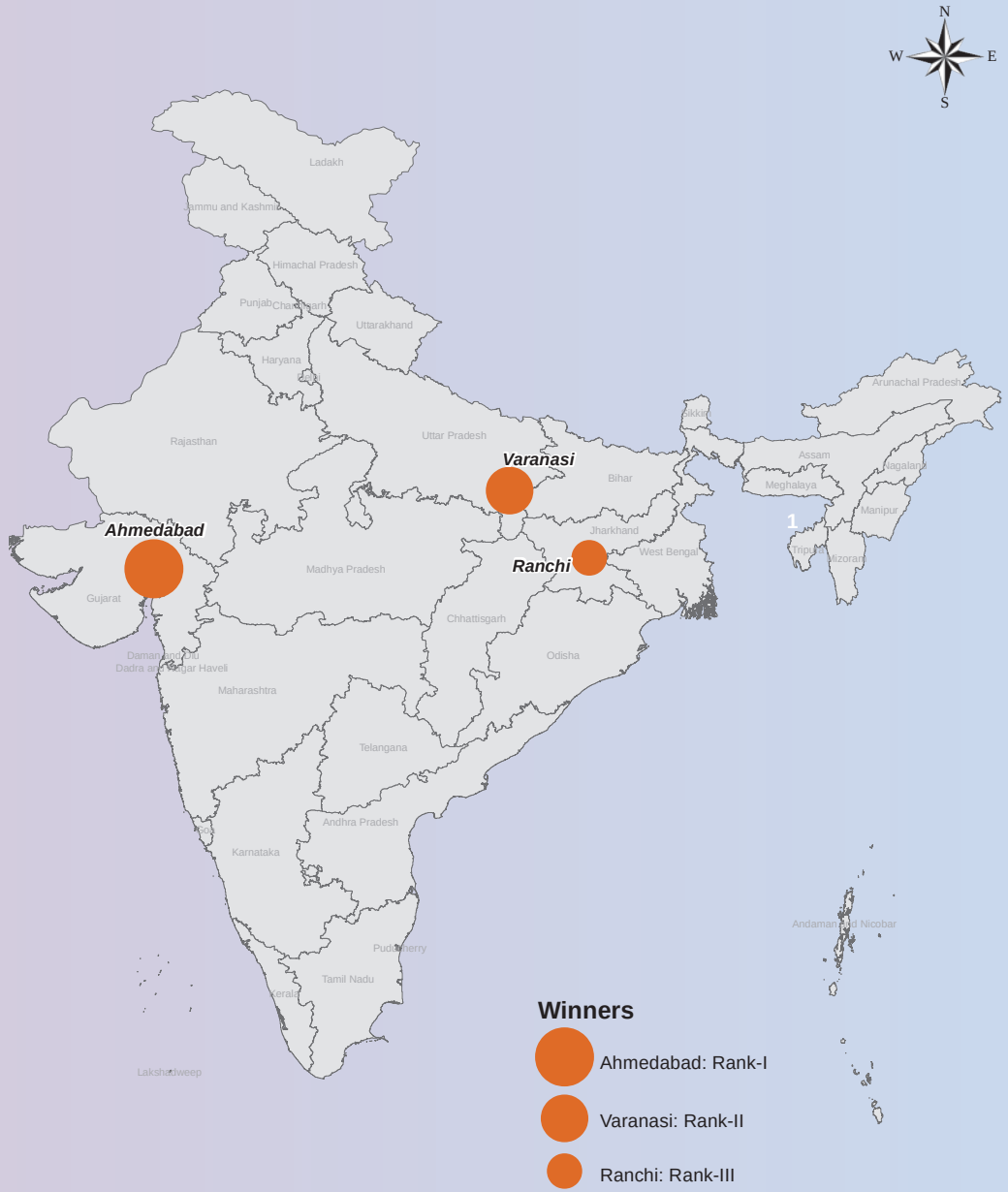
*Sappathi Kuttai School Road Pond, Sholinganallur, Chennai*

# RUBRIC FOR PROJECT EVALUATION

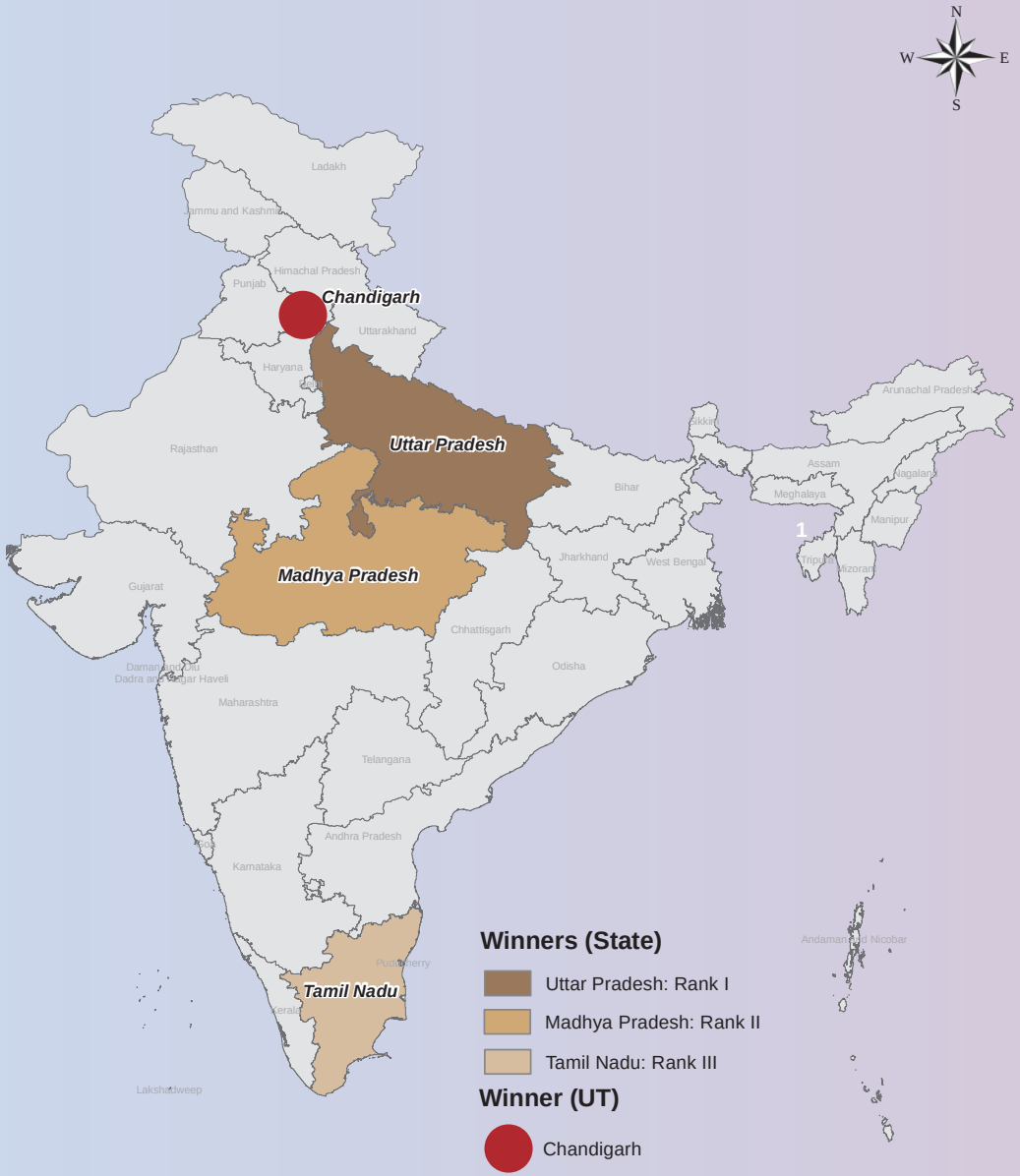
Scores were normalized based on weightage assigned for four parameters

| Maximum Marks for each Parameter | Innovation (20% weightage; max 2 marks) | Impact/Outcomes (30% weightage; max 3 marks) | Replicability/ Scalability (25% weightage; max 2.5% marks) | Sustainability (25% weightage; max 2.5% marks) |
|---|---|---|---|---|
| **10 marks** | Demonstrates highly innovative approach, including a survey of existing approaches and explanation of why the submission under the Smart Cities Mission (SCM) is innovative; AND Clearly defines strong need(s) or unresolved problem(s) being addressed under the innovative approach | Demonstrates impacts (or potential impacts) that are clear, tangible, and significant over an established period; includes focus on sustainability and/ or citizen engagement; AND Scope of impact/ size of the impacted population is demonstrably significant; AND Demonstrated impacts (or potential impacts) are shown to have not been achieved by other interventions | Has established track record of success; Clearly lays out development cycle, including information about current status; addresses questions of replicability / scalability, involves public-private- partnerships including alternative financing mechanism as well as citizen engagement | Demonstrates an approach that has characteristics of sustainability on all the factors mentioned below: a) Social inclusion and gender, b) Climate and Environmental factors, c) Financial and economic sustainability; AND Developed a comprehensive but focused data collection system for evaluating sustainability |
| **7.5 marks** | Demonstrates innovative approach within SCM but does not provide a comparative assessment with existing approaches; AND Clearly defines strong need(s) or unresolved problem(s) being addressed | Demonstrated impacts (or potential impacts) are clear, tangible, and significant over an established period; includes focus on sustainability or citizen engagement; AND Scope of impact/size of impacted population (or potential impacts) is demonstrably significant | Has established track record of success; Clearly lays out development cycle, including information about current status; addresses questions of replicability / scalability, involves public-private partnerships including alternative financing mechanism as well as citizen engagement | Demonstrates an approach which has characteristics of sustainability on all the factors mentioned below a) Social inclusion and gender, b) Climate and Environmental factors, c) Financial and economic sustainability; AND no information on data collection system for evaluating sustainability |
| **5 marks** | Demonstrates an approach that is limited or minimally innovative; OR Defines a need or unresolved problem being addressed that is limited or relatively non-urgent | Demonstrated impacts (or potential impacts) are clear and tangible, but not significant; OR Scope of impact/size of impacted population (or potential impacts) is limited or replicated elsewhere | Lays out development cycle, including information about the current status, but replicability / scalability remains doubtful or not all questions of techno-commercial sustainability are addressed | Demonstrates an approach that has characteristics of sustainability on any 2 of the following three factors: a) Social inclusion and gender, OR b) Climate and Environmental factors, OR c) Financial and economic sustainability |
| **3 marks** | Does not demonstrate innovation: other projects, initiatives, or strategies have already taken a similar approach; OR Does not respond to a need or unresolved problem | Demonstrated impacts (or potential impacts) are minimal or negligible; OR Scope of impact/ size of impacted population (or potential impacts) is minimal or negligible | Does not make persuasive case for replicability / scalability | Demonstrates an approach that has characteristics of sustainability on any one of the following three factors: a) Social inclusion and gender, OR b) Climate and Environmental factors, OR c) Financial and economic sustainability |
| **0 mark** | Does not include any information regarding the innovative characteristics of the proposal; AND Does not include any information regarding the need(s) or unresolved problem(s) being addressed | Does not include any information regarding the impact of the proposal; AND Does not include any information regarding the scope of impact or size of the impacted population | Does not include any information regarding the replicability / scalability of the proposal | Does not include any information regarding sustainable characteristics in the proposal |

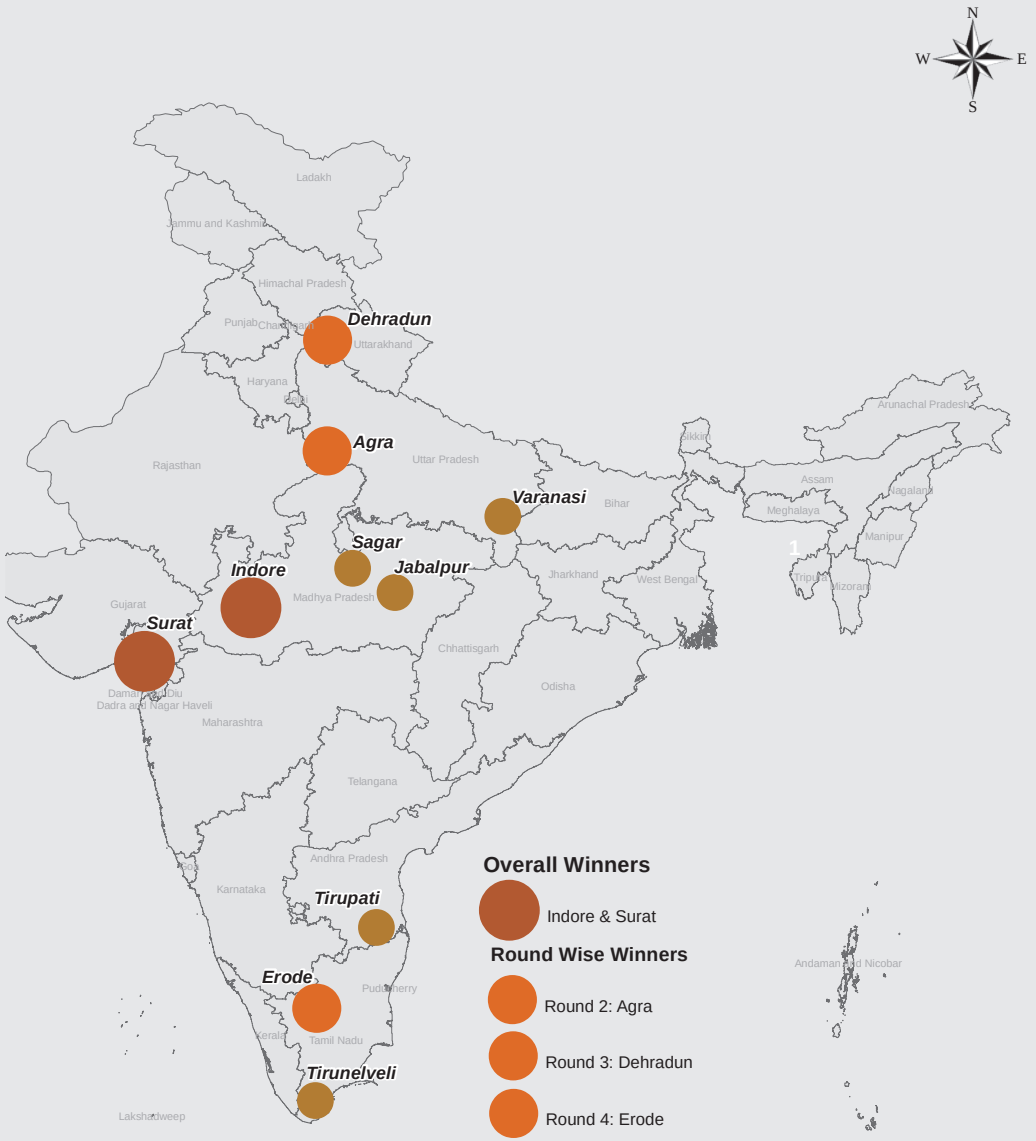
# ISAC 2020 SMART CITY LEADERSHIP AWARD



# ISAC 2020 BEST STATE/UT AWARD



# ISAC 2020: CITY AWARD




*Adaptive Reuse of Gopal Mandir, Indore*

# CITY AWARD

# Indore

Indore Smart City Development Limited (ISCDL) is one of the two joint winners of the ISAC 2020 City Award. The range of proposals shortlisted during the evaluation process run the gamut from transformation of the built environment, placemaking, adaptive reuse of heritage structures, accumulation of carbon credits, integration of urban service delivery through its Integrated Command and Control Centre, management of dry waste, and waste to energy generation projects.

Indore has been a forerunner among the smart cities in the past year and has consistently featured among the top ranked cities in the year 2020. The city is implementing projects worth Rs. 5099.6 crores under the Smart Cities Mission of which Rs. 4711.6 crores are dedicated to the projects within the ABD area. Improvement of city identity through revival of old heritage structures, development of public and commercial places, and waste management within the ABD area is an approach well received by the people of Indore. The smart city has made visible gains in a timebound manner – exhibiting strong local support for the smart city projects undertaken. A snapshot of Indore's winning and shortlisted proposals is provided below. Details of these projects are given in the later sections of the Compendium.

## Chhappan Dukan

De-congestion, pedestrianisation and revival of Chhappan Dukan - a commercial area with 56 ('Chhappan' in Hindi language) shops along a 175-metre road stretch were challenges faced by Indore Smart City Development Limited (ISCDL). The stores were allotted by Indore Municipal Corporation. Over time, the road stretch had become congested and chaotic with traffic movement, haphazard parking, and encroachments.

Indore Smart City Development Limited (ISCDL) brought order to this iconic commercial street while keeping its vibrancy intact. as converting the street into a pedestrian-friendly easy to access public space recreated along with principles of sustainability and energy efficiency. The project was implemented within a time frame of '56 days'. Indore came up with a comprehensive and coordinated action plan involving multiple agencies to work around the clock. The 175-metres of the street is now a no-vehicle zone. Façade design, LED lights, designer pavement space, plantation, theme-based seating and greenery were added for further visual appeal.


Chhappan Dukan is a landmark street development project. The area has seen a huge increase in footfall from 6,000 to 15,000 per day. The city stands to gain in revenue a betterment charge calculated at 5% of guideline value in 3 years, on-street and off-street parking charges, and a premium on digital advertisement rights for 10 years.

## Adaptive Reuse – Rajwada and Gopal Mandir

The Rajwada and Gopal Mandir in Indore, symbolic of its rich cultural tradition were taken up for adaptive reuse. Adaptive reuse is the theme of restoration works in Indore. The heritage complex in Indore consists of the Rajwada, Gopal Mandir, and various Chhatris. Most of these sites were developed around 200-400 years ago and have huge religious and socio-cultural importance.

Only traditional materials were used in the reconstruction. The chemicals used for different works such as rust and polish removal from the structure were done after testing and under supervision of experts from the State Archaeology and Museum Department. These methods are not only environmentally friendly but also reduce cement-based carbon footprints. Local artisans were also upskilled in the craft in the process.

Indore Municipal Corporation (IMC), district administration and police relocated about 150 temporary shops around Gopal Mandir and Rajwada, for a year until project completion. Currently, 112 shops have opened in a newly built G+2 shopping complex with lifts, escalators and other modern amenities like in shopping malls. With an area over 14,000 sqm conserved, restored and developed, ISCDL has made strides in conserving local art and artisans from dying out. With the redevelopment of Gopal Mandir, the premises now have multiple uses.

## Indore Integrated Command and Control Centre

The ICCC in Indore Smart City is designed to provide state-level services, city-level services, data analytics and monitoring of events. Data analysed at the ICCC helps the city take better decisions in improving operational efficiencies, maintaining order, and increasing city revenue generation. The ICCC in Indore is integrated with the

- Property & Water Tax collection services
- Integrated Solid Waste Management (ISWM)
- Automatic Vehicle Location System (AVLS) and Automated Fare Collection System (AFCS)
- Grievances Redressal System, Indore 311.
- Applications to manage the COVID-19 pandemic
- Surveillance through 400+ CCTVs


ICCC has three major components: a command centre, an analytics section, and an alert generation mechanism for municipal services, traffic issues, and public grievances. With the integration of the waste management system with Indian Oil Corporation petrol pumps, Indore

has successfully eliminated fuel theft from garbage collection vehicles. The integration has helped in the decentralization of wet waste processing. GPS tracking of vehicles has made it possible to check and validate the availability of vehicles in all municipal zones. The integration of ICCC with Indore 311 has helped keep track of citizen grievances. The integration of ICCC with AVLS and AFCS enables authorities to get real-time data in a structured format from ground operations of the city bus and I-Bus service. AFCS helped Indore improve the efficiency and usage of the transit system which reflected an increase in ridership by nearly 20 % in 2019 as compared to ridership in 2018. The monitoring of door-to door-garbage collection vehicles from the collection at source to transportation to the processing facility via transfer stations has improved the lives of 2.5+ million population of Indore and helped it achieve the topmost rank in Swachh Survekshan for four years straight.

## Carbon Credit Finance

To catalyse the financial feasibility of environmentally sustainable projects, and to give a fillip to the revenue generating sources of ISCDL. Indore Smart City initiated the carbon credit project cycle for its waste management projects. The carbon trading project for Indore Municipal Corporation (IMC) and ISCDL projects was undertaken in order to attain the following objectives: -

- To ensure financially viability of environmentally sustainable projects requiring huge investment with long gestation periods,
- To engage with potential buyers overseas to attract investment and understand global carbon market,
- To build capacity and capability to undertake this exercise end to end without a template to follow, and
- To give a fillip to revenue generating sources for the Indore Smart City.

ISCDL has implemented waste management projects to recycle the waste into usable outputs like compost and Bio CNG etc. The smart city has also installed solar power projects to harness clean power using solar photovoltaic technology. The clean power from solar projects is expected to displace electricity generated from $CO_2$ emitting coal-based power projects. Implementation of these projects will reduce around 2.91 lakh tons $CO_2$ per year. ISCDL registered these projects under the Verified Carbon Standard mechanism within seven months from the initiation of work and also completed the monitoring and verification process based on the operational data of a one-year period generating 1.70 lakh carbon credits valued at Rs. 50-70 lakhs approximately.

From the projects taken up for carbon credit trading by ISCDL, approximately 75 tons of processed compost, 2,500 cubic metres of biogas and 101.5 MW of solar energy is generated daily. The clean power from solar projects displaces electricity generated from coal-based power projects that emit $CO_2$. The projects registered are eligible for a total period of 30 years.

## Material Recovery Facility for Dry Municipal Waste

Presently, Indore generates about 1,185 tonnes per day (TPD) waste of which 100% is segregated before collection and processed on same day. 95% dry waste is segregated into recyclable components and 5% inert waste goes to the engineered landfill. Indore Smart City Development Limited's vision resonates with that of Swachh Bharat Mission in keeping Indore city clean, bin-free & litter free.

Indore has improved the service quality of dry waste management activities in the city through private sector engagement. The selection of private sector partner was determined based on their ability to pioneer the supply, installation and commissioning of a 400 TPD capacity Automated Material Recovery Facility with operation & maintenance on a PPP model. Indore has implemented a mechanism to process 100% of its dry waste generated in the municipal area on a daily basis. The automated mechanized plant is built on 4.5 acres of land provided by Municipal Corporation with an investment of Rs. 30 crores. The waste is sorted in 13 categories with the help of optical sorting technology and robotics. Recovered plastic is used in road construction, non- recyclable material (RDF) is used as fuel in cement plant. The company has uplifted and empowered 500+ waste pickers. The MRF has provided a safe workplace for female ragpickers along with an improvement in the workers' quality of life. Indore Smart City earns an assured premium of Rs. 1.41 crore per annum. With an overall boost to the waste

management industry, the MRF has proven to be a successful model for other dry waste management facilities.

## Value Capture Finance

Value Capture Financing (VCF) is based on the principle that some of the value generated through public infrastructure investments for private landowners can be recuperated, which can be used to generate further value for more communities in the future. Appropriate VCF tools can be deployed to capture a part of the increment in value of land and buildings. This generates a virtuous cycle in which value is created, realised and captured and used again for project investment.

Smart Cities Mission (SCM) Guidelines issued by the Ministry of Housing and Urban Affairs recommend for the VCF model to be adopted by the urban local body/smart cities/other government departments. Indore Smart City's VCF model is based on these guidelines. Once Indore Master Plan guidelines area amended for the ABD area following legal procedures set by the Town & Country Planning Act, 1973, the following avenues of revenue generation can be explored:

- Value Appreciation Fund at the rate of 5% & 2.8 % of property guidelines on major roads,
- Amalgamation Charges (based on land use),
- Commercial Use Charges (5 % of guideline),
- Mix use Chargers (5 % of guideline),
- Premium on floor-area ratio (FAR), and,
- Parking Cess (25 % of guideline for parking area).

Revenue generation activities started in October 2019. Out of this, 90% of the revenue was marked for Indore smart city and 10 % for Indore Municipal Corporation. Over and above these, the revenue generated within the ABD area from building permissions since October 2019 is Rs. 2.4 crores. This model of VCF will help the Indore Smart City project to become a self - sustainable model. The generated revenue will be utilised for ongoing and upcoming projects by Indore Smart City Development Limited.

## Indore Bio-CNG Plant

Indore initiated various innovative waste management processes and technologies under Swachh Bharat Mission (SBM) in the year 2015-16. It introduced the concept of decentralized processing of segregated organic waste collected from bulk waste generators and individual households on daily basis. The objective of this unique project was to create synergy between two central programmes - Swachh Bharat Mission and the Smart Cities Mission. Indore Smart City under public-private partnership of promoting decentralized treatment of organic waste established two bio-methanation plants of 20 and 15 TPD capacity.

Biomethanation process releases a mixture of methane, $CO_2$ and $SO_2$. For the first time in India, Indore Smart City came up with the concept of generating Bio CNG from this mixture of gas. Bio CNG dispensing station was also set up at this facility for fuelling the public transportation buses of Atal Indore Corporation. The digestate biomass is converted into compost, manure, NPK rich organic fertiliser and used for organic farming. These plants are set on PPP mode and viability gap funding (VGF) for the installation of these plants has been carried out by Indore Smart City Development Limited. Today, 15 buses in Indore are running on the Bio CNG and consuming nearly 1500 kg of Bio CNG per day and running more than 2000 km per day.


After the successful implementation of the two unique and innovative models at Choithram Mandi (20 TPD) and Kabitkhedi (15 TPD), Indore Smart City has now decided to install a plant of 500 TPD work which is in progress. The project will be implemented through a 100% PPP model where the concessioner will pay a premium of Rs. 2.52 crores per annum to Indore Smart City.

# Surat

Surat Smart City Development Limited (SSCDL) is one of the two joint winners of the ISAC 2020 City Award. Surat Smart City has undertaken a wide variety of projects, and used insight coupled with innovation to bring some very interesting projects in the categories of built environment, mobility, wastewater treatment, sanitation, water supply, renewable energy and technology to fruition.

Having won the prestigious ISAC City Award in 2018, Surat Smart City has repeated history. The smart city's continually surpasses its own past performance and has featured among the top ranked smart city's consistently in the year 2020. The city is implementing projects worth Rs. 2597 crores under the Smart Cities Mission of which Rs. 1802 crores are dedicated to the projects within the ABD area. Having achieved a certain degree of success in providing essential urban infrastructure and services to its citizens, Surat has shifted focus towards using technology for operational improvements. In this, Surat has stood out as a pioneer among its contemporaries. Surat's stories of innovation across categories have been outlined briefly below.

## Dynamic Scheduling for City Bus Service

An efficient bus scheduling system is essential for a public transport service as it improves the level of service for passengers while minimising operational cost for operators. With this object, Surat has deployed a vehicle planning and scheduling tool to analyse the daily ridership and schedule details. The routes and schedules are analysed for each hour of the day across the week with respect to their indicators. This enables the corporation to allocate buses as per passenger demand improving the level of service for the commuters. Surat used dynamic scheduling on the 117 km of it bus rapid transit network with 166 bus on 12 routes. and 491 kilometres of its public bus service network with 575 buses on 45 routes.

Schedule optimisation helps improve bus arrival and departure timings, accident reduction, and route optimisation, which helps reduce bus kilometre travelled. Through the use of dynamic scheduling, Surat observed a reduction in total km travelled by buses on the BRTS and city bus routes leading to cost savings during a pilot. Based on the analysis of passenger data during the pilot, a city bus route was curtailed during the off-peak hours. This led to total savings of 407 km/ day amounting to savings of Rs. 43.9 lacs/year. Further, the dead kms were optimised by reallocation of buses from the depot which resulted in savings of Rs. 62.78 lacs/year.

## Canal Corridor - Linear Park

Surat Smart City has made functional as well as visual improvements incorporating facilities such a street furniture park, children's play area, canal crossings, parking facilities, etc. The canal runs through the middle of the Canal Road as a carriageway divider. Surat Smart City has redesigned the road to include a Linear Park along the canal with the vision to add aesthetic value and utility to transform an urban road into a green mobility route.

The project has introduced a recreational zone along the canal with 13 metres of a multi-use recreational and landscaped area. The road is exclusive, dedicated and attractive 10.5-metre CC road with a 2.5-metre footpath on both sides including street furniture. The footpath has tactile paving tile and bollards at entry points to ensure universal access. The design of the footpath includes a 1.0-metre buffer zone with trees and shrubs to prevent vehicle parking. Using an existing water feature as a design element and utilizing the entire ROW has resulted in the development of a one-of-its- kind, iconic landscape project. The area has been instrumental in increasing property values along the corridor, accelerating new investments, combatting noise pollution, purifying the air quality along the corridor and helping groundwater recharge. The park provides has recreational areas for all age groups of people including a play area, shaded sitting areas amidst greenery, a pathway for easy strolls, and shrubs planted throughout the area.

## AIC SURATi iLAB

Surat Municipal Corporation and Surat Smart City Development Limited have set up a Centre, AIC SURATi iLAB to promote the culture of innovation, start-up incubation, trade facilitation, and skill development. It is the first incubation centre by any smart city in India. The Centre has been set up under the initiative by Atal Innovation Mission, NITI Ayog.


Two remote tinkering labs have been set up where the start-ups can experiment with, learn, develop and conceptualise different scientific ideas. With the rise in demand, the centre can be scaled out with zonal level sub-centres with co-working spaces including necessary facilities like IT infrastructure, free wi-fi and small meeting rooms in different parts of the cities. Memoranda of Understanding have been established with academic institutes, the Southern Gujarat Chamber Of Commerce And Industry (SGCCI), Computer Society of India (CSI), The National Association of Software and Service Companies (NASSCOM) etc. for developing and maintaining a broader perspective on start-up ideas and opportunities. The Centre helps in the creation of domain-specific mentor as they support and encourage start-ups by offering suggestions and knowledge, both general and specific. Building a network with regional incubation centres, innovators, Centres of Excellence and other such institutes will add further value to the centre. The centre is working closely with the Urban Management Centre (UMC) for implementing portability of government social entitlements to migrants affected due to the lockdown imposed during the first wave of COVID-19. The Centre housed the staff for

migrant labour tracking and assistance during COVID19. A migrant assistance cell is now set up permanently in the same building of the centre.

## Wastewater Treatment Plant

In an initiative to conserve water, Surat has taken an initiative in association with users, industries and, state agencies to recycle and treat water through tertiary level treatment.

The following types of advanced tertiary treatments facilities have been installed at Dindoli tertiary treatment plant to achieve the desired Tertiary Treated Industrial Grade Water parameters.

- Disc Filtration System
- Ultra-filtration (UF)
- Reverse Osmosis (RO)
- Activated Carbon Filtration (ACF)

The reuse of treated waste water contributes towards reducing the dependency on conventional resources of water, reduce diversion of drinking water for non-potable purposes and guarantees revenue generation for Surat Municipal Corporation. Creation of an alternative resource, creates assured quality and quantity of water resources – a basic need of industries to sustain & operate. The project involves a 40 MLD net output capacity tertiary treatment plant to treat secondary treated water from Dindoli sewage treatment plant to generate industrial grade water for Pandesara Industrial Estate, Surat at a capital project cost of Rs. 125.00 crores.

## Integrated and Sustainable Water Supply System

Aside from the surface water of river Tapti, there is no alternative source of water for Surat. The minimum demand for water in the city currently is 220 MLD, which is projected to reach 500 MLD in the year 2041. To meet the challenges imposed due to tremendous growth in city, unique initiatives have been established like augmenting the water resources through more and more French wells, water supply GRID connectivity and networking, infrastructure improvement with 24x7 water supply, use of green energy like wind power and use of solar power plants for water supply operation, implementation of rain water harvesting structures, comprehensive water quality, monitoring system, etc. Such initiatives have resulted in the provision of uninterrupted water supply at affordable rates to consumers. At the same time, cost recovery of water supply system is 100% which shows consumer satisfaction and efficiency in collection of revenues. An integrated and sustainable approach has been ensured to manage overall water supply.

The use of green energy to drive this project has optimised the unit production cost (Rs/KL) and as a result, the water tariff has stayed nearly constant between 2009-2017. In the absence of use of wind energy to power the system, the unit O&M cost (Rs./KL) in year 2019-20 would be Rs.4.18 compared to Rs.3.42 per KL that the consumer now has to pay. This translates into a saving of Rs.0.76 per KL for the consumer. The coverage of the water supply network in Surat due to this initiative is 99.1%, the cost recovery is 100%, the complaint redressal rate is 89% and the per capita supply sits well over the national average at 156 litres per capita per day.

## Smart Implementation of Pradhan Mantri Yojana

As an implementing authority of Pradhan Mantri Awas Yojana (PMAY) , Surat has demonstrated innovation by installing innovative and advanced internal & external infrastructure for 1088 units Of "Suman Sangini" PMAY Project At T.P. 53 (Parvat- Magob) F.P.82 in the ABD area of Surat Smart City. Surat Smart City has installed the following:

- Tertiary Sewage Treatment Plant (TSTP)
- Organic Waste Converter (OWC) Plant
- LED Streetlights
- Rainwater Harvesting Plant

SMC has decided to replicate the OWC, rainwater harvesting and other basic amenities in all the new sanctioned projects for construction of 14,136 housing for the economically weaker sections (EWS) at 19 locations and TSTP in projects with more than 1000 dwelling units at five locations. Also, it is under consideration to implement similar small scale tertiary treatment plants and organic waste converter in residential societies, apartments, townships, staff quarters, government offices, municipal toilet blocks, gardens, public places etc.

## Smart Communication

As part of Surat's Smart Cities Mission initiatives, a unified platform and presence on social media channels for citizen engagement in governance was conceptualised, as outreach for digitally active online urban population. This served as a medium for information dissemination, consultation, exchange of ideas/ suggestions and collaboration with citizens. Surat has achieved remarkable success in terms of social engagement, public relations (PR) and communication. The most significant achievement apart from landslide number gains in terms of social media reach, followership and engagement are the catchy and crowd rewarding campaigns. Surat's social media team has conducted various successful campaign such as SamvednaKhushionoPataro, Maru Surat No. 1 and Corona Ko Harana. With over thousands of posts, these campaigns trended organically propagated by other users and various media houses in particular. From creation of GIFs, memes, latest social media trends, to daily engagement through content ranging from quizzes, polls, activities, video songs, animated short-films, banners, print ads, radio campaigns, blogs and live streaming of multiple events – found wide traction with users. Many of the campaigns found special mentions by popular social media channels and newspapers such as Social Samosa and the Times of India. The wide spread, local yet universal with a universal touch, mixed with the magic of interactive communication has truly made Surat's social media a class apart in terms of actual conversation and opinion building.

## SMAC Centre

The Surat Smart City Centre (SMAC) is used for monitoring of various municipal functions like grievance redressal system, door-to-door garbage collection through vehicle tracking system, bus rapid transit system and city buses using intelligent transit management system etc.

Under the Safe City project undertaken by Surat city police in which Surat Municipal Corporation is a key partner, over 600 CCTV cameras have been installed at various critical locations across the city, which includes 550+ IP cameras and 25+ PTZ cameras covering over 100+ strategic locations. The feed of these cameras is used to monitor various municipal issues like road sweeping, night scraping and brushing, road repairing, water leakage / drainage overflow, and encroachments.

## Surat Ecological Park

The 85-acre ecological park developed under this project is part of 151 acres of land previously used as a crude dumping ground. The project envisages land reclamation of about 66 acres. The project is a park with multiple uses, transformed from what was previously a dumping ground. It now has various facilities like a 3.0-meter width surrounding inspection road, a 2 km cycle track and security cabin. Secondary treated wastewater from the nearby sewage treatment plant has been utilized for maintenance and gardening purposes. The project was completed in 18 months with an approximate cost of Rs 60.50 Crore.

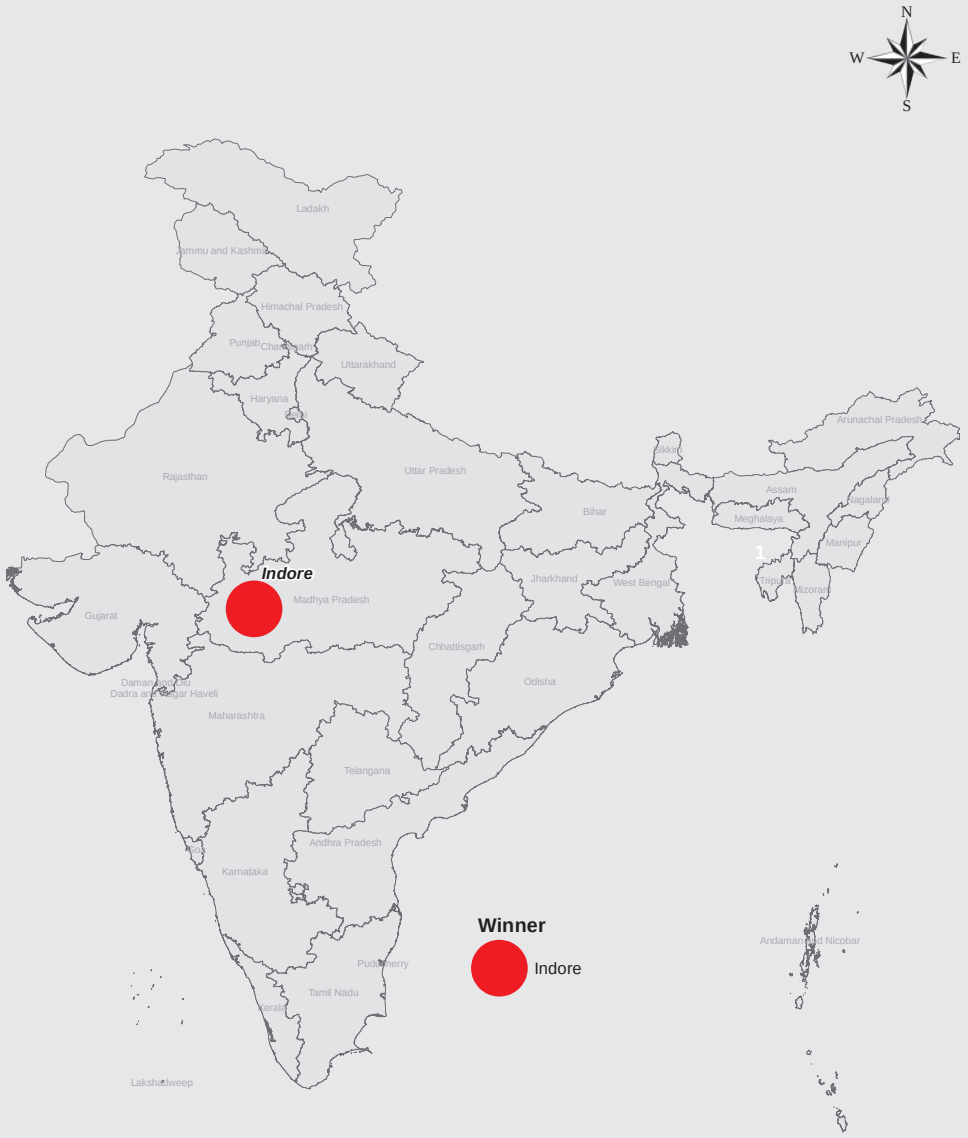
## Wind Energy for Water Supply

Surat was declared "solar city" in 2011, by the Ministry of New and Renewable Energy (MNRE), Government of India along with 60 cities across India. Moreover, to develop Surat as a "solar city", a "solar city master plan" was also prepared which later in October 2013 was approved by MNRE. Surat Municipal Corporation had planned for installation of wind power plants to minimise the electricity consumption of water supply system. The electricity consumption of Surat's water supply system is more than half of the electricity consumed by entire Surat Municipal Corporation even after various energy conservation measures. A detailed study concluded that running water treatment plants on natural gas-based power plant would not be feasible due to lower plant load factor (≈ 40%). In the effort of making corporation's water supply service economical, sustainable and renewable energy based; installation of wind power plant was chosen as an alternative. To meet the electricity requirement for the water supply system of the smart city area, SSCDL planned to install 2.1 MW of wind power plant. With the addition of this 2.1 MW plant, Surat has installed a total of 32.4 MW of wind power plants for making water supply and sewage system self-sustainable.

Section I

# WINNING PROPOSALS

# ISAC 2020:
# INNOVATIVE IDEA AWARD




*Waste management plant at Choithram Mandi, Indore*


# INNOVATIVE IDEA AWARD

Rank 1

# Indore

## Carbon Credit Finance

### Project Features

The Smart Cities Mission has played a seminal role in enhancing climate stability and undertaking environmentally sustainable actions. Indore Smart City Development Limited (ISCDL), as part of the initiatives towards ensuring balanced development of Indore has implemented various sustainable projects, including municipal solid waste treatment projects projects.

The effort to venture into carbon credit trading and to understand global carbon markets has been driven on the back of ongoing efforts to catalyse the financial feasibility of environmentally sustainable projects, and to give a fillip to the revenue generating sources of ISCDL. A carbon credit is a generic term for any tradeable certificate or permit representing the right to emit one ton of carbon dioxide or the mass of another greenhouse gas with one ton carbon dioxide equivalent ($tCO_2e$). In keeping with the spirit of the "Cleanest City" of India, Indore Smart City initiated the carbon credit project cycle for its waste management projects. The carbon

trading project for Indore Municipal Corporation (IMC) and ISCDL projects was undertaken in order to attain the following objectives: -

- To ensure financially viability of environmentally sustainable projects requiring huge investment with long gestation periods,
- To engage with potential buyers overseas to attract investment and understand global carbon market,
- To build capacity and capability to undertake this exercise end to end without a template to follow, and
- To give a filip to revenue generating sources for the Indore Smart City.

ISCDL has implemented waste management projects to scientifically treat the municipal solid waste collected and to recycle the waste into usable outputs like compost and Bio CNG etc. The smart city has also installed solar power projects to harness clean power using solar photovoltaic technology. The following projects were registered in the first round of the carbon trading cycle under the verified carbon credits:

| S.No | Project | Capacity | Location |
|---|---|---|---|
| 1 | Municipal Solid Waste to Compost | 600 Tons per day | Devguradia, Indore |
| 2 | Bio Methanation | 20 Tons per day | Choitraam Mandi, Indore |
| 3 | Bio Methanation | 15 Tons per day | Kabhetkhedi, Indore |
| 4 | Bio Methanation | 15 Tons per day | Regional Park Indore |
| 5 | Solar PV | 101.5 MW | Kabhetkhedi, Indore |

The carbon credits implementation was undertaken with the following scope of work:

- Evaluation of projects under the existing carbon credit mechanisms
- Validation and registration of projects as per applicable carbon credit mechanism
- Monitoring and verification of project as per actual operations
- Trading of issued carbon credits to realise financial benefits.

These projects by Indore Smart City Development Limited are the first set of projects to get registered for carbon credits by a city administration in the Asia.

## Key Outputs

The clean power from solar projects is expected to displace electricity generated from $CO_2$ emitting coal-based power projects. Implementation of these projects will reduce around 2.91 lakh tons $CO_2$ per year. ISCDL registered these projects under the Verified Carbon Standard mechanism within seven months from the initiation of work and also completed the monitoring and verification process based on the operational data of a one-year period generating 1.70 lakh carbon credits valued at Rs. 50-70 lakhs approximately.

Creation of compost for use in agriculture through aerobic decomposition methods and bio methanation additional by-products of the waste management exercise. From the projects taken up for carbon credit trading by ISCDL approximately 75 tons of processed compost, 2,500 cubic metres of biogas and 101.5 MW of solar energy is generated daily.

## Key Impacts

The waste management projects have reinforced Indore's brand as the cleanest city in India. Implementation of supporting strategies like 100% door-to-door collection of segregated (dry/wet) waste has contributed to the successfu implementation of the projects. The projects employ on the composting facility and indirectly through waste collection, and transportation of compost to the end-user.

In the absence of efforts undertaken under these waste management projects, waste that would otherwise be dumped unscientifically in ordinary landfills would undergo anaerobic decomposition resulting emission of methane gas. The clean power from solar projects displaces electricity generated from coal-based power projects that emit $CO_2$. By implementing these emission reduction projects, around 2.91 lakh tons $CO_2$ per year will be reduced. In their current stages, the projects are generating 1.70 lakh carbon credits value at Rs. 50-70 lakhs per annum. Once the solar projects are commissioned, the carbon credit benefits would increase too. The projects registered are eligible for a total period of 30 years.

## Replicability and Scalability

At present, there is a huge need of implementing many such waste management projects to treat the increasing municipal solid waste generation. As such many similar projects are in various stages of development in major cities of India.

In Indore, a 500 TPD bio methanation plant, a 245 MLD STP, 78,000 LED streetlights, a sludge hygienisation and bio NPK plant, a Solar PV plant, bulk waste generator an onsite waste composter, and compost plants at various gardens, e-mobility are some of the projects already proposed for the next phase. Large-scale solar PV technology has also been implemented through many public and private companies to achieve India's nationally determined contributions.

With successful projects in operation, this type of technology can be replicated and scaled up with much higher capacities.

## Sustainability

The composting project will contribute to the mitigation of greenhouse gas emissions through aerobic decomposition of the organic waste. Due to the project activity, landfilling of given waste is prevented, resulting in a reduction in the land requirement for waste disposal leading to improved environmental conditions and a replicable model. The end product of the project activity is compost that will be used as organic manure and combats soil degradation.

Carbon Financing is one of the most innovative and long-term methods of revenue generation for Smart Cities and Municipal Corporations. The entire registration is a one-time process and the returns continue to unfold over three to four decades. Newer forms of projects that reduce carbon footprint are being taken up as part of larger urban initiatives by municipal corporations. These can result in long term benefits and revenue realisations. As part of the environmental responsibilities of cities, carbon credits enhance the goal of creating sustainable cities. Since undertaking this initiative, Indore has seen tremendous private and public participation and involvement towards making Indore carbon neutral by the year 2027.

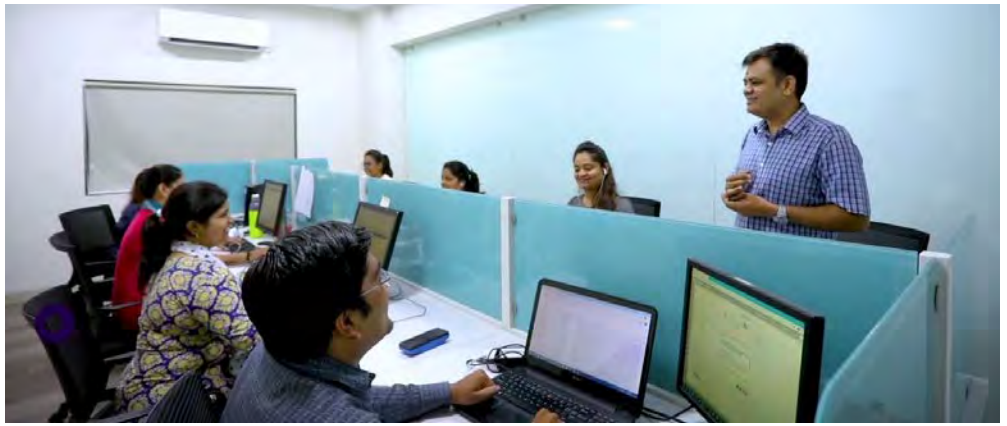
Rank
2

# Surat

## AIC SURATi iLAB

### Project Features

As a part of the Smart Cities Mission, Surat Municipal Corporation and Surat Smart City Development Limited have set up a Centre, AIC SURATi iLAB to promote the culture of innovation, start-up incubation, trade facilitation, and skill development. It is the first incubation centre by any smart city in India. The Centre has been set up under the initiative by Atal Innovation Mission, NITI Ayog, thereby complying with all the guidelines of the NITI Ayog. AIC SURATi iLAB has started tLAB Network initiative to create a network of tinkering labs .



Two remote tinkering labs have been set up where the start-ups can experiment with, learn, develop and conceptualise different scientific ideas. With the rise in demand, the centre can be scaled out with zonal level sub-centres with co-working spaces including necessary facilities like IT infrastructure, free wi-fi and small meeting rooms in different parts of the cities. A Memorandum of Understanding with academic institutes has been done to stimulate and facilitate the development of collaborative and mutually beneficial programs which serve to enhance the contribution of both the Centre and the Institute. MoUs have been signed by institutes like the Southern Gujarat Chamber Of Commerce And Industry (SGCCI), Computer Society of India (CSI), the National Association of Software and Service Companies (NASSCOM) etc. for developing and maintaining a broader perspective on start-up ideas and opportunities. The Centre helps in the creation of domain-specific mentor as they support and encourage start-ups by offering suggestions and knowledge, both general and specific. Building a network with regional incubation centres, innovators, Centres of Excellence and other such institutes will add further value to the centre.

### Key Outputs

The Centre has been developed with 120 co-working spaces, 26 teaching labs, 3 meeting rooms with 7 seats each, 2 cabins with 8 seats, a workshop to seat 56 individuals, and an auditorium with 150 seats. There have been 19 partners connected as facilitators, and 22 mentors have been appointed to assist and guide the start-ups. 41 of these start-ups are already registered with AIC SURAT iLAB, which has organized 26 events to the benefit of the start-ups.

During the current situation of the COVID-19 pandemic, a total of 34 webinars were organized by AIC SURATi iLAB Foundation. Students from various colleges and universities are facilitated and encouraged to pursue innovative business ideas and set up new ventures. The Centre also launched 4 events in virtual mode instead of in-person event including a Hackathon. The Fellowship program by Smart City Mission, MOHUA and NIUA for tracking of migrant labour was facilitated by the centre

The centre is working closely with the Urban Management Centre (UMC) for implementing portability of government social entitlements to migrants. The Centre housed the staff for migrant labour tracking and assistance during COVID19. A migrant assistance cell is now set up permanently in the same building of the centre.

## Key Impacts

AIC played a prominent role in the success of the various start-ups by providing guidance, support in various forms which was helpful to them in their journey of converting their idea into an innovation.

It gave a platform to emerging start-ups and provided them incubation facilities along with an expert panel of mentors, a common facility Centre and a highly professional co-working space. IT also facilitated the collaboration of these start-ups with a network of venture capitalists, funds, investors, potential business partners and product development. The Centre helped create an environment in the city to promote innovations and innovative ideas. With all necessary financial, mentoring and technical support to facilitate training and product development, the students in the city and the region have been given the opportunity to pursue a completely fresh line of career in entrepreneurship. The Centre serves a dual role of a nodal agency to help and facilitate various government schemes and benefits related to start-ups. The Centre gives special concession to women & specially-abled (Divyang) persons to encourage them to join. Start-ups are given a 25% discount for booking a co- working space at AIC SURATi iLAB. It also helps local businesses in skill development and innovations.

## Replicability and Scalability

In collaboration with various prominent institutes/organisations from different sectors such as textile, diamond, IT, agritech, etc. and similar centres to provide concerted support to start-ups focused on these other specific sectors. The established processes, best practices, lessons learnt and the model created at AIC SURATi iLAB can be easily replicated to the other ULB/ smart cities with similar motives and citizen aspirations. The Centre has ample capacity that, with increasing demand, can be scaled up by adding more co-working spaces, or by adjusting the co-working space to startup ratio.

With a rise in demand, the Centre can be replicated and scaled to zonal level sub-centres with similar design, functions and facilities.

## Sustainability

The Centre is completely financially sustainable, generating revenues from multiple channels. It charges the incubate start-ups mentorship fee and a stake in the start-up's equity. It is also funded by corporate social responsibility funds from private sector organizations. Events, training programs, workshops and start-up accelerator programs provide yet another steady stream of revenue. The Centre is also inclusive in terms of making its facilities available for use by academic institutions, schools, colleges, industry groups on rentals. Using revenue projections from each of these sources, it is likely that the Centre will become wholly self-sustainable in 3-5 years.

Rank
3

# Ahmedabad

## Safe and Secure Ahmedabad

### Project Features

Smart City Ahmedabad Development Limited (SCADL) with its Safe And Secure Ahmedabad project, aims to open a new frontier in serving the citizens by using advanced technologies with state-of-the-art four-storiedIntegrated Command and Control Centre (ICCC). The ICCC forms the nerve centre of information and monitoring of Ahmedabad city.

Safe And Secure Ahmedabad aims at improving the living standard of citizens, making the city safer by using cutting edge technologies with over 30,000 IoT devices installed in the city which include 50 environment sensors, 1,120 solid waste management vehicles tracked through GPS, 180 free public Wi-Fi spots and over 6,500 surveillance cameras with automatic number plate recognition (ANPR) and red-light violation detection (RLVD) facility.

Leveraging the use of the same infrastructure, a 'Stop Spitting' initiative has been started by Ahmedabad Municipal Corporation. Using CCTV cameras to identify violators across the city, is the first of its kind in the country. In the wake of COVID-19, SASA also introduced challans for not wearing a mask. Similar to monitoring spitters, SASA is also monitoring people not wearing a mask using the same CCTV cameras. All traffic junctions and public places of the city are monitored with as many as 6,500 CCTV cameras installed in 1,000+ locations under surveillance in Ahmedabad Smart City. CCTV footage is traced to the number of vehicles of violators caught spitting or without a mask using video evidence and capturing photographs.



Evidence-based memos gets prepared in a predefined format approved by the SWM department of Ahmedabad Municipal Corporation and challans are issued. So far, almost 11,000 challans have been issued. While Section-144 was imposed in city, SASA also helped Ahmedabad police monitor public gatherings. In this period 1250 public gatherings were identified and dealt in month of April and May 2020, with help of police to ensure complete lockdown.

## Key Outputs

Smart ICT Infrastructure essentially makes possible what was infeasible before. Monitoring public places with IoT devices 24x7 allows Ahmedabad to achieve the level of service quality that was previously unthinkable. Earlier, dedicated manpower was deployed to perform these various functions. Now with the use of technology the city is not only able to manage traffic but also able to leverage established infrastructure to enforce strict traffic and cleanliness discipline.

Ahmedabad is the first city to use technology to respond to spitting in public places -a public behavioral issue unique to India that is unhygienic, and considered indecent and even a public offense in many others parts of the world. This problem is extremely widespread, and completely defaces the look of the city. It was also realized during the pandemic that not wearing a mask is also as risky and health hazardous for the citizens. Such behaviours poses a health risk to people around in defiance of hygiene is not acceptable. Introducing the initiative to penalise offenders imposing a fine for spitting and not wearing a mask helped greatly in controlling the spread of COVID-19 and maintaining public hygiene in the city.

## Key Impacts

Leveraging today's technology to set up an Integrated Command and Control Centre for Ahmedabad is in line with modern citywide implementations across the world. Over 30,000 IoT devices assist in managing vehicular traffic, environmental conditions (air quality, UV exposure etc.), citizen safety, water supply and water level SCADA, solid waste management, and so on. This infrastructure itself, which includes around 6,500+ CCTV cameras, Automatic Number Plate Recognition (ANPR), and Red Light Violation Detection (RLVD), help manage a host of urban challenges.

There are over 30,000 IOTs devices installed in the city which include 50 environment sensors, 1,120 GPS-tracked solid waste management vehicles, 180 free public wi-fi spots and over 6,500 surveillance cameras with ANPR and RLVD facility. Under the same project, 130 zero tolerance junctions are being designed in order to bring traffic discipline and any violations lead to punishment of offenders through the automated E-Challan system.

Moreover, there are 126 smart LED boards that connect citizens and keep them informed with pertinent information like parking data, traffic movement, health advisory, entertainment etc. on LED boards.

Furthermore, streetlights, E-governance services, Customer Complain Redressal System (CCRS) and Water SCADA and SMART311 are systems integrated with ICCC. The Smart ICT Infrastructure essentially makes possible what was infeasible before.

## Replicability and Scalability

Even with all its features in place and proven success, the project has just started. The scope of the project will be further scaled to include the following:

- Detailed feasibility study and actual site survey for poles, CCTV cameras (including type and quantity), Wi-Fi access points, sensors (including type and quantity), digital boards/ panels, positioning of junction box, smart street, lighting poles, source of power supply, last-mile cabling route and the kind of coupling needed to mount cameras and other end devices etc.,
- Design, supply, installation, testing, commissioning of all the hardware (IT and non-IT) and software inclusive of cables and all applicable accessories required for the successful completion of the entire project,
- Civil work of non-IT infrastructure like poles/frames/fixtures/housing etc. with proper electrical earthing required based on the feasibility study report, and
- Integration of entire solutions with the various smart city components/applications.
- Operation and maintenance of entire project (IT, Non-IT and Software).

The CCRS system has proved successful in handling the tremendous pressure of COVID-19 management. Ahmedabad Smart City has been able to continue evolving new strategies and interventions to fight the virus with the help of already implemented projects like SASA. The use of existing infrastructure for purposes in addition managing the COVID-19 crisis in Ahmedabad Smart City justifies further expansion of the solution – indicating greater payoffs for its scalability.

The architecture is capable of being scaled up to more user requests or handling increased input resources in various modules. Even inclusion of additional application functionalities is met by upgrading the software editions with minimal effort. Forward and backward integration with all smart city components across all the layers is defined in the overall solution architecture. Such forward or backward integration is possible at any of the layers defined in the over-architecture viz. the sensor and actuator layer, network layer, data centre layer, application layer, integration layer, service delivery layer, command centre layer, visualization layer and security layer


## Sustainability

As mentioned above, under SASA and ICCC there are additional projects which gets monitored through ICCC. Environmental sensors installed in the city will help the government in environmental monitoring which can reduce health hazards in the city. SASA-ICCC basically collect data which helps in making informed decisions. For example, remote operability of street lights helps in saving energy expended if the lights are not switched off during the day. Similarly, different projects operated in ICCC help in saving resources and makes the city sustainable. Enforcement of restrictions on spitting and wearing masks in public places increases safety. A secondary benefit from the revenue generated by each kind of violation makes the operation and maintenance of SASA-ICCC self-sustainable financially.

Rank
3

# Tirupati

## Innovation in Generation of Solar Power

### Project Features

India has pledged to convert 40% of its power generation from fuel to non-fuel based. In pursuance of this national goal and also, the Paris Climate Agreement, Tirupati has undertaken a giant leap through implementation of 11 MW solar power projects.

Tirupati's water requirement is met through Kailashgiri reservoir located 37 km from the city. 60 MLD water is pumped to the city by 6 pumping stations along the way that consume nearly 8MW of power. 20% of the municipal corporation's budget is spent in maintenance of water supply, paying for electricity bills etc. To mitigate this cost, Tirupati Smart City Corporation Limited came up with the idea of implementing 11 MWP of solar power projects.

This proposal is about the innovation that the city has demonstrated in setting up infrastructure that will lead to generation of 4.7 MW of solar power. Out of 4.7 MW, 700 kWh will be generated using rooftops of 31 government buildings for solar panel installations in Tirupati Smart City and 4 MW from the largest floating solar farm in India, built on the Kailashgiri Reservoir in Chittoor district.

Use of solar energy has lowered energy consumption of electricity from conventional sources resulting in a reduction in electricity bills to the Municipal Corporation of Tirupati. The project needs also be credited for optimizing use of space to generate solar energy and conserving valuable land for land-intensive activities. There was no land acquisition needed for either project.

The reduction in evaporation losses from reservoir is a definite positive for the reservoir itself. Accumulation of benefits from additional energy yield, largely due to the result of cooling (of solar PV modules) from water is consistent with the negative temperature coefficient performance for PV modules. The creation of solar farms on urban water supply infrastructure/ underutilized rooftop or vacant land is generally advantageous given there are no costs usually associated with land purchase/clearing, maintenance, and insurance against flooding.

## Key Outputs

The solar energy received by the geographic area of the country has equivalent energy potential of about 6,000 million GWh of energy per year. India being a tropical country is blessed with good sunshine over most parts, and the number of clear sunny days in a year is also quite high. In most parts of India and especially in the State of Andhra Pradesh, clear sunny weather is experienced for 250 to 300 days a year. This creates a substantial opportunity for sustainable source of energy in a country where power demand is constantly increasing.

In installing the solar panels on 31 government building there have been 1,011 MWh units of electricity generated, 1,003 tons of $CO_2$ emissions avoided per year, and a Rs 0.76 crore reduction in electricity bill in the first year.

The largest operational floating solar plant in India is built on Kailashgiri Reservoir and covers about 12 acres of the 2,500 acre surface area of the reservoir. It includes 12,330 modules and 25,000 HDPE floats. The connected walkway with HDPE floats is 175m. Solar panels are accessible through dedicated 2.5 km internal walkways made of FRP grating. The walkways have high strength to weight ratio and are perforated so that gaseous exchange can happen continuously and are designed to withstand winds speeds of 200 kmph. The mooring system is specially designed to undertake both the lateral movement of plant during wind forces and vertical movement of plant as water level varies. This part of the solar project has generated 5,880 MWh units of electricity generated, 5,586 tons of $CO_2$ emission avoided, and a Rs. 3.81 crore electricity bill reduction in the first year. The land based solar plant, has generated 9,084 units of electricity in the first year, avoided 8,630 tons of $CO_2$ emissions, and accrued savings of Rs. 5.91 crores in the first year.

## Key Impacts

The project has resulted in sustainable power supply that is reliable, affordable and safe. In total, it has generated 15,975 MWh units of electricity in the first year. The city of Tirupati spends about Rs. 2 crore (including maintenance of water supply infrastructure, paying for

electricity bills etc) that can be mitigated by net savings through solar power plants. Additionally, citizens would get Rs. 10.5 crores in electricity bill savings in the first year and Rs. 318 crores in electricity bill savings in 25 years. Solar installations under these two projects have led to a total reduction in the carbon emissions by 15,219 tonnes/year which is equivalent to the amount carbon absorbed from the environment by 9 lakh trees.

Further, the floating solar plant facilitates improved water quality and cut maintenance costs due to reduced sunlight penetration and potential reduction in algae growth. It also helps in checking evaporation up to 70%. A 1 MW floating solar plant can save up to 190 lakh liters of water each year and can support the annual water requirements of 130 households. The natural cooling effect of water reduces the ambient temperature of operation of PV modules thereby improving the efficiency of solar panels by up to 7 - 10%. The payback period for the project ranges from 4.2 to 6.5 years (for rooftop solar is 6.5 years, for floating solar is 5.6 years, and for land based plant is 4.2 years).

## Replicability and Scalability

Exploring the opportunities for renewable energy source is a constant endeavor. The key is to identify techno-economic feasibility of the sites. Replication of solar energy projects has already been initiated in Tirupati. Few projects have been identified and are in various stages of design and implementation such as solar installations on the rooftops of a vegetable market and upcoming buildings under the Smart Cities Mission including the Arts District building, City Operation Centre and the Sports Arena at Indira Maidan. A gridconnected solar farm will be constructed on parking lots, and other water bodies etc. to further conserve land and water.

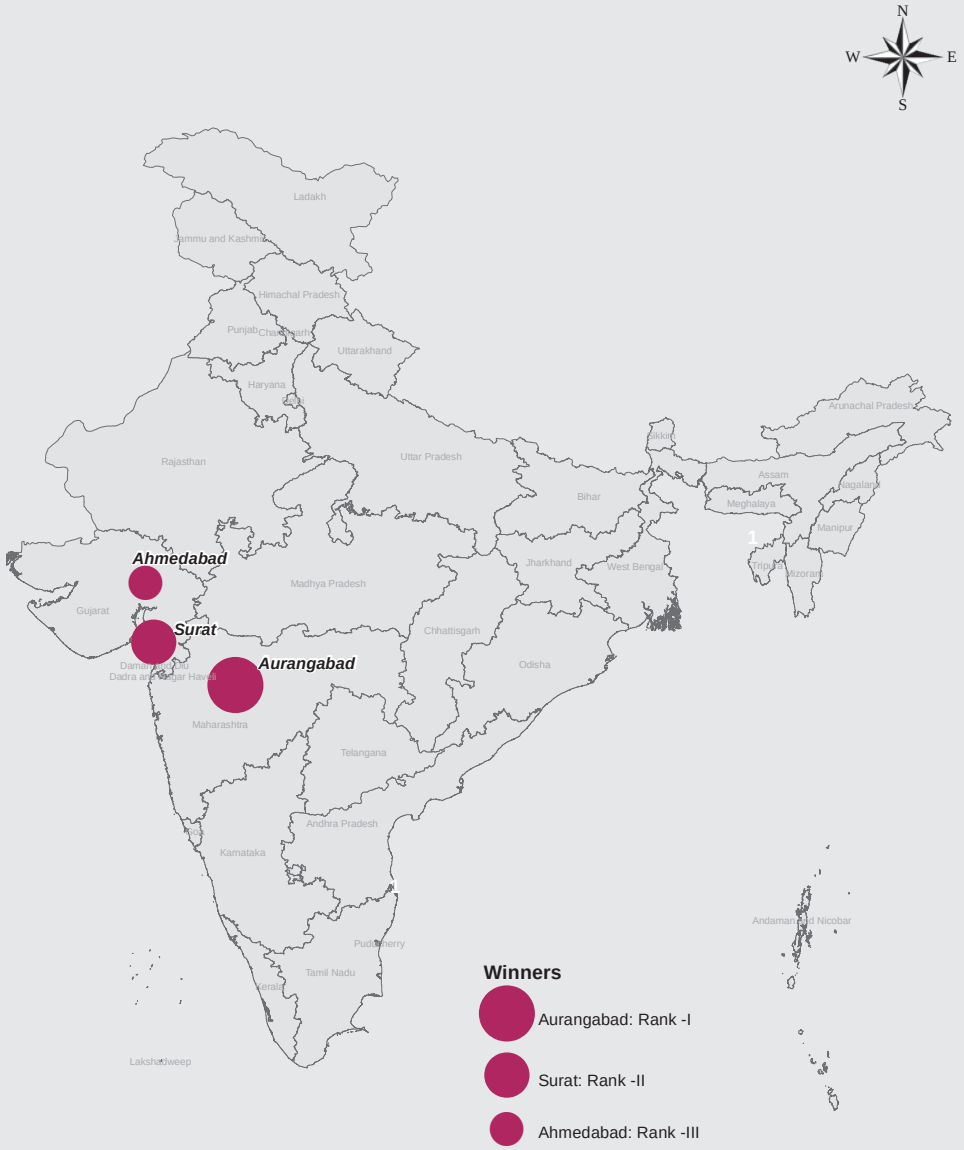
The rooftop solar potential for the proposed City Operation Centre building has been provisioned and solar panels will be installed upon completion of building construction.

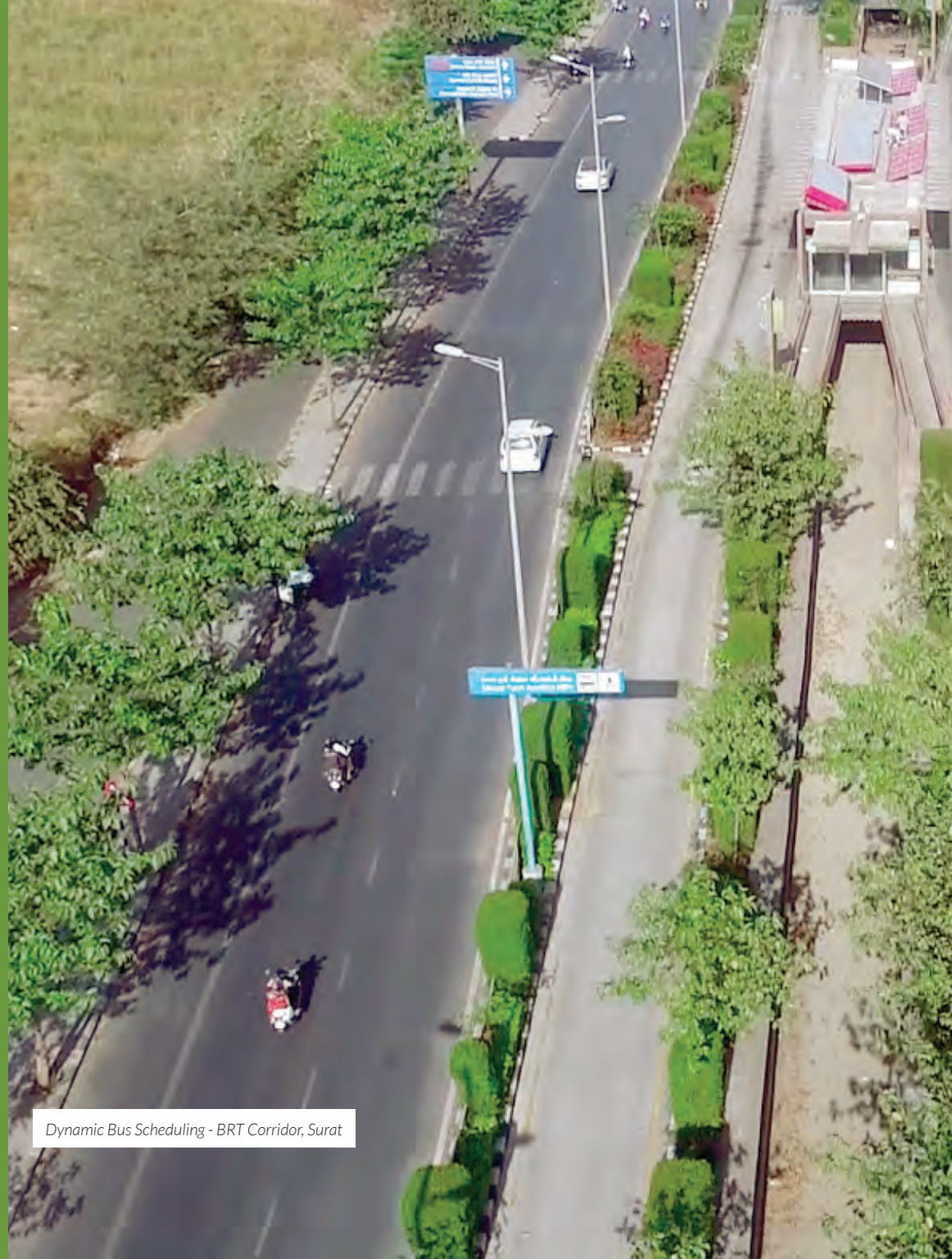
Such projects can be replicated in residential areas once agreed upon by the end users and in sites such as street lights, public toilets rail tops.

## Sustainability

With significant savings in carbon emissions, reduction in pollution from power generation from non-renewable sources, conservation of enough water to meet the water requirement of 130 households annually, and reduction in costs for the municipal corporation and the citizens, the project meets, from financial to environmental, every goal of sustainability.

# ISAC 2020: PROJECT AWARD
## Urban Mobility



*Dynamic Bus Scheduling - BRT Corridor, Surat*

# PROJECT AWARD
## Urban Mobility

Rank 1

# Aurangabad

Majhi Smart Bus

## Project Features

The project is a unique public-public partnership where Aurangabad Smart City Development Corporation Limited (ASCDCL) and Maharashtra State Road Transport Corporation (MSRTC) have formed a joint venture to operate city buses in Aurangabad. MSRTC's supporting assets like bus depot, diesel, staff and experience of operating thousands of buses, and ASCDCL's smart solutions like on-bus ITS, citizen portal, bus tracking mobile application, Passenger Information System (PIS), android e-ticketing system and other advanced features have joined to launch Majhi Smart Bus. The launch marks the commencement of a public transportation system in Aurangabad which started with none and expanded to a hundred buses in a record time of three months. The project has realised savings in upfront costs, economical usage of shared infrastructure, payment at actuals without any minimum assured kilometre requirement among many others.


Further, modern bus shelters were constructed in partnership with a private agency on an advertisement model at no cost and a revenue of Rs. 10 crores which will be realized over 15 years. ASCDCL has similarly sought to monetise other assets to increase the revenue viability of operations by utilising non-fare box revenue sources. Lack of public transportation was highlighted as a major concern by citizens in Aurangabad. The success of ASCDCL lies not only in the delivery of public transport service, but in devising an innovative institutional mechanism, ensuring financial sustainability, and introducing 'smart' features to attract commuters to the service.

## Key Outputs

The city has recorded more than 170 km of public transport operation per bus per day leading to 18,600 km of public transport operation per day. The buses ply on 35 routes covering the city and suburban areas with an average route length of 16.5 km and a fare of Rs. 2.5 per km. This has decreased reliance on autorickshaws and personal vehicles (mainly two-wheelers).

## Key Impacts

Aurangabad now transports 26,000 passengers across 44 routes and 1405 public transportation trips per day. The project has had a remarkable impact on the citizens and their travel behaviour. In addition to a new bus service, the following features have improved the experience for passengers: on-bus ITS, bus tracking, CCTV cameras, pneumatically operated doors, fire detection and suppression system, modern bus shelters with passenger information system, android bases e-ticketing set up with Smart Card / QR Code / Debit Card / Credit Card payment facility.



## Replicability and Scalability

Aurangabad has been able to create a replicable model by tying up with a State Road Transport Undertaking (SRTU) like MSRTC. This assured immediate access to quality drivers & conductors and support infrastructure like depot space. The model is appropriate for cities and Urban Local Bodies (ULBs) which lack in-house capacity and staff for bus operations. Although a game-changing initiative for travel behaviour in the city, the model has ensured savings in upfront capital costs accruing from infrastructure sharing with a large SRTU. The partnership has been mutually beneficial with enhanced cash flows for the SRTU from increased ridership and non-fare box revenues, and ultimately for citizens, 61.62% of whom had identified public transportation as a priority area in a survey conducted by Aurangabad Municipal Corporation.

While MoHUA service level benchmarks prescribe 50 buses per lakh of population, Aurangabad Smart City Bus is currently at only a fifth of the prescribed benchmark. Therefore, provisions will be made to gradually increase the fleet. ASCDCL is striving to secure additional depot space to ensure fleet expansion in the near future. The city is in the process of procuring 50 e-buses to increase the fleet and service level. The bus routes are also being expanded outside of city limits up to 20 km.


## Sustainability

In terms of environmental sustainability, increased public transportation service in Aurangabad has led to reduced reliance on two-wheelers and autorickshaws. Personal vehicles are major causes of air pollution. By introducing city buses, ASCDCL has not only managed to take steps in the direction of curbing pollution but has also tackled congestion arising from personal vehicles. Increased public transportation usage in future will have a manifold impact on mitigating air pollution and also benefit the economy of the city.

In order to ensure financial sustainability of the public transportation fleet, ASCDCL has set up a Transport Fund to ensure the financial sustainability of the project. The following are the salient features of the fund:

- Smart City Bus has been approved as a public service initiative under the Smart Cities Proposal, and the funding of gap between income & expenditure approved by ASCDCI Board,
- There are Rs. 200 crores reserved for O&M of 100 mini buses for a period of five years. ASCDCL has marked funds to be invested to ensure the fund corpus grows sufficiently to ensure gap funding in future,
- Daily revenue collection is kept in a separate bank account for funding beyond the first five years.


Rank 2

# Surat

## Dynamic Scheduling for City Bus Service

### Project Features

Surat Municipal Corporation (SMC) inaugurated its Bus Rapid Transit System (BRTS) in January 2014 with 10.3 km of stretch and expanded to 117 km (108-closed system) network with 166 bus on 12 routes. In November 2016, Surat Municipal Corporation inaugurated Surat city bus service and expanded to 491 kilometres of network in SMC and Surat Urban Development Authority with 575 buses on 45 routes. An efficient bus scheduling system is essential for a public transport service as it improves the level of service for passengers while minimising operational cost for operators.


With this object, Surat has deployed a vehicle planning and scheduling tool to analyse the daily ridership and schedule details. The routes and schedules are analysed for each hour of the day across the week with respect to their indicators. This enables the corporation to allocate buses as per passenger demand improving the level of service for the commuters.

The bus schedules are dynamic & flexible, based on real-time and past data improving the reliability of the public transport service. The dynamic scheduling system allows the city to:

- Analyse all routes and schedules,
- Classify the routes in line with their potential,
- Serve public demand i.e. headway as per the passenger load at different times of the day route-wise,
- Maximisethe percentage share of revenue km and minimise non-revenue km in the total km
- Achieve optimum vehicle utilisation for the entire fleet, and
- Minimize the number of buses while meeting the service demand with an optimum layover time.


## Key Outputs

Schedule optimisation helps improve bus arrival and departure timings, accident reduction, and route optimisation, which helps reduce bus kilometre travelled. Through the use of dynamic scheduling, Surat observed a reduction in total km travelled by buses on the BRTS and city bus routes leading to cost savings during a pilot.


Based on the analysis of passenger data during the pilot, a city bus route was curtailed during the off-peak hours. This leads to total savings of 407 km/ day amounting to savings of Rs. 43.9 lacs/year. Further, the dead kms were optimised by reallocation of buses from the depot which resulted in savings of Rs.62.78 lacs/year. The vehicle planning and scheduling tool also helped in the re-routing of city bus service for any reason. The passenger load assessment helps the organization reschedule the buses. It is estimated that a saving of Rs. 22.4 lacs/ year can be achieved if the buses are re-routed using the vehicle planning and dynamic tool in Surat based on current vehicle and traffic data.

## Key Impacts

The software used for dynamic scheduling, integrated with the existing ITMS and AFCS systems has improved the ability to prepare schedule based on actual data such as travel time during peak and off-peak hours with total ticketing data hour-wise. It can also be integrated with current stop and depots information, current lines and routes information, travel time, fare and origin-destination matrices, and Depot Management System. This will lead to a truly smart transport enterprise.



A user satisfaction survey of public transport users to assess mode shift before and after deployment of dynamic scheduling revealed that approximately 86.91% of auto-rickshaw, 6.18% of two-wheeler, 0.65% of cars, 0.78% of BRTS, 0.52% of non-motorised transport, 0.39% of old city bus and 4.56% of other users have shifted to the city bus. Because of the shift, there is an estimated reduction of greenhouse gas (GHG) emissions by 28%. There are additional positive environmental benefits envisaged upon bus network expansion, an increased ridership and modal shifts. The vehicle planning and scheduling tool 'have also improved the reliability and efficiency of operations and workforce for Surat bus operations.


## Replicability and Scalability

Currently, BRTS service is operational on 12 routes and city bus service is operational on 45 city bus routes with total network of 490 km. The average fare per passenger is Rs. 1.28/km. Currently dynamic scheduling is deployed on 750 buses within the city. The city bus service has been extended on important nodes outside city limits for commuters. In the near future, the city plans to expand its public transport service to villages around Surat city.




## Sustainability

The vehicle planning and scheduling system have optimised schedules and improved reliability on public transport service. Recent user satisfaction survey and increase in ridership indicate the modal shift from shared auto and private vehicle to public transport service. It also helped in reduction in overall city environment by reducing fuel consumption. Environmental impacts envisaged upon network expansion and increase in ridership and modal shift from private vehicles will both relieve and prevent congestion, and environmental damage.

Due to affordable fares, system-wide impacts including relief from congestion, improved safety, maximised ridership, vehicle planning and scheduling can pave way for transit-oriented and compact developments ensuring the primacy of public transport and the use of dynamic scheduling for public transport services.

Rank 3

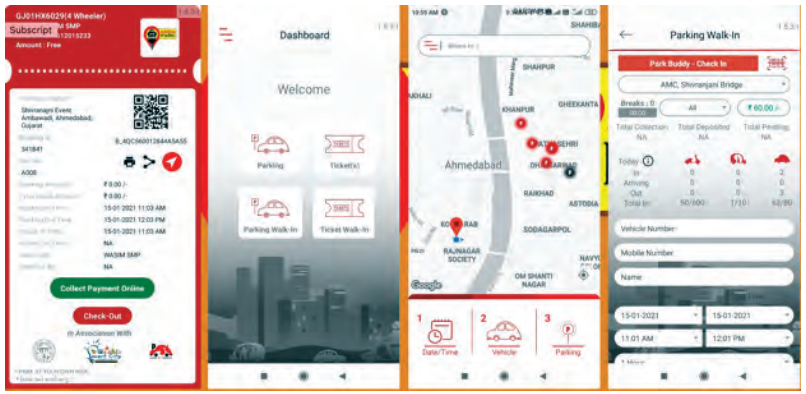
# Ahmedabad

## AmdaPark: Smart Parking Mobile Application

### Project Features


AmdaPark is a smart parking mobile application that makes it simpler for citizens to find parking, pay for parking and park their vehicles. It makes parking hassle-free by providing safe and secure parking to the commuters and citizens. The app provides a smarter way to park, while on the go. The app works in the three core verticals of Advance Booking Flow, Walk-In Booking Flow, and Event Booking Flow. It is a single solution for all parking segments on-street off-street, under-bridge, and multi-level parking.

AmdaPark promotes contactless parking and payment as a response to COVID-19. It is very popular among citizens of Ahmedabad Smart City and has also received wider coverage. It is positioned to be a game-changer in generating carbon credits, reducing traffic congestion, and reducing pollution. It has changed the way people think about parking. The project promotes gender inclusivity and there are currently 50+ women are working as park buddies. Parking lots have been landscaped with a view to keep parking areas green.




### Key Outputs

AmdaPark is a revolutionary app that has enhanced the parking experience for many citizens. It is a smarter way to organise parking spaces and reduce traffic congestion due to unavailable parking spaces in busy locations. One can search, book and pay for their parking space from anywhere using AmdaPark. By doing away with many hassles associated with parking in cities including vehicle safety, it brings relief to citizens, the police and the government. It helps

- Save time and fuel,
- Reduce traffic congestion,
- Municipalities manage their unused parking spaces efficiently,
- Ease the process of issuing tickets for parking violations, and
- Societies, apartments and institutions rent their parking spaces and generate revenue.

## Key Impacts

AmdaPark has been used for parking more than 2.5 lakh vehicles since its launch. AmdaPark usage was instrumental in preventing congestion during events like Namaste Trump Mega Event, Ahmedabad Flower Show, Kankaria Carnival, International Kite Festival etc. It is used to manage more than 50,000 vehicles at 14 parking locations of Ahmedabad Municipal Corporation (AMC). Using AmdaPark results in savings of 50,000 litres of fuel and around 12,500 man-hours every month. In 2021, AmdaPark will be used to manage around 125+ parking locations of AMC. By the end of the year, the number of vehicles supported by AmdaPark per day is estimated to be 20,000.

The app collects and provides accurate parking data and associated statistics. Authorised persons and departments can check live statistics like number of bookings done at each location as well as income generated through parking.

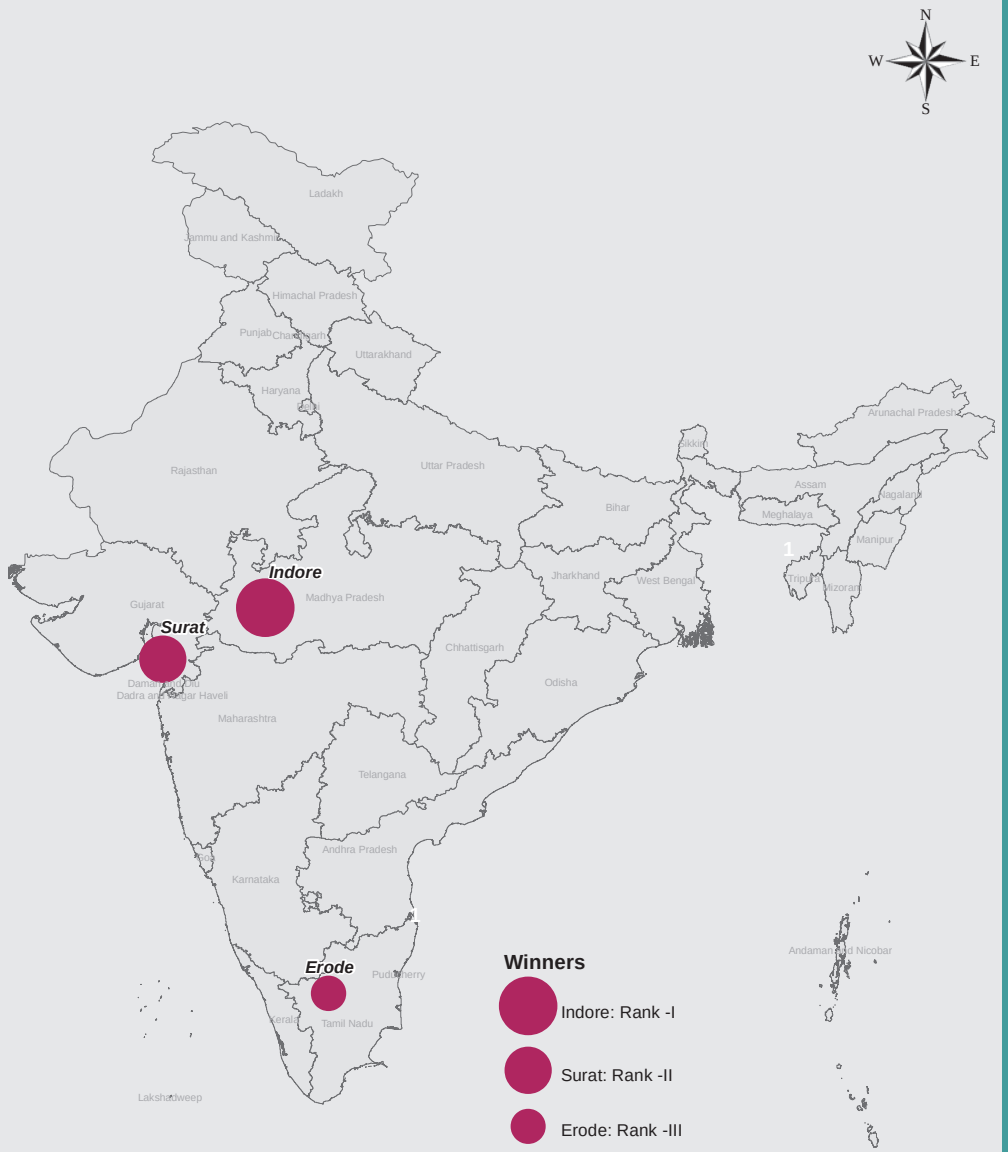
## Replicability and Scalability

Being an application, AmdaPark is easily scalable and can be used by any urban local body to manage parking within their jurisdiction.

## Sustainability

Growth in demand for private vehicle has increased the demand for parking spaces. Finding parking is often an inconvenient and time-consuming process. Smart parking projects like AmdaPark helps curb the inconvenience and inefficiencies of parking in cities. Using AmdaPark will help drivers drive fewer kilometres looking for parking, save fuel, and reduce resulting GHG emissions.

# ISAC 2020: PROJECT AWARD
## Built Environment





*Micro Compost Centre, Erode*


# PROJECT AWARD
## Built Environment

Rank 1

# Indore

## Chhappan Dukan

### Project Features

Chhappan Dukan holds the distinction for being the best-known street for Central Indian cuisine. In a city famous for its history and heritage structures, Chhappan Dukan is probably the most outstanding social and cultural landmark. Chhappan Dukan is a commercial area with 56 ('Chhappan' in Hindi language) shops along a 175-metre road stretch. The stores were allotted by Indore Municipal Corporation. Over time, the road stretch had become congested and chaotic with traffic movement, haphazard parking, and encroachments.


Indore Smart City Development Limited (ISCDL) was challenged with the task of bringing order to this iconic commercial street while keeping its vibrancy intact. They identified their objective as converting the street into a pedestrian-friendly easy to access public space recreated along with principles of sustainability and energy efficiency. The singularity of the project area's stature and visibility notwithstanding, the most innovative feature of Chhappan Dukan redevelopment was the time frame of '56 days' within which the project was implemented. The 56 days' timeline was fixed and met to symbolise Indore Smart City's commitment towards the project. The city had a timer installed in public view at the project site counting down from Day 56 to Day 0 when the implementation would be marked complete to ensure accountability and transparency. A traffic re-routing plan was worked out to avoid future hassles, end-to-end procurement plans were made and orders placed beforehand, 6 implementation agencies were mobilised to work in coordination over 3 shifts around the clock, all 7 days of the week.

The organic waste generated from Chhapan Dukan is collected in a moving vehicle called Swaaha and organically composted inside it.

### Key Outputs

The 175 metres of the street has been marked a no-vehicle zone. As alternative parking spaces in other premises, such as the nearby Swami Vivekananda School and the garden near Gadi Adda have been provided. The parking has been allotted for 200 two-wheelers and 80 four-wheelers. In keeping with the main theme of the street, the façade of all shops was designed to reflect the splendour of street food. LED lights, designer pavement space, plantation, and greenery were added for further visual appeal.

The design introduced theme-based sitting area like the social seating space, semi-open team enclosures, enclave seating and open area theatre seating. There is ample shaded green space for pedestrians. Benches and site furnishings at street corners increase pedestrian space, enhance users' experience as well provide a safe refuge for them as they wait to cross the street. They are also designed to minimise crossing distance for pedestrians.

In addition, CCTV cameras are installed for surveillance and monitoring both for security and information purposes. Modern lighting fixtures equipped with digital controllers are installed to provide dynamic lighting to add colour to the street.

## Key Impacts

Chhappan Dukan is  a landmark street development project. It is Indore's first-ever street to be designated as a vehicle-free zone. ISCDL ensured a democratic design and implementation process through continual citizen engagement. As an outcome, the smart city had full support from citizens, store owners and vendors even as they worked to meet the ambitious target of 56 days for implementation.

The area has seen a huge increase in footfall from 6,000 to 15,000 per day. The city stands to gain in revenue a betterment charge calculated at 5% of guideline value in 3 years, on-street and off-street parking charges, and a premium on digital advertisement rights for 10 years. All stores in Chhappan Dukan have been licensed by Food Safety and Standards Authority of India, which is reassuring to consumers – locals and tourists alike.  The revenue from Chappan Dukan is around 40% of the annual Rs. 5000 crores. turnover from food markets in the city.

## Replicability and Scalability

The design and implementation process employed in the redevelopment of Chhappan Dukan can and should be replicated in all urban projects, specifically similar street markets in India. Consensus among shopkeepers, vendors, customers, traffic police, police, and Indore Municipal Corporation proved instrumental in adherence to timelines and predictability during implementation. The success story of Chhappan Dukan is evidence that public participation is the key to well-executed projects.

After the success of this project, ISCDL have started Bada Sarafa, Nandlalpura & Veer Sawarkar Market projects.

## Sustainability

Chhappan Dukan has placed principles of sustainable urban development at its core. The street is marked as a pedestrian-only no vehicles zone. This has directly led to a reduction in energy consumption and a noticeable change in air quality. The area has an increased footfall and a rise in the number of children and the elderly, now that the street is safer. Various sources of revenue such as a one-time betterment charge at 5% of guideline value in 3 years after development, revenues from parking and digital advertisement rights for 10 years ensure the financial sustainability of the project..

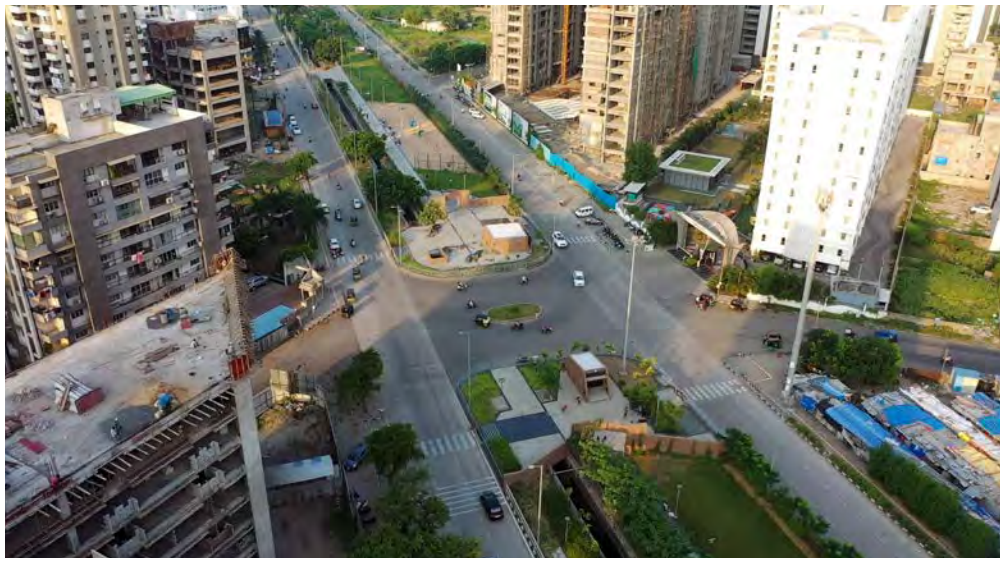
Rank
2

# Surat

## Canal Corridor - Linear Park

### Project Features

To enhance user experience along the canal road, Surat Smart City has made functional as well as visual improvements incorporating facilities such a street furniture park, children's play area, canal crossings, parking facilities, etc. The canal runs through the middle of the Canal Road as a carriageway divider. Surat Smart City has redesigned the road to include a Linear Park along the canal with the vision to add aesthetic value and utility to transform an urban road into a green mobility route. While other streets projects focus on equitable distribution of road space to each mode, this project is conceptualised with equal focus on the functional and the aesthetic aspects. The project is centred on a water feature that has long existed as no more than a stormwater drain in the city.



A land that is filled with debris and unhygienic canal condition has been well and truly turned into a model road with all the modern amenities for each age group of people through the futuristic vision of the city.

### Key Outputs

The project has introduced a recreational zone along the canal with 13 metres of a multi-use recreational and landscaped area. The road is exclusive, dedicated and attractive 10.5-metre CC road with a 2.5-metre footpath on both sides including street furniture. The footpath has tactile paving tile and bollards at entry points to ensure universal access. The design of the footpath includes a 1.0-metre buffer zone with trees and shrubs to prevent vehicle parking.

Elements like signages are planted in the green belt along the footpath to keep it clear of obstructions.

Parking space has been provided between the canal landscape area for median parking. Surat Smart City has made provisions for jogger's park, children's play area, walkways & seating, and senior citizens. The space is landscaped with seasonal plants and includes a hawking zone. The area is well-illuminated to maintain safety at all times.

## Key Impacts

Linear Park has improved the visual quality of Canal Road. Using an existing water feature as a design element and utilizing the entire ROW has resulted in the development of a one-of-its-kind, iconic landscape project. The area has been instrumental in increasing property values along the corridor, accelerating new investments, combatting noise pollution, purifying the air quality along the corridor and helping groundwater recharge.

## Replicability and Scalability

The project is replicable all over the country on any road where the ROW' is not fully utilised. Typically, cities resolve this by creating additional lanes for vehicles which in turn induces more traffic, to the detriment in air quality, road safety and universal access. Surat has paved the path of many urban design projects where cities can use existing features to their advantage to add a new dimension to liveability on streets. Surat Municipal Corporation has already initiated the development of 7 other canal corridors for a total of 15.3 km.

## Sustainability

The Linear Park is an addition to overall green area in the smart city. As the defining feature of Canal Road, it not only provides a buffer from the noise and air pollution from vehicles, but with its unique design features and amenities, also encourages residents in the area to indulge in outdoor engagements. The park provides has recreational areas for all age groups of people including a play area, shaded sitting areas amidst greenery, a pathway for easy strolls, and shrubs planted throughout the area.

In prioritising green space over carriageway expansion, Surat smart City is setting a 'smart' example by fostering principles of environment and social responsibility. The entire linear park has been innovatively imagined to maximise the utilisation of the entire ROW. The entire project is designed with an architectural brilliance combining elements such as trellis tunnel, attractive seating, artistic entry gates, sculptures, bridges, zigzag pathways, etc. This iconic project, this project will be seen as a symbol of Surat Smart City's success for many generations.

Rank
3

# Erode

## Micro Compost Centre

### Project Features

Under this project, Erode Smart City Limited implemented 100% at source segregation and door-to-door collection of municipal solid waste in the city. Prior to this, the city was generating and dumping 165 MT of garbage daily in the dumping yard. In the absence of waste processing facilities, the garbage was being dumped into stormwater drains, rivers and water bodies hampering drainage and leading to possible future public health concerns.

Under the Smart Cities Mission, Erode smart City constructed decentralised micro compost centers at 24 locations with the capacity of 72 MT per day for disposing of organic waste through aerobic composting method. Aerobic composting involves a step-by-step procedure beginning with the shredding of segregated organic waste into smaller pieces and inoculated with cultured media for decomposition. The resulting product after 40 days is enriched with Nitrogen, Phosphorus, Potassium and other essential micro nutrients-enriched bio manure.


In addition to strategically decentralising waste management by restructuring the built environment, the smart city adopted a truly 360 degree approach to resolving the larger issue. Information, Education and Communication campaigns by the city to generate awareness on waste segregation at source bolstered the efforts of the smart city team. Mechanising garbage collection vehicles facilitated operations, disincentivising defaulters, and incentivising sanitary workers proved to be effective motivators for staff support.

## Key Outputs

Erode generates around 165 MT of solid waste every day, out of which 75 MT is biodegradable wet waste, 6 MT is saleable dry waste, 72 MT is non-saleable dry waste, 0.50 MT of e-waste and 1 MT of domestic hazardous waste, 2 MT of construction and demolition waste and remaining waste is inert.

Erode smart city has delivered significant outputs by resolving the problem of waste disposal. It has achieved a decentralised and scientific disposal of organic waste by setting up micro compost centres at 24 locations with a capacity to dispose 72 MT of organic waste. The city has enforced strict implementation of segregation at source and door-to-door collection by removing all garbage bins in residential areas and introducing mechanised vehicles for waste collection.

Domestic hazardous waste is incinerated, e-waste is handed over to the Pollution Control Board approved vendors, non-recyclable, non-biodegradable waste is sent to cement factories, legacy waste is bio-mined.

Besides, delivering the immediate benefit of keeping garbage off the streets and public areas, the micro composting centres eliminate the need for secondary storage and transportation costs. Decentralisation of composting units make for effective coverage for collection and handling

of organic waste. The compost centers have treated 15,000 MT of wet waste generating 2150 MT of manure which is distributed to farmers free of cost. Entire collection of solid waste has been mechanized. Hand driven push carts and tricycles have been eradicated from garbage collection activities. There are 89 light commercial vehicle and 90 battery-operated vehicles for door-to-door collection of waste. Building compost centers has led to removal of 760 bins from residential areas, and active participation of people in waste segregation. Sanitary workers, allowed to resell the plastic from the garbage for their own benefit, have made Rs. 25 lakhs in total through this activity. Daily, 10-12 MT of manure is produced per day.


## Key Impacts

Introducing decentralized waste processing units will have positive implications for the urban built environment. Indian cities are characterized by high population density. The more the capacity and resources for waste processing are centralized, the higher the chances of neglect in some areas. With decentralization, localities all over the city get improved access to waste processing in terms of time and cost saved in collection and transportation. Decentralization also empowers citizens to take better ownership of waste segregation and their localities, and makes the ULB more accountable. Removal of waste from public areas has improved the visual appeal of Erode. This project is a major step towards improved sanitation in the city. Urban waste ends up either in dumping sites or water bodies. It has eliminated the need for dump yards or centralized processing facilities. The bio-manure generated can be distributed among residents, used in parks and urban farms

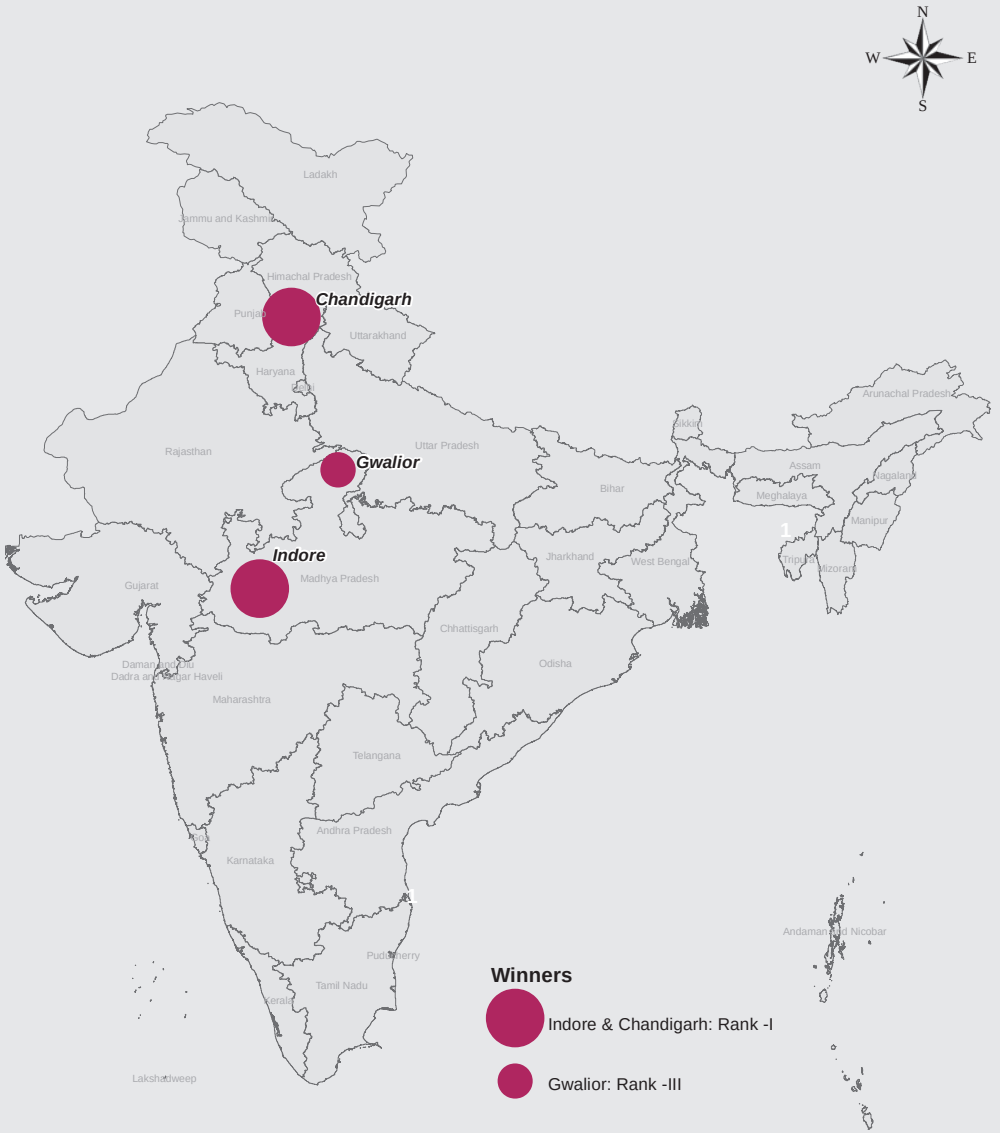
## Replicability and Scalability

This project is easily replicable across the country. The total processing capacity of all compost units is 75 MT daily for a total project cost of Rs. 12.45 Cr. The units can be made operational with only 2 weeks of training for the staff. Replication of this project could be a game changer for the face of cities in India.


## Sustainability

Erode has achieved 100% source segregation and door-to-door collection of municipal solid waste. In support of the activities under this project, Erode Smart City also generated broad community awareness and engagement through IEC activities. Ground level sanitary workers are allowed to resell recovered plastic for their own benefit. Residents are deterred from dumping garbage outside as the waste collection vehicles arrive at the doorstep. The improved visual quality of residential areas motivates the citizens to segregate at source. The synergy between different stakeholders to play a role in their own best interest in the waste management process is what ensures the sustainability of the project.

# ISAC 2020: PROJECT AWARD
## Culture




*Adaptive Reuse of Gopal Mandir, Indore*

# PROJECT AWARD
## Culture

Rank
1

# Indore

## Adaptive Reuse – Rajwada and Gopal Mandir

### Project Features

Ensuring that Indore Smart City's role, work and profile resonate with the city's aspirations, vision and culture, the Rajwada and Gopal Mandir in Indore, symbolic of its rich cultural tradition were taken up for adaptive reuse. Preserving heritage is not only about the past but a reflection of how a city looks at its own future. Adaptive reuse is the theme of restoration works in Indore.

The heritage complex in Indore consists of the Rajwada - the political palace and a mix of Mughal, Maratha, and French architecture; Gopal Mandir- a temple by the Holkars in 1832, and various Chhatris. Most of these sites were developed around 200-400 years ago and have huge religious and socio-cultural importance. The restoration work was three-fold:

- The restoration of Rajwada
- The re-construction of Gopal Mandir Complex and Gandhi Hall
- The re-development of Chhatris

Only traditional materials such as lime, jaggery, fenugreek seeds, bel fruits, and udad pulses were used in the reconstruction. No cement was used. Also, the chemicals used for different works such as rust and polish removal from the structure were done after testing and under supervision of experts from the State Archaeology and Museum Department. In Gopal Mandir complex, the traditional method of placing inverted earthen pots in the floor slab is used, which helps keep the premises cooler and the structure lighter. These methods are not only environmentally friendly but also reduce cement-based carbon footprints.

Conservation of the wooden structures of the buildings has been the biggest challenge faced. A combination of traditional methods and modern technologies such as non-destructive testing, ultrasound pulse velocity tests, crack monitors, and use of tie rods anchor systems were used to strengthen the structures. A team of artists was called in from Jaipur to take up beautiful fresco artwork using natural colors. Local artisans were also upskilled in the craft in the process.

Removal of site encroachments was the other big challenge. A combined team of Indore Municipal Corporation (IMC), district administration and police relocated about 150 temporary shops around Gopal Mandir and Rajwada to reclaim the site area. The removal revealed long-hidden facades of heritage complex. The shops were relocated for a year until the completion of projects and currently, 112 shops have opened in a newly built G+2 shopping complex with lifts, escalators and other modern amenities like in shopping malls.

## Key Outputs

With an area over 14,000 sqm conserved, restored and developed, ISCDL has made strides in conserving local art and artisans from dying out. With the redevelopment of Gopal Mandir, the premises now have multiple uses. Previously in ruins, this area will be rented to local artisans and exhibitors for a fixed duration of 1 month to allow them to promote their art.

The development of a 500-seat amphitheatre in the premises provides opportunities for local events and celebrations. People reconnect with their heritage while using the space infusing new life into old monuments. The G+2 shopping complex with 221 shops in a dense market area with lifts, escalators, basement parking and other modern amenities like in shopping malls gives visitors and tourists yet another activity of interest. The conservation of fresco paintings, architectural elements, stone and wooden arts has given a new meaning to "Vocal for Local".

The entire area is now free of encroachment with improved access to buildings. ISCDL is now planning underground cabling and a commercial plaza in front of the Heritage complex. The complex and surrounding area is being turned into Indore's primary heritage area with a "no vehicle zone" and the city is organizing heritage walks around it.

## Key Impacts

The conservation of the heritage Rajwada and Gopal Mandir complex affords economic, cultural, and environmental benefits to society. Restoration of diverse architecture has emboldened the city's sense of identity and has become a source of pride for its citizens. The project has achieved over and above a comparable exercise by adapting the heritage structures to re-use, which makes them relevant to a larger base than day tourists.

Economic benefits include increased tourist footfalls and enhanced property values. With the development of the shopping complex and adjacent Sarafa Food Street, the complex has become more attractive to buyers and shoppers. There has been a renewed interest in heritage conservation as the ongoing works are now associated with Indore's pride. The success of the project has helped Smart City build trust among citizens who, going forward, will be more likely to engage in participative planning for the city.

The complex is now much better organized and safer for children, elders and women to access and navigate. In showcasing traditional forms of building, construction and art, the project has brought in a wider acceptance and demand for local culture.

## Replicability and Scalability

The aim of this project is to not just conserve the dilapidated building but also give it a sustainable use. The building complex has been the cultural nerve of the city of Indore. The restoration was carried out keeping the socio-cultural utility of the complex intact. The uniqueness and innovation of the proposal lies in the fact that the project adds life to not only the built structure but accommodates the cultural ethos of the city in a magnificent way.

Conservation of any heritage building is a unique way of linking the past to the present. The methodology can be replicated but design solution will always be a unique. The design has addressed scalability of the project by preparing a master plan of the available land surrounding the heritage structure. An open-air theatre, a library, museum/exhibition gallery and a multi-purpose hall is proposed and interconnected with the heritage building to develop a cultural center in the coming future.

The aim of ISCDL is to create a fine mesh of the old and the new, such that those experiencing these architectural monuments are able to benefit from the different aspects of these structures and incorporate them in their living memory.

Due to the expertise developed by ISCDL in undertaking these projects using latest technologies, innovative working styles and adaptive reuse designs, it aims to further work to enhance and include other heritage restoration works into a common cultural vision for the city.

## Sustainability

The adaptive reuse of Gopal Mandir will ensure economic sustainability of project. Once in regular use, the maintenance and upkeep of the building will be more regular. The shopping complex has not only provided permanent stature to these shops but also improved amenities resulting in an increase in customer footfall.

Due to its scale, the Gopal Mandir complex was restored and redeveloped in parts. Some activities undertaken in the complex are revenue-generating in nature resulting in the entire project being economically and financially feasible. The interlinking of history with modernity has enabled Indore Smart City to make key investments into the safety of the structural monument, which had until now had been neglected. This has fused new life into dying buildings, that are now abuzz with activity.

The heritage complex has been designed in such a way that it is run by the people, for the people and through the people of Indore. This project has demonstrated to the entire city how heritage can link the past and the present, making Indore a landmark city with a unique identity sustained from the past and well into the future.

Rank
1

# Chandigarh

## Restoration of Capitol Complex, Pierre Jeanneret and Le Corbusier's Centre

### Project Features

Chandigarh is internationally renowned for its architecture and urban design. The famous Capitol Complex planned and constructed by Le Corbusier was granted world heritage status in 2016 by UNESCO. A landmark construction of India's first modern planned city, the structure with chipped concrete and eroded steel was in a state of disrepair before 2016. The restoration of the complex was required as per a UNSECO mandate. The changes to the exterior and interior of the building used by two different State Governments were however done without permissions and in a piecemeal fashion.

The largest exposed concrete complex restoration was a challenge in itself. Restoration works involved restoration of all buildings in the Capitol Complex. Among these are the three buildings in the Capitol Complex – the Secretariat, the Assembly and the High Court. The buildings have been constructed with exposed concrete and brick façade. Over the years, the façade and the tapestry work by Le Corbusier along with the interiors of Punjab and Haryana Assembly have deteriorated. With vast changes in cement production techniques over years, innovative techniques had to be adopted to match the building material to the original in color, texture and appearance.

This is India's first large-scale restoration project of a modern building.

## Key Outputs

Under this project, three buildings and 4 monuments spread over an area of 100 acres were restored based on a detailed heritage management plan developed by experts. The Capitol Complex is a major tourist attraction for the city. Almost 16,000 tourists visit the Capitol Complex every year. There has been a 20.44% increase in the number of tourists between 2018 and 2019. The construction materials and techniques used have not only improved the aesthetics of the Complex but also increased its durability by another 20 years. The smart city has added a tourist information center and project landscaping to the site.

## Key Impacts

Complex restoration and the resulting improvement in tourist infrastructure has led to a 20% increase in the overall number of tourists; of which the domestic tourist numbers have gone up by nearly 30%. The work has helped the Capitol Complex in retaining its World Heritage Site status. The project has also improved the aesthetics Administration to decide that all corridors in Sector 17 plaza will have the original red sand stone flooring which has been replaced with other kinds of flooring over time.

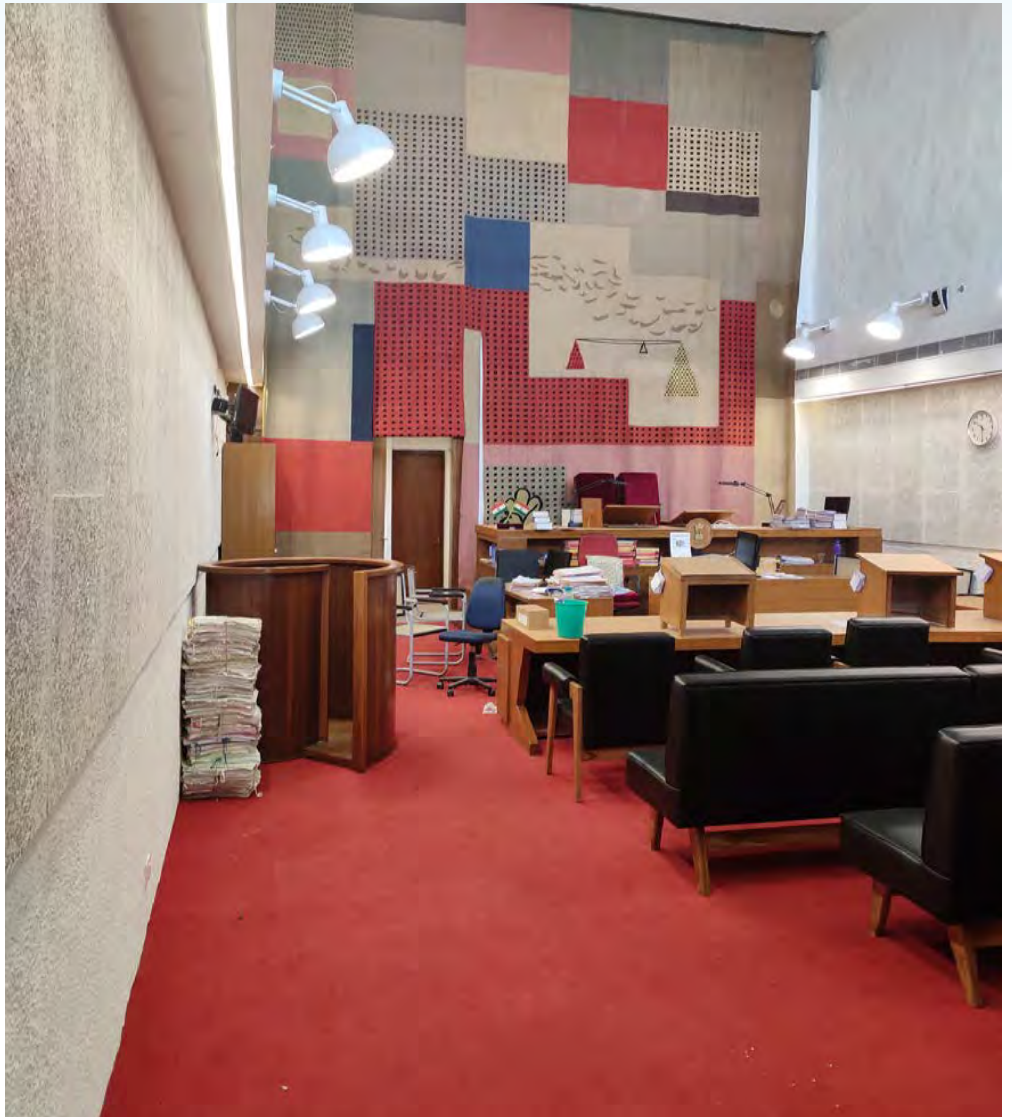
The project has received commendation letters from international foundations like Foundation Le Corbusier, France and Getty Foundation, USA. Recognition and preservation of the architectural legacy of French architects has strengthened relations between Chandigarh Administration and French Government & European Union (EU).

## Replicability and Scalability

Sectors 1 to 30 are under different heritage categories according to the Chandigarh Master Plan 2035. Restoration activities are being replicated in 47 bay buildings as well as shops cum offices owner by Chandigarh Administration in the Plaza area of Sector 17. The official residence of Pierre Jeanneret and the office of Le Corbusier have been restored following the success of the Capitol Complex restoration. The Capitol Complex has set a benchmark for restoration of large-scale modern heritage structures. It has increased awareness among the officials and the people of the value on modern heritage buildings in the urban landscape. This restoration project is likely to spur heritage restoration and conservation activities throughout the country.

## Sustainability

Any conservation project is about the sustainability of buildings and heritage that the city identifies itself with. The conservation has not only enhanced the visual aesthetics of the Capitol Complex but also increased the life of structures by such procedures as removal of fungus using water jetting, and protecting concrete from corrosion using nano chemicals. This work has upgraded the facades and interiors of buildings of global importance that were neglected for more than six decades. Further, a site and a disaster management plan have been created for continued maintenance of the complex. This effort will set the precursor for sustaining other modern heritage structures which marked the beginning of modern urbanism in India.



Rank 3

# Gwalior

## Redevelopment of Scout and Guide Center as Museum and Planetarium at Maharajbada

### Project Features

Situated in Lashkar, the heart of the old town of Gwalior, the Gorkhi Palace complex also known as the 'Maharajbada' is a series of courtyard buildings adjoining each other. With the objective of establishing a cultural hotspot for the modern tourist, Gwalior Smart City has transformed it into a standpoint digital/virtual cultural heritage museum which showcases the of the region through conservation and adaptive reuse. Through this effort, the smart city endeavors to create awareness about the remove heritage of Central India, propagate peace and broadcast the underlying values of scientific understanding.

The palace complex has been put to adaptive reuse because it offers a chance to encapsulate newer functions in an old design and serves as a conduit between the established and the experimental. The digital museum has presented the first digital showcase of the heritage and cultural experience of the region. From history to architecture, and from culture to lifestyle - everything associated with Gwalior, Chambal and surrounding regions has been taken into account while designing the content. The innovative feature of the museum is the digital content. Users feel a sense of thrill scrolling through the elaborate content set against an aesthetic backdrop. While the content showcased through traditional exhibits looks beautiful, the quantum of display is subjected to the availability of exhibit space. With digital content, the potential for storing and showcasing content becomes limitless. The content is available in English and Hindi languages.

For conservation purposes, the constructions materials used are the same as in the original structure. The original construction and building type being more energy-efficient have also been retained. Fourteen thematic galleries have been developed showcasing the historic timeline, architecture, paintings and art, music and theatre, apparels, lifestyle, leisure - sports and games, photography and food.

### Key Outputs

The digital museum is one of its kind in the entire region. The museum has been instrumental in showcasing the rich culture and aspects of heritage to the public at large. The interventions, its content can easily be updated, added and modified at periodic intervals. Since its opening, the museum has attracted more than two hundred visitors daily. With the planetarium coming up in the complex annexe, the building is set to be a prominent mark on the tourist map of the region. The number of tourists is estimated to grow to a lakh once COVID-19 related restrictions are lifted.

## Key Impacts

The digital museum has successfully marked itself as a favorite destination for people even during the challenging COVID times. Use of traditional methods and materials such as lime jaggery, pulses, handmade tiles and so on, for building construction has revived demand for such methods to the advantage of local artisans. The museum has been getting local and regional media attention, and is also popular on social media. The achievement of the project goes beyond generating awareness among locals and visitors about the grandeur of the culture and the history of region. Its establishment goes towards supporting the hospitality sector, the travel industry, local artisans and allied businesses. The museum takes up only a partial space of the building while the remaining space can be used for hosting events and other socio-culturalactivities for which potential investments exist in the pipeline.

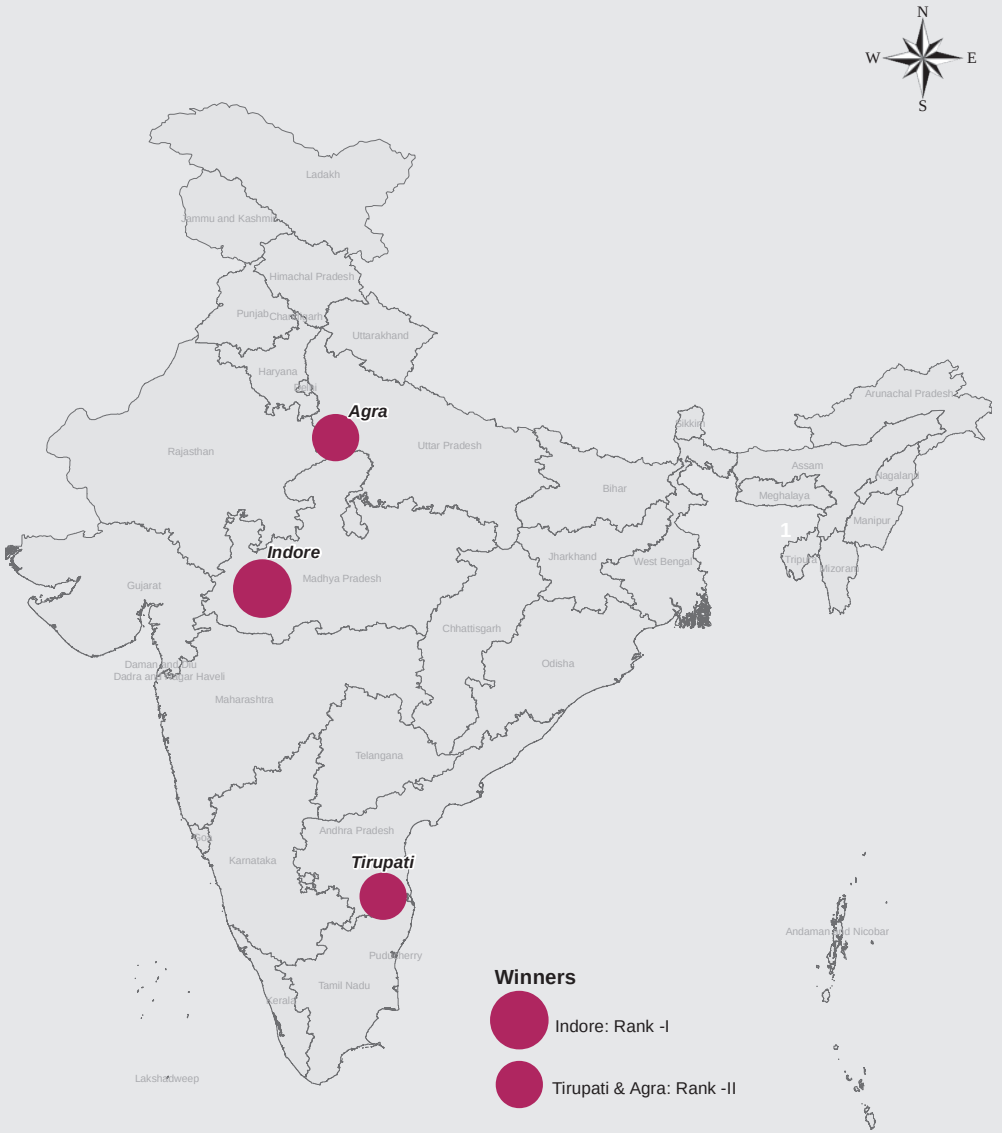
## Replicability and Scalability

The project can be scaled up to accommodate additional uses. Due to the digital nature of its content, the museum is collaborating with international museums for enriching its content at regular intervals. Similar methods for restoration and adaptive reuse are replicable and advisable for other heritage structures across the country. Gwalior Smart City plays an instrumental role in providingdigitalcontentinsupportofartifactswhichisthewayaheadforallmuseumsinthefuture.

## Sustainability

The Digital Museum and Planetarium project is one of the most sustainable projects envisaged by the Gwalior Smart City Development Corporation Limited. The estimated revenue generated through ticketing for the digital museum and planetarium will pay for the operations and maintenance of the building. Further, rental income from the leasing out the remaining floors is also expected to add to the revenue. The project is estimated to generate employment for over two hundred people from the year 2021.

# ISAC 2020: PROJECT AWARD
## Economy




*Digital Handicrafts Incubation Centre, Tirupati*

# PROJECT AWARD
## Economy

Rank
2

# Tirupati

## Digital Handicrafts Incubation Centre

### Project Features

Tirupati is well-known for its local crafts including local woodwork, terracotta sculptures and kalamkari artwork. There are over five thousand local craftsmen in Tirupati. However, their crafts are now dying out for various reasons. The artists who create designs migrate to bigger cities, leaving behind craftsmen who depend on preliminary designs from artists to build their work on. As a result, the craftspeople repeatedly manufacture the same designs which in turn leads to a decline in the value of their craft. The manufacturing processes involved in the production of art pieces are outdated; the production is plagued by delays and unsold inventory. The process of customization of handicrafts to meet market demands is time consuming and cost inefficient.

In order to reverse the trend that the local handicrafts industry is facing, Tirupati Smart City launched India's first digital handicraft incubation center. The digital handicrafts incubation center is a digital platform for artists to share designs with craftspeople thus removing the geographical barrier that exists between art and craft. The studio will enable craftspeople to digitally manufacture master patterns of new designs. Through this selective technology intervention, it ensures artists remain relevant by digitizing their skill, and craftspeople do not feel threatened since their traditional manufacturing processes still remains intact. The Design Studio generates employment for craftspeople by providing access to architects, interior designers and markets that they did not have access to earlier.

## Key Outputs

The Indian interior décor market is sized at more than $3.5 billion (Rs 25,000 crores) with a global market size of around $700 billion. Tapping into this segment through architects and interior designers opens up a host of opportunities for craftspeople.

Through the incubation center, at least 500 people from Chittoor District (including but not limited to artisans, craftsmen and non-artisans) have been trained/upskilled in a span of years in different craft forms. It is planned that the municipal school students in Tirupati will be introduced to 3D printing technology in the Design Studio. They will be trained on different forms, usage, functionality and real world applications. Two sessions per school have been conducted with a reach of 350 students from Municipal High Schools. Further,. Further, the craftspersons associated with the Design Studio can now produce any artefact in seven days as opposed to the sixty days it would take earlier. This has led to a time reduction of almost 90% in the production of crafts.

## Key Impacts

COVID-19 has resulted in a complete shutdown of urban haats and craft melas which were the two main sources of income for rural crafts persons. With the décor industry's forward linkage in place, crafts persons can take orders directly from architects/interior designers and no longer have to rely on physical platforms to showcase and sell their craft.

The timelines for metal casting is down to five days from sixty days earlier, for Kalamkari thirty days spent before are reduced to five, similarly for wood carving and terracotta the time to manufacture has been reduced to five to six days as opposed to almost fifty days earlier.

The craftspeople can use the Design Studio at zero cost and start a business with a one-point contact. With such facilitation, the craftspersons are already catering to the interior decor market in Bengaluru through four architects. Products like streetlamps, planters, benches, plazas, pathways, and other public infrastructure elements are being redesigned by local artisans with the help of the Design Studio. This will help build a local identity for the city that promotes its traditional culture and heritage.

## Replicability and Scalability

India has around 744 handicrafts clusters spread across 740 districts. The sector employs about ten million people directly and indirectly, with women accounting for over 50% of the workforce. India's share in the international market for craft is under 2%, while that of China stands at 30%. This project's focus is on establishing a handicraft manufacturing culture which promotes development of new products from design-to-product stage in the shortest timescale possible. The objective is to transform our rural artisans to 'digital micro-entrepreneurs'.

This proposal has been designed to be modular in nature and can be easily modified in terms of required capital and operational expenditure for implementation in any part of the country.

Conservatively, with approximately2.5 lakh new houses being sold across the country every year, the décor market size is at least Rs. 25,000 crores (assuming an average spending capacity of Rs. 1 lakh per house) from which direct employment for 1 lakh artists and craftspeople can be generated.

Scaling up such an initiative will promote social inclusion in the non-agricultural rural economy by empowering women with manufacturing skills. Women in rural areas are still significantly under-represented in our work force. They do not have the luxury to go out in search of work. By providing the necessary training, skills and access to resources, women can be empowered to "make from home" and be inducted into the formal workforce.

## Sustainability

The vision for the handicrafts sector should be to create an enabling environment and provide sustainable livelihood opportunities to the craftspeople. This vision will be enabled through introduction of technology such as 3D Printing and 3D Scanning. The objectives are to enable the requisite growth of the artisans, with an emphasis on business sustainability and viability along with improved living standards.

The Design Studio has been planned to become a self-sustaining model within 1 year of operation. This is being done by meticulous planning of roles and incentives for all stakeholders involved. The Design Studio is amongst India's first multifunction digital incubation centre for artists, craftspeople, and the unemployed urban and suburban population.

The sustainability aspect is in-built into the project model which is symbiotically beneficial to all parties involved .

1. Artists receive fair royalties for their original designs, which keeps them motivated to create more
2. Craftspeople receive new designs, training and perennial employment opportunities which which keeps them motivated to continue manufacturing handicrafts
3. Architects/interior designers get access to trained craftspeople who can manufacture customized crafts on demand. This keeps them motivated to get more orders the Design Studio

This project illustrates how the entire value chain of the handicrafts industry has been redesigned to make sure that each stakeholder is incentivised adequately. Following this approach, Tirupati Smart City has made sure that the handicrafts industry will gradually become self-sustainable and a lucrative livelihood option for future generations.

Rank
2

# Agra

## Micro Skill Development Centre

### Project Features

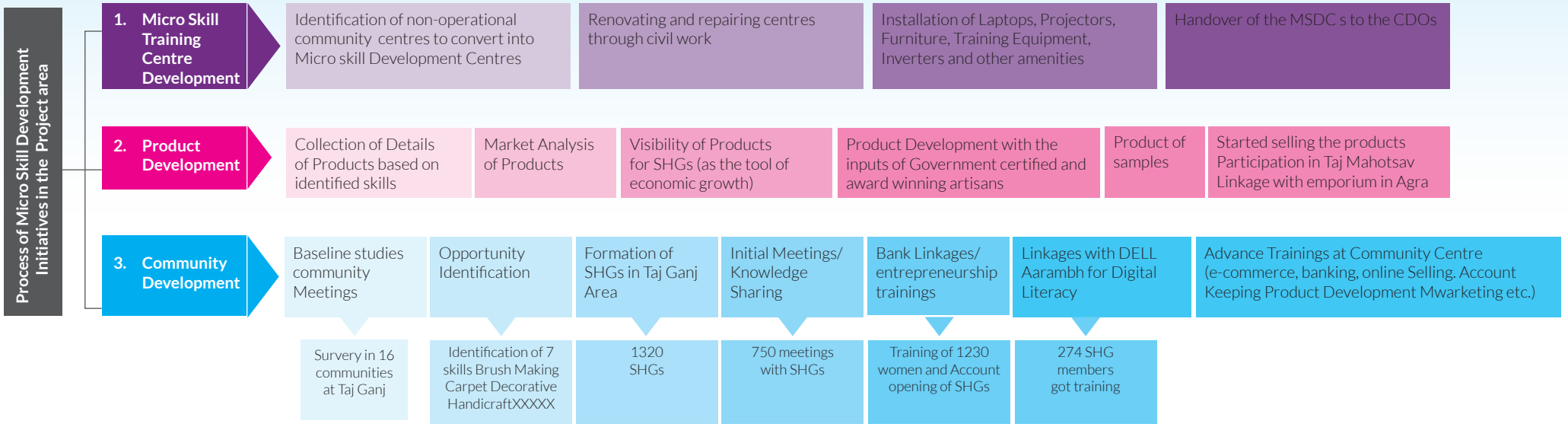
The handicraft products of Tajganj in Agra Smart City have earned global acclaim for their exquisite designs, craftsmanship and functional utility. The marble inlay articles, zardozi work, flower art, carpets and other handicraft goods of Agra are world-famous and unparalleled for quality and design.


However, even with the high potential for growth in the handicrafts industry and related employment opportunities, was found that 68% of the population in Agra is non-working. Among the working population of women, 87% unemployed women. Lack of opportunities for industrial expansion due to environmental constraints to usage of traditional methods in procurement, design and manufacturing constitute the primary causes for poor employment. The knowledge for handicrafts is limited to craftsmen and the numbers of skilled resources required for the handicrafts industry to grow are insufficient. Lack of modernization of systems also means little exposure combined with inadequate access to markets and opportunities.

Agra Smart City found an opportunity in leveraging the potential for handicrafts development to develop resources, capacity and facilities in a way that would lead to holistic benefits for the people. As part of the process of micro-skill development in the project area, Agra Smart City came up with a three-pronged initiative including developing micro skill training centres where artisans are supported in developing higher-value products, and the community is trained in skills related to handicraft production, market analysis, smart solutions, promotion, distribution and sales.

Micro skill development centres are equipped with laptops, projectors, furniture, internet, product and development tools. Community-based self-help groups (SHGs) are trained in these centres to increase their interpersonal communication skills as well. Micro skills centres have also become places of knowledge exchange and social bonding of women groups.

Process of Mico-skill development Initiatives in Project Area




In terms of product development, artisan is imparted skills through trainings and linked with sources of raw material and the market. Multi-level initiatives are proposed to incorporate community's active participation right from the planning stage to implementation of micro-skill development project and its sustainable operations.

To sustain and improve community participation in this direction, 104 SHGs have been identified to study the gaps and reasons for non-participation of workers in the handicrafts industry.

The gaps will be analyzed during several participatory activities including workshops, awareness campaigns, gender sensitization camps, capacity building programs and so on. This process will include conducting community mobilization activities, preparation of livelihood resource inventory/ maps, livelihood promotion activities, entrepreneurship development activities, formation of SHGs & local institutions, involving existing SHGs, networking and coordination, and building inventory of local traditional art. Further, a value chain analysis will also be conducted to understand which activities in the handicraft industry provide maximum competitive advantage.


Smart Cities Mission

## Key Outputs

104 SHGs comprising 1,230 women and 90 men in Tajganj area are under the Micro Skill Development Centre project by Agra Smart City Limited. 274 of these SHG members have been linked with the Dell Aarambh initiative for digital literacy.

Agra Smart City has established 4 micro skill development centres with IT solutions at Nala Shekh Buaki MSDC, Teela Shahid Nagar MSDC, Kolhai MSDC and Chowk Intara Telipada. The project is projected to create more than 5,000 livelihoods. Entrepreneurship development programmes are already in full swing in these centres. The entrepreneurship training of 1,230 women have already been conducted through 25 sessions on entrepreneurship development programmes.

45 skill development training programmes spread over 7 skills sets like zardosi, carpet weaving, marble inlay, brush making etc. have also been conducted. During the first wave of the COVID-19 pandemic more than 7,000 masks were made by the SHGs and sold and distributed across the city.

SHGs have been empowered to manage their own funds and 120 of them have even opened their own bank accounts. More than Rs. 4 lakh worth of products from micro skill development centers have been sold online.

## Key Impacts

The various training program conducted in marble inlay and zardosi skills have helped the SHGs in developing unique designs and patterns. This has improved the marketability of the products, direct employment opportunities to more than 1,350 women have been provided and indirect employment opportunities to several others. Digitization and linkages with e-commerce companies have given the handicrafts industry in Agra a fresh lease on life.

It has also led to a diversification of the tourism industry creating a novel experience for tourists to add to their itineraries. For members working under this programme, there is an approximate 10% increase in household incomes bringing social security and increased financial independence to the community, especially the women. This will prove beneficial to the social and psychological well-being of the community as a whole and will have a positive ripple effect in all other aspects of personal/societal development in the city.

## Replicability and Scalability

The training modules and the IEC materials used for skill development can be easily replicated with modification and customization based on the skillsets. The project is currently limited to 4 micro skill development centres in ABD area which are replicable all over Agra, or any city looking to develop local handicrafts.

Agra Smart City is planning similar centers and is in the process of developing customized strategies and guidelines for each. These guidelines will relate to micro credit and finance, SHG operations, awareness and publicity, monitoring and evaluation at community level, role and responsibilities of different groups, self-appraisal guideline, etc. The guidelines will also be replicable across SHGs.

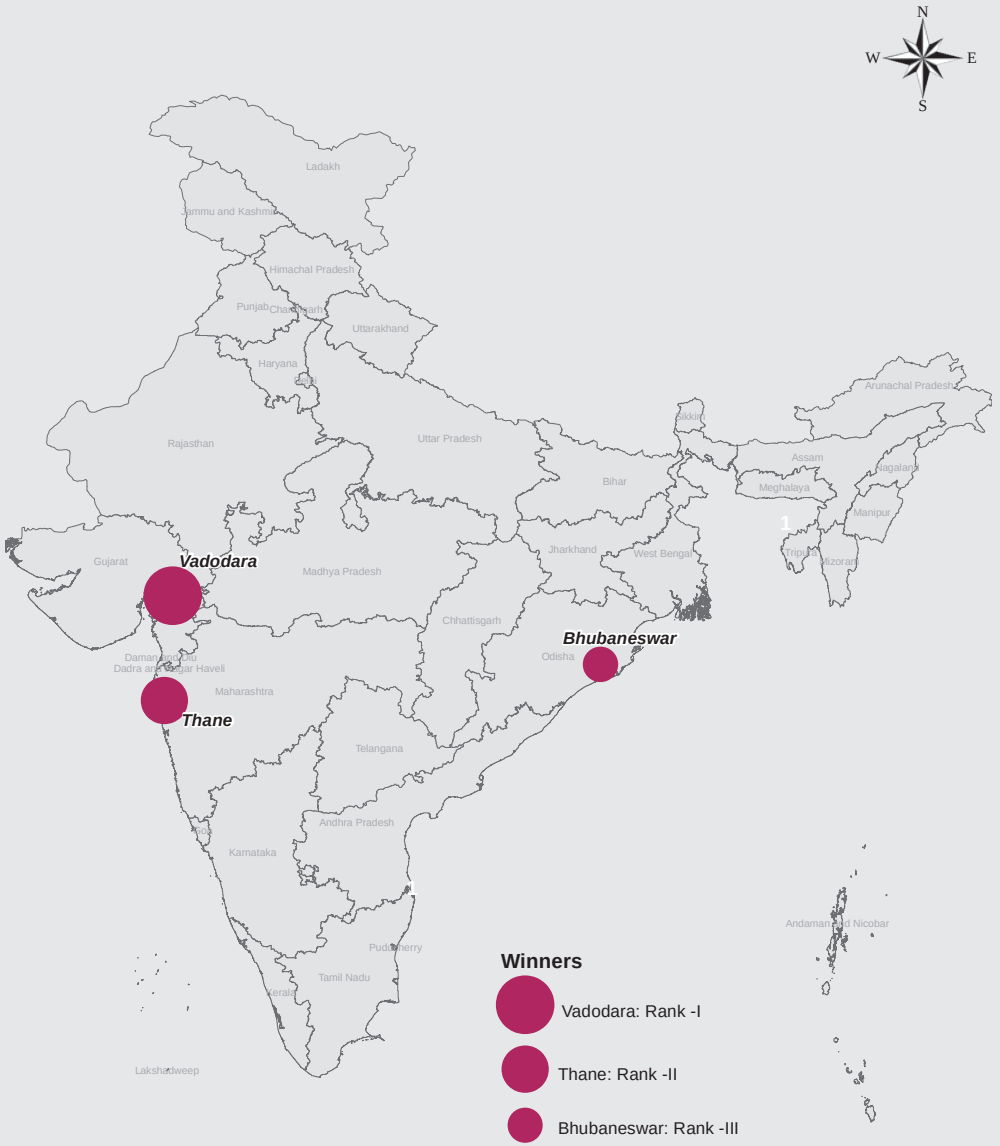
As of now 104 SHGs have been mapped to various skill centers and could be expanded with support from various government schemes from the Micro, Small and Medium Enterprises department, Skill India, and Pradhan Mantri Kaushal Vikas Yojana.

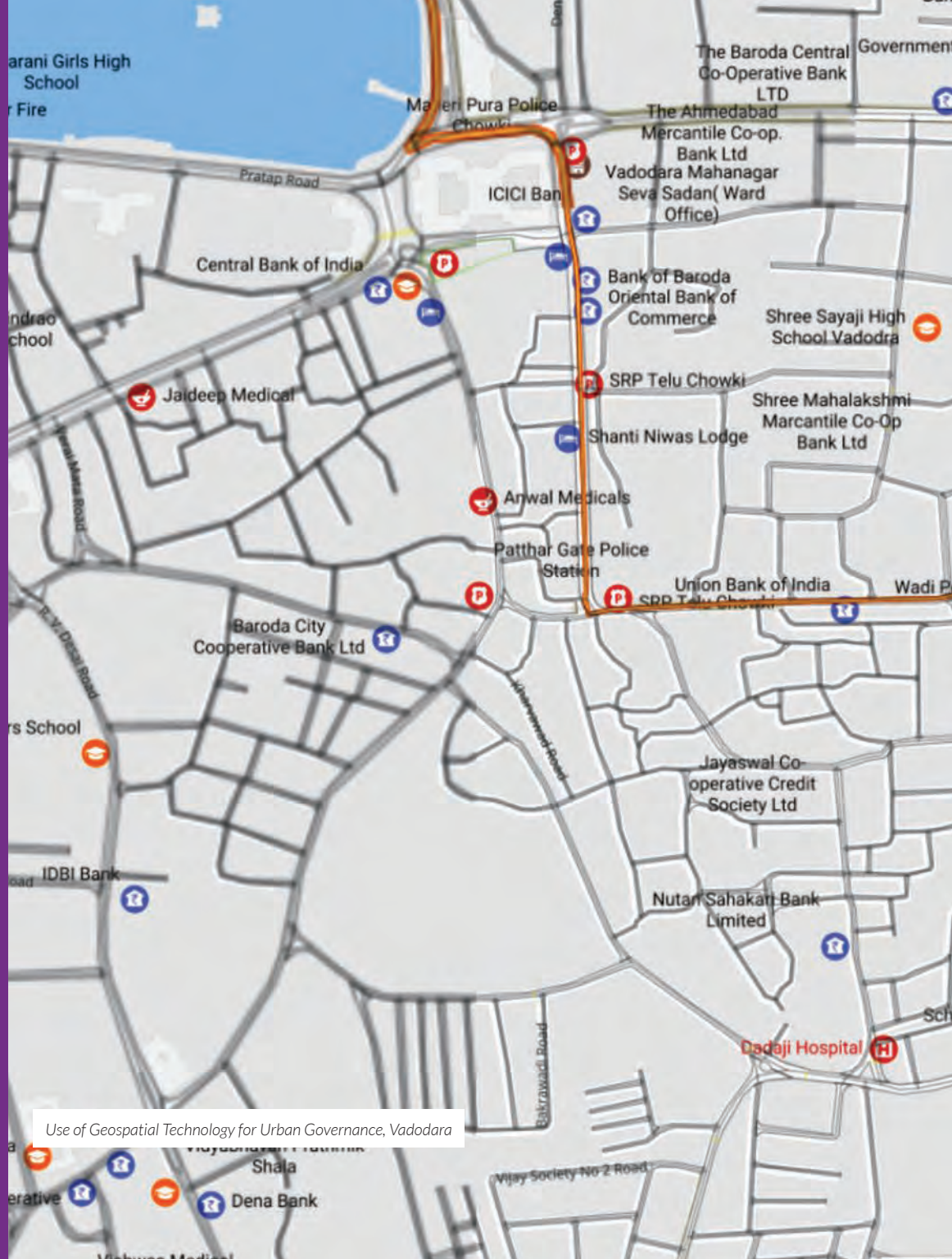
## Sustainability

The program has been developed with a special focus on evaluation and feedback-based course correction, to ensure its success and sustainability. Inclusivity, the main strength of this initiative, is a predictor of the program's sustainability. The level and depth of involvement that SHGs, local leaders, and other stakeholders have shown reflect the wide acceptance of the initiative.

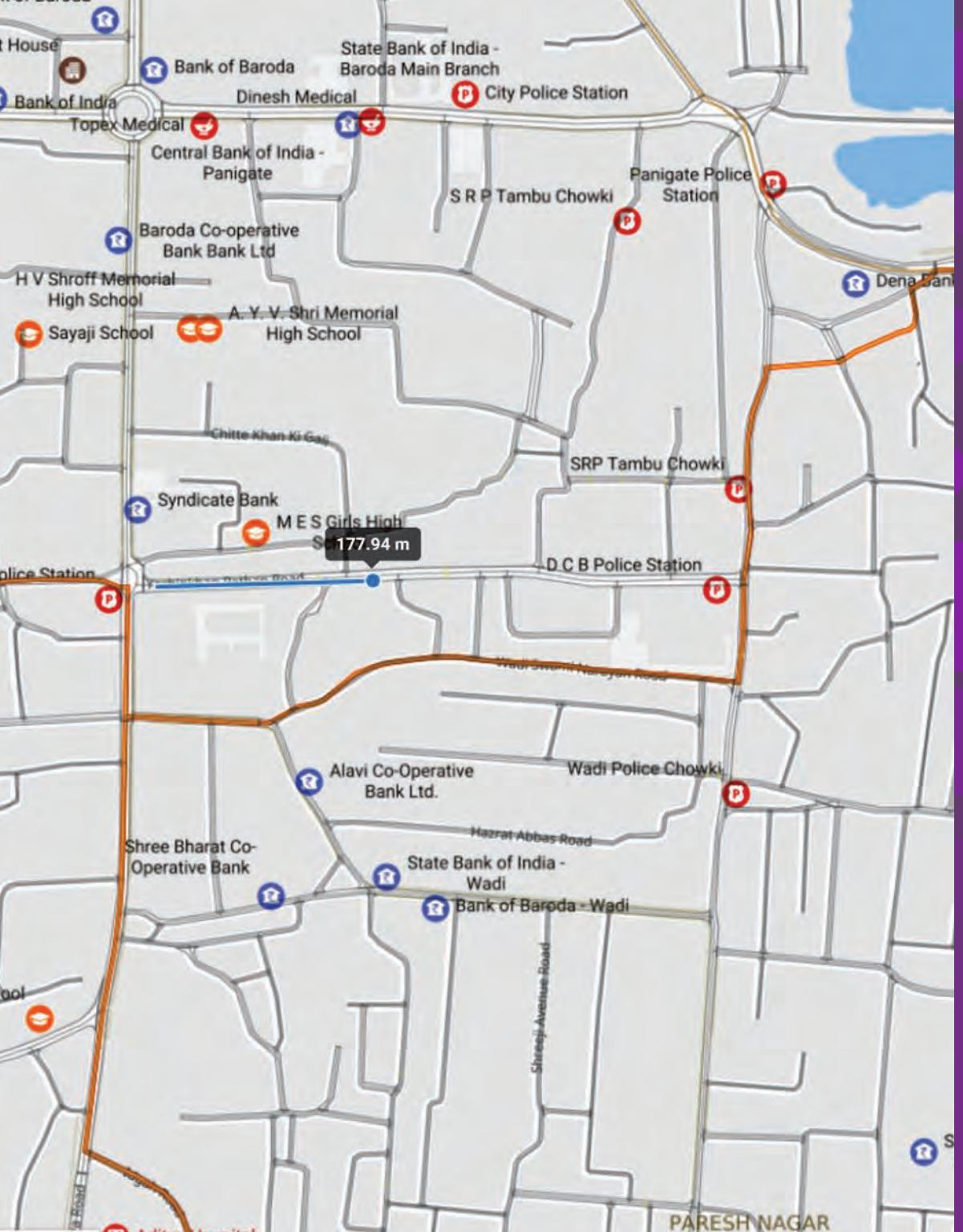
So far, more than Rs. 4 lakh worth of products have been sold online in India as well as internationally. A portion of the revenue has been kept in fixed deposit account to act as base capital in future. Memorandums of Understanding signed with Amazon , Flipkart & Paytm and tie-ups with various travel agents will ensure longevity of the initiative. The backend logistics setup has also been established with a robust IT mechanism for product delivery in the form of tie-ups with DHL and e-kart.

# ISAC 2020: PROJECT AWARD
## Governance




*Use of Geospatial Technology for Urban Governance, Vadodara*




# PROJECT AWARD
# Governance

Rank 1

# Vadodara

## Smart Governance using Geospatial Technology

### Project Features

Vadodara has setup a GIS-based system to provide a robust and reliable decision support to facilitate citizens in an effective way. The system is integrated with other ICT and smart city initiatives. As part of this setup, Vadodara has also developed a GIS platform for creation, storage & maintenance of GIS data and a web-based GIS application.

The GIS platform developed for Vadodara is an enterprise-wide system that integrates all the data from property surveys, field surveys, IOT and sensor information, GPS data and so on, to a common platform. This is helpful in creating various application services for all stakeholders from corporation users to citizens.

With the Plan Dig and Monitor (PDM) module among GIS solutions, various municipal departments, external utilities and network service providers can apply for interdepartmental approvals and digging permissions/no-objection certificates via the platform.


My Vadodara Mobile App (Downloads and Reviews)

Citizen Services

Dustbin Locator

Garbage Truck Locator

The PDM ensures that any digging work needs to be marked on the map, thereby creating the geofence. The web form once submitted is sent to the water department, sewer department, estates department, and finally, the request form is forwarded to the city engineer for the final approval. Once all the necessary approvals are in place, the requisitioner gets the notification about the approvals in place for the proposed excavation work. This tool lets multiple stakeholders take permissions simultaneously avoiding frequent and haphazard digging, and prevents malpractices and unnecessary expenditures.

The GIS map has more than 70 thematic layers including sewerage, water network, storm water drainage network, sold waste management, public utilities, town planning schemes, the road network, parks and gardens, government and municipal hospitals, residential and commercial property.

The comprehensive GIS solution deployed in Vadodara has been developed using open-source technology applications like QGIS and PostgreSQL which are highly scalable, customizable and interoperable. The solution is sized to cater to multiple sources of data like ERP data, field sensor data, GPS data, and other IOT data.

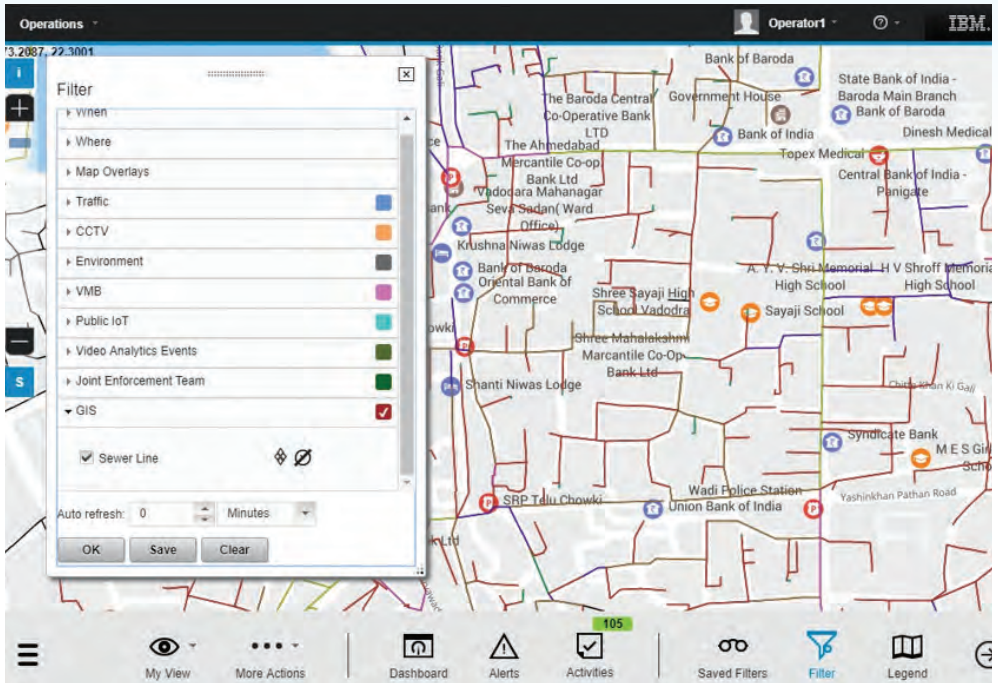
### Key Outputs

The digitized spatial data has minimized the time of research saving many manhours. Digitalization of records has supported informed decision-making in the city. Vadodara's GIS's highly intuitive spatial and non-spatial data includes more than 70 layers and more than 700 attributes of strong geo-spatial mapping, covering every facet of the city.

Under this project, 3,000 km of road network and more than 3.6 lakh building footprints have been digitized. More than 7 lakh properties have been surveyed for change in area measurements, their geo-tagging along with their usage and sub usage types, thereby mapping each property with its occupancy details.

All of this has been captured on a high-resolution (30 cm spatial resolution) satellite imagery taken over a period. It covers all above and sub-surface assets and utilities within the municipal limits of Vadodara City with area of approximately 220 sq. km

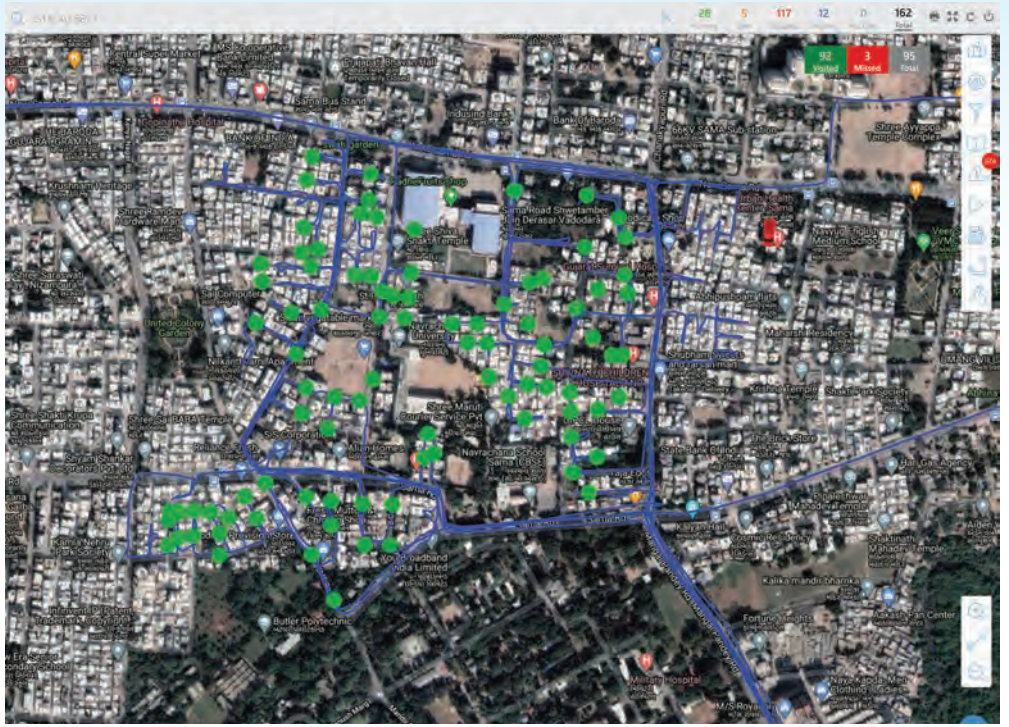
More than 1.5 lakh trees, 488 water features, approximately 1,564 km of water network, more than 700 km of gas network, and more than 425 km of stormwater line network, etc., have been mapped until now.




## Key Impacts

The project implementation has helped in identifying the following variations on-ground:

1. **Property Tax Assessment:** The city has more than 7 lakh properties within the municipal boundary. After a GIS-based door-to-door property survey was conducted, more than 20,000 new properties were identified. This has led to the revenue collection of Rs. 453 crores, an increment of approximately 4% in annual revenue collection from Rs. 436 crores in the previous year. The increase in revenue collection was possible due to the identification of changes in property classification from owner to tenant (10,000 properties) and conversion of properties from residential to commercial (12,000 properties). The increased revenue amount has already recovered the project cost incurred.



2. **Door-to-Door Garbage Collection:** With fresh impetus on Swachh Bharat Mission (SBM), Vadodara took the lead in garbage collection. With the help of GIS, more than 24,000 garbage collection Points of Interest(PoI) have been marked across the city. These Points of Interest cover the smallest streets and every door. More than 300 garbage collection vans are GPS enabled. In 2018, there were around 1.2 lakh points of interest that were missed/ skipped by garbage collection vehicles, whereas in 2019 the number of household coverage has improved by 80%. The target for this year is to collect from 100% households.

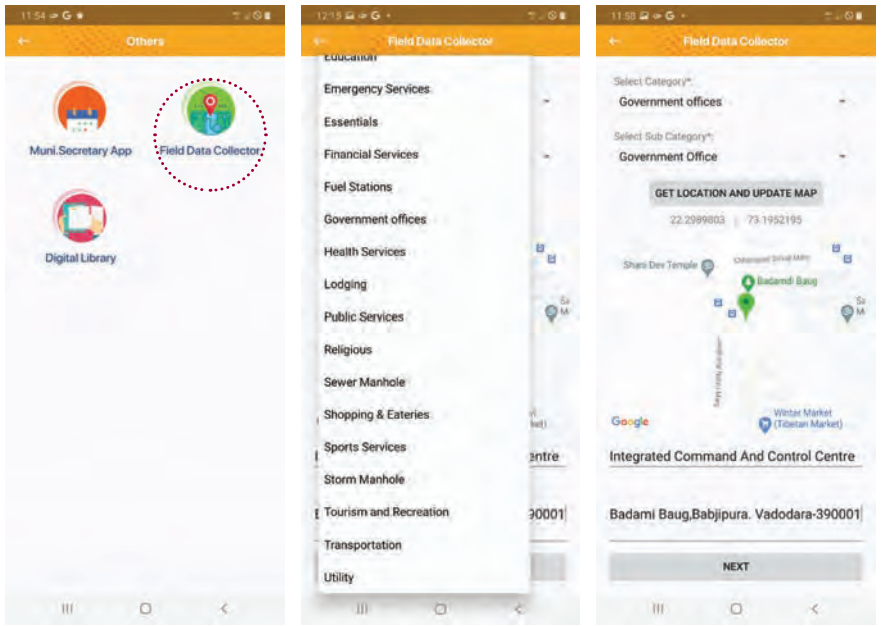
3. **City Bus Monitoring:** This system is implemented on similar lines as the door-to-door garbage collection for solid waste management. The ridership of the city bus service has improved significantly, from 90000 people in 2017-18 to 1,25,000 in 2018-19.

4. **Greivance Redressal System:** A map-based geo-tagged complaint redressal system simplifies the process by which citizens can lodge grievances. All citizens now need is to click a geotagged photograph and attach it with a complaint form. The complaint along with the location under question is directed to the concerned city official based on which the official can prioritise and address the issue.

## Replicability and Scalability

The current system can scale up the current application to visualize the entire city in 3D. The merit of the project lies in its sustainable architecture. Being an open-source customised enterprise solution, it can be customised based on the future needs without any dependence on commercial off-the-shelf (COTS) software. Also, the use of open-source technology tools makes the GIS platform highly scalable. The database sizing capacity of the tools used is almost unlimited in comparison to other database management systems.

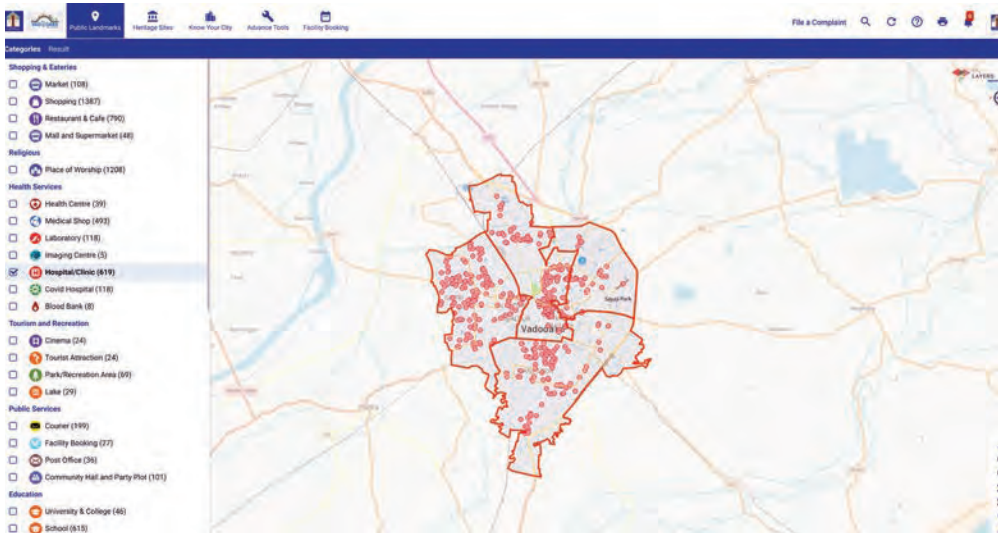
The tools and technologies used in the development of the solution adhere to the international data-exchange standards. The system can read various other data formats such as GPR data and drone imagery data which will be used for large scale mapping of underground and above ground public assets. Keeping GIS mappping at the core of city level decision making is a step towards resource and cost efficiency, and a natural next step in asset management.




The integration ability of the platform supports a wide variety of departmental functions (solid waste management, PDM, city bus monitoring and property tax collection) which results in a higher return on investments. More users, layers, geographical areas can be added to the GIS model at any time. Vadodara was the only city that has developed a COVID-19 dashboard in-house using open-source technology and existing spatial infrastructure. The property survey tagging proved inadvertently beneficial for tracking COVID-19 progression in individuals. The exact location-based information is made available in the form of an interactive map to the administration to identify COVID-19 clusters and potential containment zones. COVID-19 dashboard was made accessible to the citizens for the awareness of patient locations so that they can take precautions and avoid coming in contact with positive patients.

## Sustainability

With growing data and data to manage at the city level, the use of digital operations and data management technologies have become indispensable. City managers and policymakers are searching for approaches that have control of this digital data to improve decision making and government management.



The project will be highly sustainable in terms of its intricate usage across departments and continuous operational system. Also, in creating a 'single source of truth' where spatial and socio-economic data for the city is mapped, analysed and stored, the enhanced decision support system will eliminate redundancies minimizing the recurring cost. The solution will be extended to external vendors and contractors like telecom service providers, electricity service providers, development authority for Spatial Database Infrastructure (SDI) of a city.

The spatial data repository created during the project can be shared with third-party vendors/ contractors on monetary as well as data security terms, which could lead to the monetisation of the data. As the solution is being developed using open- source technology and tools, the


costs of yearly subscriptions or license renewals will be saved. Businesses will benefit from empowered field workers who can make quick evidence-based decisions — decisions at the edge, to improve outcomes, due to the increased fluidity of information. Maps and apps will provide a common place to inform citizens while also capturing their feedback —increasing constituent engagement. Mapping of air quality data, flood prone zones, land surface temperature maps present a synoptic view of the city to the planners, so that the city can consciously move towards making decisions supporting sustainability.

All things considered, a web-based GIS interface embodies sustainability in every aspect. It is poised for an even wider scale adoption than before as more people from the departments learn how much business value can come from geospatial data.

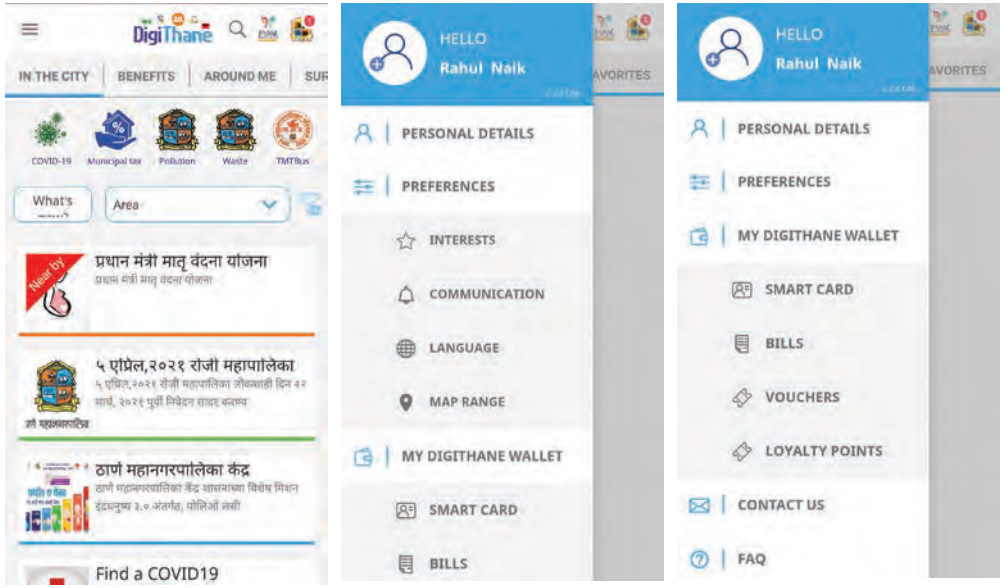
Rank 2

# Thane

DigiThane

## Project Features

DigiThane, the Digital Ecosystem of Thane is a platform to provide government-to-citizen (G2C), business-to-citizen (B2C) and citizen-to-citizen (C2C) services to the citizens of Thane. Thane's primary objective in undertaking this project was cultivating a deeper engagement with the citizens, understanding their pain points, needs and preferences, and easing their access to information about city services. Public participation goes beyond a single consultative session; it is a process. It is important that citizens are able to register inputs, feedback and grievances with the city regularly or when there is need.




Thane realized that the lack of proper participation has distanced the city administration from citizens whose support is necessary for their understanding, approval and cooperation during planning, execution and monitoring of projects. As a response to this problem, Thane launched DigiThane — an integrated digital ecosystem for data-based citizen-centric governance to ensure scalability, inclusion, and responsiveness. DigiThane comprises of digital assets (mobile application, website, SMS, merchant portal & application, social media handle) and a Citizen Engagement Operations Team to manage content, merchant ecosystem, analytics, helpdesk and registration. It is a unified platform for citizens to interact or transact with the city, deployed to make decisions based on static and dynamic data of citizens.

The static data includes socio-economic data and dynamic data in the form of active data (collected through specific surveys and polls for citizen feedback) and passive data (collected through patterns of usage of portal and application users. DigiThane makes the following services available:

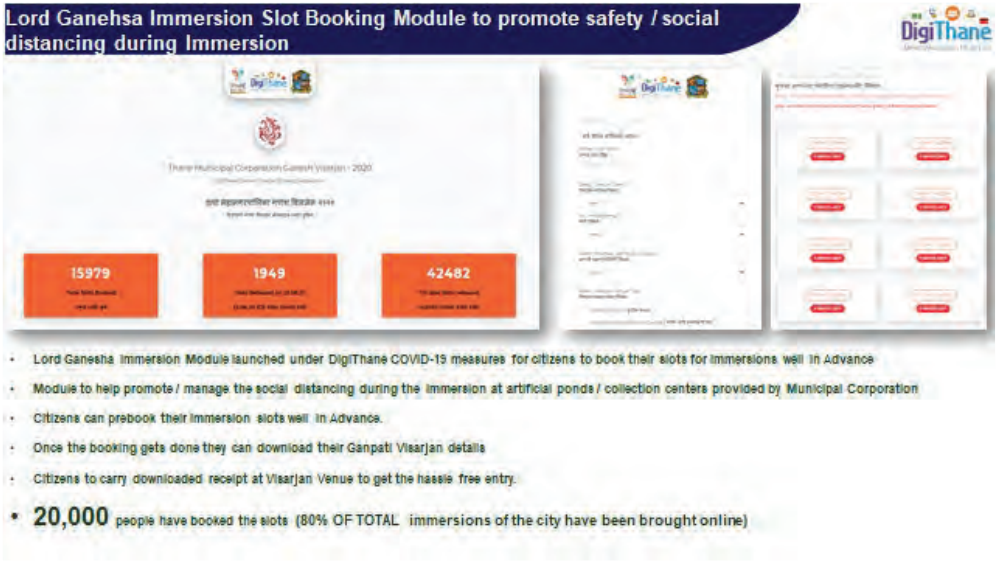
- Digital Information & Services (G2C): Integrated municipal utility services and location or preferences-based city updates on a single platform,
- Digitized Merchants (B2C): Bridging local retailers and informal sector workers to digital consumers through e-commerce transaction platform,
- Interactions with Citizens (Participatory Governance): Awareness programs/surveys/poll for gauging citizen's needs and fulfilling them effectively,
- Digital Connect between Citizens (C2C): Discussion forums /blogs /content posting volunteering/commenting /helping others through city's own social media platform,
- Digital Collaboration with different government organizations: Cross utilization of the platform for services and updates of different government organizations related to city specific agenda.

DigiThane works on the 5A model of data-based citizen centric governance that is —, Ask, Analyze, Action, Activate, Amplify.

## Key Outputs

The usefulness of DigiThane came to the fore when the city was faced with the its biggest challenge yet – COVID-19. The city quickly created a portal where citizens could get consolidated information and help for services at home to manage the pandemic better.

Through DigiThane the city managers connected to 60% of households directly and 90% households indirectly within a week. Municipal and COVID-19 data mapping helped the Municipal Corporation of Thane improve the efficiency of its COVID-19 management tasks such as aligning health workers, creating containment zones, barricading roads dynamically based on data during the lockdown. The city kept adding newer services to the COVID-19 portal which were 'amplified' and popularized through the DigiThane platform. The e-pass service, merchant listing for home delivery of food and medicines in collaboration with Zomato and Wellness Forever, ambulance booking, hospital bed allocation and Ganpati Visarjan e-slot booking for crowd management during festivities are some features that were added to the portal as and when they became of relevance.




Through DigiThane, the city reached out to the citizens over 2.9 crore interactions, received 1.6 crore responses from the citizens, saw 26+ lakh page views, had 2.64 lakh of unique visitors to the website.

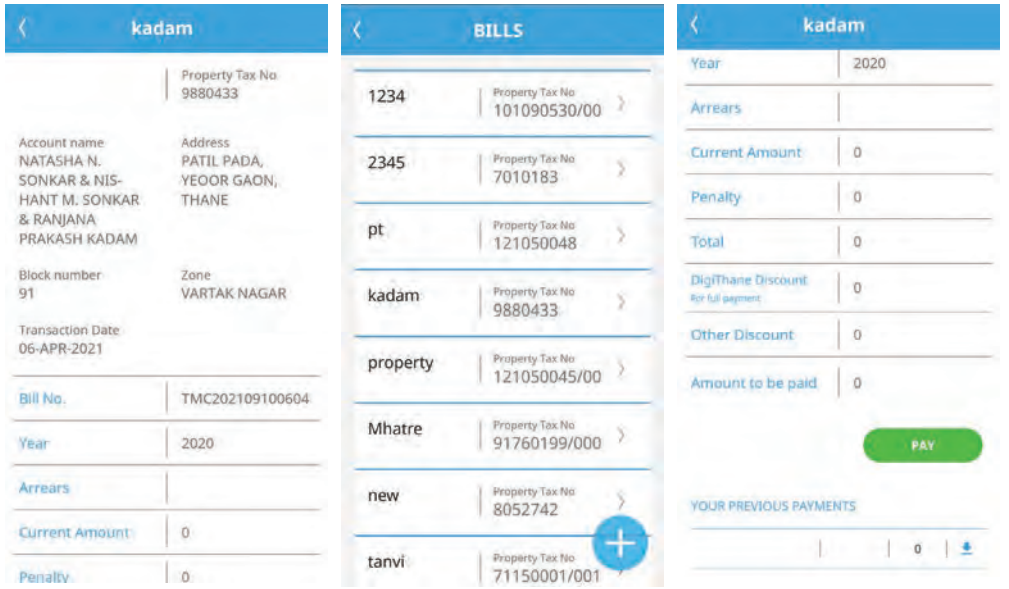
During Ganesh Chaturthi, there were 19,000 online Visarjan bookings made. Over 15,000 home deliveries were made to citizens in need during the COVID-19 lockdown period in the year 2019.

More than 5,500 citizens applied for e-pass; 17,000 citizen survey responses were recorded, over 10,000 health risk assessments were conducted, property tax collection saw an increase of more than Rs. 11 crores, and about 10,250 citizen transactions were carried out through DigiThane.

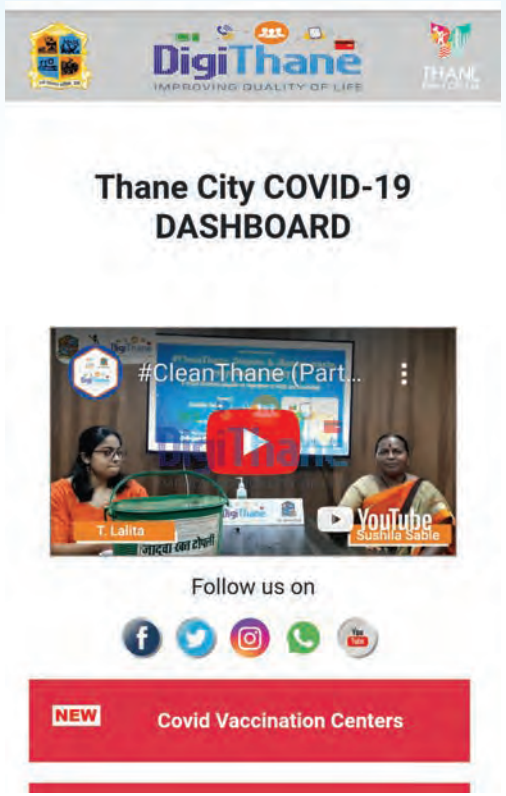
## Key Impacts

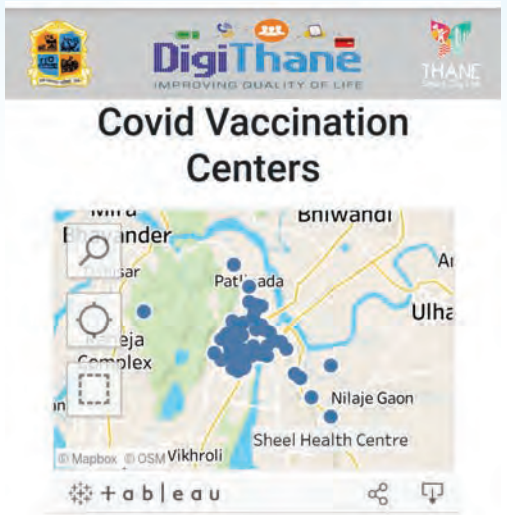
DigiThane has brought more than 2,70,000 registered users onto the digital platform. In terms of citizen outreach, more than 2.9 crore one-way interactions (as information, notifications, SMSs) and 1.6 crore two-way interactions (through surveys) have been established with the citizens of Thane since its launch. The platform has been instrumental in facilitating 'faceless governance' due to which more than 5,000 citizens are now able to interact with the municipality on daily saving time and cost involved in travel, queuing, and manual resolutions of citizen needs. Various initiatives encouraging citizen participation in voting during general elections were propagated through the portal. Nearly 15 lakh Thanekars resorted to DigiThane to find their polling booth. Other participatory activities are similarly supported by the portal. More than 25 government departments have used DigiThane to engage citizens.

In functioning as a business-to-citizen platform, DigiThane helped keep over 110 merchants in a 50-year-old brick-and-mortar shopping area afloat in the times of e-commerce. Now there are over 780 existing merchant partners and over 1100 real-time benefits provided. Currently, there are 1.5 local Thane merchants and 2.5 exclusive in-store offers added to the digital platform every day. On account of increased sales through the platform, these merchants can now offer 10-40% discount, and these benefits are ultimately relayed to the local citizens.



In terms of emergency response time, the response rate for blood donors has seen a turnaround time of fewer than 45 mins. More than 8 lives have been saved through emergency response services through DigiThane.




## Replicability and Scalability

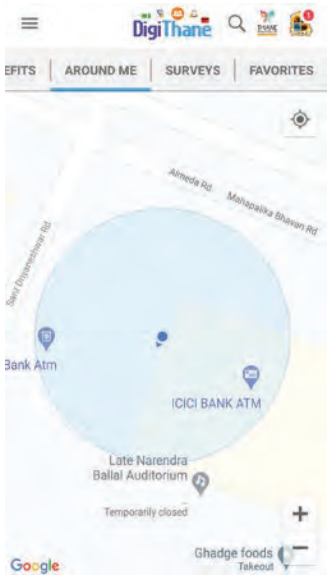
Cities need to cultivate an engagement and trust-based partnership with their citizens. For this, a participatory form of local governance that allows for two-way communication had to be established. In line with Hon'ble Prime Minister's Smart Cities Mission to have a citizen centric delivery model and with the government's approach to communicate with its citizens through concepts like 'Mann ki Baat' and "My Gov" Portal - the evident step forward is establishing tech-based citizen engagement channels. This is where DigiThane comes in.

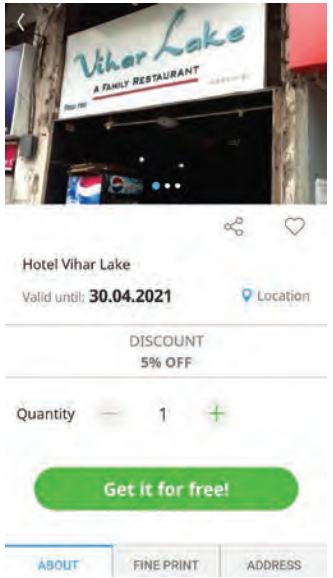
DigiThane will continue scaling and adding users by making the dialogue more effective, convenient and personalized. A platform like DigiThane helps in multiple areas of development like transport, education, payments, infrastructure and makes local governance an approachable entity to residents.

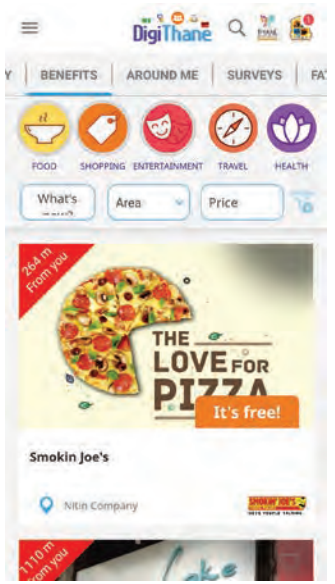
The project is easily replicable by other cities across the country. A Citizen Engagement Program comprising of a platform and citizen engagement cell can help any city start its process of engaging citizens, gathering unified citizen data, analyzing data to make decisions, and help the government, businesses and citizens by bringing them to a common city services platform.

## Sustainability

The city plans to use monetary income from displaying paid advertisements on the website and social media channels to keep DigiThane operational well into the future. This will also help businesses on the platform improve visibility. DigiThane is set to save the city costs incurred during physical data gathering. DigiThane captures and authenticates the citizen data digitally through unique identity (mobile number) of the citizen. This data can be easily and frequently utilized without additional expenditure. The use of DigiThane is therefore, increasing the city's revenue, by saving costs that would be incurred in its absence.




Further, DigiThane facilitates digital payments that can be made quickly and efficiently, helping manage operating costs in many areas, thereby reducing the cost of individual transactions.

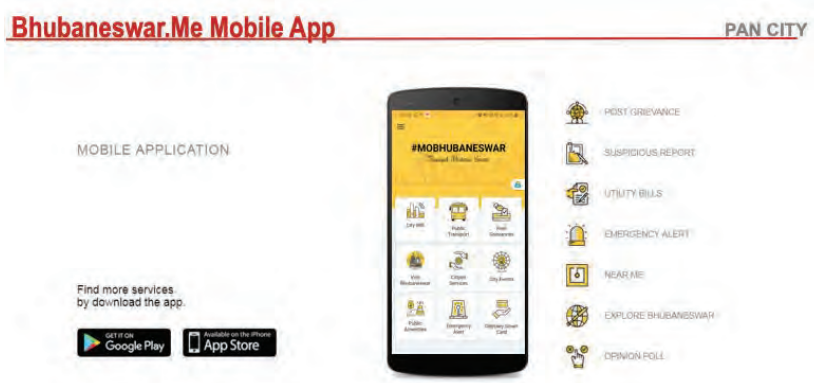
Rank 3

# Bhubaneswar

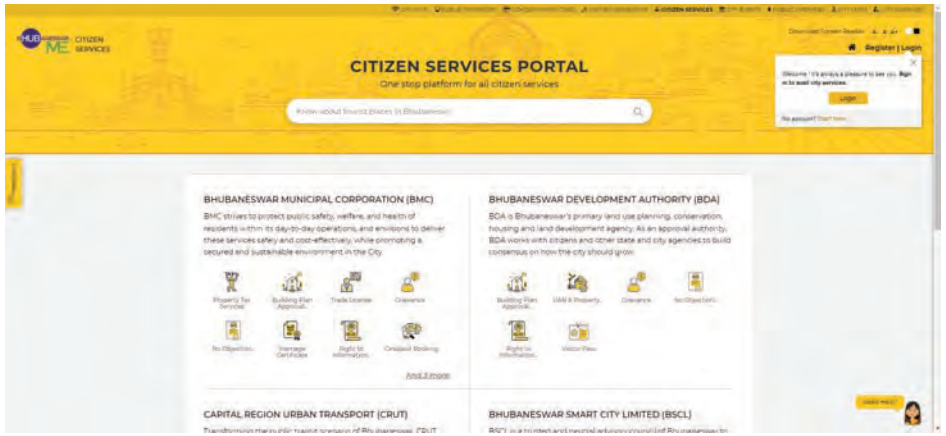
## Bhubaneswar.ME App

### Project Features

Bhubaneswar Smart City has revamped citizen experience of using online municipal services through Bhubaneswar.ME. This unified online city portal has been developed as a one-stop solution for all citizen services. It is simple, easy to navigate with a single sign-in to uncomplicate the registration process which is the first deterrent to a citizen trying to access municipal services online. The system provides a single sign-in for managing all services like e – office, the workflow of all services, and updating GIS.

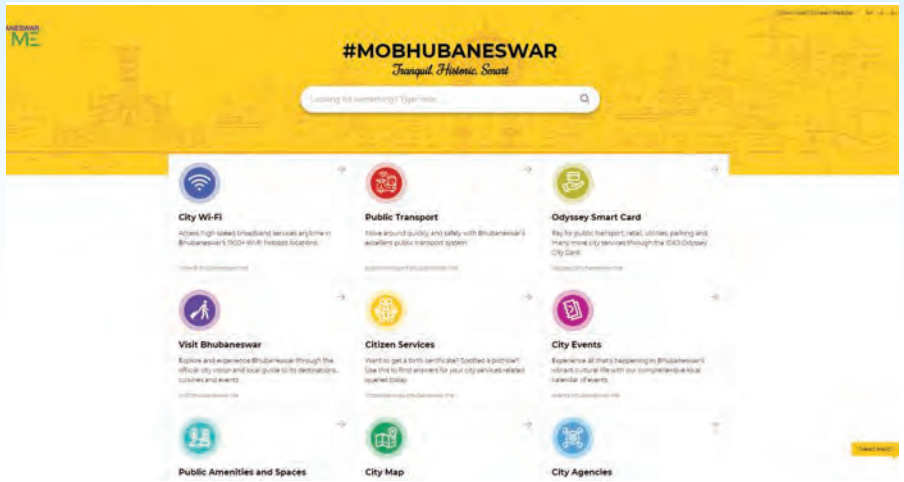



It provides real-time tracking of applications by citizens and officers through a configurable dashboard, SLA, and escalation matrix. Citizens have document lockers to upload and keep their municipal documents. There is a 24*7 helpdesk feature that helps ensure responsiveness at any time of need.

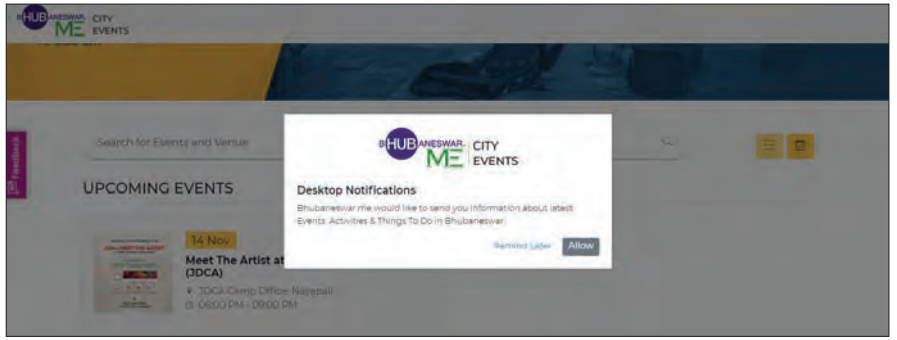



Among the broad segments of Bhubaneswar.Me are

1. **City Wi-fi** - Access, Recharge and Lodging complaints on city city-wide Wi-Fi,
2. **Public Transport –** Real-time information on the city bus service Mo Bus, with provisioning for integration with Mo Cycle application and e-rickshaw,
3. **Odyssey Smart Card –** Pay and recharge for public transport, retail, utilities, parking and municipal services through Odyssey Card,
4. **Visit Bhubaneswar –** An exclusive module for the visitor to help them explore the temple city with authenticated information,
5. **Citizen Services –** A gamut of citizen services are being offered through the portal ranging from Grievance Redressal to Building Plan Approval System, with a dedicated and configurable officer workflow enhancing efficiency, transparency, and accountability in the overall service delivery paradigm,
6. **City Events –** List of events across the city with the booking of tickets,




7. **Public Amenities and Space –** This section provides a feature of locating amenities and spaces and their ratings to help the city monitor, evaluate and improve,



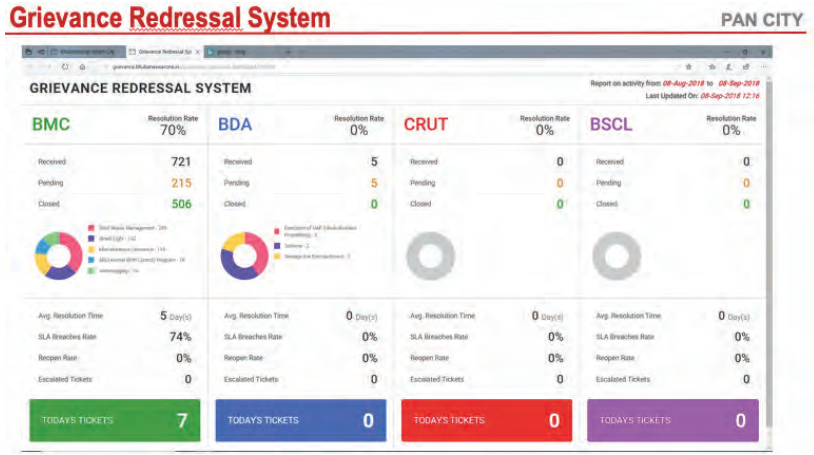

8. **City Map –** This helps people navigate across the city using the GIS map. It has a seamless officer workflow for updating attributes for accurate information, and
9. **City Agencies –** List and Redirection to all city agencies website.

The system shares real-time notifications, queries and actions with the users through notifications on the portal, mobile applications, SMS, and mail. It also provides notifications for events and emergencies in the city in real-time.

## Key Outputs

Bhubaneswar.Me is in wide use by the people of Bhubaneswar. The portal is also available as a mobile application. The success of the system can be defined from the metrics below:

1. Number of Hits – There have been more than 10 lakh hits on the portal with a good retention time of users as it offers a plethora of services and information.
2. Grievance Redressal System – More than 10 lakhs of grievances have been resolved through the system with complete automation. The analytical dashboard has demonstrated that the overall grievance response time has improved drastically.




3. Building Plan Approval System – The city offers an online building plan approval system, where more than 3000 building plans had been approved as of November 2020. The pre-approved designs have a record approval time of 48 hours which helps in enhancing service delivery.
4. Trade License and Property Holding Tax – This service has been completely automated and made online reducing any leakage of the system. This has been extensively used in enhancing the revenue of Bhubaneswar Municipal Corporation during COVID times.
5. Bhubaneswar.Me has received requests for integration from different agencies such as IPICOL, the police, the fire department, and other administrative agencies demonstrating the usability and impact of the system in large.
6. The mobile app in Android and iOS versions has more than 1 lakhs of downloads.
7. Based on the enhanced usability and preference of the system over other websites, the portal made available to the citizens through 50 indoor digital kiosks and 25 outdoor digital kiosks.

## Key Impacts

The application has a considerable impact in bringing about a perceptible change in the overall delivery of citizen services. The application has ensured that the grievance redressal system which led to crowding, long queues, and wastage of a huge amount of manpower is automated and made efficient, transparent, and quicker. This has led to no crowding in municipal offices at the same time the number of grievances being received and resolved has increases manifolds implying a positive change in service delivery.

The application has ensured an overall enhancement in the collection of trade licenses and property and holding taxes. The application has saved numerous manhours and has indirectly helped in saving travel time for accessing the services as they are completely made online. The application has ushered in a cashless transaction economy as all the services are integrated with a payment gateway that provisions for online payment. This has considerably reduced the leakage and has reduced effort in the reconciliation of finances.

The system overall has supported the administration in taking decisions backed by real-time data and analysis. The real-time analysis helps the administration identify gaps and accordingly modify implementation processes.

## Replicability and Scalability

Bhubaneswar.Me is developed with the concept of scalability at its core. The application has a dedicated and modular content management system which ensures that the new applications can be easily added to the portal. The architecture of the application is highly modular and provisions for a single-window approach as well as necessary role-based access to ensure that only relevant data are provided to the officers and citizens based on their roles and rights.


The scalability of the application can be demonstrated through the recently concluded internship program of the MoHUA where an "Open Space Tool Kit" application was developed and integrated with the system and provided to the user as a singular offering. The system can be easily enhanced and any number of users with levels can be configured through the modular workflow which makes the system flexible, scalable, and future-proof. The system has been extended to various departments on multiple occasions which were originally not part of the initial structure such as the police department.

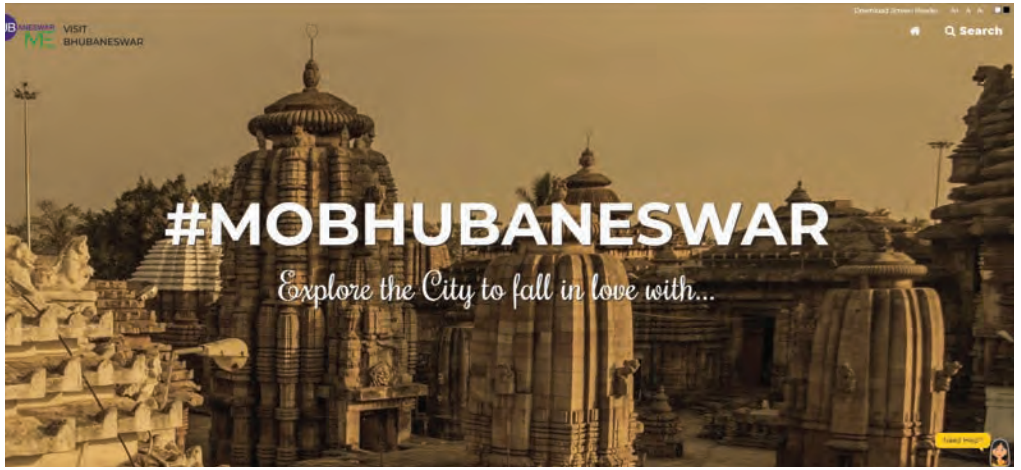
The application of Bhubaneswar.ME can be scaled by:

1. Adding additional services
2. Creating a unified portal for the state/ country
3. Using the data portal to collect, analyse, and disseminate data for research and data-backed decision making
4. Integrating with Bhubaneswar Smart City MIS platform to provide real time information of the city about traffic, parking and emergencies

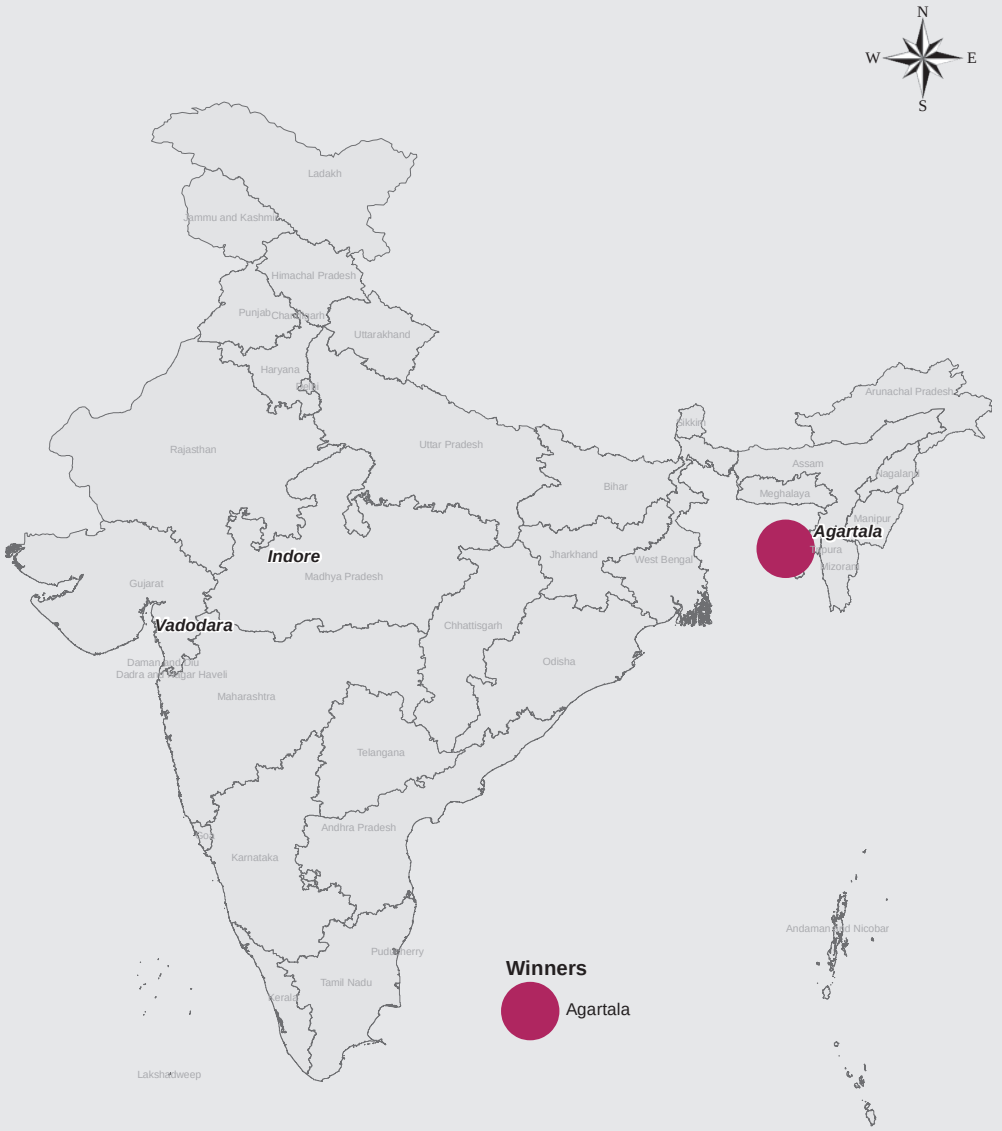
## Sustainability

The project is inherently sustainable as there are no operational expenses in running the application apart from that the application needs to be hosted on a server, the costs for which have been covered under the Smart Solutions project.

The project also has a future revenue generation model, where tickets to events are sold and a certain percentage of the same will be shared with city authorities as part of the portal handling charges.



# ISAC 2020: PROJECT AWARD
## Sustainable Business Model of ICCC





*Integrated Command and Control Centre, Agartala*


# PROJECT AWARD
# Sustainable Model of ICCC

Rank
1

# Agartala

## Integrated Smart City Solutions

### Project Features

Agartala Smart City Limited (ASCL) has developed the Integrated Command and Control Centre (ICCC) under Integrated Smart City Solutions which aims to enable collation of information and collaborative monitoring, thus helping in the analysis of various information for quicker decision making. It also increases Intelligent Operations Capabilities ensuring integrated data visualization, real-time collaboration, and flood monitoring through CCTV surveillance cameras across the city. The Smart city solutions integrated with Agartala Smart City ICCC are,

1. City Surveillance
2. Integrated Traffic Management System (ITMS)
3. Traffic Violation Detection System
4. Red Light Violation Detection (RLVD)
5. Automatic Number Plate Recognition (ANPR)
6. Emergency Call box and Public Address System
7. Intelligent pole (including environmental sensor, wi-fi access point, variable message display (VMD), turbine light, etc.
8. Public wi-fi
9. ASCL optical fiber backbone
10. E-Challan devices
11. Passenger Information System (PIS)
12. Automatic Vehicle Location System (AVLS_
13. GPS Onboard Units for government vehicle movement tracking
14. Optical Fiber Backbone

### Key Outputs

Agartala Smart City ICCC provides various services to the citizens of Agartala. The services are not restricted to city surveillance and traffic management system. It also has the infrastructure to provide environmental data and free Wi-Fi services across 23 locations to the citizens.

Further, it also has 23 variable message display (VMD) boards function for public ad displays and citizen information interfaces, 26 smart kiosks and 18 public address systems (PAS).

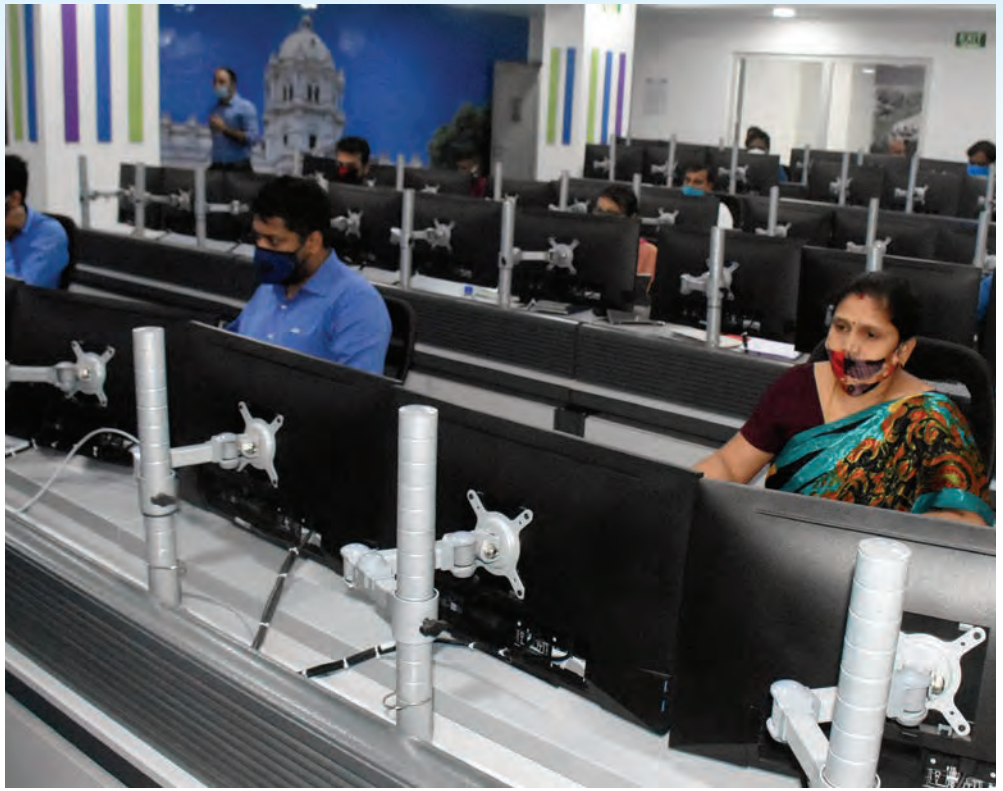
These integrated solutions helped the government in creating awareness on COVID-19 during the lockdown and post-lockdown in the year 2020. Information was disseminated through messages displayed on VMDs and recorded announcements played across the city on the 18 PASs. Improvement in urban mobility was a major step ahead under which 22 Integrated Smart Intelligent Traffic Signals installed across the city simplified traffic management for the traffic department. The ICCC provides real- time data & holistic analytics across heterogeneous platforms about the functioning of services, movement & conditions in the city to support optimization of network efficiencies, resource allocation & decision making through an intelligent & adaptive traffic control system.

63 emergency call boxes installed across the city improved perceived safety on roads among citizens and is expected to help both citizens and the police in delivering instant assistance in the event of any emergency. The ICCC provides a secure and trusted offering of real-time control and monitoring of sensors and supporting networks through 6 environmental sensors deployed on smart poles for weather.

442 fixed box cameras and 22 pan-tilt-zoom (PTZ) cameras installed in 131 locations across Agartala city for surveillance offer secured & trusted data storage for critical surveillance feeds and traffic violation detection. In addition to these cameras, 45 smart bus shelters have fixed box cameras, emergency call boxes, passenger information system & variable message display. Optical fiber backbone of 156 kms has been laid to integrate all smart elements across different locations with the ICCC.

## Key Impacts

ICCC infrastructure of ASCL played a pivotal role in managing the waterlogging and stagnation of water across the city in the seven flood-prone zones by utilizing the fixed boxes and PTZ cameras used for city surveillance. In addition to this ASCL installed environmental sensors at intelligent poles across six locations in Agartala city that provide rainfall data used in forecasting future rainfall patterns based on current data. This feature will enable the flood water monitoring team at the ICCC to manage the flood pumps in an efficient way to combat water logging across the city.



ASCL Limited has implemented a holistic and integrated traffic and transport management system in the city thereby providing citizens with a seamless, safe, and convenient public transportation system along with centrally controlled traffic systems. The integrated traffic and transport management system will synchronize signals which will help regulate and maintain a free flow of traffic. This will lead to optimally utilization of road space, shortening of queues at intersections and reduced congestion. A lower idling time will mean improved air quality. Real-time traffic monitoring and centralized traffic control will help reduce accidents by identifying hotspots helping prevent/respond to accidents in advance or much faster.

## Replicability and Scalability

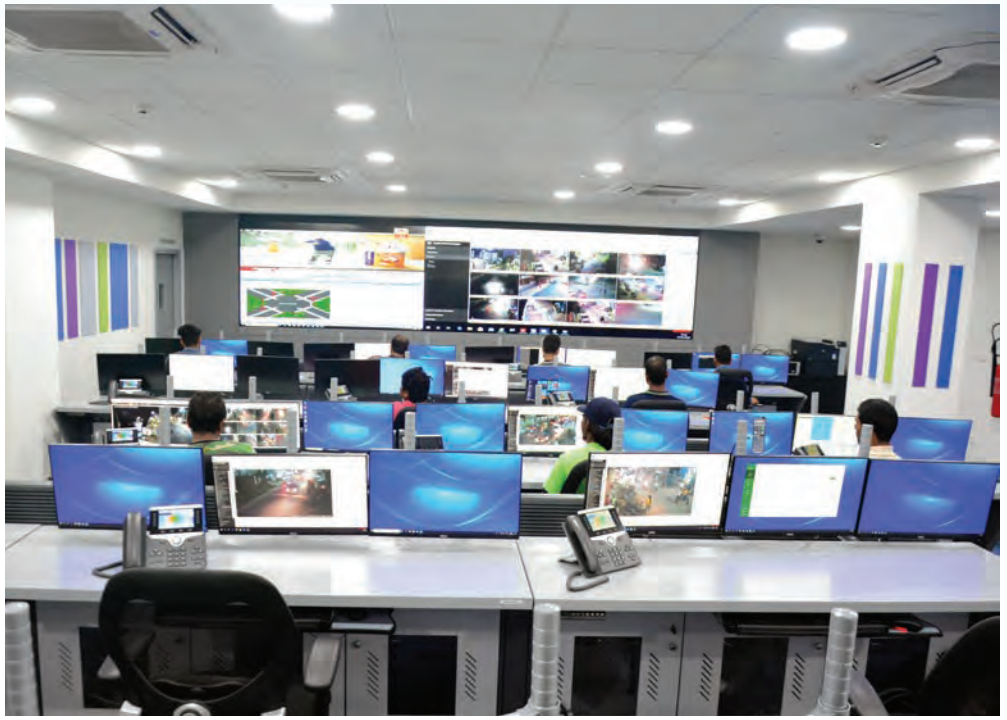
The smart solutions and their use cases deployed in the Agartala ICCC project may be replicated across cities, in India or abroad, with similar challenges to Agartala. Although ICCC is a pan-city project, a similar project with large scale integration of every component may be implemented beyond the city limits as well.

ASCL Data Centre's IT infrastructure is scalable to accommodate up to a 40% increase in smart elements without any additional procurement with regards to the core Data Centre IT infrastructure components such as network, servers and security devices. As ASCL's scope is within the boundary of Agartala Municipal Corporation, the expansion of the municipal boundaries will lead to scaling of the project as well. Certain components may be scaled in terms of performing a wider range of functions such as the VMD and digital information kiosks, both of which may also be used in an online billing system, hospital management system, newly initiated e-governance system, advertisement for VMD for commercial purpose and other municipal services.

Agartala Smart City's data will be accessible after an API integration with the Indian Urban Data Exchange (IUDX), which will enable service & innovation collaboration through an open and shared data platform.

## Sustainability

ASCL has developed a revenue model for the sustainability of the project after 5 years of its operations. The VMD boards and the PAS have been leveraged for revenues from advertisements. Revenue through leasing of VMD for displays of advertisements and awareness messages for line departments has earned a revenue of Rs. 2 lakhs.



Other components such as ITMS & CCTV surveillance solutions will be leveraged to generate revenue to sustain in the coming years. For example, there may be developed a revenue-sharing model between ASCL & Traffic Department in which fines collected by the traffic department and data-monetisation of data captured by the Adaptive Traffic Control System (ATCS) can be shared by the two agencies. A convenience fee could be charged for the use of digital kiosks for online payments. Data monetisation of data collected through the use of kiosks can also be done. Further, public & commercial service offerings through GIS property application & city mobile app are presently under deployment. Videos of flooding captured by CCTV cameras can be sold to different agencies for research & development purposes.

Agartala Smart City is one of the few smart cities that has its own dark optical fiber backbone of 156 kms laid across the city to integrate all smart elements installed on the field and other important locations across the city. This optical fiber backbone has been designed to support redundancy across two optical fiber routes. ASCL is presently planning to lease out the same to other departments for accessing their respective applications hosted in the State Data Centre through intranet as well. The leased rates will be similar as charged by BSNL, RailTel, Airtel, Vodafone, Tata Telecommunications, and other ISP's. An estimated annual revenue is expected if 25 OFC cores of 1 Gbps are leased as per TRAI rates. It would generate a revenue of approximately Rs.10.47 crores annually for 622 Mbps bandwidth on each core.

Rank
2

# Indore

## Integrated Command and Control Centre

### Project Features

The ICCC in Indore Smart City is designed to provide state-level services, city-level services, data analytics and monitoring of events. Data analyzed at the ICCC helps the city take better decisions in improving operational efficiencies, maintaining order, and increasing city revenue generation.

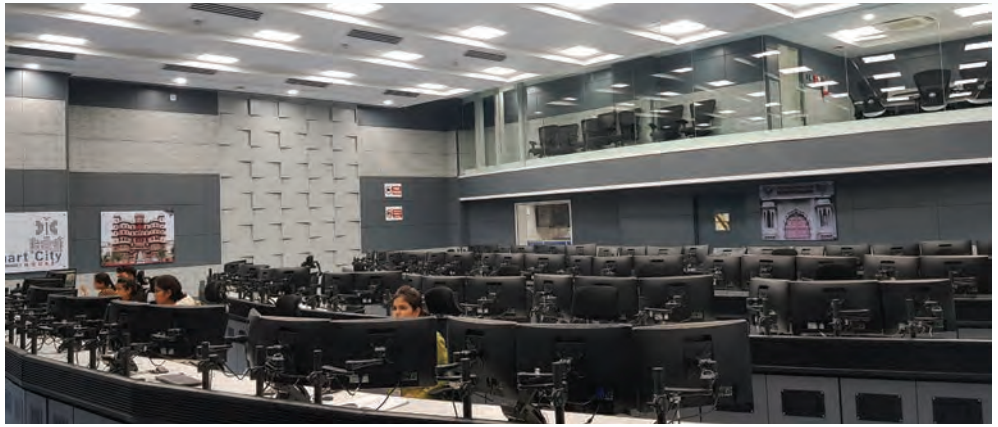
The ICCC in Indore is integrated with the

- Property & Water Tax collection services, capturing the total collection and outstanding payments. Integration of the City GIS platform is also planned, through which Indore can identify and mark locations of defaulting property owners for further action,
- Integrated Solid Waste Management (ISWM) to track the location of 1275 garbage collection vehicles from collection at source to transportation to the garbage transfer station(GTS) and the central processing facility,
- Automatic Vehicle Location System (AVLS) and Automated Fare Collection System,
- (AFCS) which track the location of buses and identify fare collection by mode of payment on all routes,
- Grievances Redressal System, Indore 311. Indore 311 is a mobile application used by approximately 3 lakh citizens of Indore. With the help of the ICCC analytical dashboard, a heat-map of complaints is created which helps authorities plan and prioritize actions. Pending grievances trigger alerts for action so that such issues are addressed on priority,
- Applications to manage the COVID-19 pandemic: Indore Smart City Development Limited (IDSCL)used the ICCC as a war room to conduct operations for COVID-19 response for the entire district. Indore ICCC also enabled, and
- Monitoring of home-quarantined cases with geo-fencing
  a. GIS-based tagging of hotspots to ensure real-time monitoring
  b. Development of the first city-wide screening app and web portal for mapping spread of the virus and predicting future hotspots
  c. Surveillance through 400+ CCTVs

### Key Outputs

ICCC has three major components: a command center, an analytics section, and an alert generation mechanism for municipal services, traffic issues, and public grievances. With the integration of the waste management system with Indian Oil Corporation petrol pumps, Indore has successfully eliminated fuel theft from garbage collection vehicles. 1,275 such vehicles are monitored via GPS in real time. The integration has helped in the decentralization of wet waste

processing by analyzing the volume of wet waste being collected at the respective GTS and composting it on-site. GPS tracking of vehicles has made it possible to check and validate the availability of vehicles in all municipal zones to enable decisions on increasing or decreasing the vehicles on ground for each zone. Each zone's performance can now be evaluated from the data generated on door-to-door dry/wet/total garbage collection and transportation. In addition, the volume of garbage recycled, landfilled, and composted is also known, helping the city manage garbage end-to-end, forecast production and management techniques in advance.



Further, the integration of ICCC with Indore 311 has helped keep track of citizen grievances and their redressal related to municipal services and facilities. Feeds from the mobile application help reduce time and effort in the identification of wards where grievances are multiple, long pending, or frequent, and highlight areas in the city where the municipal functioning needs improvement. It enables authorities to view aggregated complaints on the city map which helps the city allocate and optimise resources.

## Key Impacts

The integration of the ICCC and field sensors to monitor threshold limits of water pH, BoD, andother parameters, has led to the analysis of historical data on the stated parameters through different weather conditions which are used to optimise STP usage through different weather conditions over the year.

The integration of ICCC with AVLS and AFCS enables authorities to get real-time data in a structured format from ground operations of the city bus and I-Bus service. AFCS helps in identifying fare by mode of payment on all routes, and further to plan and promote cashless modes of payment. Analysis of passenger footfall helps in efficient fleet management and route planning to meet the needs of citizens.

This system helped Indore improve the efficiency and usage of the transit system which reflected an increase in ridership by nearly 20 % in 2019 as compared to ridership in 2018.

The monitoring of door-to door-garbage collection vehicles from the collection at source to transportation to the processing facility via transfer stations has improved the lives of 2.5+ million population of Indore and helped it achieve the topmost rank in Swachh Survekshan for 4 years straight.

Visualizing data on citizen grievances through heat maps from integrating Indore 311 has helped the smart city and municipal authorities prioritize redressal. The solution flashes a trigger alert when grievances are about to cross set threshold limits. Currently, the ICCC helps receive and resolve 500+ complaints monthly. The World Economic Forum (WEF) has selected Indore Smart City as one of the 36 Pioneer cities from 22 countries and 6 continents.

## Replicability and Scalability

The components of ICCC are deployed on a shared cloud platform which can be scaled up in terms of computation power and storage required for future projects. The existing IoT platform is able to connect with more than 1 million IoT devices without compromising data security. Indore ICCC is being geared up to add on to its solutions the following features:

**Intelligent Traffic Management System (ITMS)-** Consisting of key modules like Adaptive Traffic Control System (ATCS), which will help in optimizing the traffic at all junctions, and Traffic


Enforcement Management System, which will help in improving commuter safety. This solution will be integrated with ICCC for use by the Traffic Police department for intelligent traffic management and support in emergency response.

**Enterprise GIS:** This platform will be a common repository of GIS layers of various city departments like Police, Health, Education, T&CP, etc. Its integration with ICCC would allow operators to locate city asset details easily on the city's GIS map with its comprehensive attribute information and high-resolution drone imagery.

**Electrical SCADA:** Sensors will be installed in the underground electric supply network to monitor the flow of electricity and detect any disruptions aiding theft prevention and enabling quick resolution of issues like power outages or short circuits.

**Water SCADA:** Similarly, sensors will be installed throughout the water supply network to identify and eliminate non-revenue water, contamination, etc.

## Sustainability

Indore ICCC is integrating services with identified use cases, such as ISWM, property and water tax collection, AVLS, AFCS, etc. The project will be made sustainable by the use of data generated from these applications to reduce the operational expenses of Indore Municipal Corporation, improve tax collection, as well as generate additional revenue by data monetization. Indirectly, leveraging data sets to improve the performance of city-level authorities will have positive financial implications too.

Thousands of transactions on the public bus system are analyzed by the AFCS system. Using that data, ridership profiles based on gender and age can be created which can be useful for advertising agencies to promote specific types of product based on the rider profile on the respective city bus/BRTS stop/route. The city has identified this as an opportunity to generate revenue. Similar opportunities can be created by monetizing appropriate data from other applications such as City GIS.

Rank
3

# Vadodara

## Public Wi-Fi and Intelligent Poles

## Project Features

The Vadodara ICCC model was designed as a win-win for all stakeholders. Run as a public-private partnership, it has positive returns for the city administration as well as the project concessioner.

The concessionaire will pay a positive premium for 15 years of project duration to Vadodara Smart City.

The 150 km optical fiber cable is at the core of the ICCC project in Vadodara. Intelligent poles linked by the OFC provide connectivity to IoT devices across the city. Under the contract, the smart poles are provided by the private stakeholder in the partnership and are, therefore therefore, free of cost to the city. Intelligent poles are designed to help solve many urban problems from their ability to incorporate smart elements such as environment sensors, city surveillance cameras, variable messaging signboards, emergency call boxes and public address system, etc. The poles have aesthetically designed multi-functional components and there is no limit to the potential features and functions that can be integrated into the intelligent poles. The public wi-fi is a relief to the residents of the city where cellular network connectivity is sometimes sporadic. Vadodara aspires to be a city of the future of which seamless internet connectivity is the first building block.

## Key Outputs

The project is being done entirely on a public-private partnership model in line with the Smart Cities and the Digital India Missions. The project does not impose any costs on either Vadodara Smart City Development Limited or Vadodara Municipal Corporation. Vadodara Smart City has received Rs. 90 lakhs as revenue in the first year of project operations and maintenance, and also has free OFC connectivity at 150 locations in the city.

The project is the digital backbone of the city and already connects 500 IoT devices at 150 locations. The city has improved telecom reception. There is a big reduction in the infrastructure cost which would be otherwise incurred in the installation of other smart pole components besides wi-fi. The poles have CCTV cameras, digital billboards, environment sensors, public address systems, emergency call boxes, and LED lights. The poles are designed aesthetically so that they blend with the surroundings.

The residents of Vadodara get 100 MB or 30 minutes of free wi-fi daily (whichever limit is reached first). The smart poles are integrated with the ICCC, and so information collected by one component on the smart pole (an environmental sensor for example) is sent to the ICCC and disseminated out through another component on the smart pole (through the variable messaging display). Such integrated use of the smart poles and the ICCC was very useful during the 2019 floods in Vadodara and Covid-19 pandemic.

## Key Impacts

The solution has proved to be extremely beneficial to the local governing body and the residents of the city. Residents have free and improved internet connectivity. A local city application with a focus on the safety of women and senior citizens has been created. The project has improved 4G telecom coverage in Vadodara.

Under this project, Vadodara will earn a projected revenue of Rs. 22.41 crores over the time period of 15 years. Vadodara Smart City Development Limited has received Rs. 80 lakhs as revenue in the first year of project operations and maintenance, and will continue to earn this amount for the first 5 years as advertising revenues by displays of commercials on the VMDs. The poles have provisions to add telecom equipment and could be leased to a telecom company in the future for additional revenue.

## Replicability and Scalability

The project derives its uniqueness from being carried out in a public-private partnership (PPP) model. The city not only added a technological component to its face but also adhered to design principles for sustainable infrastructure. The modular design of the pole allows flexibility to add or remove smart components depending on the need and context.

i-Poles (Smart Poles) with provisions for installing smart elements are easily replicabl. Similar contractual agreements with private stakeholders could also be replicated in other Tier 1 and Tier 2 cities in the country.

## Sustainability

The business model is designed in such a way that there is a win-win situation for the city administration as well as the project concessioner. The project will generate a revenue of Rs. 22.41 crores over 15 years for the city. It has already added Rs. 80 lakhs through advertising on variable messaging boards to the city revenue. With additional 15 VMDs in the next year, the city anticipates generating an additional Rs 25 lakhs in revenue every year. 20,000 new properties tagged through the GIS-based property survey will add Rs. 17 Crore in property taxes to the city's coffers.

The true value of the project comes together with the integration of data. To achieve this the feeds from the poles are further processed, analysed and get converted to actionable intelligence at Vadodara City Command and Control Centre. This underscores the relevance of the project well into the future. The modular design of the pole ensures that the same infrastructure can be leveraged to add new technologies like 5G-LiFi etc. to maintain business sustainability.

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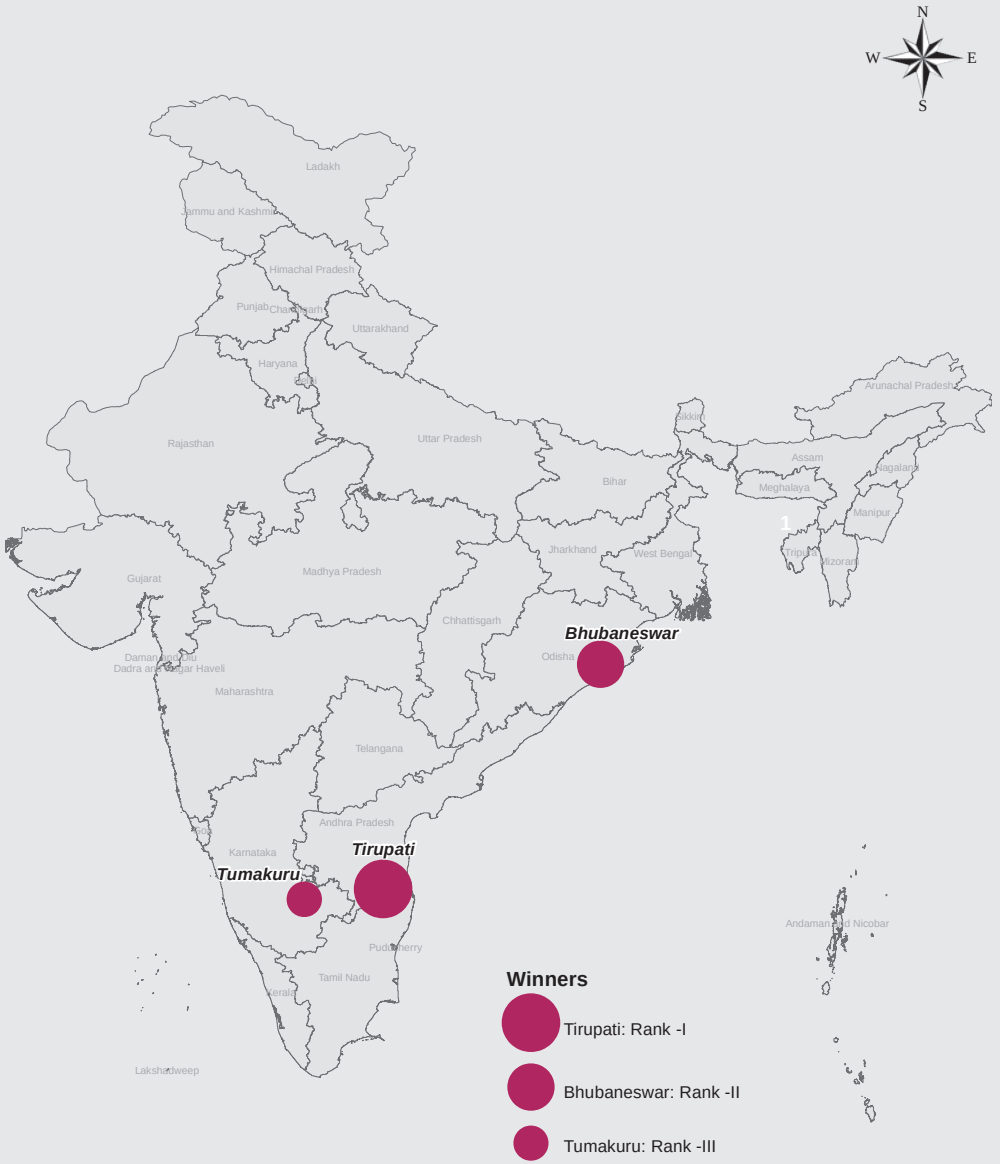
# ISAC 2020: PROJECT AWARD
## Social Aspects





*COVID Sachetak Training, Bhubaneswar*


# PROJECT AWARD
## Social Aspects

Rank
1

# Tirupati

## Health Monitoring System in Municipal Schools

### Project Features

The project is focused on building a scalable, technology-enabled, standardized health benchmark for municipal schools in Tirupati which ensures a demonstration of comprehensive health program for age groups 2.5 -17 years and its sustainable implementation for coming years.


The project leverages existing government schemes like Jawahar Bala Arogya Raksha and Rashtriya Bal Swasthya Karyakram to enhance the health monitoring system. The students are registered through creation of unique IDs for each. There is onsite assessment of each student based on growth parameters. Technology is used for real-time medical assessment. Once data is uploaded after assessment, health records of students are auto generated. In order to ensure follow ups, health reports are published for parents, the school education board, district officials, the Municipal Corporation of Tirupati and CEO/MD of Tirupati Smart City Corporation Limited (TSCCL). The reports are checked for quality by a qualified medical doctor. If the health report is found lacking, information and consultation is provided to respective parents through teleconsultation. The health school benchmarking system also ranks 'Healthy Schools' based on detailed data analysis. The e-health solution has a completely automated the quality check process in addressing errors in health reports and in highlighting critical issues within health records for immediate addressal.

The biggest advantage of the system apart from offering a clearly important social benefit is in reducing implementation costs by providing a Standard Operating Procedure for all medical health assessments. Given that a system to assess and track the a comprehensive health check-up, detection of anomalies at early age that may impact student's education/learning, is currently lacking in public schools. This project aims to ensure that early age health issues do not hinder students' during their learning years and through life.

## Key Outputs

In alignment with the smart cities vision, Tirupati has focused on modernising its education & health infrastructure. E-health solution caters to student population which are primarily from low-income families. The typical assessments for the student population include assessments for growth, physiological, ear-nose-throat health, dental health, and eye health. The online health records uploaded to a digital locker, are for all parents and students to have lifetime access to health data of the students. The e-health solution addresses issues in a meaningful way through capacity building of government bodies on the ground to use online health data which helps them optimise time and resources.

The project impacts 700 students from municipal schools in Tirupati.


## Key Impacts

The project has generated greater awareness amongst students about basic health/sanitation/ hygiene activities such as hand washing, brushing teeth, bathing etc. Students have started taking pride in the program especially if their school is ranked among the top healthy schools.

From Round 1 to Round 2 of assessments it was found that in Round 1, out of 524 students, 516 had at least one health deficiency and only 8 had no issues; in Round 2 out of 700 students assessment all students had either one or more deficiencies. Anaemia and acute scabies were critical concerns observed by doctors themselves.


These health issues were impacting the students' academic performance. The knowledge of these deficiencies helped the administration take timely action and provide nutritional or medical advice via tele-consultation. The referral program through which the parents were informed about the health condition of their child was widely appreciated by parents. The purchase for distribution of eye glasses to students who were found to need prescription glasses was funded by the private sector. Around 50 students benefited from this initiative. All reports have been published on an exclusive Amazon cloud server and are available to the parents and TSCCL via a customized portal created and hosted by HealthSetGo.

# World Day Against Child Labour

June 12

12 June is celebrated as World Day Against Child Labour. This year the ILO (International Labour Organisation) will be celebrating its 100th year of inception.


## Replicability and Scalability

Through a detailed analysis of existing similar initiatives in the city, the broad objectives were developed in consultations with authorities, citizens and other stakeholders. Each of the objectives has the potential to be replicated throughout the city either individually or in combination, depending the contextual needs. In terms of replicability, a second phase of the project has been launched under which it has been implemented in all remaining forty municipal schools of Tirupati. The same has also been replicated for 800 sanitation workers in Tirupati. In this new phase, additional emphasis has been given on ensuring 'behavioural changes' by conducting daily events. The project can be easily scaled to include all schools in the district.

Given the social nature of such projects, funding sources for future scalability can include ULB/ state funding with a potential to monetise health solution by engaging local private players/ corporates to provide medicines, eye glasses etc.

## Sustainability

In tracking health assessments of students, will create health awareness among parents, medical professionals, educators, and the students. This project will have a citywide impact across current and future generations. Detecting and addressing health deficiencies early will help bolster the learning ability of lower income students in municipal schools and make their access to opportunities in later years a little more equitable with students who have received better nutrition in their early years.

Children are likely to become ambassadors of healthy living at home, and inspire healthy lifestyles within their families which is where the behavioural shift towards a healthy lifestyle will also begin.

Rank
2

# Bhubaneswar

## Socially Smart Bhubaneswar

### Project Features

Citizen centric planning for making Bhubaneswar socially smart is a collaborative initiative of Bhubaneswar Smart City Limited (BSCL) & United-Nations-Population-Fund (UNFPA) to strengthen the social components of smart city. It is a unique initiative of BSCL which has made Bhubaneswar the only smart city being developed under Smart Cities Mission (SCM), Government of India (GOI) to have a fully developed social project. It was initiated in 2017 in 8 slums of Bhubaneswar Town Centre District (BTCD) area and expanded to reach 100 slums across Bhubaneswar in 2019.

The project focuses on young people to drive them to change for the better. The initiative began at the community level with the process of community-mapping and listing of young people to understand the needs and interests of the youth in the area, their educational qualifications, current economic status and their training needs. This was followed by bringing stakeholders of different departments on board to discuss with the community the issues and challenges of the area. 120 young boys and girls from the intervening slums were identified and trained to take on leadership roles to help address issues of the community. A series of orientations and capacity-building initiatives were undertaken for the peer leaders including 9 days of life skill education to develop a leadership approach in life.

These young boys and girls are now taking the lead to help the community especially during periods of disaster like Cyclone Fani and also during the COVID-19 pandemic. The project also plays a key role to create safe spaces for girls and women besides taking up special initiatives to build the capacity of girls and women. More than 500 girls have been provided 10 days of self-defense training.

After the community mapping exercise, initiatives like repair/ installation of streetlights, stopping the open sale of liquor and drugs etc. were taken up to help create safe environment for girls.

### Key Outputs

The important aspect of the project is that it trains young people from the slums as peer leaders in liaison with Bhubaneswar Municipal Corporation (BMC), Odisha Water Supply & Sewage Board (OWSSB), State Electricity Board, State Legal Cell and Commissionerate of Police, etc. and enable them to lead the upliftment of the community as well as betterment of the facilities and utilities. Following are some of the works undertaken by the peer leaders in the last one year, but not limited to

- Repair and installation of 25 streetlights with an objective of creating a safe passage for girls and women in the slums.

- Mass cleanliness drive conducted along with desilting of drains and garbage dumps. Installation of dust bins in 30 slums in the city. 200 meters of drain was also constructed in Niladri Vihar slum.
- 50 peer leaders from different slums participated in "Monks, Caves, Kings-Heritage" walks in the city and supported cleaning of the heritage sites. Also, they undertook a "Plogging" activity across two hill sites of Bhubaneswar viz Khandagiri and Udaygiri.
- During COVID 19 lockdown, 140 vendors were linked to the Covid loan scheme.
- More than 60 youths from various slums were in gaining admission to Government Industrial Training Institute (ITI)s for their vocational training.

## Key Impacts

120 peer leaders are being capacitated to process pro-community, pro-sustainability changes, and help address issues, challenges, and linkages with ongoing projects and provisions of the government. This includes creating awareness on a clean and green environment by taking lead on activities like promotion of non-motorised transport which is not only a non-polluting mode of transport but also, facilitates access to livelihood opportunities especially for women. Therefore, 40 peer leaders have been gifted bicycles under India Cycle4Change Challenge to build visibility and awareness for cycling which is beneficial to the slum community is more than one ways.

Safai Karmacharis under "Mu Safaiwala" (I am Safaiwala) is another initiative where efforts are being made to create dignity for a downtrodden section of the society. The campaign focuses to create understanding and imbibe the culture of self-cleaning by citizens as well as respect the dignity of labour. Safai karmacharis are being re-branded as frontline COVID-warriors and recognized for their effort during the pandemic; they are provided with safety-kit by CEO, BSCL. 120 peer leaders were trained by BMC in July 2020, to work as COVID Sachetaks at ward committee level. These youths, in a group of 5 young people, went to community and started creating awareness door-to-door.

By the of October 2020, 46 groups comprising 230 young people were working as COVID Sachetaks. They visited more than 15,000 households and oriented approximately 50,000 people on COVID management. They also supported 14,736 COVID Sachetak app downloads, which helped people directly avail support services including medical help during the pandemic. Approximately 29,000 people were thermally scanned, and their pulse oximeter reading taken. 950 vulnerable people, including divyangs and senior citizens, were identified & supported during pandemic by these Sachetaks.

Peer-Leaders have been recognized as important stakeholders of community and they are being involved in all major decision-making process at the community level by different stakeholders including ward-officers, ANMs, schoolteachers, anganwadi-workers etc. 3 peer leaders, all girls, were recognized by Police Department to work as special police officers (SPO)

at the community level. The National Health Mission (NHM) works closely with these peer leaders to create awareness on vector borne diseases and other health issues at community level.

## Replicability and Scalability

The project was piloted in 8 slums of BTCD area of Bhubaneswar in 2017. Due to the tremendous impact and response it created, the initiative was expanded to cover all 24 slums of BTCD area. Finally, in 2019, the project was further expanded to bring into its fold another 76 slums bringing the total number of slums covered by the project to the project to 100.

'Sachetak' app developed at the onset on the pandemic has helped in effective monitoring of the pandemic in and around Bhubaneswar. Sachetak committees consist of volunteers from within the community who are trained in awareness building and outreach on aspects such as symptoms of COVID-19, modes of transmission, how to protect oneself from infection etc., benefitting more than 17,000 citizens. This method of involving the community for raising awareness and participation in public discourse requires commitment but is replicable, scalable and essential.

The peer members and leaders regularly participated in the COVID Sachetak committee meetings organized at slum and ward level in Bhubaneswar. The Sachetak volunteers carried outdoor-to-door awareness on COVID-19, identification of returnees and marking houses under quarantine, thermal scanning/ checking oxygen level of people, teaching methods of maintaining hygiene, identification and supporting government officials involved in managing the COVID-19 crisis.

## Sustainability

The project is being implemented in Bhubaneswar in collaboration with United Nations Population Fund (UNFPA). It seeks to address issues faced by the more vulnerable sections of society through community action.

With support of non-government organisations (NGOs) in terms of their expertise in the sector, the project is working closely with different stakeholders from various government departments like National Health Mission (NHM), Women's and Child Police Department, State Women Commission, State Skill Mission and the State National Social Service (NSS) Unit. to promote safety-cum-security to women through community partnership in Bhubaneswar with specific focus on urban slums. Community integration is likely to ensure the longevity of the intent and actions undertaken.


The entire process of change at the community level is being taken forward by the trained peer-leaders who are well-versed with ongoing government schemes and capacitated enough to liaise with them which makes the project sustainable.

The Youth Connect Program, operational in approximately 80 educational institutes in Bhubaneswar, is being operated thorough NSS officers and volunteers who are scaling project activities beyond the project area, applying learnings from their experiences gained from working with communities.

With their promptitude, dedication, enthusiasm and "Never Say No" spirit, the peer-leaders are making inspiring and training other youths in the community to expand the reach of the project and its impact.

Rank
3

# Tumakuru

## Digital Library

## Project Features

Tumakuru Digital Library, the first of its kind in India, is an efficient Library Management System (LMS) along with digital rights management (DRM) enabled content rendering system, making information highly secure, scalable, reliable, and accessible on any electronic device to its members.

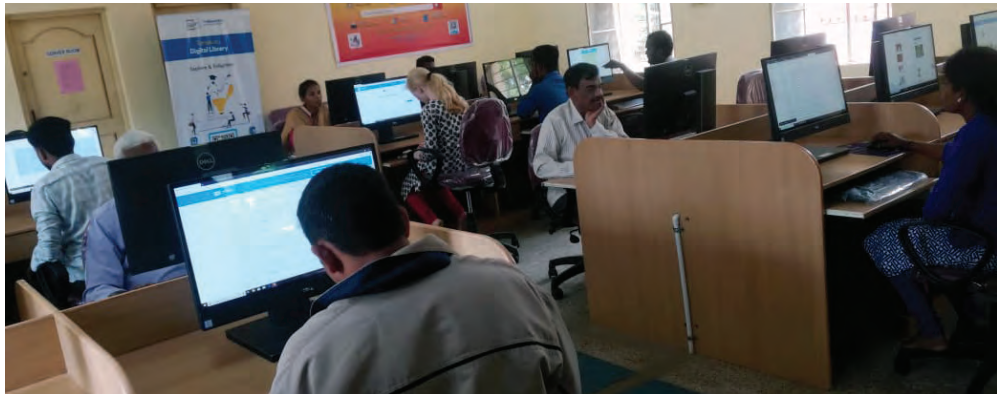
The public library in Tumakuru was faced with multiple challenges related to requirements of patrons, administerial delays with respect to approvals and follow ups, lack of technical experts in the library department and lack of exposure of patrons/library managers to library technologies. Lack of diversity in book subjects, limited physical space in the library and in accessibility during holidays led the smart city to include exhaustive and useful content on the digital library platform.

The Digital Library is a collaboration of many stakeholders including the State level Book Selection Committee, Department of Public Library, Tumakuru District Central Library, Tumakuru City Central Library, prestigious academic institutions and the citizens of Tumakuru.

The Digital Library is always open for feedback from readers and library users. Requests for book suggestions are accommodated by the digital library depending on the availability of their e-versions.

## Key Outputs

The digital library is set up at the Town Hall Circle with 20 all-in-one touch-based desktops for public use. The Town Hall Circle provides free Wi-Fi to the library users and has CCTV installed for constant surveillance. The library is integrated with Indian Business Insight in addition to 58,000 e-books, 27,000 e-journals, 35 local and state level e-magazines and e-newspapers and 60,000 knowledge videos. The library provides some of the best courses for self-development of patrons. The digital platform also provides access to a blog writing space, a learning platform for learning computer languages, rare Indian books, and top employment websites.



Tumakuru Smart City organised the first blog writing competition for 21 students from Maruti Vidya Kendra had participated and the winners were rewarded. Innovative videos on science and technology are played in the digital library. The first webinar conducted on 30th April 2020 had illustrious readers like Dr. Shivananda Shivacharya Swamiji - Sukshetra Hiremath, from across Karnataka address students and library users to avail the facility more frequently. The second webinar organised in September 2020 saw an awareness campaign for the library conducted through the digital library platform. More than 10 awareness talks across Tumakuru (smart schools, government degree colleges, and private degree colleges) were held to encourage students to utilize the platform to its best. Around 1,600 students registered for the awareness sessions.

In total, there are 12,386 registrations across the domain verticals (for example students, researchers, teachers, professors, professionals). A digital library book was released on 14th November 2020 on the occasion of Children's Day and Library Week, consisting of student articles, forwards from Swamiji and officers, appreciation notes from readers and drawings by students.

## Key Impacts

Based on the assessment from 23rd September 2019 until 27th October 2020, the library saw a total of 1,100 active users; this number increased to 120 regular users over the last month. The total number of daily users per day currently is over 1,000. Besides the regular users, the library has seen more than 10 lakh impressions since the launch of the application in September 2019. New users have been steadily increasing on the platform. The platform has over 8,000 readers from Karnataka.

## Replicability and Scalability

The Digital Library platform uses open-source applications for its Library Management System and digital repository. It can be easily replicated in other smart cities and digital libraries since the open source applications can be easily deployed in other libraries. The platform is scalable to host and integrate any additional content subscribed by the library.

Additional books brought by the library can be hosted on the DSPACE platform. DSPACE is dependent on the hardware storage capacity to host any number of books brought by the library.

New content from sources other than newspapers and magazines can be linked to the digital library platform as it provides an entry point for any content to be added by the user. Following the success of this model, other cities in like Shivamogga and Lucknow have also developed their own digital libraries.

## Sustainability

The project is provisioned for maintenance for 5 years through the smart city. As most of the content is open source, the project is completely financially sustainable. The cost of the e-Bhandara application is minimal. Presently the membership of the portal is free for all, but, it is proposed that a one-time registration fee is charged in order to have more credible content on the application.

# ISAC 2020: PROJECT AWARD
## Sanitation


*Integrated Solid Waste Management, Tirupati*

# PROJECT AWARD
# Sanitation

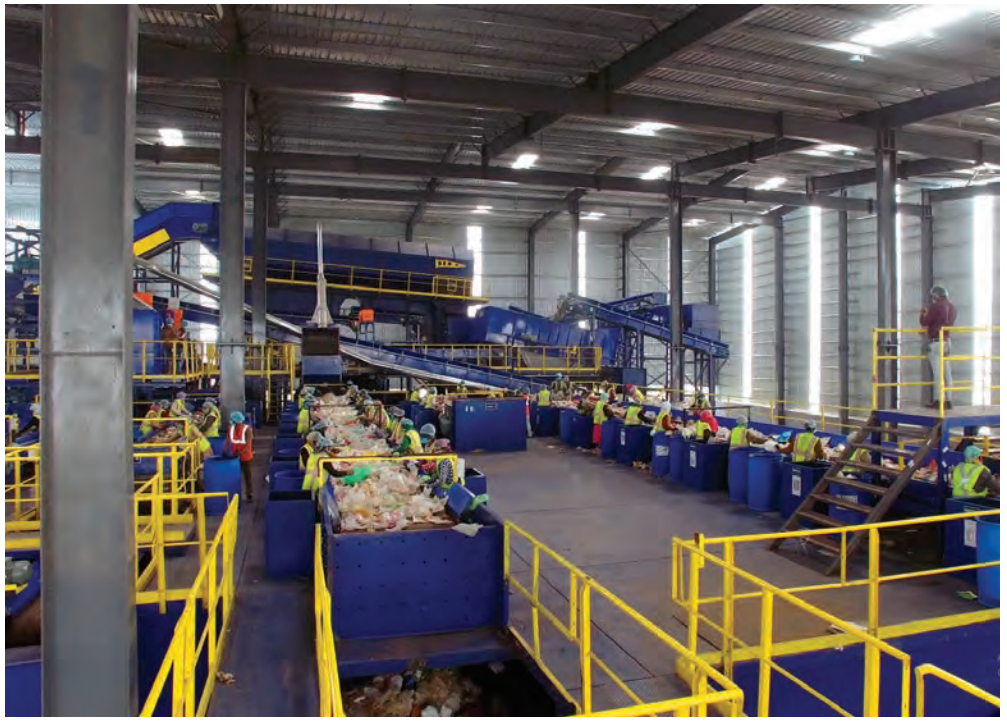
Rank 1

# Indore

## Material Recovery Facility for Dry Municipal Waste

### Project Features

Presently, Indore generates about 1,185 TPD waste per day of which 100% is segregated before collection and processed on same day. 95% dry waste is segregated into recyclable components and 5% inert waste goes to the engineered landfill. Indore Smart City Development Limited's vision resonates with that of Swachh Bharat Mission in keeping Indore city clean, bin-free & litter free.



Indore was keen on substantially improving service quality of dry waste management activities in the city through private sector engagement. The selection of private sector partner was determined based on their ability to pioneer the supply, installation and commissioning of a 400 TPD capacity Automated Material Recovery Facility with operation & maintenance on a PPP model. Indore has implemented a mechanism to process 100% of its dry waste generated in the municipal area on a daily basis. The material recovery facility has given livelihood opportunities to many, and is a safe & healthy working environment for its workers.

The automated mechanized plant is built on 4.5 acres of land provided by Municipal Corporation with an investment of Rs. 30 crores. The waste is sorted in 13 categories with the help of optical sorting technology and robotics. Approximately 140 tons of plastic has been recovered for recycling by Indore Municipal Corporation for use in road construction by shredding the plastic, making plastic pipes etc. Non- recyclable material (RDF) is used as fuel in cement plant. The material recovery facility will soon be accorded the status of a zero-waste landfill.

### Key Outputs

This is India's first automated material recovery facility. It has a processing capacity of 400 TPD. This facility can segregate 13 different fractions from dry waste like plastic, glass, metal, leather, non- ferrous metal, shoes, paper, cardboard, white and grey board, clothes, rugs, RDF etc. The disposal and processing of waste is done on a daily basis hence no waste is carried over to the next day.

- There is downstream integration of the facility with recycling factories, a cement plant,
- HDPE pipe industries and road construction agencies which ensuring reuse,
- MRF has given employment to 500 experienced rag-pickers who are trained and engaged by the processing agency to help in quality check and segregation,
- Workers' income has risen to Rs. 400 per day from 150 per day; and they are linked to all the health and insurance schemes of GOI. They are paid a fixed monthly income,

- Safety of female workers on the facility is given special importance, and
- Plastic EPR is implemented through this project. RDF is sent to cement plant to be used as alternative fuel.

## Key Impacts

The company has uplifted and empowered 500+ waste pickers. The MRF has provided a safe workplace for female ragpickers along with an improvement in the workers' quality of life. The facility is able to procure good quality of RDF from the process. Indore Smart City earns an assured premium of Rs. 1.41 crore per annum. The quantity of inert waste has now reduced to 5%. The MRF has also proved to be a big support to the small scale recycling industries since it provides a better quality product with 98% purity level to attract more recyclers. With an overall boost to the waste management industry, the MRF has proven to be a successful model for other dry waste management facilities.

## Replicability and Scalability

Given that the output of the process employed by the MRF is of a better quality that was generated through manual processes earlier, the model is able to attract more recyclers. The facility also has the capability to provide processed material over raw material to the manufacturers. All this leads to strengthening of the waste management supply chain with a series of beneficiaries emerging from establishment of one such facility. The process therefore, has automatically led to the scaling of the industry and has a multiplier effect on livelihood generation for downstream businesses.

Already the success of MRF has been the subject matter for many study tours for city administrators and managers leading the replication of more such facilities throughout the country. Presently, four such material recovery facility ranging from 200 TPD to 500 TPD are under construction in various cities of country.

## Sustainability

The MRF plant helps in ensuring maximum recovery, minimum intervention and a better health safety environment for the workers and also, for the citizens at large. There is more than 60% valuable recyclable material being recovered from segregated waste. The facility has evolved to provide cost and time effective customized solutions for waste management.

The facility not only contributes to the sustainability in what it produces but also in how it produces good quality recyclable waste. The electrical consumption of internal lighting for plant is powered by rooftop solar panels. It used an ERP based system and real time-based operations to bring in more efficiency, transparency and reliability in its functioning. Energy efficiency is given special emphasis in Indore MRF.

In terms of financial sustainability, this has emerged as a successful PPP model in which 100% capital investment and all the expenses for day-to-day operations and maintenance is borne by the concessioner. Indore Smart City earns a premium of Rs. 1.41 crores per annum from the facility which will increase by 5% per year.

Rank
1

# Tirupati

## Integrated Solid Waste Management

### Project Features

Tirupati Smart City Corporation Limited has implemented Integrated SWM to for comprehensive waste management in the city. The comprehensive waste management solution involves use of the following infrastructural units:

- Transfer Station
- Bioremediation & Bio-Mining
- Bio-Methanation Plant

The transfer station is equipped with GPRS, a weight bridge software, RFID reader and CCTVs. The structure is tech enabled to monitor incoming vehicles, produce online weight slips, and generate online reports for ward-wise deployment of vehicles and number of trips per vehicle. The online records help keep a tab on total dry and wet waste generated, and transported to the processing plant. The automation helps in route optimisation for primary collection. Physical characteristics of the waste delivered to the transfer station are monitored which helps in regulation of moisture content in the waste. The hook loader with the vehicle is artificial intelligence enabled to check improper loading.

The equipment for bio-mediation and biomining is similarly state-of the-art, fully automated and tech enabled. For bio-mining, the land under abandoned stone quarries has been reclaimed. The low-lying area was filled up with 'legacy waste' -- construction and demolition (C&D) waste collected and kept for years in a landfill. After that, reclamation, plantation was carried out over the area increasing the green cover in the area. The ground and surface water, soil and air are tested every month in and around the site, and a monthly checkup is conducted to ensure safety and health of the workers in the bio-methanation plant. Phytoremediation is carried out to reduce concentration of heavy metals to protect flora and fauna in the area.

## Key Outputs

Nearly 150 ton of waste is transported to the processing plant every 8 working hours. Since waste is transported by 150 e-scooters, there is a 40% reduction in fuel costs. Due to automation the transfer station no longer requires supplementary moving machineries for loading and unloading of waste because of which there is a 35% reduction in manpower requirement. There is no odour from spillage of waste and discharge of leachate since waste is carried in closed containers. GPS and RFID enablement have made monitoring of all primary and secondary vehicles easy. Also, the use of technology has led to route optimisation and optimal vehicle deployment for primary and secondary vehicles. The facility is also able to keep track of wet and dry waste generated on a daily basis.

This project has uplifted the look and the visual appeal of the city noticeably.

The legacy waste picked up for bioremediation and bio-mining was spread over 25.36 acres and had an average height of 1.79 meters. The plant set up to clear out this waste has a capacity of 40 ton/hour. So far around 2 lakh tons of legacy waste has been processed and with the 17.6 acres of land has been reclaimed. The reclaimed area has abandoned mines and low-lying areas which are suitable for cultivation and plantation. The transformation of the site from a landfill to a green cover has reduced the adverse impact of the earlier use on the water, soil and air. There is a marked reduction in dusty particulate matter, odor, flies, mosquitos and pathogens; toxic gases have been eliminated with the clearing out of the site.

## Key Impacts

With this integrated waste management solution, Tirupati has prepared itself to handle waste generated for several years to come. The secondary bins have been abandoned and the city has become bin free. This has given Tirupati a huge aesthetic advantage which puts in favourable stead with millions of visitors/pilgrims who visit the area through the year. The project has done away with the hot spots that attract stray animals. Earlier, waste was disposed-off at Ramapuram dumpsite unscientifically. This legacy waste has been processed by bioremediation & bio-mining. 85% of the waste has been remediated. The refuse is used to derive fuel which is transported to nearby cement factories. C&D waste and stones are used to fill low-lying areas before filling out with a green cover. The organic bio-earth is distributed to farmers and used for city gardening , and recyclables are sold to approved vendors. Bio-Medical & hazardous waste is treated appropriately. After completion of the project the quality of air, soil and water near the site and surrounding area has improved remarkably. The biodiversity in the area has also flourished. 17.6 acres of abandoned mines/low laying area for cultivation and plantation has been reclaimed. Air pollution from open surface burning of materials and greenhouse gases, soil and water contamination from potentially toxic elements are not directly quantifiable but are invaluable outcomes any urban project would be proud of.


## Replicability and Scalability

The transfer station is replicable in any city where the processing plant or disposal site is far from the city. The system's capacity will be determined by the amount of waste generated. Similarly, the bioremediation and biomining are replicable anywhere where surrounding environment has been exposed to large volumes of legacy waste. The selection of processing capacity and machinery will depend upon the volume of the legacy waste and characteristics of the waste.

## Sustainability

The project has made concrete strides towards environmental, visual and financial sustainability. Automation has made the processes used in waste collection and management energy efficient, and environmental sustainability has received a boost through bioremediation and biomining activities.

Reduction of waste, waste bins, spillage and uncollected garbage on the streets has given back the city its aesthetic quality. Finally, reclaimed land value is higher than the expenses incurred for project, and the property value of nearby land has also improved.

Rank
3

# Surat

## Wastewater Treatment

## Project Features

In an initiative to conserve water, Surat has taken an initiative in association with users, industries and, state agencies to recycle and treat water through tertiary level treatment.

The following types of advanced tertiary treatments facilities have been installed at Dindoli tertiary treatment plant to achieve the desired Tertiary Treated Industrial Grade Water parameters.

- Disc Filtration System
- Ultra-filtration (UF)
- Reverse Osmosis (RO)
- Activated Carbon Filtration (ACF)

The reuse of treated waste water contributes towards reducing the dependency on conventional resources of water, reduce diversion of drinking water for non-potable purposes and guarantees revenue generation for Surat Municipal Corporation. Creation of an alternative resource, creates assured quality and quantity of water resources – a basic need of industries to sustain & operate.

The project involves a 40 MLD net output capacity tertiary treatment plant to treat secondary treated water from Dindoli sewage treatment plant to generate industrial grade water for Pandesara Industrial Estate, Surat at a capital project cost of Rs. 125.00 crores.


## Key Outputs

The project has helped curtail diversion of drinking water for industrial purposes, reduced the dependency on conventional resources of water and conserved valuable ground water resources through recycling and reuse of wastewater along with guaranteed revenue

generation for Surat Municipal Corporation. The amount of secondary wastewater treated at this facility is 57 MLD of which the treated wastewater for industrial use generated is 40 MLD. The supply of this water to industries is expected to generate revenues to the tune of Rs. 42 crores annually.

## Key Impacts

Treatment and reuse of wastewater reduces the burden on water bodies, in which secondary level treated waste water is discharged. The pollution load on water bodies from the 57 MLD of secondary wastewater which is now sent for tertiary treatment has been eliminated through the implementation of the plant.

Another outcome of the project is waste water conservation where directly 40 MLD of fresh water from natural sources are conserved where secondary wastewater is used as input in the plant. Further this project reduces the burden on the local water bodies. Water supply is one of the most critical urban services and therefore, long-term planning to cope up with water demand for citizens as well as for industries is also very critical for the local government. This initiative supports the supply of potable water as 'water saved is also water earned'. For Pandesara Industrial Units the dependence on bore-wells and private tanker operators has also reduced as they now have tertiary treated water supplied to them by the city. It has assured water supply to industrial units by providing supplementary source of water in addition to drinking water.

## Replicability and Scalability

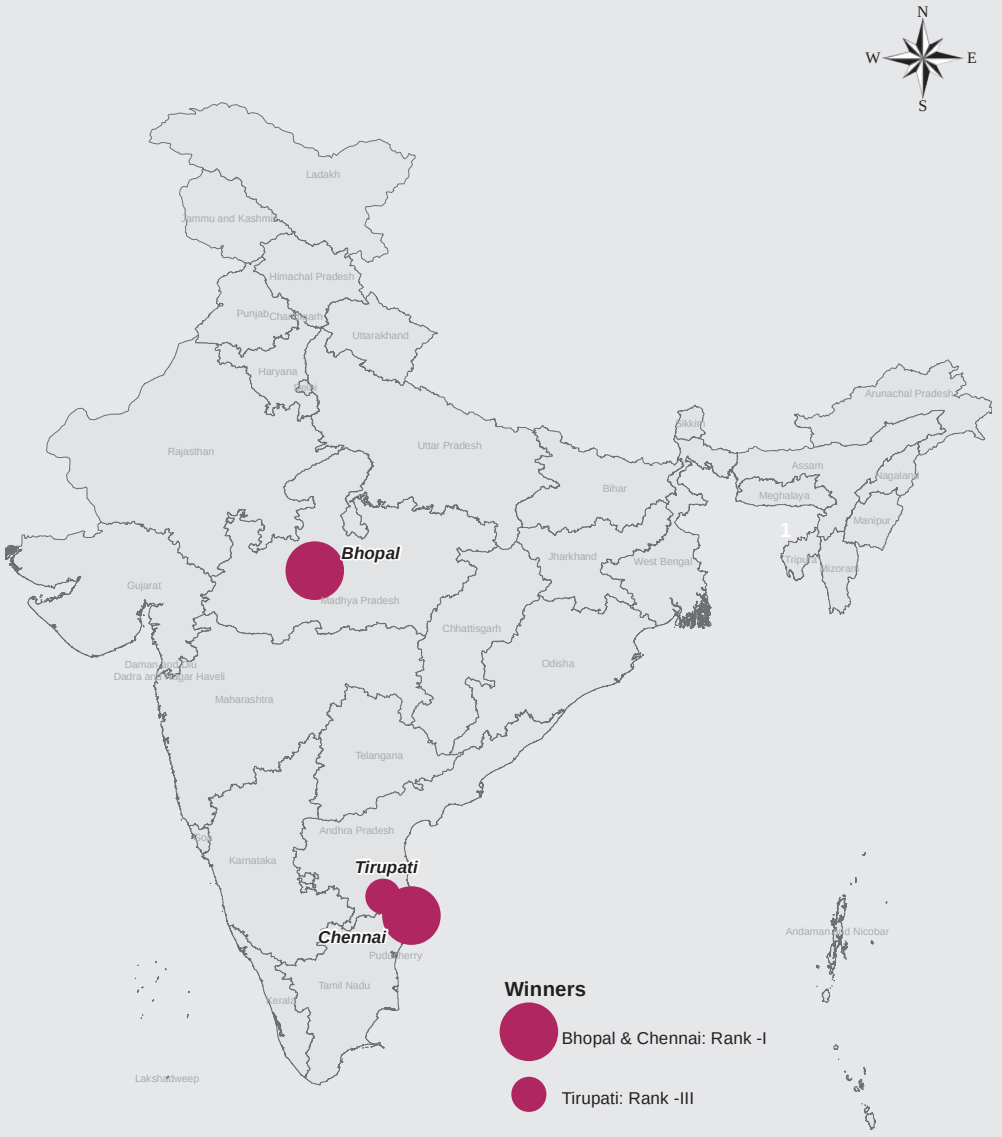
Considering the amount of sewages that are being currently treated and based on the recent policy of the Government of Gujarat on 'Reuse of Treated Wastewater Surat has proposed to replicate this project to supply industrial grade water to industries located near the city. Based on the location of industries in and around Surat and location of various sewage treatment plants in the city, the complete area has been zoned into mainly three clusters viz. Bhesan Cluster, Dindoli Cluster and Bamroli Cluster.

Details of the demand for water supply among various industries have been collected from the industries and forwarded to the State Government for its approval. Further, inspired by the the success of this project, the industrial setup adjacent to the city has highlighted their demand for 35 MLD treated wastewater from Surat.


## Sustainability

The project supports water conservation and the ideals of environmental sustainability. It is also financially viable given that the payback period for the project is 6 to 7 years, in which time, the project will be generating an annual revenue for the municipal corporation. The financial surplus after the end of the payback period will be applied towards other infrastructure projects.

# ISAC 2020: PROJECT AWARD
## Urban Environment




*Khathaa Kuzhi Kulam Pond Rejuvenation, Chennai*

# PROJECT AWARD
# Urban Environment

Rank 1

# Bhopal

Clean Energy

## Project Features

According to the Smart Cities Mission guidelines, at least 10% of the electricity generated in a smart city must be from renewable resources. Following this, Bhopal Smart City Development Corporation Limited (BSCDCL) has taken the initiative to produce green power by installation of rooftop solar power plants. In the same vein, BSCDCL has further rolled out its biomethanation project with the philosophy that "Nothing Should Go Waste" and so, to create useful products such as biogas and organic manure from organic waste. Also, the smart city has installed 20,000 LED street lights by replacing the conventional sodium lamps and mercury lamps.

While a majority of the world's current electricity supply is generated from fossil fuels such as coal, oil and natural gas, these traditional energy sources face a number of challenges including rising prices, security concerns over dependence on imports from a limited number of countries that have significant fossil fuel supplies, and growing environmental concerns over the climate change risks associated with power generation using fossil fuels. As a result of these and other challenges facing traditional energy sources, governments, businesses and consumers are increasingly supporting the development of alternative energy sources and new technologies for electricity generation. As opposed to fossil fuels, which draw on finite resources that may eventually become too expensive to retrieve, renewable energy sources are generally unlimited in availability. Installation of solar power plants, biomethanation plants and LED streetlights are initiatives undertaken by BCDCL to promote the generation and use of renewable energy.

## Key Outputs

The scope for biomethanation plant involved construction and maintenance of plant in Bittan Market of Bhopal. The waste collected on daily basis from the nearby shops and vegetable vendors are processed on a daily basis to generate power for streetlights. The streetlights project in Bhopal is implemented on a public-private partnership basis for a specified concession period. This project aims at creating a "No Headlight' zone in Bhopal. About 20,000 LED streetlights along with the radio frequency (RF) controllers and 400 content management system (CMS) panels have been installed at present. For this a backbone of 175 kms optical fibre cable (OFC) cable was laid. Earlier poles had electricity board (EB) connections that were metered. Now, under the PPP model, the street poles on which these streetlights have been mounted have revenue-generating spaces for advertisements.

Rooftops projects of 35 KW have been installed at the municipal head office, 120 KW solar plant at ISBT, and a 750 KW solar plant at the lake front. The biogas plant installed at Bittan Market has capacity to process tonnes of segregated organic waste daily. There are over 50 hotels and 500 vegetable vendors in the area, making the location an ideal base to collect organic waste.

## Key Impacts

The biogas converts waste in to high quality fertilizer which can be used in landscaping or farming. This is the cheapest and reliable method to produce low-cost energy. This plant is simple and easy to operate. The energy produced is used to illuminate the streets while

reducing dependence on fossil fuels. Power generated through rooftop solar plants at premises is consumed within the premises. Implementation of LED streetlights helps to improve the quality of life of city residents by improving the city lighting and conserving energy and has ensured that there are no dark spots or unsafe areas resulting in increased safety and prevention of accidents and crimes in the city.



The biomethanation plant, helps reduce landfill and makes for a cleaner environment. This plant also reduces city level pollution in terms of solid waste, air and water. This plant has a direct impact on the cleanliness of market places..

## Replicability and Scalability

It is the need of the hour to install energy efficient lights, harness solar energy to generate power and build more biomethanation plants in a bid to build India energy secure. The projects covered here are not only good for the environment but also, economical considering that generating energy in the form of biogas or solar power electricity gives very positive returns on investment. Once the solar panels are scaled and connected to the grid, the solar energy generated can be exported back to the grid and the savings can be transferred back to the citizens. Savings can further grow if excess electricity is sold at high rates during the day and then bought from the grid during the evening when the rates are lower. Generation of biogas is easily replicable and can find uses within cities and rural areas if scaled.

## Sustainability

The biogas plant is an innovative and a cost-effective solution in waste management, to convert the waste to energy under Swach Bharat Mission, The solar power plant has a low cost of operation. Once a solar plant is installed there is little cost associated with the operations. In addition, excess energy produced can be delivered back into the power grid for credits.

Generation and application of renewable energy is the right direction for other smart cities aiming at a sustainable, cleaner and healthier environment.

Rank
1

# Chennai

## Restoration of Water Bodies

### Project Features

Urban water bodies or lakes play a vital role in socio-economic development of any city and to provide sustainable water security to the local population. Over the years, these water bodies were not properly maintained. Hence, many water bodies shrunk in size. Water bodies/ urban lakes are an intrinsic part of the ecosystem. They have traditionally served the function of meeting water requirements of the people for drinking and household uses. They also recharge ground water, channelized water flow to prevent waterlogging and flooding. In Chennai there are around 210 water bodies. For centuries these water bodies have played a vital role in ensuring water security to Chennai and surrounding areas. To restore and protect these water bodies, the Hon'ble Chief Minister announced in the floor of Assembly the Sustainable Water Security Mission during 2015 for the restoration and rejuvenation of various water bodies and temple tanks in Tamil Nadu.

There are 210 water bodies and lakes in the Greater Chennai Corporation area. Out of these, 63 tanks have been taken up under the Smart Cities Mission at a cost of Rs.48.08 crore. The restoration of of the water bodies a part of the larger project. Other similar projects with the Chennai Smart City include restoration of 15 temple tanks, 32 waterbodies and so on. The restoration works carried out includes widening of the pond, deepening of the pond, bund formation, toe wall, revetment, inlet and outlet arrangements, walkway, plantation and landscaping.

### Key Outputs

Through the multiple water bodies restoration works, 65 ponds and lakes will be rejuvenated. The completion of the restoration works of waterbodies under Smart Cities Mission alone is expected to provide water storage for nearly 943 crore litres of water. The overall Chennai's water security framework is expected to provide for 1 TMC of water. The Chennai Smart City water restoration projects account for a third of such recharge.

## Key Impacts

In the recent north-east monsoons recorded in Chennai (i.e., during September and October 2020) a significant improvement was found in Chennai's groundwater levels because of the improved retention capacity of the lakes and ponds after restoration. The Indian Meteorological Department reported an increase of 4.63 metres in the level of groundwater recharge over the previous year. This level of improvement is reversing the water retention capacity of the city back to the level at which it was in the year 2015. With sustained efforts, this can undo and reverse the encroachment and urbanization patterns from up to a decade back.

Three lakes/areas where the Phase 1 restoration works were carried out and the ground water level difference metres),as of November 2020:

- Ambattur: 1.05
- Valasaravakkam: 0.56
- Madhavaram: 1.40

It is to be noted that this is only Phase-1 of the project. Along with restoration of community wells, mandatory rainwater harvesting structures, Villivakkam tank restoration and other remaining phases, Chennai is well on its way to a 'water-secure' future.

## Replicability and Scalability

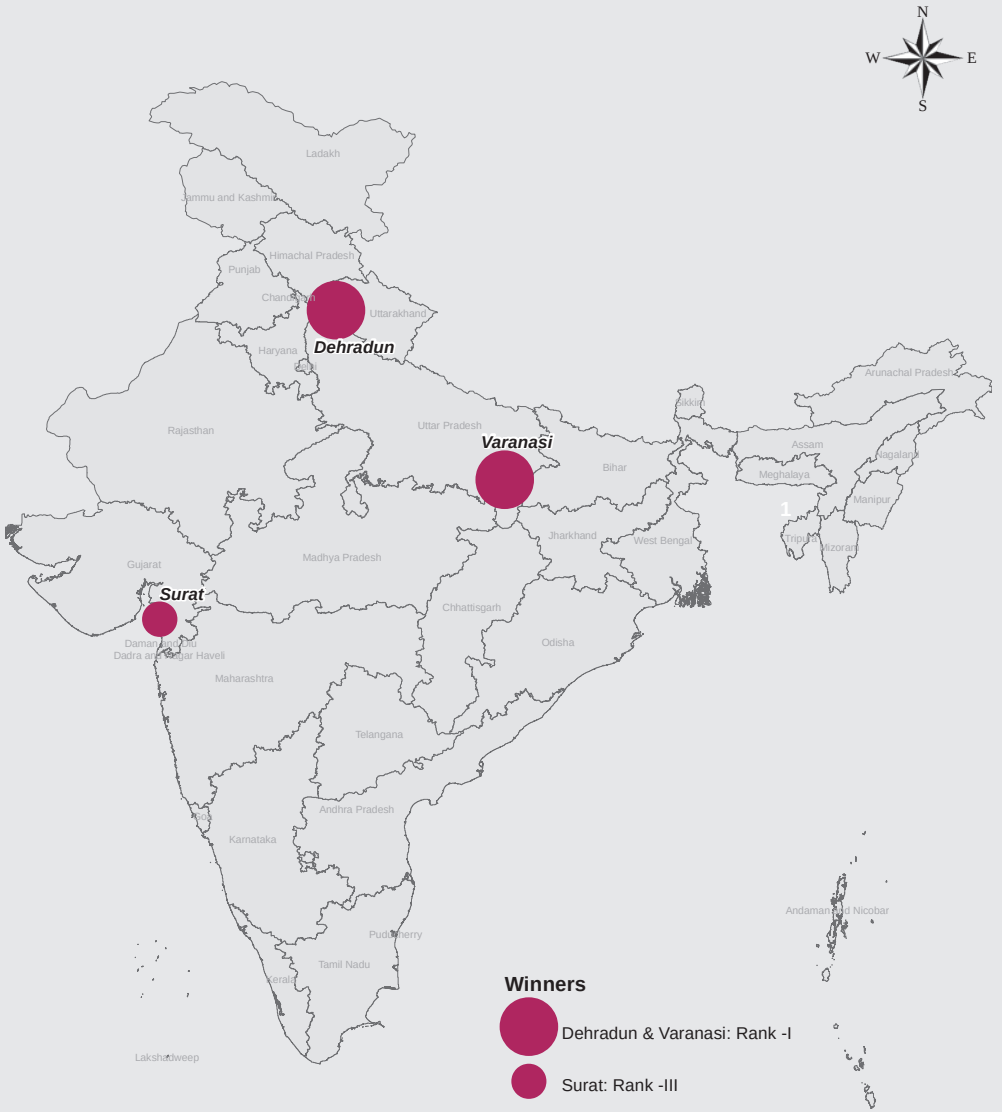
Since the Chennai Smart City's water restoration works are a part of a larger exercise, the Greater Chennai Corporation is already in process to restore another 137 water bodies. The restoration works are being funded under various programs, schemes and plans with support from the State Government.

The mechanism involved in identifying water bodies and monitoring restoration works is decentralised. Zonal authorities are empowered to carry out more restoration works as per the topography of their regions. The works carried out such as creation of inlet/outlet channels, bund formation etc. are easily replicable across regions. Further, the project area can be customised to suit the local community's interests-- such as creating a border walkway or children's play area.

## Sustainability

Apart from the project being funded by the Smart CitiesMission, it is supported by CSR funding and also Chennai Mega City Development Fund (CMCDM) funding for the remaining 137 waterbodies. In this manner, there is equal participation from the SPV, civil society and the government in restoration works. Moreover, with the creation of public open spaces around the ponds and temple tanks, Chennai Smart City Limited greatly encourages community ownership and participation in the maintenance of the water bodies. Civil society organisations such as the Environment Foundation of India, Chennai City Connect, C40 cities and 100RC have been instrumental in mobilising support, providing technical assistance and also preparing a disaster-resilient water security framework for the city. Truly this is a project created for the people of Chennai, executed in partnership with the people of Chennai and owned by the people of Chennai.

# ISAC 2020: PROJECT AWARD
## Water





*Integrated Water Supply, Surat*

# PROJECT AWARD
## Water

Rank 1

# Dehradun

## Water Supply Improvements

### Project Features

This project is an integrated project comprising four unique components through which Dehradun Smart City has tried to level up the provision of water in the smart city.

1. **Water Supply Augmentation & Water Supply along Smart Roads**
   Water supply distribution and re-organisation of ABD area (old GI/AC) is proposed with DI pipes for increased durability/sustainability. The present practice is to give consumer connections direct from the pipeline, necessitating road-digging for maintenance or for providing a new connection. This project aims to replace this practice with the innovative concept of connection headers. These are 10 meters long each and are provided every 20 to 60 meters spacing on both sides of roads. All existing/new connections are transferred to/given from these headers.

2. **Smart Water Metering**
   Water Supply Distribution Zones have been sub-divided into smaller District Metered Areas (DMAs) with 100% metering of all domestic/non-domestic connections, aimed at enforcing water-discipline and regulating/reducing/checking water consumption/ wastage/pilferage at the consumer's end. These Automatic Meter Reading (AMR) meters have a special electro-magnetic interface. Monthly/bi-monthly readings are recorded remotely by radio-frequency based hand-held units, transferred to a database of consumers for direct generation of computerized bill that can be accessed via a mobile app.

3. **Water ATM**
   The project involves installing water ATMs at busy locations across the city, providing packaged quality drinking water outlets for tourists, market-goers, school children, and the general public at affordable rates (300ml@Re.1, 300ml with biodegradable glass@ Rs.2, 1 litre@Rs.3, 5 litre@Rs.14) in a public-private partnership (PPP) mode. These water ATMs are unmanned and fully electronic with quality and quantity sensors/ displays, Multi-Processor Integrated Control System with interface cables/connectors, data-logger and GPRS-based backend wireless communication to DICCC.

4. **Smart Water Management**
This project involves complete automation of all overhead tanks (OHTs)/transitional waters (TW)/water pressure boosters with ultrasonic level/depth/pressure transmitters, flow-meters, valves with actuators, automated chlorine analysers/dozers and installing/ maintaining energy-efficient pumping machinery/equipment, achieving guaranteed 10% energy saving on energy service company (ESCO) model, real-time data transfer to DICCC on 4G GPRS network with 10 years O&M in PPP mode. Sharing of additional energy saving between DSCL and concessionaire will be additional benefit to DSCL and the local government and the revenue will help the concessionaire recover their investment.

## Key Outputs

1. **Water Supply Augmentation & Water Supply along Smart Roads**
Under this project 34.5 kms of new DI distribution pipelines with connection headers have been laid in the ABD area. 1.54 kms of new DI D/F rising mains of existing tube-wells (which are connected direct to distribution line) have been laid up to the nearest OHTs, very old AC rising mains of three existing tube-wells have been replaced and 1.44 kms old AC distribution main running through ABD area but feeding outside have been laid. All existing water connections will be transferred to the headers.

2. **Smart Water Metering**
The total area under reorganisation of water supply within ABD area has been divided into 6 smaller DMAs for better management. All 4,934 domestic and 967 non-domestic (total 5,901) connections are being metered 10% 591 additional AMR meters will be procured for future connections. Implementation of volumetric tariff of water supply and billing will follow.

3. **Water ATM**
Out of the total 24 Water ATMs envisaged, 15 have been installed in Phase-1 depending on the availability of suitable sites. The locations of maximum footfall have been chosen.

4. **Smart Water Management**
Drilling of auxiliary 85 bore-wells with depth sensors/transmitters, complete automation with electro-magnetic flow-meters, pressure-transmitters, smart energy meters/sub-meters, valves with actuators, automated chlorine dozers/analysers energy efficient pumping machinery/equipments, Ultrasonic Level Transmitters, RTUs and SCADA system in all 206 tube-wells, 9 GPS having 38 pumps and 72 OHTs is being done.

## Key Impacts

1. **Water Supply Augmentation & Water Supply along Smart Roads**
Improvement in management of water supply distribution system with zonal and sub-zonal segregation is necessary. The innovative arrangement of giving consumer connections from water headers will eliminate frequent digging of roads and ensure proper water supply at the desired pressure to the consumers.

2. **Smart Water Metering**
The significant outcomes of this project is enforcement of water-discipline among consumers, monitoring of water consumption, reduction in in water wastage/pilferage, implementation of volumetric tariff, realisation of value of portable water by public and consumers' satisfaction of paying for what they consume. This is likely to reduce water consumption by about 10%, whereas revenue collection of Uttarakhand Jal Sansthan (UJS) is likely to increase by about 15%. Automated meter reading, feeding into consumer database, computerised bill generation and communication through mobile notifications will be added advantages.

3. **Water ATM**
This PPP project has greatly increased the ready availability of packaged-quality drinking water at public places like tourist places, markets etc. The water ATMs are being converted into fully electronic modes, which can be operated by consumer through card/ coins. The quality parameters of water will be displayed at the ATMs and monitored in real-time at DICCC along with daily/cumulative data of water dispensed in various denominations. People have stopped carrying water bottles within the city, substantially reducing use of plastic bottles.


RATE LIST
QUANTITY
Samta Tea & Bakery

4. **Smart Water Management**
This will result in a reduction of10% of annual energy cost saving of Rs 3.5 crores, savings in the cost of pumping machinery maintenance of approximately Rs. 4.5 crores amounting to Rs. 80 crores during 10 years of the project period with improved infrastructure/ maintenance in PPP mode, better consumer-services, capacity building of UJS/DSCL and real-time quantitative/qualitative monitoring of water supply. The concessionaire will try to achieve more saving in energy cost to get the maximum recovery of their investment in PPP mode, resulting in more savings to the government.

## Replicability and Scalability

1. **Water Supply Augmentation & Water Supply along Smart Roads**
The same innovative approach of zone/sub-zone wise water supply distribution reorganization with zonal/sub-zonal segregation, providing water connection headers instead of giving consumer connections direct from the distribution pipelines and shifting all connections to these headers can be easily replicated in rest of the city.

2. **Smart Water Metering**
The innovative approach of smaller DMAs and 100% metering of all domestic/non-domestic water connections with AMR meters enables recording of meter readings remotely with RF based hand-held devices and feeds the readings directly to the data base of consumers for computerised bill generation. This can be easily replicated for consumers across the city.

3. **Water ATM**
The project has been proposed/implemented as a pilot project in PPP mode to make drinking water at public places in Dehradun Smart City at affordable rates. The scaling up of water ATMs will come at no additional cost to ether DSCL or Dehradun Municipal Corporation. The concessionaire will bear the cost of such infrastructure in exchange for advertising rights on the ATMs.

4. **Smart Water Management**
This innovative hybrid ESCO model in PPP mode, with instrumentation on price-bid and automation, SCADA & replacement of energy-efficient pumping machinery/equipment on PPP mode with 10 year's O&M can be replicated in other cities of the state/country, where water supply involves substantial energy consumption or costson pumping systems, to achieve the objective smart water management, improved infrastructure with energy efficient pumps & equipment. This will encourage a positive shift in the practice of maintenance activity being breakdown-driven to preventive maintenance-driven. It will also lead to better service to consumers and savings in water/energy bills.

## Sustainability

1. **Water Supply Augmentation & Water Supply along Smart Roads**
Proper management of any water supply system can sustain only if made manageable by zoning/sub- zoning of distribution system with strict zonal/sub-zonal segregation. This project ensures it within the project area. Moreover, the system should make sure that no other public services are disrupted by maintenance of water system. Providing innovative system of water connection headers will help sustain road infrastructure and other services by eliminating need of frequent digging of roads.

2. **Smart Water Metering**
Water supply services can better survive if they are financially self-sustainable, for which applicability and enforcement of volumatic water consumption tariff is an essential requirement. This project with well-defined DMAs, 100% AMR metering, remote recording of meter readings with RF technology, its integration with consumer database, computerised bill generation and digital notifications for bill payment to consumers will certainly be a leap forward towards self-sustainable water supply in project-area.


3. **Water ATM**
Easy availability of good quality portable water in market and other public-places in any city is a big issue. This project on PPP mode solves this problem in an innovative manner. Revenue for sustainability comes from affordable water tariff fix by DSCL and advertising rights given to the concessionaire.

4. **Smart Water Management**
Proper management of water supply systems largely depends on energy-efficient pumps/machinery/equipment, supervisory control and data acquisition. This project is aimed to provide necessary instrumentation, automation, real-time monitoring of all TWs/BPSs/OHTs. measurement/control devices are on price-bid, while all measures for energy saving, automation, SCADA and O&M for 10 years are on ESCO model in PPP mode. This is the best model for sustainability of a pumping system of a water supply.

Rank 1

# Varanasi

## Eco-Restoration of Assi River

### Project Features

The Assi is a very important water-body/river for Varanasi city. Varanasi was named after rivers Varuna and Assi. This rivulet is gradually being converted into a nalla and is losing its existence due to discharge of sewerage and solid waste by the households residing in the vicinity.

Under this project, Varanasi Smart City Limited (VSCL) took urgent steps to control encroachment of the water surface and save the river. VSCL, Nagar Nigam Varanasi along with M/s Green Water Revolution Pvt. Ltd., Pune (GWRPL) under technical guidance with Shrishti Eco-Research Institute, Pune (SERI) have used Green Bridge Technology to clean the entire stretch of the river from its point of origin in Kandwa, Sundarpur, Sankatmochan and final confluence to River Ganga near Ravidas Park.

### Key Outputs

The project will eventually lead to cleaning and desludging of the river stretch. It will result in stream watershed development by removal of hurdles in the waterways, (training of streams and through silt control and erosion control measures. Efforts under the project include preventive measures for dumping of municipal solid waste (MSW). The MSW is trapped and subjected to in-situ treatment such as bioremediation or phytoremediation. The reclaimed water surface will be developed for ecological and recreational purposed. Already the DO level at the pond of origin has increased to 4mg/l and in the whole stretch it has started increasing from zero to 2 mg/l.

## Key Impacts

As an outcome of the project, there will be complete eradication of water hyacinth with change in the aquatic biodiversity. Cleaning of the entire stretch by removing more than 100 dumpers of MSW has resulted in decreased anaerobic condition caused by the waste. Occurrences of phytoplankton, zooplankton and four to five types of fishes, water snakes, tortoises and ducks have been reported in the river stretch under the project. There is an increase in Avifauna and birds like Kingfisher feeding on aquatic species throughout this part of Assi River. Also, there is lot of improvement in the physical parameters like color, odour and turbidity.

Residents and commercial settlements in the vicinity have reported satisfaction with the change, clean river and surrounding environment.

## Replicability and Scalability

The project has been developed as a model project that has demonstrated the success of environmentally sensitive and sustainable methods that are bioremediation and phytoremediation. Varanasi is a historic city situated on the banks of River Ganga. Restricting the flow of untreated waste into the Ganga is very crucial for its sustainability. The feasibility of such a project using natural processes like bio-remediation has proven to be useful in treating waste-water/sewage in the other parts of the city. The project has potential to be replicated in other parts of the city in treating waste-water channels, nallas etc. The city also has several ecological assets in the form of ponds, lakes and kunds and based on the results and assessment on the gaps, Varanasi has gradually started adopting such process for naturally treating the water.

## Sustainability

The project relies on bioremediation which is a natural method of disintegration and treatment of waste and sewerage. The resources required to run the system are minimal and are not cost- intensive. The medium required for degeneration also involves specific plants and natural processes that are environment friendly. This nature of the process is the reason behind its adoption at other places in the city.

Rank
3

# Surat

## Integrated and Sustainable Water Supply System

### Project Features

A high growth in population in Surat in the past three decades has imposed a growing demand for basic amenities including water. The city falls in the flood prone zone and may be potentially vulnerable to the effects of climate change. Assuring water security therefore became top priority for Surat Smart City.

The surface water of River Tapti is the main source of nearly 1,285 MLD of the city's daily water supply. There is no alternative source of water for the city. The minimum demand for water in the city currently is 220 MLD, which is projected to reach 500 MLD in the year 2041. To meet the challenges imposed due to tremendous growth in city, unique initiatives have been established like augmenting the water resources through more and more French wells, water supply GRID connectivity and networking, infrastructure improvement with 24x7 water supply, use of green energy like wind power and use of solar power plants for water supply operation, implementation of rain water harvesting structures, comprehensive water quality monitoring system, etc. Such initiatives have resulted in the provision of uninterrupted water supply at affordable rates to consumers. At the same time, cost recovery of water supply system is 100% which shows consumer satisfaction and efficiency in collection of revenues. Wind power plants, 24 x 7 water supply, French wells etc. are being replicated since initiatives are resulting in operational and economic benefits. Integrated and sustainable approach has been ensured to manage overall water supply.

## Key Outputs

Water supply GRID networking helps to address water supply breakdown issues. Also, through networking, revenue generating industrial consumers get committed and assured water supply. The revenue generated is used for cross-subsidizing domestic consumers.

In terms of the quality of water supplied, Surat's achievement is notable. Consumer water samples collected and tested in dedicated water testing laboratory by the health department of Surat Municipal Corporation, showed that 99.5% of the total collected samples were declared fit for consumption in the year 2019-20. 24 x 7 water supply system helps consumer save time and space by avoiding unnecessary storage. Water losses in transmission are also monitored in this system. Network is pressurized and hence cross contamination issues have been avoided. A social impact study revealed that citizens now have better access to water. This has a positive spillover effect on social and economic upliftment.

## Key Impacts

The use of green energy to drive this project has optimised the unit production cost (Rs/KL) and as a result, the water tariff has stayed nearly constant between 2009-2017. In the absence of use of wind energy to power the system, the unit O&M cost (Rs./KL) in year 2019-20 would be Rs.4.18 compared to Rs.3.42 per KL that the consumer now has to pay.

The coverage of the water supply network in Surat due to this initiative is 99.1%, the cost recovery is 100%, the complaint redressal rate is 89% and the per capita supply sits well over the national average at 156 liters per capita per day.

## Replicability and Scalability

All initiatives implemented to manage the water supply system in an integrated manner are replicable in nature:

1. French wells – These infiltration wells are the most economical alternative to the conventional water treatment plant. In order to replicate these wells, a heliborne survey has been conducted so that immediate steps for execution can be taken. The present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capacity of infiltration wells is 155 MLD which is being augmented with an additional capacity of 100 MLD.

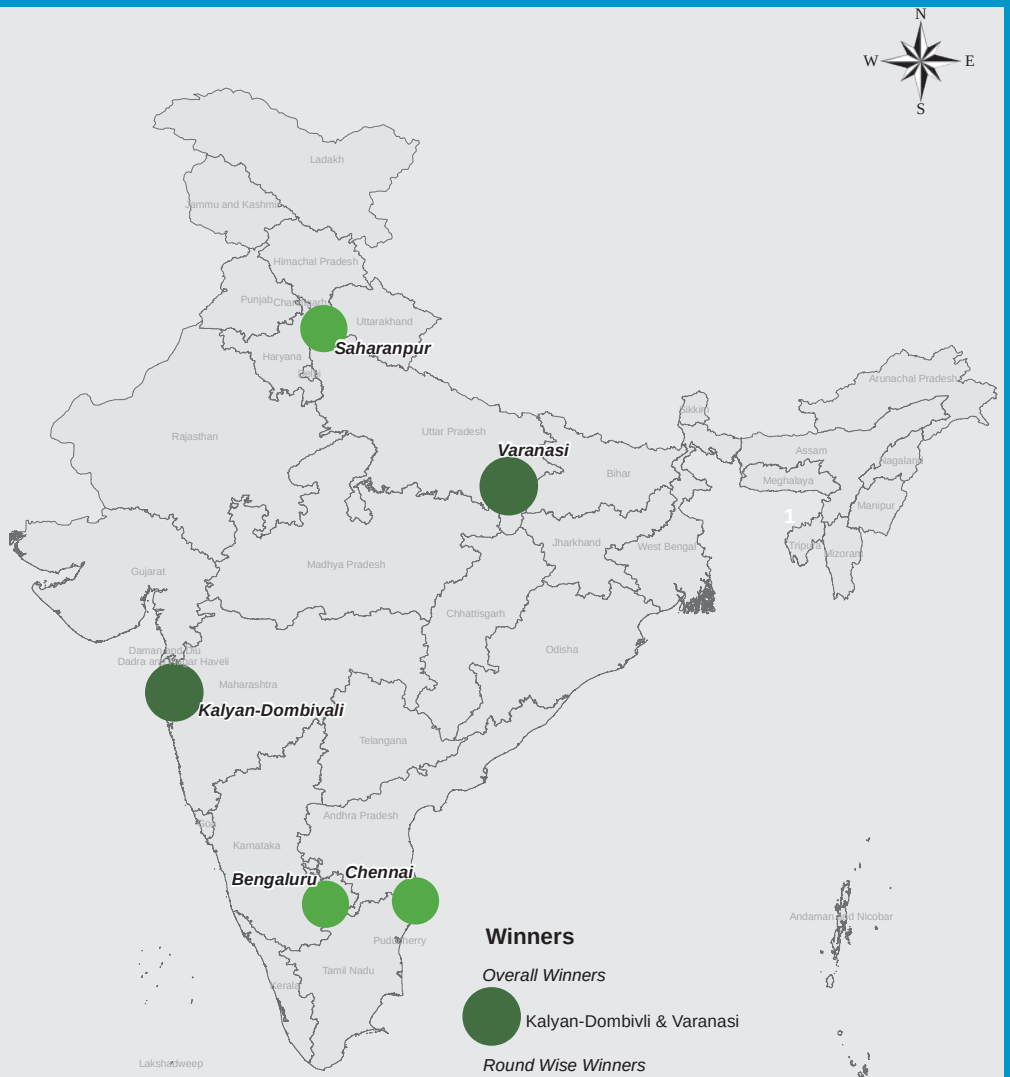
2. 24x7 water supply is successfully in operation and as a result, city water supply is being switched over from intermittent to 24x7 gradually.
3. Wind power has resulted in financial sustainability. Presently, 52% of the total energy requirement in water supply is powered by wind energy, reducing production costs. Following this, more wind power projects are being planned for power generation.
4. Rooftop Solar Power Plants are being expanded in coverage to power the water supply system for captive use.
5. To preserve ground water, more rain water harvesting structures are being executed every year so that during monsoon, ground water can be charged through percolation of rain water.

## Sustainability

Most of the initiatives implemented in water supply are aimed directly or indirectly making water supply sustainable. French well is, technologically and economically, the most feasible option. Comparison clearly indicates that French well is the economic option against conventional water treatment process. Installation of wind power has been initiated since 2010 and till 2019-20, a total 32.4 MW capacity of WPP have been commissioned, resulting into cumulative savings of a total of Rs.215 crore O&M cost (Rs./KL) realized with the benefits of wind power is Rs.3.42 per KL in year 2019-20. Had there been no wind power plants, the average unit O&M cost (Rs./KL) for year 2019-20 would have been Rs.4.18 per KL and therefore, there is a saving of Rs. 0.77 per KL in overall water supply management. Solar power plants installed at water distribution stations and water works are based on the concept of net metering and help in off-setting electricity consumption. Moreover, agencies involved for the execution of the project have been given 10 years for its maintenance and to ensure its and performance.

Water supply grid networking is helping in generating committed industrial revenue income which in turn makes water supply financially sustainable. All essential components like water treatment plant, booster stations, water distribution stations have been given to competent agencies for effective operation and maintenance. To oversee the performance of the agencies, a, dedicated team of engineers has been deployed. To ensure overall sustainability of the water supply management, water tariff and user charges applied are found reasonable by consumers in exchange for the value of the service provided. This has resulted in 100% cost recovery for the project making it financially sustainable.

# ISAC 2020
# COVID INNOVATION AWARD




*COVID Telecounselling Centre, Chennai*


# INNOVATION AWARD FOR COVID-19 RESPONSE

Overall 1

# Kalyan Dombivli

## An Overview Of City Initiatives

A simple two-word description which set initiatives in Kalyan-Dombivli apart are "Collaborative Approach". For tackling the unprecedented challenges of pandemic, the city developed collaborative methods which has three cornerstones – (a) plan together, (b) execute together, and (c) share resources. Few illustrations of such innovative approach are as follows:

- The teamwork between the Municipal Corporation and the Indian Medical Association (IMA) was established early on. A team, 200 medical practitioners strong was developed. Among them, thematic core teams planned responses along with officers from Municipal Corporation/Special Purpose Vehicle (SPV) and implemented them. Continuous interactions, knowledge / information and experience sharing were features unique to this initiative.


- This city established India's first post COVID-19 rehabilitation centre. This centre does not require typical hospital beds. The facility is for recovered patients achieve full recovery before discharge. Cured patients with more than 60% lung involvement have a potential threat of developing fibrosis of lungs and need $O_2$, spirometric exercises etc. even after testing negative for COVID-19. Kalyan-Dombivli Municipal Corporation (KDMC) invested in procuring necessary equipment and provided space and the Indian Medical Association (IMA) mobilized a team of local physiotherapists to run it. This collaborative set up has a capacity to attend to nearly 250 cases per day.
- This city was among the first few in India to have a monitoring dashboard, which was recognized by the MoHUA. Collaborative efforts of KDMC / SKDCL, PwC, ESRI and Amnex made this possible; without any cost to KDMC / SKDCL. A dashboard for visualisation of spatial spread, and containment zones based on which informed decision making through data analysis was possible was created.
- Monitoring lockdown using drones, using centrally operated public addressing systems at key locations, portal indicating bed availability in all COVID-19 hospitals were few other innovative steps.

## Keeping Information Channels Flowing

It is crucial to collect and manage information about new patients, at an early stage of COVID-19. KDMC/Smart Kalyan Dombivli Development Corporation Limited (SKDCL) decided to focus on involvement of private practitioners, through a collective innovative campaign named as "Family Doctor – COVID Fighter (FDCF)". It is common for households in Kalyan-Dombivli to have family doctors. The knowledge of family doctors, aware of the health profile of the families they serve could be leveraged as they would become the first 'points of contact' for citizens to reach out to if the first signs of the illness appeared. This existing network had its benefits. Citizens were more comfortable in sharing their symptoms with family doctors. KDMC / SKDCL decided to build upon this strength and formed clusters of average five family doctors. Common antigen testing centers were made operative within the localities of clinics of those doctors.

In private clinics with daily OPDs of around 100, antigen testing facilities were provided by KDMC. Tests at those centers were conducted completely free of cost. The system of family doctors referring cases with initial symptoms to those centers became accepted practice.

The disease in many cases would get detected and treated early. Early detection, early testing, early isolation, and early treatment through this approach helped to control the spread. By late September 2020, nearly 1,000 family doctors were part of this initiative. Around 50 testing centers were functional, each conducting 75 – 100 tests per day. More than 12,000 tests have been conducted till date, resulting in about one third of them as early detected positive cases, and getting cured.

As a result, recovery rates have crossed 90% and the death rate now is below 1.7%. For management of logistics, the city applied a similar collaborative approach. 120+ food camps through 8 community kitchens and 110 distribution centers catered to around 45 lakh people during the lockdown. About 80,000 food packets were made available daily through collaborations with a number of NGOs, CBOs, citizens groups, Gurudwaras, and municipal corporators.

## Innovations in Two-way Communication

The Municipal Commissioner and CEO, SPV, KDSCL conducted citizen interaction sessions on Monday through Facebook Live. Complete day schedules of feeds on KDMC's social media platforms were worked out. The schedule would be replete with citizen's health centric activities like yoga, aerobics exercises, performing arts, motivational speeches, COVID-19 experience sharing and so on. This twin city is traditional known for artists in the media and entertainment industry. Collaborating with them resulted in the creation of more than 750 small video clips, which were posted regularly. The Facebook handle of KDMC has seen a 600% increase in activities, and 1,000 % increase in viewership on Instagram.


To reinforce inclusivity, "Corona Vigilance Committees" were formed at ward levels. In each electoral ward, a committee was formed under the leadership of the local corporator and members of CBOs / NGOs, shopkeepers' associations, pharma stores associations, doctors, and also municipal officers and staff from within that locality. These committees proved useful in maintaining vigilance during the lockdown, keeping the supply of essential commodities flowing, facilitating medical help and handling other contingencies at local level etc.

A collaborative approach was deployed for contact tracing through door-to-door surveys. Many volunteers were mobilized for this. A ratio of contact tracing of nearly 1:30 was maintained, i.e., for 42,000 12.6 lakh, 12,60,000 contacts were scanned. A call center was established to interact with people in home quarantine. Over 1.39 lakh calls have been made till now at an average of 4,900 calls per day. A 'Hello Doctor' initiative is aired every Wednesday for resolving queries / doubts from citizens by doctors. Also, a spatial dashboard is being updated daily and made visible to citizens to inform them of new cases and boundaries of containment zones. During the initial days of the pandemic, the dashboard had nearly 9 lakh hits per day, which was a record.

## Innovations in COVID Management

For management of disinfection, KDMC / SKDCL undertook special drives on Sundays. All machinery available, such as fire engines, tractors, fogging machines, other types of spray machines were mobilised together at a pre-decided time to disinfect areas. This effort infused an awareness of cleanliness and a sense of public/personal hygiene among citizens. For supply of essential services during lockdown period, KDMC introduced a system of decentralized vegetable markets at open areas, during specified times. Municipal and private open spaces were identified. Systems were set up for vegetables and other essential purchases by citizens. SKDCL procured a mobile application for aggregating supply of grocery and other essential commodities. Local level volunteers were identified as delivery partners, and KDMC provided them required authentications for mobility during lockdown.

Capacities of municipal engineers, proficient in designing and constructing bridges and roads, collaborated from engineers from the Railways and the Army, to understand and build healthcare infrastructure construction in record time.

Facilities that could be converted into Dedicated COVID-19 Hospitals (DCH) were identified and on an average, new healthcare facilities were set up in 15 to 20 days. Health facilities with a total capacity of 5482 beds (General-3916, Oxygen-1085, ICU+Ventilators-481) were set up through these efforts. was close to 27,000 by October 2020, including a 106 year old patient. The healthcare infrastructure in city had zero testing facilities and dedicated COVID-19 beds at the start of the exercise. Towards the end of 2020, the city was carrying out nearly 3,500 RTPCR tests per day, and had an equal number of bed capacity for COVID-19 treatment. Skilled resources to run these facilities are available through collaborations. Out of approximately 42,000 cases till end of September 2020, successfully treating nearly 37,800 (90%) and keeping the mortality rate below 1.70% was possible only due to such participatory approach.

## Preparedness for Future Exigencies

The city initiated the strategic preparedness and response plan focusing on requirement projections for – (a) COVID-19 Care Centres (CCC), Dedicated COVID-19 Health Centres (DCHC) and Dedicated COVID-19 Hospitals (DCH), & DCH, (b) medical equipment, medicines and safety gear stocks, and (c) medical human resources. Predictive analytics for this was used by constant updating of doubling rates and weekly growth rates. The dashboard with heat maps outlining geographical spread was useful in deciding areas for concentrating efforts. Criticality in having real time information available about hospital bed vacancies and ambulances was addressed through creation of a centralised hospital bed management system and vehicle tracking system by SKDCL.

This information was made available in the public domain. The ICT systems to map vulnerable population and other demographic characteristics such as age and sex helped in monitoring risk groups and regions.

Another major theme in preparedness was to plan facilities for COVID-19 patients with differing requirements, such as, patients requiring dialysis, special needs for patients with other types of co-morbidities, pregnant women, differently-abled patients etc. There are instances of successful normal and cesarean deliveries of COVID-19 positive women from lower income families at KDMC operated health facilities. Planning process often goes into cycles of review, re-planning and implementation. Special attention was given for procuring Bi-PAP machines, ventilators, essential medicines through corporate social responsibility (CSR) funds and donations. Smaller equipments, such as pulse oximeters, thermal guns too were procured in sufficient quantities and made available to volunteers participating in door to door surveys and contact tracing. Mobilizing medical human resources, such as, physicians, nurses, ward boys, technicians, pharmacists was possible through collaborations with IMA and other professional bodies / organizations. The city, which started with dependency on neighboring Mumbai for testing the swabs, is now a trusted and self-sufficient destination for surrounding rural areas and smaller ULBs.

## Further…

This is a story of how SKDCL / KDMC was continuously able to turn crises during the COVID period into one opportunity after another. Kopar Bridge, the lifeline connecting Dombivli East to Dombivli West was closed for more than a year. KDMC identified that with trains not running during the lockdown, the time would be well utilised in construction of the bridge. Demolishing the bridge which would have taken 4 months under normal circumstances, was done in 12 days. This effort of the SKDCL / KDMC was appreciated by the Railways and served as an example for other cities to emulate. The Indian Railways urged all cities across the country to complete similar works during the lockdown.

SKDCL / KDMC leveraged COVID-19 crisis as a force to promote sustainable waste segregation practices. The officials went to chawls, housing complexes and organised campaigns to raise awareness about zero garbage and segregation. Around 350 garbage bins were removed. Waste segregation, which was previously 5-10 tonnes, has gone up to 170 tonnes. It is a matter of pride that from 15th August 2020 no additional garbage has been dumped into the Adharwadi dumping ground. KDMC has also been successful in managing COVID-19 medical waste.

During initial panic phase of COVID-19, there was resistance from some sections of society for surveys and contact tracing. Devising an innovative way to generate consensus, the municipal administration approached the opposing factions. Community leaders were assured that local volunteers would be trained to conduct the surveys. Communities selected volunteers from their localities, The urban local body(ULB) provided them with necessary tools, such as PPE kits, thermal guns etc. Once on board, these volunteers proved to be assets. A school in the locality was identified and converted into DCHC, reassuring the community for treatment in the same locality, thus gaining confidence of the community.

Overall
1

# Varanasi

## An Overview Of City Initiatives

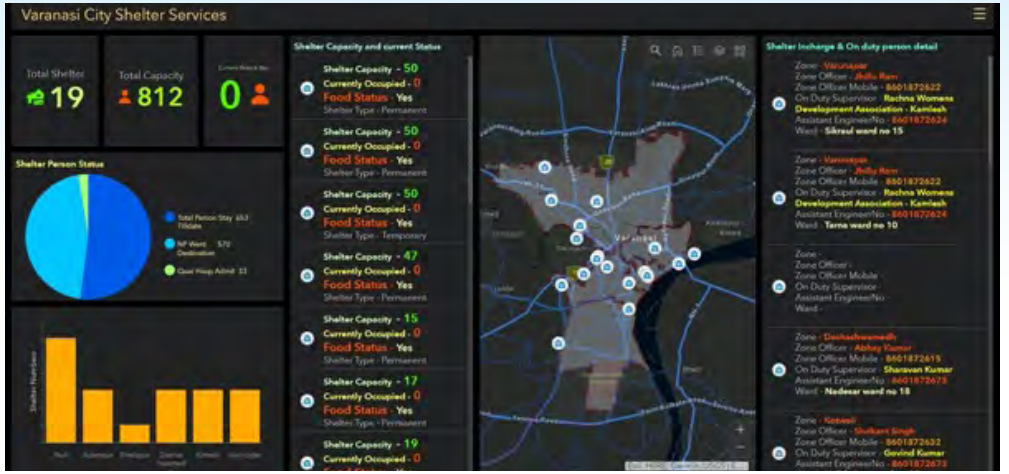
As soon as the national lockdown was announced, the Kashi Integrated Command and Control Centre (KICCC) Centre under Varanasi Smart City was converted to an emergency COVID-19 war room at a short notice. All emergency services of the District were shifted to this central location with a toll-free no. 1077 with video relay service (VRS) facility becoming functional. The entire state-of-the-art ICT infrastructure in KICCC like city wide CCTV camera surveillance, centrally controlled public announcement (PA) system, variable messaging system and computer facilities were placed at the disposal of the war room. This helped the city cope with citizens' needs and complaints in a systematic way. Teleconsultations and telemedicine facilities were the highlights of the war room. Citizens calls were returned for the fulfillment of their needs by a follow-up call and verification. Varanasi Nagar Nigam also developed a mobile application called 'Safe Kashi" through which the citizens could keep themselves informed of all critical activities in the city and also of government announcements. The app provided links to access grocery stores, home delivery of medicines, milk and vegetables.


Through the Smart City, Varanasi Nagar Nigam also deployed drones for sanitising containment zones and hotspots where manual spraying was a challenge. The city created multiple temporary shelter homes and played a key role in ration distribution to citizens especially migrant workers and the homeless. Community kitchens were set up and cooked food was also distributed to the homeless and trapped migrants.

## Keeping Information Channels Flowing

The data about positive cases and health care facilities were collected from the Chief Medical Officer's team and was populated both in the database of the Safe Kashi mobile app as well in the GIS attribute table. Safe Kashi mobile app, developed by the Smart City in response to COVID-19 was in use by over 3 lakh citizens in the city. The information about Positive, Quarantined and Isolation cases was spatially mapped in the GIS platform and displayed through digital dashboards for use by the war room staff, medical team, district administration and hospital authorities.

For logistics supply and essentials, the Smart City had tied up with an online platform called kiranalinker.in that provided access to its micro sites through the Safe Kashi mobile app. This website provides information about nearest grocery stores, accepts orders online and delivers groceries and essentials to the doorstep. Apart from this, the app also provides information on medical stores, provision stores like Spencer's, Big Bazaar, vegetable and fruit vendors who would deliver to the doorstep in containment zones. The information was also made available through web portals of both VSCL and Varanasi Nagar Nigam. As on 31st August 2020, Varanasi had witnessed 8,416 total cases, 6,402 recovered cases, 1,845 positive cases and 169 deaths. This information was always available with geo-coordinates and contact numbers in a GIS-based digital platform. 1,495 hot spots were identified and digitally monitored. Five hospitals were allocated for isolation, six hospitals were used for quarantine and these were digitally mapped. Locations of 450 fruit and vegetable vendors, 16 medical suppliers and 19 shelter homes were mapped; the critical shelter homes were also monitored through CCTV surveillance. 15,480 were home quarantined in the city.




## Innovations in Two-way Communication

The city established excellent communication with the citizens through multiple media - the Safe Kashi mobile app which always provided up to date information, advisory and guidelines. Web portals with information similar to or more than the mobile app, coupled with social media established effective two-way communication between the city and the citizens.


The war room was equipped with an Interactive Voice Response System (IVRS) with separate numbers assigned to various type of grievances. As of 31st August 2020, a total of 4,950 calls were received for medical purposes only, out of which 1,688 were administered telemedicine.


ACCURATE

Consultations over WhatsApp were was also provided to 879 patients. Other medical related calls were 3,262, out of which 619 were requests for ambulance services and the remaining were requests for other enquiries about hospitals, quarantine facilities, symptoms etc. Other than medical queries a total of 20,977 grievances/ calls were received which pertained to ration, food supply, non-availability of medicines and groceries. The city established a robust feedback mechanism to cross check the redressal of the grievances by calling back the same mobile number the next day and recording the response. As many as 9,828 calls were made for reverification of the grievances and the success rate was recorded as 98%.


Doctors administering telemedicine and engaging with the patients through WhatsApp video call from the war room was an excellent way of communicating with the citizens. As many as 879 video calls were successfully made with the patients to provide them with medical prescriptions and guidance.

## Innovations in COVID-19 Management

The city had geared up to disinfect the vulnerable areas with round the clock deployment of its staff for solid waste management, spraying of bleaching powder and marking of circles for social distancing. In addition to this, 14 special Quick Response Teams (QRT) consisting of 2,472 personnel were constituted for spraying sodium hypochlorite solution using 1542 machines in 90 wards 4,071 locations were covered. 694 machines were used for anti-larva spray at 1,691 locations. Also, fogging was done at 120 locations regularly. The Smart City had engaged a private firm for spraying disinfectant over a total area of 1750 acres in 45 days' time period.


Lockdown enforcement was strengthened through video surveillance of junctions using MIRASYS software at KICCC and sending alerts to concerned police teams. Video recordings of violations were maintained. The municipal corporation deployed a number of mobile handwashing vehicles and positioned these vehicles at prominent locations in the city. A unique hands-free hand wash machine was developed and placed at 10 prominent locations which health care workers and officials were frequenting during the lock down. Mobile clinics were also commissioned so that for minor health problems the medical services were available at the door step of citizens.

One of the major issues faced was that of the migrant workers. As many as 42,000 migrant workers who travelled by foot and through trucks from faraway places like Mumbai, were received at the outskirts of the city and made to stay in specially organized camps. They were provided with food, clothing and medical supplies. 1,350 buses were arranged for taking these migrants to their native states like Jharkhand, Bihar, West Bengal, Madhya Pradesh etc.

## Preparedness for Future Exigencies

GIS-based analytics was performed using buffer zone and proximity analysis of the infected and quarantined persons. Containment zones provided some scientific data about the vulnerable localities and other geographic areas for monitoring. Smart City intends to engage data scientists to analyse the data collected and collated from the medical team and hospitals to arrive at future requirements of healthcare facilities. The lessons learnt from handling the COVID-19 pandemic and war room operations provided insights and data that will be applied to development of best practices, standard operating procedures and disaster management methods. This work is in progress.

## Further…

VSCL has continued its efforts post un-lockdown and continues to assist the city police and district administration in the following:

- Issuing of e-passes to auto-rickshaws, e-rickshaws and taxis was added to the safe Kashi Mobile app and and Smart City Web portal as a module,
- Issue of e-passes to street vendors and allocation of vending zones, vending zones was conducted to prevent overcrowding inmarket places. As many as 30,342 e-passes for vending zones were issued through the app and the portal,
- Again, when the government announced the Prime Minster's Street Vendor Atma Nirbar Nidhi (PM-SUVA Nidhi), the enlisting, approval and disbursement process was facilitated through automated processes. Applications of as many as 39,677 beneficiaries were filed out of which 22,733 were approved and 11,313 were disbursed with a grant of Rs.10,000 each,
- When the city faced a shortage of face masks and PPE kits, the city engaged NGOs and organizations involved in the National Urban Livelihood Mission (NULM) program to stitch these and provided the same to the medical staff and other COVID-19 warriors, and
- Distribution of sanitary pads for women and distribution of food for stray dogs and animals was another step taken to make the support truly inclusive.

In summary, Varanasi Smart City Limited rose to the occasion and used everything at its disposal to help the city and its citizens cope up with the pandemic. It deployed its ICT resources and innovative measures in the best possible manner during COVID-19 and is continuing its efforts till data.

Round 1
1

# Chennai

## An Overview of City Initiatives

Greater Chennai Corporation (GCC) and Chennai Smart City Limited (CSCL) have taken multi-pronged action to manage the crisis situation stemming from the COVID-19 pandemic. There have been several physical and technological interventions for collection of data, prevention of community spread, dissemination of public health information and monitoring of daily statistics.

To begin with CSCL established 19 tele-counselling centres at zones and headquarters with 17 medical officers, 80 volunteers/social workers, psychologists and counselors associated with Loyola College, Chennai and another 200 volunteers working from home. This centre provides a bouquet of integrated services consisting of contact tracing of patients, quarantine monitoring, symptomatic assessment, identifying the suspected cases and psycho-social support. The center also provides training for contact tracing to those involved. It interlinks professionals from Medicine, Social Work, Psychology, Engineering, and Public Health Management. The centre works in three shifts round the clock.


Secondly, GCC introduced three apps namely, Corona Monitoring, Home Quarantine and Isolation management System(HQIMS), and VIDMED, for COVID-19 patients to upload details, receive test results and trace contacts. They helped in curbing the spread while also ensuring effective governance in providing for the needs of the patients and their contacts on priority basis through Friends of Covid Persons Under Surveillance (FOCUS) volunteers.

Further, GCC launched mobile fever camps/clinics, with one medical officer, two paramedical staff such as staff nurse and pharmacist and two workers to support the team. As of 31st August 2020, a total of 40,244 camps were conducted andnearly 22 lakh persons had attended the fever camps. The outreach workers in the field informed the people about the location of the clinic and referred the symptomatic patients identified during the house to house survey to the fever clinics.

Finally, through proactive information and awareness campaigns on social media, conventional media and community campaigns, citizens have been educated on the best public health practices.

## Keeping Information Channels Flowing

The GCC Corona Monitoring app was launched within one week of lockdown announcement by GoI. GCC asked the citizens to report through this application. Below is the flow:

1. It was made available in Playstore,
2. After downloading, citizens can take a photo of their door and upload in this application if they have fever symptoms,
3. 3.The tele-counselling team doctors would call the citizens to give advice,
4. If the symptoms are related to COVID-19 then the medical team was sent to the respective person's home,
5. Further, every response in this application was geo-tagged to find the clusters of fever symptoms and more resources were directed to control the spread, and
6. Further, the containment zones were shown through this application.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Simultaneously HQIMS app was developed to monitor the spread of cases, provision of food, healthcare needs etc for quarantined/ symptomatic citizens. HQIMS stands for Home Quarantine and Isolation management System and FOCUS for Friend of COVID Person Under surveillance. Under HQIMS system every person under isolation or quarantine is monitored physically by FOCUS volunteers twice a day. This system is not only to monitor but also to help with the daily needs of quarantined individuals across GCC. 3500 volunteers have been engaged in a paid manner for covering 15 zones and 200 wards.

Chennai became the first Indian city to bring technological intervention to isolation monitoring at grass root level with dedicated workforce. The data related to isolation comes from almost 18 different sources including Testing Labs, testing labs, contact tracing team, hospitals, Police Department, airport, etc. This data gets consolidated into single document every day and shared to respective zones across GCC. As a result, Chennai's growth rate of COVID-19 cases fell to -5.6% from July to August 2020.

## Innovations in Two-way Communication

At the tele-counselling centre, calls are are received by a social worker/psychologist to collect basic details. Based on the needs like medical or psychological calls are diverted to the respective professional. In case there is a need for food or medicinal support, the team of engineers and administrators communicate it to the zonal officers who are equipped to to handle the same. This smooth pipeline provides end to end connectivity to ensure clear and early service delivery.

The centre provides a bouquet of integrated services consisting of tele-medicine consultation, contact tracing of patients, quarantine monitoring, home isolation surveillance of COVID-19 patients, and psychological support. The center also provides training for contact tracing at field level and home isolation to those involved. The centre works in three shifts, 24x7.

A unique feature of this center is the emergency team which was formed in the month of July 2020. The team includes seven volunteers to escalate emergency cases and have done around eight Green Corridor Operations in a successful manner. In addition to the above, over 723 home isolation patients have been shifted to government hospitals, in case of emergency. Also 158 suicidal cases were successfully addressed by trained psychologists. This centre has recorded over 3,91,769 incoming calls and around 8,12,849 follow up outgoing calls that were handled by the the tele-counselling team..

Apart from the tele-counselling centres, GCC launched the VidMed app through which citizens can consult a doctor online, to prevent coming out to clinics and hospitals and increasing the spread. The consultation with the doctors are done through video, prescription is sent over email and both, the patient and the pharmacist. The doctors on call give the patient a 'Plan of Care'. Launched on 4th May 2020, over 5000 consultations have happened through the app.

## Innovations in COVID-19 Management

One of the immediate actions taken by GCC was to open up 94 COVID Care Centres (CCCs) where free treatment is provided for persons from low- income backgrounds. Additionally, the Corporation also converted schools, community halls and Amma Canteens in several of its zones to act as shelters for migrant labourers who were either left in the lurch or unable to travel home because of lockdown restrictions. In typical cases, the Zonal Officers assisted by teams of Revenue, Tax and License officials and inspectors were given the duty of supplying

basic ration to citizens stuck in the lockdown without essentials or money to purchase. Special drives were made by the GCC officials to rescue homeless persons and rehabilitate them in temporary shelters.

Through these temporary shelters, GCC was able to provide accommodation for 6673 migrants between March and July 2020. At the Amma Canteens, ration supplies and cooked food was made available to all labourers and needy visitors. The Tamil Nadu Civil Supplies Organisation provided ration kits consisting of 15kg rice, 1kg dal and 1 litre oil. These in turn were distributed by GCC to the urban poor. Totally, 42,281 ration kits were distributed by GCC. In slums, whenever fever clinics were established for testing and monitoring, local autos were hired by GCC to immediately transport patients to hospitals for treatment, free of cost.

## Preparedness for Future Exigencies

The launch of mobile fever clinics to do proactive testing and containment of rapidly spreading zones was an effective method to curb the spread of COVID-19. By, July 2020, Chennai became the first metropolitan city in the country to have recorded 5 lakh RT-PCR tests. A daily dashboard that tracked the Tests Waiting Results (TWR), positive cases occurring zone-wise, it became immediately possible for GCC to geo-tag and map containment zones. Accordingly, it was helpful for Zonal Officers, Medical Officers and Regional Deputy Commissioners to re-allocate resources such as mobile fever camps, FOCUS volunteers and beds at COVID Care Centres. The daily dashboard had real-time monitoring of total positive cases, recovered patients, total active cases, number of deaths, and daily positive cases recorded. Further, this was again categorised by age, gender and location which immediately reflected on a heat map of the city. The highly-infected zones were immediately cordoned off as 'containment zones' and FOCUS volunteers were deployed at the street and household-level to do thermal screenings. The daily analysis through the HQIMS app and dashboard showed trends in a zone-wise manner. Later, sanitary officers and vector control officials were also deployed for daily sanitising of the containment zones to prevent further spread.

Through the HQIMS app, persons arriving in Chennai through airports, road and rail were tracked to their homes and put on quarantine monitoring. Additionally, nearly 300 hotels in the city tied up with the corporation to provide isolation facilities for contacts of symptomatic persons. Through advanced data collection, analysis and dissemination, an effective system was put in place to predict virus spread, reallocate healthcare infrastructure and attend to COVID-19 hotspots.

Finally, GCC has also been distributing an Ayurvedic potion called 'Kabasura Kudineer' as a preventive medicine to boost immunity. As of August, 2020, over 14 lakh Kabasura Kudineer Kabasura Kudineer packets were distributed in Chennai.

## Further…

In an effort to actively rope in the public, street plays were conducted in slums and public spots to generate awareness on the symptoms for COVID-19 and the best practices to prevent the spread, such as wearing masks and maintaining social distancing. These were called the 'community intervention programs'. A proactive bilingual campaign was taken up across print and social media to reach out to citizens regarding the best practices. Through these forums, regularly information was passed regarding helpline numbers, Advanced Tour Programmes of the fever clinics, tips for managing medical waste, zone-wise updates on COVID-19 spread, protocol to follow in case symptoms occur, etc.

Further, GCC & CSCL ran collection and distribution drives for ration supplies and essential kits, by converting an indoor stadium as a mobilisation point.

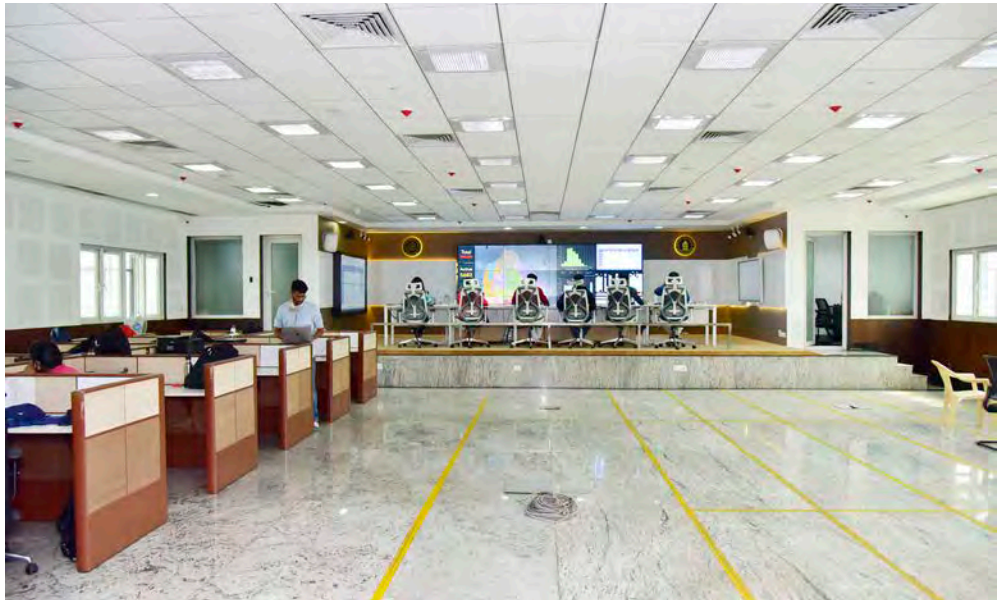
Right from the 25th of March, 2020 to the present, there has been consistent messaging from the government & the Smart City SPV, full transparency in numbers and active resource mobilisation under the dynamic guidance of bureaucrats and city officials. All the apps were developed in-house by Smart City Fellows and the Electrical Department.

Round 3
1

# Bengaluru

## An Overview of City Initiatives

Bengaluru Smart City Limited (BSCL) and Bruhat Bengaluru Mahanagara Palike (BBMP) has undertaken the Strategic Operations Command Center, an innovative initiative by setting up a COVID-19 war room. The BBMP COVID-19 war room. was established on 22nd March 2020 as the first War Room in the country using ICCC for the COVID-19 crisis management. Bengaluru Smart City has made efforts on outcome-oriented approach in terms of comprehensive city-level planning and preparedness and fighting the COVID-19 pandemic with the use of technology, a major metropolitan city with around 13 million population.



The COVID-19 war room is functioning as a single point interface for all departments for all COVID-19 related activities. The BBMP COVID-19 War Room Command and Control Centre and has all the appropriate applications, technological interventions, integration, and effective management of a single city-wide technology platform to onboard all the stakeholders to effectively combat the COVID-19 pandemic.

Ahead of the onset of the COVID-19 pandemic at Bengaluru, Bengaluru Smart City took prompt and decisive action to control its spread in the city and undertook multiple initiatives in this direction, ensuring surveillance of all the wards and stringent tracing for people with symptoms and enforced monitoring through frequent field inspections by its officers.

Daily video conferences were held by the top leadership of Bengaluru Smart City / BBMP with all zonal officers on the health status in their respective zones. The major components of the war room include Information – dashboards, reports with analysis, virtual learning, training modules, public grievances platform, development of an application for registration of NGOs / volunteers, predictive modelling, issuing advisories, citizen chatbot, telemedicine, etc.

The Smart Cities Mission has identified the BBMP COVID-19 war room as a Model War Room and has given technical support for the Bengaluru War Room team to evolve as the vanguard for the for the other 99 smart cities. Smart Cities.

## Keeping Information Channels Flowing

Bengaluru Smart City has developed an innovative application called Index Application which consumes information on COVID-19 positive cases from the ICMR portal, provides the user interface to the Zonal Command Centers and all field teams for action and implementation of tasks, and has significantly reduced the time taken from 24 hours to near real-time for monitoring at the war room.

The Index Application creates a database of COVID-19 positive cases and provides this information to the multiple use cases in real-time for action and with integration enhances the real-time monitoring of the situation. This application is an interface for the complete Patient


Total
390786
Active
5682
Recovered
Death

Management System, from accessing the information on COVID-19 positive cases for action by the zones, including shifting of the patient to healthcare facilities either to a hospital or a COVID Care Centre based on the symptoms, to arranging ambulances, tracking patient lifecycle, etc.

The application, owing to the high effectiveness and user-friendly interface, has already been expanded and replicated for the entire state of Karnataka (which has a population of over 65 million) and cities across the country.

The outcomes of the Index Application have been analysed by the Indian Institute of Science (IISc), Bengaluru. It was evident that the response time has become quicker and delays have decreased uniformly across all categories after the introduction of the Index Application. There are significant gains across all categories and delays longer than three days have been eliminated almost completely. This resulted in a critical outcome in the case of the vulnerable categories of senior citizen patients and patients with comorbidities, as this quick response has the key to make the difference between life and death.

BenSCL laid down a blueprint well before the national lockdown and introduced technology-enabled solutions such as a hunger helpline, GPS-enabled Mobile Medical Units(MMU) and a dashboard for decision-making.

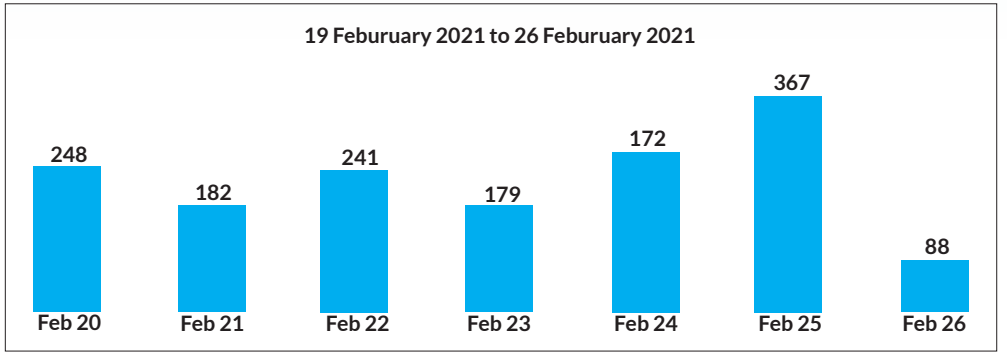
## Innovations in Two-way Communication

Bengaluru Smart City has multiple touchpoints for citizen communication. 'The Leaving No The 'leaving-no-citizen-uninformed-approach' is being followed. The administration has taken all steps to ensure citizens are reached and constant civic engagement is a clear goal identified at the War Room. It is a matter of fact that the BBMP Daily Bulletin has a reach of over four million readers on an average day and this has been one of the most informative bulletins being released daily by metropolitan cities of this size in the country. Bengaluru is the only city to release its 200th edition of the Bulletin.

Citizens can access the Apthamitra helpline to assist in health-related queries on COVID-19. Sahaaya Sethuve App, BBMP Contains App, Call Centre Control Room, TeleHealth Helpline were created in-house to enable effective citizen communication. Information dissemination to the citizens is one of the highest priorities of BBMP, real-time information dissemination through all forms of media, dashboard, situation reports with analysis, daily bulletins, weekly bulletins, updation on apps and all platforms, social media sentiment analysis are made available. Panic/stress management was used to communicate effectively while sentiment analysis through social media was deployed to maximum citizens to prevent panic and give the authentic information. Every COVID positive patient is communicated with a "Care for Cure" SMS alert providing them a Unique District code for being COVID positive with a follow-up call by the Zonal Command Centre. Every operator at at the Zonal Command Centres is given hands-on training to communicate and handle COVID positive patients. On an average, 15,000 calls are made daily to the citizens on various communication for follow-up actions. The war room also maintains a dedicated, well-trained call centreof 200 resources. BBMP and BSCL twitter handles are updated regularly on the latest information.

## Innovations in COVID-19 Management

Bengaluru Smart City and BBMP have undertaken multiple innovative solutions to tackle the outbreak, manage the healthcare infrastructure, and deliver the essential services to its citizens in the most efficient manner.




### a. Real-Time Hospital Infrastructure Management

The COVID Hospital Bed Management System (CHBMS) is integrated with the Index Application (the application that handles the data collection, prediction, analysis, and dissemination of information of the COVID-19 patients to the authorities). The application is deployed in all the hospitals in the Bengaluru limits, both public and private, to record the admission and discharge of patients in the respective hospitals in real-time.

The CHBMS allocates hospital beds to the patients based on the location proximity and the bed priority requirement of the patients based on the residential location and health status of the patient. The application displays real-time resource availability and the zonal authorities have the visibility on the category of beds (ICU bed/ventilator bed/normal) Once the bed is allocated and the patient occupancy acknowledgment is received from the respective hospital, the data gets updated on the hospital bed capacity dashboard instantly.

Other actions managed by the CHBMS include:

a. Drone-based disinfecting
b. Tele-medicine: Tele-triaging, Tele-monitoring and Tele-counselling
c. Digital Application for the distribution of essentials

d. Distribution of periodic circulars to improve the transparency of the functioning of the COVID-19 crisis management by BBMP
e. GIS based heat mapping of the area under the BBMP smart city limits

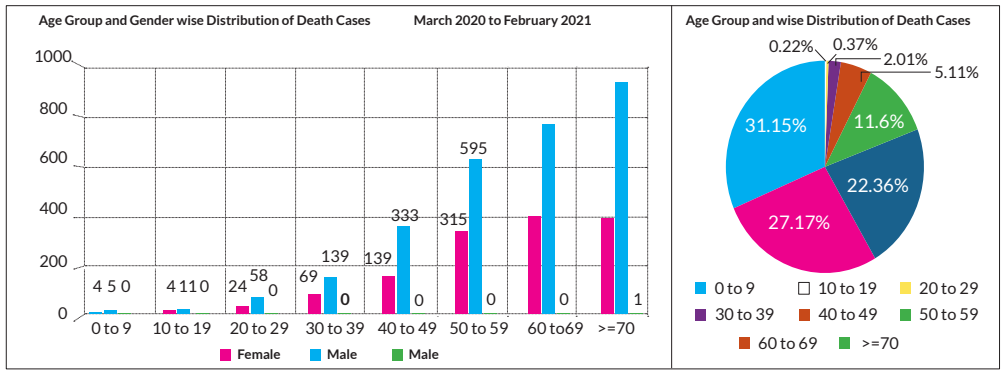
## Preparedness for Future Exigencies

Bengaluru Smart city through the implementation of the COVID-19 war room has developed the technological capability by deploying the COVID-19 Emergency Response (CoVER) solution to effectively manage any pandemic-induced healthcare crisis and to prevent any such outbreaks in the future.

### a. ICCC Module

Three major functions are the acquisition of data from various subsystems, defining of SOPs to manage incidents, and facilitating data visualisation . Customisable dashboards and reports will be displayed in an interactive web-based client application. Data and events can be provided to third-party applications including notification systems and emergency services.

### b. AI-based Analytics Engine




An AI-based engine that analyses the data and helps in recognizing the model of potential disease transmission using multilayer perceptron based multivariate time-series. A model with SIR (Susceptible-Infected-Recovered) and SIRD (Susceptible-Infected-Recovered-Deceased) based simulation models. The platform features a modular and scalable architecture built on big data infrastructure and is capable to ingest data from varied sources. It is a design-driven solution for cross-vertical analytics which helps to quickly mash up data from varied sources and also visualise insights.

### c. Volunteer/NGO Management Solution

This platform is a one-stop medium for connecting citizens, volunteers, doctors who volunteer, and NGOs with BBMP officials. The application also allows the BBMP city officials to create/ update inventory requirements, approve or view NGO inventory donation requests, and manage inventory, thus, acting as a suitable inventory management solution for BBMP.

### d. A cloud-based decision support tool kit

This platform assists the war room authorities to predict the need for healthcare staff in the future and allows the city to assess the implementation of lockdown measures imposed across the city.

## Further…

The data analysis team of IISc has estimated that the use of response time distribution has reduced the number of COVID-19 deaths between July and August 2020 by 25% than the forecasted number of deaths in the same period in Bengaluru. The BBMP And BSCL COVID-19 war room is an exemplary setup of where technology has been harnessed for social good by the local civic authorities. The war room in Bengaluru Smart City is already acting as a lighthouse to cities inspired by its efficacy in managing the COVID-19 crisis. The Data Analysis Team of IISc has also observed that, estimating the number of deaths from case-load in July-August period, using response time distribution has reduced by 25 % than the predicted numbers.

Round 4
1

# Saharanpur

## An Overview of City Initiatives

Saharanpur Smart City Limited managed the COVID-19 pandemic through a 360-degree approach. Sanitisationand fogging were done in all the containment zones, public places such as government offices, schools, police stations, religious places, streets, railway stations, bus stands, general stores, shops etc. The smart city also provided food facility with the help of 31 community kitchens in which it had four vehicles deliver almost eight lakhs packages. In this process multiple social organizations such as Prabhu ji ki Rasoi, Radha Swami Satsang Trust etc. helped the Municipal Corporation. There was a telemedicine facility also launched and medicines were distributed to the urban poor and the staff of every ward.

The city made provisions to shelter migrant labourers and supported their basic requirements like food and health services through medical staff to all migrants. With the help of the district administration transport services were also provided. For essential supplies provisioning, the citizens could call up 24*7 helplines. To create COVID-19 related awareness, 25 vehicles were deployed to disseminate information throughout the city. Also, nearly 750 wall paintings were made, virtual meetings were called among parishads, officers and citizens and masks were distributed. A plantation program was carried out to give the city a healthier edge which would help create a conducive environment for building immunity and combatting the disease.

## Keeping Information Channels Flowing

A COVID war room was created to collect the information regarding COVID-19 cases through helpline numbers at a centralized location. COVID 19 reporting groups were created on WhatsApp rapid response teams were set up to collect information, requirements of people and to provide essential facilities. The positive cases were identified and marked. The 100 meter area surrounding a quarantined zone was also heavily sanitized.

Telemedicine and teleconsultation services were provided based on which the citizens were also delivered medicines at their doorstep. For regions identified as hotspots, a team of municipal workers for sanitisation, fogging and cleaning was set up. There were almost 3,000 calls for teleconsultation, for which a team of 90 doctors of varying specialties was appointed by the city. The whole city was sanitised with the help of 15 sanitisation vehicles, 100 battery operatedsanitisation machines, 10 fogging machines and 13 dual fogging machines.. It took 10 days for the designated team to sanitise all 70 wards in the city.

As a result of these initiatives, people in the city were soon sensitised to the dangers of COVID-19 which encouraged them to maintain social distancing and follow the proper guidelines to keep the disease at bay. The city made the citizen's life easier by providing them all necessary supplies at the doorstep. By providing the frontline workers with the latest equipment, the staff was kept motivated to carry out their responsibilities with due diligence.

## Innovations in Two-way Communication

The 24x7 helpline numbers were doubled to handle the volume of COVID-19 related queries coming in. Citizens were given access to contact details of all the zonal officers for emergency contact. The city used various social media platforms like WhatsApp and Facebook to stay connected with the citizens at all times.

Around 604 calls arrived for sanitisation and fogging which were received and met and over 23,000 requests for food delivery were also entertained by the city. The team of doctors assigned for teleconsultations in the COVID-19 war room of the city treated more than 3,000 patients through audio, video and WhatsApp calls. The control room kept the citizens connected to their city administration 24x7. The two-way communication between the citizens and the city especially with the marginalisedsections helped in enforcement of the lockdown. The shift towards use of technology to take care of citizens during the pandemic helped the city really scale its efforts in COVID-19 management.

## Innovations in COVID-19 Management

Saharanpur Smart City sanitised and fogged the city on a regular basis. They ran a special drive for plantation all over the city taking advantage of the lockdown when there was minimal activity outside to improve the liveability in terms of encouraging greenery in the city. There were 18,200 trees planted as part of this intervention. The city proactively distributed all essential items to the citizens including food, medicines, masks, multivitamins and found innovative ways to raise awareness among the citizens such as setting up a Mask ATM near

the Nagar Nigam campus. Other innovative methods to raise COVID-19 related awareness by Saharanpur was the use of wall painting, loud speakers and hoardings in public spaces to reach out to one and all.

## Preparedness for Future Exigencies

The smart city officials met daily with the district administration to monitor COVID-19 related cases in the city. Saharanpur Smart City initiated the Integrated Command and Control Centre (ICCC) project, with the help of which the city could easily monitor the COVID-19 related cases and other essential requirements. With a team of 2,036 workers, 15 sanitisation vehicles, 100 battery operated sanitisation machines, 10 fogging machines, 13 dual fogging machines, thermo scanners and 25 COVID-19 related awareness announcement vehicles. The city is well poised to take on any future exigencies that may occur.

## Further..

Saharanpur Smart City is now working on building a multi-specialty clinic with a health ATM to provide health check-ups. The smart city team constantly encourages and motivates staff members to perform exercises to build their immunity such as organising Cyclothons that promote a mode of transport which is non-polluting, healthy and also allows for social distancing. The city has provided all equipment to its workforce to facilitate them in the fight against COVID-19. In the true spirit of compassion, the smart city has also embraced its animals and birds and provided them with food when the city was shut down and food sources for the strays were scarce.

Section II

# OTHER SHORTLISTED PROPOSALS

# Innovation Award

## Ujjain: Biomethanation Plant

### Project Features

The 'Waste to Energy' focused biomethanation plant established by Ujjain Smart City Limited processes the bio-degradable waste of the city to generate electricity and compost. The plant is currently processing 5 tonnes of waste per day and is planned to be scaled up in the near future. This plant helps in the solid waste management of the city and is also a step towards reducing the burden on non-renewable resources by producing electricity. The project is self sustaining since the plant is using existing waste resources to generate electricity, The same electricity is used for plant operations and for powering streetlights in adjacent areas.


This unique initiative has been aimed to achieve the following objectives:

- Decentralisation of market waste treatment,
- Increasing efficiency of treatment for biodegradable waste,
- Reducing transportation cost as well as the load of waste which is to be transported to the landfill site for treatment, and
- Incentivising bulk generators of waste to cooperate in treatment of food waste, by treating it free of cost.

### Key Outputs

This unique initiative is the first important step towards a greener Ujjain. It promotes awareness about clean and green technology, use of renewable energy sources on an industrial level and reduction in emissions of greenhouse gases into the environment by approximately 12,176 kg/month.

The slurry produced from biomethanation is used use landscaping, gardening and farming purposes. It provides a citywide solution for sustainable disposal of waste by conversion of waste to organic fertilisers — also good for the environment can further be used for the good of the environment.

The initiative helps reduce the waste from landfills by 5 tonnes per day. It produces 200 units of electricity a day which at the cost of Rs. 7 per unit saves 0.42 lakhs per month in electricity costs for the plant. The 18-20 MT of compost generated per month from the plant fetches Rs. 0.90 lakhs on sale. Additionally, the reduction of about 150 MT organic waste from transportation to landfill sites saves Rs. 2.54 lakhs per month (@Rs 1690 MT) and the processing fee for disposal of waste is also saved by Rs. 0.25 lakhs per month.

This amounts to an overall saving/revenue generation of about Rs. 4 lakh per month for the municipal corporation.

## Key Impacts

The project has multiple positive outcomes discussed in previous sections. As a result of various activities undertaken as part of the project, the most important outcome is the reduction in greenhouse gas emissions by approximately Rs. 12,176 kg/month.

## Replicability and Scalability

The project can be scaled within the city to all locations where vegetable waste or food waste from bulk generators is available. If the project is scaled up to 50 TDP, as envisaged, it will bring about a green revolution to the smart city of Ujjain. There will be 9,000 – 11,000 cu.m. of bio gas and 3,100 -3,800 kg of automotive fuel grade methane (CBG) generated per day.


## Sustainability

The set of calculations below provide evidence for the financial sustainability of the project:

- The sink capital cost of the project is approximately Rs. 2 crores,
- The energy production: 200 units/day @ Rs 7 = Rs. 0.42 lakhs per month,
- Compost generation: 18 – 20 MT per month @ Rs 5 / kg = Rs. 0.90 lakhs per month,
- Saving on tipping fee for collection and transportation of waste 150 MT @ Rs. 1690/MT = Rs. 2.54 lakhs per month,
- The processing fee for disposal of waste is also saved by the amount 150 Mt @ Rs. 165.38 = Rs. 0.25 lakhs per month, and
- The O&M expense (included in the sink capital) for this project is Rs. 1.13 lakhs against a saving of Rs.3.88 lakhs per month.

The cost saving is roughly four time the O&M costs incurred per month, establishing the project as highly financial sustainable.

# Urban Mobility

## Pimpri Chinchwad: Public Bicycle Sharing

### Project Features

Rising traffic congestion and longer urban commutes are leading people to look for alternative ways to reach their destination in the most convenient, affordable, and time-efficient manner. Despite the presence of cab hailing apps such as Ola and Uber, the majority of the Indian population still travels by private or public transport — personal cars, buses, local trains, and metro. With an increase in traffic and congestion, government has taken various initiatives to strengthen public transport.

A growing reliance on polluting motor vehicles for last mile connectivity, poor internal connectivity within large industrial estates and poor access to facilities prompted Pimpri Chinchwad Smart City to launch a public bike sharing (PBS) project with state-of-the-art GPS enabled bicycles. The bicycles have front baskets with solar panels to power the battery for inbuilt RFID. The bicycles are fitted with IOT-driven smart locks along with manual locks which help capture ride details of the users and charges.

### Key Outputs

The PBS in Pimpri Chinchwad is serving the last mile connectivity and is also in use for recreational cycling on weekends. 34 locations for stands were set up across the city at points based on demand and were located where they would be easily visible. The PBS has 539 bicycles deployed, over 35,000 unique users, and close to 95,000 rides until date. The average trip rating improved from 4.3 in 2018 and 2019 to 4.5 in 2020.

## Key Impacts

The public bike sharing has found immense traction among users who live in residential complexes indicating that the main objective of PBS addressing last mile connectivity issues are being addressed. A demand for 250 additional bikes means that the service will likely be expanded to areas like Wakad, Hinjewadi, Akurdi, Chinchwad, and Pradhikaran.

## Replicability and Scalability

This project is easily replicable and scalable across the city given the keen interest in other parts of the city. A public bike sharing plan has been prepared for the entire city and the second phase of implementation targets an addition of 50 more stations to the existing number. The city plans to establish 400 cycle stations with 6,350 more bicycles in the future.


## Sustainability

The first phase of the project was launched on 15th August 2018 covering 34 locations at the localities of Pimple Gurav and Pimple Sudagar. These localities have been identified as "Area Based Development" (ABD) under the Smart Cities Mission. Subsequently, demand for targets 50 additional locations within Pimpri Chinchwad such as Akurdi, Pradhikaran, and Chinchwad. The project effectuates an affordable alternative to travel by personal vehicles, cabs and auto rickshaws. In 2019, PBS usage lowered 13 tons of $CO_2$ emissions and 17 tons of $CO_2$ emission in 2020.

# Tumakuru: Development of Field Marshal Cariappa Road

## Project Features

The project envisions an upgraded version of urban roads which provides conflict-free spaces to its users in a planned and organised manner. This smart road project also promotes safety and make public spaces more people centric rather than vehicle centric. The project has been designed on the framework of TenderSure Roads and aims to set an example for other smart road projects in Indian cities.

## Key Outputs

The project is a complete street project which will benefits all roads users. Salient features include utility chambers with underground ducting, inspection chambers, footpaths, cycle tracks, street furniture and green spaces. Provision of ducting space will ensure that all utility service providers will pay the city to use utility ducts.

## Key Impacts

The project will enhance quality of experience for all road users. A uniform carriageway will help ease congestion in traffic and allow for seamless flow. Well-developed and illuminated public spaces will make the streets safer and more vibrant. The design of the road promotes pedestrian and non-motorized transport. This coupled with ensuring vehicle users have designated on-street parking spaces has precipitated higher footfalls for commercial spaces along the road.

Incorporating underground ducting will give citizens safer and faster access to telecom and electric services. It will also support city departments in maintaining and servicing utilities. Green-scaping improves the aesthetics of the street and the overall appearance of the city. Organized parking spaces will reduce congestion on the free-flowing traffic.

## Replicability and Scalability

The project will be scaled up to 18 roads with a length of 14.5 km in Tumakuru Smart City. The design of the roads can be scaled up to any and all urban roads with similar widths and Right of Way (RoW).

## Sustainability

This project underpins the aspect of sustainability by prioritising cycling and walking through inclusion of segregated footpath and cycles tracks in its design. Pedestrian-friendly streets are also good for business, as they are for safety and security on the street. Through provision of underground ducts for cabling, Tumakuru has ensured that unnecessary and haphazard digging for maintenance activities is avoided in the future.

# Chennai: Public Bicycle Sharing

## Project Features

Public Bicycle Sharing (PBS) implemented in Chennai is a technology driven, app based, pay-on-the-go model. A citizen (user) can hire a cycle from any designated stand, where the cycles are docked. The cycles are fitted with an automatic app based SmartLock, which is unlocked through the QR code in the app. Once the cycle is unlocked, the citizen can drive around the city and park it back at the designated docking station in any part of the city. A pause feature is also enabled for the citizen, in case he/she wants to take a break but not end the ride. At the end of the ride, based on the hours utilised the citizen is charged a minimal fee (Rs 5 per hour). Thus, the PBS system in Chennai is user friendly, app-based closed-loop model which places the citizen at the forefront of the framework.


The project is driven by several innovations such as

1. App Based Technology Driven Cycling Experience
2. Pay-On-The-Go Model
3. World Class Geared Cycles for Citizen Use
4. Smart Lock system for Cycles
5. GPS tracking for cycles
6. Centralised Dashboard Monitoring
7. PPP model to ensure quality and sustainability of the project

## Key Outputs

Since the launch of the project and till the 2nd of February, 2020 (Pre COVID-19), the Public Bicycle Sharing system has displayed tremendous success among citizens of Chennai. 78 stations have been installed in various locations housing 500 cycles. The project app has crossed 1,59,000 downloads, with 36,673 user registrations and close to 1,41,000 rentals. On an average, 272 rides are recorded in the city daily and more than 94,000 hours of cycle rides have been recorded. It is to be noted that since the station locations were selected to maintain a healthy mix of interior and main roads, the project has created a change in the commuters' choice of mode for last mile connectivity. Post-lockdown, operations have resumed in 55 locations, averaging over 500 rides in a month. This is a PPP project at no cost to the government/SPV.


## Key Impacts

The project aims at driving citizen's behavioural change in favour of non-motorised transport (NMT) modes of transport such as cycle sharing for last mile connectivity. There are established studies which report that cycling could realistically substitute for 40% of short car trips or motor-vehicle trips. Riding a bicycle accounts for about 21 gm of CO2 emissions per km– again, more than ten times less than a car. By all these accounts and back of hand calculations, with the implementation of PBS in Chennai, an average of 57 kg of CO2 emissions is curbed every single day. This makes Chennai eligible for 20 tonnes of carbon credit every year, by simply promoting non- motorised transport usage.

In a direct peak of number of rides, in pre-COVID-19 February 2020, the total rentals were 13,469. The monthly rentals had risen from 6,134 in May 2019. This is a direct outcome of expanding to more locations and more citizens adopting the bicycle sharing system.

Also, studies have shown that modal shift from cars or motor-vehicles to cycles reduces travel time by nearly 50%. With the available data, it is safe to say that Chennai citizens have experienced at least 15% reduction of travel time in last mile/ short distance commutes. Indirectly, a shift to bicycles for commuting will decrease congestion, air pollution and relay benefits through a healthier lifestyle choice.

## Replicability and Scalability

The PBS system is implemented as a pan city initiative in phases. Currently, at 78, the number of stations is set to be increased to 500 with 5000 cycles in a systematic manner. In accelerator-assisted e-bikes are proposed to be introduced along with normal cycles to facilitate longer travel on cycles. Secondly, this project is an example of a robust PPP framework to tap the power of technology and sustainability through the private sector coupled with the infrastructure of the public sector to deliver critical public goods at subsidized rates. Hence, this model can be replicated across other cities while allowing for customisation to suit their local conditions.

## Sustainability

Chennai like all Indian cities was facing increasing vehicular population, causing a surge in pollution and congestion. In response, Chennai envisaged and implemented a path breaking Public Bicycle Sharing (PBS) in February 2019 under the Smart Cities Mission. The project though capital-intensive, presented a direct opportunity for revenue generation. Hence, a PPP model was proposed and the project was tendered out to SmartBike Mobility team. The operations are carried out by the SmartBike team, whereas the execution in terms of identifying location, assisting with land permits, adherence to city's rules and regulations are all monitored by the SPV and local body. The Public Bicycle Sharing system has grown into one of the most successful projects of the Chennai Smart City Limited.

# Built Environment

## Pune: Placemaking and Open Spaces

### Project Features

The concept of placemaking is revolutionary — transforming a neglected, underused space, engaging citizens, creating a themed space using recycled and unusual materials, maintaining or creating green cover, all to generate a social hub in the heart of city neighborhoods.


Pune's placemaking project has pioneered the concept of placemaking in India. Citizens from the surrounding neighborhood were involved during its construction. They helped create innovative nylon-based seating, copying the first set created by professionals. Citizens were also involved in oversight of the maintenance activities carried out at the four sites. The placemaking sites are theme based: each evokes a specific theme, and the installations, seating and infrastructure - all match the theme.

The "Science Park" has innovative scientific play equipment for all age groups, given its proximity to educational institutions and many youths in the neighbourhood. The "Bookzania" can be used for reading and hobby activities like painting and board games and has facilities of an outdoor library as well as e- library kiosks, please remove, it is repeating and canvases. Keeping sustainability at its core, the sites have provisions of solar and rainwater harvesting.

The seating is innovatively designed to allow for universal accessibility and unique seating elements like reading bus and open amphitheaters are part of the design. All placemaking sites allow Wi-Fi access—a Wi-Fi totem pole allows citizens to use the internet for free by logging on to this network. The space is also monitored through a CCTV camera for enhanced safety and security.

The relevance of the theme to the neighbourhood and the quality of the implementation have already begun to attract CSR funds. A few sites and also elements like solar trees and public toilets have been implemented at Pune Smart City Development Corporation Limited (PSCDCL) sites through CSR funds.

### Key Outputs

The location of the site was a very important aspect—it needed to be of high visibility, close to major transit routes and have access to social infrastructure. The project objective was to solicit suggestions from the citizens for all such potential spaces to be developed as placemaking sites within every neighbourhood. The guiding principle for placemaking is to "keep it simple yet impactful", with the following design features:

- Design mantra: Build a cost-effective place with high recall value,
- User profiling: For any theme and any site of placemaking, the activities and facilities cater to citizens of all age groups, the underprivileged and people with special needs,

- Use of prefabricated, precast, modular elements,
- Identity and branding: A thematic element for each site, for example, yoga, skilling, pet park
- Smart Element: ICT integration allowing theme-specific content and functional enhancement,
- sustainability: green features, reused material, local resources and low maintenance, and
- Fast implementation: The transformation happens quickly.

Pune Smart City has undertaken work for more than 15 unique themes such as:

- Science,
- Books,
- Community farming,
- Kids and pets park,
- Contemporary art,
- Skating and roll ball,
- Environment park,
- Water conservation with 24*7 implementation display,
- Park for the differently-abled,
- Bamboo garden,
- Augmented reality,
- Senior citizen park,
- Fitness and rejuvenation,
- Adventure and cross fit training. and
- Defense theme park.

## Key Impacts

PSCDCL's placemaking initiatives have helped to offer residents a new hub, a getaway, and an opportunity to engage differently within their neighborhoods. It encourages Punekars to be outdoors in a constructive manner, and these sites are inclusive spaces for all people.

Residents in the neighborhoods are delighted with these transformed spaces. Around 100-150 people visit these sites daily, and the number doubles on weekends, with up to 250-300 people clustering in these inviting open areas. The spaces are buzzing with activity, with daily yoga sessions, weekend workshops for children and the elderly, and other gatherings.

As the newly made places gain greater popularity, they are helping to push up the real-estate value of the neighbourhoods increasing revenues for the ULBs. This is expected to happen in every neighbourhoods where such a project is executed, as it revamps a neglected part of the area and makes it attractive to people of all age groups.

More than 15 sites have been identified for placemaking, with a variety of themes. Four of these projects have been executed and construction work has initiated for the rest 11 sites.

Over time, the placemaking project envisions that residents of the city should have—within walking distance—spaces that offer them creative and constructive options to engage with the city.

`Placemaking has set a precedent of low-cost ways to create something that is of interest and directly useful to people given their current lifestyles.

## Replicability and Scalability

People's growing interest in taking the placemaking concept to other parts of Pune means the idea is gathering momentum. The project has already been replicated quite successfully—Pune Municipal Corporation applied the same approach to create two new spaces in Bibwewadi and Wadgaon Sheri. PSCDCL, after completion of pilot sites, is leading the development of more than 20 placemaking sites in the Phase 2 across Pune city. Design development, as well as appointment of contractors for execution, has already been completed for 15 unique themes.

The completed sites with the daily visitors are examples of the success of this model. They exemplify the citizen engagement approach and suggest that other interested authorities can also go the CSR route to finance such initiatives. Learnings from the first set of projects helped to decide and cap a budget—around Rs.1 crore to create such a space, and around 1 lakh per month to maintain it. Diverse themes already implemented or underway capture a wide range of interests given people's contemporary lifestyles. They could be used as they are adapted to suit the specific needs of the immediate neighbourhood..

As such, the placemaking initiative has immense potential for scaling up across the city for greater impact and enhanced livability. An infinite set of themes could be implemented, given the dynamic interests and needs of citizens.

As the spaces become more popular, they are ready-made, popular venues that can be monetised, such as by charging the brand or company seeking an opportunity to connect with potential customers through a customized event. For example, an organic or health food brand could partner with a site that has the theme of health, offering open-air workshops on healthy cooking or kitchen gardening.

## Sustainability

The locations for placemaking sites in Pune Smart City were consciously identified across the city to make the impact visible to a large number of citizens. Citizens actively engaged across every step of implementation have now taken "ownership" of the sites to ensure upkeep is taking place as per the requirements. The implementation process was as follows:

- The first step of the study was to identify the facility to be developed on the placemaking sites. This was done through surveys of the site neighborhood, conducting a demand-supply analysis of recreation facilities and a check on the status of the amenities. Teams also conducted an opinion survey of residents to understand their aspirations about the amenities needed in the neighbourhood,
- Secondly, the themes for the placemaking sites were finalised after a design competition for appointment of leading architects and designers for each site and an analysis of the citizen surveys,
- Design drawings were then prepared by the appointed architects based on a careful study of the national and international best practices for the design of specific public amenities, and the relevant furniture, site development ideas to suit local needs,
- Subsequently, the concepts and themes were finalized through stakeholder consultations and approval from competent authority,
- Proposals were then invited from contractors for construction as well as comprehensive maintenance for a period of three years after construction, and

The sense of ownership developed through a consultative process is expected to motivate citizens to continue stewarding open spaces they helped build.

# Surat: Smart Implementation of Pradhan Mantri Awas Yojana project

## Project Features

As an implementing authority of Pradhan Mantri Awas Yojana (PMAY), Surat has demonstrated innovation by installing innovative and advanced internal & external infrastructure for 1088 units Of "Suman Sangini" PMAY Project At T.P. 53 (Parvat-Magob) F.P. 82 in the ABD area of Surat Smart City. Surat Smart City has installed the following:

A **Tertiary Sewage Treatment Plant (TSTP)** of which reduces the overall demand for water in the city by recycling & supplying treated water from TSTP. The dual plumbing system supplies non-potable gardening and household use.

An **Organic Waste Converter (OWC) Plant** which converts wet organic waste to fertilizer eliminating the need for wet waste collection and transportation to a landfill. The fertilizer can be utilized within the residential premises or put up for sale.

**LED Streetlights** which are more cost and energy efficient, and provide better luminosity than conventional lights.

**Rainwater Harvesting Plant** for improved water management under 'Dhara Trupti Abhiyan'.


## Key Outputs

The tertiary sewage treatment plant is able to recycle and generate 198 kilolitre (KLD) daily of non-potable water out of the installed capacity of 272 KLD. This amounts to savings of nearly Rs. 11 lakhs per annum towards collection, transportation, and treatment cost of sewage and fresh water by optimising in design for the SMC.

The organic waste converter has an output of 67 kgs of compost fertilizer per day against the capacity of 500 kgs of wet garbage input per day. This results in savings of approx. Rs 2 lakhs per annum to the SMC toward system of collection, transportation, and treatment cost. The sale of excess compost fertilizer can generate Rs. 60,000 per annum by for the housing society.

81 LED street lights save 16 kWh/day and 5840 kwh/day and accrue Rs. 35,000 in cost savings as compared to conventional streetlights. Since it takes a lower number of LED streetlights to generate the same amount of luminosity as a given number of conventional lights, the space requirement for installation of LED lights is also lower.

Approximately 6000 to 7000 litres of water has been harvested through the rainwater harvesting plant resulting in the rise of the water table from 78 feet to 54 feet underground from the year 2017 to 2020.

## Key Impacts

The TSTP facility has resulted in the reduction of the frequency of door-to-door collection of a portion of the total waste, its transportation and related costs for the urban local body (ULB). It has directly reduced the wastage of potable water for non-potable water uses such as gardening or flushing. Nearly 30% of potable water is saved through greywater recycling within the residential campus.

The OWC treats sewage generated at the source and reduces the load on the municipal sewerage system. This helps save transmission costs, reducing the capital cost of the project. Installation of a better quality of streetlights than conventional streetlights will ensure cost and energy efficiency, while also making streets feel safer for movement at night. Better lighting has an impact on improving security of the residential campus as well.

The positive impacts resulting from rainwater harvesting have been well established. The rainwater harvesting unit installed in Suman Sangini society has replenished the water table and is helping in water conservation through an environmentally sound and progressive best practice.

## Replicability and Scalability

SMC has decided to replicate the OWC, rainwater harvesting and other basic amenities in all the new sanctioned projects for construction of 14,136 housing for the economically weaker sections (EWS) at 19 locations and TSTP in projects with more than 1000 dwelling units at five locations. Also, it is under consideration to implement similar small scale tertiary treatment plants and organic waste converter in residential societies, apartments, townships, staff quarters, government offices, municipal toilet blocks, gardens, public places etc.

## Sustainability

The project is directly aimed at natural resource conservation through appropriate infrastructure improvements. Each element under this project is aimed at environmental sustainability either through conservation of water or composting at source, or energy efficiency. Regular composting of wet waste at source will reduce land requirements at landfill sites. Use of TSTP eliminates costs of fetching water from River Tapi, treatment and transmission of potable water, and transmission of sewage and its treatment.

# Vishakhapatnam: Social Integration through Public Spaces - All Abilities Park

## Project Features

The smart city plan for Vishakhapatnam is based on the vision for creating - "A Resilient and Healthy Metropolis for People". Aligned with this vision, Visakhapatnam has focused on creating a healthy environment by improving parks and public open spaces essential to the development of children and the health and social well-being of senior citizens.

The Greater Visakhapatnam Smart City Corporation Limited (GVSCCL) has put substantial emphasis on upgrading the city's social infrastructure, especially parks and open spaces. Retrofitting existing Greater Vishakhapatnam Municipal Corporation parks and transforming them to become universally accessible and functional is one such project.

In a bid to counter the ills imposed by the convenient but sedentary modern-day lifestyle, Vishakhapatnam Smart City developed an all-ability public space that enables social inclusion through universal accessibility and sensory play equipment for persons with varying abilities.

The park has interactive and functional outdoor spaces for children with play equipment and ethylene propylene diene monomer (EPDM) flooring to offer complete safety.

## Key Outputs

The park has been welcomed by the citizens looking for options to help them enjoy the outdoors and nature within the city. Parks are often valued lower by urban developers focused on revenue generating concrete structures, but are integral to wholesomeness, safety, health and well-being of citizens. They provide unquantifiable social and psychological benefits essential for well-being of individuals who can then contribute positively to the development of the society. In addition to such benefits, the all-abilities park exemplifies inclusivity and universal access through urban design.

## Key Impacts

The all abilities park has paved a way to build more vibrant and socially organized spaces. It has become a source of pride for residents living nearby. This is evidenced by the growth in the number of people using the park for walking and jogging. The number of park users has grown by 300 to 500 from weekdays to weekends. Despite growth in the number of users, city residents have taken ownership of this marquee project and there has been no littering observed in the park since it was upgraded.

## Replicability and Scalability

The approach which has led to the successful implementation of the 'All Abilities Park', is replicated in other parks in Vishakhapatnam Smart City. This includes CW Children Park, CW Colony Park, VUDA Park and nine other locations within the ABD area. The project is easily replicable across any park.

Already the idea has inspired many other cities and its design principles are being adopted in their upcoming projects.

## Sustainability

The project is planned comprehensively for better sustainability. The infrastructure installed in the park is robust and procured to meet the standards of coastal climate and for longer durability. The project also includes a defect liability period and regular preventative maintenance for smooth functioning of the park. An operation and maintenance team has been engaged for regular upkeep and maintenance of the park. To ensure that the park continues to thrive even after the Smart Cities Mission is over, the municipal corporation has agreed to take over for its continued maintenance.

# Culture

## Tirupati: Re-imagining Water Tanks & Blank Walls through Public Art

### Project Features

Public art has been used by many cities over the world and even through the centuries for placemaking, downtown rejuvenation and enhancing heritage/cultural value. In creating visual impressions with which cities can be associated and differentiated, public art is valuable in creating a sense of identity for cities and their residents.

Under this project, Tirupati Smart City has successfully experimented with creating its own urban identity through incorporating context sensitive public art on walls and water tanks. In using water tanks, Tirupati has taken inspiration from the global public art movement which has seen such projects as New York City's 'Water Tank Project'.

The artwork on tanks and walls are an abstract depiction of the relationship between humans (worshipper) and their gods. Combining modern abstract form of art and spiritual essence of the City is the key for this project. Projects are named Kurma (Deity) and Archana (Devotee) keeping in mind the spiritual characteristics of the city but designed and executed for them to be relatable to all.

The street art movement that started in Delhi in 2010s by a handful of artists has evolved into idea of public art, where art serves not just to beautify a public space but also creates a framework for interaction with people. This project has been instrumental in giving the boundless cultural significance of Tirupati a recognisable face and a captivating expression.

### Key Outputs

This project is about rethinking the role of water tanks from mere storage structures to city markers, which not only re-define the identity of city and its under-utilised back-of-the-house services but also act as sustainable community level activity nodes. It also focuses on re-imagining blank walls through public art.

Water tanks constructed in various sites including public open spaces and parks generate under-utilized pockets in active community parks while raising aesthetic concerns. Water tanks city are monotonously designed but high visibility infrastructure components, which lends them a high potential as visual markers.

The M.R. Palli Vaikuuntha Puram where the public art project has been initiated has become visibly more vibrant. It is a source of pride for residents in the area where the project is implemented; they have proactively engaged with the artists while the latter were at work with inputs to improve the visual quality of the paintings. No littering or urination on walls has been observed on walls where the project has been executed.

## Key Impacts

The public art project has helped enhance the identity of the city by capturing local heritage in artwork. It has enhanced the city's skyline. Water tanks are 60 feet high and by creating high visibility markers for residents and 75,000 visitors daily to observe, the project has been able to promote local artists and their work to a larger base.

The project serves as an interface with the community and a place for social congregation. Public art walls have now become selfie points for the tourists to the city and have transformed 15,000 sq ft of space with context sensitive public art.

## Replicability and Scalability

Currently, Tirupati has three overhead water tanks. One new water tank is proposed under the Smart Cities Mission and fourteen new water tanks proposed under Atal Mission for Rejuvenation and Urban Transformation (AMRUT). Out of a total of eighteen water tanks that the city will have, seven will be in existing public parks.

Post completion of the overhead tanks and public wall projects, Tirupati has taken up multiple other public art projects engaging local artisans. The value added by addition of elements to the quality of public spaces through this project can be monetised.

## Sustainability

The public art in Tirupati amplifies city's spiritual heritage, and gives the city a cultural identity drawing from but also, beyond its religious significance. The displays on water tanks and walls have been designed to impress a unique image of Tirupati on the minds of pilgrims and tourists.

The overhead water tanks are some of the main attractions in Tirupati. The painted walls lend a vibrancy to match the liveliness of the city. These projects have caught the attention through use of vibrant colours and are likely to keep tourists around the city longer helping local businesses attract potential buyers and support livelihoods.

## Chandigarh: Dedicated Cycle Track and Footpath

### Project Features

Over the years, Chandigarh has taken a number of steps towards improvement of road user experience. The Dedicated Cycle Track Project aims at reducing common hindrances including safety issues, lack of dedicated lanes, obstructions, security concerns and so on, faced by cyclists on smart city roads. Such problems faced by the cyclists demotivate people from using cycles.

Cycle tracks encourage a greener lifestyle even as pollution from motorised vehicles proves to be a menace in urban areas. The absence of segregated lanes for cycling keeps potential cyclists from resorting to cycling as a mode for commute or for exercise. Either way, public health gains will be lost before they can be accrued if cities do not enable an environment for cycling urgently.

In a bid to fast track a cycle-friendly environment, Chandigarh Smart City is constructing dedicate cycle tracks to motivate citizens to ride bicycles. Key features of the project are:

- Shared space between the cycle track and the footpath,
- Special signals installed for cycles for intersection,
- Redesign of junctions to incorporate cyclist movement,
- Provision of cycle track on one or both sides of the road depending on right of way (RoW) availability, and
- Traffic police deployed at different points along the cycle track to educate cyclists.

## Key Outputs

Chandigarh Master Plan 2031 lays emphasis on making Chandigarh a pedestrian and cycle-friendly city. Le Corbusier who created the first plan for the city, established a functional road hierarchy for all streets from V1 (arterials) through V7(footpaths and cycle tracks). The project tried to revive V7 roads as intended for bicycles in the master plan of Chandigarh. Existing cycle tracks along with V3 roads were improved and integrated with zebra crossings near intersections. Longitudinal green belts were developed as green corridors both for the pedestrians and cyclists.

Under this dedicated cycle track project, 200 km of cycle track was constructed pan-city (covering almost whole length of major roads up to V3) that connects major institutions, tourist areas, heritage sites, schools and colleges for last mile connectivity. The expected modal shift from this together with upcoming bike sharing projects in the city could reduce 60-100 MT of greenhouse gas emissions annually. Cyclists are less prone to accidents due to this project. The number of cyclist fatalities in road accidents have been reduced from 28 in the year 2016 to 10 in the year 2019 (Source: Chandigarh Traffic Police).

Segregation of NMT the non-motorised traffic lane from the main carriageway has also resulted in better road user experience and fuel savings.

## Key Impacts

The dedicated cycle track has led to a reduction in travel times of 5-10 minutes for cyclists who now perceive improved safety for cycling on the roads. Correspondingly, the average speed of cyclists has gone up from 8 kmph to 12 kmph. Building the cycle track in a citywide network has received a positive response from citizens who are using it in increasing numbers to reach important landmarks it connects. Cyclist fatalities have been reduced from 18.54% of total fatalities in road accidents during the year 2016 to 9.62% of total fatalities in road accidents during the year 2019.

## Replicability and Scalability

The first phase of the project has been replicated all over the city with the result that there are 200 km of cycle tracks constructed now. The city plans to have the peripheral areas integrated with the main city by cycle tracks. Within the city, all major roads up to V4 will also have segregated tracks within the right of way.

It is expected that the adjoining cities of Panchkula and Mohali will replicate and extend the network within their limits.

## Sustainability

Plans to implement a public bike sharing project through which 5,000 bicycles will be made available to citizens are in the pipeline. Another project for illumination of the complete cycle track is under the tender process.

The Chandigarh Traffic Police formed a Cycle Safety Squad in August 2012 to build awareness around cycling and to inform people of safety for cyclists on the cycle tracks. This squad has also prosecuted over 500 cyclists/motorists plying on/near cycle tracks. In order to lead by example, all Chandigarh Smart City officials cycle to work on Fridays.

These initiatives are expected to create an environment which will sustain the relevance and utility of the project, and also serve to encourage future demand and public support for expansion of the project.

# Dehradun: Rangotsav

## Project Features

Wall art or graffiti making has been an integral component of the Swachh Bharat Abhiyaan. Calling attention to the importance of citizen engagement with particular focus on sanitation and cleanliness in India, Dehradun Smart City Limited launched its first ever, wall painting competition called Doon Rangotsav.

The event was an open-air wall painting competition seeking to beautify urbanscape and to promote civic participation. Doon Rangotsav was conceptualised and initiated to identify some of the most littered or ill-maintained walls in the city and undertake their complete transformation and beautification.

Doon Rangotsav was a citizen-led graffiti /wall art making competition with its core objective to promote citizen engagement and ensure citizen participating in the process of city cleanliness. A total of 28 teams participated in the competition which started on December 12, 2019 and concluded on February 29, 2020. The participation was team based with each team consisting of minimum 5 members and a maximum of 15 members.

Themes suggested by Dehradun Smart City Limited were mainly related to cultural heritage, wildlife and tradition of Uttarakhand. The initiative aimed at at encouraging face-lifting of the city and promoting lively urban spaces. Once a particular wall was allocated to a particular team after the on-line registration, "before" and "after" wall photos were also collected/documented on the designated email ID registration along with photos.

Dehradun Smart City Limited constituted a committee of independent experts to adjudge and decide the winners. The top three teams were awarded a total of Rs. 75,000; Rs. 50,000 and Rs. 25,000 respectively. A Certificate of Participation was provided to every team along with cash prize of Rs. 5,000. These prizes were awarded by the Hon'ble Chief Minister of the state, Shri Trivendra Singh Rawat on 29th February, 2020.

## Key Outputs

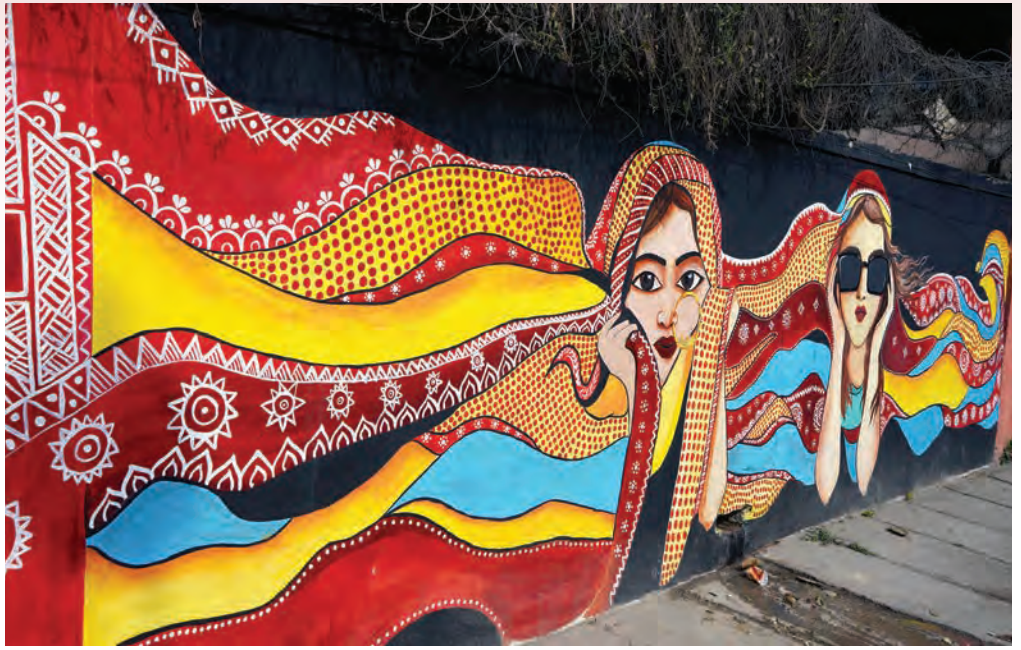
A total of 28 teams participated in the competition which started on December 12, 2019 and concluded on February 29, 2020. The minimum members per team were set to 5, while the maximum number was 15.


The Rangotsav Wall Painting drive took part in the city of Dehradun, Uttarakhand, and covered walls in the area of one square kilometer extending from the center of the city near the Clock Tower (Ghanta Ghar). The competition helped spread the message of the importance of having a clean city while promoting the significant cultural heritage of Uttarakhand.

## Key Impacts

The most positive impact of this drive is that the walls around the Clock Tower that were once old and broken, have been repaired and painted with rich cultural paintings. This has helped spread awareness about Uttarakhand's cultural heritage, while restoring a sense of pride in the residents of the smart city.


नन्दा तेरी डोली कैलाशली जूला सजि धीजिक
Smart Cities Mission



Citizen participation has also been a positive outcome of this painting drive as citizens have experienced, on a personal level, the responsibility that goes towards keeping the city clean.

Building on this, the larger message that this drive has sent to the citizens of Dehradun is advocating for the Prime Minister's mission of 'Swaccha Bharat', and making India a greener, and cleaner country on an international level.

## Replicability and Scalability

Following citizen's enthusiasm, Rangotsav is an event which will be held every year. With each year, more public walls beyond the central areas of the city will be incorporated into the fold, repaired and beautified with public art. Making this an annual event will help popularise Uttarakhand's culture and heritage among citizens as well as tourists. Leading as an example, Dehradun's Doon Rangotsav Painting Drive can inspire other cities to take similar actions and beautify India in the process.

## Sustainability

Areas around these painted walls are now clean and citizen themselves take it upon themselves to not litter these spaces. Rangotsav is an annual event which aims at repainting the walls if the paintings get damaged due to weather conditions.

The project has inspired a bond among the residents of Dehradun Smart City a bond with their community, culture and public spaces.and the events annual presence will only help further this feeling.

# Economy

## Indore: Value Capture Finance

### Project Features

Value Capture Financing (VCF) is based on the principle that some of the value generated through public infrastructure investments for private landowners can be recuperated, which can be used to generate further value for more communities in the future. Appropriate VCF tools can be deployed to capture a part of the increment in value of land and buildings. This generates a virtuous cycle in which value is created, realised and captured and used again for project investment. VCF is distinct from the user charges or fees that agencies collect for providing services. It gives governments the opportunity to launch new projects. even with a small resource base.

For the private sector, VCF is an opportunity because projects are properly planned and backed up by the Government either through an executive authorisation or through risk sharing.

Smart Cities Mission (SCM) Guidelines issued by the Ministry of Housing and Urban Affairs recommend for the VCF model to be adopted by the urban local body/smart cities/other government departments. Indore Smart City's VCF model is based on these guidelines. The original master plan of the city in published by Town & Country Planning in the year 2008. While states/ULBs have been developing and using some of the VCF methods. The Central Government Ministries/Departments have not yet systematically used VCF methods as a revenue generation tool. As per the SCM in the project, area-based development (ABD) area for retrofitting was approved. This ABD areas a part of central core area.

### Key Outputs

Once Indore Master Plan guidelines area amended for the ABD area following legal procedures set by the Town & Country Planning Act, 1973, the following avenues of revenue generation can be explored:

- Value Appreciation Fund at the rate of 5% & 2.8 % of property guidelines on major roads,
- Amalgamation Charges (based on land use),
- Commercial Use Charges (5 % of guideline),
- Mixed Use Charges (5 % of guideline),
- Premium on floor-area ratio (FAR), and
- Parking Cess (25 % of guideline for parking area).

Revenue generation activities started in October 2019. Out of this, 90% of the revenue was marked for Indore Smart City and 10 % for Indore Municipal Corporation. Over and above these, the revenue generated within the ABD area from building permissions since October 2019 is Rs. 2.4 crores. This model of VCF will help the Indore Smart City project to become a self - sustainable model. The generated revenue will be utilised for ongoing and upcoming projects by Indore Smart City Development.

### Key Impacts

Land value tax is considered a valuable tool which apart from value increment helps stabilise property prices, discourage, speculative investments and is considered to be most efficient among all value capture methods. Fees for changing land revenue codes provided for procedures to obtain permission for conversion of land use from agricultural to non-agricultural use can also add to the smart city's revenue. The most widely used fiscal tool i.e. development charges (impact fees) are area-based and link the development charge to the market value of land by carrying out periodic revisions. Development charges can be collected for works such as road widening, junction improvements including traffic signals, flyovers, rail over-bridges, rail under-bridges, modern lighting on major roads, development of major stormwater drains, riverfront and parks and for Geographic Information System (GIS) applications. Using all these tools, and given plans for future development, Indore Smart City can realize a total of Rs. 11,185 crores in revenues the breakup of which is as follows:

- Land uses charges – Rs. 242.05 crores,
- Additional FAR – Rs. 402 crores,
- Parking charges – Rs. 489.03 crores,
- Plot amalgamation charges – Rs. 405 crores, and
- Value appreciation fund –Rs. 47.82 crores.

## Replicability and Scalability

This model of VCF will help the Indore Smart City project become self-sustainable. The generated revenue will be utilized for ongoing and upcoming projects by Indore Smart City Development. Area-based application of value capture is best suited for urban areas. In line with this concept, Indore Smart City is making amendments for the ABD area within the Master Plan. The VCF policy framework aims to encourage and enable States/ULBs and Central Government Ministries and their agencies to use appropriate VCF methods for generating resources from new and existing infrastructure projects in both urban and non-urban areas.

## Sustainability

This project will guarantee the financial sustainability of Indore Smart City. As property values rise, so will property taxes. Rather than just receiving property taxes, the smart city will be able collateralise them. This action will turn future revenues into collaterals with which to get money from investors who can be paid after the tax is collected. A second revenue stream will be to gain profits from the value of the land itself. This means any business deriving enhanced value from public infrastructure will pay extra. Finally, Indore Smart City will be able to effectively trade land for future infrastructure projects. This means that a smart city may sell parcels of land (or the right to build on that land) to private investors. The agreement will oblige investors to fund future public works in exchange for the sale of land parcels.

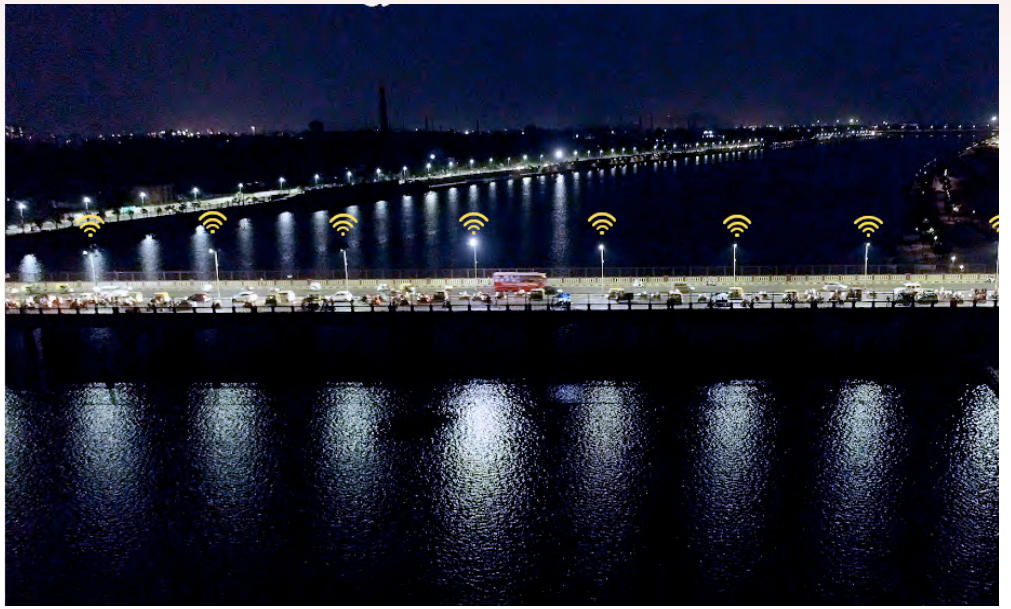
# Ahmedabad: Smart Streetlights

## Key Features

Smart City Ahmedabad Development Ltd (SCADL) has successfully retrofitted streetlights with smart controllers on all major arterial roads within Ahmedabad Municipal Corporation (AMC) limits.

A single streetlight controller controls two or more lamps on each pole, provides faults and metering values, ensuring low capital cost and providing higher utilisation of available resources. Overall, 14,200 streetlight controllers cater to over 26,000 streetlights on major arterial roads of the city reinforcing safety.

The streetlight controllers are underpinned by Internet of Things (IoT) network based on LoRaWAN™ technology. The streetlights are automatically turned off in daytime halving the electricity consumption. Alerts and notifications are issued during maintenance within 5 minutes from the Integrated Command and Control Centre (ICCC). The lights can be adjusted in clusters depending on relative darkness/brightness in each location, which helps reduce manpower costs and energy consumption.



The city's zone-wise burning ratio, or SLAs for time taken from breakdown to restoration, or alerts triggered in real time to improve city's lamp efficiency, are delivered to a mobile application from the ICCC. Further, an innovative technique for installation by not making any single change in the existing infrastructure has saved crores of rupees of public money for AMC, at same time provided an effective and a fail-safe mechanism to improvise operational efficiency.

## Key Outputs

The project is expected to save approximately Rs. 11.32 crores for Ahmedabad over the period of next five years through operational efficiencies, reduction in power consumption, and optimisation of system efficiency. The system is expected to deliver indirect benefits to Ahmedabad by providing improvised burning ratio, faster fault resolution time and uniform illumination along with better vehicle and pedestrian safety.

Since the streetlights poles are spread across the city, this system will enable integration of other smart solutions using the same platform, without any further network costs, thereby creating a strong foundation of IOT network for the city.

## Key Impacts

Streetlighting is now a core piece of Ahmedabad, creating a safe environment for pedestrians and drivers alike. The reduction in operation and maintenance costs will amount to 90% of the current costs.

The automation of streetlights controls has eliminated the need for manual night patrolling by O&M teams to identify faulty poles/lamps, saving manpower and labor costs.

Illumination of streetlights has reduced in dark zones/spots in the city on vital roads helping prevent fatal accidents. Better illumination has also improved CCTV coverage on the main roads. Excess and unnecessary daytime energy consumption is avoided. It has become easier to identify power theft and illegal connections from implementation of this project. Smart streetlights also make it easier to manage and pre-empt maintenance of streetlight infrastructure.

## Replicability and Scalability

The smart streetlight automation system uses state of the art IoT based technology. The LoRa WAN network is spread throughout the city including expanded geographical limits of Ahmedabad City.

At present, 14,200 streetlights controllers are spread throughout all zones and wards on major arterial routes of the city. The LoRa WAN network has created a backbone for other solutions to be easily scaled and implemented in the city. Furthermore, it is a non-proprietary and unlicensed network that eliminated reliance on a single network provider.


Ahmedabad plans to invest in smart city systems to run on top of their public infrastructure backbones like water, energy and public lighting systems. Lighting is part of public ways, streets, bridges, parks, shopping areas, parking lots and schools, and the infrastructure for its provision is already well established in the city. Additionally, the streetlight infrastructure can house sensors and other technologies to enhance the quality of life for residents. By utilizing the existing network, any kind of sensor that improve urban service delivery (traffic, air quality, pedestrian safety, noise detection and more) can be deployed.

Since utilising poles are spread across the city, this system will enable integration of other smart solutions using the same platform, without any further network costs, creating a strong foundation of IoT network for the city. The project will be replicated on all secondary and internal roads on the same network easily without further investments.

## Sustainability

The smart lighting solution will help Ahmedabad to realize cost savings on energy, operations and maintenance, while at the same time help to create a more attractive and safer environment. It will allow to remotely monitor, manage and control the entire lighting infrastructure and get insight on its performance– through a single sustainable platform. The sensors deployed in this project have components with a life reliability of more than seven years.

The ability to control and define illumination levels for a specific streetlight, a street, or an entire region will save energy, cut carbon emissions and lower light pollution. Users will receive automatic status and fault reporting straight to the mailbox, thereby enabling the streetlight/electricity department to promptly initiate a repair/replacement. The system can identify several light-related faults, so that one can exactly identify why a particular luminaire has failed.

Insightful data on energy usage and savings through metering or calculation of each individual pole will help in optimising the entire lighting infrastructure. Accurate data also helps make actionable plans for the future.

# Chandigarh: Rooftop Solar Energy Plants

## Project Features

With the current installed capacity exceeding 37.5 MWp, Chandigarh has been at the forefront of solar energy generation among cities in India. Almost all major government buildings and places have been used for installation of solar panels. Chandigarh Renewal Energy and Science & Technology Promotion Society (CREST), the agency promoting implementation of non-conventional energy projects in the city, targets to achieve 100 MWp by 2022. Through rooftop projects, Chandigarh has been able to generate around 10 MWp of solar power.

CREST has collaborated with the Municipal Corporation of Chandigarh to install 6.25MWp solar power generation facilities at the four water works in the City. The project altogether has resulted in reduced electricity bills for the municipal corporation.

## Key Outputs

Out of the 37MWp installed capacity in the city, more than 15 MWp is from the five project sites under this proposal. Solar rooftop solar projects have been producing 114 million units of electricity for different consumers over past eight years. The solar energy produced from installations at the waterworks is consumed by the waterworks and street lights.


## Key Impacts

The five solar installations have helped the waterworks facilities in accrual of Rs. 1.5 crores of annual electricity cost for electricity from the grid. Savings of more than Rs. 30.1 crores is accrued to consumers from all rooftop solar units in Chandigarh generating 16.6 MWp. About 3,300 tonnes of greenhouse gases are reduced annually from these projects. The installed capacity of the five projects combined can meet up to 4.4% of electricity demand in the city.

The rooftop projects in Chandigarh cover residential, commercial and institutional buildings. Eighty two government schools with rooftop solar installations have nearly eliminated expenditure on electricity usage.

## Replicability and Scalability

The solar rooftop projects are easily replicable. In Chandigarh alone, it is planned that 100MWp will be generated annually the year 2022 in support of which the installation of 300kWp and 200 kWp solar photo-voltaic (SPV) power plants in the parking area of ISBT in Sector 43, SPV power plants at Chandigarh Industrial and Tourism Development Corporation (CITCO) establishments, and SPV power plants at different government residential houses in Sector 1, 19 and 23, are in progress.

- Installation of 300kWp and 200 kWp solar photovoltaic (SPV) power plants in the parking area of,
- ISBT in Sector 43,
- SPV power plants at Chandigarh Industrial and Tourism Development Corporation (CITCO) establishments, and
- SPV power plants at different government residential houses in Sector 1, 19 and 23.

## Sustainability

Natural and conventional energy resource conservation is a direct benefit of this project. Solar panels last several years and can be recycled for reuse after the completion of their serviceable life span of 15-30 years. Solar energy is most sustainable source of energy and solar plants are free from major operation and maintenance issues. As government policies shift towards promoting electric vehicle usage, green energy projects will experience an increase in demand.

Further, by reducing Chandigarh city's dependence on the thermal-powered electricity grid, such projects will reduce electricity costs, the savings from which will be invested in other public infrastructure projects.

# Governance

## NDMC: Street based Addressing System

### Project Features

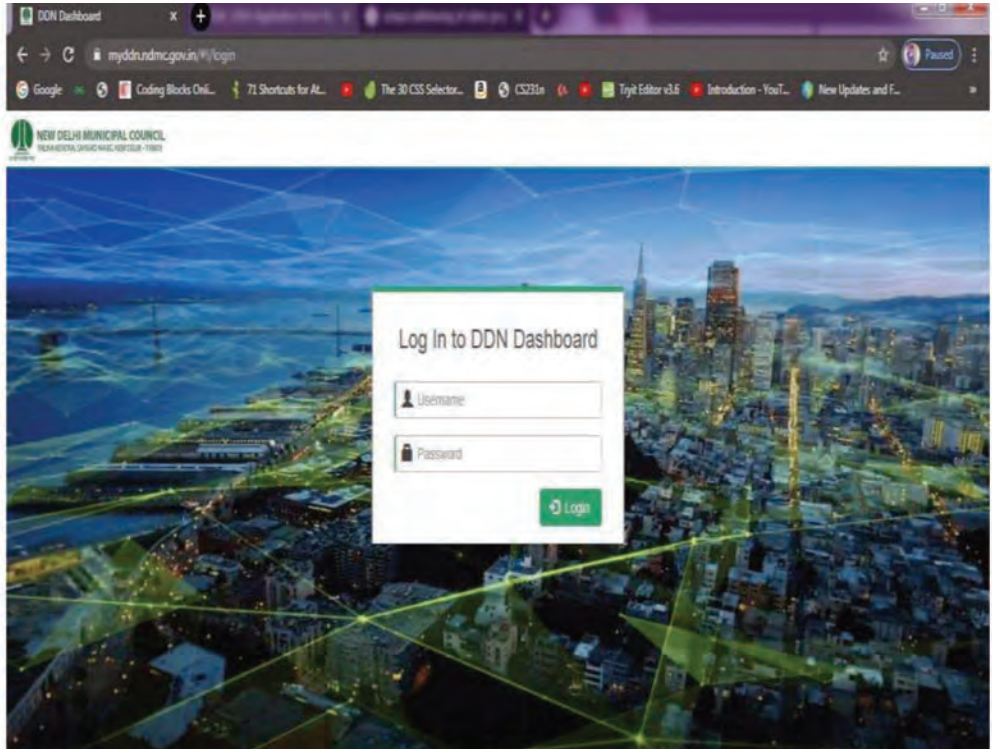
One of the major issues in urban planning is a consistent way to identify and number a house. Inconsistency in house numbering leads to issues with accessibility and uniform identity. Issues with accessibility pose great challenges to urban service delivery. Also, each department in the municipal administration accesses the properties for multiple use cases. Different formats of the same address make it difficult to identify the property across departments.

To solve these two issues, NDMC has introduced Digital Door Numbering (NDDN) project across its properties.

NDDN is a a scientific, street-based addressing system that adheres to international guidelines. NDDN future-proofs and works for city's unique topology by not relying on grids or the latitudinal-longitudinal nomenclature.

- NDDN is the first of its kind in the country in which,
- Digitally identifies each property on the city's GIS map,
- Places a QR code and RFID at the entrance of the property to build access-based use cases for solid waste management, vaccination etc., and
- Integrates property level data across departments like water, electricity and revenue with NDDN and seamlessly identifies cumulative revenue.

This NDDN will be further integrated with public and private service providers to improve service delivery of ambulance service, police response, other grievance redressal and so on.




### Key Outputs

NDMC Smart City procured the latest satellite imagery with 50 cm resolution and digitised the complete NDMC area with unique street numbers and locality codes. NDDNs for 50,894 homes in the NDMC area were created. NDDN plates with rustproof UV printing and QR/ DDN printed were developed. RFIDs of frequency range between 865-867 MHz and minimum 2KB memory were installed along with the NDDN plated.

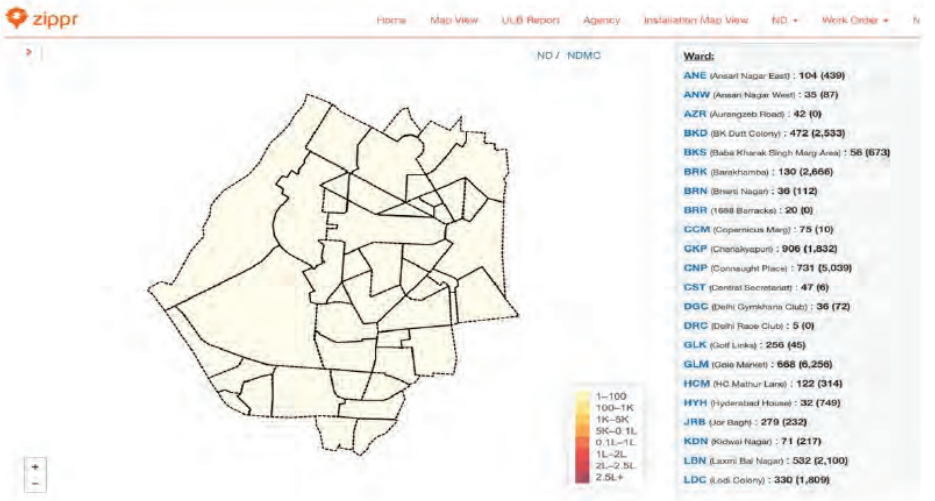

## Key Impacts

NDMC is the first city in the country which has introduced a smart, scientific and future proof house numbering system. Every house has a standard nine digit, access road based house number. This has paved the way for some cities in Andhra Pradesh to implement a similar system. Teams from municipal corporations of Bhopal, Hyderabad and other cities have visited NDMC to understand the nuances of project implementation and understand best practices.

NDDN has enabled direct interaction between municipal departments and houses using NDDN through which all municipal dues (electricity, gas, water and property) can be collected via a single ID. NDMC uses NDDN's RFID/QR code-based system as the tool to monitor and manage solid waste management (SWM) effectively. A mobile app to scan the QR code of the NDDN and gather insights on waste type and segregation has been developed. NDDN sends progress tracking updates to the NDMC ICCC directly from where necessary action can be initiated in response.

## Replicability and Scalability

NDDN is issued to 50,894 homes across 48 localities in the NDMC area. All roads across these 48 localities have been digitized and given a unique street code. The entire algorithm, system and approach is highly scalable to the entire country.Post-implementation in NDDN in NDMC, DDNs have been issued across some cities in the state of Andhra Pradesh and in a few other cities in India.



## Sustainability

NDDN is a one-time house number issued to a property. This removes the need to reassign house numbers multiple times saving costs in repetition. Street numbers assigned during the exercise also helps standardise street numbers. Streets are typically named after landmarks and personalities, and are liable to change with the passage of time. This saves the cost of redoing the street signages. Once integrated into the upstream and downstream systems like the Public Distribution System, property registrations, Census, electoral rolls etc, NDDN will eliminate the duplication and leakages from the system. Since NDDN has the exact address, image of the building and precise location data, this can be monetised across private players who can be charged for every usage of NDDN across systems. This will ensure financial sustainability of the project indefinitely.

# Kakinada: System Integrator

## Project Features

A Citizen Helpdesk has been established as part of the command control center's (CCC) smart innovative solution in Kakinada Smart City. The helpdesk enables people to connect to the Center and get assistance anywhere with a very short "response time". The objective is to receive and respond immediately to emergency calls made by the public seeking assistance by directing the patrolling police vehicles available for the purpose. CCC is equipped with latest technological tools like computer-aided dispatch (CAD) to attend and handle public distress calls for services.

The Citizen Helpdesk is provided with one primary rate interface (PRI) line single toll-free telephone number to a group of minimum 10 lines. The Citizen Helpdesk aims to ensure that calls can be made to a toll-free number from any phone whether landline or mobile. The system has multiple caller interfaces and is capable of receiving 10 calls at a single instance. The Citizen Helpdesk operator is able to view the nearest fire station, hospital or blood bank, for providing additional assistance at the site of the incident. After the call has been logged in by the call taker, the toll-free number system sends an SMS to the caller stating the CFS/tracking number along with a password as an acknowledgement to the call made to the control room. ICT-enabled government services is another innovative governance component of the project. The enterprise resource planning (ERP) modules integrated with CCC are property tax, vacant land tax, water charge management, trade license, grievance management, advertisement tax, town planning, GIS, biometric system for attendance, AP e-procurement, government project management system (GPMS), Drawing and Disbursing Officer (DDO), Urban Water Supply Information, Swachh Andhra Corporation, e-office, Birth and Death, Vehicle Tracking, etc.

## Key Outputs

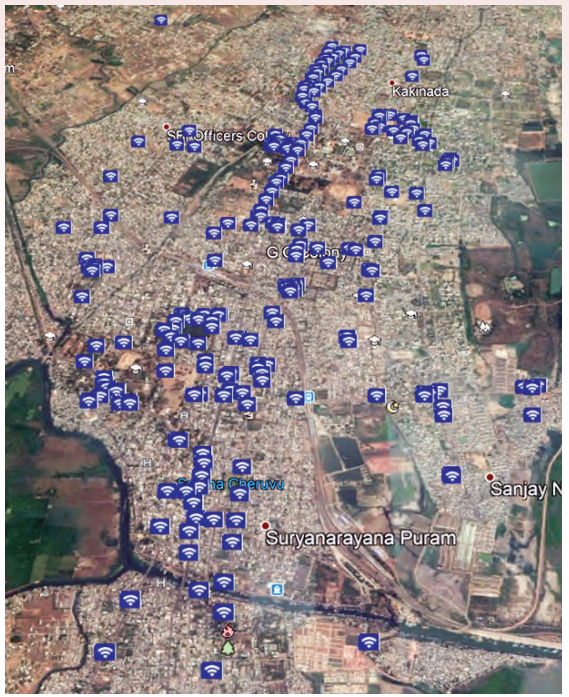
The important outputs of the project are 350 cameras (pan-tilt-zoom (PTZ) and Fixed Box) placed in consultation with the municipality and the police, equipped with intelligent video analytics feature to identify traffic and parking violations, intrusion prevention, theft and abandoned objects. Emergency call boxes with two-way audio and one-way video facility are installed throughout the city. Face recognition capability in cameras has found great utility with the local police identifying the criminals in the city. 247 free wi-fi hot spots are installed across the city. Government offices are installed with smart city free wi-fi hotspots.

Public safety messages related to cyclones, thunderstorms, inclement weather, health advisories, traffic jams, the importance of sanitation for good health are announced on the public announcement system and displayed on large video screens installed (VMD) across the city. Social media news/topics sentiment analysis and trend identification is available to identify the spread of any rumor in early- stage to take precautionary measures without violating the privacy any user.


## Key Impacts

With the help of robust IT connectivity within government departments, citizens are now able to improve their access to ICT led government services such as property tax, vacant land tax, water charge, building permissions, layout regularisation, and vehicle tracking. Cameras are connected on city's own fiber-based network. The city has its own data center where feed from all cameras is saved. Advance video analytics are used to get alerts related to abandoned/ unattended objects, traffic jams, crowd management, loitering, a vehicle going in the wrong direction etc. Alerts related to public safety applications are sent to police teams through collaborative tools for instant alerts.

SOS button is available in Citizen Mobile App which connects instantly to citizen helpdesk for support. Artificial intelligence and machine to machine communication is being used to send alerts automatically to concerned officers based on the type of alert and location of the incident through SMS, mail, data collaboration tools and automatic voice calls on mobile phones with real-time location of incident and incident type without human intervention for reducing response time to a minimum. Emergency call boxes are installed from where a citizen can call to the helpdesk for getting timely help. Helpdesk executive use real-time and nearby location of support facilities like police stations, fire stations, ambulances etc. to arrange for help.




## Replicability and Scalability

Under the Smart Cities Mission, Kakinada Smart City Corporation Limited had taken steps to strengthen the digital infrastructure and enabled the Command and Communication Center (CCC). Under the system integration project various components were installed to improve safety and quality of life of Kakinada citizens. Installation of surveillance cameras was one of the major components of the system integration project, installed in the major areas or junctions. of the city. Kakinada being an economic city is now proactively monitoring the city activities. Locations of cameras have been jointly finalised by the municipal authorities and crime and traffic branch of the police. Kakinada has recently tackled two major cyclones through CCC public address system to create awareness on the 'dos and dont's' during cyclones and during the spread of dengue in the city. Emergency call box had been installed in various locations with due consultation from stakeholders. Additional solutions to the existing CCC infrastructure make the project scalable. The CCC is already replicated across many smart cities in the country and can be established in all urban areas.


## Sustainability

The operation and business model of the project technically and financially sustainable. The business model contract between KSCCL and Sterlite Technologies is an engineering, procurement, construction (EPC) contract and hence, one-time installation charges are borne by KSCCL. Technical, execution, operational support and field maintenance is received from the original equipment manufacturers (OEM). Revenue is generated by leasing the underground 120 km fibre optic cable to the potential telecom/digital operators. Advertisement fees are collected through displaying ads at Variable Message Display (VMD). The project will be operated by Sterlite technologies for a period of five years.



# Surat: Smart Communication

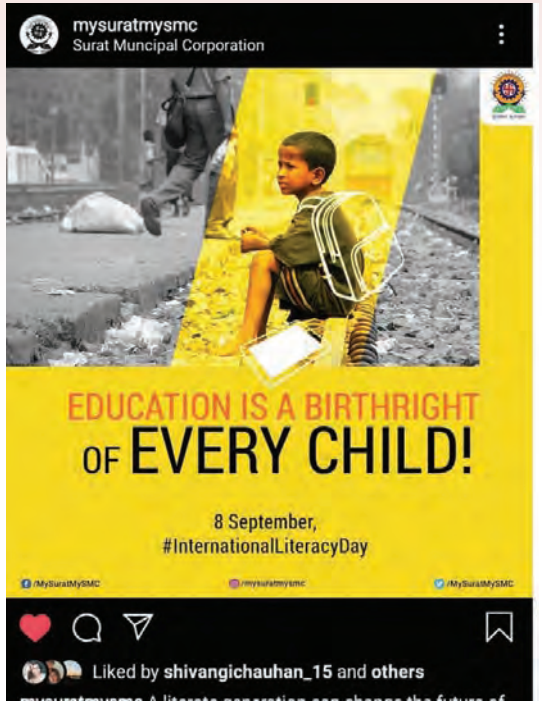
## Project Features

As part of Surat's Smart Cities Mission initiatives, a unified platform and presence on social media channels for citizen engagement in governance was conceptualised, as outreach for digitally active online urban population. This served as a medium for information dissemination, consultation, exchange of ideas/ suggestions and collaboration with citizens. Surat has achieved remarkable success in terms of social engagement, public relations (PR) and communication. The most significant achievement apart from landslide number gains in terms of social media reach, followership and engagement are the catchy and crowd rewarding campaigns. Surat's social media team has conducted various successful campaign such as SamvednaKhushionoPataro, Maru Surat No. 1 and Corona Ko Harana. With over thousands of posts, these campaigns trended organically propagated by other users and various media houses in particular. From creation of GIFs, memes, latest social media trends, to daily engagement through content ranging from quizzes, polls, activities, video songs, animated short-films, banners, print ads, radio campaigns, blogs and live streaming of multiple events – found wide traction with users. Many of the campaigns found special mentions by popular social media channels and newspapers such as Social Samosa and the Times of India. The wide spread, local yet universal with a universal touch, mixed with the magic of interactive communication has truly made Surat's social media a class apart in terms of actual conversation and opinion building.

## Key Outputs

The outputs of the exercise were reflected in the significant rise in numbers of social media followers and engagements made. In a duration of about a year, Surat's Instagram account followers grew to 41,000, Facebook account followers grew to 1,28,009 and Surat Municipal Corporation's (SMC's) Twitter accounts (CommissionerSMC and mySuratmySMC) followers grew to 51,000.

The outreach numbers for Surat's Facebook posts were over 1 crore with post-engagement reach over 13 lakh and video views ranging from 5 to 13 lakh for different video lengths. Over 1 crore impressions were reached on Instagram and over 43 lakh impressions were reached on Twitter.




Along with this, with this the city's social media account reached millions of people on a daily basis through various activities for engagement like the clothes collection drive "Samvedna". There were over 1 lakh total live views of the "Partial Solar Eclipse" post, scores of reactions to the Facebook posts about Surat's Swachhata Heroes (frontline sanitation workers) and thousands of shares on SMC Swachhata posts. This only shows that SMC social media page has established itself as every Surati's trustworthy companion and valued friend on social media front. Surat's brand memory in social media extends as easy and solution-oriented.

## Key Impacts

Surat became India's second cleanest city in #SwachhaSurvekshan2020 and social media played a giant role in this process.The major statistics in terms of website engagement are noteworthy. During the period from 13th October 2019 to 5th November 2020 there were a total 93,718 active user sessions with over 4.5 lakh page views. This simply means that more than 10% of entire city's population has interacted and participated directly with SMC in digital space. Social media channels' goal is to communicate local government initiatives and services to the citizens in a very local, witty and engaging manner.


Surat Smart City had several projects and citizen centric services that had to be communicated in a unique fashion. One example was that Surat had always come in the top 15 list in "Swachh Sarvekshan Rankings". To reach its true potential, a campaign "MaruSuratNo1" was launched with a vision to make Surat climb to the top position in SwachhataSarvekshan rankings. Through this campaign Surat seasonally and regularly promoted important topics like solid waste management, waste segregation, clean river Tapi, river front project, advanced waste water management system and wasteland restoration.

With#SwachhSurvekshan2020 Surat topped the ranking for three consecutive months in SwachhaSurvekshan Central Government listing. Surat's Twitter was top trending with #EoI2020's #MyCityMyPride. #CornoKoHarana has more than 1000+ posts that are still trending on a regular basis. There were over 10 lakh items collected through the clothes collection drive #SamvednaKhushiyoNoPataro that were eventually distributed to the underprivileged in the city.


## Replicability and Scalability

Surat leaped from #14 to #2 in Swachhasurvekshan2020. The digital feedback and awareness played a major role in this achievement. Surat has outshined other cities for five times in last 8 months. Following this success, Surat plans to scale its social media outreach success to the following initiatives:

- **Corona Ko Harana:** Campaign to get maximum engagement of citizens by constantly posting latest health updates to prevent COVID-19. This hashtag has become a social media synonym of Surat's war against COVID-19.
- **One Minute Lockdown Challenge:** This was a social media influencer/crowd engagement campaign which saw impressive results by engaging local celebrities, influencers and local media buzz by tagging and nominating different influencers of the city to promote essential values of Social distancing, hand hygiene and disinfection creatively.
- **Municipal Commissioner Live:** During the situation of lockdown, SMC Municipal Commissioner addressed people of the city through a daily evening LIVE on various social medial platforms, which kept citizens updated.
- **EOL2019:** Hundred plus posts, videos, GIFs, testimonial, photographs and blogs have been posted regarding this. This hashtag trended 9 times nationally trending on daily dashboard.
- **SwachhSurvekshan 2020 Surat:** 1000s of posts, videos, GIFs, testimonials and blogs have been posted keeping Surat at the top spot in social media for many days for voting awareness and re-tweets.

- **Surat Money Card:** A prepaid card targeted for City Bus users and multi-purpose swiping, Surat money card was successfully promoted with #CardEkFaydaAnek campaign, showcasing special discounts for citizens.


## Sustainability

After a successful execution of nomination campaign called #OneMinuteLockdownChallenge, Surat has created a buzz within City's influencer circle and aims to connect through more citizens with ongoing competitions to raise awareness regarding on cleanliness ('Swachhta') through various citizen engagement activities.

Competitions with two more interactive series of campaigns like #SwachhTalk "Swachhta road to success!" "Swachhata Se Success Kamarg" will be launched where entrepreneurs' journey of success through cleanliness and eco-friendly measures will be touched upon. Further planned are campaigns like #SmartSurat2.0 & #SuratCleancityHeritageWalk to respectively raise awareness regarding user- friendly digital administration process and to raise awareness regarding keeping the City's heritage monuments clean.

SMC social media has come a long way to be in a position to be the most active, creative and diverse. Social media exercise was initiated in wake of the Smart Cities Mission. The exercise in highlighting smart city projects in the city for active citizen participation. It has also touched upon all the spheres of city administration for propagating civic sense, be it for cycling lanes, paying city taxes promptly or other aspects of civic governance.

# Sustainable Model of ICCC

## Agra: Integrated Command & Control Centre (ICCC)

### Key Features

The Agra Smart City ICCC is the critical converging technology that enables all technology implementation in the city to be monitored, managed, and optimized to improve the quality of service delivery in the city. Agra ICCC Application is seamlessly integrated with the following to manage:

- Traffic Management System
- Safe City Cameras Feed
- Emergency Response and Disaster Management
- Smart Pole
- Smart Lighting
- Solid Waste Management Services
- Intelligent Transport Management System
- City GIS Platform

It can be seamlessly integrated with additional city systems in the future including

- Municipal Corporations Call Center
- Municipal Corporations Services Portal
- Met Department
- City Application
- Water Management System
- Fire Brigade Control System
- Smart Parking
- Public Bike Sharing


Agra's ICCC is unique and innovative in a few different ways. Agra Smart City is a frontrunner in becoming the most spatially intelligent city in India, given the depth and coverage of its GIS system. Agra Smart City has implemented an enterprise GIS system linked with 12 departments and systems pertaining to the management of land, estate, disaster and emergency services, parks and gardens, water, sewerage, roads and traffic, stormwater drainage, streetlights and capital projects monitoring and control.Agra ICCC has showcased business process innovation by leveraging the command center technology, systems, and platforms as tools in convening multiple city departments to combat the COVID-19 pandemic with an integrated response. This approach of turning the ICCC into a war room, lauded as the "Agra Model", has been praised by Ministry of Housing and Urban Affairs (MoHUA) and showcased as an example by by the Ministry of Health and Family Welfare (MoHFW). The ICCC hardware and software was used in contact tracing, lockdown monitoring, crowd control, cluster heatmaps and containment, and facilitating essential and emergency services to citizens.

## Key Outputs

Agra ICCC brings together twelve city functions, and their associated edge hardware, sensors, software, and systems onto a common platform. Depending on the type of systems and functions, the monitoring and/or controlling from the Command Centre application, can be done with the option of sharing feed to another agency as required. The technology elements in Agra ICCC are:

- Use of cloud-based Data Centre Disaster Recovery (DC-DR) to host common command centre and save data related to common command centre applications,
- Cloud based DC-DR is designed to host common applications like integration layer, analytical layer, emergency management system, key management system, information and cyber security applications, etc. required for Command Centre Applications and ICCC working,
- Cloud based DC & DR is designed to receive information (ex: from the field devices) and send the information to the ICCC platform or visualization layer, and
- Use of comprehensive, agile, and resilient system of geospatial maps and enterprise GIS system and mobile applications. The city assets have been geo-tagged so that processes, tasks, status, and events can be geo-referenced.

Agra city has installed 790 fixed box and 326 pan-tilt-zoom (PTZ) cameras, 43 emergency panic buttons, 50 body worn police cameras, 48 upgradedUP Dial 100 vehicles, automatic number plate detection (ANPD) camera at 43 junctions, red light violation detection (RLVD) cameras at 31 locations, Adaptive Traffic Control Systems at 62 Junctions, and 39 Environmental Sensors. Solid Waste Management covers 35,00,000 households and 500 commercial establishments across 100 wards. Data from these systems comes to the ICCC for analytics, visualisations, alerts, and event triggers.

The data from all these systems and devices are providing real-time, comprehensive insights to city officials and enabling them to take decisions on ongoing city operations and future development plans.

## Key Impacts

Cities are complex, interconnected systems with complicated processes that can generate a lot of real time data about the performance and incidents in the city. Deriving insights from this data – both in real-time and over historical time period – is extremely challenging.

The ICCC system and software is being used by various city departments to monitor, manage, visualise, and optimise their operations. Interconnecting safety, security, mobility, disaster management, and other systems enables the city to function effectively as a cohesive entity. This has already been successfully demonstrated during the first wave of the COVID-19 pandemic where Agra was one of the pioneers in the country in using smart city ICCC technologies in response management.

Specific impacts of the Agra ICCC system are:

- Interconnected systems, data, and advanced analytics to address social, residential, commercial, and national threats
- Use of technology for an integrated and efficient control and management platform
- Ability to adopt a structured approach to handle incidents effectively and efficiently
- Effective replacement of legacy and manual systems with automated and hybrid processes
- Ongoing business process reengineering, training of leaders, and capacity building in city staff in managing the command centre
- Focus on safeguarding personal data
- Effective use of video wall via adequate training

Specifically, during the COVID-19 pandemic, ICCC technology was used for:

- Identification and management of hotpots and cluster containment using GIS systems. Agra deployed 1248 special teams to survey 9.3 lakh citizens and screen 1.65 lakh households.
- Monitoring lockdown safety, crowd control, and essential and emergency services delivery by coordination between traffic, police, city administration by coordination between traffic,

Police Department, city administration and officials for essential services such as water, electricity, sewage, and more.


## Replicability and Scalability

Agra ICCC is scalable and replicable. The platform is currently connecting twelve city departments and functions. Collectively, these solutions provide the following:

1. Actionable intelligence with in-depth insights on city operations and as-is scenarios
2. The PMS Suite presents real time video data to address real world challenges
3. Monitoring of last mile systems, processes, equipment, and staff. Specifically, with respect to health services management - the ICCC helps to monitor social distancing in queues, detects masks and identifies vehicles of interest, and
4. The suite helps authorities ensure compliance by citizens on traffic safety, use of masks, littering/spitting in public spaces, minimising adverse incidents including spread of the infectious diseases.

The platform is scalable within Agra to include newer systems and functions related to municipal operations, city services, digital payments, citizen awareness and engagement initiatives and more. The platform is easily replicable in other cities or regions and can be customized to include the unique input systems, features, analytics, and insights needed by those cities.

## Sustainability

Agra ICCC is a prime example of using city technology for effective management of services for citizens from all walks of life and to support the governance of city functions, services, vendors, and staff.

It meets the Sustainable Development Goals of the United Nations, specifically SDG 11 for creating sustainable cities and communities, with specific attention to SDG 10 to reduce inequalities by bringing in solutions such digital health kiosks, remote healthcare, digital classrooms, and digital skills development center to help the disadvantaged sections of society, and SDG 3 of creating healthy city ecosystem to benefit all citizens.

Given the penetration of digital technology in Agra department functions, and the use of ICCC to showcase success during the COVID-19 response management, the need and benefit of the ICCC has been firmly established amidst all stakeholders – administration, staff, vendors, citizens, and policymakers. This will ensure that the use of ICCC technologies will sustain, complemented by effective and ongoing training, change management, and capacity building.

The initial analytics and insight focus on governance and compliance related to city systems and services. As the solutions, analytics, and users mature, further insights can be derived to support preventive and predictive tasks, planning, inter-agency coordination, budgetary planning, and inform the future growth and development plans of the city. As this happens, the city will effectively move towards a data driven entity, and use data insights to manage events and use data trends to deliver better and improved city solutions, infrastructure, and services.

# Aligarh: Integrated ERP for Nagar Nigam

## Project Features

The integrated enterprise resource planning (ERP) project from Aligarh Smart City features the implementation of a GIS based survey to increase the tax collection base. The initiative has also led to improvement in traffic challan collection due to implementation of e-challan system. The integrated ERP uses variable messaging system (VMS) for advertising revenues. It also enables collection of user charges for solid waste collection by implementation of mobile application based usage charge collection application. The system has precipitated multiple tangible and intangible benefits by implementation of ICT based e-governance system.


## Key Outputs

With the advent of smart ICT initiatives and extensive door-to-door household survey in the municipal area tax collection base has increased manifolds. It was earlier assumed that the tax liable households in the municipal area were approximately 1.3 lakh, but this number was found to be over 2.7 lakh households after the development of GIS-based base map. This has greatly helped the administration in increasing the tax base which was missing earlier. After the lockdown due to COVID-19 , the online tax collection has increased to approximately Rs. 4.5 crores,which was just Rs. 30 lakhs during the same period in the year 2019.

## Key Impacts

The increase in revenues for the municipal corporation will be channelised into further development works in the city. The increase in municipal tax revenue through this part of the exercise has been over Rs. 4 crores.

## Replicability and Scalability

The supporting infrastructure of ICCC is designed in such a way that any future integration with the existing ICCC can easily be done.

## Sustainability

Implementation of Smart ICT initiatives will greatly improve the efficiency of the system, customer satisfaction, service delivery and grievance management which in turn will increase the tax collection and revenue from different sources. The project will become sustainable within its O&M period.

# Surat: Smart City Centre (SMAC Centre)

## Project Features

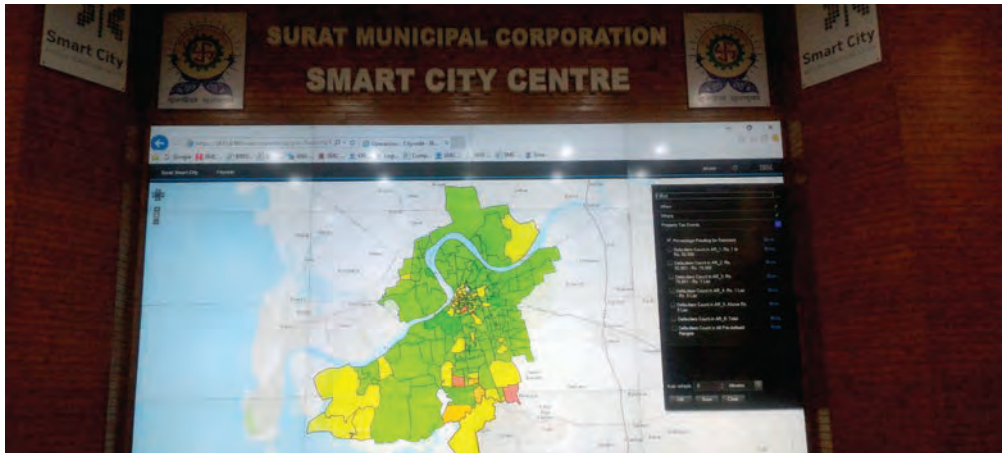
The Surat Smart City Centre (SMAC) is used for monitoring of various municipal functions like grievance redressal system, door-to-door garbage collection through vehicle tracking system, bus rapid transit system and city buses using intelligent transit management system etc.

Under the Safe City project undertaken by Surat city police in which Surat Municipal Corporation is a key partner, over 600 CCTV cameras have been installed at various critical locations across the city, which includes 550+ IP cameras and 25+ PTZ cameras covering over 100+ strategic locations. The feed of these cameras is used to monitor various municipal issues like road sweeping, night scraping and brushing, road repairing, water leakage / drainage overflow, and encroachments.

This system also enables defining of the key performance indicators (KPIs) for various departments, their periodicity, type of KPI, etc. It is flexible enough to capture data from any domain system. The captured KPIs can be graphically presented for ease of understanding. The KPI system provides flexibility to set different representation layouts for different sets of audience.

Going further, Surat envisages following advance components to enrich and embed within SMAC ecosystem

- **Digitise and Monitor:** It is envisaged that major departmental functions will be digitised either on standalone domain systems or through an enterprise-wide solution like ERP.
- **Smart Sensors:** It is envisaged that functions like fire and emergency, public safety, water quality, street light monitoring etc. will be automated.
- **Correlate data and advanced analytics:** It is envisaged that command and control centre solution will correlate data from different sensors and domain systems to provide analytics and reports which will be helpful in decision making.




## Key Outputs

The SMAC centre has achieved diverse goals towards civil infrastructure creation and IT infrastructure creation.

- **SMAC Centre Civil Infrastructure:** The SMAC centre has been constructed in the Head Quarter of Surat Municipal Corporation. The center encompasses the video wall, server room, operator seating space and meeting/conference room. The floor area of the SMAC Centre is 2100 sq.ft.


- **SMAC Centre IT Infrastructure (Hardware):** The hardware IT infrastructure of SMAC centre consists of the video wall, video controller, servers and desktops. SMAC centre video wall consists of 16 cubes. Each cube is 70 inch in size with DLP rear projection. The total size of video wall is 240 square feet. The servers housing the SMAC centre solution has been hosted at SMC's existing data centre.


- **SMAC Center IT Infrastructure (Software):** SMAC Center operates utilizing various domain systems.
- The IBM Intelligent Operations Centre (IOC), KPI monitoring system and domain systems are being used to monitor and manage operations.

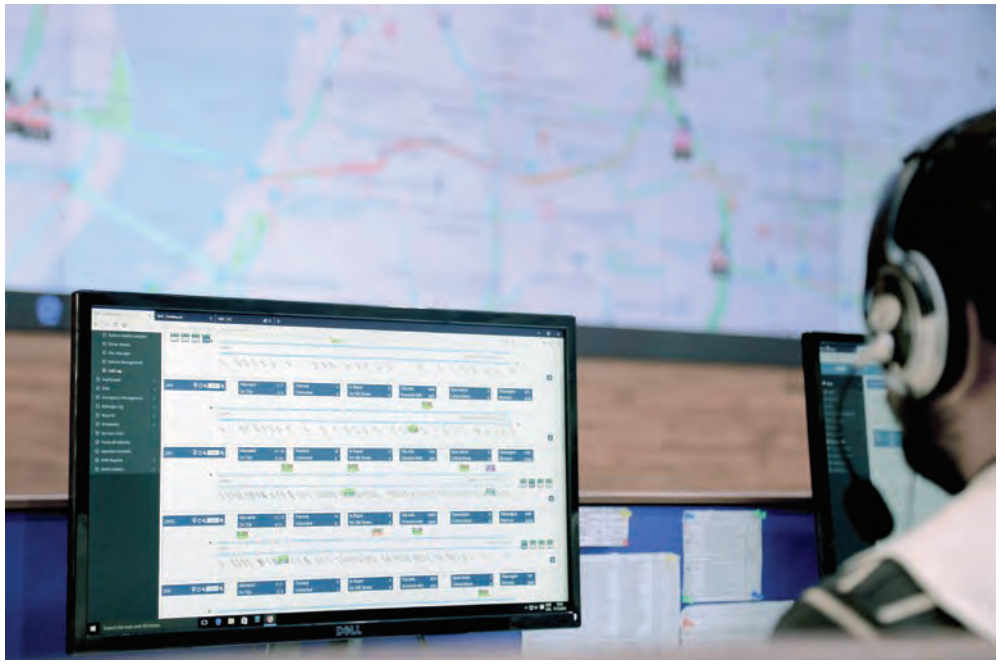
## Key Impacts


Surat Municipal Corporation's performance has been at the forefront among Indian cities in of sanitation, healthcare, financial performance, efficiency in revenue collection, investment in public infrastructure, execution of self-funded, and state central government funded schemes, and smart cities projects, affordable housing, and building an enabling environment for growing city economy, education and a plethora of mandatory and discretionary services suited to urban residents. The SMAC center is first of its kind for a municipal corporation in India. The system runs on IBM Intelligent Operation Centre (IOC). It collates data from various databases and helps in monitoring and resolving civic complaints promptly. The integration of CCTV system of Surat police with SMC's Command Centre is a classic example of multi-agency coordination which indicates that the same systems can be used for different purposes. For example, the police department uses CCTV cameras for law and enforcement while SMC uses the cameras for other administrative monitoring purposes. Various standard operating procedures (SOPs) have been prepared to ensure that outcome based activities are carried out from command center and the problems identified and resolved in due course of time.

SMAC Centre has been useful in monitoring the civic issues and complaints. The system enables proactive identification of issues rather than being reported by citizens. Better monitoring and follow-up of pending issues and complaints has helped provide better citizen satisfaction.

## Replicability and Scalability

Surat has added various domain systems in a phased manner for monitoring and management purposes from SMAC Center. It has been planned to first monitor the systems through domain application itself or through some intermediate application. SMC has implemented the IBM's IOC, integrating property tax, grievance redressal etc. IBM's IOC is capable and scalable for integration with other domain systems as well. The decision with regards to integrating different domain systems on IOC or similar master integration platform will be taken after evaluation of the cost benefit analysis for such integration.




The SMAC centre rides on availability of backend IT systems. Most of the urban local bodies (ULBs) have strong IT systems in place and are in process of augmenting and strengthening the IT systems under the Smart Cities Mission. The functioning of most of the ULBs are more or less similar in nature and availability of such an integrated command and control centre can be helpful to them.

## Sustainability

Surat has made dramatic improvements in providing basic amenities and services to the citizens to meet the best quality standards. SMC provides various services like health care, water supply, sewerage, solid waste management, fire and emergency response, ambulance, parks and gardens, swimming pools and sports facility, primary and secondary education, etc.

To cater to the city, a task force of more than 20,000 employees is in place. SMC's budget is more than Rs. 5000 crores. It is very important to monitor various service parameters and take corrective actions. The idea of creating SMAC centre was conceived with a view to establish a centre that helps inter-departmental coordination and enables monitoring of key business domains and service indicators. Since the overall aim of implementation of SMAC centre is to improve the quality of services and to provide a better decision-making platform, it is expected that savings through operational efficiency and citizen satisfaction will sustain the initiative in the future.

The purpose of issuing eChallan through SMAC centre is not primarily revenue generation, but also to bring awareness about cleanliness and awareness about not spitting in public. The revenue generated through such operation, however, also helps in sustaining the initiative.

# Social Aspects

## Varanasi: Disbursement of Benefits to Street Vendors

### Project Features

The project was launched on 1st of June, 2020 to help formalize street vendors and open up new opportunities to enable their upward mobility wherein entire funding is from Government of India. In an innovative and one of the first of its kind of projects in India, the online processing of vendor registrations and issuance of QR coded ID was done through mobile application and web-portal developed and managed by Varanasi Smart City Limited at Kashi Integrated Command and Control Centre (ICCC).

Registered vendors can submit the issued registration certificate and QR coded ID along with relevant documents including photographs to preferred financial/lending institutions such as nationalised/commercialised/co-operative banks for processing, sanctioning and disbursement of working capital loans, without any security deposits in a time-bound manner and with minimal paper work.

### Key Outputs

Street vending activity is a common practice in Indian cities. Typically, street vending is a low income generating activity. The holy city of Varanasi also has a number of informal street vendors in different parts of the city earning their livelihood. There were about 1,500 street vendors registered with Nagar Nigam in December 2019 who were not entitled to any additional benefits in any financial institutions or government schemes to help them advance. Under this project, the street vendors were registered and supported in receiving a working capital loan of upto Rs. 10,000/- through online processing of loan application.

Under the project, Varanasi Smart City Limited received 40,016 applications/SV data uploaded on PM SVANidhi Portal and 31,493 street vendors received registration certificates and QR coded IDs. After verification, 28,139 registered street vendors under Town Vending Committee were sanctioned a working capital loan of Rs. 10,000 in November 2020 out of which 21,755 street vendors received loan in their bank accounts under PM SVANidhi.

### Key Impacts

This project has helped unregistered street vendors secure recognition by municipal authorities and also opened avenues that make them eligible for associated benefits. Aside from working capital loans, they are also eligible to receive platforms and physical spaces allotted to them to conduct their business. Registered vendors can receive cash-backs/rewards/benefits up to Rs. 100 every month on digital transactions encouraging them to resort to digital modes of payment.

Registration of vendors made it easier for the city to engage their services for door-to-door deliveries of essential commodities to residents/citizens during the COVID-19 lockdown. This acted as an incentive to other vendors to join for registrations while affording benefits to the vendors.

Digital payment aggregators like NPCI, UPI, PayTM, Google Pay, BharatPay, PhonePe and other payment aggregators have helped in imparting financial literacy among the street vendors, encouraging their onboarding onto digital payment platforms. Steps taken to capacity build and train street vendors to conduct e-commerce and obtain necessary quality certificates form concerned agencies like FSSAI etc. has upskilled the participating vendors to be future ready.

## Replicability and Scalability

The remarkable success of the project in urban areas of Varanasi, can just as easily be replicated/scaled to adjoining rural areas of Varanasi city, Varanasi district and in other cities of the country. The scaling of this project is a social and economic necessity for the whole nation.

## Sustainability

The project focuses on providing financial assistance to formalise the street vendors and open up new opportunities for them to move up the economic ladder using e-commerce, digital payment processes and associated monthly rewards. It helps vendors for easy repayment of working capital loans. The incentives associated with registration help vendors access low-cost finance, vending spaces and upgrades, and the city benefits from being able to organize a sector which is largely informal and therefore, difficult to plan for and manage. The project is mutually beneficial to both stakeholders which is likely to ensure its sustainability.

# Tumakuru: Digital Nerve Centre

## Project Features

The Digital Nerve Centre DiNC in Tumakuru Smart City is based on the concept of providing healthcare through sub-centers and primary health care centres for all minor health ailments in a 'Primary Healthcare Centre (PHC) first approach'. patient care coordinators (PCCs), clinicians and medical experts have been deployed at healthcare units. The centre has a virtual network of synchronous and asynchronous solutions. A remote patient consultation system under local medical supervision through specialists stationed at the tertiary health units (THU) is established. Consultation at THUs has been enabled by real-time communication between doctors, patients and healthcare units. Patients are referred to the THUs through a triaging service by medical experts to enable care seekers at the primary care level.

The DiNC has digitised patient health data (structured and unstructured) into a Centralised Data Repository (CDR). This enables a single click view of patient history. The DiNC also augments non-communicable diseases (NCD) identification and care coordination, mother-child care and coordination (MC3) and end to end mental healthcare coordination.

DiNC assisted patient centric healthcare needs are met through phygital means through follow ups and reminders. Patient tracking and guiding system helps guide treatments especially long-term treatments such as cancer. The DiNC provides preventive care in the form of mandatory assessment of citizens aged 30 years and above for oral cancer, hypertension and diabetes mellitus, while women also undergo thorough cervical and breast cancer screening. The health workers undergo digital training on DiNC and healthcare service (Asha) applications.

## Key Outputs

The introduction of DiNC has increased utilisation of Primary Healthcare Centres (PHCs) and reduced patient movement to the district hospital. It has reduced patient wait time and ensured proper delivery of healthcare services. Digitisation of health services has eased post-consultation care with minimal travel and cost burden. It also enables effective communication through all channels of healthcare delivery and monitoring of the healthcare delivery through dashboards and reports. Maintaining patient history, structured and unstructured data on patient consultations has led to an increase in planned visits leading to optimal use of resources and infrastructure.


Provisions of programmes programmes and schemes such as Ayushman Bharat are better utilised with the DiNC coming into operation. The robust referral care has ensured that the right treatment is provided through the appropriate healthcare facility. This, in addition to the intensive use of the virtual environment for consultations has taken the pressure off health care facilities. The medical workforce can thus give undivided attention to cases which need it most. Irrespective of the severity of the disease, digitisation of healthcare in Tumakuru Smart City provides assured and quick access to doctors and health services to all citizens.

Patients, especially diabetics, cancer patients and expectant mothers have revealed that the appointment booking and alert service by DiNC has helped them immensely in maintaining their treatment - helping with booking and reminders of follow-up consultation / diagnostic schedule.

With the mechanism to monitor and track patient/population health with ease, healthcare in the city is progressing from curative to preventive care.

## Key Impacts

The key outcomes of the project are as follows:

- A Known Citizen Drive conducted to spread awareness about DiNC has reached 3,77,341 citizens, which is 100% of the city's population and covers 30% persons across the district,
- 3 lakh citizens are availing DiNC. They are now part of the digital healthcare umbrella,
- 4,000 expectant mothers have been care coordinated via DiNC, Kolar,
- 20,000 patients have benefitted from DiNC's pre-planned visits at healthcare facilities,
- 8,000 medical queries / 2300+ non-medical queries have already been addressed by DiNC,
- 35,000 NCD patients have been screened, of which 2,772 tested positive and care coordinated,

- 9,000 cases of care coordination have been done through DiNC Centre,
- 2,100 patients have been referred to TH/PHC/SC enabling load reduction at TH and optimal utilisation of PHCs, and
- 149 people have been recruited from local community – giving boost to employment.

## Replicability and Scalability

DiNC is bringing visibility to Tumakuru Smart City. Digitisationof patient history is easily scalable and will be scaled to the whole district. Apart from Kolar, DiNC enabled PHC is currently underway in four districts of Telangana and in two districts of Himachal Pradesh.

DiNC helps the care seekers and the healthcare system interact with each other through a digital system. This will serve as a stepping stone for Karnataka government to follow through with its desire of creating a health information network.

In terms of addition of new services, the scope of services has been scaled up to include Adolescent Reproductive and Sexual Health (ARSH), Rashtriya Bal Swasthya Karyakram (RBSK) and counseling services for mental health care.

## Sustainability

DiNC is a sustainable and scalable solution. It works in tandem with the existing ecosystem and establishes cooperation amongst the different stakeholders to create an integrated and engaged PHS. DiNC, creates a much-needed synergy, not only between specialist care, tertiary care and primary care, but also different departments such as IT and telecom.

Accompanied by a comprehensive communication and messaging programme, which includes a change management, and a training and engagement system covering all the stakeholders, DiNC changes the very perspective of healthcare service from doctors and patients to healthcare workers and administrators, thereby instituting a sustainable and replicable model of change in healthcare.

DiNC has also been facilitating tertiary care for the top four Indian cancer hospitals. The State Cancer Institute, Assam has also roped in DiNC to help manage cancer treatment for those living under its shadow, having little or no access to medical help. DiNC will also be part of the nineteen cancer hospitals and sub hospitals that are being setup by the TATA Trust in Assam.

# Tumakuru: Smart Poles

## Project Features

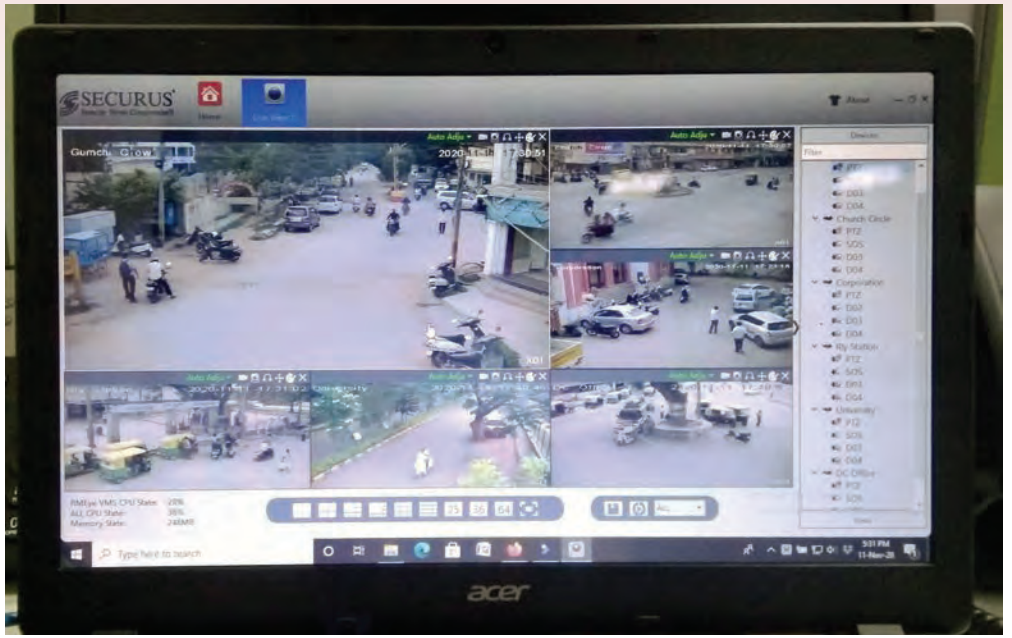
The smart pole is an integrated technology and single point solution to facilitate ease of living and efficient urban service delivery for citizens. Smart poles are installed at six different locations in Tumakuru city. The smart pole installed at Tumakuru University provides free Wi-Fi for internet accessibility and has CCTV managed and controlled surveillance. The smart

pole at Gumchi Circle has an in-built electric vehicle (EV) charger and a mobile charging point.

The smart poles have been installed with a smart display on the double sided outdoor LED screens to show information of public importance. Other smart elements integrated into the smart poles include dimmable LED streetlights, air quality sensors, PTZ cameras, and panic buttons. For scalability, a micro services architecture has been used and REST APIs have been incorporated for integration with the command and control centre. The poles use artificial intelligence and machine learning for advanced video analytics for face recognition and number plate capturing in the command center.

This project is an innovative digital solution to/for:

- Public safety
- Emergency announcement (PAS)
- Monitoring criminal activities
- Environment monitoring (pollution, noise, weather)
- Reduction of energy and maintenance cost (solar energy)




## Key Outputs

This project has many tangible benefits for the citizens. The PAS system has been used to make close to 5,000 announcements per month. The variable message display is similarly used approximately 36 times in a month for public information display. There are about 50 users of public Wi-Fi daily of which 22% are repeat users. Smart pole LED streetlights have helped conserve 540 KWh energy per month since installation.

## Key Impacts

Tumakuru Smart City has improved energy efficiency, lowered operational costs (energy cost savings of approximately 60%) by installing LED lights in the smart poles, enabled remote lighting management and control, resulting in improved citizen safety. The six smart poles can be remotely managed. Smart displays installed in the smart poles also help in disseminating public information. Emergency messages from district authorities and the Police Department can also be flashed onto the display screens remotely. Emergency/panic buttons are provided for additional safety for citizens in distress to talk to the control room.

The manpower requirement in the maintenance of smart poles is lower due to the advantage of remote detection. Free public wi-fi is used by vegetable vendors, passengers form railway station, bus station and neighboring shops and commercial establishments, and students.



The digital sign boards have been enabled to display important messages which was proved efficient during COVID-19 pandemic. The environmental sensors at two locations provided continuous data on air quality-predictive analysis. The CCTV cameras installed on smart poles have helped Tumakuru Police in crowd management during the lockdown in 2020.

## Replicability and Scalability

The project will be replicated along smart roads in Tumakuru in Phase II of implementation. In Phase II, fifty smart poles covering all important junctions will be installed. The project is expected to deliver bundled smart services to the citizens while maximising the value for money of the services provided by the city authorities. The project will foster a secure and safe environment to the citizens of Tumakuru while simultaneously making the city attractive in terms of service delivery.

## Sustainability

Smart poles can help bring together the functions overseen by different municipal authorities like municipal corporations, police, emergency responders and healthcare services to bring their services to the doorsteps of citizens. With such overarching functionality, this project and others that bring technology into urban service delivery will not only be sustainable but indispensable to municipal governance.

# Sanitation

## Indore: Bio CNG Plant

### Project Features

Indore initiated various innovative waste management processes and technologies under Swachh Bharat Mission (SBM) in the year 2015-16. It introduced the concept of decentralized processing of segregated organic waste collected from bulk waste generators and individual households on daily basis. The objective of this unique project was to create synergy between two central programmes - Swachh Bharat Mission and the Smart Cities Mission. Indore Smart City under public-private partnership of promoting decentralized treatment of organic waste established two Bio-methanation plants of 20 and 15 TPD capacity.

Biomethanation is a process that is accepted globally because its product, biogas, offers a subsitute for fossil energy. Compared to fossil fuels, biogas combustion releases lower methane emissions and is produced from cleaner processes. Since, the biogas plant is a closed system and treated materials are not in contact with the atmosphere, the typical negative effects on neighbourhoods are minimized.

Biomethanation process releases a mixture of methane, $CO_2$ and $SO_2$. For the first time in India, Indore Smart City came up with the concept of generating Bio CNG from this mixture of gas. To produce 95% pure Bio CNG, Indore Municipal Corporation decided to set up gas separation, cleaning and compressing 95% pure methane at 210 bar pressure and filling it in gas cylinders. Bio CNG dispensing station was also set up at this facility for fueling the public transportation buses of Atal Indore Corporation. The digestate biomass is converted into compost, manure, NPK rich organic fertiliser and used for organic farming. These plants are set on PPP mode and viability gap funding (VGF) for the installation of these plants has been carried out by Indore Smart City Development Limited. Today, 15 buses in Indore are running on the Bio CNG and consuming nearly 1500 kg of Bio CNG per day and running more than 2000 km per day.

## Key Outputs

The project leverages synergies between government programmes and an important urban service i.e. public transport. Both these plants have been established on PPP mode wherein 50% VGF is provided by Indore Smart City Development Limited and the remaining 50% is invested by the PPP partners. The following benefits are accrued as a result:

- Close to 100% segregated organic fraction of MSW is processed at Bio CNG facilities.
- 12,000+ tons of organic waste treated scientifically every year
- 500+ tons of Bio CNG/CBG generated every year as fuel for AICTSL buses
- 1,200+ tons of high-quality by-product in the form of digestate bio-manure is produced every year
- 35,000 carbon credit accrued

## Key Outcomes

The bio-methanation plant is a zero-discharge plant. This approach of looking at waste is unique and beneficial to society at large. The plant is producing Bio CNG and rich quality organic fertilizer out of degradable organic waste. This innovation which provides green and cheap energy and an organic by-product, is a true example of a circular economy.

The waste can be decomposed in scientific manner only, hence the sentence is redundant in agriculture. The by-products of the exercise are utilized by the public transport system and in farming. One ton of processed food waste produces 1200 kWh biogas energy, which is enough fuel to drive a gas fueled car for 1,900 km

## Replicability and Scalability

This initiative is scalable and can be replicated in other cities. The flexibility of the Bio-CNG plant and its ability to digest a multitude of organic feedstock, while producing a significant range of products ensures the role of biogas in the circular economy.

After the successful implementation of the two unique and innovative models at Choithram Mandi (20TPD) and Kabitkhedi (15TPD), Indore Smart City has now decided to install a plant of 500 TPD work which is in progress. The project will be implemented through a 100% PPP model where the concessioner will pay a premium of Rs. 2.52 Cr. per annum to Indore Smart City.


## Sustainability

The methane gas generated from the waste is converted into CNG gas by a unit which is setup within the plant. This ensures the financial viability of the project while also enabling the company to provide gas at a cost of Rs. 5 per litre lesser than the market price and supplies it to the city transport company which is owned by the Municipal Corporation. Atal Indore City Transport Services Ltd. is provided the fuel at a lesser cost to incentivize usage of green fuel.

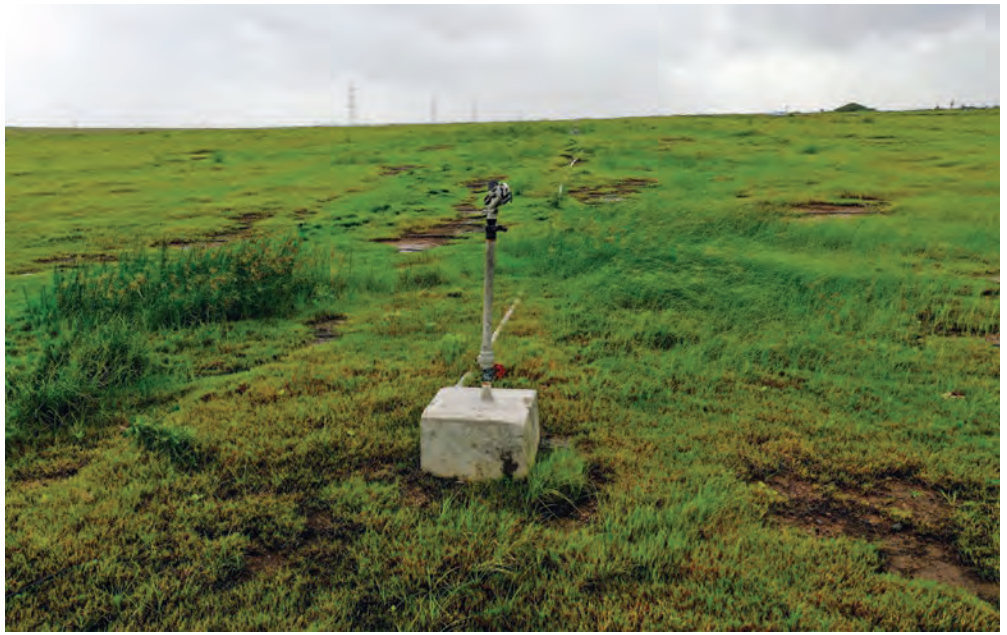
# Surat: Ecological Park

## Project Features

The 85-acre ecological park developed under this project is part of 151 acres of land previously used as a crude dumping ground. The project envisages land reclamation of about 66 acres. In addition, a provision has been made for the collection of methane gas by constructing a grid of perforated PVC pipe on a layer of gravel. In order to avoid exposure of rainwater and to prevent contamination of underground water reservoirs, HDPE liner along with eight leachate collection wells has also been provided.

## Key Outputs

The project is a park with multiple uses, transformed from what was previously a dumping ground. It now has various facilities like a 3.0-meter width surrounding inspection road, a 2 km cycle track and security cabin. Secondary treated wastewater from the nearby sewage treatment plant has been utilized for maintenance and gardening purposes. The project was completed in 18 months with an approximate cost of Rs 60.50 Crore.



## Key Impacts

Frequent burning of crude dumping was not only creating an unpleasant space in the city but also air pollution. The land transformation under this project has reduced approximately 20% of the air in the vicinity in which the park is situated. The development of ecological park has increased the green cover area of the Surat city by 0.2%. This ecological park now serves as a recreational area for various activities and has a direct positive impact on the liveability of the smart city.

## Replicability and Scalability

The project can be replicated and scaled towards tansforming similar existing landfill or open dumping sites. While analysing the crude dumping, Surat Municipal Corporation found that most fractions of waste were non-biodegradable and non-recyclable, This was because waste collected from the flooded areas was also dumped in this dumped site past 20 years. What makes the project viable is unclear in this line, it consists of half information only stating the comparison to the other projects

## Sustainability

The minimal operation and maintenance cost of project makes it more viable in comparison to the bio mining procedure which is costly and unsuitable for managing non-biodegradable waste dumping site. The developed site can be used for public recreational purposes under the proposed DREAM City Project of Surat making the project self-sustainable.

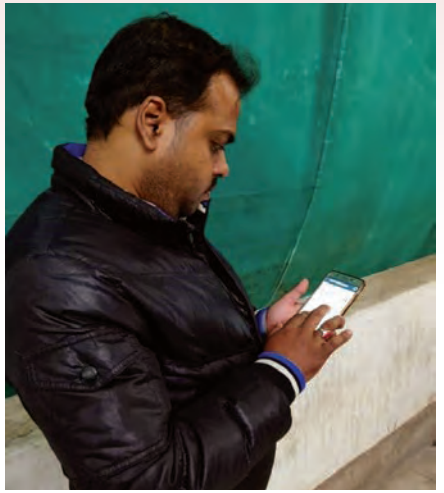
# Varanasi: Kashi Solid Waste Management System

## Project Features

Varanasi Smart City's efficient solid waste management techniques uses smart intervention like RFID tagging of bins, RFID readers on vehicles and handheld readers, volume sensors in the bins, GPS tracked vehicles of Municipal Corporations, Supervisory Modules, Attendance Management Systems, Grievance Redressals Mechanisms through escalation matrices, etc.


## Key Outputs

The solid waste module under the smart city initiatives through this project has improved the monitoring, supervisory roles and attendance mechanisms towards the operations of Municipal Corporation impactfully. The attendance monitoring is linked with the regular wages and income of the workers and henceforth the citizen grievance redressals have efficient closures. The vehicle movement is being tracked efficiently and the supervisors are in better operational connections with the vehicles on road through the mobile application.



## Key Impacts

The project has made the benefits of the time-saving parameters apparent developed to achieve the cleanliness objectives apparent to all stakeholders. Stakeholders include supervisors who monitor operations and attendance, workers who carry out operations, Municipal Corporation/KICCC officials handling citizen grievance, and drivers. These outcomes in turn is also improving the performance of the municipal services. The project has resulted in fuel saving by 24%, achieved minimal overflow at bins and secondary collection points, and reduction incitizen complaints by 37%.

## Replicability and Scalability

The solution is devised in such a way that there are no limitations set for adding physical devices i.e. GPS, biometric attendance device, RFID tags and readers etc making the solution extremely scalable. As far as the replicablity is concerned, the solution has been well designed, tested, fine-tuned and now well established into a mature model. The solution can be easily replicated in other Indian cities with the assistance of Varanasi Smart City, if required.

## Sustainability

The project is designed to be sustained via revenue generation methodologies adopted under various other components of Integrated Solutions and other projects of Varanasi Smart City. This mainly includes the data monetisation approach, and e-Governance and e-Commerce services offered to citizens.

This solid waste management (SWM) project has been taken up for the Indian Urban Data Exchange (IUDX) project for which the pilot is under implementation. Publishing the SWM data in the IUDX platform provides the opportunity to commericialise the data from potential agencies like SWM operators, organic waste to manure manufacturing agencies etc. This will help in developing a revenue stream which can be ploughed back to meet the operational cost of the project.


# Urban Environment

## Surat: Wind Energy for Water Supply

### Project Features

Surat was declared "solar city" in 2011, by the Ministry of New and Renewable Energy (MNRE), Government of India along with 60 cities across India. Moreover, to develop Surat as a "solar city", a "solar city master plan" was also prepared which later in October 2013 was approved by MNRE.

Surat Municipal Corporation had planned for installation of wind power plants to minimise the electricity consumption of water supply system. The electricity consumption of Surat's water supply system is more than half of the electricity consumed by entire Surat Municipal Corporation even after various energy conservation measures. A detailed study concluded that running water treatment plants on natural gas-based power plant would not be feasible due to lower plant load factor (≈ 40%). In the effort of making corporation's water supply service economical, sustainable and renewable energy based; installation of wind power plant was chosen as an alternative. To meet the electricity requirement for the water supply system of the smart city area, SSCDL planned to install 2.1 MW of wind power plant.

With the addition of this 2.1 MW plant, Surat has installed a total of 32.4 MW of wind power plants for making water supply and sewage system self-sustainable.

### Key Outputs

Surat Municipal Corporation, through the "Wheeling of Power" mechanism as per "Gujarat State Wind Power Policy 2016", "Gujarat Solar Tariff Order No. of 2016", has installed wind power plants in the coastal region of Gujarat. The power generated from this 2.1 MW plant is used for powering the smart city area through the "Wheeling of Power" mechanism. This has made Surat Smart City the first smart city to instal wind power plant for minimising the conventional usage of electricity in smart city area. The electricity drawn from the state electricity grid through the regional distribution electricity utility is presently at an average tariff of 6.6 Rs. /kWh regulated by the Gujarat Electricity Regulatory Commission (GERC). With the help of the electricity wheeled by the 32.4 MW wind power plants including 2.1 MW of wind power plant for smart city area, SMC is able to generate 71.89 GWh electricity from wind plants and which results in saving of Rs. 47.45 crores per annum in power supply.

Thus, the project has helped in reducing the operations cost of water supply in the city which has in turn helped the municipal corporation to direct funds to make technological and operational improvements for increasing water supply network and efficiencies.

### Key Impacts

The Guidelines for Improving Water-Use-Efficiency issued by the Ministry of Jal Shakti (MoJS) in 2014 states that almost 40-50% of the operations and maintenance costs of water management in any given area is incurred as the cost of electricity. In Surat, electricity costs formed 60% of the total O&M costs annually. The electricity was earlier drawn from the state electricity grid through the regional distribution electricity utility at an average tariff of 6.6 Rs. /kWh regulated by the Gujarat Electricity Regulatory Commission (GERC). With the help of the electricity wheeled by the 32.4 MW wind power plants located in different location in the state of Gujarat, SMC was able to save Rs. 47.45 crores/annum in power supply.

As a direct benefit, there has been no drastic rise in production cost for water supply operations. The O&M costs of water supply has been reduced to Rs. 3.57/KL from Rs. 4.37 / KL.

Having implemented the wind power plants for water supply operations, the share of electricity expenditure has been brought down from 60% to 54.38%.

Further, the recurring electricity generated from 32.4 MW of wind plants is 71.89 GWh/annum and the recurring saving in electricity bills from 32.4 MW of wind power plants is Rs 47.45 crores/annum. This project will help reduce the $CO_2$ emission by 60,297 tonnes per annum.

## Replicability and Scalability

Surat started installation of wind power plants in the year 2010. The first wind power plant with a capacity of 3 MW was installed at Adodar, District in Porbandar. Since then another 8.4 MW capacity wind plant was installed at Bhanvad in Jamnagar, a 6.3 MW capacity of wind plant at Ratdi in Porbandar.

As part of long-term planning, Surat Municipal Corporation has decided to achieve the target of taking the capacity of wind power plant from 32.4 MW to 40.8 MW by 2021-22. Surat has provided full support to Ahmedabad Municipal Corporation for installation of their first wind 4.2 MW wind power plant, starting from feasibility to commissioning. The project is already being replicate in other parts of Gujarat and can be scaled upto other coastal areas in the rest of the country.

## Sustainability

Savings in O&M cost for water supply by using wind power is over Rs. 9 lakh daily. This saving is from reduction of the cost of transmitting and distributing 276.44 MLD of water per day.

The reduction of O&M costs from Rs. 4.37 per KL to Rs. 3.57 per KL of in 2018 resulting from the partial switch to use of wind energy is Rs. Rs. 0.80. It is safe to state that the financial sustainability of the water supply system in Surat is improved by 40% through this project.

# NDMC: Digital Interactive Panels

## Project Features

NDMC Smart City Limited has setup 50 high resolution 55-inch display panels with a network of 50 public Wi-Fi hotspots that are networked to convey public messaging from the NDMC control room through a public-private partnership (PPP) model. Each unit has eight mobile charging ports that enable charging of 400 smartphones at a time across the entire networkConnaught Place. The infrastructure setup at the heart of Connaught Place in New Delhiprovides free internet connectivity throughout the area. The digital screens setup around the corridor at strategic locations provide effective messaging of public messages regarding social distancing, sanitation measures during COVID-19 and also other important information of public relevance such as real time Air Quality Index. Large numbers of people visit Connaught Place daily which makes it an ideal location for convergence of such nature.

Owing to its location, the project is built not only to inform but to also engage and entertain. One such activity promoted by NDMC smart city is “Mask Fie” – a type of ‘selfie’ where participants are to upload their selfie with their masks on to promote the good practice through their Twitter handle. The entry with highest likes is displayed on the screens to promote usage of masks during the COVID-19 pandemic.


## Key Outputs

Every day about 600 people log into the free Wi-Fi Hotspot service and the digital screens. Thousands of people visiting Connaught Place uses free mobile charging facilities installed in these Digital Panels.

## Key Impacts

The network of digital screens serves as an effective communication platform for NDMC which guarantees connectivity to the multitudes who visit Connaught Place, which is the heart of commerce, shopping and dining for the city of Delhi. The communication infrastructure ensures synchronized communication throughout the area. The control room wirelessly pushes messaging content over the internet and the network plays the content on all screens at pre-programmed time.Information regarding Air Quality Index (AQI) count shown in real time provides invaluable assistance to pedestrians to seek remedial actions such as wearing PM 2.5 masks or avoiding exposure all together, this information would not be available to general public instantly, thus the infrastructure provides invaluable health benefits to the city at the same time. The control software can automatically poll the real time AQI readings of all the AQI readers installed in the city and display them for public to know the AQI index of their area. Along with this, Twitter handles of Delhi Police Commissioner, NDMC commissioner can be programmed to beam the tweets on the digital panels for a centralised public addressal communication.


## Replicability and Scalability

The project can be rapidly scaled to cover the entire city as only digital screens need to be installed at strategic locations and the messaging is beamed from the control room. The screens can be grouped area-wise and specific information to each area can be indepedently and automatically displayed. The miniature Wi-Fi hotspots serve as a cost effective and scalable way for providing free wi-fi infrastructure in cities. Mobile charging points can be installed with additional screens which is very widely used by public as well as foreign tourists.

## Sustainability

The digital screens being electronic communication media, provides for eco-friendly communication without any paper trial and printing needs. Public Wi-Fi serves to make internet accessible, a means to enable local commerce. Project, investment is done by the concessionaire i.e. M/s. Signpost. All running expenses are also the responsibility of the concessionaire. In addition, the concessionaire gives fix revenue to NDMC every month for each digital screen. Financially, it is a self-sustainable project.



# Chandigarh: Subway from Sector 17 to Rose Garden

## Project Features

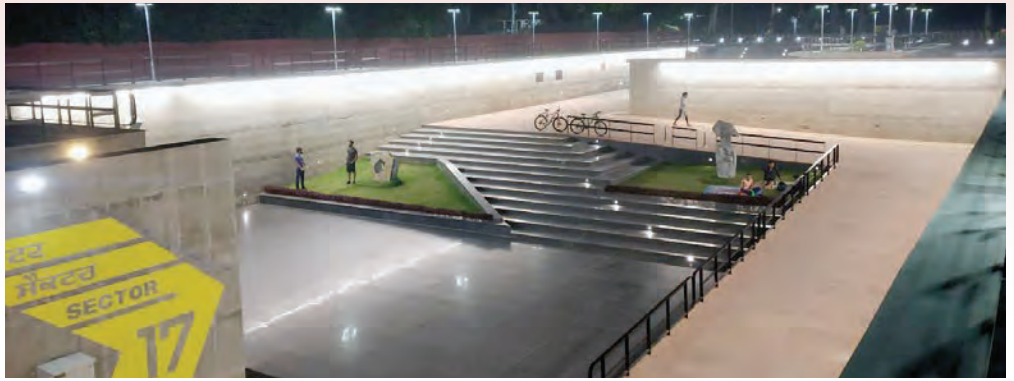
Historically, Chandigarh has been a proponent of prioritising pedestrianisation. In line with this long-established goal, a unique concept was envisaged to connect the central plaza of the Central Business District (CBD) in Sector 17 to one of the city's main attractions i.e. the Rose Garden in Sector 16. This project to enables seamless connectivity on foot for the citizens without approaching the main roads. A first of many, the subway connecting two sectors has been playing a pivotal role in promoting placemaking activities such as karaoke, yoga, music, skateboarding for users. The project also promotes safety for pedestrians with ample lighting along the stretch which makes it an aesthetic element as well as a functional one. The subway has become a hub of social and cultural activities. The subway is used as an art gallery, performing and visual arts events are carried out here and often people can be spotted here practicing dance. Apart from this, the space is not only conducive for yoga but also for sport activities such as cycling, skating and board skiing.

## Key Outputs

Development of the subway has had a direct impact on the numbers of visitors to both Sector 17 and the Rose Garden. The lighting and music of the space created lends it a relaxing and an eye-catching ambience which attracts citizens to the sub-way and incentivizes them to walk than traverse the distance in their private vehicles. The presence of artistic works makes the subway a public place, much more than just a mobility corridor.

## Key Impacts

The number of visitors to the Rose Garden have increased by 50% since the establishment of the subway, increasing footfalls from Sector 17. This area is now a public space that provides a stage to the artists to display their craft in visual and performance art events daily. The design of the subway not only allows mobility through walking and cycling, but also provides a space for various art and games forms.




## Replicability and Scalability

The project can be replicated anywhere in the form of heritage circuit development projects. Similar projects are further planned for providing connectivity from Sector 17 to Sector 9 and from Sector 17 to Sector 18.

## Sustainability

The projects in itself is non-polluting. It promotes pedestrianization while connecting two important heritage places. Going by its usage and popularity, the project has gathered significant social value among the citizens. As more and more people use such infrastructure, cities will have reduced dependence on fuel consumption, which can be further invested in newer avenues resulting in economic development.

# Water

## Jabalpur: Rainwater Harvesting (RWH) System

### Project Features

Jabalpur's rainwater harvesting systems have employed simple and effective methods to meet a municipality's stormwater management program requirements of individual properties. Rainwater harvesting can reduce stormwater runoff from a property.

The elimination of runoff can reduce contamination of surface water with pesticides, sediment, metals, and fertilizers. By reducing stormwater runoff, rainwater harvesting can reduce a storm's peak flow volume and velocity in local creeks, streams, and rivers, thereby reducing the potential for streambank erosion. Among the several factors that influence the rainwater harvesting potential of a site, eco-climatic conditions and the catchment characteristics are considered to be the most important.

The rainwater harvesting project in Jabalpur Smart City has the following specifications:

- Modular Crosswave Technology,
- Pre-filter chamber,
- 5-sided percolation,
- Load bearing structure,
- Added geotextile filter,
- Pit size for the effective holding volume only 20 CuM (eg), and
- Backfill with Soil – Non time consuming.

## Key Outputs

The total amount of water that is received in the form of rainfall over an area is called the rainwater endowment of that area. Out of this, the amount that can be effectively harvested is called the water harvesting potential. JSCL has conserved an ample amount of water this year as we were successful to harvest 1350cum of water. This capacity will able to cater the rainfall of approx. 30 acre of land.

JSCLhas implemented the RWH in 13 locations, among which, the prominent locations are LNY school, Ranjhi, water treatment plant (WTP) Ranjhi, MR4 Road, ISBT, Madan Mahal, Primary School Tamarhai, Vitnary college, a polytechnic college etc. The team analyzed the data of precipitation in different areas to evaluate the availability of rainwater for harvesting considering the runoff. The locations were selected strategically to increase the ground water table of the areas which are facing water scarcity and also to cater the water logging issues.

## Key Impacts

The strategic location of water shortage areas is now improving because RWH system. After the rainy season the water table of nearest borewells are increased by 30% to 40%.

The issues of water logging have also been resolved after the implementation of rainwater harvesting system. The additional water from the water treatment plant in Ranjhi and the surface runoff from MR4 roads is also being harvested through this system.

## Replicability and Scalability

RWH may be an effective alternative solution to face water scarcity. Though functional only for a duration of the year, RWH, is is a useful secondary source of water. Rainwater harvesting system is itself a very vast and important project which has a number of techniques. Rainwater harvesting systems can be built anywhere and scaled up across the country. Even The system can be upgraded with components used in the Jabalpur RHS even after implementation.

The installation of additional components is easy due to the modular design of the system. system. The heavy load carrying capacity of the modular design also allows for addition of components to an existing underground rainwater harvesting system to be implemented in places where there is vehicular traffic or other activities on the ground surface.

## Sustainability

The Jabalpur rainwater harvesting system uses simple technologies that are inexpensive and easy to maintain. The system can be easily retrofitted to an existing structure. This system is very flexible and allows for expansion, reconfiguration, or relocation, if necessary. It can provide an excellent back-up source of water for emergencies as well as for daily use. With advanced technologies such as employed by the Jabalpur RWH system, wastewater can be purified to the extent that it can be used as potable water.

# Tumakuru: 24x7 Water Supply

## Project Features

The main source of water supply to Tumakuru City is the Hemavathi canal. 1.135 TMC of Hemavathi canal water has been allotted to Tumakuru city. Due to insufficient capacity of drinking water storage reservoirs, it was not possible to utilize the allotted water to the possible extent. The idea of utilizing the existing Tumakuru Amanikere tank having a capacity of 172.39 mc ft for drinking water storage is innovative and economical as it avoids the acquisition of huge extent of lands required for creation of new storage reservoir. Tumakuru Smart City Limited has funded the project of filling Tumakuru Amanikere tank, involving the construction of a 14m x 12m size housing chamber with foot bridge at Bugudanahalli tank, and laying a 914 mm diameter rising main from proposed housing chamber to Amanikere for a length of 6 km. The project also includes the supply, erection, electrification and commissioning of 335 HP capacity pumping machineries in order to pump water from Bugudanahalli tank to Tumakuru Amanikere.

## Key Outputs

Tumakuru Amanikere has a capacity of 172.39 mc ft. This tank was proposed to be filled in a period of 90 days by continuous pumping of water from the housing chamber at Bugudanahalli tank. Accordingly, the infrastructure has been created for pumping 54.22 ML(1.91 Mcft) of water daily by running two 335 HP capacity pump sets for 20 hours a day. The execution of this project has facilitated pumping of 54.22 ML(1.91 Mcft) Hemavathi canal water to an additional drinking water storage reservoir. This impounded water is proposed to be utilized for drinking purpose during summer season when the water in Bugudanahalli tank, which is the main drinking water storage reservoir of Tumakuru City is depleted.

The raw water impounded in Tumakuru Amanikere is proposed to be pumped to an existing 50 MLD capacity water treatment plant in PNR Palya, which after treatment, will be supplied to the city through existing distribution system.

## Key Impacts

The creation of additional drinking water storage reservoir will meet the water supply needs during the summer season through recharging of ground water in the areas surrounding the tank. The storage of water in Tumakuru Amanikere tank supports the growth of aquatic life.

The water filled Tumakuru Amanikere tank located in the heart of the city also lends an aesthetic quality to the city.

## Replicability and Scalability

This type of project can be proposed in cities/towns where there is availability of surface water and a lack of shortage reservoirs/space. The project is being replicated in the southern areas of Tumakuru surrounding Maralur lake.

## Sustainability

The idea of utilising the existing tank in the city to meet the drinking water needs fits the concept of sustainability. The infrastructure created for pumping water to the tank assures filling of the tank every year.

# New Town Kolkata: Solar Power Pumping Sets

## Project Features

New Town Kolkata has several public gardens, for the maintenance of which water needs to be brought from distant sources through pipes. To ensure effective and easy watering of these gardens, tube wells with solar pumping stations close to these gardens have been set up.

six solar pumping stations have been set up in six gardens in New Town's Eco Park, and each pumping station is a self-sustaining, off-grid system that is solar powered and does not have any external dependence on the grid. Each pumping station has a solar panel to trap solar energy. Further, the pumping station has a provision for storing the trapped solar power, which is then used to pump the ground water into the reservoir, from which water is taken out through tube well, as and when required, for watering the gardens where they have been set up.

## Key Outputs

This is a low-cost intervention, which adequately waters six large public gardens, and requires a lean workforce. Moreover, no dependence on grid or external power source and connections, makes this intervention an economically viable one. Also, by using water from these tube wells, the use of costly treated water is reduced.

Also, it eliminates the cost of setting up elaborate networks of pipes for bringing water to the gardens from distant sources.

## Key Impacts

In keeping with New Town's commitment towards environment, the intervention under discussion is a completely eco-friendly one. Solar energy is an alternative for fossil fuels as it is non-polluting, clean, reliable and renewable source of energy, and hence leveraging of solar power eliminates greenhouse gas emissions.

Besides, through this intervention, the maintenance of the gardens wherewhere the solar pumping stations have been set up, have become easier and more convenient.

## Replicability and Scalability

The project is easily replicable in a country like India where sunshine is aplenty. Solar power is cheap, unlimited, and easily available, which means solar power can be easily leveraged for scaling up or replication of projects of this kind. Similar projects will only require that locations that receive ample sunlight are chosen where solar energy can be easily harnessed.

The standardised design of the project may be used for scaling it up further or replicating it. The current project will serve as a pilot where major decision points and project bottlenecks (availability of non-schedule items, vendor development, etc.) have been clarified, so that scaling up or replicating becomes easier.

## Sustainability

Solar energy is renewable energy, which by definition is sustainable. Moreover, solar energy is clean energy, which is environment friendly. Hence, this intervention is completely self-sustainable. Being without any dependence on electric grid, the project incurs no additional electricity cost. Additionally, operation and maintenance cost for the project is captured within the project budget to safeguard cost of repairs. A proper service level agreement as the one created for this project, also ensures uninterrupted performance of the project, which adds to the project's financial sustainability.

**TITLE**
Smart Cities Mission: A Compendium of Best Practices

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**Ministry of Housing and Urban Affairs**

**Government of India**

# SMART CITIES MISSION

## A COMPENDIUM OF BEST PRACTICES