

Smart Cities Mission

A story of unique interventions

June 2019



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Foreword

The period of 2015 to 2019, under the Smart Cities Mission, shall be considered as the establishment era for better living conditions, technological advances, and responsive governance.



Due to the ever-growing population globally, there is increasing shortage of food, water, and energy. Cities are becoming crowded and polluted, leading to global warming and environmental degradation. India alone makes up for about 17.74% of the world's population and is therefore facing challenges of deteriorating living standards.

The Central Government's flagship investment programme, Smart Cities Mission, was launched in 2015 to make 100 cities of India smart. The purpose of the mission was to improve the quality of life, save the environment, and provide good governance to the people of the country.

As per official data of the Ministry of Housing and Urban Affairs (MoHUA), between January 2016 (when the first batch of 20 smart cities was chosen) and January 2018, projects worth INR 33,970 crore were tendered. This grew by 270% in a year to INR 1,26,000 crore by February 2019. Even the number of projects completed increased manifold in 2019, showing significant progress over the last two years. The value of projects grounded or completed stood at INR 19,041 crore in January 2018. This increased by 319% to INR 79,780 crore in February 2019.

The period from 2015 to 2019, under the Smart Cities Mission, shall be considered as the establishment era for better living conditions, technological advances, and responsive governance. This era shall also be known for the transformation of the mindset of the people, where they are not only demanding their well-being and welfare but also ensuring the maintenance and upkeep of the facilities provided.

Leveraging its expertise in technology, Grant Thornton in India has been collaborating with the Government of India for the country's transformation. As a Project Management Consultant for seven smart cities, namely, Nagpur, Varanasi, Namchi, Gangtok, Tumkuru, Jalandhar and Sagar, Grant Thornton is attempting to make good use of green initiatives, local renewable energy sources, and cutting-edge technologies to create clean, hygienic, and secure cities with adequate water and electric supply, efficient transport management, sustainable environment, effective education system, robust IT connectivity and good governance.

This era shall also be considered as a crucial period for the collection of data from numerous connected devices. Going forward, the next era shall consume this data to surface the insights for developing new schemes, reforms, and policies for transforming cities into better and sustainable places to live.

We hereby acknowledge our gratitude to all the CEOs and nodal officers of the aforementioned smart cities to allow the publication of this document, which celebrates the achievements of the smart cities teams.

We hope this compendium can serve as a guide to other aspiring smart cities. We look forward to your suggestions.

Ravinder Reddy
Partner
Grant Thornton India LLP

Executive summary

The data from new technological interventions in urban transportation, solid waste management, water supply, and sanitation is extensive and is to be utilised for informed decision-making.

The Smart Cities Mission of the Government of India has helped improve the livability of the cities it targeted. By identifying a list of 100 cities keeping important parameters in mind, the mission has been actioned upon with an Indian approach to urban development. The municipalities were given the flexibility to adopt their own vision and priorities based on citizen consultation. This shows the inclusive approach of the mission. They were also given a platform to challenge each other for accessing the grants, which shows the mission's adaptive approach. Embracing technology is still relatively new to the urban sector, but these smart municipalities have managed to seamlessly incorporate it in different areas of municipal services.

The urban sector has witnessed a spurt of new projects, most of which are a result of the citizens' preferences from the vision chalked out for these cities. Municipalities have combined urban planning, strategy, and information technology to improve efficiency in provision of urban services to their citizens. Even though there are several initial bottlenecks like comprehension of the scheme itself, dichotomy in institutional setup, and imbibing technology to traditional project formulation and implementation, the mission has taken off in the right direction.

The data from new technological interventions in urban transportation, solid waste management, water supply, and sanitation is extensive and is to be utilised for informed decision-making. The ability of urban local bodies, who are responsible for converting the data into meaningful and useful conduits for decision-making, is something that the sector needs to start witnessing. There has been a mixed response to the creation of these platforms for capturing data. It may take a next wave of urban transformation before analytics can be applied to the data and utilised for decision-making.

The government's efforts towards the implementation of the scheme is commendable. From technical expertise interventions, information dissemination workshops, seminars and conferences, capacity building sessions, creating competitive platforms for innovative concepts, building frameworks for livability index to enabling competition through ranking, the government has been on a constant watch to meet the objectives of the Smart Cities Mission.

Grant Thornton in India has been an important player in this transformation exercise. Being among the early entrants to have started providing project management consultancy services to these smart cities, Grant Thornton in India has acted as a catalyst for implementing several initiatives for its smart city clients. This compendium features a few first-of-its-kind projects that smart cities have attempted to implement. We have taken a grounded approach in creating 'smarter' cities through formulation, conceptualisation, and development of sustainable projects, both in area-based development models and pan-city models. Some of these models can be replicated in other cities and can also be scalable within the city. Some practicalities of implementation have also been highlighted in this compendium, which can be a learning point for other cities.

Smart Cities Mission – An overview

The Smart Cities Mission was launched on 25 June 2015 by the Ministry of Housing and Urban Affairs (MoHUA), Government of India (GoI), with a vision to develop 100 smart cities in India. The objective was to promote the development of these cities by improving their livability, increasing job opportunities, and creating a clean and sustainable environment by applying smart solutions.

To implement the smart city programme, the government convened a national competition wherein a standard template was circulated among these cities to encourage them to submit Smart City Proposals (SCPs). The SCPs of these cities were

then appraised according to the parameters set for these processes, the extent of citizen participation, and the smartness and cost-effectiveness of the solution proposed.

100 cities were selected and provided a grant by the Central Government and the respective state governments of INR 1,000 crore per smart city over a period of five years. The grant was then disbursed during the project development and implementation phase by the respective special purpose vehicles (SPVs) to implement their SCPs.

The table below shows the classification of the selected 100 cities based on their population:

Population range	Number of cities
4 million or more	9
1-4 million	44
Less than 1 million	17
0.5-1 million	20
Much-frequented cities of religious importance	10
	100

Source: <http://moud.gov.in/>



Smart Cities Mission Guidelines stipulate two strategic components for smart city development: area-based development (ABD) and pan-city development initiatives.

Area-based development

The ABD proposal of each shortlisted city is expected to encapsulate a retrofitting, redevelopment, greenfield development model, or a mix of all that is to be then replicated to the entire city at a later point in time. The strategy of ABD is as follows:

1 Retrofitting (city improvement)

- Planning in an existing built-up area
- More than 500 acres of area to be identified
- Depending on the existing level of infrastructure services and the vision, preparation of a strategy to become smart
- More intensive infrastructure service levels and a large number of smart applications to be packed
- Shorter completion period for easy replication in other parts of city

2 Redevelopment (city renewal)

- Replacement of the existing built-up environment with a new enhanced infrastructure
- More than 50 acres of area to be identified
- For example, a new layout plan of the identified area will be prepared with mixed land-use, higher FSI and high ground coverage

3 Greenfield (city extension)

- In an existing vacant area of more than 250 acres
- Using innovative planning, plan financing, and plan implementation tools, for example, land pooling and land reconstitution
- Provision for affordable housing, especially for the poor
- Could be located either within the limits of the urban local body (ULB) or within the limits of the local urban development authority (UDA)

Under ABD, along with the development of 24 smart city features, all applicable smart solution(s) will be implemented. The core infrastructural elements of smart cities implemented in the ABD area are illustrated in the table below:

Core infrastructure elements

Adequate water supply	Assured electricity supply	Sanitation, including solid waste management
Efficient urban mobility and public transport	Safety and security of citizens, particularly women, children, and the elderly	Good governance, especially e-governance and citizen participation
Sustainable environment	Health and education	Robust IT connectivity and digitalisation
Affordable housing, especially for the poor		

Pan-city development initiatives

Pan-city development initiatives include application of the selected smart solution(s) to the existing city-wide infrastructure. After due consultation with citizens, a priority sector will be identified for implementation. Application of smart solutions will involve the use of technology, information, and data to make infrastructure and services better.

Smart Cities Mission Guidelines provided each city with a set of 24 smart city features and suggestive smart solution(s) that each city is supposed to implement to become a smart city. The table below provides an insight into the scenarios that a city is required to achieve to become a smart city. These same scenarios can then be used as benchmark to compare their development.

Smart city feature	Scenario to be achieved in order to become a smart city
Citizen participation	<ul style="list-style-type: none"> Online and offline medium of constant communication with the citizens Set priorities and shape development projects in the city Improve governance
Identity and culture	<ul style="list-style-type: none"> Ensure that both man-made and natural heritage is preserved and utilised as anchor of the city Enhanced historical and cultural resources Ensure that public spaces, open spaces, amenities, and public buildings reflect local identity and are widely used by the public through festivals, events, and activities
Economy and employment	<ul style="list-style-type: none"> Adequate jobs opportunities for all sections of income groups and skill levels Job-oriented skill training supported by the city and industry Economic activities are suited to and built on locational and other advantages of the city
Education	<ul style="list-style-type: none"> Adequate and high-quality education facilities within 10 minutes walking distance to every residential area Institutes are connected with specialised teaching and multimedia-enabled education Regular assessment of institutes based on the number of students, attendance, teacher-student ratio, facilities available, and other factors
Health	<ul style="list-style-type: none"> Adequate health facilities at an accessible distance Individual health monitoring systems for elderly and vulnerable citizens Connected hospitals to prevent emergency health risks Foresee potential diseases to develop response systems and preventive care
Mixed land use	<ul style="list-style-type: none"> Mix land use is adopted by every part of city A 15-minute trip to office buildings, markets, shops, etc. Land use regulations encourage developers to develop mixed land use areas
Compact	<ul style="list-style-type: none"> Compact and dense walkable neighborhoods Regulatory provisioning to encourage or incentivise re-development of under-utilised land parcels in the city centre Optimal residential density and affordable housing available
Public open spaces	<ul style="list-style-type: none"> Well-dispersed public open spaces throughout the city Open spaces constructed at a 10-minute walking distance All types of open spaces developed for various sections of the society
Housing and inclusiveness	<ul style="list-style-type: none"> Housing supply meets housing demand Affordable, moderate, and luxury housing are clustered together
Transport	<ul style="list-style-type: none"> Public transportation network covers the entire city Affordable options of public transport for all sections of the society Multimodal integration and reasonably-priced on-street and off-street parking Prevalence of walking and cycling
Walkable	<ul style="list-style-type: none"> Pavements developed on every street with trees along sidewalks to provide shade to pedestrians

Smart city feature	Scenario to be achieved in order to become a smart city
IT connectivity	<ul style="list-style-type: none"> Free Wi-Fi services for citizens, enabling them to connect to high-speed internet across the city
Intelligent government services	<ul style="list-style-type: none"> All major services are provided through online and offline platforms Citizens and officials can access information on accounting and monitor status of projects and programmes through data available online Robust data infrastructure system to share information and enhance internal governmental coordination
Energy supply	<ul style="list-style-type: none"> Electricity is available 24×7 in all parts of the city with smart metering linked to online platforms for monitoring and transparency
Energy source	<ul style="list-style-type: none"> At least 10% of the energy used in the city is generated through renewable sources
Water supply	<ul style="list-style-type: none"> A 24×7 treated water supply which follows national and global standards, and is affordable for everyone Non-revenue water (NRW) is less than 15%
Water management	<ul style="list-style-type: none"> 100% metered water supply with remote monitoring Installation of rainwater harvesting systems and treatment of storm water Supply of recycled water for secondary uses
Waste water management	<ul style="list-style-type: none"> No waste water because all the waste water is collected, treated, and recycled
Air quality	<ul style="list-style-type: none"> Clean air by international standards Live air quality monitoring and mapping across the city
Energy efficiency	<ul style="list-style-type: none"> All public buildings employing energy efficiency principles in development and operation and applying for energy rating by national and international forums Promotion of energy-efficient buildings through incentives and regulations
Underground electric wiring	<ul style="list-style-type: none"> More than 90% of the city has an underground electric wiring system
Sanitation	<ul style="list-style-type: none"> 100% of the city's population is covered
Waste management	<ul style="list-style-type: none"> 100% generated solid waste is segregated and sent for recycling 100% organic waste is sent for composting Energy creation through waste is considered
Safety and security	<ul style="list-style-type: none"> All residents feel safe in all parts of the city during all hours of the day

Source: Smart Cities Mission Guidelines

The journey



Grant Thornton in India's interventions in the Smart Cities Mission commenced with providing consulting services to ULBs during round one of the SCM competition. A journey that started with the preparation of two smart city proposals for ULBs was successfully extended to seven cities: Nagpur, Tumakuru, Jalandhar, Namchi, Gangtok, Sagar, and Varanasi. Today, Nagpur is ranked number one by the MoHUA in terms of

progress of ongoing smart city projects in India.

The scope of work includes smart mobility, smart living, smart governance, and smart environment. Our execution of a number of such projects is provided in the table below:

Smart city feature	Name of the major projects implemented under our advisory
Category 1: Mobility and accessibility improvement	
Sustainable and planned urban mobility	<ul style="list-style-type: none"> • Smart parking • Multi-level car parking • Public market places • Move people initiative • E-rickshaw • Cremation facilities • Integrated bus terminal • Public bicycle sharing system • Intelligent transport system • Conversion of diesel auto to CNG with parking for auto-rickshaws • Smart buses, including bus terminals and bus stops • Smart roads and smart parking
Category 2: Livability and improved quality of life	
Recreation of urban green and restoration of the city's heritage	<ul style="list-style-type: none"> • Improvement of road junctions • Improvement of ghats and facades • Have public market places • Retrofitting and construction of footpaths • Canal area rejuvenation • Railway station development
Healthy and safe city	<ul style="list-style-type: none"> • Smart parks • Retrofitting of central park • Development of multi-specialty hospitals • Having e-health platforms
Clean Cleanliness (Clean Initiative)	<ul style="list-style-type: none"> • Installation of smart bins • Environment monitoring • Solid waste management systems
Category 3: Ecology and environment	
Sustainable core infrastructure	<ul style="list-style-type: none"> • Solar rooftop PV system • Solar grid interactive systems • Rooftop PV project • Roof top solar power • Safety, security, and utility ducting • Improvement of roads and junctions • Project TenderSURE • Integrated water supply distribution • Management, conservation and rain water harvesting • Street lighting control system

Smart city feature

Name of the major projects implemented under our advisory

Category 4: Governance and public service management

Command centres and applications	<ul style="list-style-type: none">• Project Suraksha App• Intelligent signaling• Variable messaging system• CCTV city surveillance• Integrated command and control centre (ICCC)• Integrated city management control centre• Mission Jyoti mobile application• Smart kiosks• Smart city lounge
Smart energy	<ul style="list-style-type: none">• Solar LED lighting• Street lighting control system
Citizen outreach programmes	<ul style="list-style-type: none">• Project Kaushal• Namchi Mahotsav

The following sections highlight Grant Thornton in India's interventions in some of the smart cities across the country.



Smart cities: Case studies



Nagpur

Nagpur is one of the largest cities in central India, and the third largest city in Maharashtra after Mumbai and Pune. As per the 2011 census, the city has a population of 24,05,665. Over the last few decades, Nagpur has witnessed an increase in urbanisation, which led to inadequacy of infrastructure provision to keep up to the required levels.

Through the Smart City Mission, Nagpur envisioned to provide excellent infrastructure, a sustainable environment, and smart solutions in a holistic manner. As part of the mission, a retrofitting is proposed on the eastern periphery of the city including areas like Pardi-Punapur, Bharatwada, and Bhandewadi. Nagpur was one of the unique cities to prepare the strategic plan called Town Planning Scheme (TPS) to implement the smart projects in a planned manner in the proposed ABD area. It was predicted that the TPS and smart city project will improve the quality of life of around 1,15,000 inhabitants, and regularise and resolve land use conflicts in the ABD area.



1,15,000

Improving the lives of 1,15,000 inhabitants

Project 1: TenderSURE

Provision of good roads in the ABD area is an important part of urban mobility in the smart city proposal of Nagpur. The TenderSURE model has been adopted to upgrade roads up to 52 km as per international standards.

The need

- Uniform standard carriage way width from one junction to another
- Properly designed footpaths with ample space for pedestrians and a bicycle lane wherever required
- The bus bay to accommodate easy egress and ingress of passengers, with well-designed parking bays and road intersections
- Dedicated corridors below footpaths to lay conduits of essential amenities such as electricity, water, sewage, optical fibre cables (OFC), etc., to eliminate the need of excavation of roads during repair
- Bituminous or rigid pavement carriageway with proper camber as per the Indian Road Congress (IRC) guidelines for streamlined vehicular movement
- Usage of LED for street lamps for minimised power consumption and increased longevity
- Incorporating a road sign, road marking, and zebra crossing on junctions for pedestrian crossing
- Storm water drainage system on both sides of the road to eliminate accumulation of rain water on roads
- Landscaping to ensure that the roads are aesthetically appealing

The solution: TenderSURE roads

This project has been designed and developed with a combination of primary and secondary research regarding new concepts, designs, and projects. A review of existing literature, policies, relevant guidelines, and codes has been carried out. Analysis of the information/data collected through these sources finally conceptualised the project in Nagpur.

Design standards and guidelines:

- Standards and guidelines laid down by the IRC
- Specifications for roads and bridges by Ministry of Road Transport and Highways (MoRT&H)
- Indian standards laid down by the Bureau of Indian

Standards

- Urban street guidelines laid down by the MoHUA
- Standards and guidelines of the American Association of State Highway and Transportation Officials (AASHTO)
- British standards

The proposed road network includes roads width ranging from 9-30 metres. The proposed road width is on the basis of land usage pattern along the length of the roads.

Road width

36 metre wide
24-30 metre wide

Land usage type

Commercial streets
70% area permitted for commercial

Expected outcome

Improve the quality of life and safety for users through the following:

- Enhanced road network with uniform carriageway, road markings, and safe intersections
- Seamless mobility and easy access through a well-defined footpath, cycle tracks, and pedestrian crossing for safety of pedestrians
- Accessibility for physically challenged and senior citizens
- Channelised and well-designed junctions
- Provision of public utilities
- Reduced travel time and vehicle operation cost
- Consistent water supply to the locality, and efficient solid waste management system ensuring improved health and sanitary conditions

With its unique design guidelines, the project TenderSURE of the ABD area of Nagpur city will serve as the benchmark for the nation.



Project 2: Construction of dwelling units, and other infrastructure facilities for resettlement and rehabilitation of people at Pardi, Bharatwada, Punapur, and Bhandewadi

The need

- The residential areas in Nagpur accounts for 82% of the total occupied houses, shops/offices accounts for 9%, and the remaining ones have mixed usage. The city is expected to require additional six lakh houses by the end of 2041.
- Nagpur Smart City Ltd. aspired for an appropriate Town Planning Scheme (TPS) to implement smart projects in a planned approach in order to improve the quality of life of around 1,15,000 inhabitants and regularise conflicts of land usage in the proposed ABD.
- The area, on the eastern periphery of the city with villages Pardi-Punapur, Bharatwada and Bhandewadiand, is spread across 1,730 acre. It is a combination of residential and commercial areas, with a large scope for improvement through the retrofitting exercise.

Draft town planning scheme and proposed land reservations



The solution: Affordable housing

Total 4,000 dwelling units are proposed to be provided under project **Home Sweet Home**. In the first phase of the project, 1,024 units are expected to be constructed for the people, who are considered to be affected due to the implementation of the town planning scheme.

The dwelling units will be monolithic concrete buildings with solar roof tops, rainwater harvesting plants, sewerage treatment plants, commercial shops, gardens, lifts, parks, play areas, walking/jogging track, parking lot, basketball court, volleyball court, and a gated entrance with security guard cabins.

The design is based on the 'green building concept' with green architecture providing natural cooling, environmental protection, recycling value, energy efficient LED lighting and solar panels.

Expected outcomes

- The utilisation of modern technology will support in cost-effective speedy construction with high seismic resistance, longer lifecycle, low maintenance, and better aesthetics
- High-quality houses with latest infrastructure and amenities
- Resettlement and rehabilitation of affected people

Site plan and 3D view – EWS



Varanasi

Varanasi, Banaras, or Kashi is a city on the banks of the river Ganga in the state of Uttar Pradesh, India. It is a city with historical prominence and has represented the culture and heritage of India. This city experiences major tourist footfall due to temples of religious importance.

Grant Thornton in India's role

To help the government transform the face of the city, Varanasi Smart City Limited (VSCL) appointed Grant Thornton in India as its project management consultant.

VSCL, a company registered under the MoHUA, was responsible for the implementation of the smart city initiatives. It aimed to transform the city with IT and non-IT interventions while also conserving its heritage and culture. The initiatives undertaken by Grant Thornton in India were being closely monitored by the Prime Minister's office. VSCL had outlined more than 100 initiatives/ interventions to be put to action at a cost of INR 2,268 crore. Grant Thornton – along with its team of sub-consultant companies – implemented and executed both IT and non-IT initiatives at a cost of INR 900 crore.



Vision for Varanasi as a smart city

“To rejuvenate the oldest Indian living city of Varanasi as a great place to live and visit by conserving and showcasing its enriched heritage, culture, spirituality and traditions through innovative social and financial inclusion solutions.”

Project 1: Branding and beautification of Varanasi smart city

The need

The evolution of a smart city can be estimated when people realise and endorse the advancement. Therefore, the first requirement was to create awareness and build a positive conviction about the smart city initiatives in the local residents. It was also important to create a ‘tourist’ destination identity that stays in the minds of tourists for a long time.

Total project outlay

INR 13.69 crore

Commencement date

November 2018

The solution

Branding and beautification through smart interventions

Grant Thornton in India proposed graphically designed existing super structures like water tanks, and proposed new designed unipole signs, totem signs, etc., with façade lighting and backlit arrangements to enhance the image of the heritage city.

The solution offers an ideal blend of heritage and modern technology.

Graphically designed super structures



Achievements

The project was conceptualised and delivered in three months' time and was inaugurated by Hon'ble Prime Minister of India on 26 December 2018. Grant Thornton in India was appreciated by the MoUD and the Commissioner of Varanasi Nagar Nigam for its innovative approach and effective project management.



Project 2: Varanasi integrated smart solutions

The need

VSCL sought to transform Varanasi into a technologically advanced city, while also keeping the rich culture and heritage of the city unchanged. The department needed integrated solutions and applications to carry out functions like automating municipal operations, optimising energy consumptions, monitoring traffic and surveillance, handling solid waste, examining environment quality, implementing smart street lighting, constructing smart vehicle parking facilities, and developing e-Governance platforms for grievance redressal systems.

Total project outlay

INR 154.96 crore

Present completion progress

90%

The solution: Integrated IT solutions through KICCC

Grant Thornton in India conceptualised, consulted, designed, and managed the Kashi Integrated Command and Control Centre (KICCC).

- Multiple departments are working for daily operations under one roof
- Video wall made of 21 screens of 50 inches each for better viewing
- 700 cameras for surveillance all over the city
- 60 junctions to be managed by the surveillance equipment
- Data centre built on hyper converged infrastructure (HCI) technology
- Energy savings due to 10,000 smart lights
- 24X7 help desk
- One-stop solution for mobile app and portal
- GIS layering for infrastructure
- Inter-operable solution
- Advanced video analytics



Achievements

The project was completed within a year, and the Hon'ble Prime Minister of India inaugurated and flagged its services on 19 February 2019. The fast pace and successful coordination of various stakeholders were commended by the Prime Minister and the Chief Minister of Uttar Pradesh.

The KIOCCC allows for ease in controlling and managing unforeseen situations on the field through inter-operability

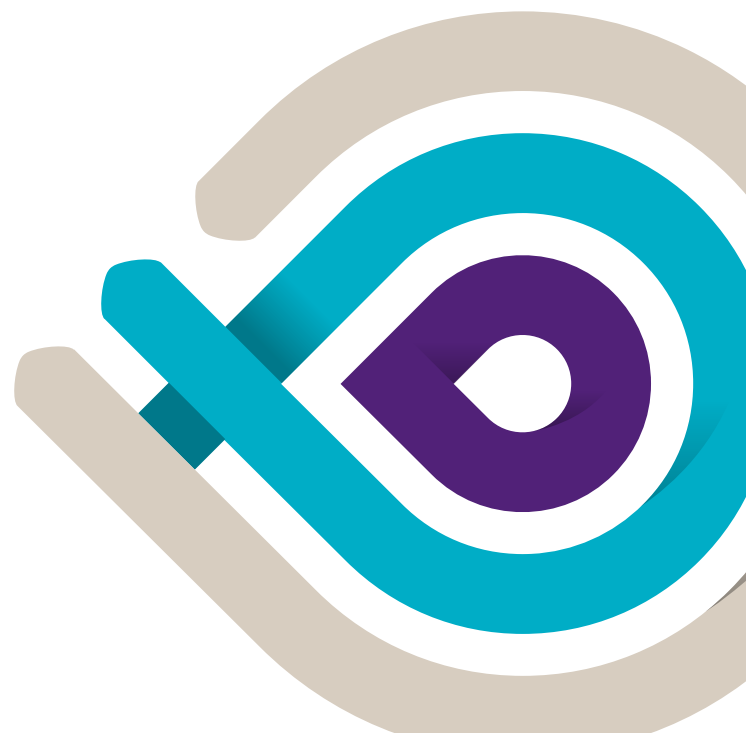
of policing, administration, and municipal operations. This is being coordinated seamlessly with instant data sharing and circulation of actionable items and tasks to quickly mitigate the issues.

Case study

A truck, while transporting matchboxes, caught fire in the middle of a residential-cum-commercial area. The visuals of the incident were captured on the video feed from the surveillance camera positioned at the spot of incident. The camera feed was then shared with relevant departments and action was taken within five minutes to avert any major damage to the nearby area.

This prompt action due to interconnected feeds saved loss to property and lives of the country by avoiding accidents that could have happened to passing-by vehicles at that point in time.

The integrated solutions have provided the city of Varanasi with a common platform where different ULBs can work together to take immediate actions with better co-ordination complemented with a sophisticated monitoring eye for the city facilitating security, safety, and integrated measures.



Namchi

Namchi is the district headquarter of south Sikkim, and the second largest town of the state. It sits at an elevation of approximately 5,500 feet above sea level and is becoming a major tourist attraction and pilgrimage centre.

The existing municipal boundary of the city is limited to only 7.15 sq. km. This covers commercial and administrative centres, and important places of tourist interest like Siddheswara Dham (popularly known as Chardham) and the statue of Guru Padmasambhava at the Samdruptse hill.

To bring about a wave of development projects, and enable mobilisation of resources encompassing the entire gamut of civic administration, Namchi was brought under the government's smart city radar. The government aimed to develop Namchi into a world-class tourist destination and simultaneously maintain ecological balance with a vibrant community offering an enriched quality of life supported by a robust local economy.



7.15 sq. km.

The existing municipal boundary of the city is limited to only 7.15 sq km

Project 1: Smart water management solution

The need

As per the 2011 census, Namchi has a population of 12,194. The city's infrastructure for providing potable water supply did not match with the pace of city's growth.

Consumer connection coverage was only 64% of the total households, and the city was struggling with issues like intermittent water supply, unequitable flow and pressure management, high levels of NRW, haphazard distribution of

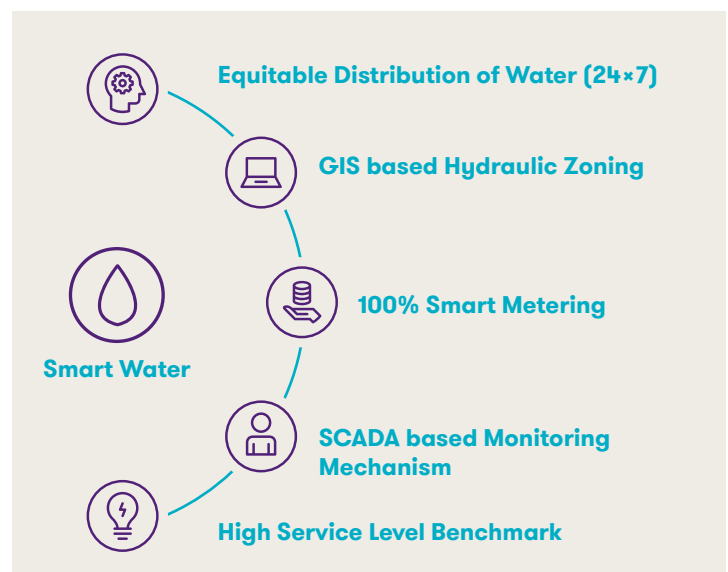
networks, obsolete infrastructure, and contamination, resulting in unhygienic living circumstances.

The city was therefore seeking to transform the water supply delivery mechanism through a sustainable water management system.

Solution

Grant Thornton in India suggested and applied smart water management solutions to enhance, expand, and scale the existing water supply infrastructure and delivery system.

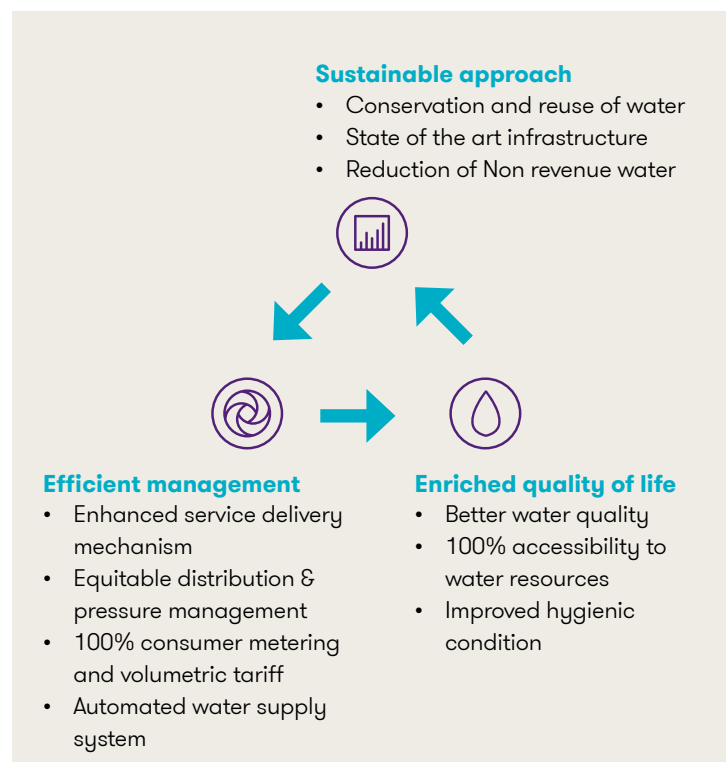
Key principles	Innovation	Implementing strategy
<ul style="list-style-type: none"> Ensure equitable distribution of water Improve system efficiency Implement smart management practices 	<ul style="list-style-type: none"> GIS-based hydraulic zoning of distribution network Automation of water supply system Smart metering Co-polymer based rainwater harvesting 	<ul style="list-style-type: none"> 24x7 water supply Supervisory Control and Data Acquisition (SCADA)-based monitoring mechanism High service level benchmark



Expected outcome

The proposed smart water management solution is futuristic and organic and will provide potable water to every household for years to come. It will improve the living hygienic conditions and enhance the residents' quality of life.

In the next 24 months, the team aims to commission the project and make it fully operational. The innovative solution aspires to act as a light house for hilly cities.



Co-polymer based rainwater harvesting tanks have been installed in Kamrang College, and gravity main and distribution main pipes of 4.31 km have been installed in Zone 15 of the city.

Physical progress of RHW Storage Tanks 1 (co-polymer technology)



Physical progress of laying DI pipes (under progress)



Project 2: Infrastructure and allied facilities at the cremation ground at Aahley Gumpa, Namchi

The need

There are two cremation grounds and one burial ground in Namchi. One cremation ground is located in the Aahley Gumpa area and the other one is located near Tifin Samdruptse Dara. The citizens of the city prefer the Aahley Gumpa crematorium because of its close proximity to most locations. But its existing infrastructure has structural inadequacies, scarce water supply, and lack of parking space. With only one cremation

pyre on site, sometimes there are multiple funerals lined up. The funerary ritual is attended by the family and friends of the deceased, so the place gets crowded.

Namchi Smart City Limited (NSCL) decided to provide infrastructure and allied facilities at the Aahley Gumpa Namchi crematorium ground to address the issues.

Solution

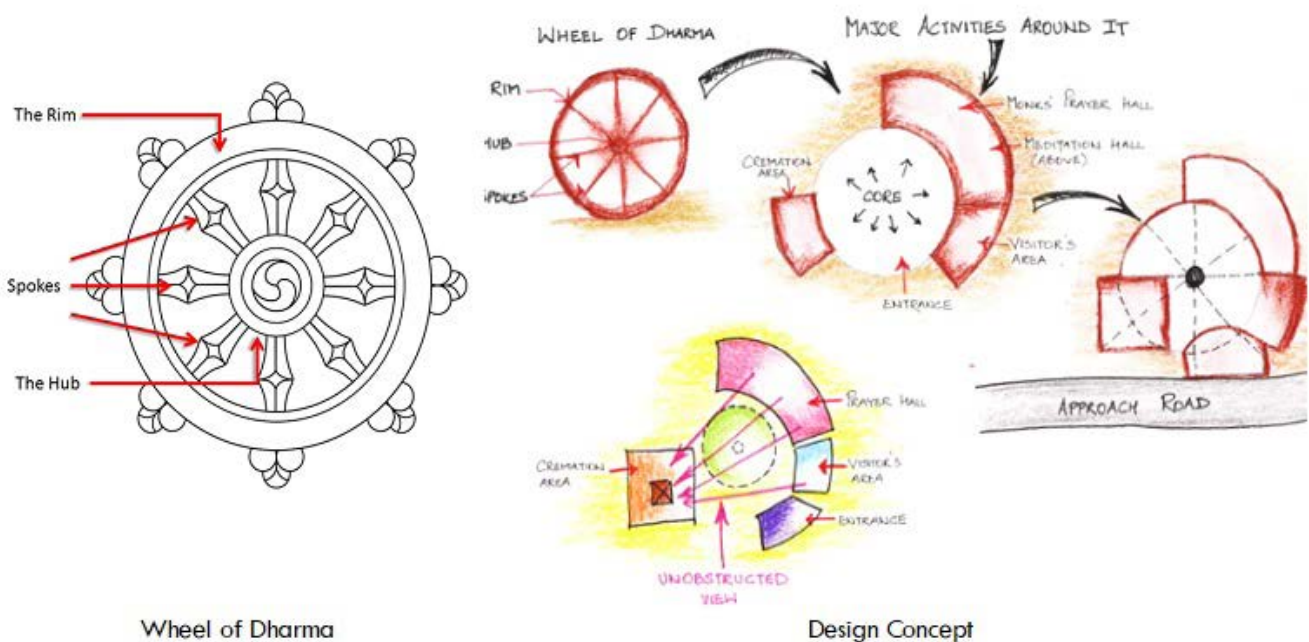
Design concept - Wheel of Dharma

The unique design concept for the project has been derived from 'the Wheel of Dharma' with eight spokes, a rim, and a hub, representing Buddhism.

The design of the crematorium has a hub/core in the centre, which is surrounded with multiple facilities like entry and exit gates, a parking lot, a park, toilets, food preparation areas, a

prayer hall, a meditation hall, and a cremation furnace on the rim, resembling a wheel.

The design is a notable aspect for the local residents and lamas, since it aligns with the core beliefs of Buddhism, which is widely accepted and followed there.



Expected outcome

The foundation stone of the works was laid by Durga Shanker Mishra, Secretary, MoHUA, on 11 January 2019. The construction work will be completed in the next 18 months.

This project will provide an upgraded and comfortable space equipped with the latest infrastructure and facilities to perform rites and rituals.

Before

Inadequate infrastructure



Dilapidated cremation pyre



Concept pictures

Bird's-eye view



Ceremonial space and cremation furnace



Allied facilities complex



Prayer hall and meditation hall for the monks



Foundation laying ceremony held on 11 January 2019



Project 3: Mission Jyoti – An ICT-based solution for the prevention and protection of children from sexual offences

The need

The most alarming concern regarding child sexual abuse is under-reporting. Estimates say that on average, less than 50% of such incidents are reported to the police. In Sikkim, there has been a distressingly consistent rise in child abuse.

The city government of Namchi proposed a web-cum-mobile application to reduce the threat of sexual violence through robust reporting mechanisms, increased transparency, and assured protection of privacy.

Solution

To battle the issue of child sexual abuse and security, the city government of Namchi initiated Mission Jyoti - Flame of Fearlessness. It includes the development of a mobile and web application along with running awareness campaigns to make the surrounding as conducive as possible in the event of an offence.

The application provides the following:

- Information to identify subtle hints suggesting abuse and reach the concerned department
- Risk minimisation through access to information about child rights and POCSO Act, 2012
- Ensuring anonymity through cyber security while reporting incidents of concern

Mobile application

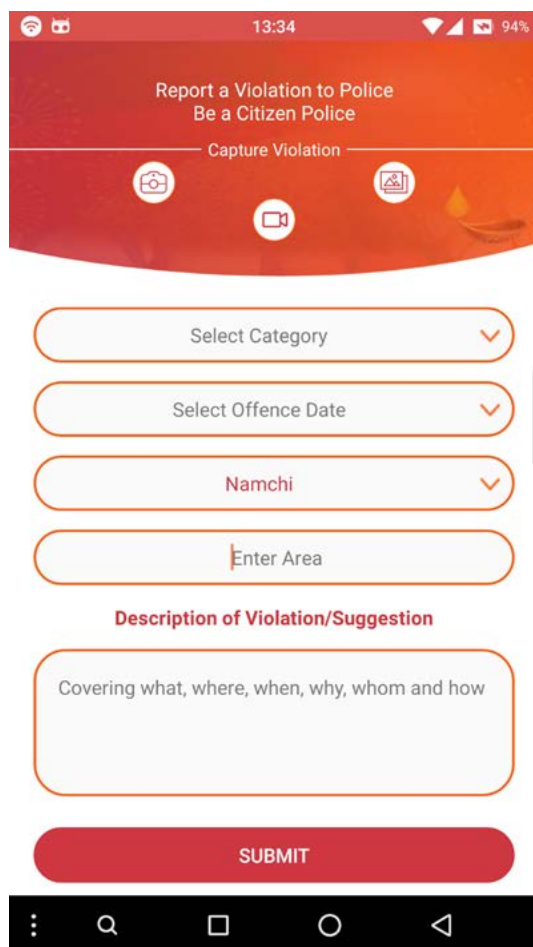


Expected outcome

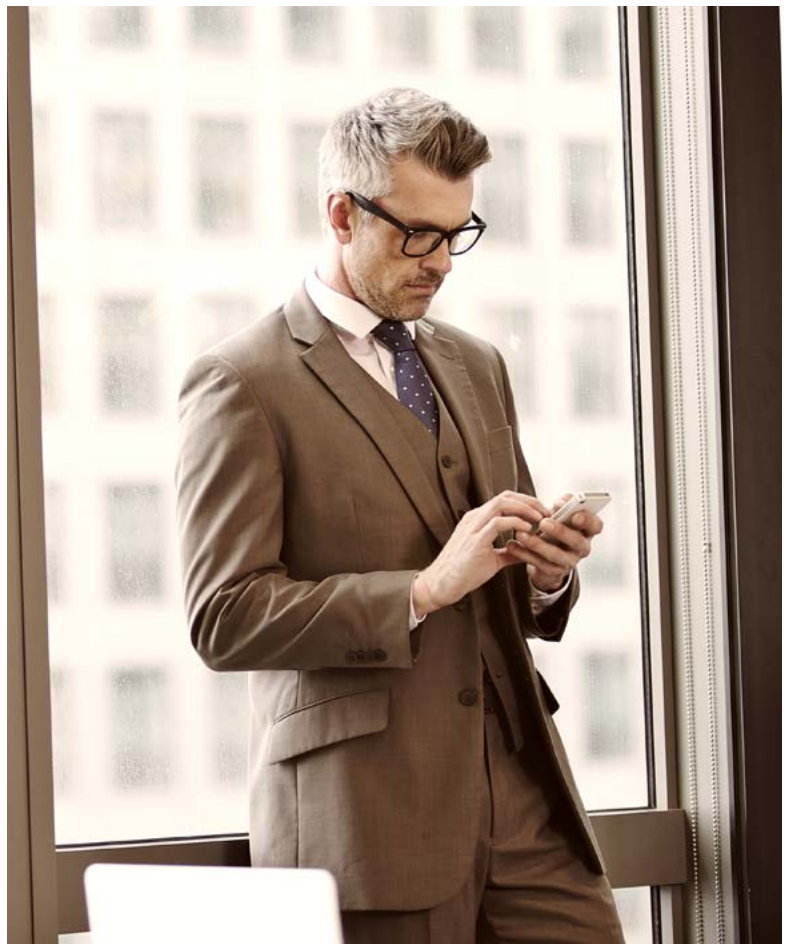
The Mission Jyoti app is among the first few ICT interventions of the Smart City Mission. The beta version of the mobile application was launched in December 2017 and the web application was launched subsequently.

This initiative will equip the children and adults with the necessary resources to help them recognise child abuse, and respond to it.

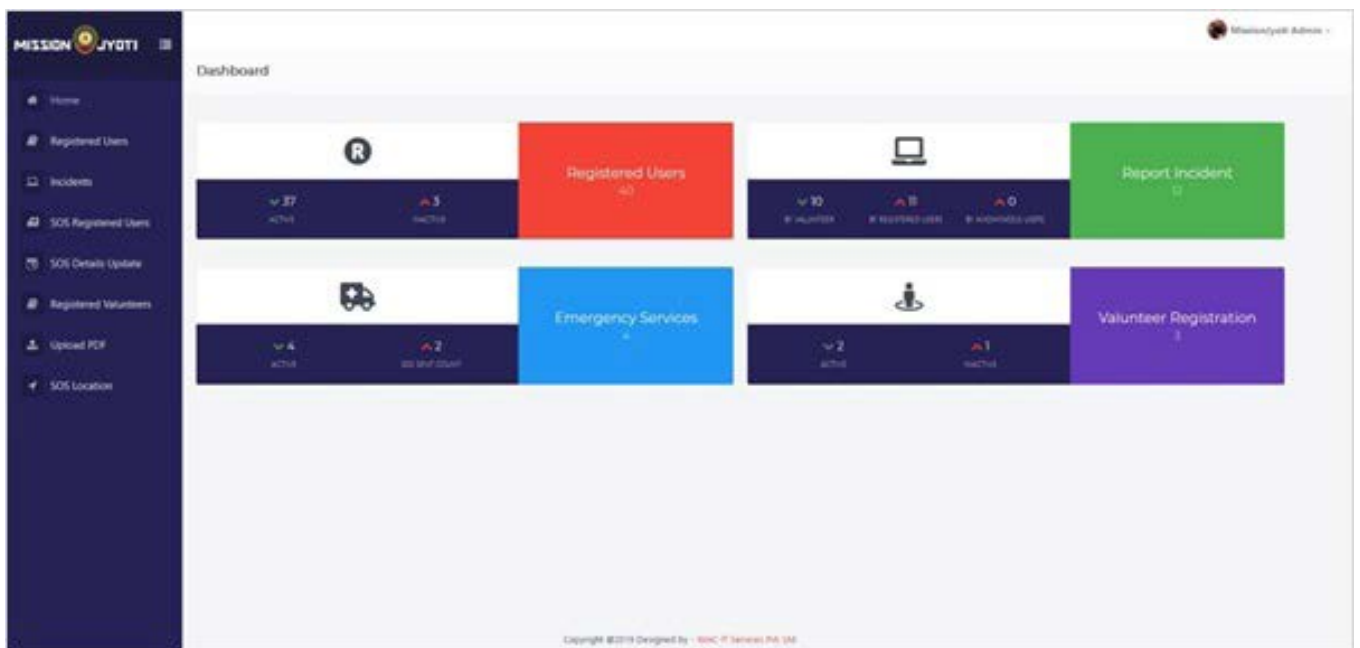
Mobile application



The screenshot shows the mobile application interface for reporting a violation. The top status bar displays the time 13:34 and battery level 94%. The app header is red with the text "Report a Violation to Police" and "Be a Citizen Police". Below the header, there are three icons: a camera, a speech bubble, and a document. The main form consists of several input fields: "Select Category" with a dropdown arrow, "Select Offence Date" with a dropdown arrow, "Namchi" with a dropdown arrow, and "Enter Area" with a text input field. Below these fields is a section titled "Description of Violation/Suggestion" with a text area containing the placeholder text "Covering what, where, when, why, whom and how". At the bottom of the form is a red "SUBMIT" button. The bottom of the screen shows the Android navigation bar with icons for back, home, and recent apps.



Web application



Gangtok

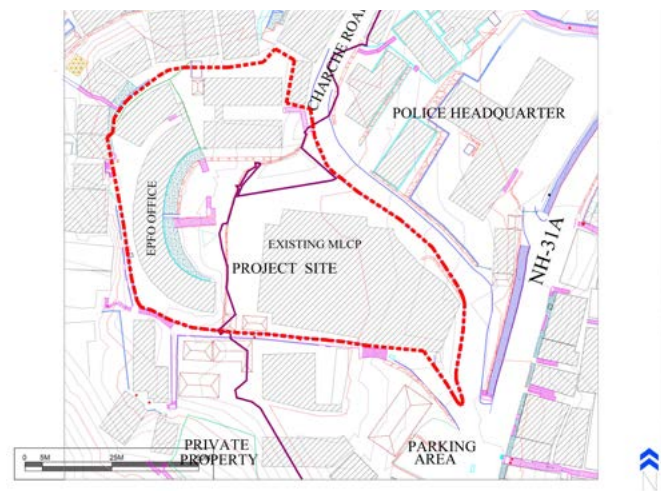
The Gangtok Smart City Development Limited (GSCDL) was formed by the Gangtok Municipal Corporation along with Government of Sikkim to implement various area-based as well as pan-city level projects under the Smart Cities Mission. The GSCDL aimed to plan, appraise, approve and release funds, and implement, manage, operate, monitor, and evaluate various smart city development projects in Gangtok.

Project 1: Development of multilevel car parking (MLCP)-cum-commercial development

The need

The MG Marg market area is largest commercial hub of Sikkim with major tourist footfall and crowded narrow roads. People prefer to park vehicles on the street, which makes the carriageway even more congested. The existing multi-level parking did not meet the parking requirements.

GSDL required an attractive and efficient parking with easy accessibility and pedestrian connectivity. It was to be made keeping energy conservation in mind, and was supposed to include LEDs, water management, minimal heat retention, urban heat island effect, etc.

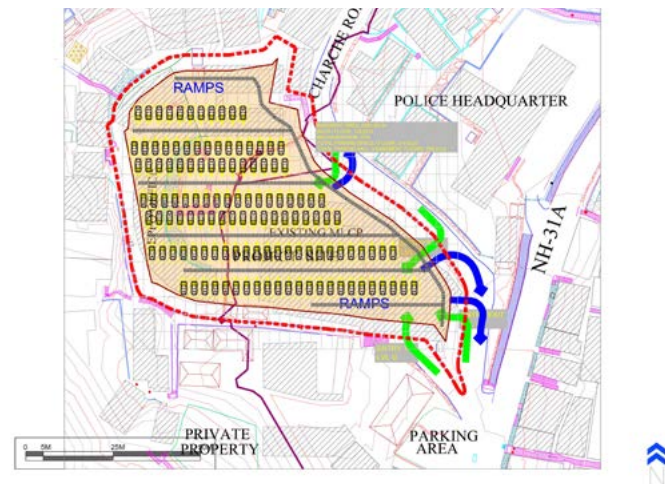


The solution

GSCDL identified an existing MLCP for its redevelopment into a state-of-the-art modern MLCP-cum-commercial complex through the public private partnership (PPP) model.

The total built-up area which was allowed for commercial development, as part of concession, was approximately 11,400 sq. m. and had parking for almost 850 equivalent car space (ECS). Semi-automatic type parking was suggested with stack parking per bay to double up the parking numbers per parking bay, increasing the capacity of one parking bay to two cars.

A world-class structure was proposed with a cohesive design of Sikkimese identity. The MLCP is proposed to be equipped with lifts, energy-saving fitments, safety and security signs, public WiFi, video surveillance, smart parking, smart street lighting, pedestrian access, central information portal with citizen apps, a visitor management system, and an emergency-response system.



Location of MLCP site



Expected outcome

Completion of the MLCP will provide the following:

- State-of-the-art parking-cum-commercial facility for the residents
- Reduction in on-street parking and congestion, as a result of which tourists and local population will have an improved experience in the city
- New business opportunities and rentals



The MLCP is proposed to be equipped with lifts, energy-saving fitments, safety and security signs, public WiFi, and other amenities.

Project 2: Palace rejuvenation, retrofitting, and redevelopment

The need

The original complex of the Palace of Gangtok contains the Chogyal Palace and Tsuklakhang Monastery. The compound consists of the Royal Palace, the Royal Chapel, the main gate, the office building, and the Yabring (prayer hall) that formed the original complex in the first place. The palace compound lies on top of the hill called The Ridge Park. On the other end lies the official residence of the Chief Minister of Sikkim. The site has a total area of 14 acres.

Over a period of time, several construction activities like an accommodation block for the monks, school, and infirmary,

among others, have been carried out without paying attention to the heritage of the palace compound. This has resulted in a disconnect between the monastery and palace building. The new construction has also resulted in a loss of space, and devalued the importance of the palace.

GSCDL wanted to retain the Sikkimese culture and traditions by rejuvenating and redeveloping the Gangtok palace. It aimed to do this by retrofitting the heritage monastery and reviving the palace compound in a way that reflects its glorious past.

The solution

Grant Thornton in India proposed the redevelopment of the palace compound through conservation and new development.

1 **Conservation:** This includes rejuvenation and retrofitting of the existing structures in the palace compound by carefully assimilating old with new fabric. The structures considered under conservation are as follows:

- **The Royal Palace:** The Royal Palace, or the residence of the Chogyal of Sikkim, is the only residential reminiscent of the past that stands tall till date. The structure is built in wood, stone, and lime mortar, inspired by the British's style of architectural layout and Tibetan art. This style is unique and is a discovery of new architectural vocabulary. The building is in a state of despair and calls for immediate retrofitting.
- **The Royal Chapel or Tsuklakhang:** The Royal Chapel of the Chogyals is the key place for prayers with an assembly hall in the centre and a large repository of Buddhist scriptures and literature. The Chapel also contains altars that are lined with Buddha, Bodhisattvas, and Tantric deities. The palace celebrates the Pang

Lhabso festival, which is held in mid-September in honour of Mount Kangchenjunga (revered as the protector deity).

Repair and overhauling works without much interference to the original structure are the need of the hour.

- **The main gate:** The main entry gate that is aesthetically well-proportioned is still in its original condition. The gate has also been a synonym to the image of Sikkim.
- **The Yabring:** The beautiful and intricately detailed structure is a place where the monks command and perform various rituals during the religious course. Guests of importance are also housed here during occasions. The Royal Chapel, in its calendar, has several such programmes that date back to the ruling days. The structure is in a need of minor repairs and art work.
- **Ancillary existing structures:** Some structures that are new constructions will need to be demolished, and some will need to be retrofitted to reflect the existing heritage.

2 **New infrastructure development:** The palace rejuvenation



project needs modern infrastructure development that is sustainable, green, and future-centric. It also needs to accommodate the growth of visitors, religious discourses, and cultural events that are held regularly.

The proposals of the project shall contemplate the existing site conditions and issues due to inadequate logistics with the outcome of user-friendly and interactive tourist spots.

- **The Dukhang:** The proposed single-storey Dukhang or the prayer hall will be solely used for religious events and discourses by high lamas or monks. The structure can house up to 450 people at a time. This will also have a lawn for gatherings. The interior walls will be decorated with intricate traditional carvings and religious murals.
- **Monks' quarters:** We have proposed the construction of three blocks of monks' quarters on the western side of the complex. The quarters can be inhabited by 600 monks.

Expected outcome

This project attempts to fulfil the long-standing aspirations of the Sikkimese community to bring the palace compound in the limelight and develop it as one of the major tourist attractions in Gangtok. The project will revive the area and help in showcasing the tangible and intangible elements of Sikkim's art, culture, and heritage. The area is expected to be the cultural hub of Gangtok and preserve Sikkim's traditional arts, crafts and cultural forms.

Allied facilities complex



All three blocks will follow the key principles of 'green building' and will be connected by intermediate utility lawns that do not cause interference to the main chapel.

- **Chimey Lhakhang:** The existing Chimey Lhakhang is a structure for visitors and devotees to pay respect through prayers and offerings. It is currently small and inadequate, and does not cater to the growing demands of the people. The proposed Chimey Lhakhang will be able to house more visitors and devotees, and will be equipped with thousands of butter lamps.
- **Guest house:** A guest house is proposed to host important dignitaries and high lamas for revenue generation to sustain the maintenance of the complex. The proposed structure will be of three storeys and will have all the modern amenities with Sikkimese architecture.
- Public toilet and water drinking facilities

This project will have its own standing among the numerous projects under the Smart Cities Mission, as it very uniquely emphasises and contributes in preserving and reviving one of the most important heritage sites of Gangtok.

Prayer hall and meditation hall for the monks



Tumakuru

Tumakuru is located 70 km from Bengaluru with an approximate area of 1,354.97 acres. Tumakuru Smart City Limited (TSCL) was incorporated in 2017 with an aim to spearhead various development initiatives in the city. The projects under the Smart Cities Mission aim to provide people with safe living conditions, smart transit, better transportation, and a green infrastructure.

Project 1: Integrated bus terminal, Tumakuru, Karnataka

The need

An integrated bus terminal was needed to provide transiting facilities and enable a mixed use of different services. This demanded the facilities to be planned systematically, and address user requirements effectively, as the lack of an efficient and functional environment would have led to friction, which will ultimately compromise the attractiveness of the system.

This is why TSCL wanted to decongest the heart of the city and provide a safe movement facility to people.



The land parcel is in the heart of Tumakuru near the central market area spread across 4 acres.

The proposed site is within a 2 km radius from the DC office, city town hall, city library, and the railway station.

The area is well connected to Ashoka Road, MG Road towards the west, JC Road towards the east, Mandipete Road towards the north and BH Road towards the south.

The solution

An integrated bus terminal is proposed to decongest the existing network by distributing city services and regional services, and integrating them for safe and free movement of passengers and buses.



As per the proposed design, the terminal will have the following:

- Defined and planned entry and exit points for free bus movement and circulation
 - Barrier-free passenger areas
 - Administrative areas for uninterrupted bus operations
 - Well-designed passenger waiting areas
 - Accessible and well-designed passenger amenities
 - Clear and visible signage for smooth movement
 - Formalisation of street vending to ensure better upkeep
 - Adequate safety and security measures
 - Appropriate finishes for best aesthetics
- **Green building technology**
 - As the building frontage is towards the west, the facade will be treated with angular openings with glazing towards the north to avoid direct heat
 - Glass fibre reinforced concrete (GFRC) net will be used to cover the glazed area to reduce overall internal heat
 - Energy-efficient LEDs and solar lights will be used
 - Rainwater harvesting pits and tanks will be provided
 - **Cluster of other services**
 - Adequate parking spaces for two and three wheelers
 - Commercial office and retail spaces
 - Lifts, staircases and escalators
 - Disabled-friendly infrastructure and services
 - Multiplex space
 - Lodging facilities



Jalandhar

One of the oldest cities in Punjab – Jalandhar – has developed into a supremely industrialised centre buzzing with commercial activity. It was selected in the third list of 27 smart cities, and is said to become the first ‘sports city’ of the country.

Project : Burlton Park sports hub

The need

Punjab has always given sports a top priority and hence the sports equipment manufacturing industry in the state has flourished. Jalandhar is one of the sports hubs in the state and is known for exporting 65% of the manufactured sports goods to countries like the US, the UK, and Germany.

The state of Punjab houses about 12 major sporting venues. Three of these major stadiums (the Gandhi Stadium, Guru Gobind Singh Stadium and Surjeet Hockey Stadium) are in Jalandhar and are utilised for training and hosting international events.

The available facilities were unable to meet the current requirements of the athletes, and the maintenance and upkeep of the existing infrastructure and green fields were getting difficult due to the depletion of ground water.

The government therefore desired a solution that could accommodate more green fields without affecting the depleting ground water table, provide more training infrastructure for athletes, and generate revenue for the state.

The solution

The Burlton Park area already has numerous sports stadiums, educational institutions, hospitals, and other planned interventions for strengthening the roadways’ infrastructure. With the proposed construction of flyovers at SMV Chowk, Kapurthala Chowk, and Chikchick Chowk, accessibility to the entire region is augmented.

Grant Thornton in India, as the smart city consultant, recommended an environment-friendly multipurpose sports hub at Burlton Park, offering facilities like physiotherapy clinics, healthy food stalls, medical centres, sports apparel shops, sports equipment stores, and hostels and PG houses on PPP model. This model will support the construction of multipurpose sports hub without initial investment, and will house all sports-related commercial facilities to generate revenue through renting.

The proposed hub will enable the city to host international sports events that will result in increased tourism. The increase in the tourism will not only generate revenue for the state but also create employment opportunities in fields like communications and media management, journalism, security and surveillance, merchandising and branding, funding and investments, advertising and marketing, and people management.

Grant Thornton in India recommended this project after an exhaustive market assessment of the retail and tourism industry. The project has gained immense popularity and demand as per feedback from citizen consultations.

Expected outcome

The sports hub will provide better facilities to the sportspeople of the state while keeping in mind the key principle of saving the environment. It also will be a milestone for enhancing tourism in the state and generating revenue.

This project will flourish associated industries like manufacturing of sporting goods, hospitality, and retail. It will create avenues for the sale of local handicrafts through a

specialised business centre as part of the hub.

In addition, the tourism is expected to make Jalandhar a global landmark for ecological sustainability in the sports sector.



The proposed structures of Burlton Park sports hub



Sagar

The city of Sagar was constructed around the Lakha Banjara lake. It was built by Govind Rao Pandit, the Peshwa's representative in charge of Sagar Kingdom. He was the one who first planned Sagar as the capital of Madhya Pradesh. The lake that forms the centre of the town extends over an area of about 400 acres.

Project 1: Lakha Banjara Lake's front development and rejuvenation

The need

The Lakha Banjara Lake is located in the heart of the city and is culturally close to the people of Sagar.

- It is heavily loaded with pollutants as a lot of drain flows into it.
- The drain on the southern side brings in a lot of silt and agricultural residues along with organic chemicals, pesticides, fertilisers, etc.
- The carrying capacity of the lake has reduced due to the deposition of silt on the lake bed.
- Discharge of sewage water into the lake is dominant.

The aesthetic value and water quality of lake has therefore degraded, which is why conservation of the lake is the top priority for Sagar Smart City Limited (SSCL). The city wants rejuvenation and renovation of the lake by construction of retaining walls, desilting of the lake bed, enhancement of the ghats, development of recreational spaces and roads around the area, etc.

The city is also interested in the following interventions:

- Creating public awareness for conservation of the lake and optimally utilising cultural and natural heritage resources
- Enhancing public experience and alleviating ownership
- Establishing tenable and compliant relationship with urban activities
- Integrating smart ICT solutions for management of natural features
- Showcasing place making of core natural assets

The solution

The following components and phases have been suggested for the rejuvenation of the lake:

First phase: Conservation

- Dredging, desilting, and soil mediation to improve the water quality and holding capacity of the lake
- Erosion protection, embankment strengthening, slope stabilisation, and natural bund construction around the lake's edges
- Improvement and redevelopment of waste weir, automatic hydraulic sluice gates, aqueducts, causeways, and culverts around the lake's edges
- Development of peripheral storm water trap and treatment facility-peripheral catch drains/ducts, silt traps, oil traps, filter strips, swales, filter drains, permeable paving, hydro-cell bio filtration tanks, catch basin/pond, on situ clarification, reed tank treatment, grit chambers, etc.
- Wetland bio-restoration and afforestation
- Procurement of smart water quality and asset monitoring systems



The rejuvenation and renovation of lake Sagar and its surroundings will take place in phases.

Second phase: Lake front development

- Smart fencing, boundary wall, and controlled entry and exit points
- Lakefront promenade development by constructing pathways, cycle tracks/NMT corridors, and pause points
- Redevelopment/provision of public parks
- Redevelopment/provision of ghats and ferry jetties
- Redevelopment/provision of public amenities and facilities
- Heritage building restoration and adaptive reuse of the existing district hospital complex (abandoned) as 'Sagar Haat'
- Heritage building restoration and adaptive reuse of the existing building near the district hospital complex as a mini convention centre
- Integrated landscaping by plantation, paving, installation of street furniture, etc.
- Development of leisure water sports activities
- Development of pisciculture tanks and angling deck
- Development of board walk at wetland area
- Development of a bio-diversity conservatory
- Procurement of smart water quality and asset monitoring systems



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Acknowledgements

Contributors

T Ravinder Reddy
Padma Priya J
V Vishnu Vardhan
Abhinav Singh Sisodia
Puneet Agarwal
Sapna Nauhria
Amlan Dutta
Arjun Kardam
Thanish Yadav
Anshul Mishra
Phani Upadrasta
Jivesh Anand
Arun Selvarasu
Manash Sarma
Vandana Kaushik
Emam Ali
Ayush Sharma
Vishnu Jeesha
Sarath Babu
Sneha Lata Sharma
Prashant Harle
Vivek Gautam

For media queries, please contact:

Spriha Jayati
E: spriha.jayati@in.gt.com
M: +91 93237 44249

Editorial review	Design
Shambhavi Modgill	Gurpreet Singh

**For further queries,
please contact our expert:**

Ravinder Reddy
E: Ravinder.reddy@in.gt.com

Contact us

To know more, please visit www.grantthornton.in or contact any of our offices as mentioned below:

NEW DELHI

National Office
Outer Circle
L 41 Connaught Circus
New Delhi 110001
T +91 11 4278 7070

NEW DELHI

6th floor
Worldmark 2
Aerocity
New Delhi 110037
T +91 11 4952 7400

AHMEDABAD

7th Floor,
Heritage Chambers,
Nr. Azad Society,
Nehru Nagar,
Ahmedabad - 380015

BENGALURU

5th Floor, 65/2, Block A,
Bagmane Tridib, Bagmane
Tech Park, C V Raman Nagar,
Bengaluru - 560093
T +91 80 4243 0700

CHANDIGARH

B-406A, 4th Floor
L&T Elante Office Building
Industrial Area Phase I
Chandigarh 160002
T +91 172 4338 000

CHENNAI

7th Floor,
Prestige Polygon
471, Anna Salai, Teynampet
Chennai - 600 018
T +91 44 4294 0000

DEHRADUN

Suite no. 2211, 2nd floor Building
2000, Michigan Avenue,
Doon Express Business Park
Subhash Nagar, Dehradun - 248002
T +91 135 2646 500

GURGAON

21st Floor, DLF Square
Jacaranda Marg
DLF Phase II
Gurgaon 122002
T +91 124 462 8000

HYDERABAD

7th Floor, Block III
White House
Kundan Bagh, Begumpet
Hyderabad 500016
T +91 40 6630 8200

KOCHI

6th Floor, Modayil Centre point
Warriam road junction
M. G. Road
Kochi 682016
T +91 484 406 4541

KOLKATA

10C Hungerford Street
5th Floor
Kolkata 700017
T +91 33 4050 8000

MUMBAI

16th Floor, Tower II
Indiabulls Finance Centre
SB Marg, Elphinstone (W)
Mumbai 400013
T +91 22 6626 2600

NOIDA

Plot No. 19A,
7th Floor
Sector - 16A
Noida 201301
T +91 120 485 5900

PUNE

3rd Floor, Unit No 309 to 312
West Wing, Nyati Unitree
Nagar Road, Yerwada
Pune- 411006
T +91 20 6744 8800

For more information or for any queries, write to us at contact@in.gt.com



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