Urban Green Growth Strategies for Indian Cities

VOLUME 3
Green Growth Good Practices

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Foreword

India has undergone unprecedented population growth and urbanization in the recent decades, propelling the country to become the second largest urban system globally. With urban areas expected to contribute to 75% of the country's GDP and house 590 million of its people, emerging cities of India are truly the engines of her future growth.

Local governments in particular, face a key challenge in ensuring that urban infrastructure and services keep pace with this rapid urban transformation. There has been an increased focus on following a responsible growth path which takes into consideration impacts on the environment while ensuring optimum economic and social prosperity for urban dwellers.

In light of the recent thrust by Government of India on Smart Cities, 'Urban Green Growth' is a very relevant but relatively new approach which integrates economic and social objectives with environmental goals. ICLEI South Asia and the National Institute of Urban Affairs (NIUA), with support from the Global Green Growth Institute (GGGI), have undertaken this project to enable Indian cities to better understand the Green Growth process and communicate its potential benefits to India's urban growth story. To this end, the project entails developing a framework to pilot the Green Growth approach in Indian cities. An assessment of ten tier-two Indian cities of geographically diverse regions and compilation of fifteen good practices of urban India in the context of Green Growth Principles were carried to test the applicability of the framework. The idea is to demonstrate the imperative of long term integrated planning and investment that would yield multiple development benefits.

The project team would like to thank the local governments and the stakeholders in the cities for their enthusiastic response and support. Going forward, we hope that the outcomes of this initial exercise will help Indian cities to develop and implement the Green Growth theory and practice, to meet their development objectives in a holistic manner. We also believe the analysis and recommendations would be useful to design the national and state policies on smart cities.

With best regards,

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Green Growth Good Practices

1.1 Introduction

This research is a collection of fifteen urban practices that represent how cities in India respond locally to the urban challenges they face, through the adoption of green growth approaches. The cases have been chosen to illustrate themes on environment, economy, energy, housing, transport, water supply and sanitation and solid waste management. They are spread all over India and demonstrate a broad range of approaches and cities' commitment to engage with ecologically sustainable, economically efficient and participative urban development.

These urban green growth good practices are a rich mix of initiatives, each of which responds to a specific challenge in a city. As part of the 'Urban Green Growth Strategies for Indian Cities', these practices were analyzed, and specific questions were asked to understand the practices' relevance to urban development and Green Growth in other cities in India, like, What are the innovative solutions that are being tested? What barriers have to be overcome? How are finances committed and managed? Is there capacity in the city, and can this be mobilized? Is the leadership in the city willing to take this step?

At the time these practices were conceived and implemented in the cities, the concept of Green Growth was not prevalent. In the preliminary phases of the project, a set of indicators was identified by the project team, to help shortlist initiatives in Indian cities that could correspond to the concept of Green Growth. The team thus examined good practices that are economically viable, environmentally sustainable and socially inclusive, and that led to improved governance.

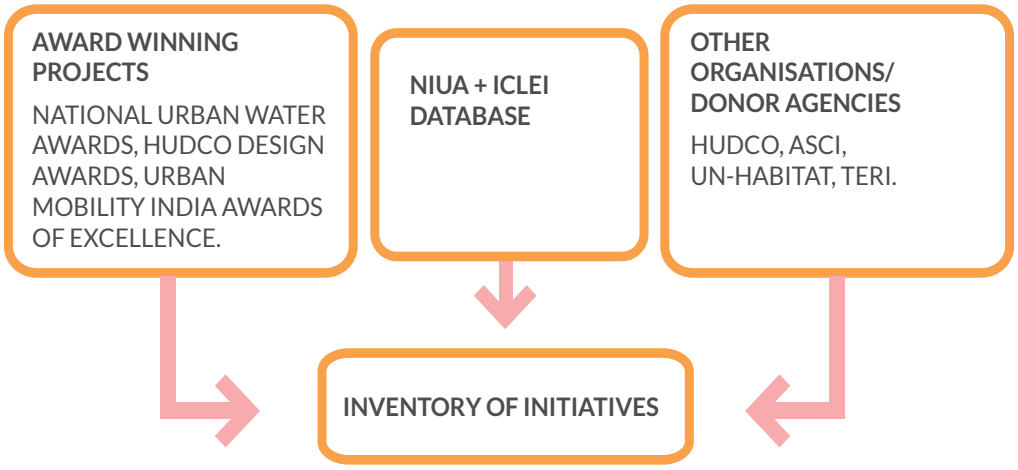
It must be acknowledged that these case studies are good only in part. It is often the difficulties that cities have faced and even their failures in overcoming problems that help the reader to understand the challenges of implementation. These case studies show that a detailed examination from a range of viewpoints can reveal interesting ideas, problem-solving solutions, modes of cooperation and collaboration. Good practices are therefore those experiences that have the potential to develop new thinking, and which can inspire institutional learning in other contexts and situations, by engaging public policy towards more fair and just socio-spatial development. As these cases undoubtedly provide a rich learning platform, they can be considered good practices, regardless of their success rate.

This volume of the report presents a detailed analysis of all the practices studied.

1.1.1 Framework for the selection of good practices

Inventory of good initiatives

An exhaustive inventory of good initiatives was prepared based on the information available in the database of NIUA, ICLEI South Asia and other relevant organizations. The initiatives were then arranged in a city wise matrix under the six broad themes of environment, economy, energy, housing, transport, water supply and sanitation and solid waste management.



Assessment with respect to "Green Growth"

The above-mentioned inventory was then assessed with respect to 'Green Growth'. Under the six themes, each initiative is examined from the perspective of sustainability to help understand how the initiative has benefitted the local stakeholders and economy. The assessment includes aspects that look at economic viability, environmental sustainability, social sustainability and improved governance. The indicators are summarised below:

Indicator	Sub-indicator	Context
Economic Viability	a) Increase in revenue generation b) Recovery of O&M cost c) Employment generated d) Enhanced investment attraction e) Coverage	To understand the "Growth Factor" in the implementation of the initiative the practices were examined to assess whether the initiative is economically viable and has contributed to the economic growth of the city by creating infrastructure or providing services that can enhance avenues for further investment.
Environmental Sustainability	a) Resource conservation b) Reduction in pollution c) Promotion of use of alternate energy d) Increased demand for green product e) Innovative technology	These criteria were used to determine the impact of the practice on the city's environment: whether it has facilitated conservation of resources, lowered pollution levels and promoted green products and services. The use of innovative technology was also considered.
Social Sustainability	a) Improvement in education b) Improvement in health c) Awareness generation d) Improvement in ICT e) Social inclusion - gender, elderly, children, challenged, economically vulnerable	The contribution of the initiative towards the betterment of the local community and society at large was assessed, analyzing it in terms of improvement of social infrastructure, awareness generation and overall inclusion.
Improved Governance	a) Ownership b) Institutionalization c) Improved participation d) Replicability e) Scalability	The ownership of the recipient institution and the participation of stakeholders in the whole life cycle help understand how sustainable the initiative is. Organizational and institutional factors also contribute to the success of the initiative. Its influence on future policies is also important. These aspects were explored to understand features of replicability and scalability.

1.1.2. Identification of relevant good practices

Inventory of good initiatives

Each initiative was analysed with respect to the set of indicators mentioned above and were then weighed on a matrix (5 marks for each sub indicator). The highest scoring initiatives in each theme were then selected for a detailed analysis from a "Green Growth" perspective. From this analysis, fifteen initiatives were ultimately shortlisted to be showcased as good practices for "Green Growth".

1.1.3. Good practices for Green Growth

A template was prepared to examine the various facets of these initiatives from a green growth perspective. Each of these practices was then researched upon, based on available secondary data. Further, the team visited each of the sites and held extensive deliberations with the stakeholders involved. They included city officials, NGOs, private partners, specials cells created under the practices, subject experts, nodal agencies and the users. Presented below is a list of all the initiatives studied. The succeeding pages present the detailed information about the practices in a question and answer format.

Themes	Name of good practice		
Environment	Planning for reducing the impact of disaster in Surat	Kankaria Lake Redevelopment Project, Ahmedabad	
Economy	Revitalization of Bazaars, Jaipur	Ghat ki Guni: A Revitalisation Rroject for Tourism Development, Jaipur	
Energy	Green energy generation from sewerage gas by setting up of sewage gas based power plant, Surat	Pioneering India's Solar Cities Program, Thane	
Housing	Crosscutting Agra Programme (CAP), Agra		
Transport	G-Auto, Ahmedabad	Bus Rapid Transit (BRT) System, Ahmedabad	Traffic Transit & Management Centers (TTMC) by Bangalore Metropolitan Transport Corporation (BMTC)
Water supply and sanitation	Decentralized Waste Water Treatment (DEWAT) System in Kachhpura, Agra	Rain Water Harvesting Initiatives, Thane	Waste water recycling and reuse through four tertiary treatment plants in Bangalore
Solid waste management	Centralized Bio-medical Waste Treatment Facility (CBWTF) on Built-Own-Operate-Transfer (BOOT) basis, Surat	Composting of municipal solid waste through PPP model, Ahmedabad	

Enviornment

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02

Environment

2.1. Planning for reducing the impact of disaster in Surat

2.1.1. Introduction – brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

Inter departmental deliberations and inter organizational collaboration for information and knowledge sharing is crucial for developing integrated solutions for complex urban issues, like dealing with climate resilience. For a city to be resilient to the shocks of disaster, a platform for knowledge sharing is essential to bring together expertise from all walks of urban sector to maximize the efforts of each individual, organization or department for securing the development of the city on the green growth path. This practice demonstrates how an early warning system for floods can help in not impeding growth.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

India is the most flood affected nation in the world after Bangladesh. "Unprecedented floods" take place every year in one state or the other of the country[1]. The Mumbai flood of 2005, Barmer flood of 2006, Leh flood of 2010, Uttarakhand flood of 2013 and Jammu and Kashmir flood of 2014 are some of the "never-before" kind of events in recent years. Many of them had also a significant urban impact. Cities will be hit increasingly harder in the times to come. The United Nations Office for Disaster Risk Reduction has identified floods as the single most widespread disaster risk to urban settlements globally[2]. This initiative addresses the challenge of dealing with such a disaster, in a proactive manner.

Surat is one of India's most economically successful and also one of the most flood-prone city. The city is located on the Tapi River and faces flood risks not only from heavy precipitation in and around the city but also from heavy precipitation upstream and from high tides downstream. Reducing the risks from upstream depends on better water management in a water catchment area and dam reservoir located far outside the city authority's jurisdiction and in another state.

This initiative is about an "end to end early warning system" of floods that has been instrumental in reducing flood risks to the city. It has shown that part of the city's response needs to be a greater ability to live with floods, while minimizing the costs these usually bring in terms of loss of life, damage to homes and disruption to businesses.

Who were the main actors involved?

The practice was funded by the Rockefeller foundation under Phase II of the Asian Cities Climate Change Resilience Network (ACCCRN) initiative. The process of building a resilient city was spearheaded by the Surat Municipal Corporation with technical support from TARU Leading Edge, a research and consultancy company working on disaster management and climate change.

[1] *OzaS.andChauhanV.(2010). Big Floods in Small Towns:How Communities Rebuild Resilience. Urban Risk Management in South Asia. SAARC Disaster Management centre, New Delhi.*

[2] *http://indianexpress.com/article/opinion/columns/good-cities-are-safe-cities/99/*

What is this practice?

The Surat Climate resilience Strategy was developed under the Phase II of the Asian Cities Climate Change Resilience Network (ACCCRN) initiative funded by Rockefeller Foundation. Under ACCCRN, a City Advisory Committee was established to study the impacts of climate change in Surat. This Committee included actors from all sectiosn of urban life – academia, industry, local Govt, civil society etc. The synchronized effort of all these actors led to the creation of Surat Climate Change Trust, a unique instrument designed to develop a Resilience Strategy for the city.

Why is this practice relevant to other cities in India?

High population densities, concrete surfaces and poorly maintained drainage, sanitation and solid waste infrastructures make urban areas more prone to floods as the water is not able to drain quickly.[3] Given this scenario the Surat experience of building a resilient city is a success story which can be followed by other cities to build safe and resilient cities and communities.

IMPACT OF LOCAL CLIMATIC CONDITIONS ON THE BUILDINGS, SURAT

[3] http://indianexpress.com/article/opinion/columns/good-cities-are-safe-cities/99/

2.1.2. Green Growth good practice

Why is this practice relevant to a Vision for Green Growth in the Climate Change Resilience Sector for Indian cities?

Addressing environmental challenges by building a resilient city and community is crucial for achieving green growth. By embarking on the path of building a resilient city Surat has been able to ensure sustainable economic growth in the city in the face of the ecological challenges.

Why is this practice a good demonstration of Green Growth principles?

On account of reducing the flood hazard intensity, the initiative has been able to minimize economic losses due to floods in the city. As a result of the timely and accurate information on floods, the city has been able to sustain its high economic growth, which is majorly driven by its diamond and textile industries. In doing so the city has set a positive example for other cities facing such ecological challenges to ensure sustainable economic growth, by adequately addressing the ecological challenges through a resilience strategy.

What specific Green Growth benefits does this practice demonstrate?

As part of the strategy, an "End-to-End Early Warning System" was setup to reduce the intensity of floods and resultant flood damage to Surat city. This system calculates the volume of water to be added to the Ukai Reservoir based on the amount of precipitation received in the catchment area of the reservoir. The system has made it possible for the local authority to accurately predict the amount of water to be released from the reservoir, the time taken by the water to reach the city and the extent of flooding of the city. The model has enabled the city authority to predict the extent of the area to be flooded and the approximate rise in water level at a particular place.

Since 1979, there have been five major floods in Surat: in 1979, 1990, 1994, 1998 and 2006. The flood of 2006 inundated 75 per cent of the city area with a very high cost to the population, the city economy and the municipal corporation (running to several hundred billion rupees).

Since its inception,the system has been able to save the city from any intensive impact of flood hazard for the past three years. By providing timely and effective information on flood hazards, the system has been able to reduce its intensity by timely evacuation and preparedness. It has enabled the administration to prepare for effective last mile response well in advance. Most significant achievement of the system is the increased respite time for the residents of Surat. During the 2006 floods, the people were given a respite time of 4 to 8 hours. Now, when the city dam approaches its capacity, citizens learn about it via SMS starting 48 hours in advance of the release, giving them enough time to respond and evacuate if necessary.

Through a rigorous public awareness campaign the practice has been able to sensitize and train citizens to respond rationally during flood alerts. People now know that the discharge of a certain amount of water from the reservoir will cause the water in their area to reach a specific level. They are thus prepared well in advance to face the situation.

The practice has led to the creation of the "Urban Health and Climate Resilience Centre" in the city. The centre is a first-of-its-kind dedicated research centre that works on urban health and on building climate change resilience. The centre aims to improve urban health management through evidence-based research, improved surveillance, and the development of operating procedures among city lifeline services departments.

[4]OzaS.andChauhanV.(2010). Big Floods in Small Towns: How Communities Rebuild Resilience? Urban Risk Management in South Asia. SAARC Disaster Management centre, New Delhi.

This centre works with local authorities to study the impacts of climate change on health, with a particular focus on poor and vulnerable city residents. The centre also carries out disease surveillance alongside education and training, to better improvethe city's resilience to outbreaks of disease that may be exacerbated by climate change impacts such as floods.

A form has been developed for the surveillance and each urban health centre sends reports of various diseases and health problems to Surat Municipal Corporation on a daily basis. Surat Municipal Corporation gets information on health problems and diseases also from private medical practitioners, which are then fed into the system. The information is compiled centrally at the Corporation and the report shared with the Municipal Commissioner, who takes the actions necessary to tackle any health problem in the city. For instance, if there is an outbreak of malaria or diarrhea in any part of the city, immediate action is taken to spray disinfectants or fumigate the area in the first case and get water tested in the second case.

The major achievement of the initiative was the inclusion of a budget line specifically for climate change in the Surat Municipality budget for 2013-2014. This signals greater commitment and support of the local body for resilience-building actions.

Surat is the only Indian city in Rockefeller's list of 100 resilient cities. This has enabled the city to receive funds for a chief resilience officer to coordinate and oversee the resilience-related activities.

2.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

The flood of August 2006 was among the worst experienced by any city in Gujarat in recent times and it was the biggest in the last 34 years for Surat. The sudden release of a huge amount of water from the Ukai dam led to over 80% of Surat going under water. More than 20 lakh people - almost two third from low income areas - were trapped in their own or neighbours' houses without food, drinking water, milk, electricity and communication with outside world for four days and nights. About 150 people lost their lives and the economy of the vibrant city came to a stand still for nearly a month causing a loss of more than Rs. 21,000 Crores. This loss does not include loss of income by the informal economy[4].

Thus, the 2006 floods brought major disruption to the city's economy, and the industry took nearly a month to return to production. Some of the industries located on the eastern edge of the city were not inundated – but they were affected by the absence of workers. Around 77 per cent of the working population lost between 15 and 30 days' work. Industrial losses totaled INR 160 billion; with around three-fifths of this being direct losses and the rest from loss of production. Loss to public infrastructure, including the dam, flood embankments, electricity and telephone lines totaled INR 25 billion[5].

This made the city realize that the high economic growth rate that the city is proud of can only be sustained by adequately addressing the climate change issues. The End to End Early Warning System set up as part of the city resilience strategy has been able to save the city from any intensive flood hazard. By providing timely and effective information on flood hazard the system has been able to reduce hazard intensity by timely evacuation and preparedness. It has also helped provide adequate respite time and has enabled the administration to prepare for effective last mile response well in advance.

It may be mentioned here that the End to End Early Warning System is under a trial period. It has been successful in predicting the time and intensity of floods accurately for the last three years.

[5]Bhat G.K., Karanth A., Dashora L. and Rajasekar U. (2013) 'Addressing flooding in the city of Surat beyond its boundaries'. Environment and Urbanization. 25. pp.429-441. , http://eau.sagepub.com/content/25/2/429

[6]TARU (2011) Surat City ResilienceStrategy

[7]TARU (2011) Surat City ResilienceStrategy

How did this practice tie into specific city development objectives?

The practice has led to institutionalization of Climate Change Resilience Strategy by inclusion of a budget line specifically for climate change in the Surat Municipality budget for 2013-2014. The commitment and dedication of Surat Municipal Corporation towards building a resilient city has led to the inclusion of Surat in Rockefeller's list of 100 resilient cities. This has enabled the city to receive funds for a Chief Resilience Officer to coordinate and oversee the resilience-related activities.

How did the main actor(s) make this happen?

Under the ACCCRN project, a City Advisory Committee was established to study the impacts of climate change in the context of Surat, and to recommend strategies that would create higher level of resilience among the local community. The City Advisory Committee incorporated the views, wisdom and commitment of all sections of urban life, from academia, industry, trade, local government and civil society[6].

The Committee initiated the process of assessing the likely impacts of processes of climate change on the socio-economic life of Surat, identifying the probable challenges in future and initiating the formulation of viable and thoughtful strategies to address the same. This process included analysis of some of the critical sectors of the socio-economic life of Surat, such as water, energy, environment, transportation, flood risk management and health. For the first time, an assessment was made on the vulnerability of different sections of the population to the changing weather patterns that may result in, increased precipitation, frequent flooding, changes in disease pattern, sea level rise, increasing energy demand etc[7].

Realizing the cross sectoral nature of the impacts, the City Advisory Committee adopted an interactive and holistic approach entailing engagement with a wide array of stakeholders. A number of Risk Resilience Workshops were held. Thus the process of formulation of a city Resilience Strategy was initiated in Surat during 2009-10.

This required the creation of an entity which could provide a sustainable and neutral platform that would bring key institutions together to identify integrated solutions for complex urban problems, which has support from national, state and community institutions and which could include technical experts and public at large within the decision making process. This led to the creation of the Surat Climate Change Trust – a unique instrument to spearhead the building of a resilient city[8].

The Trust was established under the Bombay Public Trust Act, 1950 to engage in policy advocacy regarding urbanization and climate change, to assess urban growth scenarios and to advise the local government on sustainable habitat development. The 14-member body formed under ACCCRN includes various stakeholders like the Centre For Social Studies, the District Collectorate, the Irrigation Department, the South Gujarat Chamber of Commerce and Industry, Surat Municipal Corporation, Sardar Vallabhbhai National Institute of Technology and TARU.

The main purpose of setting up the Trust was to spread awareness about techniques, technology and practices related to urbanization and climate change and ensure the sustainability of the initiative beyond the ACCCRN project period.

The City Resilience Strategy was spearheaded by the Trust with technical support from TARU. The Strategy aimed at reducing the impacts of climate change by identifying sectors and communities most vulnerable to risk. The strategy provided an overarching framework with a clear vision and direction for improved service delivery by the stakeholders, actions to be undertaken by the communities, thereby promoting economic development of the city[9].

[8]*TARU (2011) Surat City ResilienceStrategy*

[9]*TARU (2011) Surat City ResilienceStrategy*

With the funding support from the Rockefeller foundation, the Trust spearheaded two key interventions within the city as part of the City Resilience Strategy - End to End Early Warning System and Urban Health and Climate Resilience Centre.

The End-To-End Early Warning System was setup to reduce the intensity of floods and resultant flood damage in Surat city. It aims at providing timely flood information to city administration.

The Urban Health and Climate Resilience Centre is the first of its kind dedicated research centre in India to work on urban health and building climate change resilience. The centre is expected to improve urban health management through evidence-based research, improved surveillance, and the development of operating procedures among city lifeline services departments.

What were the main barriers? How did they overcome the barriers?

Due to Surat's large migrant population, representing 60 percent of the total, building public awareness about the local disaster risks, preparedness and mitigation approaches are becoming difficult. A massive awareness generation programme in various vernacular languages need to be taken up on priority basis to sensitize the public towards climate change impacts and how they can contribute towards developing resilience.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc).

Urban Local bodies need to develop network with local institutions and subject experts to address climate change and its impact. This is an effective mechanism to assess and critically analyze their working practices and learn how to change their patterns of decision making to build a more resilient city. Surat did this by initially forming the City Advisory Committee to sensitise people from all walks of urban life towards climate change and its impact which led to the creation of Surat Climate Change Trust.

Inter departmental convergence in terms of information and knowledge sharing and technical support is crucial for building a City Resilience Strategy. In Surat the sharing of information between various concerned departments or organizations like State Disaster Management Authority, State Irrigation Department, Indian Meteorological Department and Surat Municipal Corporation etc. was crucial for the setting up of End to End Early Warning System and Urban Health Climate Resilience Centre.

Are/were there additional follow up phases or stages planned?

Presently TARU is planning to develop a mobile app which will play a significant role in rescue and relief operation during flood in the future. During any major flood, based on their coordinates, the app will provide all necessary information like nearby hospitals, relief centres, relief camps etc to people who are trapped any where in the city. Through the app, people who require any emergency service or evacuation can send their coordinates to the rescue team[10].

[10] *TARU*

2.2. Kankaria Lake Redevelopment Project, Ahmedabad

2.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

This practice demonstrates how a disordered lake front has been converted into a high quality environmental zone with benefits at the physical, organizational and societal level. Not only has this practice helped in the conservation of a natural asset of the city, it has also helped in decongestion by restructuring the circulation network and has thus led to Green Growth. This has been achieved through a coordinated effort of a number of agencies.

KANKARI LAKE,AHMEDABAD

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

The urban challenge addressed by this initiative is upgradation of city environment through comprehensive and organized lakefront development.

Kankaria, a lake located in Ahmedabad city, was visited by hundreds of visitors and was an urban chaos characterized by unclean Ghats, traffic chaos on the 2.4 miles periphery road, unorganized street life including a congested eating area on one corner thriving with street food vendors. The periphery wall at the lake precincts was in a dilapidated state. Vehicle parking along the periphery walls often blocked the view, and visiting children had a hard time amidst the noise, traffic and resultant chaos. The water in the lake was unhygienic due to drainage run offs and dumping of waste.

The project for redevelopment of the lake and its precincts was taken up by AMC in 2006 and completed in December 2008. As a part of this initiative, the environment surrounding the lake was upgraded through a comprehensive and organized lakefront development project, converting it into an high quality urban public space for recreation and leisure showcasing Indian culture and lifestyle, provision of high quality resource and asset management given that the lake represented a source of aquifer recharging water and improving air for the environment in the area. In a nutshell, the project included components of lake front development, restructuring of circulation network and a number of recreation activities.

Who were the main actors involved?

Ahmedabad Municipal Corporation (AMC) was the lead in this initiative. They adopted a model of service delivery of various recreational activities through in-house planning and capacity building combined with use of capable and experienced private sector players in a phased manner. The recreation activities were conceptualised, planned and developed by AMC and thereafter the service delivery was ensured through comprehensive operations and maintenance contracts. About 45 people (particularly food vendors) were part of the process and were provided with organised vending opportunities within the redeveloped area. In addition, they were also trained in Hotel Management and Service Delivery Systems at Institute of Hotel Management at Ahmedabad. They were also assisted in getting a subsidised financial support up to INR 0.2million from Banks.

Thus, in this initiative, the role of AMC has been restricted to supervision, coordination and provision of space. The operations and maintenance with regard to house-keeping, security, maintenance and other comprehensive services are outsourced. A variety of recreational activities have been implemented through Public Private Partnerships.

What is unique about the way that this practice addresses the challenge?

The lake was transformed into a comprehensive high quality environment zone that provided a healthy environment. The Corporation resolved to charge the entry to cover the maintenance expenses at the premises. The response from the citizens has been overwhelming. Since operationlization, more than 1.18 crore visitors have enjoyed the ambience of the transformed Kankaria Lake Front (70 lacs visitors during weekdays since operationalization and 48 lakh people participated during the Kankaria Carnivals of 2008 and 2009). More over 12.5 lacs visitors and children have taken the joyride of mini train – 'Atal Express'. Further, every day during morning hours, approximately 7,500 health conscious citizens living in the nearby area of Kankaria Lake Front regularly visit for Jogging (without being charged entry fee) from 4 am to 8 am. Festivals, small gatherings, educational tours, jogging, informal meetings, picnics etc. have become new face of Kankaria to attract younger generation in a meaningful way. Further, the Lake is emerging as a platform for creative expressions of different communities of artists. Programs like ultrafast laser show with sound, fireworks and musical nights are attracting tourists from other cities and states. A week long Kankaria Carnival has become an annual event for the state of Gujarat[11].

What is this practice?

Kankaria Lake has been a significant urban icon of Ahmedabad that has undergone transformation. Built four centuries ago, Kakaria Lake has always been one of Ahmedabad's most significant landmarks. Surrounded by several places of interest such as Jaldhra, Balvatika, a swimming pool and the zoo, it is a favourite hotspot for morning walks, informal gatherings and fast food. It is also home to several heritage structures.

Over the years, lack of civic discipline, ignorance and haphazard planning has resulted in a collective abuse of this place. Busy traffic, unsafe intersections for pedestrians, disconnection between lake and surroundings and underutilized land were some of the main challenges that have been needed to be addressed. With a view to curb the further abuse of this place and to

[11]*HUDCO award 2012 for best practices to improve the living environment under the category of environment management*

revive it's lost glory, the AMC guided by the Govt. of Gujarat embarked upon this initiative to transform the lake front into a picturesque and robust public place.

KLF (Kakaria Lake Front Development) has been creatively conceived to create a lake front precinct. A comprehensive Master plan was charted out to restructure the outer vehicular ring, design the lake front, conserve the heritage structures and improve the water management system of the lake. The earlier chaotic traffic all around the lake was restricted to a streamlined vehicular route thereby giving way for a large pedestrianized recreational area. A full circle pedestrian promenade has been created where people can take leisurely walk, sit at leisure and peacefully enjoy the serene lake view. A bicycle track has also been created around the lake, along with a dedicated train track where children enjoy rides. As per the master plan, parking areas have been created parallel to the vehicular road. Further plazas and entrance points, dedicated children's play areas and green spaces at regular intervals have also been prepared. Well managed food courts, organised larrie or vendor clusters, handicraft bazaars and boating facilities have also been laid out. The ghats (or lake fronts) have been cleaned up. The area near Naginavadi, Balvatika (both heritage places) have got facelifts and the intersection has been reconfigured into safer intersections, wider roads and well planned access points. All this has transformed the area into a clean and green environment. Kankaria has been converted to an international class urban asset that is clean and green in all respects and brought citizens closer to nature.

The project for redevelopment of the lake and its precincts was taken up by AMC in 2006 and completed in December 2008. It has fulfilled its objectives for upgradation of environment surrounding the lake through a comprehensive and organized lake front development project, converting it into an international quality urban public space for recreation and leisure showcasing Indian culture and lifestyle, provision of high quality resource and asset management given that the lake represented a source of aquifer recharging water and air for the environment in the area.

2.2.2. Green Growth Good Practice

Why is this practice relevant to other cities in India? Why is this practice relevant to a Vision for Green Growth in the Heritage Conservation Sector for Indian cities?

Lakes provide various benefits microclimate, flood control, encouraging biodiversity and replenishing groundwater. The microclimate of the area surrounding the lake benefits if the lake water level is maintained. Lakes also have an aesthetic significance.

A number of Indian cities are endowed with lakes and many of them face challenges in management and upkeep of lakes. This practice showcases how the development of a lake within a city as a functionally compact regional whole with clear geographical limits surrounded by a compact cluster of activities including heritage conservation can enhance tourism and generate revenue for its operation and maintenance.

The Kankaria Lake Front Development (KLFD) in Ahmedabad is also a successful example of sustainable heritage conservation along with maintenance of lake through people's participation and empowerment. People at Kankaria agreed that it is important that users pay for the utilizing the facilities offered because of various reasons. It makes them aware that maintenance involves costs and people appreciate and value a well maintained place. They also added that some penalties like fines and sanctions are also necessary to change behavioural patterns and create awareness.

KLFD also demonstrates that to achieve green growth in any city, political will, coordinated effort of the civic agencies and people's empowerment are necessary ingredients for success.

Why is this practice a good demonstration of Green Growth principles?
The following aspects of Green Growth principles are addressed by this practice:

Political will can definitely change the course of development towards improvement of public spaces. It mutually helps both governing bodies and public at large to create a positive image of a city and people take 'pride' in their city. The KLFD initiative has elevated the lake front from a mere physical and ecological entity to a center of cultural and political events. In the long run, this will help in keeping the place alive and also aid in its upkeep and maintenance.

The completely pedestrian area has showcased the concept of a complementary transformed vehicular zone.

KLFD has helped boost the morale of local vendors by organizing and providing formal spaces to them.

It has also shown how public places can have organized vendors and hawkers in design and consider them as stakeholders, while designing public spaces.

What specific Green Growth benefits does this practice demonstrate?
The entire lake front area has been pedestrianized with access to the lakefront area through three entrance plazas and two other entrances. A 2.25 km long continuous pedestrian promenade made of grey granite was constructed around the periphery of the lake. A 2 m wide bicycle track along the periphery was also added. The highlight of the development was provision of a 42 m long mini toy train. The train operates around the periphery. Provision was made for creation of a handicrafts market to provide experience of shopping for traditional items of Gujarat to visitors. Green space was enhanced by creation of two linear parks 200 m wide one on each side. This provided the necessary open space for recreational activities. The project also included construction of new public toilets supported by overhead tanks. Clean water treated by an in-house reverse osmosis plant supplies drinking water to visitors free of cost. The development of the lakefront was planned with facilities like food courts, walkways, linear gardens and landscapes and musical fountains[12].

2.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
The historical Kankaria Lake is situated at the centre of Ahmedabad city. It has a periphery of about 2.5 Km and has been the symbol of Ahmedabad's identity since almost four centuries. The historic lake is located around an island garden called Naginawadi and has been an evergreen outing place for the people of Ahmedabad. Along with the adjoining Zoo, Balvatika, Aquarium and surrounding hill gardens, it offers a complete entertainment centre. With an expanse of around 4 sq km of water body, it has acted as the lungs of the relatively lower income south-eastern part of the city.

Situation before the initiative: Kankaria was visited by hundreds of visitors and was an urban chaos characterized by unclean Ghats, traffic chaos on the 2.4 miles periphery road, unorganized street life including a congested eating area on one corner thriving with street food vendors. The periphery wall was in a dilapidated state, and lake precincts presented somewhat unclean and disorganized environment. Vehicle parking along the periphery walls often blocked the view, and visiting children had a hard time amidst the noise, traffic and resultant chaos. The water in the lake was unhygienic due to drainage run offs and dumping of waste.

Situation after the initiative: The entire lakefront area has been pedestrianised with access to the lakefront through three entrance plazas and two other entrances. A 2.25 km

[12] *AMC, 2014*

long continuous pedestrian promenade made of grey granite was constructed around the periphery of the lake. A 2 m wide bicycle track along the periphery was also added. The highlight of the development was provision of a 42 m long mini toy train. The train operates around the periphery giving a joyride. Provision was made for creation of a handicrafts market to provide experience of shopping for traditional items of Gujarat to visitors. Green space was enhanced by creation of two linear parks 200 m wide one on each side. This provided the necessary open space for recreational activities. The project also included construction of new public toilets supported by overhead tanks. Clean water treated by an in-house reverse osmosis plant supplied drinking water to visitors free of cost. The development of the lakefront was planned with facilities like food courts, walkways, linear gardens and landscapes and musical fountains.

RECREATION SPACE, KANKARIA LAKE, AHMEDBAD

How did this practice tie into specific city development objectives?

The success of the KankariaLake Front Development project and the overwhelming public response for the project triggered support for development of more public spaces such as Sabarmati River Front Development Project.

How did the main actor(s) make this happen?

The Ahmedabad Municipal Corporation (AMC) adopted a model of service delivery of various recreational activities through in-house planning and capacity building combined with use of capable and experienced private Recreation activities (like Atal Express Train, Zoo, Balvatika, Naginawadi- Ultra Fast Musical Fountain with Multi-Colour Laser Show, Water Sports - Boating, Amusement Park, Glider Ride at One Tree Hill Garden, etc.). These were conceptualised, planned and developed by AMC and thereafter the service delivery

was ensured through comprehensive Operations and Maintenance contracts.
Another feature of the initiative was accommodation of the 45 project affected food vendors within the redevelopment by providing three cluster areas for them in an organised manner. The food stalls were reconstructed as per uniform design specified by AMC. The stalls were given individual Natural Gas connection, electricity with private meters, and water facility. Each stall was given space in the front of the stall for laying tables. Food stall Vendors were given training for Hotel Management and Service Delivery Systems at Institute of Hotel Management. They were also assisted in getting a subsidised financial support upto 2 lakh from Banks. The design also provided for branded food stalls, which is presently occupied by an international food retail chains outlet.

The project was completed in 2008 at the cost of Rs. 36 crore within a period of 18 months. The lake was transformed into a comprehensive high quality environment zone providing a healthy environment. The Corporation resolved to charge the entry to cover the maintenance expenses at the premises. The response from the citizens has been overwhelming.

What were the main barriers? How did they overcome the barriers?

Three Public Interest Litigations were filed against Ahmedabad Municipal Corporation regarding charging of entry fee, construction of ring road around the lake and for not taking the mandatory no-objection certificate from Archaeological Survey of India before starting construction around the sluice gates known as inlet to the lake. This inlet was declared a protected monument in 1928 under the Ancient Monuments Preservation Act.

According to the petitioners, the lakefront development was in violation of the Bombay Provincial Municipal Corporations Act, the Gujarat Town Planning Act and the Ancient Monuments and Archaeological Sites and Remains Act.

As per officials of the Ahmedabad Municipal Corporation (AMC), permission was obtained from the state and central Government. An amendment was made to the Bombay Provincial Municipal Corporations Act to legalize the entry fee to the lake premises. The town planning scheme of the area was modified to include the ring road around the lake. A 'No Objection Certificate' from the Archaeological Survey of India was also obtained by presenting to them the before and after situation of the project and its premises. This convinced all the concerned authorities that the construction has benefitted the lake and helped in its conservation.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc).

As a result of the project, a chaotic spot has been converted into a high quality environmental zone with benefits at the physical, organizational and societal level. The improvement in environment at this public place has been noticed to have improved by manifolds. The place is very clean and always thronged by visitors. The ecology of the place has attracted many new species of birds for breeding. The water in the lake has been completely cleaned owing to stoppage of sewerage water draining into the lake as well as disposal of waste into the lake. The major source of water now for the lake is rainwater runoff. The continuous presence of clean water in the lake has helped in the recharging of the ground water in the vicinities, limiting energy use.

The project demonstrates a useful model for incorporation of project affected people like the food vendors into the project. The project provides opportunities to launch city level and state level events that see participation from all communities and strata. The capability of the initiative to recover its own maintenance expenses is contributing strongly to self-sustainability and is a motivating factor for further improvements.

[13]*HUDCO award 2012 for best practices to improve the living environment under the category of environment management*

Further, AMC has outsourced several activities like housekeeping, operations & maintenance and security to qualified private sector parties through ensuring transparent bidding processes backed by detailed contracts to appoint, and manage the operators[13].

Are/were there additional follow up phases or stages planned?

Presently the Kankaria Lake Front Development Department of Ahmedabad Municipal Corporation is planning to add a number of activities or recreational elements like butter fly garden, night safari etc.

KANKARI LAKE, AHMEDABAD

Economy

Volume 3

03

Economy

3.1. Revitalisation of Bazaars, Jaipur

3.1.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

To embark on the path of Green Growth, a heritage city needs to undertake conservation work that provides impetus to the local economy by revitalising its built and cultural heritage resources for promoting tourism related activities.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

The historic old core areas in Indian cities are stained by several problems like inadequate and obsolete infrastructure facilities, inadequate use of buildings, lack of open spaces, traffic congestion, a mix of conflicting non-conforming land uses, poor dwellings and unhygienic conditions, environmental dispossession, social malice, unemployment and poverty. While most of them still stand replete with buildings, artefacts, and other features of historical and cultural value, these living traditions and cultures fall into neglect, often as an unintended by-product of rapid urbanization. These historic core areas represent opportunity for growth and economic generation. Thus revitalization of the historic old core areas is significant from multiple perspectives of environment, economy, heritage and tourism etc[14].

ALOODA HOUS CHORA RASTA BAZAAR BEFORE AND AFTER REVITALISATION

[14]*Macwan J. E. M. and Kapadia A. V.Revitalisation of Historic Urban Center in the Indian Context: A Case of Jaipur. http://www.ubicc.org/files/zipped/revital%20paper_616.pdf*

[15]*DRONAH*

Who were the main actors involved?

The preparation of Detailed Project Report for the initiative was awarded to Development and Research Organisation for Nature, Arts and Heritage (DRONAH) by Jaipur Municipal Corporation as part of the project – "Revitalization of Jaipur Walled City." The initiative was implemented by Amber Development and Management Authority with funding support from Jawaharlal Nehru National Urban Renewal Mission. The local Residents Welfare Associations, shopkeepers and Bazaar Committees who were involved at all stages of the initiative played a crucial role in successful implementation of the initiative.

What is unique about the way that this practice addresses the challenge?

The Walled City Revitalization Plan of Jaipur was the first heritage project approved and implemented under JNNURM. The initiative generated the interest of Urban Development Ministry towards heritage conservation project, which in turn encouraged other cities with historic inner areas to come up with similar projects[15].

CHORA RASTA BAZAAR BEFORE AND AFTER REVITALISATION

What is this practice?

The walled city of Jaipur is under constant pressure owing to rampant commercialisation. Lack of basic infrastructure facilities, insufficient parking, unauthorized construction and encroachments has led to dilapidation of the historic structures and traditional urban fabric of the area.Thus the Jaipur walled city was identified as a special heritage zone under Jaipur Heritage Management Plan and a revitalisation plan was prepared for conservation of the walled city. The heritage management plan of Jaipur aimed at developing the city area as an international tourist destination with world class facilities and providing impetus to the local economy by developing a thriving hub for local arts and crafts.

The main commercial streets - bazaars were identified as significant heritage precincts within the walled city and listing of the properties in the area were undertaken as part of Heritage Management Plan. The revitalization of three main commercial streets – Tripoliya Bazaar, Jauhari Bazaar and Chaura Rasta, which were a part of the Walled City Revitalization Plan of Jaipur were taken up as pilot projects under JNNURM.

Why is this practice relevant to other cities in India?

The practice sets a positive approach for other Indian Cities with historic inner areas to conserve their heritage value, through a holistic plan that aimed at urban renewal, local economic development and sustainable growth for the city.

3.1.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the heritage conservation Sector for Indian cities?

The practice demonstrates that conservation work needs to aim at improving people's life and developing local economy to be sustainable and successful in the long run. Conservation of built heritage can trigger Green Growth by developing a living heritage city which is a thriving hub for traditional art and craft, rather than being confined only to repair and restoration of individual monuments of historic value.

Why is this practice a good demonstration of Green Growth principles?

The maintenance works in bazaars (or old shopping area) were usually in hands of the shopkeepers and the 'committee for bazaars' or 'committee of shopkeepers' which resulted in segmental improvements ignoring the heritage character, traditional materials and aesthetics. There were no holistic plans for all the major market stretches. Under this initiative all the actors - shopkeepers, Temple Trust and residents etc. were brought under one umbrella to do it in a unified way.

What specific Green Growth benefits does this practice demonstrate?

After the implementation of the initiative the market areas are clean, aesthetically appealing, less chaotic and full of space and facilities for pedestrians. It has improved the premises and created a healthy environment for the buyers and the sellers.

As per the Amber Development Management Authority (ADMA) officials, it has also enhanced the possibilities of revenue generation by generating a sense of hygiene and safety. However no survey has been conducted by them to validate this information.

3.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

The burgeoning tourist activity along with the increase in commercial activity in the main commercial streets posed a threat to the infrastructure and historic built fabric as market pressure on the owners lead to inappropriate modifications and alterations to existing structures.

The revitalization work has significantly improved the environmental condition in the Bazaars and has been able to restore the old buildings to their erstwhile grandeur.

How did this practice tie into specific city development objectives?

The practice was part of overall Heritage Management Plan of Jaipur. The Heritage Management Plan of Jaipur was an initiative of the Jaipur Heritage Committee. This Committee was specially formed to supervise the preparation of the Heritage Management Plan with representatives of various government agencies and to coordinate works of different departments. It was dissolved after the completion of the plan.

Jaipur was the pioneering city to formulate a Heritage Management Plan that was incorporated in the Master Plan of the city. The heritage management plan was formulated to get a holistic overview of the built heritage resources of the city. It aimed to use heritage conservation as a tool for economic regeneration and sustainable growth of the city [16]. It has two broad parts – the walled city and the heritage area outside the walled city.

The plan listed structures, streets and precincts within the walled city that required to be

[16] *DRONAH, Jaipur Heritage Management Plan - Built Heritage*

[17] http://dronah.org/Projects.aspx

[18] http://dronah.org/Projects.aspx

conserved and revitalised. The three bazaars - Tripoliya Bazaar, Jauhari Bazaar and Chaura Raasta, taken up for revitalisation under the first phase of walled city revitalisation plan funded by JNNURM were part of this list.

How did the main actor(s) make this happen?

The Phase 1 of the Walled City Revitalization Plan included revitalization of three major commercial streets - Tripoliya Bazaar, Jauhari Bazaar and Chaura Raasta. A Detailed Project Report for Revitalisation of Jaipur Walled City - Phase 1 was submitted by the Jaipur Municipal Corporation to Ministry of Urban Development in 2008 and was subsequently sanctioned under the sector 'Urban Renewal' in 2008-09[17].

The Detailed Project Report outlined a series of projects within the walled city area for urban revitalization, infrastructure improvement and heritage conservation in the city. It was sanctioned by the ministry on 19th June 2008 with an outlay of INR. 289.6 million. The work was required to be executed in 4 packages. The tenders for all the 4 packages were floated by Jaipur Municipal Corporation in 1st phase amounting to INR 214.6 million[18].

The work for façade restoration of the Bazaars was undertaken by ADMA and the work for improvement of roads and infrastructure was undertaken by Jaipur Municipal Corporation. Through series of consultations and meetings, the local community was made aware of the significance of the restoration work and was subsequently involved at all stages of the project –preparation of Detailed Project Report, implementation and maintenance.

What were the main barriers? How did they overcome the barriers?

Due to limited funding resources only the façade restoration and road improvement works could be undertaken in the Bazaars. Clearing of overhead electric lines which hamper the façade view still remains a major challenge for the project.

Initially the residents, shopkeepers and property owners were apprehensive of the restoration work. They were also afraid of sealing or acquisition by the government or the local body. Through continuous consultation with the local community ADMA was able to assure the people that the restoration work will not hamper the ownership of the properties.

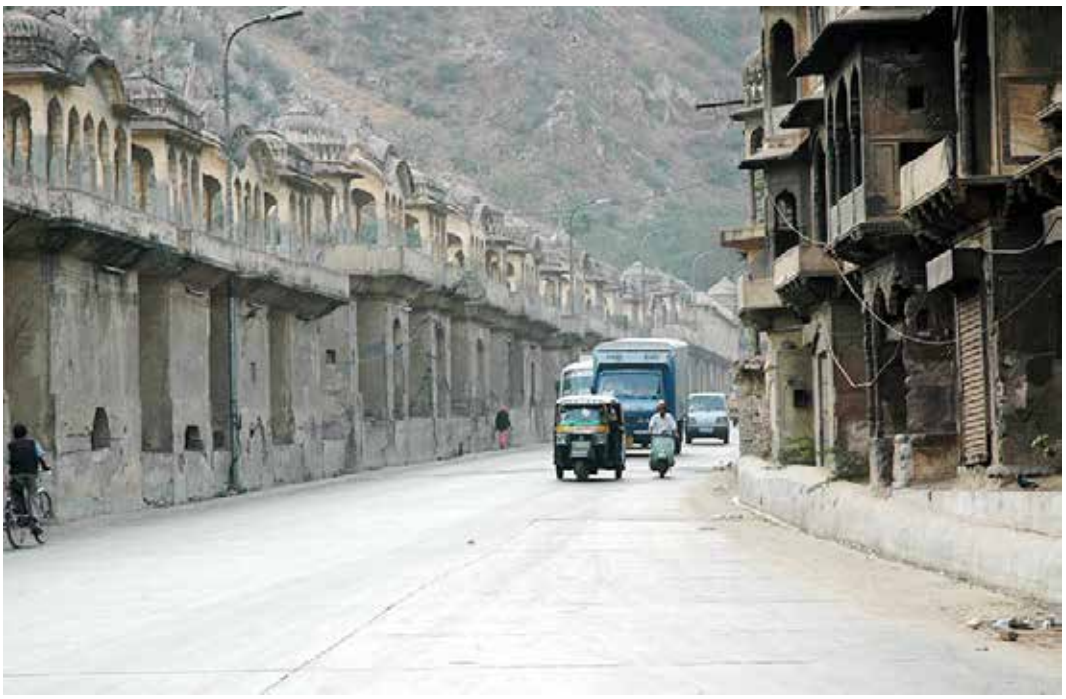
What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

This initiative conveys the message that, as an alternative of taking up piecemeal development, cities need to develop a comprehensive plan with a well-defined vision for conservation of heritage structures present in the city. Jaipur did this by preparing the Heritage Management Plan which was later on incorporated in to the Master Plan of the city.

Are/were there additional follow up phases or stages planned?

Though a holistic plan for Revitalization of Jaipur Walled City was approved under JNNURM in 2008-09, till May 2014, many of the initiatives under this could not be taken up by Jaipur Municipal Corporation due to the lack of funding resources. Till the time of the city visit for this report, Jaipur Municipal Corporation was awaiting the approval of Ministry of Urban development for the Detailed Project Report submitted for revitalization works in Jaipur Walled City.

3.2. Ghat ki Guni - A Revitalisation Project for Tourism Development, Jaipur



GHAT KI GUNI BEFORE REDEVELOPMENT

3.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

Instead of going for a monument-centric conservation approach which is limited to a single building, cities should resort to adaptive reuse of land rehabilitation of a historic neighbourhood or entire urban precinct to fully realize the economic benefits of the natural and cultural heritage resource of the city. The conservation and adaptive reuse of heritage precinct for creating vital urban recreational area with the finest banquets, hotels, restaurants, shopping and recreational experiences will not only improve the environmental condition in and around the area but also generate tremendous economic opportunity in a city, especially for the local community.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

India has a rich cultural, historic and natural heritage. Indian cities with limited financial resources are facing the challenge of preserving heritage in a commercially viable way. The role of heritage conservation in achieving local economic development has not been fully recognized by the cities nor have heritage needs been integrated into development plans of the city. Given this scenario Jaipur's endeavor to integrate Heritage Management Plan to the Master Plan of the city and linking heritage conservation to local economic development sets a financially viable alternative for management of heritage resource of the city.

Who were the main actors involved?

In July 2009, the Department of Urban Development & Housing, Government of Rajasthan decided to integrate all past efforts for the revival of the historic Ghat ki Guni stretch.

Development & Research Organization for Nature, Art and Heritage (DRONAH) was selected as a technical consultant for preparing the detailed project report. The work of restoration of the heritage structures was assigned to Amber Management & Development Authority. The work of construction of tunnel, provision of infrastructure facilities and development of recreational activities is done by Jaipur Development Authority.

What is unique about the way that this practices addresses the challenge?

Instead of considering the conservation of heritage resources as an economic liability for the local government, the project has successfully converted the heritage conservation work into an opportunity for local economic development by adaptive reuse of the heritage precincts for development of a cultural and heritage tourism hub.

What is this practice?

Ghat ki Guni is a significant historical landmark of Jaipur. Situated amidst the ghats (hills) in the east of Jaipur, it is about a 2 km long Guni (mountain pass), which forms the gateway to Jaipur from Agra. The distinguishing feature of the area is the beautiful historic buildings on the either side of this passage, having characteristic architectural style and elements of the Rajput and early Mughal Architecture. It has unique conglomeration of 52 properties consisting of a series of planned gardens, havelis (big mansions) with stepped terrace gardens and temples that present a glimpse of the Rajputana Architecture. The grandeur of the establishment is further complimented by its natural setting.

Over time, this stretch was immensely dilapidated due to lack of conservation and pollution caused by heavy traffic flowing through the stretch. Several government initiatives have been envisaged since 1991 for the revitalization of this culturally, historically and aesthetically rich heritage zone of Ghat ki Guni. Recognizing the economic potential of the stretch for development as a cultural and tourist hub, in 2009, the Government of Rajasthan planned to take up revitalization work of the stretch in an integrated manner.

Why is this practice relevant to other cities in India?

Adaptive reuse is a key to preserving a structure while propping it up for new use. The preservation of historic buildings and other cultural resources provides a window into how our built environment had been structured in the past as well as gives a vision of where they fit into our future. Where a building is no longer able to function with its original purpose, a re-adapted use may be the only way to preserve its heritage significance .

This initiative provides a positive alternative for Indian cities with rich heritage and cultural resources to develop economic opportunities by resorting to adaptive reuse of the heritage precincts. This helps to preserve the heritage value of the structure while advocating it as a thriving tourist hub[19].

3.2.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the heritage conservation Sector for Indian cities?

Identifying environmentally sustainable economic opportunities is crucial for achieving Green Growth. This initiative shows that conserving the heritage precincts and resorting them for their adaptive reuse provides a positive alternative for Indian cities with rich heritage resources to develop a green economy based on the tourism potential of the city.

Why is this practice a good demonstration of Green Growth principles?

The initiative provides a successful approach for conservation of heritage precincts and full realization of its economic potential by adaptive reuse which retained the building's heritage

[19] http://cultureinperil.blogspot.in/2011/01/adaptive-reuse-and-cultural-heritage.html

significance while adding a contemporary layer of urban services and infrastructure that provides value for the future.

What specific Green Growth benefits does this practice demonstrate?

The adaptive reuse of the restored gardens and structures like Bidyadhar ka Bagh, Raj Niwas and Roop Niwas as destinations for wedding and functions has created a source of revenue for Amber Management & Development Authority.

The facade restoration of the private structures motivated the owners of these buildings to undertake revitalization work of their buildings. With the improvement in the surrounding areas many of the owners have successfully converted the heritage buildings in to hotels, restaurants and party destinations. The conservation work has generated economic opportunity for this otherwise dilapidated and neglected stretch. For example, Olympia Garden is a private property and has become a successful destination for weddings and functions.

Amer Development & Management Authority has started some recreational activities like musical fountain etc. in the restored gardens to attract tourists. As per the officials, the number of tourists visiting the place has considerably increased after the restoration work. They are hopeful that the development of other recreational and cultural activities will result in tremendous economic opportunity for the area.

REDEVELOPED GARDEN, GHAT KI GUNI

[20]*DRONAH, Jaipur Heritage Management Plan - Built Heritage*

3.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
The route passing through Ghat ki Guni was part of the National Highway connecting the two major cities of Jaipur and Agra. The pollution and vibration caused by the heavy traffic passing through the area endangered the heritage value of the small yet significant stretch. This stretch had two historic gates at both its ends. Over the time one of these gates was demolished and the other was burnt down to facilitate the movement of heavy vehicles through the stretch.

Government of Rajasthan, realizing the potential of Ghat ki Guni as a possible cultural hub for multiple activities, decided to work out a planning strategy to conserve, revitalize and rehabilitate the stretch. This led to the decision to divert the national highway away from this stretch by initiation of the 'Ghat ki Guni Tunnel Project' through the Jhallana hills. The Tunnel has been completed and is functional at present.

Presently, the restoration of gardens and buildings along the stretch is being done by Amer Management & Development Authority. This restoration work has successfully restored the erstwhile grandeur of these heritage precincts. Jaipur Development Authority is planning to take up the development of infrastructure services and recreational activities for developing this stretch as cultural and heritage tourist hub.

How did this practice tie into specific city development objectives?
The practice was part of the overall Heritage Management Plan of Jaipur. Jaipur was the pioneering city to formulate a Heritage Management Plan that was incorporated in to the Master Plan of the city. The heritage management plan was formulated to get a holistic overview of the built heritage resources of the city. It aims to use heritage conservation as a tool for economic regeneration and sustainable growth of the city[20]. It has two broad parts – the walled city and the heritage area outside the walled city. Ghat ki Guni is a part of the list of heritage structures outside the walled city.

How did the main actor(s) make this happen?
In 2006, Jaipur Development Authority with financial assistance of INR 38.3 million from the Department of Urban Development & Housing, Government of Rajasthan, initiated the work of revitalization of Ghat ki Guni for development of the area and the surrounding hills as a tourist destination. As part of the initiative, it undertook the work of construction of a tunnel for diverting the traffic moving through the valley and assigned the work of restoration of some of the gardens and structures like Raj Niwas, Peela Mahal, Roop Niwas and Bidyadhar Ka Bagh to Amer Development and Management Authority.

In July 2009, the Department of Urban Development & Housing, Government of Rajasthan decided to integrate all past efforts for revival of the historic Ghat ki Guni stretch. It made a financial allocation of INR 66.3 million in to Jaipur Development Authority for taking up the conservation work for the rest of the structures in the stretch. To review the progress of redevelopment and heritage conservation work taking place in the city like the conservation of Ghat Ki Guni, Amer and Walled City of Jaipur, a Committee was constituted under the Chairmanship of Chief Secretary, Government of Rajasthan. The members of this committee included Principal Secretary (Department of Art & Culture), Principal Secretary (Urban Development & Housing & Local Self Government), Secretary (Local Self Government) and Chief Executive Officer (Jaipur Municipal Corporation), and Director (Town Planning, Jaipur Development Authority).

[21] http://cultureinperil.blogspot.in/2011/01/adaptive-reuse-and-cultural-heritage.html

Jaipur Development Authority commissioned the preparation of a detailed project report for conservation and adaptive reuse of Ghat ki Guni to DRONAH. The report prepared by DRONAH evaluated all the past efforts and presented an action plan and investment outlay for the project.

The Department of Art & Culture declared all the 52 structures in Ghat ki Guni as state protected heritage structures to prevent any further alteration or modification of the structures by the residents. The restoration work of the Government owned structures and the facade restoration of the rest of the private owned structures is being done by Amer Development and Management Authority. The provision of infrastructure facilities, development of recreational activities and hotels etc. will be done by Jaipur Development Authority.

What were the main barriers? How did they overcome the barriers?

One of the major prerequisite for the revitalization work was the diversion of the heavy traffic moving through the valley by construction of a tunnel through the adjoining hills. The clearance from Forest Department for construction of the tunnel took considerable time which delayed the project by approximately one year.

The work for provision of underground electricity lines, water supply lines, sewerage and drainage lines has not been completed due to lack of funding. The provision of these facilities is very much essential for the holistic development of the area as a tourist destination.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc).

Adaptive reuse is self-defeating if it fails to protect the building's heritage value - its appearance; its social, cultural, or historic meaning; or its fundamental nature[21]. Cities need to develop the proposal for adaptive reuse of heritage precincts that aims at minimum impact on the heritage significance of the resource and its setting and maximum development of local economy through various recreational activities.

Are/were there additional follow up phases or stages planned?

In the endeavour to develop Ghat ki Guni as a tourist destination, certain recreational activities like - craft markets, trekking and camping facilities on the hill, rope ways and camel ride etc. have been planned by Jaipur Development Authority. Proposals are also being considered for developing some heritage hotels in some of the privately owned heritage structures to provide boarding facility for tourists visiting this area. This will not only help create economic opportunity for the owners of these buildings but also provide the tourists an opportunity to spend longer time in the area and enjoy the various recreational activities.

Energy

Volume 3

04

Energy

4.1. Green Energy generation by setting up of sewage gas based power plant, Surat

4.1.1. Introduction – brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

The initiative demonstrates that reuse of energy can be made economically viable through innovative thinking. It also demonstrates that decentralization of power and creation of a second tier of leaders can be enabling factors for implementing innovations and achieving green growth. The officials from Surat Municipal Corporation were able to implement the project because of the strong leadership and support of the then Municipal Commissioner, who gave the officials full independence to research, develop and implement a project which was pioneering in the state of Gujarat.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

The Urban Local Bodies have to spend a significant amount on energy consumption for provision of various municipal services. The generation of energy from sewage gas for captive utilization in the sewage treatment plants can lead to energy efficiency in the waste water treatment sector.

Utilizing the sewage gas for energy generation is an economically viable option for making the sewage treatment process energy efficient by reducing the consumption of grid based power. This also reduces the emission of greenhouse gases in to the atmosphere.

Sewage treatment plants generate sewage gas during the treatment of sludge as part of the treatment processes. This sewage gas which usually contains about 60 to 70 percent methane which is a greenhouse gas and 30 to 40 percent carbon dioxide, and other gases, including ammonia, hydrogen sulfide and other noxious gases, has a very high calorific value.

Who were the main actors involved?

This initiative provides a good example of combination of efforts put forward by a Municipal Corporation (Surat Municipal Corporation), an academic Institute (Indian Institute of Science, Bangalore) and Ministry of Non Renewable Energy.

The project was successful because of the prompt action of Surat Municipal Corporation and able guidance of Ministry of Non Renewable Energy. Ministry of Non Renewable Energy extended techno-financial support to Surat Municipal Corporation for successful implementation of a pilot at Anjana Sewage treatment plant and Indian Institute of Science, Bangalore supported Surat Municipal Corporation in preparing the detailed project report for setting up the plant.

Based on the learning from the pilot project, Surat Municipal Corporation moved forward to implement such plants on a city wide scale.

What is unique about the way that this practice addresses the challenge?

The initiative which is a pioneering effort in the state of Gujarat is a successful example of creation of eco-efficient energy infrastructure. It demonstrates that waste water treatment system can be made energy efficient by resorting to the generation of non-renewable energy.

What is this practice?

Surat Municipal Corporation is generating electricity by establishing sewage gas based power plant through sewage gas based engine generator technology. This has resulted in reduction in electricity consumption of grid power and also reduced the emissions of greenhouse gases. The initiative has a multiplier effect as to maximize the generation of energy. Surat Municipal Corporation has strengthened the sewerage and drainage network in the city so as to collect maximum amount of sewage to feed the plants. Presently 100% of the habitable area in the city is covered under sewer network. The city has 35 Sewage Pumping Stations and 9 Sewage Treatment Plants which treat 100% of the sewage generated in the city[22].

Why is this practice relevant to other cities in India?

Waste water treatment is an energy intensive process. The shortage of energy and rising energy prices amplify the need for the cities to resort to a more energy efficient waste water treatment process.

SEWAGE TREATMENT PLANT ,SURAT

[22] *ICRIER's program on capacity building & knowledge dissemination on urbanization in India preparing for the urban challenges of the 21st century, service delivery of water and sanitation - challenges faced by metropolitan cities, (Surat City), February 06, 2013*

4.1.2. Green Growth Good Practice

Why is this practice relevant to a Vison for Green Growth in the Water/Wastewater Sector for Indian cities?

The sewage gas based energy plants in Surat is an economically and ecologically sustainable solution to optimize the energy potential of the sewage treatment plants. The initiative shows that capturing carbon emissions from high carbon-emitting energy sources such as sewage gas for generation of energy can lead to transition towards a low-carbon energy system which triggers "double dividends and less environmental impact"along with more employment opportunities in the city.

Why is this practice a good demonstration of Green Growth principles?

Apart from the energy saving potential, other co-benefits of these plants such as reduction in emission of greenhouse gases, reduction in pollution and creation of employment opportunities ensure that such plants can support the development of the city in the green growth path.

What specific Green Growth benefits does this practice demonstrate?

The generation of energy from sewage gas has helped in recovery of Methane, a potent Greenhouse gas which in normal course would have been emitted in open atmosphere due to decomposition of sewage.

The plant is an eco-efficient (ecologically and economically) project which has negligible negative impact on the environment. The used scrubbing solution in the H_2S scrubber is the only waste generated in this power plant. Even this is so negligible that it can be diluted and treated along with the inlet sewage in the Sewage Treatment Plant. This power plant, along with the Sewage Treatment Plant, is regarded as more or less a 'zero waste' system.

SMC is earning additional revenue through sale of the organic manure generated from the digested sludge.

By captive utilization of the energy produced, Surat Municipal Corporation has been able to cover 80% of its energy demand for the Sewage Treatment Plants. This has drastically reduced the expenditure on electricity which can now be used for constructive purpose(s).

The reduced consumption of grid based energy has not only reduced transmission loss but also the carbon foot print of the city by minimizing its dependence on fossil based fuel. This has made the plants eligible for carbon financing.

It is estimated that the project would generate 58,586 CER (Certified Emission Reduction). The proposal to get the carbon credit from three Sewage Gas Based Power Plant has been approved by Ministry of Environment & Forest and is under process for validation and project registration at United Nations Framework Convention on Climate Change (UNFCCC).

The table below lists the energy savings and reduction in carbon emission achieved by each plant.

ENERGY SAVINGS AND REDUCTION IN CARBON EMISSION				
Parameters	**Name Of The Sewage Treatment Plant**			
	Anjana	**Karanj**	**Singanpore**	**Bhatar**
Energy Generated				
Installed capacity of power plant (MWe)	0.5	1	1	1
kWh units generated since commissioning (till December 2013)	16766752	12499011	7338832	4072017
Generation (in Rs till December 2013)	74740501	60618186	34761512	19711906
Energy Saving Per Annum				
Units	2739000	4455000	3696000	3894000
Amount	14516700	23611500	19588800	20638200
Revenue Generation				
Net saving after subtracting auxiliary consumption and O&M cost till December 2013 (in lacs)	484.00	553.84	257.03	126.59
Carbon Credit Per Annum				
CER Units	-	19500	18000	18500
Amount in Lacs	-	125	122	123

Apart from the environmental benefits the project has also created employment opportunities in the city both during implementation and operation & maintenance of the plant.

4.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Since the outbreak of the plague epidemic in 1994, SMC has undertaken massive infrastructure up-gradation in the water supply and sanitation sector in the city, whose operation and maintenance involves consumption of large amounts of electricity. With the increase in population, the volume of sewage generated in the city has also increased thus further enhancing the electricity requirement for pumping and treatment of the sewage. This had heavily increased SMC's expenditure on electricity. Hence, in order to reduce its dependency on grid based power Surat Municipal Corporation decided to generate energy from sewage gas. This approach also helped make the sewage treatment process energy efficient.

As a result of captive utilization of the energy, Surat Municipal Corporation has been able to cover 80% of its energy demand for the Sewage Treatment Plants. This has drastically reduced the expenditure on electricity which can now be used for more constructive purposes.

How did this practice tie into specific city development objectives?
The initiative has led to energy efficiency in the waste water treatment sector.

How did the main actor(s) make this happen?
Under the umbrella of the national programme on Energy Recovery from Urban and Industrial Wastes, the Ministry of Non Renewable Energy had been promoting and financially supporting demonstration projects involving recovery of energy from wastes of renewable nature, besides attempting to reduce emission of greenhouse gases (GHGs) into the atmosphere[23].

In 1997, the Ministry of Non Renewable Energy invited about 30 representatives from various Local Bodies to introduce the concept of 'Waste to Energy' Program. Representatives from Surat Municipal Corporation participated in this programme. After returning back these officials discussed the idea with the higher authorities in Surat Municipal Corporation.

At that time, the city had two sewage treatment plants whose operation and maintenance work was very energy consuming. Thus to reduce the expenditure on energy by minimizing the consumption of grid based energy, Surat Municipal Corporation decided to generate energy from sewage gas.

To oversee the activities of the project, Surat Municipal Corporation constituted a Project Implementation Committee of leading consultants from the academia and industry. To assess the techno-financial viability of the project Surat Municipal Corporation, Ministry of Non Renewable Energy and Indian Institute of Science, Bangalore signed a Memorandum of Understanding for preparing the detailed project report for setting up of the sewage gas based power plant at the two existing Sewage Treatment Plants.

The report estimated that around 1 MW of electricity can be generated from the existing Sewage Treatment Plants. As a pilot project, SMC decided to set up 0.5 MW sewage gas based energy plant at Anjana, which is one of the oldest Sewage Treatment Plants in Surat.

[23]*M.K. DAS, Sewage Gas Based Power Generation at Sewage Treatment Plants Surat Municipal Corporation, Surat, Akshaya Urja, Vol-5, Issue-3, December-2011.*

Conceived in January 1997, a blue print of the project was prepared by Surat Municipal Corporation and tabled for scrutiny before the Ministry of Non Renewable Energy in July 1997. This early initiation led to in-principle agreement between the Ministry of Non Renewable Energy and the Surat Municipal Corporation to co-steer the project, subject to scientific confirmation about its techno-commercial feasibility and viability.

The project was successful because of the prompt action of Surat Municipal Corporation and able guidance of the Ministry of Non Conventional Energy Sources. Though the meeting convened by MNRE was attended by the representatives of a number of ULBs, SMC was the only ULB who came forward with a blueprint for a pilot project. This prompt action by SMC was duly recognized by MNRE who extended techno-financial support to SMC for successful implementation of the pilot. Based on the learning from the pilot project, SMC moved forward to implement such plants on a city wide scale.

The first sewage based energy plant was commissioned at Anjana in October 2003. It took around six years for commissioning the plant from which around 1.5 years time was for setting up of the plant. Through a process of competitive bidding, Surat Municipal Corporation selected Chemtrols Engineering Ltd. (CEL), Mumbai, in June 2002 for setting up the 0.5 MW electricity bio gas based power plant at Anjana Sewage Treatment Plant at the cost of INR 260.46 lacs.

The prestigious project, first of its kind in India, to generate green energy from sewage gas was based on the use of an imported, 100 per cent sewage gas based engine of Spanish origin, duly complemented with high levels of automation and a state-of-the-art polymer based inflatable gas balloon. The completely integrated plant successfully generated 0.5 MW during the trial runs in October 2003.

The present generation of electricity from the plant is about 8300 units per day, which is consumed to run Anjana STP itself. Surat Municipal Corporation was able to recover its part of the investment (50%) within only 40 months of commissioning of the project.

After successfully commissioning this prestigious plant, the Surat Municipal Corporation took quick actions to setup sewage gas power plants at 3 other STPs at Singanpore, Karanj and Bhatar within five years from the commissioning of the first plant. These Sewage Treatment Plants are set up on the Conventional Activated Sludge process. Sewage gas is being generated in these sewage treatment plants by the process of anaerobic digestion.

The cost economics and energy generation data of each plant is given in the following table.

DETAILS OF THE SEWAGE BASED ENERGY GENERATION PLANTS AT ANJANA, SINGANPORE, KARANJ AND BHATAR

Parameters	Name Of The Plant			
	Anjana	Karanj	Singanpore	Bhatar
Timeline				
Date of Commissioning	Oct-03	Mar-08	Mar-08	Aug-08
Duration taken for setting up of the plant	16 months	13 months	13 months	18 months

Cost Economics				
Total Project Cost in Lacs	271.46	625.00	617.00	621.00
Grant from MNRE / GEF in Lacs	130.23	200.00*	200.00*	200.00*
SMC Contribution in Lacs	150.63	425.00	417.00	421.00
Payback period for SMC fund (approx. in months)	40 months	47 months	61 months	58 months
*Grant partly received				
Energy Balance				
Biogas generated from digester (cu m per day)	4900	4500-6200	4200-5200	4200-5400
Biogas consumed by engine (cu m per day)	4800	4500-6200	4200-5200	4200-5400
Biogas stored in gas holder (cu m per day)	100	100	100	100
Electricity generation (kWh per day)	8300	13500	11200	11800
Auxiliary consumption (kWh per day)	560	850	840	990
Net electricity utilized for plant (kWh per day)	7740	12650	10360	10810
Engine electricity efficiency (per cent)	35.40%	39.20%	39.20%	39.20%
Source: Surat Municipal Corporation				

Presently Surat Municipal Corporation is planning to set up sewage gas based power plant at Barmoli (0.5 MW), Bhesan (0.5 MW), Dindoli (0.75 MW), and Variav (0.6 MW), STPs. After the commissioning of these plants, out of the 9 STPs in the city, 8 will become energy secure. Based on the previous experiences, SMC has specified the minimum amount of electricity that can be generated by these plants in the work contract for construction of these plants, failing which the short fall in guaranteed generation will have to be borne by contractor.

What were the main barriers? How did they overcome the barriers?

As such there were no barriers for implementation of the initiative.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

After successful implementation of the pilot project at the Anjana Sewage Treatment Plant, Surat Municipal Corporation has implemented similar sewage gas based power plant at Karanj, Singanpore, Bhatar Sewage Treatment Plants. Surat Municipal Corporation is now including a bio-gas based power plant along with construction of sewage treatment plant so that generation of electricity can start as soon as the Sewage Treatment Plant starts operating.

For the proposed Sewage Treatment Plants at Barmoli, Bhesan, Dindoli and Variavloacted in Surat, installation of bio-gas power plant has been incorporated along-with the construction of treatment plant. This shows the initiative is highly replicable. With a modest beginning from a single pilot project, the initiative has now been scaled up, city wide.

Are/were there additional follow up phases or stages planned?

The success of the project has also encouraged Surat Municipal Corporation officials to further their efforts in research and development of innovative sewage treatment technologies. Presently they are preparing the blue print for setting up of plant for generation of CNG which has more economic potential (details given in the table).

Comparative analysis of energy and CNG generation from sewage gas

Bio Gas Quantity	Product Generated	Engine Efficiency	Quantity Generated	Rate / Unit	Revenue Generated/ Unit	Additiona Revenue
1 cu. m	Energy	34%	2.0 KW	Rs 5.65/unit	Rs 10.50	Marketing of organic manure generated as a by-product
1 cu. m	CNG	70%	455 g	Rs 40/kg	Rs 20.93	Marketing of carbon dioxide generated as a by-product which has very high industrial demand

Source: Surat Municipal Corporation

Also as the engine efficiency is very high for the CNG conversion (70%) compared to energy generation (34%), more benefits can be achieved by generating CNG rather than energy. The energy produced by the plant is not grid-based. Hence, it has to be used at the plant site. The added advantage is that CNG has no storage or transportation problem.

CLARIFLOCCULATOR ,SEWAGE TREATMENT PLANT

4.2. Pioneering India's Solar Cities Program, Thane

4.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

Local leadership is the key to move from vision to implementation. Success of this local energy governance model relies significantly on the leadership abilities of those in the local public administration.

In Thane, the city's Electrical Department and its 'Energy Conservation Cell' played a key role in the implementation of the energy projects. Good leadership within this department ensured support from other public and private stakeholders.

ROOFTOP PHOTOVOLTAIC POWER SYSTEM

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

Energy is a vital component of urban infrastructure. Energy intensity is extremely high in an Indian city compared to a similar-sized city in a developed country. Most cities do not have projections of their energy requirements, leave alone strategies to tackle projected shortages. Issues such as substitution of energy sources or even concepts of energy convergence have not been given much attention. A plan of action to combat the adverse environmental impact of energy consumption is also missing. The optimum mix of energy sources to ensure sustainable and reliable energy delivery has not even been thought. Energy conservation issues are normally given a 'go by.' With the increasing gap between supply and demand of energy, issues such as energy sufficiency and efficiency merit serious attention[24].

This practice asserts that increasing energy efficiency and resorting to renewable energy sources offer a cheaper and cleaner alternative to meet India's growing energy demands.

Who were the main actors involved?

The Thane Municipal Corporation, its Electrical Department and its 'Energy Conservation Cell' played a key role in the implementation of the energy projects. They established a

[24] *India Infrastructure Report, 2006*

renewable energy and energy efficient vision, identified specific workable projects and through these, delivered tangible results.

ICLEI South Asia, an international association working with cities worldwide, provided the technical assistance for preparation of the Solar City Master Plan. The Ministry of Non Renewable Energy provided the financial assistance for the preparation of Thane Solar City Plan.

What is unique about the way that this practice addresses the challenge?

The Thane experience suggests a paradigm shift in thinking about energy consumption in the city. Instead of considering the city as a major energy guzzler, the Solar Cities Program, has made the city a site for energy generation, energy governance and sustainable innovation.

What is this practice?

Thane City which was pioneer in Municipal Energy management in the country has been working towards the Renewable Energy and Energy Efficiency measures since 2000-01. In 2009, as a natural continuation of its portfolio of local energy initiatives, Thane joined the Ministry of Non Renewable Energy's Solar Cities Program. As part of the Solar City programme, Thane Municipal Corporation in collaboration with ICLEI-South Asia evaluated its energy performance, identified areas for improvement and developed locally tailored solutions. This has resulted in greater awareness of local energy dynamics contributing to reduced consumption.

Why is this practice relevant to other cities in India?

Energy governance in India has been the domain of state and centre level government, leaving the cities with little scope to shape their own energy agenda. The Solar Cities Program of India's Ministry of New and Renewable Energy addresses this by enabling cities to develop tools to reduce demand and increase renewable energy supply. Participating cities commit to a target of 10 per cent reduction in the demand for conventional energy over the course of five years. This reduction is to be achieved through a combination of renewable technology utilization and energy efficiency techniques .

4.2.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Energy Sector for Indian cities?

This initiative is a good example of how Local energy governance can play a key role in responding to the joint challenges of environmental management and local economic development.

Why is this practice a good demonstration of Green Growth principles?

Operation and maintenance of urban infrastructure services are energy intensive processes. The initiative illustrates that the use of energy management measures (renewable energy and energy efficiency) in service delivery by urban local bodies can provide opportunities to reduce energy demand, harvest financial savings from reduced electricity use and reduce related Greenhouse gas emissions.

What specific Green Growth benefits does this practice demonstrate?

The city's many positive results are related not only to the Solar Cities Program but to several earlier initiatives that provided a solid foundation for the program. Over the thirteen years starting from 2001 till date Thane Municipal Corporation has been able to save 428 lacs units of energy which is equivalent to a saving of INR 194.9 million[26].

[26] *ICLEI - South Asia, Thane, India, Pioneering India's Solar Cities Program*

[27] *A compendium of the award winning and other entries for the "HUDCO Award for Best Practices to Improve the Living Environment" 2011-12.HSMI-HUDCO Publication, World Habitat Day, October 1, 2012*

[28] *A compendium of the award winning and other entries for the "HUDCO Award for Best Practices to Improve the Living Environment" 2011-12.HSMI-HUDCO Publication, World Habitat Day, October 1, 2012*

As a result of amendment in building permission rules and rebate in property tax for solar water heater, more than 9 lac litres per day capacity solar water heating systems have been installed by developers or owners of tenements. Thane Municipal Corporation has installed 36,000 litres per day capacity solar water heating systems on its own buildings[27].

As part of its non-renewable energy generation initiative it has also established 50KWp Solar Photo Voltaic System for main administrative building with generation of 65,000 units of electricity per annum, 145 Solar Garden Lights, 80 T capacity solar air conditioning for municipal hospital and 15 T capacity bio-methanisation plant for provision of energy to the municipal hospital.

Thane Municipal Corporation has saved 28.37% of energy because of energy efficiency measures in street lighting sector, 45.16% of energy because of energy efficiency measures for Municipal Buildings and 56.15 % of energy because of energy efficiency measures for C.S.M. Municipal Hospital[28].

Building on its own past and extensive experience in renewable energy, and benefiting from the valuable lessons learned through the experience with ICLEI on this initiative, Thane is aiming to become a leader in local renewable energy innovation. The city has developed an in-depth understanding of its own energy dynamics, which has enabled a prioritization of areas of action for energy and Greenhouse gas emission reduction. It has developed a better understanding of how energy is consumed in municipal operations as well as in the overall city.

The Solar Cities Program is supporting these efforts by providing momentum, funds and expertise. Enhanced public involvement via the Solar City Stakeholder Committee is providing additional avenues for expert involvement. The scheduled 'Solar City Cell' will improve public awareness as well as facilitate opportunities for the general public to avail of renewable energy and energy conservation in their business and homes.

PHOTOVOLTAIC SYSTEM INSTALLED ON ROOFTOP OF THE BUILDING, THANE

[29]*Thane Municipal Corporation*

4.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Prior to the year 2001, there was no awareness about importance of energy efficiency and renewable energy in municipal services. The electricity bill of street lighting and municipal buildings was to the tune of 102 million during the financial year 2000-0129.

Thane City was unaware of it's energy consumption status and its contribution towards Greenhouse gases emission. In the absence of an energy master plan, targets and objectives could not be set to undertake sector wise Energy Efficiency and Renewable Energy projects and the financial outlay required for the same. Under the solar city programme, a master plan has been prepared for identifying targets and projects for reducing 10 per cent in energy consumption in the city through energy efficiency and renewable energy generation measures.

How did this practice tie into specific city development objectives?
The various energy efficiency and renewable energy initiatives of Thane Municipal Corporation since 2001 have led to the institutionalization of energy conservation measures in the city development framework. Based on the learning from these initiatives it has prepared a Solar City Plan which aims at 10% reduction in city's energy consumption over a period of five years.

How did the main actor(s) make this happen?
Thane City, which is pioneer in Municipal Energy management in the country has been working towards Renewable Energy and Energy Efficiency measures since 2000-01.

For implementing the various energy conservation measures, Thane Municipal Corporation established an Energy Conservation Cell headed by Additional Municipal Commissioner. The cell manages all the stages of execution of electrical works - designing, installation, testing, commissioning & maintenance of electrical installation. The Cell comprises qualified engineering staff of TMC and a committed team that works on Energy conservation efforts of the municipality. Three certified Energy Auditors are also part of this team.

Renewable Energy and Energy Efficiency projects in Municipal services involved in house engineers who studied the connected load, its operating hours, diversity etc. Thus they assessed the actual energy consumption and also cross checked the same with information from the bills generated by the Maharashtra State Electricity Distribution Co. Ltd (MSEDCL). Energy audit of electrical installations was conducted through qualified in-house engineers of TMC and Bureau of Energy Efficiency accredited energy auditors.Energy conservation was aimed at creating awareness among the citizens and through the use of cost effective energy saving measures and projects e.g. micro processor timers for street lighting, energy efficient tube lights, fans, solar water heating systems etc.

In 2005, the Thane Municipal Corporation (TMC) made solar water heating systems mandatory for all categories of new buildings. Subsequently, based on the success of this initiative, a new initiative was started to promote installation of solar water heating system in existing residential buildings by providing 10% rebate in property tax.

Further, in 2008, TMC jointly with ICLEI-South Asia, an international NGO, carried out a research project on "Integrating Renewable Energy and Energy Efficiency Measures in municipal services." This project aimed at preparation of energy status report & GHG inventory for Thane city, formulate city level climate protection policy, develop local action plan to lower the carbon emission reduction, identify key stakeholders from local bodies,

capacity building of Thane Municipal Corporation to take up the various activities and promote community participation in various energy conservation initiatives. Under the project an action plan for city level Climate Protection Policy was proposed.

Thane Municipal Corporation developed the city energy and emissions profile and the city energy status & GHG emission inventory was published on the municipal corporation website - www.thanemahapalika.com. This report was an outcome of the SPF-CCE - Carbon Emission Reduction project through City Level Local Action Plans by integrating Renewable Energy & Energy Efficiency measures into city activities done by ICLEI South Asia Supported by British High Commission.

In 2009, as a natural continuation of its portfolio of local energy initiatives, Thane joined the Ministry of Non Renewable Energy's Solar Cities Program. The programme aimed at promoting energy efficiency and renewable energy in 60 cities and supporting cities in becoming a driving force for local energy innovation and investment. ICLEI-SA was appointed as the energy master planner, taking the responsibility of preparing Thane's Solar City Master Plan.

Under the Solar City Programme, Thane will receive up to INR 5 million over five years from the Ministry of Non Renewable Energy for the development of the Solar City Program. These funds are to be used towards the development of the city's energy masterplan, the establishment and running of the Solar Cell, oversight and implementation support, and promotional activities.

Thane's Electrical Department played a key leadership role and successfully engaged a variety of local stakeholders in the 'Solar City' process. A 'Solar City Stakeholder Committee' was formed to bring all the key actors in the energy sector of the city on one platform. The Solar Cities Stakeholder Committee counts on the participation of key local and regional players such as the Maharashtra Chamber of Housing Industry, the Maharashtra Solar Manufacturers Association, state level energy bodies, local energy - related businesses and educational organizations, NGOs and elected representatives.

"Solar City Stakeholders Committee" which acted as an advisory board ensured public involvement and participation in the Solar City Plan. Through the process of developing the Solar City Master Plan, stakeholders attending the meetings of the Solar City Stakeholder Committee engaged in high-level discussions ranging from how to bring new technologies to the city, to the possibility of gaining additional funds for low carbon energy initiatives through innovative funding mechanisms.

The Solar City Master Plan has been prepared after conducting extensive surveys and deliberations in city stake holder committee meetings. The Solar City Plan for Thane aims at minimum 10% (5% by Energy Efficiency and 5% by Renewable Energy) reduction in projected demand of conventional energy over a period of five years. This gives the city a 10% reduction goal of 230.1 MU. Thane is implementing the Solar Cities Program by building upon its own experiences and tools and by working with ICLEI-South Asia, it is also building on the lessons of other Indian cities involved in ICLEI's Loca l Renewable(s) program.

What were the main barriers? How did they overcome the barriers?

The Preparation of a master plan required exhaustive sector wise survey for collection of energy consumption data from different energy or fuel suppliers and consumers. The energy or fuel suppliers where either reluctant to share data or the available data was not accurate and maintained properly. Thus officials from thane Municipal Corporation visited concerned offices and explained the importance of data collection.

The Local power supply utilities were not issuing bills as per energy meters. Thus, it was difficult for Thane Municipal Corporation to measure and establish savings achieved by various Energy Efficiency Projects. In case of street lighting energy conservation project, problems were faced due to unbalanced three phase supply. Thane Municipal Corporation rigorously pursued with local power supply utility officials and submitted the energy meter readings of around 600 municipal connections taken simultaneously by its Engineers. Street lighting power supply network was balanced for all three phases by undertaking cable fault rectification.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

The energy strategy for any city should actively and meaningfully involve stakeholders at the local level, from the general public to local business and organizations. It is crucial to engage with the final energy user to usher in greater energy efficiency.

It is also crucial for the city to find tangible entry points to justify and promote change. In Thane, the energy audits became a starting point for specific energy initiatives. They showed tangible benefits such as energy savings, cost reductions and equipment maintenance could be achieved. Energy audits provide a baseline for addressing energy consumption and can eventually lead to sustainability innovations in public services and demonstration projects[30].

Are/were there additional follow up phases or stages planned?

As part of the Solar City Plan, Thane is in the process of opening a 'Solar City Cell' which will serve as a demonstration space and knowledge hub for providing information and resources on energy conservation and renewable technologies. The Cell will generate public awareness and foster public participation in the various energy conservation measures[31].

ICLEI-South Asia has been appointed to manage the cell for the next 3 years. The Cell will be modeled after Nagpur, Bhubaneswar and Coimbatore's 'Renewable Energy and Energy Efficiency Resource Center', an initiative of ICLEI's Local Renewable(s) project[32].

[30] *ICLEI- South Asia, Thane, India, Pioneering India's Solar Cities Program*

[31] *ICLEI- South Asia, Thane, India, Pioneering India's Solar Cities Program*

[32] *ICLEI- South Asia, Thane, India, Pioneering India's Solar Cities Program*

Housing

Volume 3

05

Housing

5.1. Crosscutting Agra Project (CAP), Agra

5.1.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?
Stable leadership is critical for project success which is hindered by an unstable environment -e.g. frequent transfers of the Municipal Commissioner. The absence of a strong leadership has hindered Agra Nagar Nigam's ownership of the entire initiative to carry forward and build upon the experience gained through Crosscutting Agra Programme.

Working in partnership with the local Government is key to the sustainability of green growth initiatives. In a multi-agency environment, mechanisms for cooperation must be developed.

Community inclusion is critical for improved basic services. People at the Bottom of the Pyramid are important actors in building the city economy and can work with the private sector.In scaling up developmental planning, there is no leapfrogging over participatory processes.

In the Crosscutting Agra Program (CAP), CURE (a development NGO) has been the only constant partner that has supported the initiative starting from the pioneering project on CAP and finally translating into the City Wide Slum Upgrading Plan. CURE is still working in Agra and is yet to develop an organized exit strategy with the local community to ensure sustainability of the initiative.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.
The urban poor residing in the slums in Indian cities have complex and disparate characteristics. Their issues and needs and can be regarded as a group that is vulnerable to a variety of external events (both natural and man-made) beyond their control due to their non-homogenous nature. Increasing incidence of urban poverty which is manifested in the burgeoning slums in Indian cities has exerted tremendous pressure on urban services and questioned the efficiency of local governments in cities. Lack of economic and employment opportunities has led to the exclusion of urban poor from all urban facilities and benefits of economic growth taking place in the cities . Lack of security of land, shelter and employment opportunity for the urban poor has led to continued problems in cities where poor live in slums in dismal conditions. In this context the endeavor of Agra achieve inclusive and sustainable growth through the Cross Cutting Agra Programme which has evolved from a small employment generating initiative to a City Wide Slum Upgradation Strategy is a paradigm shift in approach to slum upgradation adopted in Indian cities.

Who were the main actors involved?

CAP was an alliance among four USAID departments (Social Development; Population, Health and Nutrition; Energy, Environment and Enterprise; and Economic Growth) that committed development assistance to address cross-sectoral concerns of women and young people from urban poor communities. The United States Agency for International development (USAID), its Offices of Economic Growth and Social Development, provided both financial and technical support under this programme.

The Centre for Urban and Regional Excellence (CURE), a development NGO working in the urban sector, was identified to facilitate the process of community mobilization for improved sanitation and sustainable livelihoods in selected slum communities in the city . CURE, coordinated the programme, facilitated social mobilization processes set the inclusive poverty cum reform agenda and developed the Community Based Information System. It forged partnerships with private sector, civil society organizations and elected representatives. They also helped identify local field facilitators and built their capacities to work in their communities.

The Agra Nagar Nigam (ANN) provided both physical office space and institutional support for implementing project activities in the area of sanitation. It also facilitated CURE's linkages with other local agencies in the city.

Civil Society Organizations were involved for youth asset development, local knowledge, expanding outreach, ownership and advocacy. Community Based Organisations were enabled to manage community credit funds for toilets and personal needs[34].

The programme also received extensive support from the Special Secretary (Urban Development) Government of Uttar Pradesh, Divisional Commissioner Agra and District Magistrate and District Urban Development Authority.

Apart from Agra Nagar Nigam several agencies/organizations and citizens in Agra were also involved in the programme which enabled CURE to get a better understanding of ground realities so as to effectively plan and meet people's needs. These agencies include Archeological Survey of India, India Tourism and Citizen Council. Active engagement of the local NGO SANKALP and the private sector through the Tourism Guild was responsible for the successful development of the livelihood component under the programme.

Technical interventions were also provided by faculty and students from the London Metropolitan University and Tourism Consultant from Heritage Design which helped CAP sharpen the products under in the areas of sanitation and tourism development[35].

To ensure the sustainability of various development activities initiated under the programme even after the exit of USAID and CURE, an NGO called Centre for Action and Participatory Planning was registered in Agra which comprised community leaders and facilitators associated with the project.

What is unique about the way that this practice addresses the challenge?

CAP helped initiate a process of engagement between organizations of low-income communities and the government for inclusive planning in Agra. It successfully forged multi-stakeholder partnerships between government agencies, private sector and civil society. This brought the governance mechanism a step closer to Public-Private-People Partnership (PPPP).

[33] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[34] *UNHABITAT, Crosscutting Agra Program for City Wide Slum Upgrading, Good Practice, 2008*

[35] *http://pdf.usaid.gov/pdf_docs/pdacw410.pdf*

What is this practice?

CAP is a small organic project implemented by the Centre for Urban and Regional Excellence (CURE) a development NGO, with financial support of the USAID since August 2005. The project was also actively supported by the Agra Nagar Nigam. It aimed at improving the quality of lives of poor people through better access to basicsanitation services and livelihoods. It was designed around a Heritage Trail of four lesser-known monuments in Agra linked to the Taj Mahal and the Agra Fort on the other side of River Yamuna and five nearby slum communities: Katra Wazir Khan, Marwari Basti, Kachhpura, Nagla Devjeet and Yamuna Bridge. Over the one and half year of project implementation, it has grown from a small grass root level initiative to a city wide technical support project enabling Agra city to undertake citywide pro-poor urban development. It has both widenedand deepened its interventions and has provided the city with a demonstrable model for development of urban poor communities capable of replication in other sites and areas[36].

In 2007 it was scaled up to a ward level slum up gradation approach which has led to the formulation of a city wide slum up gradation and poverty reduction strategy through in 2010 which has been aligned with the Slum Free City Plan of Action.

Why is this practice relevant to other cities in India?

Urbanization and economic progress are concomitant processes. Presently, Indian cities are facing the challenge of providing equitable services and opportunity to all segments of urban residents. To sustain the pace of economic growth India is pivoted towards, the immediate challenge before Indian cities is how to harmoniously integrate the needs of the vulnerable ? And have inclusive and sustainable economic growth. Given this scenario, the approach followed in CAP sets a positive model for cities to achieve inclusive green growth by enabling the urban poor to participate in building the economy of the city and equally benefit from the achievements of green growth.

5.1.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Housing Sector for Indian cities?

For a city to achieve inclusive green growth, it is absolutely critical that the systemic change towards green growth is supplemented by inclusive social policies that ensure fair distribution, of the benefits of green growth. The cross-sectoral approach adopted by CAP addressed the various dimensions (sanitation, solid waste management, livelihood and housing) of slum upgradation. It has set up a demonstrable model for inclusive planning for slum upgradation and sustainable livelihoods.

Why is this practice a good demonstration of Green Growth principles?

The CAP experience has highlights the need for multi-stakeholder partnerships led by local government for achieving success in pro-poor service delivery. The process also highlights the importance of community participation at every stage of program development. The program has demonstrated that access to basic services and livelihoods for urban poor can be sustained by integrating low-income settlements with city-level infrastructure and economy[37].

What specific Green Growth benefits does this practice demonstrate?

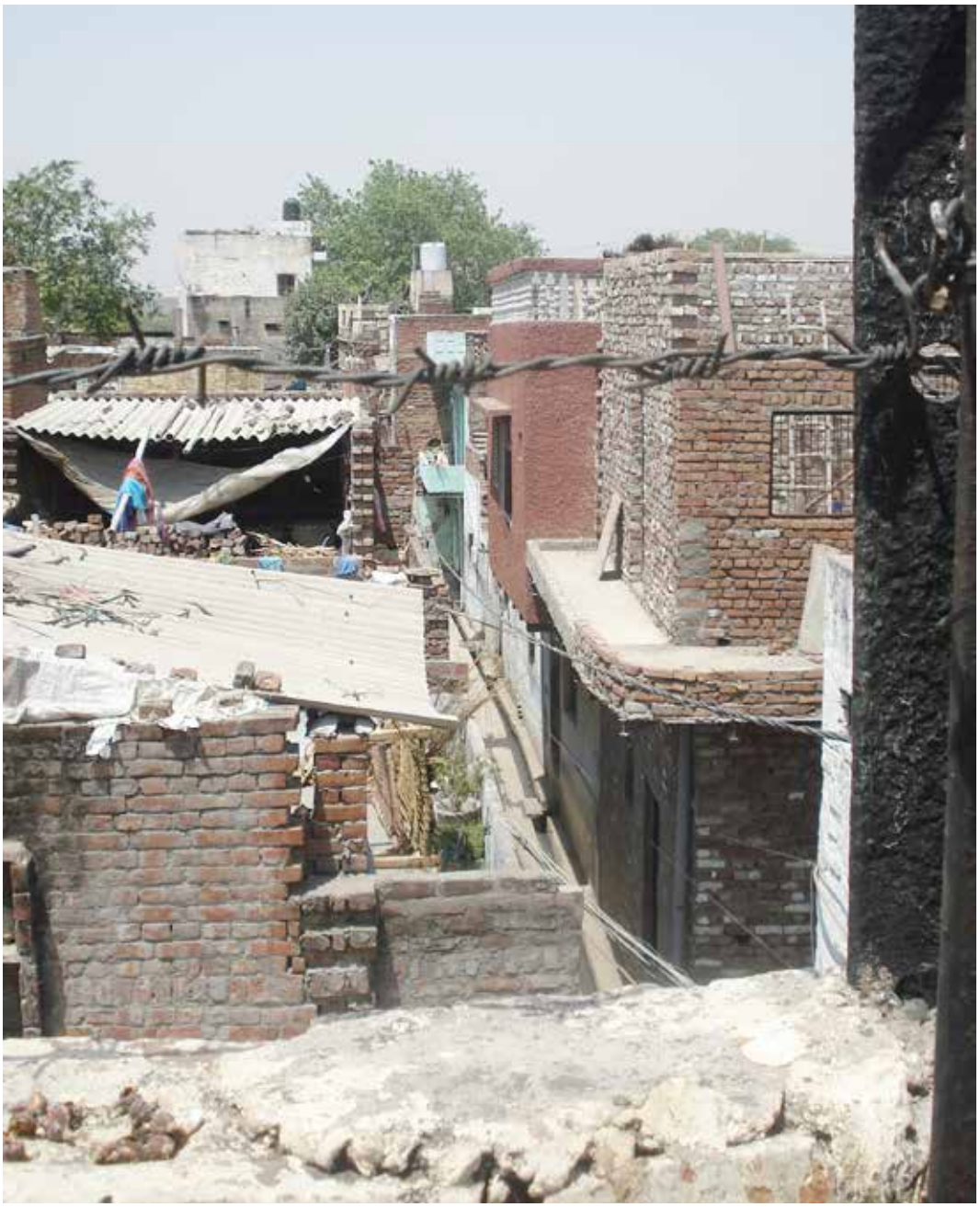
CAP has led to the organization, capacity building and empowerment of the communities to address their own livelihood needs. People's responses have changed from skepticism to confidence in the project's ability to improve the quality of their lives, indifference to active cooperation and participation in project initiatives and from dependence on governments to self-reliance and willingness to invest in improving their lives.

[36] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[37] http://www.niua.org/indiaurbaninfo/fire-D/ProjectNo.37.pdf

CAP was designed to provide a demonstrable and inclusive model for urban poverty alleviation and slum development planning for local government through sustainable livelihood generation, linked to the city's economy, especially for youth and women. It was instrumental in unleashing the potential of the youth and women through proper training and handholding.

Women in particular have been empowered through their involvement with the Self Help Groups and livelihood groups. They operate bank accounts, receive and deposit cheque payments, manage their own finances and deal with clients by themselves using their own letterheads, and bill order books. Women are now financially more empowered and are better able to negotiate for their rights within the family[38].



SLUM COLONY IN AGRA

[38] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

Livelihood Initiatives Under Crosscutting Agra Programme:

1. Mughal Heritage Walk:

- Initiated in August, 2007
- Average no. of tourist visiting per year: 800
- Peak season: 600 tourists
- Cost per tourist-INR 700
- Converted to enterprise, has separate bank account managed by three people, transaction cross checked by each other
- Savings till date INR 4,00,000
- Profit split between key players:

Tour animators (2 regular - INR 10,800 monthly salary and 5 part time)
Tea terrace Owner - INR 75/tourist
Girls crafts group - product profit, sell handmade cards/ bookmarks etc with a profit margin of 30-40 % on sale

2. Womens Livelihood Group:

- Bag making team began in 2006
- Products: shoe pack, carry bag, laundry bag, wine holder, newspaper bag, cake Bag
- Comprised of 12 no. Kachhpura women
- Each member earns INR 150/ day after working of 5 hours.
- Receive order from pvt. sector
- Access to bank and saving account from Shreyas Gramin Bank

3. Savings Group:

- Account managed by women's group
- Each saves INR 100/month
- 2% interest on savings
- Savings till date INR.1,05,600

The five project settlements are now mainstreamed with city systems and city economy. Women and youth are deriving incomes from tourism - the key drivers of city economy.

By the end of the programme, women's incomes had gone up with over 120 days of work annually and savings groups had revolved INR 0.0045 million in personal loans, enabling women to swap high cost debt from private lenders with low cost credit. Livelihood groups were less dependent on project funds, having generated sufficient savings for capital investments in businesses. Youth (110) were trained in employment linked livelihoods in emerging markets. Private sector contributed through long term orders for products and services from livelihood groups[39].

CAP which started with one Self Help Group in 2006, has now increased to five groups, and Mughal Heritage Walk enterprises which stated with 2 tour animators and facilitators in 2007, has 12 animators and facilitators now. Two tour animators have been permanently appointed by Mughal Heritage Walk enterprises at a monthly salary of Rs 10,800.

Sanitation activities under CAP have resulted in cleaner settlements, which are valued by their residents and there is greater willingness to maintain these environments. Demand for basic and better services has increased.

CAP has reached all 2700 households through various sanitation interventions with visibly

cleaner communities. Nearly 200 households (1200 people) have access to personal or community toilets. Additionally, 200 girls and boys have access to school toilets. Improved drains and roads have benefited 200 households directly and door-to-door private waste collection services cover 850 households. This has resulted in improvement of health of the community because of less occurrence of sanitation or water related illness. Health care expenses have dropped from Rs 700 to Rs 150 per month due to home toilets.

Under Kacchpura Slum Upgradation Programme which was an outcome of CAP, toilet designs were developed through individual consultations to fit space and needs. A Toilet Savings Group was facilitated to enable families to access finance. The group developed the subsidy and lending plan, and decided on interest rates and repayments.

The first toilet was critical and catalytic. To overcome people's reluctance, construction started at the home of the resident facilitator. Soon a street full of toilets got developed and was named "clean street". Toilets in the local school enlarged outreach. Willingness to add toilets in homes increased with toilets adding to people's sense of worth. Demand for toilets were raised in other settlements both project and non-project. Street and drain improvement works were planned around the Mughal Heritage Walk with an eye on tourism promotion and engaged the larger community in design, construction and oversight, community consensus[40].

Archeological Survey of India's (ASI) restrictions on construction in homes within 50-100 meters of protected monuments have been relaxed to enable poor people to build personal toilets[41].

CAP managed to leverage government resources for major development works such as road widening links to project settlements and lesser known monument. Increase in no of visitors to the Mughal Heritage Walk, prompted ASI to revive the lesser known monuments lying in a dismal state. Ram Bagh the first Mugal Graden and Tomb of Itmad-ud-Daulah are being revived under the World Monument Fund.The ASI is also planning to revive the 43 Mughal Gardens located on the banks of river Yamuna beginning with Ram Bagh and Mehtab Bagh. Agra Development Authority has also started leveraging its fund for development of approach road and infrastructure facilities around the lesser known monuments. Under the Taj Ganj Tourism plan around INR 120 Crores fund has been approved for improving the surrounding road of Taj Mahal and upgrading the Taj Ganj Area.

As part of the CAP, CURE developed a Community Based Information System for the five settlements. The system has been uploaded on Agra Nagar Nigam's computer systems as a project on the property tax database. The customization enabled Agra Nagar Nigam to use the system as an instrument for monitoring slum upgradation. The then Municipal Commissioner and team were oriented to the system and its potential applications. On request by the Commissioner to scale up the system on a citywide basis to capture the benefits of Agra's economic potential for all its residents[42], a citywide system as part of a City Development Strategy was prepared with support from the Cities Alliance.

[39] *UNHABITAT, Crosscutting Agra Program for City Wide Slum Upgrading, Good Practice, 2008*

[40] *UNHABITAT, Crosscutting Agra Program for City Wide Slum Upgrading, Good Practice, 2008*

[41] *UNHABITAT, Crosscutting Agra Program for City Wide Slum Upgrading, Good Practice, 2008*

UPGRADED SLUM COLONY UNDER CAP , AGRA

5.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

Agra, is a fast growing million plus city[43] and a global tourist destination because of the presence of two world heritage sites – Taj Mahal and Agra Fort. In 2007-08, it witnessed an inflow of 2.7 million foreign tourists bringing in revenue of USD 2.3 million to the Taj Mahal alone[44]. With such attractions, the city has enormous potential for developing a strong and broad-based economy centred on tourism.

While the city has expanded rapidly as a result of its tourism potential, much of that growth has been unplanned and chaotic, creating development challenges that could impede the city's valuable tourism industry.

City sanitation in Agra has been a key concern for its citizens. Despite numerous previous interventions, Agra continued to have only partial coverage of underground sewerage, inappropriate wastewater drainage systems, and an inefficient and ineffective solid waste collection and disposal mechanism. These problems were influencing the health and well being of its citizens and threatening its core economy - tourism.

Besides, a sizeable urban poor population of Agra, was mostly residing in its burgeoning slums. These were extremely vulnerable due to little or no access to municipal services, especially for solid waste management, surface water drainage or toilets, resulting in highly insanitary living environments and acute health risks for the poor.

Agra Nagar Nigam, the urban local body responsible for provision of sanitation services (solid waste disposal and waste water drainage) had scarce financial resources and technical capacity to plan and implement a citywide total sanitation initiative and was unable to include slum community to its systems due to issues regarding illegal tenure, low affordability and lack of voice of the community.

Multiple agencies without clear lines of control have meant confused/overlapping responsibilities, low institutional commitment to development of basic infrastructure services in slums resulted in a tossing around of responsibilities that leave the poor excluded from the system. Weak financials of the Agra Nagar Nigam was exacerbated by its technical capacity. Even though there were engineering skills, domain knowledge and ground information within the organization, there was little information on the new technologies being experimented across the country. This hampered the development/implementation of urban renewal plans[45].

Recognizing the potential value of Agra to be developed as a tourist hub and its urban development challenge, USAID offered technical assistance to the city to address specific sanitation and livelihood concerns. Over the one and half year of project implementation, CAP grew from a small grass root level initiative to a citywide technical support project enabling Agra city to undertake citywide pro-poor urban development. In 2007 it was scaled up to a ward level slum up gradation approach which has led to the formulation of a city wide slum up gradation and poverty reduction strategy in 2010 which has been aligned with the Slum Free City Plan of Action.

[42] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[43] http://southasia.oneworld.net/resources/indias-urban-poverty-in-agra-slums#.U2m74YGSzZM

[44] http://southasia.oneworld.net/resources/indias-urban-poverty-in-agra-slums#.U2m74YGSzZM

[45] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

How did this practice tie into specific city development objectives?

CAP is a toilet-by-toilet and drain-by-drain development of Agra into an Open Defecation Free city with comprehensive sanitation solutions[46]. It was able to establish a brand identity and many future interventions started flowing through the CAP umbrella to build upon the tourism economy of Agra and for opening up avenues for the poor to tap into it.

How did the main actor(s) make this happen?

Through the CAP, USAID (India) aimed to foster the potential of disadvantaged youth and women as leaders for community development and conflict resolution in poor, urban neighborhoods and improving the quality of lives of poor people through better access to basic sanitation services and livelihoods. USAID India in consultation with national and state level agencies selected Agra as a focus area for such developmental activities.

Thus, CAP was designed as an inclusive project around a Heritage Trail of four lesser-known monuments starting from Ram Bagh-the first Mughal graden till Mehtab Bagh-the garden facing Taj Mahal across river Yamuna, passing through five slum settlements: Katra Wazir Khan, Marwari Basti, Kachhpura, Nagla Devjeet and Yamuna Bridge. The program was designed to focus on the cultural heritage resource of Agra, its Mughal history, as a means to enhance opportunities for livelihoods and incomes among the poor for a sustainable improvement in the conditions of living in low-income areas.

It began in January 2005 and was conceived through a detailed stakeholder analysis undertaken by USAID with support of CURE. The main purpose of stakeholder consultations was to identify problems of vulnerable groups, in particular youth, women and slum dwellers, and engage with city stakeholders to assess the city's special strengths and opportunities[47].

It was designed as a small project, to catalyse slum upgrading and create synergies between sector specific/isolated USAID programmes. With Cities Alliance support, it was broadened to plan citywide upgradation and city poverty policy. Additional resources came from Water Trust, UK and private donors for construction activities. Agra Nagar Nigam, key project partner and other development agencies (Archeological Survey of India, Agra Development Authority) complemented resources through physical/sanitation works. Tourism Guild provided the strategic marketing link for livelihoods.

The overall project goal was to develop a livelihood and slum upgrading pilot program around a heritage trail of lesser-known monuments in Agra. To achieve this, CAP followed a two-track approach to development, livelihood and sanitation improvement. Specifically, its key areas of intervention were:

- Mobilize and organize communities using participatory techniques.
- Develop the heritage trail product to enhance tourist based economic opportunities.
- Create a community credit fund for promoting livelihood opportunities.
- Mobilize private sector participation around heritage trail development and livelihoods.
- Build tour animation skills among youth groups.
- Promote handicraft development for broadening the range of livelihoods.
- Develop of a community-based information system (CBIS) for improving effectiveness of poverty alleviation programs and strategies.

[46] *ASCI, Hyderabad, Reimaging Sanitation in Agra – Agra Municipal Corporation*

[47] *http://pdf.usaid.gov/pdf_docs/pdacw511.pdf*

CAP was implemented with financial support of the USAID. Apart from the components mentioned above, FIRE D III[48] provided support to two elements of the project; networking and sanitation. From October 2006 till 15 March 2007, FIRED also supported the livelihood; community mobilization and heritage trail development components.[49]

The startup phase of the programme focused on rapport building in project communities, and engaging with the local government, private sector and civil society at large. Based on the pre project stakeholder analysis, local NGOs and civil society organizations were engaged in a dialogue on the broad outline of the project and its approach. SANKALP and Man Eco, two local NGOs were among some of the NGOs who became local project partners and were engaged in project activities from this phase. The project began with the identification of the project area and specific communities based on a windshield survey of the city and transect walks in select communities.

Since tourism was the corner stone of the programme, considerable time was spent in identifying the lesser-known monuments of Agra with support from SANKALP, a local NGO working on community based tourism. Rapid assessments of access to basic services and livelihoods helped to identify the five at-risk settlements along a Heritage Trail. The Heritage Trail was decided as a 4km (approx.) stretch of area on the east bank of Yamuna across the Taj Mahal, with five large and well preserved, but lesser known monuments of Agra and several small and unknown monuments and ancient villages. Five low-income communities on this stretch of road linking these monuments comprised the project.

Rapport and confidence building activities were initiated in the selected communities with support of a group of trained community animators. A team of local young boys and girls from project settlements was identified to work as local community facilitators. The local facilitators were trained in Participatory Learning and Action tools and skills in community mobilization and organization. Baseline data for project communities was also collected using Participatory Learning and Action tools (community and household mapping, diagrams and matrixes for identifying issues and concerns) by the trained local field facilitators.

Community problems and priorities were identified through the Participatory Learning and Action exercises related to home-based livelihood opportunities, vocational training for women and young girls, improved waste management systems, toilets, education for young children and learning support for school going children.[50].

With support from CURE, the local community facilitators set underway intensive community mobilization activities. These were aimed at deepening understanding of local problems mentioned above. Each community was encouraged to prepare a community level action plan with self-help solutions to prioritize concerns. Women's livelihood groups for home-based income generation activities and self-help credit groups were among the first to be formalized. A group of 21 young boys willing to undergo training as youth animators also emerged out of which 17 boys completed the first round of training as youth tour animators for the heritage trail area.

A value chain study undertaken with the support of an urban livelihood expert examined the available skills especially among poor women in the project communities in the context of the city economy and developed the chain of value relationships between current opportunities, available skills and market demand. An inventory of products in demand in the tourism industry was developed and distilled to focus on two key livelihoods - sewing skills among women and requirement for products such as shoe covers, newspaper bags, plate covers, and laundry bags in the vibrant hotel industry in Agra. Brainstorms with local tour and hotel industry were used to test out the product value.

[48] *Financial Institutions Reforms and Expansion (FIRE D) a program for Urban Reforms supported by USAID's Department of Economic Growth. FIRE D has provided support to two elements of the CAP project; networking and sanitation.*

[49] *http://pdf.usaid.gov/pdf_docs/pdacw511.pdf*

[50] *http://pdf.usaid.gov/pdf_docs/pdacw511.pdf*

The earliest livelihood groups from two communities developed product samples received orders and delivered the same. CURE helped the group in obtaining raw material, finalizing the sample and working out product costs[51].

Simultaneously, the programmes's engagement with the private sector was strengthened through meetings with associations of hotels, the tourism guild, travel agencies, shoe industry, etc. to understand their business needs and develop livelihood linkages where ever possible.

A community credit fund began to take shape. CAP provided loans to livelihood groups to purchase the products at no interest. On receipt of payment, the groups returned the full cost of the loan after deducting costs and profits and made a small saving that was used for servicing the next order. Community self-help groups were formed which began to save.

They were provided training in Self Help Group management, leadership, book keeping, credit giving etc. They were also imparted life skills training. Tour animators from the project communities were trained on several aspects of tour facilitation; the story around the monuments, tourism protocol and manners, etc. Field experiences were provided through official visits to project sites.

Extensive photo documentation and background research on the Mughal monuments was conducted and a heritage trail brochure was developed to advocate the heritage trail. The low visibility of the Heritage Trail was proposed to be managed through a formal business plan. It was decided to formalize the tour animators as a micro enterprise around community tourism. A micro enterprise plan was developed for a group of youth from the community for sanitation along the Heritage Trail. A multi skill souvenir pack was developed that includes miniature whips, incense sticks, pottery incense stick holder and a box[52].

Intervention activities in response to community demands were undertaken. These included setting up of a Balwadi (preschool center) in the poorest of the five communities, Marwari Basti with a trained teacher paid by the program and partly supported by community fees. Free books were provided to the children of the Balwadi by the local administration. Community contributed for a school shed and in greening the space around the shed. The teacher was provided additional training in play way methods of learning at the IIT nursery school in Delhi.

Marwari Basti also participated in an environmental sanitation initiative for improving the natural/informal drains in the settlement using a rudimentary plan and following the natural slope and linking to the main drain the area. Community youth participated in cleaning up the community for an inter community cricketing tournament both physically and through monetary contribution. They were also provided training in life skills and several concerns of young boys and girls on issues related to sex education, livelihoods, etc. Sanitation groups in the community were organized who prepared community sanitation action plans and participated in community awareness campaigns, door-to-door waste collection systems and toilet designing[53].

To ensure the sustainability of various development activities initiated under the programme even after the exit of USAID and CURE during the exit phase of CAP an NGO called Centre for Action and Participatory Planning was registered in Agra which comprised community leaders and facilitators associated with the project.

[51] http://pdf.usaid.gov/pdf_docs/pdacw511.pdf

[52] http://pdf.usaid.gov/pdf_docs/pdacw511.pdf

[53] http://pdf.usaid.gov/pdf_docs/pdacw511.pdf

What were the main barriers? How did they overcome the barriers?

Sanitation interventions under CAP often required changes in strategy to meet the situational demand. This has been made possible by the openness and flexibility of the project design itself that permitted the programme to explore a variety of routes to achieve project outcomes and fit in with ground reality. The project being primarily process oriented, activities were not preset, and rather they were decided in consultation with the communities themselves[54].

Strategic changes made in the course of project implementation were mainly due to issues of land ownership, guidelines/restrictions on development around heritage monuments, presence of multiple agencies and a powerless Agra Nagar Nigam, a weak civil society and high level of community dependence on free public services[55].

Strategic changes were also undertaken after a mid-review assessment. The appraisal was useful as it helped the project to delimit its activities, sharpen focus and agree upon a set of concrete deliverables. It was decided to reduce interventions in two project areas where community mobilization was slow/became more challenging due to non-responsive authorities. The programme decided to reduce active intervention in the area faced by a dispirited community. This allowed the programme to deepen its interventions in the remaining three project settlements and limit its involvement in the remaining two to advocacy and awareness activities[56].

Land tenure was a major hurdle in project implementation, in particular where land belongs to the State. Decentralized waste management processes had to be abandoned infavor of regular waste disposal from communities and linking settlements to city clearance systems, because of restrictions on digging and building permanent structures within 100 meters of protected monuments[57].

Similarly, composting plans (both pit and barrel based) had to be discarded due to land ownership issues. Other reasons included low quantity of organic waste generation in the community the bulk of which was given to animal owners; private land owners unwilling to cooperate and allow composting site to be developed, and limited understanding of community participation among the civil society of Agra[58].

Toilet construction in Yamuna Bridge area too was dropped owing to lack of response of the District authorities in releasing land to Agra Nagar Nigam for construction, and Agra Nagar Nigam's powerlessness to get the land sanctioned from the State authorities[59].

Till the programme it does not have a major role in delivery of basic services, except sanitation, because all the functions under the 74th Constitutional Amendment Act are yet to be transferred to it. Its responsibilities do not extend to slum renewal, which is largely the responsibility of District Urban Development Authority. Even though District Urban Development Authority sits within the Agra Nagar Nigam it is accountable just to state authorities. Till date the functions have not been transferred to it[60].

[54] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[55] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[56] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[57] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[58] http://pdf.usaid.gov/pdf_docs/pdacw511.pdf

[59] http://pdf.usaid.gov/pdf_docs/pdacw511.pdf

[60] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

Various initiatives under CAP have been widely replicated in other Indian Cities. CURE has prepared Community Based Information System for Savda Ghevra a slum in Delhi under the Bhagidari-Sanjha Prayas project of Government of National Capital Territory of Delhi, Community Based Information System Jal (Water) for Delhi Jal Board on Access to Water in Urban Slums in Delhi, Disaster Mitigation Community Based Information System for Andaman Islands and City Wide Slum Community based Information System for Ludhiana Municipal Corporation. It has also replicated the Sustainable Urban Livelihoods approach for Savda Ghevra. CURE is also preparing the City Wide Slum Upgrading Plan for Raipur and Ludhiana. This shows the high potential for replication of the various initiatives under CAP.

The CAP experiences demonstrate that for any city to achieve sustainable urban poverty reduction, multi-stakeholder partnerships of local government, civil society, private sector and all government partners in the city is the most essential requisite. The initiative must be anchored in the local government for better ownership, responsiveness and accountability to the poor. Community inclusion is critical for sustainable development and participatory processes must be given due time and resources.

Sustainable livelihoods development and community sanitation pose enormous challenges. To improve sanitation, a key priority in low-income communities, cities must follow a total sanitation or citywide integrated approach. The success of such an approach lies in the degree of flexibility of the initiative to enable people to choose the best fitting solution as per their requirement and capacity. To ensure long-term sustainable employment opportunity cities must link the livelihood plans for urban poor to the local economies.

Are/were there additional follow up phases or stages planned?

Over the one and half year of project implementation, CAP has grown from a small grass root level initiative to a citywide technical support project enabling Agra city to undertake citywide pro-poor urban development. It has both widened and deepened its interventions and has provided the city with a demonstrable model for development of urban poor communities capable of replication in other sites and areas[61].

Towards the end of the programme additional resources from USAID and Cities Alliance were received to not only deepen and widen its scope in the five settlements under the programme but also to develop the strategy for a roll-out on a citywide basis. These funds came through the Kachhpura Settlement Upgrading Program, Cross-sectoral Youth Program and City Development Strategy projects.

The Kachhpura Settlement Upgrading Program was designed to access resources for basic physical improvements in the Mughal Heritage Walk (MHW) area, in particular around the Kachhpura courtyard. The implementation of KSUP started in November 2006 and was completed by September 2007 with a grant provision of INR 1.2 millions. A key feature of the plan was to improve sanitary conditions along the Mughal Heritage Walk, making it a pleasing tourist experience. It was envisaged that such an initiative would help in sustainable improvement in the environment besides improving the place for tourism.

To strengthen its livelihood approach CAP received additional funding from USAID under Cross Sectoral Youth-India project which directly served 241 young men and women living in 5 slum communities in Agra, behind the Taj Mahal[62]. The programme was implemented between March of 2007 and August of 2008 with a grant provision of INR 7.2 million.

[61] http://pdf.usaid.gov/pdf_docs/pdacw410.pdf

[62] http://www.csy.edc.org/india/pd.asp

The project promoted readiness for livelihoods and leadership in community development among the Youth, increased their access to the number and quality of sustainable livelihood opportunities through development of new tourism related employment and micro-enterprise pathways and linkages with local government and private sector.

Cities Alliance extended its support to Agra Nagar Nigam in December 2006 with a grant of INR 11.2 million to develop a City Development Strategy as part of the Jawarharlal Nehru National Urban Renewal Mission. The strategy incorporated a number of activities aimed at benefitting the city's poorest residents, including Citywide slum mapping of 378 slum neighbourhoods, providing accurate data on Agra's informal settlements for use in comprehensive city planning; integrating that data into the Community Based Information System - a map-based information system that makes citywide data easily accessible to Agra Nagar Nigam.

The City Development Strategy process which was completed in September 2008 laid the groundwork for a second major activity: the development of a Citywide Slum Upgrading Plan for Agra. The Citywide Slum Upgrading Plan was also prepared with Cities Alliance Support between March of 2010 and April of 2014 with a grant provision of INR22.4 million. It aimed to formulate an inclusive, integrated citywide slum upgrading plan, create an enabling environment for sector reforms to facilitate the implementation of such a plan and strengthen the capacity of local institutions to implement participatory slum upgrading projects.

The Citywide Slum Upgrading Plan was aligned with the Slum Free City Plan of Action formulated under Rajiv Awas Yojana. As part of the Slum Free City Plan of Action the state has already leveraged INR 100 million for a pilot project of upgradation of the Taj Ganj area consisting of 15 slums. Apart from physical upgradation of these areas the project also involves conservation of old hawelis located in the slums, initiating rain water harvesting, reviving the old heritage wells and developing a heritage walk through the Taj Ganj area.

As part of the City Wide Slum Upgrading Plan, an inclusive development plan has also been prepared for the improvement and management of the 4.4 KM long Taj East Drain flowing through the Taj Ganj area carrying the water from 17 upstream settlements to river Yamuna. On the request of Uttar Pradesh Tourism Department, CURE prepared the Taj East Drain Improvement Plan with an aim to improve the environmental conditions around Taj Mahal, making its surroundings odor free, open defecation free that has helped further the flow of tourists to the area. The project has been approved by the State Government and is now awaiting the final approval of Uttar Pradesh Tourism Department.

Water Supply and Sanitation

Volume 3

06

Water Supply and Sanitation

6.1. Decentralised Waste Water Treatment System (DEWATS), Kachhpura, Agra

6.1.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

The initiative shows that community participation in decision making and consultation is essential for achieving green growth. Ultimately it is networking with the local community and local government that leads to change and it is the focus on inclusion, empowerment, pluralism, and incrementalism that makes the change happen[63].

The Urban Local Body's ownership of the project is imperative for sustainability and up scaling of innovative projects that can foster the development of the city in the green growth path. DEWAT in Kachhpura is a pilot project which has been working successfully for past seven years. Though Agra Nagar Nigam was supportive for the implementation of the project, because of its lack of ownership of the project,the up scaling and replication of the DEWATS system in other parts of the city still remains to be a challenge.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

Conventional centralized wastewater management has largely failed to address the wastewater disposal needs of poor communities due to the high capital investment required and a failure to recover these costs from low income communities, leading to poor operation and maintenance and system breakdown. Moreover, slums are located in congested areas where traditional sewer connections cannot be laid[64].

The census of India, 2011 shows the multitude of exclusion of slum settlements from all types of sanitation services due to the lack integration with city systems. As per census 2011, 17.4% of urban households reside in slums and 38 % of these slum households are in 46 million plus cities. About 31 per cent of all slums have no drainage facility and the figure is considerably higher for non-notified slums (45 percent) than for notified slums (11 percent)[65].

In the absence of any proper collection and treatment system majority of wastewater from these areas is discharged without any treatment into water bodies posing a hazard to the environment and health of the slum dwellers. There is therefore a need in these areas to implement wastewater management systems based on a decentralized approach[66].

[63] *Renu Khosla, Metropolis Indian Cities: Managing Urban Growth, making slum renewal work*

[64] *ACCESS Sanitation, Case Study 1 Agra Nagar Nigam, Agra, Uttar Pradesh, 2012*

[65] *Census 2011 designates these slums in three different ways - notified, recognised and identified. While the first two are designated as slums by some official authority, identified slums do not have legal status as a slum.*

[66] *ACCESS Sanitation, Case Study 1 Agra Nagar Nigam, Agra, Uttar Pradesh, 2012*

Who were the main actors involved?

DEWATS in Kachhpura became a successful initiative because of the appropriate role sharing between an Urban Local Body-Agra Nagar Nigam, NGO - Centre for Urban and Regional Excellence (CURE) and Vigyan Vijay Foundation[67] (VVF). The location of DEWATS was finalized in consultation with Agra Nagar Nigam, CURE, Kachhpura Gram Panchyat and the community.

Agra Nagar Nigam provided the administrative support for the initiative. The group engaged with Vigyan Vijay Foundation for technical support and DEWATS system was designed and constructed by the CURE with the help of Vijay Vigyan Foundation. For financing the initiative CURE shared the proposal with Water Trust UK through London Metropolitan University[68]. Water Trust agreed to provide funding for a small DEWAT system of 50 KL capacity.

In this multi stakeholder approach CURE acted as the nodal agency to bring together the expertise of other organizations to ANN to augment its capacity for taking up such projects in future. Through continuous community consultations, CURE managed to mobilize the community and ensure their participation in the entire process staring from site selection till maintenance.

DEWATS IS TREATING BLACK WATER FROM UPSTREAM SETTLEMENT

[67]*Since 2000, The Vigyan Vijay Foundation has constructed over fourteen DEWATS in Northern India with active collaboration from The Indian Institute of Technology (IIT) Delhi and was actively promoting the DEWATS concept through a number of capacity building programmes and advocacy initiatives in India.*

[68]*Under the Cross Cutting Agra project CURE had established a formal partnership between the Department of Spatial Design, London Metropolitan University that bound the two agencies into a knowledge sharing agreement with CURE offering students from the department live projects for architectural practice. Water Trust - UK funded the studio programme of London Metropolitan University in India.*

What is unique about the way that this practice addresses the challenge?

The DEWATS system is a decentralized system that uses a natural-three-step bioremediation process. DEWATS technology was selected by CURE for its low primary investment, requirement of special technologies/power machines. DEWATS being energy independent; has low power requirement.

It's simple low-level technology/design ensures efficient construction locally with local resources. It does not require expensive and sophisticated maintenance and local communities can easily manage the operation and maintenance, ensuring system sustainability. As it is a decentralized system it can lead to more active participation by the local community developing a sense of ownership towards DEWATS.

What is this practice?

DEWATS facility was constructed at a low income settlement called Kachhpura in Agra by the Centre for Urban and Regional Excellence (CURE) a development sector NGO with active participation of Agra Nagar Nigam, financial support from Water Trust, UK and technical support from Vigyan Vijay Foundation, Delhi. The initiative was part of the Cross Cutting Agra Programme of the USAID (that started in 2005), the main objective of which was to bring to the forefront the monuments not known by majority of tourists visiting the Taj Mahal.

In order to implement Cross Cutting Agra Programme, it was realized that the basic prerequisite was improvement of the physical environment of Kachhpura (a low income settlement that passed through a heritage walk developed under Cross Cutting Agra Programme). This was done through design and construction of a DEWATS system for treating the waste water that flows through a drain that traverses Agra and passes through Kachhpura before discharging to River Yamuna. Construction of the DEWATS began in September 2009 and the project became fully operational in June 2010.

The benefits of DEWATS have been far reaching and include not only disease prevention and the protection of natural habitats but also a boost in employment opportunities for local community and enhanced property values of the locality[69].

KACHHPURA DEWATS ,AGRA

[69] *ACCESS Sanitation, Case Study 1 Agra Nagar Nigam, Agra, Uttar Pradesh, 2012*

Why is this practice relevant to other cities in India?

The DEWATS in Kachhpura is an example of holistic approach of environmental up-gradation, poverty reduction through local economic development and employment generation through participatory sanitation project. It shows that decentralized systems can be utilized for provision of sanitation facilities at a lower cost to the urban poor.

The success of the decentralized waste water management facility also demonstrates that sanitation projects can become more effective with community participation in planning and decision-making and can lead to enhanced ownership among the community. Without the respect of the villagers, maintenance of the system been ineffective, possibly making the situation worse.

6.1.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Water/Wastewater Sector for Indian cities?

The DEWATS in Kachhpura is a successful pilot of low-cost waste water treatment facility which is instrumental in unpacking the tourism opportunities in the settlement by improving the environmental condition through construction of a decentralized waste water treatment system. Through its multi-pronged environmental and economic benefits, has essentially triggered the future development of the settlement in the green growth path.

Why is this practice a good demonstration of Green Growth principles?

The initiative is an example of holistic approach to environmental up-gradation, poverty reduction through local economic development and employment generation through participatory sanitation project. It shows how decentralized system can be utilized for provision of sanitation facilities at a lower cost to the urban poor.

What specific Green Growth benefits does this practice demonstrate?

DEWATS has led to reduction in pollution at the outflow of the drain. The DEWATS has reduced BOD levels in the 50kl of treated wastewater from 170ppm to 30ppm. The treated water is used to dilute the untreated water at the outflow of the DEWATS. This has led to 61% reduction in BOD, 64% reduction in COD and 94% reduction in TDS[70]. Apart from diluting the untreated water of the drain, the water from DEWATS is being used for irrigation purposes.

The construction of DEWATS has improved the environmental condition in the settlement and lead to seeding of community space. The large, open, kuchha drain which was a breeding ground for diseases is now a paved street and a safe space for community activities/ recreation. It is now used for community gathering during festivals and marriage functions. The area near the drain consisting of vacant private land used to be a dumping ground. After DEWATS this area has become cleaner and people have started constructing houses in this area. CURE is planning to develop a garden on a piece of vacant disputed land adjacent to the DEWATS, which will be irrigated by the DEWATS water.

People are now aware of the economic benefits of maintaining a clean environment. With the improvement in environmental condition, land prices in the village have gone up by three to four times, and a number of new houses are being constructed. According to the residents improvement in the environment through provision of infrastructure has motivated them to invest in their houses and improve its structural condition. Number of construction activities and newly constructed houses can be seen in the settlement. The treated water from DEWATS is used for such construction activities also.

[70] http://cseindia.org/node/3770

6.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Agra, a fast-growing, million-plus population city in Uttar Pradesh suffers from numerous sewerage and waste management issues, including: incomplete coverage of underground sewerage, ineffective wastewater drainage, ineffective solid waste collection and disposal systems, and poorly maintained public sanitation facilities. The worst affected are the poor and marginal groups living in slums and low-income communities[71]. As per the Census of India, 2011, 29.8% of urban household in Agra reside in slums. The number of slums in the city has increased from 378 in 2006 to 403 in 2010.[72] Many slum settlements in Agra are not integrated with city systems.

Kachhpura a slum located on the outskirts of Agra devoid of any municipal service needed a wastewater management systems based on a decentralized approach to improve the environmental condition in the area. Though Kachhpura is an historic settlement in Agra on whose land Taj Mahal was built, it had gradually degraded to the status of a slum due to lack of integration with city systems. Prior to the intervention under Cross Cutting Agra Programme in 2005, it was a typical low income settlement of 448 households characterized by narrow brick paved inner pathways and open brick lined kuchha drains which ran through the settlement containing household wastewater and fecal matter.

One of the most pressing issues in the settlement of Kachhpura was that of sanitation. There was no regularized sanitation in the settlement and the inhabitants defecated in the open. The existing drains emptied into the large open city drain that flowed towards the north side of the settlement. This drain passed close to Mehtab Bagh a historic gardens and significant tourist destination located at the rear side of Taj Mahal across river Yamuna. By the time the drain reached the river Yamuna, it was in a very foul state.

As the settlement was not connected to the city system, the only option for cleaning the drain was through decentralized approach. Thus a DEWATS was constructed at Kachhpura. The properly understood and well managed DEWATS system in Kachhpura has generated employment opportunity for local community and has lead to enhancement in property value in the locality. It is not only providing clean water for use in construction activities and irrigating nearby fields but has also improved the environmental condition in the settlement leading to improvement in health of the community.

How did this practice tie into specific city development objectives?
The initiative was instrumental in making Agra Nagar Nigam and the local community realizes the economic and health benefits of adopting an environmentally sustainable development approach of treatment of waste water prior to its disposal in water bodies.

How did the main actor(s) make this happen?
The Crosscutting Agra Program was initiated in August 2005 with the support of the Agra Nagar Nigam and USAID with the aim of improving sanitation in selected low income communities and enhancing livelihoods for young people and women. The Centre for Urban and Regional Excellence (CURE), a development NGO working in the urban sector, was identified to facilitate the process of community mobilization for improved sanitation and sustainable livelihoods in selected slum communities in the city.

Five settlements namely Katra Wazir Khan, Marwari Basti, Kachhpura, Nagladevjeet, Yamuna Bridge Colony alongside Agra's lesser-known monuments were selected for intervention under Crosscutting Agra Program with the active participation of residents, in particular with participation from women and young people.

[71] http://www.niua.org/indiaurbaninfo/fire-D/ProjectNo.37.pdf

[72] http://www.niua.org/indiaurbaninfo/fire-D/ProjectNo.37.pdf

A Mughal Heritage Walk highlighting the lesser known monuments of Agra was planned across the Kachhpura village to reveal 'Agra beyond the Taj' to tourists visiting the city. The walk aimed at giving visitors an insight into the pre Taj Mahal Mughal era monuments and the flavor of rural life in a village lying in Taj's shadow. CURE engaged with villagers who were employed as 'tour animators' and worked with local women and girls for making souvenirs.

Since Kachhpura was an integral part of the Mughal Heritage Walk and tourists were expected to pass through the village, towards the end of the Crosscutting Agra Program additional resource were sanctioned by USAID and Cities Alliance for another programme called 'Kachhpura Settlement Upgrading Program' for sanitation improvements along the Mughal Heritage Walk. This involved construction of household toilets, improvement of drains and pathways.

While implementing the various development works under Kachhpura Settlement Upgrading Program, CURE came across one of the major concerns of the area - the large city drain flowing on the northern side of the settlement creating unsanitary environment with high health risk for local residents. They discussed the problem with the village panchayat and local community and proposed a Decentralized waste Water treatment System (DEWATS) for cleaning of the drain and treating the water before discharging to the River Yamuna.

The DEWATS technology was selected by CURE because it needed less investment in terms of money and power and was simple in terms of technology. It was constructed using locally available construction material and manpower and required low levels of maintenance. The entire system was built around the idea that local communities could easily manage the operation and maintenance, ensuring system sustainability.

CURE with the assistance of Vigyan Vijay Foundation, prepared the detailed drawing of the DEWATS system. It was approved by the Pollution Control Board through Agra Nagar Nigam. CURE discussed the drawings with the community and secured its confidence through a series of discussions with the Gram Panchayat and the villagers.

Since, the initiative was a pioneering effort for the city administration and CURE, there was no fixed deadline for completion. It was taken up more as a learning process to set up a small scale pilot water treatment system whose success relied to make DEWATS an integral part of overall city sanitation plan for future.

Construction of the DEWATS began in September 2009 and the project became fully operational in June 2010 at a cost of INR 1.27 million. The cost of construction of the DEWATS further increased by INR 0.15 million due to the construction of a relief storm water drain on the other side of the DEWATS to carry away excess water during rain to prevent the flooding of the settlement due to excessive rainfall.

For maintenance of the DEWATS a community managed operation and maintenance system was designed where the people of Kachhpura were involved in the maintenance of DEWATS. Resources for the maintenance were generated from the ticket sales from the Mughal Heritage Walk.

The maintenance of DEWATS involves regular cleaning of the drain to ensure smooth flow of water through the system. A full time sweeper from the local community has been hired at a monthly remuneration of INR 4,500/- to look after the operation and maintenance of the system which involves daily cleaning and raking to keep the inlet clear. The chambers are cleaned and de-silted in every six months to ensure smooth operation.

The people of the community have taken ownership of the DEWAT. They oversee the sweeper's performance and check the chambers at regular intervals to ensure smooth flow of water through the system. In case the sweeper is absent or the chambers clog, residents inform the CURE office to take immediate necessary action.

The other maintenance expenditure includes the cost of cleaning of Root Zone Chamber which has to be done every year for a nominal charge of INR 4000 and the cost of de-silting of the drain which has to be done at every two years at charge of INR 10,000. But till date none of these have been required for the DEWATS at Kachhpura.

What were the main barriers? How did they overcome the barriers?

The project was delayed several times because of a number of reasons like delay in getting approval from ASI, shifting the location of DEWATS, lack of skilled labour for construction of DEWATS and delay in construction work because of heavy rainfall etc. All these factors lead to the rise in the cost of construction of the DEWATS.

The sanctioning of the site for DEWATS from the ASI and various State Government departments took around a year and half which considerably delayed the project. Initially DEWATS was planned along the Mehtab Bagh (the rear historic garden of Taj Mahal) wall. ASI refused to grant permission to locate the DEWATS within 100 meters of Mehtab Bagh a state protected historic garden, despite being mostly covered compared to the foul open drain flowing along the border of Mehtab Bagh.

The site for DEWATS was relocated and Agra Nagar Nigam applied to ASI for a No Objection Certificate and District Office to construct the DEWATS on Nazul (Government) land.

The relocation resulted in new barriers. At the relocated site, no Government land was available. So it was decided that the DEWATS would be constructed, on the existing drain which further complicated the process of construction. As the drain was a natural drain, its width varied at different places.

The relocated site was much near to the settlement and the drain was much wider at this place. Also the capacity of the drain at this point was 1.5 times more than the capacity of the DEWATS. Because of funding limitations, it was decided to go-ahead for the 50 KL system with provisions for incremental enhancement in future. A diversion drain was proposed to carry the excess water to the fields and further to the river.

As the project was the first of its kind in the city, most contractors were reluctant to take up the project. Several options were considered for construction of the DEWATS. Though CURE had all the sanctions and drawings in place, the lack of skilled construction workers further delayed the project.

At last, Agra Nagar Nigam and CURE came up with the idea of labor contract which involved local labor that also generated livelihood among the poor. The labor contract was managed by CURE to ensure the quality of material and construction.

The local contractor who had worked with CURE for construction of toilets under Cross Cutting Agra Programme was selected and trained for DEWATS construction by Vigyan Vijay Foundation. CURE supervisor, masons, plumbers and labor were also trained on job by Vigyan Vijay Foundation.

Though the DEWATS worked seamlessly for quite some time after construction, heavy rainfall caused flooding in the settlement leading to the community dissatisfaction. This was a major setback for the system whose aim was to make the situation in Kachhpura better. Perhaps more damaging than the flood waters was the damage done to the confidence of the villagers in the system and its purpose - as far as they were concerned, things were worse not better as they had never experienced flooding on this scale before.

The combination of a number of factors created a bottleneck for the water flowing through the DEWATS, which in turn caused the flooding. Due to heavy rainfall a larger volume of water was channeled into the drain. Though the DEWATS was never designed to treat monsoon flow, it continued working at its maximum rate. Due to a lack of municipal waste collection in Kachhpura, people used the watercourse as a way of disposing rubbish which blocked the system. This further worsened the condition leading to flooding of the settlement[73].

To avoid such flooding in future CURE had to construct a relief storm water drain on the other side of the DEWATS to carry away excess water during rain to prevent the occurrence of such floods in future. This further increased the cost of construction of the DEWATS by INR 0.15 million.

The flood like situation also made CURE realizes that the operation of the DEWATS requires regular supervision and community support. Thus a community managed O&M system was designed where the people of Kachhpura were involved in the maintenance of DEWATS.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

The DEWATS in Kachhpura is a replication of a DEWATS constructed in Vasant Vihar, New Delhi by Vigyan Vijay Foundation. Replication of DEWATS is thus possible in other cities especially in low income communities with similar situations. The DEWATS in Kachhpura has a strong participatory approach at all stages starting from site selection till maintenance. This project has demonstrated that communities can participate in the development and maintenance of sanitation solutions. Such an inclusive approach is eminently replicable.

DEWATS is a low-cost system that can be built quickly and efficiently as opposed to larger STPs and can effectively treat water before it is reused or drained into the River. The engineering aspects like volume, length etc. can be tailored as per the community requirements and its capacity can be incrementally enhanced to treat additional water ensuring that the city's investments are productive and futuristic. Since it is cost effective, Agra Nagar Nigam can develop similar systems in other parts of the city contributing significantly to the clean-up of the city and in turn, the River Yamuna.

Are/were there additional follow up phases or stages planned?

The DEWATS at Kachhpura was only a pilot project constructed to assess and validate the benefits of DEWATS system. Though it has been running successfully for around four years, it is yet to be implemented speedily at other locations in the city. Under the Agra City Sanitation Plan, similar DEWATS were recommended on other drains in the city. But till date none of these have been constructed. Though Agra Nagar Nigam is supportive, it is required to take the lead and initiate the development activities fast.

On realizing the benefits of DEWATS, the Uttar Pradesh Tourism Department has expressed interest for preparation of an inclusive development plan for the improvement and management of the 4.4 Km long Taj East Drain carrying the water from 17 upstream settlements to river Yamuna through low cost, low maintenance and energy independent bioremediation techniques like DEWATS. Four DEWATS have been proposed under this plan. The project has been approved by the State Government and is now awaiting the final approval of Uttar Pradesh State Tourism Department.

[73]*Beardon Oliver, Johnston Rebecca, Lee Vanessa, O'Grady Rachel, Timberlake Victoria, Weaver Jonathan, Agra BeyoundTaj, 2010*

6.2. Rain Water Harvesting Initiatives, Thane.

6.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?
This practice conveys the message that the 'green' orientation in policy has to be followed by mandatory enforcement, stringent monitoring and adequate awareness. This is essential for the success of any initiative that aims to motivate people to adopt a green lifestyle.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.
By 2020, about 50 per cent of India's population will be living in cities. This is going to put further pressure on the already strained centralized water supply systems of urban areas. In most cities, centralized water supply systems depend on surface water sources like rivers and lakes. Where surface water sources fail to meet the rising demand, groundwater reserves are being tapped, often to unsustainable levels[74]. 210 billion cubic metres of groundwater is extracted in India annually, which is the highest in the world[75].

Cities in India need to create a more sustainable water infrastructure to cater to the demand of the growing urban population. Amidst these trends the rainwater harvesting initiative of Thane Municipal Corporation sets a positive alternative for developing a sustainable water infrastructure.

Who were the main actors involved?
Thane Municipal Corporation is responsible for encouraging, implementing and monitoring rain water harvesting initiatives in the city. This was also mandated as one of the reforms under of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), that the city ULB was committed to undertake. A significant role was played by the residents of the city who supported the successful implementation of the policy reform by widely resorting to rain water harvesting.

What is unique about the way that this practice addresses the challenge?
Coordinated operation of both centralized (municipal water supply for potable use) and decentralized (rain water harvesting for non potable use) water systems has led to the emergence of eco-efficient water management system in the city.

What is this practice?
In order to reduce the burden on the water supply department and augment the decentralized sources of water supply Thane Municipal Corporation initiated policy reforms for large scale implementation of rain water harvesting measures. It has made rain water harvesting mandatory for all buildings constructed after 2005 and has announced 5% rebate in property tax for installing rain water harvesting system in buildings constructed prior to 2005. The initiative has lead to the emergence of many successful rain water harvesting projects in all types of building use like residential, commercial, office spaces etc.

Why is this practice relevant to other cities in India?
In India, 65% rainwater runoff goes into the sea causing soil erosion, river flooding and siltation of water bodies. India is using only 35% of the rainwater it receives[76]. By effectively implementing rainwater harvesting projects, rainwater which is wasted can be used to create an eco-efficient water infrastructure which can efficiently combat the water scarcity and drastically reduce the dependency on municipal water supply through surface and ground water.

[74] http://www.rainwaterharvesting.org/crisis/urbanwater-scenario.htm

[75] http://www.downtoearth.org.in/content/water-stress

[76] http://www.downtoearth.org.in/content/water-stress

6.2.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Water/Wastewater Sector for Indian cities?

The initiative is an example of eco-efficient water resource management which is essential for achieving green growth. Decentralized water system such as rain water harvesting is a secure and sustainable water source for the city. Coordinated operation of both centralized and decentralized water systems is essential for securing the development of the city in its green growth path.

Why is this practice a good demonstration of Green Growth principles?

Decentralizing water resource management through rain water harvesting has not only reduced the financial burden on Thane Municipal Corporation for creation of infrastructure for water supply but also secured the water resource for the city by recharging the ground water and prevented urban flooding by reducing surface runoff.

What specific Green Growth benefits does this practice demonstrate?

Around 450 million liters of water per day is being supplied to the whole of Thane corporation region, of which 60 percent is being used by residential buildings. Out of a total population of 2,000,000 around 55,000 people occupy buildings constructed after 2005 wherein the provisionof a rain water harvesting system has been made mandatory. About 2.4 million liters of water per day has been conserved by means of these compulsory rain water harvesting projects[77].

This has drastically reduced the demand for municipal water supply in new buildings. The proportionate increase in water demand is much less than the increase in population (details given in the table).

POPULATION GROWTH AND RISE IN VOLUME OF WATER SUPPLIED IN THE CITY

Year	Population in lakhs	Water supplied in mld
2011	12.61	320
2011	12.61	320

Source: Thane Municipal Corporation

[77] *A compendium of the award winning and other entries for the "HUDCO Award for Best Practices to Improve the Living Environment" 2011-12.HSMI-HUDCO Publication, World Habitat Day, October 1, 2012*

Such an initiative has saved Thane Municipal Corporation the huge cost of laying pipelines/ canals, construction of water treatment plant and its ongoing maintenance to carry water from various reservoirs across the miles for distribution in the city. The reduction in water demand has also reduced the energy requirement for water supply sector of Thane Municipal Corporation.

NUMBER OF BUILDINGS WITH RAIN WATER HARVESTING SYSTEM

Population in lakhs	Number Of Buildings
2005-09	50
2009-10	87
2010-11	147
2011-12	256
2012-13	120
2013-14	115
Total	775

Source: Thane Municipal Corporation

WATER POND, THANE

Rain water harvesting projects have been implemented in approximately 775 buildings in the city. Though in quantitative terms, it does not sound substantive compared to total number of buildings in the city, the increase in number is encouraging as seen in the trend during the last three years.

6.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

Thane Municipal Corporation was dependent on other agencies to a great extent to fulfill the water demand of the city. The water supply capacity of Thane Municipal Corporation was 425 Mld which came from four major sources - Independent Water Supply Scheme (IWSS) - 180 Mld; Brihan Mumbai Municipal Corporation (BMC) - Raw Water 30 Mld, Treated Water 30 Mld; Maharashtra Industrial Development Corporation (MIDC)-80 Mld; Shahad-Temghar Water Supply Authority (STEM) 105 Mld. The water charges of other agencies were much higher than that of it's own source and scheme.

82.88% of households had water supply connection out of which only 3.96% were metered. The extent of nonrevenue water was as high as 24.8 %. With only 75.44% cost recovery in water supply services and 72.21 % efficiency in collection of water related charges, Thane Municipal Corporation was facing a financial crunch for fulfilling the water demand of the city. The high growth rate and population projection reveal the urgent need of new source for the city.[78]

Thane experiences an average of 100 days of rainfall per year resulting in at least 3163 mm of rainfall per year. Each day the ground water table in Thane was depleting due to reduced percolation of water in the ground because of excessive construction of non-permeable surfaces. Thus ground water table which was a potential source of water supply needed to be refurbished with the use of rain water harvesting in Thane[79].

In order to reduce the burden on the water supply department and augment the decentralized sources of water supply Thane Municipal Corporation initiated policy reforms for large scale implementation of Rain water harvesting measures. The initiative has led to the emergence of many successful rain water harvesting projects in all types of building use like residential, commercial, office spaces etc.

How did this practice tie into specific city development objectives?

After successful implementation of rain water harvesting in new buildings, Thane Municipal Corporation is now aiming at installing rain water harvesting in old buildings to make entire city water efficient.

How did the main actor(s) make this happen?

Rain Water Harvesting was one of the optional reforms under Jawaharlal Nehru National Urban Renewal Mission and the main objective behind making Rain Water Harvesting mandatory in all building is to recharge ground water aquifers or to store rain water for direct use by occupants of the buildings.

Thus Thane Municipal Corporation, in its notification dated 18.01.2005, made it mandatory to have rain water harvesting structures in all buildings constructed after 2005. On March 10, 2005, the State Govt initiated a modified proposal under section 37 of the MRTP Act 1966 of the existing development control regulations to incorporate special provision for installation of Rain Water Harvesting System in new construction. The Modified Development Control Rules came into force on April 10, 2008. Dual mode flush tanks have been made mandatory for all buildings after 2005.

[78] *Thane City Sanitation Plan*

For successful implementation of the policy, Thane Municipal Corporation officials were provided technical knowhow by Administrative Staff College of India. This capacity building programme enabled them to incorporate rain water harvesting systems in twelve of its own buildings using various techniques like open well method, bore well method, percolation/ recharge pit, percolation/recharge pit with bore, recharge trench, recharge trench with bore, recharge well, recharge well cum bore and recharge shaft. These buildings were instrumental in illustrating the techniques and benefits of rain water harvesting to the general public.

Since the implementation of the reform in April 2008, the Thane Municipal Corporation does not issue completion certificate to buildings without rain water harvesting system constructed after 2005. Thus it has been successful in getting rain water harvesting system installed in all the new buildings. The initiative has led to the emergence of many successful rain water harvesting projects in all types of building use like residential, commercial, office spaces etc.

The initiative aimed at making people use the stored rain water for non-potable activities like flushing, washing, gardening etc. Today, Thane Municipal Corporation has to supply 135 lpcd of water from which 45 lpcd is used for such activities. By making it mandatory to use the stored rain water for these purposes AMC now supplies only 90 lpcd for the new buildings. This coordinated operation of both centralized and decentralized water systems has lead to the emergence of eco-efficient water management system in the city.

LAKE IN THE OUTSKIRTS OF CITY, THANE

[79] *A compendium of the award winning and other entries for the "HUDCO Award for Best Practices to Improve the Living Environment" 2011-12.HSMI-HUDCO Publication, World Habitat Day, October 1, 2012*

The city is thus able to mitigate the water scarcity. Not only this, it does not have any financial liability, as the rain water harvesting systems are installed by the developers who recover the cost from individual flat owners.

Thane Municipal Corporation also made rain water harvesting mandatory for public buildings like hospitals, colleges, administrative offices, gardens, and stadiums etc where demand for water is very high. As a front runner it also implemented rain water harvesting projects in a number of its own buildings.

RAIN WATER HARVESTING INITIATIVES IN GOVERNMENT BUILDINGS

Sr. No.	Name Of Work	Estimated Cost (INR)	Year Of Completion
1.	**Temghar Water Treatment Plant Administrative Building.**	4,60,367	2009-10
2.	**Kopari Ward Committee office**	6,54,151	2009-10
3.	**Late. H.G. Raut School in Kopari Ward Committee Area.**	3,20,886	2009-10
4.	**Vartaknagar Ward Committee Office.**	8,23,800	2010-11
5.	**Vasant Vihar Jidda School in Vartaknagar Ward Committee Area.**	9,99,800	2010-11
6.	**Manpada - Waghbill School in Majiwada - Manpada Ward Committee Office.**	7,29,000	2010-11
7.	**Balkum Fire Brigade Station in Majiwada - Manpada Ward Committee Area.**	9,99,000	2010-11
8.	**Uthalsar Ward Committee Office.**	8,16,000	2010-11
9.	**School No. 25 Patlipada in Majiwada - Manpada Ward Committee Office.**	7,03,200	2010-11
10.	**School No.120 Savarkarnagar in Railadevi Ward Committee Office.**	9,97,400	2010-11
11.	**Naupada Ward Committee Office.**	8,95,300	2010-11
	Total	83,98,904	

Source: Thane Municipal Corporation

It also undertook many city level rain water harvesting initiatives by constructing artificial lakes like deep pits at strategic locations to collect and store rain water and digging up holding ponds for arresting the rain water during high tides for percolation to the ground.

Any policy initiative requires public acceptance for its successful implementation. Thus Thane Municipal Corporation undertook a number of awareness generation activities for motivating people to adapt the rain water harvesting system. To generate public awareness it widely circulated pamphlets describing the advantages of rain water harvesting and also made attractive floats during the Gudi Padva (Marathi New Year) celebration.

With the support of the people of the city, Thane Municipal Corporation has been able to create an eco-efficient water resource management system.

What were the main barriers? How did they overcome the barriers?

Monitoring of the installed rain water harvesting systems remains to be a barrier for success of the initiative. Presently Thane Municipal Corporation is only concerned about the installation of rain water harvesting systems. There is no mechanism for post installation monitoring.

A dysfunctional system or a system which doesn't purify the rain water prior to its percolation through recharge pit will pollute the ground water. A strict monitoring mechanism is required to ensure the proper functioning of the installed rain water harvesting systems.

Thane Municipal Corporation has established a Solar City Cell to promote the use of alternate energy by generating public awareness about techniques and benefits of utilizing solar energy. Similarly it can establish rain water harvesting Cell or theme park which will act as a demonstration space and knowledge hub for providing information and resource on rain water harvesting.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

A stringent monitoring mechanism needs to be adopted to ensure proper functioning of the rain water harvesting systems. An ill maintained or dysfunctional system cannot serve the purpose of the initiative.

Massive awareness generation is necessary to motivate people to use the harvested water. The initiative will not be successful in reducing the dependency on municipal water supply, until people actually use the harvested water.

Are/were there additional follow up phases or stages planned?

After the successful implementation of rain water harvesting in new buildings, Thane Municipal Corporation aimed at encouraging rain water harvesting in old buildings. It has been giving 5% rebate on property tax for buildings with solar water heater for which it has received very good public response. Based on the learning from this initiative it declared 5% rebate on property tax for existing buildings with rain water harvesting system. This aimed at encouraging the installation of rain water harvesting system in existing structures.

But the response of existing buildings is not as good when compared to the new buildings. The cost of installation of rain water harvesting system in old buildings is 30% to 40% more than the cost of installation of similar system in a new building of same area. Additionally, many of the old buildings lack the open space required for the construction of underground recharge pit.

Presently Thane Municipal Corporation is planning to increase the rebate in property tax to motivate more people to install rain water harvesting systems.

6.3. Waste Water Recycling And Reuse Through Four Tertiary Treatment Plants, Bangalore

6.3.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

Public outreach and involvement is crucial for the acceptance of even a very well planned and techno financially feasible waste water reuse project. The apathy of the end users towards the concept of "toilet to tap" is because of their lack of awareness regarding benefits of recycling and reuse of water. Great technological advancements for treatment of water are not enough to ensure the success of "recycle and reuse" initiatives unless consumer participation is promoted through proper public outreach programmes.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

The water supply sector in India continues to be plagued with severe deficiencies in terms of availability, quality, and equity of services[80]. The increasing population in the cities has immensely stressed the existing water supply sources. Many cities which are not located near perennial surface water source have to transport water from a long distance for supply in the city which has immensely increased the investment on creation, operation and maintenance of water infrastructure in the city. Also the large dependency on ground water in the cities without any consideration for its recharge has led to potential drop in ground water level. These factors have created acute water shortage in cities.

Thus cities in India need to resort to creation of more sustainable water infrastructure which aims at replenishing natural water sources and conservation of fresh water through reuse and recycling of waste water. Cities need to adopt a water sensitive growth approach to ensure sustainable future development.

This initiative demonstrates efforts in recycling and reuse of waste water through tertiary treatment by the Bangalore Water Supply and Sewerage Board (BWSSB).

Who were the main actors involved?

The tertiary treatment plants for recycling and reuse of waste water were setup because of the progressive thinking of the Bangalore Water Supply and Sewerage Board in its strive for creating a eco efficient (ecological and economical) water source for the city.

The tertiary treatment plants at Yelahanka and Vrishabhavathy Valley were set up with the financial assistance from HUDCO and Indo French Protocol. The tertiary Treatment plants at Lal Bagh and Cubbon Park were funded by Bangalore Development Authority.

Bangalore Water Supply and sewerage Board has outsourced the operation and maintenance work of the plant to M/s Degremont Limited, a private agency.

What is unique about the way that this practices addresses the challenge?

The success of the initial four tertiary treatment plants has led to replication of such city level plants to cater to industrial and commercial water demand. The city has also developed a proposal for setting up of 108 one MLD tertiary treatment plants in 125 wards of the 225 sq km core area of the city to cater to the water demand for non-potable purpose in residential areas.

[80] *Hingorani Pritika; The Economics of Municipal Sewage Water Recycling and Reuse in India; India Infrastructure Report 2011*

What is this practice?

This practice is a good example of city level efforts for reuse of municipal and industrial wastewaters for non-potable and industrial use. Bangalore water supply and Sewerage Board resorted to recycling and reuse of wastewater to cater to the commercial and industrial water demand.

The city began with the establishment of a 10 MLD plant that was commissioned at Yelahanka. This plant was setup to supply treated water to the upcoming Bangalore International airport. The success of this plant prompted the establishment of three other plants at Vrishabhavathy Valley, Lal Bagh and Cubbon Park. By 2005, Banagalore had four tertiary treatment plants to recycle and reuse wastewater.

The 60-MLD plant at V-Valley which was second in the row was the biggest Tertiary Treatment Plant in India at that time. This was setup to supply treated water to the upcoming Bidai Power Plant. The relatively smaller 1.5 MLD plants at Lal Bagh and Cubbon Park were setup near the city level parks for providing treated water for gardening.

The treatment, though expensive, is profitable in this water deficit area. The cost of treatment of water is INR 10 to 12 per kilo litre (kl), while the board sells water for INR 15 per kl for water collected at the plant and INR 25 per kl for water supplied through a pipeline.

Why is this practice relevant to other cities in India?

Together, India's million plus cities generate more than 38,254 million litres of sewage each day. Of this, it is estimated that less than 30 per cent of what is collected undergoes treatment before it is disposed into freshwater bodies or the sea. Untreated sewage is the single most important contributor to surface and groundwater pollution in the country. On the other hand, the large volume of sewage offers tremendous potential for cities to recycle water and reduce their reliance on bulk freshwater sources. While freshwater is needed for human consumption, sewage can be treated to the minimum quality required for its subsequent use and safely reused for many non-potable industrial and agricultural uses[81].

TREATED WASTE WATER FROM PLANT IS USED TO CATER THE DEMAND FOR NON-POTABLE USE

6.3.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Water/Wastewater Sector for Indian cities?

Green Growth requires creation of infrastructure which emphasizes water-sensitive development and aims at achieving both ecological and economic efficiency. By resorting to recycling and reuse of water, Bangalore Water Supply and Sewerage Board has strived to achieve a compact and sustainable urban water cycle and economically viable infrastructure, thus leading the city in the path of green growth.

Why is this practice a good demonstration of Green Growth principles?

The initiative has helped Bangalore Water Supply and Sewerage Board achieve two objectives in the water system: minimize freshwater demand and the consequent investment on developing the infrastructure and operation costs and reducing the adverse environmental impact by treatment of wastewater.

The initiative has not only led to the creation of economically efficient water infrastructure at present but has also helped in eliminating future hidden costs of pollution by treatment of wastewater.

WASTE WATER TREATMENT PLANT

[81] *Hingorani Pritika;The Economics of Municipal Sewage Water Recycling and Reuse in India; India Infrastructure Report 2011*

What specific Green Growth benefits does this practice demonstrate?

Bangalore Water Supply and Sewerage Board has been able to reduce the water scarcity in the city by setting up these tertiary treatment plants for supplying recycled water for industrial and commercial use and for gardening in major city parks.

These plants located in various parts of the city have helped save electricity and cost of bringing water from long distances. The plants that are conveniently located near the source of demand have saved the Board from the high cost of laying pipelines/canals, construction of water treatment plant and its ongoing maintenance. They have reduced the need to carry water from various reservoirs across long distances for distribution within the city.

The wastewater treatment process which was otherwise a financial liability for the Board has now become a new source of revenue generation. The cost of treatment of water is INR 10 to 12 per kl, while the board sells water for INR 15 per kl for water collected at the plant and INR 25 per kl for water supplied through a pipeline.

The success of the first tertiary treatment plant at Yelahanka triggered the establishment of three other plants and Vrishabhavathy Valley, Cubbon Park and Lal Bagh.

The success of these initial initiatives has led to mainstreaming of water recycling and reuse in the development of water-related infrastructure of the city. Bangalore Water Supply and Sewerage Board has started setting up additional treatment plants to cater to the industrial and commercial water demand in the city.

Apart from setting up of large plants, the Board has also prepared the blueprint for setting up of 108 one MLD tertiary treatment plants in 125 wards of the 225 sq km core area of the city. These plants will supply water for non-potable use such as construction activity, gardening etc.

DETAILS OF EMPLOYMENT OPPORTUNITIES GENERATED BY THE INITIATIVE

	Vrishabhavathy Valley	Yelhanka	Cubbon Park	Lal Bagh
Plant Manager	1	1	1	1
Chemist	1	1	1	1
Electrician	3	3	4	4
Fitter	3	3	-	-
Unskilled Manpower	30	24	8	8
Total	39	32	14	14

Source: Bangalore Water Supply and Sewerage Board

Though the plan has been approved by the state Government and budget allocation has been made for the project, it has failed to initiate because of non-availability of land to set up these plants. Stiff public resistance for setting up of the plants, which they perceive as major polluting activity, near their houses has made it difficult for getting land for the plants.

These tertiary treatment plants have not only generated employment opportunity in the city but also created immense business opportunity for Waste Water Treatment Plant Design, Operation and Maintenance Services. Bangalore Water Supply and Sewerage Board has outsourced the maintenance work of all four tertiary plants and planning to setup another plant at Raja Canal on PPP Basis.

6.3.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
The initiative which is still at the pilot stage has not contributed to any significant change in the city's water sector. Though it has led to the reduction of fresh water demand by the new commercial and industrial developments emerging in the city the data regarding the volume of reduction in fresh water demand is not available at present.

How did this practice tie into specific city development objectives?
The success of these initial initiatives has led to mainstreaming of water recycling and reuse in the development of water infrastructure of the city.

How did the main actor(s) make this happen?
To cater to the water demand of the upcoming commercial and industrial development in Bangalore (e.g. the new international airport, Bidai power plant), Bangalore Water Supply and Sewerage Board decided to start recycling and to discourage the use of fresh water for non-potable use.

The Board established its first 10 MLD tertiary treatment plant at Yelahanka to provide water for no potable use to the Bangalore International Airport. The plant was set up in 2003 with funding assistance from Indo French Protocol and HUDCO at a total project cost of INR 130 million. Apart from the International Airport, the plant supplies recycled water to a number of other industries like Bharat Electronics Limited, Rail Wheel Factory, ITC Limited etc. It generates revenue of INR 1.8 million per month.

Based on the learning from the first plant, BWSSB established another 60 MLD plant at Vrishabhavathy Valley to supply recycled water for non-potable use to the Bidai Power Plant and some nearby industries.

At present the plant is running at half its capacity as the Bidai Power Plant has not yet been setup due to certain geo-political reasons. At present, it supplies only 1 to 1.5 MLD water per day to the Arvind Mill. It also provides treated water to the local farmers, free of cost.

Bangalore which is known as the City of Gardens has many large city parks. These parks require large amount of water for irrigation and landscaping. The source of water for these parks was ground water. To prevent further depletion of the already sinking ground water levels, Bangalore Development Authority requested the BWSSB to provide recycled water to two major city parks at Cubbon Park and Lal Bagh.

In 2004, the board setup two 1.5 MLD capacity tertiary treatment plants at Lal Bagh and Cubbon Park with funding assistance from Bangalore Development Authority. The plant at Lal Bagh was set up at a project cost of INR 40.0 Million and the plant at Cubbon Park was set up at a project cost of INR 30.0 Million. These plants generate revenue of INR 0.67million per month each.

The cost of treatment of water in these four plants is INR 10 to 12 per kl, and the Board charges INR 15 per kl for water collected at the plant site and INR 25 per kl for water supplied through a pipeline.

What were the main barriers? How did they overcome the barriers?

The most critical barrier for Bangalore Water Supply and Sewerage Board was, garnering public acceptance for recycled water. Lack of public awareness regarding recycled water which was a fairly new concept for the city resulted in fears and uncertainties about the health risks, which severely affected public acceptance. The city had ambitious plans to take its treated water to its water source - the Hesaraghatta reservoir. But these met with stiff public resistance. Residents of the city were not prepared use the treated waste water for potable purpose[82].

On recognizing the benefits of recycling and reusing of water Bangalore Water Supply and Sewerage Board has prepared the blueprint for setting up of 108 one MLD tertiary treatment plants in 125 wards of the 225 sq km core area of the city. These plants will supply water for non-potable use such as construction activity, gardening etc. The Board's plan for setting up 108 one MLD tertiary treatment plants is taking time to initiate because land is not being made available to set up the plants. There has been a lot of public resistance for setting up of the plants, since they perceive the STPs as a polluting activity located near their houses.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc

Cities need to develop a favorable regulatory framework to overcome health risks of using recycled water and secure public acceptance. Pilot projects need to be undertaken at first to assess the impact of use of recycled water. The learning from pilot data and results should be shared with the end users through public outreach programmes to garner public acceptance for the project.

The capacity of water treatment plants needs to be decided based on the market demand for recycled water in that area to ensure economic viability of the project. The type of water demand in the city needs to be studied to decide the type of treatment plant required – large capacity centralized plant or small capacity decentralized plants.

The application of water reuse depends heavily on local circumstances. Proper selection of treatment technology as per the purpose of use and local needs is essential to ensure economic viability of the project. Large scale investment in high-tech treatment for producing high-quality recycled water may not be an economically viable option for cities where there is no demand for such water.

Are/were there additional follow up phases or stages planned?

In order to find an alternative source of water and decide technology and safeguard measures on how to recycle and reuse water, the Bangalore Water Supply and Sewerage Board has signed a Memorandum of Understanding with Singapore Cooperation Enterprise and Temasek Foundation, an investment arm of the Singapore Government, to share technical expertise in reusing waste water for potable purposes, stakeholder engagement and public acceptance. The state government had approached Singapore as it is the world's leading city in waste water treatment, particularly in indirect potable reuse of treated water, termed 'NEWater'.

Presently the State Government is planning to setup additional waste water treatment plants for recycling the entire waste water generated in the city and use this recycled water for recharging thirty-nine lakes in Kolar District and eight lakes in Chikkaballapur district.

[82]*Centre for Science and Environment, Excreta Matters, Bengaluru - The Water - Waste Water Portrait*

Solid Waste Management

Volume 3

07

Solid Waste Management

7.1. Centralised Bio-Medical Waste Treatment Facility (CBWTF), Surat

7.1.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

The Urban Local Body's ownership and strong support is imperative for fostering the development of the city in the green growth path. Strong leadership is essential for motivating teams. This helps to bring in innovation and empowerment which is crucial for implementing green growth initiatives on priority basis

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

Health is a significant factor contributing to the development of human capital. Provision of adequate health care facilities to cater to the needs of the growing population in a city is essential to allow the residents to be productive citizens. However, with the increase in number of health care facilities, the management of healthcare waste becomes an integral part of waste management programs in cities. These health care facilities including hospitals, nursing homes, veterinary hospitals, clinics and general practitioners, dispensaries, blood banks, animal houses and research institutes produce large amounts of biomedical waste.

The CBWTF in Surat addresses the challenge of treating biomedical waste through a coordinated and integrated approach.

According to the Ministry of Environment and Forests, the gross generation of biomedical waste in India is 4,05,702 kg/day of which only 2,91,983 kg/day is disposed of. This means that almost 28% of the waste is left untreated and not disposed, finding its way to dumps or water bodies. According to another report of Ministry of Environment and Forests almost 53.25% of Health Care Establishments are in operation without authorization from State Pollution Control Board/Pollution Control Committee. Thus, waste generated from such facilities goes unaccounted for and is dumped without any scientific treatment[83].

Mixing bio-medical waste with municipal waste contaminates the non-hazardous/non-toxic municipal waste which jeopardizes the efforts undertaken for overall municipal waste management and can spread infection and diseases. Injuries from sharps and exposure to harmful chemical waste and radioactive waste, unauthorized recycling of disposable items such as hypodermic needles, tubes, blades, bottles etc and use of discarded medicines can cause health hazards in a city. Especially it poses grave occupational health concern for medical personnel, health workers, rag pickers and waste workers who handle such waste.

[83] http://www.cseindia.org/node/3702

Who were the main actors involved?

This facility provides a good example of synergic efforts put forward by a Urban Local Body (Surat Municipal Corporation -SMC), medical professionals (representatives of major hospitals and clinics along with leaders of various associations like General Practitioner Association, Indian Medical Association), law enforcers (Gujarat State Pollution Control Board) and operators of the facility (ENVISION Enviro Engineers).

The success of the initiative is attributed to the synchronized role sharing between the various actors. SMC took the leadership and brought all the actors on one platform. Under the leadership of the then Municipal Commissioner, SMC organized meetings with various medical associations present in the city. Through a series of consultations, SMC and the various actors arrived at the conclusion that a centralized bio-medical waste treatment facility was the only economically viable option for treatment and disposal of Bio-Medical waste as per the Biomedical waste (management and handling) Rule.

At each stage of the project, SMC actively supported the operator and monitored the health care facilities for compliance of the biomedical waste Rule. The sanitation team of SMC monitored the health care facilities to identify the amount of biomedical waste generated and the method of disposal of these waste by the generators.

With the active support of SMC, the operator of the plant managed to convince the health care facilities for depositing their bio-medical waste to the facility. The operator also carried out rigorous training programmes of health workers to generate awareness regarding segregation and storage of different types of waste.

A significant role was played by Mr. Nihar Doctor, the head of the En-Vision Bio Medical Treatment Plant who also belonged to Surat. Being an environmental & structural engineer by profession, he designed the building and structure of the plant himself and stressed on having all indigenous technology at the plant.

What is unique about the way that this practice addresses the challenge?

A pioneering initiative in the state, this practice was the result of the forward thinking of the SMC in its endeavor to ensure sustainable development of the city. The facility became operational on 1st January 2003 much before the notification of the guidelines for common biomedical waste treatment facility by Central Pollution Control Board. This facility became a pilot on the basis of which the guidelines for management of biomedical waste were formulated.

What is this practice?

Bio-medical waste is infectious in nature and requires special attention starting from the point of generation till its final disposal. Biomedical Waste (Management & Handling) Rule 1998, stipulated that occupier of every organization generating biomedical waste must comply with the Rule to manage the waste, so as not to cause any harm to the environment. As specified in the Rule, bio-medical waste was required to be treated in a specific way which was not economically viable for an individual health care facility. Thus, SMC in consultation with various medical professionals and associations set up a centralized bio-medical waste treatment facility which was the only economically viable option for safe disposal of bio-medical waste. As SMC lacked the financial resource or the technical expertise for setting and operating such plant it was set up on Built-Own-Operate-Transfer (BOOT) contract basis which was awarded to ENVISION Enviro Engineers. The facility was commissioned on 1st January 2003. The concession period of seven years has been extended further for 14 years after expiry of first concession period on 31st December 2009.

Why is this practice relevant to other cities in India?

Though levels of bio-medical waste management services in the country have started improving on account of formation of Biomedical Waste (Management & Handling) Rule 1998 and active monitoring by the Central and State Pollution Control Boards, there still is a long way to go.

With the notification of Bio-Medical Wastes (Management and Handling) Rule 2011 proper management of biomedical waste has become mandatory for Health Care Establishments. However, Common Treatment Facilities are inadequate in comparison to the Health Care Establishments in most of the States of the country and in house management of waste in Health Care Establishments remains far from satisfactory[84].

In the given scenario this successful PPP model sets a road map for Urban Local Bodies to develop an effective method to scientifically manage bio-medical waste generated in cities. With the enforcement of the notification of Bio-Medical Waste (Management and Handling) Rule 2011, the creation of such facility has become essential for economically viable management of bio medical waste.

Representatives from various urban local bodies have visited Surat to study the system and replicated the same in their region. After successfully running the plant in Surat ENVISION has also been selected for setting up a similar plant at Udaipur. It is also assisting to set up such plants in Ranchi, Bhalsar, Kalyan, Goa and Kerala. This iterates the high replication potential of the initiative.

7.1.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the solid waste management sector for Indian cities?

Green Growth requires a shift in perspective on waste management. In many cities, dynamic waste streams demanding scientific treatments, such as bio-medical-waste, pose great challenges. Amidst these trends, SMC's cognizance of treatment of biomedical waste and according it high priority to mainstream environmental concerns in development activities sets a positive approach for leading a city on the Green Growth path.

Why is this practice a good demonstration of Green Growth principles?

The initiative of setting up a centralized bio-medical waste treatment facility has not only improved the quality of environment but has also turned bio-medical waste into a source of revenue and employment by opening avenues for private sector investment in waste management sector.

What specific Green Growth benefits does this practice demonstrate?

Recognizing the environmental concerns of specialized waste such as biomedical waste has helped in mainstreaming environmental concerns in development activities and fostering harmony between economic, social and environmental needs of the city. The creation of a system for management of biomedical waste has encouraged SMC to focus on improving the health infrastructure in the city in its endeavor to enhance the access of the people to health facilities.

As the treatment significantly reduces the amount of waste to be disposed of at sanitary land fill site, it has reduced the requirement of area for landfill site thus leading to efficient use of land which otherwise would have been converted to landfill sites.

[84] http://www.cseindia.org/node/3702

Continuous interaction with the various actors at all stages of the project has helped in sensitizing the people by generating awareness regarding environmental concerns of biomedical waste. The success of the plant signifies the benefits of using smart technological solution for environmental management through proper waste treatment and disposal.

SMC was able to implement the compliance of Biomedical Waste (Management and Handling) Rule in better way and within stipulated time. The facility became operational on 1st January 2003 i.e. even before the guidelines for common biomedical waste treatment facility were published by Central pollution control board. Many features required for a common biomedical waste treatment facility was adopted from this facility.

The initiative has lead to the creation of a systematic approach for registration of health care centers present in the city. SMC is in the process of initiating a detailed inventory of the existing number and type of health care facilities. It is planning to make registration of it all the new health care facilities. With the database of the number of biomedical waste generators, monitoring of the amount of bio-medical waste generated and the entire system of treatment of the waste will become rationalized.

The active support of SMC to the private entrepreneur and stringent monitoring of the health care facilities by SMC and Gujarat State Pollution Control Board for making the project successful has improved the image of SMC as a proactive service provider.

Another important feature of this project is that practically whole of South Gujarat, comprising eight districts is being served by this facility. Cost of treatment and disposal for a kilogram of biomedical waste would have been exorbitant, if such a facility were to be developed in each of these small towns. Due to this facility biomedical waste generators in towns around Surat are also able to avail its service at a moderately higher cost than Surat. This has also helped in making the facility economically viable.

The operator is supposed to transfer part of the treatment rate collected from private generators to the corporation at an agreed terms of contract. Thus, SMC is able to generate additional revenue from this facility which can be utilized in sustainable direction.

As the entire system works on the polluters pay principle, no additional investment was required from SMC. The project has created additional source of revenue for SMC in terms of lease, rent and fee received from the operator per kg of waste collected. The entire cost is borne by the operator who has to recover it from the generators thus making the project financially viable and sustainable.

The project has not only bridged the skill gap in handling biomedical waste and financial inadequacies of SMC by bringing in new investment and better technology but also opened the avenues for future private sector investment in infrastructure development in the city. It is a working model of a business opportunity for an entrepreneur in biomedical waste management sector.

Setting up of the plant has also lead to the generation of employment opportunities in the city (details given in the table).

Employment opportunity generated by the initiative	No.
Staff Members	8
Plant Operators	10
Pick-Up Vehicles	13
Drivers/Helpers	22
Total	53

Source: Surat Municipal Corporation

ENVISION has taken a number of measures to ensure the safety and security of its employees who are dealing with infectious waste. It regularly provides training to the employees concerning the safe handling of Bio-Medical waste. The waste in the plant is transferred through covered carts and the employees have been provided safety gears like apron, mask, cap etc. It has a mandatory regular vaccinations facility and shower facility for the employees. ENVISION has also provided insurance facilities to its employees.

7.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

Prior to the enactment of the Bio-medical Waste (Management & Handling) Rule-1998, the impact of Biomedical Waste was not much recognized and 'deep burial method' was practiced for disposing biomedical waste. This lead to wastage of land and there were chances of reuse of medical kit without proper sterilization. This further had the potential to lead to consequent outspread of serious transmissible diseases.

Due to low levels of awareness among people on various types of bio-medical waste and their disposal techniques, substantial amount of biomedical waste was mixed with other municipal waste. This was jeopardizing the efforts undertaken for overall municipal waste management.

Occupational health concerns also existed for medical personnel, health workers, rag pickers and waste workers. Injuries from sharps and exposure to harmful chemical waste and radioactive waste, unauthorized recycling of disposable items such as hypodermic needles, tubes, blades, bottles etc and use of discarded medicines - all had potential for major health hazards in the city.

In 1998, the Bio-medical waste (Management & Handling) Rule was framed by the Government of India about appropriate treatment for their safe disposal of various categories of Bio-medical wastes. The Rule, stipulated that occupier of every organization generating biomedical waste (as defined in the Rules) must manage his biomedical waste as prescribed in the Rules so as not to cause any harm to the environment.

SMC responded promptly by setting up a centralized bio-medical waste treatment facility so as to prevent any health or environmental hazard in the city. As a result of this facility, management of biomedical waste has become simple for all healthcare units of Surat and practically whole of the South Gujarat comprising eight districts. It has not only improved

the quality of environment in the city but has also turned bio-medical waste into a source of revenue and employment by opening the avenues for private sector investment in waste management sector.

How did this practice tie into specific city development objectives?

The success of the practice has led to the institutionalization of the management of health care facilities by creation of extensive data base of all types and sizes of health care facilities present in the city and mandatory registration of these facilities.

How did the main actor(s) make this happen?

SMC started with the formation of a Steering Committee headed by the Municipal Commissioner. The Committee initiated a series of consultations with all the actors who were directly involved and affected by the decision. Several meetings were arranged with leaders of various associations like General Practitioners Association, Indian Medical Association and representatives of big hospitals and clinics to create awareness about the Bio-medical waste (Management & Handling) Rule and to identify an economically viable and technically feasible treatment mechanism as per its provisions.

The treatment option specified in the Rule was not economically viable for small hospitals, clinics and dispensaries. Hence, through several consultations it was agreed that the best possible solution is to set up a centralized bio-medical waste management plant (CBMTF).

It took SMC six months to convince the professionals for setting up a CBWTF. After a lengthy consultation procedure SMC, through a Standing Committee Resolution, resolved to install the plant on BOOT basis for treatment of Bio-medical waste and to keep the plot reserved at Bhatar for allotment to the successful agency at a token rent for installing the plant.

As SMC did not have the financial resource nor the technical expertise for setting and operating such a plant it was decided to set up a plant on Built-Own-Operate-Transfer (BOOT) contract basis. As per the BOOT contract, it planned to appoint a private agency through competitive bidding process to set up the plant. As per this contract the agency had to set up the entire plant with its own investment that would be recovered by running the plant for a specific duration.

The success of this project depended on three things - revenue generated by the operator, concession period and amount of waste collected by the operator. A minimum amount of waste was required to be collected for the plant to be economically viable. In addition, the agency needed to have some source of revenue to incur the operation and maintenance cost and a concession period was necessary to give the agency adequate time limit to recover the capital cost.

SMC initiated a pilot survey in leading hospitals in the city to assess the quantum of Bio-medical waste being generated in the city and at the same time it started consultations with various stakeholders to decide specific features of the BOOT contract (e.g. mechanism for treatment of waste, method of charging the health care units for the waste generated by them etc.).

The first tenders floated included incineration as the only treatment technology to be set up on turnkey basis. By the end of 2001, after several revisions the final tender evolved. The treatment technologies specified in the final tender were incineration and sterilization (autoclaving) followed by shredding. These were decided on the basis of typology of waste generated and their treatment mechanism specified in the Bio-medical waste (Management & Handling) rule. Specifications of the equipment and plant were also laid down during the tendering process as per requirement of the rule.

Before awarding the contract to any agency or entrepreneur, SMC decided to adopt certain conditions for the operator to ensure viability of the plant even while strictly adhering to the Bio-medical waste (Management & Handling) rules[85]. Following were the conditions: An entrepreneur who intends to develop a common biomedical waste treatment facility will purchase land on his own; obtain all necessary permissions from the State Pollution Control Board (Regulatory authority); develop a complete facility as per the requirements of Biomedical Waste (Management & Handling) Rules and in adherence to the CPCB guidelines for common biomedical waste treatment facility; decide the schedule of rates on his own or at the most in consultation with the local medical association; and frame the policy of his operation to his convenience for running the facility.

The bid from En-vision Enviro Engineers Pvt. Ltd. was the only one that successfully met the conditions specified. Consequently, EN-VISION Enviro Engineers Pvt. Ltd. was appointed. Due to lack of experience in this area of expertise, SMC allotted seven years concession period to En-Vision to assess its performance.

The CBWTF was commissioned on 1st January 2003. The concession period of seven years has been extended further for 14 years after expiry of first concession period on 31st December 2009.

SMC supported the project by providing 2400 Sqm land to the agency (M/s En-Vision) for establishment of CBWTF for a token amount of Rs 1.00. The entire investment for setting up the plant was made by the operator. The operator had to recover the capital and Operation and Maintenance cost by collecting charges from health care facilities for treating their waste.

Once the operator was appointed, SMC continued consultations with medical professionals to decide on the method of charging the health care units for the waste generated by them and permitted En-vision Enviro Engineers Pvt. Ltd. to negotiate an economically feasible rate. Most medical professionals were opposed to adopting the billing system of 'per bed basis', though this was the practice for similar plants in other cities. Instead, per Kg. (weight) basis of billing was almost unanimously favoured. Various schemes for making payment to the agency for treatment of bio-medical waste were discussed and it was finally decided to keep the rate of treatment as INR 10/- Per kg.

During the tendering process, En-vision had quoted a rate INR 7.5/per kg of waste to be collected and treated by the facility. Surat Municipal Corporation revised this rate at INR 10/per kg. keeping in mind the financial viability of the agency. It made a revenue arrangement as per which the difference of INR 2.5/kg is credited to it by the agency in return for which it is assured of minimum of 200 kg per day of biomedical waste irrespective of the actual quantity of biomedical waste generated by corporation run hospitals/maternity homes, laboratories and urban health care centers.

The quotation of rates for collection and treatment of bio medical waste given by En-vision on the basis of minimum 1.5 MT of waste/day was met only during the sixth year of operation as memberships grew. Had SMC not assured the minimum 200 kg/ day quantity of biomedical waste, En-vision would have faced difficulties to achieve economic viability.

SMC also supported the initiative by providing waste collection centers at twenty seven of its healthcare units which were termed as 'Urban Health Centers' to the benefit of small waste generators. These health care units served as collection points where the private generators could deposit the biomedical waste to the person authorized by

[85]*Sardar Patel Institute of Public Administration, Ahmedabad; Installation of Centralized Bio Medical Waste Treatment Facility on boot Basis*

the agency. This person, would, in turn, issue receipt of quantity of biomedical waste received to the generator. This helped the agency economize on the cost of collection and transportation of waste.

This unique feature of the waste collection system helped to keep treatment and disposal charges low. The agency had to operate vehicles for door-to-door biomedical waste collection only from big hospitals and health care units where the quantity of biomedical waste is large enough to make the transportation process economical. In this case the generator has to pay extra charges for the cost of the transportation. The contact number of the facility and its BOOT operator was circulated among beneficiaries so that information on malfunctioning of waste collection and transportation would be received.

SMC also allowed the agency to collect the bio medical waste from surrounding towns to meet the utilization capacity of the plant and to achieve economy of scale in operation. In return, it benefited by receiving a small part of charges collected from private healthcare units as administrative charges.

The entire process of disposal of Bio-Medical waste has clearly defined roles for all the stakeholders at different stages. The health care facilities in the city have to take permission from Gujarat State Pollution Control Board to establish and operate the facility. The generators of the waste have to segregate the waste in different coloured bags provided by the operator of the plant as per the biomedical waste (management and handling) rules. They have to either deposit the waste to designated Health Centres or the waste collection vehicle of the operator in case of a door-to-door waste collection.

The operator of the plant provides regular training programme to the medical staff for proper segregation and handling of bio-medical waste. They have also circulated CDs, pamphlets and training material in the vernacular (Gujarati) language in the various health care centres.

SMC has made it mandatory for all the health care units to register with the waste treatment facility. New health care units are not allowed to operate in the city without registering with the facility. Due to the active support and monitoring of SMC, the numbers of health care units registered with the facility have increased from 7,746 in 2003 to 10,093 at present, the details of which are given in the following table.

NUMBER OF HEALTH CARE FACILITIES REGISTERED WITH THE CBWTF

Health Care Units	2003	2013	2014 June
Hospitals	356	485	785
Beds	5780	6860	6928
General Dispensaries	1154	1892	2100
Pathological Labs	156	239	280
Total	7446	9476	10093

Source: Surat Municipal Corporation

At present there are 24 collection centers in the city. The entire liability of the waste lies with the operator from this point. It is the responsibility of the operator to transfer the waste in closed vehicle from the source of collection to the treatment facility. The entire process of collection and transportation of waste is done as per biomedical waste (management and handling) Rule.

After reaching the plant the different types of waste are either incinerated, shredded or autoclaved as per the requirements of the rule. At present ENVISION treats around 4000 kg of waste which it receives from the medical centers from Surat and other areas from South Gujarat. The inert material left after the waste treatment i.e. incineration ash and shredding waste are collected by SMC's solid waste collection vehicle for disposal at sanitary landfill site.

The operation of the plant is monitored by Gujarat State Pollution Control Board. The operator has to submit a quarterly report to Gujarat State Pollution Control Board. Regular checking by Gujarat State Pollution Control Board and occasional surprise visits makes it necessary for the plants to comply with the law. It has a centralized monitoring facility operated through SCADA system. ENVISION keeps upgrading the plant to meet the latest requirement of the biomedical waste (management and handling) rules. Lately it has started a centralized online tracking system (OMATICS) for the waste collection vehicles.

What were the main barriers? How did they overcome the barriers?

For SMC, it was hard to convince the medical professionals to agree for a centralized bio-medical waste treatment facility. Though the Biomedical Waste (Management & Handling) Rule 1998, mandated medical professionals for safe and appropriate disposal of bio-medical waste, they were reluctant to pay for something that was meant to be thrown out. The low levels of awareness among medical staff who actually dealt with the waste made training on safe segregation of waste a daunting task.

In view of this situation, the then Municipal Commissioner organized several meetings with various medical associations present in the city and through a number of consultations managed to convince the medical professionals for a centralized bio-medical waste treatment facility to be setup on Built-Own-Operate-Transfer (BOOT) basis.

Having done that, the next challenge for SMC was to identify an operator for setting up the plant. About three of such treatment plants were operating in India at that time. Since the concept of a centralized bio-medical waste treatment facility was a pioneering effort for the state of Gujarat, it received only one bid from M/s Envision Enviro Engineers Pvt. that could successfully meet the conditions of setting up a centralized bio medical waste treatment facility in Surat. So, the contract of setting up a centralized bio medical waste treatment facility in Surat on Build Own Operate and Transfer (BOOT) basis was awarded to En-vision Enviro Engineers Pvt. Ltd.

As there were no guidelines for such a plant at that time, Mr. Nihar Doctor, the operator of the plant had to come up with some innovative ideas of his own. Being an environmental & structural engineer by profession, he designed the building and structure of the plant himself and stressed on having all indigenous technology at the plant. Without any role model to follow, he came up with some innovative ideas of his own for designing the plant. During his visit to Israel, he had an opportunity to have a close look at some of the best equipment for such a treatment plant. Being an engineer, he incorporated some of the ideas and designed the machines for the plant.

A major barrier for the economic viability of the facility is the non revision of tariff for collection of biomedical waste. The rate for collection of waste has not been revised in last fourteen years because of the stiff resistance from the health care establishments. Though the health care units charge the patients for the disposal of waste they are not ready to pay the operator for disposal of their waste. The present biomedical rule should setup the guidelines for fixation of rates for collection of waste and revision of rates for ensuring economic viability of such plants.

Despite the extensive training programme by the operator and stringent monitoring by SMC for the last ten years, proper segregation of waste at source, storage of segregated bio-medical waste and handing over of the waste to the operator still remains a challenge. With the frequent change in staff, it becomes difficult for the operator to conduct repeated training programmes. Due to negligence of paramedical staff, Biomedical Waste is not being stored according to specified color coded waste collection bags. Incineration of waste meant for autoclaving or vice versa may lead to malfunctioning of the machinery. Thus the operator has to segregate the collected waste at the plant.

A study was conducted in 2012 by the Surat Municipal Institute of Medical Education & Research (SMIMER) that consisted of participant observation and interviews from 20 health centers of SMC. Results show that in 65.0% of health centers blue bags were not available, most inappropriate contents were found in red bags (50.0%) and in yellow bags there were least inappropriate contents. The study also identified that at 25% places waste was not segregated at the site of generation and the waste was being dumped in the surroundings of 50% of the health centers. Certain deficiencies in the waste management practices of various categories of health workers were identified. It revealed that 35% peons, 20% Medical Officers, 10% nurse and 10% Laboratory Technicians did not know about the 'bio-hazards symbol' printed on bags[87].

The system for training has to be streamlined to ensure proper segregation of waste at source. To reduce the burden on the operator a system of in-house training facility and training of the trainers by the operator has to be established. Every major health care unit needs to have a dedicated official for training and monitoring of the staff. These in-house trainers can be provided regular training by the operators. Also a centralized training facility can be setup to avoid repeated training programmes at various health care units.

Monitoring of the health care facilities still remains a challenge for SMC. At present there is no mechanism for monitoring of the health care facilities. Gujarat State Pollution Control Board has strict norms for granting permission to new health care facilities. Monitoring of the existing facilities need to be strengthened to ensure success of the initiative. Though Gujarat State Pollution Control Board conducts surprise checks of the health care facilities, the frequency of such visits is not very high.

Even with the minimum charges of Rs.10/per kg of Bio Medical waste, there are incidents of selling of medical waste such as plastic bottles, glass apparatus etc or disposing the biomedical waste in the municipal waste container instead of handing over the waste to the treatment facility.

As these health care facilities operate within the urban local body limit, safe disposal of the waste generated by them is a liability for the urban local body. So SMC has started a monitoring mechanism to penalize the defaulters. Under Sec 176 of Bombay Provincial Municipal Corporation Act SMC has the power to penalize persons for damaging public property. Under this provision, whenever bio-medical waste is found in Municipal Solid Waste container, it collects INR 1000 as administrative charge from the defaulters. This

[87]Ashish Naik1, Bhautik Modi2, Bansal RK3; BIO-MEDICAL WASTE HANDLING PRACTICES IN URBAN HEALTH CENTRES OF SURAT MUNICIPAL CORPORATION; National Journal of Community Medicine Vol 3 Issue 1 Jan-March 2012

is a very nominal amount. Therefore officials from Surat SMC urged for the need for greater power to monitor these units and heavily penalize the defaulters.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

The recovery of the investment in given concession period depends mainly on the quantity of bio medical waste, otherwise it may not be possible for any operator to operate and maintain the plant. So factors like quantity of biomedical waste generated on daily basis and number and types of health care facilities present in the city are required to be studied before implementation of this kind of project.

Database of healthcare facilities operating in a city is essential for ensuring 100% collection and treatment of bio-medical waste. A systematic approach of registration of the health care facilities and empowering the urban local bodies to monitor and penalize the defaulters is essential for the success of the initiative.

Healthcare waste management should be supported through appropriate education, training and the commitment of the healthcare staff. Simple guide lines to manage proper biomedical waste is reduction in the production of waste, segregation of waste at origin and proper collection and storage of waste till its final disposal. The success of the initiative depends on the proper segregation of waste at source and handing over the waste to the operator. Therefore, the roles of health workers who directly handle the biomedical waste in the health care units become important in the proper management and safe disposal of biomedical waste.

Are/were there additional follow up phases or stages planned?

Though health is not an Urban Local Body subject, Urban Local Body is responsible for ensuring the safe disposal of biomedical wastes generated by the health care facilities operating within its limit to prevent the occurrence of health hazards due to mixing of bio-medical waste with municipal solid waste.

Thus to ensure effective monitoring of the system SMC is planning to devise a registration facility for the health care units present in the city. They are in the process of initiating a detailed inventory of the existing number and types of health care facilities. It is planning to make it mandatory for all the new health care facilities to register with it. With the database of the number of biomedical waste generators, monitoring of the amount of bio-medical waste generated and the entire system of treatment of the waste will become rationalized.

7.2. COMPOSTING OF MUNICIPAL SOLID WASTE, AHMEDABAD, GUJARAT

7.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

This practice is about Ahmedabad Municipal Corporation's initiative to set up a composting plant on PPP basis as a pioneering effort in Gujarat. The initiative has thrived due to Ahmedabad Municipal Corporation's, support and appropriate role sharing between the Urban Local Body and the private partner (EXCEL industries). It demonstrates that the ULB's support coupled with a strong leadership of the Municipal Commissioner is imperative for successful implementation of environmentally sustainable approach towards waste management systems.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

Management of municipal solid waste has been one of the most neglected areas of urban development in India. Municipal agencies spend about 5-25% of their budget on management of municipal solid waste which includes solid waste collection, transportation, treatment and disposal. Ironically, hardly any amount is spent on scientific disposal of waste[88]. Open dumping, open burning and landfill (dumpsite) fires, and open human and animal exposure to waste are common practices in Indian cities. Open burning of waste and landfill fires are a major source of air pollution in India's large cities[89]. The total waste quantity generated by the year 2047 is estimated to be about 260 million tons per year. It is estimated that if the waste is not disposed of in a more systematic manner, more than1,400 sq km of land, which is equivalent to the size of city of Delhi, would be required in the country by the year 2047 for its disposal[90].

Amidst these trends Ahmedabad Municipal Corporation's initiative to strive for a zero waste development, which was triggered by a small initiative to set up a composting plant on PPP basis, sets a positive approach for other cities to follow.

Who were the main actors involved?

The initiative was a PPP project by Ahmedabad Municipal Corporation with EXCEL Industries.

What is unique about the way that this practice addresses the challenge?

The urban Local body's proactive support to the private operator and strict monitoring at every level was instrumental for the private operator to thrive.

What is this practice?

Ahmedabad Municipal Corporation (AMC) entered into a fifteen year agreement with EXCEL Industries Limited in 1997 for setting up a composting plant for generating organic manure from municipal solid waste. Despite rigorous efforts of Ahmedabad Municipal Corporation, the plant has not been able to achieve economic viability. But it made AMC recognize the economic and ecological benefits of proper management of municipal solid waste. Building on the learning from this initiative, Ahmedabad is developing a road map for becoming a zero waste city.

[88] http://www.ebtc.eu/pdf/110926_REP_EBTC_Greentech_SolidWaste.pdf

[89] http://www.cleanindiajournal.com/indian_crisis_scenario_a_report/

[90] http://www.ebtc.eu

Why is this practice relevant to other cities in India?

ULBs in India spend a large share of the budget on solid waste management which is generally considered as a loss making sector. Other cities can follow the Ahmedabad Municipal Corporation's path for converting the solid waste management sector into a business opportunity.

7.2.2. Green Growth Good Practice

Why is this practice relevant to a Vison for Green Growth in the Solid Waste Management Sector for Indian cities?

Though the initiative is yet to achieve economic viability, it has channelized the thinking of Ahmedabad Municipal Corporation towards integrated solid waste management in the city through coordinated use of a strategically chosen set of waste management options for prevention and reduction of waste and its transportation, and in material and energy recovery from wastes towards achieving maximum resource efficiency. The initiative catalyzed the development of the city in the Green Growth trajectory.

Why is this practice a good demonstration of Green Growth principles?

The project is an example of generating business opportunity and employment by efficient management of municipal solid waste. Ahmedabad Municipal Corporation is recovering resources from waste by changing the policy focus for municipal solid waste management from waste dumping to the 3R (Reduce-Reuse-Recycle) approach.

What specific Green Growth benefits does this practice demonstrate?

The plant facilitated the compliance of the municipal Solid Waste (Management and Handling) Rules (2000) by Ahmedabad Municipal Corporation by best utilization of bio-degradable waste. The plant was also instrumental in highlighting the significance of the 3 Rs policy (reduce-reuse-recycle).

Ahmedabad Municipal Corporation started setting up a number of waste treatment plants. The details of the initiative are given in the table below.

WASTE TREATMENT PLANTS SETUP BY AHMEDABAD MUNICIPAL CORPORATION

Sr. No.	Type of Project (Compost/Waste to Energy/Integrated/ Decentralized)	Name of Agency	Size of Project (Tons/Day)	Mode	Term of Project
1	**Compost**	Excel Industries Ltd.	500	PPP mode (DBFO)	15 years from 1997
2	**Composting and RDF/Pellets & Fluff**	UPL Djai Power Ltd	250	PPP mode (DBFO)	25 Years from 2005
3	**Composting and RDF/Pellets & Fluff**	Creative Eco-Recycle Port Pvt. Ltd.	800	PPP mode (DBFO)	25 Years from 2009
4	**Composting and RDF/Pellets & Fluff**	Hanjer Biotech Energies Pvt. Ltd	500	PPP mode (DBFO)	30 Years from 2009
5	**Construction & Demolition Waste into Various Products**	Ahmedabad Enviro Projects Pvt. Ltd.	300	PPP mode (DBFO)	29 Years from 2013
6	**De-Centralized Model Compost Plant**	Innovative Eco-Care Pvt. Ltd.	1	PPP mode (DBOM)	5 Years from 2013
7	**De-Centralized Model Compost Plant**	Gujarat Consumer Industries	1	PPP mode (DBOM)	5 Years from 2013

Source: Ahmedabad Municipal Corporation

Apart from these city level projects Ahmedabad Municipal Corporation has also started decentralized composting facilities. In 2011 Ahmedabad Municipal Corporation has initiated a pilot project at Law Garden for generating organic manure from gardens, hotel kitchens and other green waste with the help of an organic waste convertor machine of the EXCEL Industries Ltd. and with project site management assisted by Gujarat Consumer Industries on PPP mode. This also has a registration facility for individual citizen to deposit their green waste and earn credit points. Organic manure to the tune of 30% of the green waste given will be returned back to the member, free of cost.

DETAILS OF EMPLOYMENT OPPORTUNITIES GENERATED BY THE PLANT	
Manager (Site In charge)	1
Clerical Staff	4
Technical Staff	6
Supervisor	3
Operators	12
Labors	18
Others	6
Total	50

Source: Surat Municipal Corporation

The AMC has also started a Wealth out of Waste Project (WoW) which aims at promoting segregation of solid dry recyclable waste at the source i.e. at the house hold Level. The segregated waste will be collected from the household level and the citizen will be paid for the segregated waste like Recyclable Paper, Plastic, Metal (Ferrous & Non Ferrous) and Glass (Non Hazardous to handle).

Ahmedabad Municipal Corporation's effort of converting waste to wealth by efficient collection, transportation and treatment of solid waste has not only created business and employment opportunity in the city; it has additionally created a source of revenue.

In the past seventeen years, it has received INR 1.7 Million as lease rent and INR 30,137,11 as royalty from EXCEL. The revenue generated from this initiative can be used by Ahmedabad Municipal Corporation to expand and improve their service in more sustainable directions. It has improved the public image of Ahmedabad Municipal Corporation as a cost conscious and efficient public service provider.

7.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Prior to the initiative, the municipal solid waste management practice followed by Ahmedabad Municipal Corporation involved collection and dumping of waste at Pirana Dump Site. Ahmedabad Municipal Corporation did not have any waste segregation and processing or treatment facility. With the increase in the amount of waste generated in the city and saturation of the dump site at Pirana combined with lack of space for creation of further dump sites, Ahmedabad Municipal Corporation was grappling with the issue of management of municipal solid waste in the city.

In 1997 AMC, in partnership with EXCEL Industries Limited set up a composting plant for generating organic manure from municipal solid waste. The benefits from the initiative made Ahmedabad Municipal Corporation realize the economic and ecological advantage of proper management of municipal solid waste. Building on the learning from this initiative it started several other city level and decentralized waste management initiatives (Composting, Waste to Energy and segregation at source etc.).

At Present, the city is developing a road map for "Zero Waste Ahmedabad – 2031"

How did this practice tie into specific city development objectives?

The practice triggered the development of the city towards the 'Zero Waste' path by following the 3R (Reduce-Reuse-Recycle) policy.

How did the main actor(s) make this happen?

In 1997, EXCEL Industries approached Ahmedabad Municipal Corporation (AMC) with the proposal of setting up of a composting plant as part of its Corporate Social Responsibility (CSR) activities.

With the enactment of Municipal Solid Waste (Management and Handling) Rules, 2000, it had become mandatory for the Urban Local Bodies to segregate waste and process the various types of waste as per the guidelines of the rule to minimize the disposal of waste at sanitary landfill sites.

AMC was also struggling with the waste at its landfill or dump site. At this juncture, a proposal was submitted by EXCEL Industries that aimed at microbial composting of bio-degradable municipal solid waste for generating organic manure and processing of maximum possible amount of bio-degradable waste without any financial burden on Ahmedabad Municipal Corporation.

The plant was going to help Ahmedabad Municipal Corporation in efficient use of the present dumping site by reduction in the quantity of waste going to the dump site and efficient use of available land by avoiding the creation of further dumping site(s). Recognizing the benefits of such a plant, Ahmedabad Municipal Corporation welcomed the proposal and in 1997, it entered into a 15 year contract with EXCEL Industries to set up a 500 TPD Composting plant on Design-Build-Finance-Operate (DBFO) basis.

Ahmedabad Municipal Corporation facilitated EXCEL industries by providing 10 ha of land with all infrastructure provision like road, water, electricity etc. for setting up of the plant at a token rent of Rs. 1 per Sq m per annum. It also facilitated the plant by ensuring the daily delivery of non-segregated municipal solid waste. For this, EXCEL had to pay Ahmedabad Municipal Corporation a royalty of 2.5% of ex-plant realization value of material produced by Excel excluding levy, cess and taxes, on sale of Bio Organic Soil Enricher and other products produced from municipal solid waste delivered by Ahmedabad Municipal Corporation.

The plant was commissioned in the year 2000 with a capital cost of INR 17 crore. As per the contract the entire investment for setting up and running the plant was to be done by EXCEL. The compost produced by the plant is called CELRICH: "Bio Organic Soil Enricher".

What were the main barriers? How did they overcome the barriers?

Despite Ahmedabad Municipal Corporation's support the plant is still struggling to achieve economic viability because of a number of reasons.

Firstly, segregation at source is the most essential requirement for getting the right quality and quantity of biodegradable waste that is the deciding factor for the value of organic manure generated. Since segregation at source still remains to be a challenge in Ahmedabad, the compost plant is faced with the additional burden of seeking tipping fee for segregation from Urban Local Bodies.

As the waste provided by Ahmedabad Municipal Corporation was mixed in nature, it had to be segregated at the EXCEL plant. EXCEL requested for a tipping fee of INR 220/ MT for segregation of the waste. As tipping fee was not part of the contract Ahmedabad Municipal Corporation declined to agree. The organic manure thus generated was of inferior quality because the biodegradable waste supplied by Ahmedabad Municipal Corporation to EXCEL was of mixed nature.

Operation of the plant was becoming nonviable for EXCEL. The plant has a capacity of producing 75 MT of compost per day by microbial composting of 400 TPD of municipal solid waste, but it was operating at one third of its capacity due to lack of good quality and quantity of bio-degradable waste and apprehensions were raised about its economic viability.

Cost Economics Of The Plant	
Operation And Maintenance (O&m)/Annum	**Rs 3 Cr**
Revenue Generated/Annum	**Rs 2.5 Cr**
Source: EXCEL Industries Ltd.	

The closure of the plant would have led to loss of INR 150/ MT of waste for AMC, as Ahmedabad Municipal Corporation would have to spend extra amount for transportation and disposal of the waste at the dumping site. Also this would have burdened the already saturated dumping site.

To overcome this barrier, Ahmedabad Municipal Corporation attempted to ensure the supply of good quality and quantity of biodegradable waste. It initiated door to door collection of household waste from residential areas during morning hours and separately delivered this waste to the plant. Additionally, AMC also ensured the transportation of waste from vegetable fish and meat markets, slaughter houses and green waste generated from around 200 gardens owned by them, to the plant by dedicated vehicles without mixing these with other non-biodegradable waste[91].

In 2008, Ahmedabad Municipal Corporation appointed two agencies – Sahara Public Health Organization and Abhishek Sanitation Mart through competitive bidding procedure for collection of bio-degradable waste from eating joints and public spaces. These agencies covered 1,613 such hotels, restaurants, canteen, street food markets, marriage halls, party lawns, malls etc. As per the contract, these agencies had to deposit the collected waste at sites designated by AMC. This waste was supplied to EXCEL. It also supported the plant by providing its dumper for transportation of the inert waste from the plant to the landfill site without any additional charges[92].

Despite all these efforts, the plant is running at only 50% of its capacity - producing 7000 tons of compost against the installed capacity of 15,000 MT of compost per month.

[91] http://www.indiaurbanportal.in/Bestpractices/Bestpractices94/Bestpractices94561.PDF

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One major barrier as mentioned by the officials is the dichotomy in the policy - on one hand, a lot of awareness is being raised about the benefits of consuming organic products. On the other hand, the subsidy on chemical fertilizers is substantive. National and State level policies promoting the market for organic manure is essential to ensure economic viability of compost plants.

The cost of production of one kg of organic manure is Rs 2.20, but EXCEL is selling it at a subsidized rate of Rs 1.80 per Kg. Not withstanding this, EXCEL is struggling to market the organic manure that faces strong competition from the highly subsidized chemical fertilizers. Moreover, the demand for organic manure is only for three to four months in a year. But EXCEL has to run the plant throughout the year, substantial space is therefore needed to store manure. Transportation of organic manure is also fairly expensive and addition of transportation cost will further increase the cost of the product.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

For the success of such initiatives, effective monitoring by the urban local body is essential to ensure segregation at source. Segregation at source is the prime requirement for getting the right quality and quantity of biodegradable waste and is, in turn, the deciding factor for the value of organic manure generated. Segregation at source remains to be a challenge for most Indian cities, compost plants are faced with additional burden of seeking tipping fee for segregation from ULBs.

The Urban Local Body's proactive support to the private operator and strict monitoring at every level was instrumental for enabling the private operator to carry on. The Success of the initiative highlights that by optimal role sharing between public and private sectors, PPP can be applied to many developing towns and cities for effective service delivery in the solid waste management sector by the local body.

National and State level policies promoting the market for organic manure is also essential to ensure economic viability of compost plants that face tough competition from highly subsidized fertilizers.

Are/were there additional follow up phases or stages planned?

Building on the learning from all these initiatives, Ahmedabad Municipal Corporation is developing a road map for "Zero Waste Ahmedabad – 2031" for which it has sought technical assistance from the United Nations Centre for Regional Development (UNCRD). Ahmedabad has become one of the first metropolitan cities from the developing world to adopt a zero waste goal. In view of this prospective technical support from UNCRD, AMC will move forward for increasing resource efficiency and reduction of waste, development and implementation of policies for resource efficiency and environmentally sound waste management

Transport

Volume 3

08

Transport

8.1. G-Auto: A Para Transit System, Ahmedabad, Gujarat

8.1.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?

The G-Auto project indicates that the Para-Transit/IPT (Intermediate Public Transport) sector can be revamped by organizing auto rickshaws into a branded and marketed fleet through greater operational accountability, leading to quality of service which is reliable and encourages people to use the Para-Transit/IPT system.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.

Auto rickshaws, or tuk-tuks, form a vital part of the mobility mix in many South Asian cities and especially in India. They serve key roles in providing last-mile connectivity, ensuring that people connect to public transport hubs and provide door-to-door transport services. Thus it ensures that ensuring people's mobility needs can be met without a reliance on private vehicles. The sharply increasing demand for urban mobility led to a doubling in production of these motorised three-wheelers between 2003 and 2010. However, negative perceptions abound of the auto rickshaw sector – with safety of vehicles, personal security and emissions are all key concerns[93].

Who were the main actors involved?

This initiative is a pioneering entrepreneurial effort by Nirmal Foundation - A Public Charitable trust registered under Bombay Trust Act 1956. It received full support from the then Chief Minister, Shri. Narendra Modi and Government of Gujarat.

Later on it was supported by some other patrons that included nationalized banks like State Bank of India, Bank of India, Bank of Baroda, UCO Bank etc. and private sector units like Adani group, BPCL, IOCL, LIC (India), Reliance (ADA Group). These patrons gave business in the form of advertizing for them.

What is unique about the way that this practice addresses the challenge?

The G-Auto system organizes rickshaws into a branded and marketed fleet, thus necessitating greater operational accountability, leading to quality and reliable service. G-Autos are driven by trained professionals and charge government-regulated fares on a meter basis. In addition, as part of the project, an on-call option is also being made available through mobile phones– one of the first times to be implemented in India.

What is this practice?

The City of Ahmedabad has a transport network that is heavily dependent on two-wheelers and auto rickshaws. To make the auto experience more enjoyable,

[93] *Scaling up Solutions for Sustainable Mobility, Shell Foundation, 2012*

the Nirmal Foundation initiated the 'G-Auto' rickshaw scheme in Ahmedabad. The G-Auto system organizes rickshaws into a branded and marketed fleet, thus necessitating greater operational accountability, leading to quality, reliable service. G-Autos are driven by trained professionals and charge passengers government-regulated fares on a meter basis. In addition, as part of the project, an on-call option is also being made available - one of the first times this has been implemented in India. Prospective passengers need to only dial a number to arrange convenient pickup by one of the city's G-Autos. Initially, 50 rickshaws were available to passenger's on-call, 24 hours a day, with up to 500 within a year. The system promises to be socially and economically sustainable as passengers are ensured fair, consistent fares, and auto drivers receive accident and health insurance, along with steady employment. Also, by incorporating IT such as online booking and online customer feedback forums, the revolutionary G-Auto scheme promises to improve India's IPT sector.

The idea of the G-Auto project was conceived and mentored by Mr. Nirmal Kumar, a management graduate from IIM-A and social entrepreneur by profession. It is a concept where in auto rickshaw drivers (Only driver-cum-owner) are organised under the social umbrella brand 'G-Auto' to offer safe and reliable metered auto rickshaw service to commuters. G-Auto also endeavors to solve the problems of RATS (Refusal, Accessibility, Transparency and Safety) for auto rickshaw users. On the other hand, its focus is also to provide security, prosperity and dignity (Suraksha, Samridhhi and Samman[94] called 3S of G-Auto) to auto rickshaw drivers and their family. The fare is charged as per government norms with additional nominal fee of Rs 15 as a facility charge. G-Auto has network of 15000 auto rickshaw drivers across Ahmedabad, Gandhinagar, Rajkot, Surat and Delhi[95].

G AUTO FLEET

[94] *(surakksha means safety, samriddhi means prosperity and samman means dignity)*

[95] *G-Auto, Nirmal Foundation, 2014*

[96] *Scaling up Solutions for Sustainable Mobility, Shell Foundation, 2012*

[97] *Organizing the Role of the Intermediate Public Transport Sector: Focus on Auto rickshaw services, 5th Urban Mobility India Conference & Expo 2012, by Taral Shukla & Asso.Prof. Manjiri Akalkotkar, CEPT University. (http://urbanmobilityindia.in/Upload/Conference/cd4e57d8-8a0b-4048-9b8b-acb5f441339e.pdf)*

Why is this practice relevant to other cities in India?

The nature of the auto rickshaw market in Indian cities, where the vast majority of vehicles are run by Individual owner-drivers making thin margins, means that neither the needs of the customers nor the drivers are best served. Economies of scale cannot be enjoyed and there is no effective mechanism to introduce widespread vehicle or service improvements. Drivers' income is typically unreliable and they have no source of social benefits, access to finance or opportunity to provide a more professional service[96]. This practice tries to deal with this aspect and not only attempts to make the markets of auto-rickshaws more reliable, it has also tried to deal with social issues like disciplining the auto-drivers by making them more accountable by linking behavioural (RATS - Refusal, Accessibility, Transparency and Safety) change with economic incentives (Suraksha, Samridhhi and Samman called 3S of G-Auto).

8.1.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Urban Transport Sector for Indian cities?

Urban mode of travel in Indian cities is a predominant composition of walking, cycling and public transport including IPT (Intermediate Public Transport) i.e taxis, auto rickshaws etc. This system of IPT in the form of Taxi/Auto-rickshaw Services is flexible, demand-based and provides door to door services to the user. The auto rickshaws are one of the major mode of public transport in India and yet fraught with lack of professionalism, unsafety, unreliability and poor social status of auto rickshaw drivers[97].

Why is this practice a good demonstration of Green Growth principles?

The concept is first of its kind to bring auto rickshaw drivers under one social umbrella brand and to give them social & financial security, prosperity and dignity. The concept gave a brand identity to the auto rickshaw community. They respect the brand and do everything possible to maintain its dignity. Brand loyalty of passengers gets them more business. People feel the difference in behavior of auto rickshaw drivers of G-Auto. Nirmal Foundation earns revenue from sponsorship and advertisement on G-Auto. They have offered the Public transport systems operators like the metro rail and BRTS to partner with organized fleet of auto rickshaw as a reliable feeder services.

What specific Green Growth benefits does this practice demonstrate?

G-Auto project organizes auto rickshaw drivers under a social umbrella brand to ensure social and financial inclusion of auto rickshaw drivers and their family, ensure safety and comfort to commuters, makes auto rickshaws a pleasant and passenger friendly transport system and make auto rickshaw drivers aware and responsible citizens.

8.1.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?

The nature of the auto rickshaw market in Indian cities, where the vast majority of vehicles are run by individual owner-drivers making thin margins, means that neither the needs of the customers nor the drivers are best served. Economies of scale cannot be enjoyed and there is no effective mechanism to introduce widespread vehicle or service improvements.

Drivers' income is typically unreliable and they have no source of social benefits, access to finance or opportunity to provide a more professional service. Customers are reliant on hailing a vehicle at the side of the road and negotiating a fair price with the driver if he is willing to take them to their desired destination. Reports of disagreements and assaults

[96] *Report of Working Group on Urban Transport, National Transport Development Policy Committee (NTDPC), Submitted to Ministry of Urban Development (MoUD), Government of India, 2012*

[97] *Organizing the Role of the Intermediate Public Transport Sector: Focus on Auto rickshaw services, 5th Urban Mobility India Conference & Expo 2012, by Taral Shukla & Manjiri Akalkotkar, CEPT University. (http://urbanmobilityindia.in/Upload/Conference/cd4e57d8-8a0b-4048-9b8b-acb5f441339e.pdf)*

are rife, while vehicles have no safety improvements and are often old and polluting[98].

G-Auto concept brings forth safety and comfort to passengers while providing income and job satisfaction to G-Pilots (i.e. auto drivers). The G-Pilots receive training to ensure safety and comfort of passengers. It offers on demand auto rickshaw service to passengers. This service is especially useful for senior citizens, differently able citizens, tourist and others needing door to door service. Passengers can call reservation facility round the clock and request the auto-rickshaw. Auto rickshaws have free newspaper and magazine available for passenger to read during travelling as well as local map with important destination.

Additionally the rickshaws have bill book, feedback book & public call facility for customers. The complaint and suggestion number is also prominently displayed. In summary, G-Auto programme meets its objectives of insuring safety, security and reliability in para-transit system; making the service passenger friendly; ensuring social and financial insurance of auto drivers.

How did this practice tie into specific city development objectives?

Urban travel mode in Indian cities is a predominant composition of walking, cycling and public transport including Intermediate Public Transport (IPT) i.e taxis, auto rickshaws etc. This system of IPT in form of Taxi/Auto-rickshaw Services is flexible, demand-based and provides door to door services to the user[99]. The auto rickshaws are one of the major mode of public transport in India and yet fraught with lack of professionalism, unsafe, unreliable and poor social status of auto rickshaw drivers.

ORIENTATION PROGRAMME FOR AUTO DRIVERS: G AUTO

[100] *Urban New Digest, April 2013*

[101] *Scaling up Solutions for Sustainable Mobility, Shell Foundation, 2012*

How did the main actor(s) make this happen?

The Founder and Managing Director of Nirmal Foundation, the organization which regulates G-Auto is Mr. Nirmal Kumar. The trigger behind G-Auto initiative was a bitter personal experience of Mr. Nirmal Kumar with an auto rickshaw driver who overcharged him and was rude, while Mr. Kumar was in his second year of MBA at the Indian Institute of management, Ahmedabad (IIM-A). He started this initiative by organizing 15 auto rickshaw drivers from the gate of IIM-A in 2008 that grew to 1000 within few months. He entered into a deal with the auto drivers who park outside the IIM campus and assured them free newspapers and health-cum personal insurance cover, for which he spent his own money. In return, they only had to give an undertaking that they would charge proper fares.

The idea clicked, and the next batch of funding came from some companies in Gujarat since the expenditure also accounted for their corporate social responsibility (CSR) activities. Finally, he wrote to the then chief minister of Gujarat, Mr. Narendra Modi for an appointment to discuss his future venture, and he actually got one. Fifteen minutes stretched into 50 minutes, and Modi agreed to inaugurate G Auto. "When I needed more funds, I contacted Gujarat Chief Minister Narendra Modi. He allotted funds and designated a senior bureaucrat to ensure we got the money," says Mr. Kumar. With funds, Kumar increased the facilities for drivers, and developed the brand 'G Auto'. The drivers got benefits like subsidised health care and education for their wards, besides the insurance[100].

The initiative was formally inaugurated by the then chief minister of Gujarat, Shri Narendra Modi in 2009 in Ahmedabad. As of today the project is operational in Delhi, Ahmedabad, Gandhinagar, Rajkot and Surat with strength of more than 15000 auto rickshaw drivers. The project has been recommended by Government of India to all the states of India to replicate it in their cities. It has been named the OOSO Model, where the first 'O' stands for Organise (Organize the auto rickshaw fleet to offer meter rickshaw service) and second 'O' stands for Operate (Operate the services at places like Airport, Railway Station, Bus Stand etc.). 'S' stands for Share (Share the revenue with the partners like AAI, IR, SRTC etc.) and the last 'O' stands for Optimize (include more number of rickshaw drivers into fold of organized fleet).

The G-Auto project has been documented as a good practice for urban transport by Institute of Urban Transport, India. G-Auto project has been selected for Smart Mobi Prize 2014 among top 15 social entrepreneurial ventures in sustainable transportation in world. The award has been created by the University of Michigan (USA) with the generous support of the Rockefeller Foundation. It has also received the first runner up prize of the prestigious Volvo Sustainable Mobility Awards 2014.

What were the main barriers? How did they overcome the barriers?

The disorganized nature of a sector dominated by individual owner-drivers means that services are not optimized and large numbers of kilometres that are driven by drivers searching for fares – deadheading, as it is known. An opportunity exists for the auto rickshaw sector to be upgraded, providing a safer, cleaner more convenient form of transport and enhancing its role in providing a vital intermediate transport service – connecting people to mass transit systems and giving them accessible, point-to-point mobility without the need for private cars.

Customers are reliant on hailing a vehicle at the side of the road and negotiating a fair price with the driver if he is willing to take them to their desired destination. Reports of disagreements and assaults are rife, while vehicles have no safety improvements and are often old and polluting[101].

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

Firstly, formal training needs to be imaparted to auto drivers in terms of driving skills as they are found to be rash drivers. Further, there should be a strong emphasis over a complaint authority to be set up. It is an accepted fact that owning an auto rickshaw is a costly affair, therefore majority of auto drivers are rented drivers. This is because they face difficulty in loan availability, couples with the requirement of too much documentation and higher interests charged by private loan lenders. Most drivers engage an agent to get a license. The main reason behind this is the lack of complete documents and a time consuming process. The lack of appropriate positioning of auto stands adds to their woes. Due to all these factors, auto drivers lack a feeling of economic and social security.

Are/were there additional follow up phases or stages planned?

The Nirmal Foundation is organizing auto rickshaws drivers under a social umbrella brand called 'G-Auto'. They already have group of 10,000 auto rickshaws in Ahmedabad, Gandhinagar, Surat and Vadodara. They have recent plans to replicate the concept across major cities of India. For all 'A' class cities of Gujarat, they propose to serve a target of at least 10, 00,000 members by 2020. There are plans to provide special stand for G-Auto in places like bus stands and railway stations and to provide feeder service for BRTS and metros and also to provide affordable meal for G-Pilots. (As they have named the auto drivers)

Although G-Auto is a young enterprise, they have shown impressive growth and continued expansion plans. The key to achieving this will be developing a financially viable model to support it. The Nirmal Foundation currently contributes grant funding to subsidise the model, but some city funding has been secured and value-added services such as advertising on rickshaws are being developed. Building a more business-based approach and organisational capacity to deliver at scale will give G-Auto the potential to significantly multiply its impact and to incorporate more sophisticated technologies into their services. The G-Auto model shows sizeable potential for replication by others in addition to the growth of their own operations.

HERITAGE SERVICE BY G AUTO

8.2. Bus Rapid Transit (BRT) System, Ahmedabad, Gujarat

8.2.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?
Strong political support at state and stable local level is imperative to foster a paradigm shift in urban transport policy and quick release of funds for implementing transport initiatives on priority basis that can foster green growth. Strong administrative support at state and local level is essential to give the officials autonomy to bring in innovations, independence to choose better quality over low cost options and new approaches of contracting and engaging the private sector.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.
In India, the pace of urbanization and the rapid growth of the urban economy has put the spotlight on urban sector. For urban areas to be able to support the required level of economic activity, they must provide for easy and sustainable flow of goods and people. However, such flow of goods and people has been facing severe problems of congestion, pollution and accidents coupled with lack of coordination amongst various agencies. Unless these problems are remedied, poor mobility can become a major hurdle to economic growth and cause deterioration in the quality of life[102].

Who were the main actors involved?
Ahmedabad Municipal Corporation (AMC) was the lead agency for planning and implementation of the initiative and CEPT University, Ahmedabad was the principal consultant for the initiative. The BRT system in Ahmedabad was named as "Janmarg – people's way." To implement the BRT project on priority basis a special purpose vehicle – Ahmedabad Janmarg Limited (AJL) was created under the Companies Act to manage the entire system and bring all the actors and organizations concerned with urban transport on one platform eg. police department, state urban development department, mayor, leader of opposition party, state transport authority etc. Municipal Commissioner is the chairman of AJL.

What is unique about the way that this practice addresses the challenge?
BRT in Ahmedabad followed a network based development approach instead of a corridor based development approach in which it tried to connect busy places but avoided busy routes.

What is this practice?
In 2005 Gujarat celebrated the "Year of Urban Development" during which various initiatives were undertaken to resolve the urban issues one of which was traffic management and improvement of public transport service. This coincided with the launching of the JnNURM and National Urban Transport Policy (NUTP) at the national level in 2006. The JnNURM and the NUTP had an important agenda of encouraging and supporting better public transport in the cities. Ahmedabad was among the first of the cities to grab this opportunity and submitted a Detailed Project Report under JnNURM.

The Gujarat Infrastructure Development Board (GIDB), AMC and Ahmedabad Urban development Authority (AUDA) jointly drafted a comprehensive urban mobility plan which included proposals for BRT. It was an important decision, as it also increased expectations of getting properly laid out roads, the creation of proper road space for pedestrians, cyclists and vendors, management of on-street parking and mainly the provision of an efficient and reliable bus system[103].

[102] *Anandkat V. and Bhatt. A. (2013), Bus Rapid Transit: Paradigm shift in urban transport system, Shelter, HUDCO-HSMI*

[103] *http://www.unep.org/transport/lowcarbon/Pdf's/BRT_Casestudies_India_fullreport.pdf*

CEPT University, Ahmedabad was assigned the work of preparing a detailed project report for BRT which AMC submitted for funding under JNnURM. The project got approval in the year 2006 and the work started in 2007. The sanctioned length of the project was 88.8 km and it was divided into two phases (58.3 km in first phase and 30.5 km in second phase). Under JNnURM, AMC received 50 per cent contribution for the project is from Central Government, another 30 per cent from the Government of Gujarat and the rest 20 per cent was AMC's own funding. The first corridor of length12.5 km from RTO to Chandranagar was opened to the public in October 2009[104].

Why is this practice relevant to other cities in India?

In the absence of any good quality and cost efficient public transport system, the urban transportation sector in Indian cities is generally dominated by private vehicle. Every city in the country is required to undertake corrective measures which aim at a high modal shift from private automobiles towards public transport. The need of the hour is to plan and integrate urban mass transportation systems to gain maximum benefits out of them. Given this scenario, BRT system adopted in Ahmedabad which is a high-quality customer-oriented public transport system that delivers fast, comfortable, and low-carbon urban mobility is a good alternative for other cities to study and adopt as per their local circumstances.

AHMEDABAD BRTS PROVIDES LEVEL BOARDING TO FACILITATE RIDERSHIP AND UNIVERSAL ACCESSIBILITY

8.2.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Urban Transport Sector for Indian cities?

Green growth requires creation of sustainable mobility options that minimise adverse ecological impacts of transport sector and enhances economic opportunities in the city. The BRT system in Ahmedabad which has not only provided the city an efficient, cost effective, safe and low carbon mobility option but also has resulted in generation of economic opprtunities in terms of escalation in land values, spurring of new developments, creation of job and business opprtunities in the transport sector in the city sets a postive altenative for other Indian cites to follow.

Why is this practice a good demonstration of Green Growth principles?

The practice shows that by restructuring the urban transport system that caters to the mobility needs of people rather than vehicles can lead to more sustainable urban development and enhanced economic growth. Development of such sustainable urban transport system though requires high initial investment, in the long term it will generate many socio-economic and ecological benefits for the city in terms of reduced congestion, lesser pollution, efficient use of fuel for transport sector and enhanced economic opportunities.

What specific Green Growth benefits does this practice demonstrate?

Ahmedabad is reaping benefits in the form of faster and safer commutes, reduction in air pollution and creation of an overall positive impact on urban development. The system is expected to carry over 700,000 passengers by the end of 2014. This would translate into vehicle mileage savings of one million km by 2014[105].

BRT has also led to modal shift from private vehicles to bus. During one of the surveys conducted by Centre for Excellence in Urban transport, CEPT University it was observed that 86% sample commuters owned private vehicles but still preferred to uses BRTS. The survey also identified that BRT has resulted in 27% shift from private vehicles (2 Wheelers & 4 Wheelers) and 17% shift from Intermediate Para Transit like autos and taxi services[106].

The entire network has been planned in a manner that ensures that almost all destinations are covered. Similarly, the widening of the BRT system with new roads and bridges has helped better connect the city, and spurring new development.[107] For example, part of the corridor passes through vacant former mill lands that now are being developed.

This includes new housing and shopping areas for the urban poor. The meticulous planning of the BRT network has resulted in enhancement of property values in the city. The study conducted by centre for Excellence in Urban Transport, CEPT University along six BRT corridors shows that a 50 to 105% hike in residential land price and 60 to 185% hike in commercial land price has been observed after the construction of BRT corridor[108].

The successfully running BRT system has created sustainable revenue generation opportunity for AJL. AJL is generating revenue from the sale of tickets in the bus, park and ride facilities and advertisements along the BRT corridors. AMC has enhanced the Floor Space Index (FSI) along the BRT corridor, to promote high intensity development along the BRT routes. The revenue generated from the sanctioning of additional FSI is transferred to "Urban Transport Fund" – a fund created to improve the transport sector in the city[109].

[104] http://www.unep.org/transport/lowcarbon/Pdf's/BRT_Casestudies_India_fullreport.pdf

[105] http://unfccc.int/secretariat/momentum_for_change/items/7098.php

[106] Swamy. S, (2014), Landuse and Economic Impacts of BRTS Ahmedabad, http://asialeds.org/sites/default/files/resource/file/2_Janmarg%20impacts%20-%20June%2024.pdf

BRT has also generated business opportunities for the private sector. The private sector has been involved in nine PPP Arrangements (Contracts) including Bus Procurement, Operations and Maintenance; Integrated Information System, Automatic Ticketing and Vehicle Tracking System; Supply & Service Contracts for Bus Station Sliding Doors, Turnstiles; House Keeping & Cleaning of Bus Stations; Management of Pay & Park facilities; Lease of Advertisement Rights; Development of Foot Over Bridges; Maintenance Contracts for Bus Stations (Civil Works), Lighting of Bus Stations & Corridor; and Monitoring and Maintenance of BRTS Corridor (Civil works), Signage etc.

The success of the BRT system has also led to an overall improvement in the service quality of the Ahmedabad Municipal Transport Service. All old diesel buses with obsolete technology have been replaced with Compressed Natural Gas buses. AMTS has added more than 900 new buses over the last four years. The routes for these buses are now being operated as feeder services for Janmarg[110].

8.2.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Prior to BRT, AMC was operating its own bus services under the name of Ahmedabad Municipal Transport Services (AMTS). Over the years the fleet size of AMTS was reduced due to resource crunch and operational inefficiencies. As a result significant loss in patronage was experienced by AMTS. While the ridership for buses declined, the share of ridership for autos and private vehicles considerably increased. This led to increased pollution levels and heavy traffic congestion in the city. To improve the public transport system and develop a low carbon mobility option AMC decided to implement BRT project in the city.

The BRT in Ahmedabad was designed as a strategic intervention, to attract latent transit demand, improve air quality and help the city remain compact. It has successfully built a city wide rapid transit network that is becoming increasingly popular amongst the people of the city. With the expansion of the BRTS, both ridership and revenue has grown impressively.

The BRT system has revolutionized the public transport system in the city by providing efficiency, affordability, safety and security. Presently the city has an 86 km long BRT corridor which operates 155 buses on 9 routes and has a ridership of approximately 0.16 million passengers per day[111].

How did this practice tie into specific city development objectives?
The BRT system has led to redesigning of the city structure and transport system towards greater accessibility, efficient mobility and low carbon future.

How did the main actor(s) make this happen?
Creating a successful BRT system was the result of strong leadership, in this case, demonstrated by the then chief Minister at the state level and the then Municipal Commissioner at the city level. The Chief Minister monitored the project himself and ensured that there is no political or bureaucratic interference. This expedited the decision making process and helped in implementing the project in a time bound manner.

It also involved adequate coordination among stakeholders, and good technical planning and careful implementation, achieved with the support from the Centre for Environmental Planning and Technology (CEPT). CEPT and AMC looked at other BRTS in cities around the world and adapted their best practices in the context of Ahmedabad[112]. It was decided to create a project on the lines of Bogotá's Transmilenio, with median bus

[107] http://unfccc.int/secretariat/momentum_for_change/items/7098.php

[108] Swamy. S, (2014), Land use and Economic Impacts of BRTS Ahmedabad, http://asialeds.org/sites/default/files/resource/file/2_Janmarg%20impacts%20-%20June%2024.pdf

[109] Ahmedabad Janmarg Limited

[110] http://unfccc.int/secretariat/momentum_for_change/items/7098.php

lanes and Non Motorized Transport (NMT) facilities along the BRT lanes[113].

Three major decisions were taken to ensure the sustainability of the BRT system in the city. The first decision was regarding creation of AJL which aimed at bringing in all actors concerned on one platform. This helped in synchronizing the efforts and harmonizing the concerns of all actors. The second decision was to make the Municipal Commissioner, head of AJL and the mayor a member of AJL. This decision was very much essential to synchronize the concerns of both administrative (Municipal commissioner) and political head (Mayor) in the city. The third decision was to give autonomy to AJL to manage the fare structure for BRT. Prior to BRT, the fixation of fare for buses was a state subject. Thus, through approval of the state legislative assembly amendment was made to assign autonomy to AJL to revise the fare for the BRT corridor. This was essential to ensure the economic viability and long term sustainability of the system[114].

The BRTS network was designed by following the ideology of connecting busy places but avoiding busy roads. The network was planned to connect all major commercial, industrial, institutional and public places while avoiding the congested and traffic prone routes. This ideology played a strong part in how the first route was selected for design and implementation by the AMC. The first BRT route in Ahmedabad did not create problems for private vehicle users because it returned back a similar amount of road space while providing a good service to regular bus users. This was a good public relations exercise for the new system[115].

The other major guiding principle was “Designing a Network and not a corridor”. In the very first proposal Janmarg aimed at creating a city-wide network, rather than delineating corridor by corridor. This approach also helped AMC to realise the project in the context of the city, rather than specific roads.

The other major guiding principle was “Designing a Network and not a corridor”. In the very first proposal Janmarg aimed at creating a city-wide network, rather than delineating corridor by corridor. This approach also helped AMC to realise the project in the context of the city, rather than specific roads.

The guiding principles for the selection of the network routes are the ability to reach a larger segment of people. Thus the BRT network was strategically planned to provide accessibility to the low and middle income group residential areas and areas inhabited by urban poor who constitute a major section of the ridership. The appeal of the system has reached previously under-served social groups. For example, the afternoon hours, which are the off-peak, have seen a rise in female travelers; almost 40 per cent of commuters in the afternoon are women[116]. Also considered was the routes’ ability to accommodate BRTS, integrate well within the existing infrastructure, contribute to ease the traffic problems in a significant way, provide opportunities for improvements in land use, be implemented quickly, inexpensively and provide potential for cost-recovery.

The Janmarg team was very pro-active about the branding of the project as the success of the system depended on its public acceptability and popularity. They have successfully forged a brand identity for the system. The system was also advertised well on all international forums. All details of system extension, and achieved landmarks in terms of daily fare collection and ridership are regularly reported in most local newspapers. A big factor in the success of BRT has been the positive role played by citizens. The Ahmedabad Municipal Corporation held regular press briefings on the planning and designing process, public exhibitions and presentations, responding to all suggestions and recommendations received from the public.

[111] *Ahmedabad Janmarg Limited*

[112] *http://unfccc.int/secretariat/momentum_for_change/items/7098.php*

[113] *http://www.unep.org/transport/lowcarbon/Pdf's/BRT_Casestudies_India_fullreport.pdf*

[114] *Ahmedabad Janmarg Limited*

[115] *http://www.unep.org/transport/lowcarbon/Pdf's/BRT_Casestudies_India_fullreport.pdf*

The success of the BRT system is due in part to the technological advancement of the new buses compared to the old AMT buses in Ahmedabad. Smart cards were introduced for reducing the cost of riding the bus for smart card holders and reducing the wait time to buy tickets at the bus stops. Janmarg's bus management system includes GPS units on each bus that constantly monitors the location and speed of the bus and transmits this information to a central command center. This allows the system performance to be evaluated in real time and passengers to receive accurate information such as the arrival time of the next bus. These are incentives for passengers to choose the BRT system, since the regular city buses currently do not use any of this technology.

What were the main barriers? How did they overcome the barriers?

AJL faced problems in procuring low floor buses that could operate in the BRT corridors. Thus they got the first bus custom designed as per their requirement by one of the local entrepreneur. This bus design has been adopted as the standard design for BRT corridor by Government of India.

AJL is also facing the challenge in procuring skilled drivers and other work forces for running the buses. AJL conducts training programme for the drivers and other supporting staffs. As the staffs leave frequently, AJL has to conduct frequent training to train the new staffs.

The end to end connectivity still remains to be challenge for the BRT corridor. To discourage people from using private vehicles and to increase the ridership of the BRT, AJL is planning to develop cycle sharing project on PPP basis to provide the end to end connectivity. It is also planning to auto stands and feeder bus services at major junctions to increase the accessibility to and from BRT corridors.

PASSENGERS ALIGHTING AT BRTS STATION

[116] http://unfccc.int/secretariat/momentum_for_change/items/7098.php

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

Since its inception, Janmarg has been a source of learning, and has been visited by representatives from various cities across India and some international cities, which are keen on implementing their own BRT systems. But the BRT system in Ahmedabad can't be considered as a singular 'successful' model of BRT. Each city will have to evolve and adopt the concept of BRT (prioritized bus corridor with adequate walking-cycling paths) in many different ways.

Cities need to follow an approach that doesn't treat BRT as an exclusive system rather integrates the existing systems with the new systems. Janmarg is doing this by rationalising the BRT and AMTS bus routes to avoid overlapping. It is also planning to integrate the BRT to the proposed rail-based transit system. This will ensure that the various transport options complement each other rather than compete with each other.

Are/were there additional follow up phases or stages planned?

Route rationalisation is being planned to integrate the BRT and AMT service to avoid overlapping of both services. Presently there is 26% overlapping of BRT AMTS routes. AMC is planning to reduce this overlapping to 2.6%[117].

Janmarg is now part a larger level regional plan for Ahmedabad, where transit corridors have been identified and the system is expected to have a much wider coverage. It will also be integrated with the proposed rail-based transit system[118].

[117] *Ahmedabad Janmarg Limited*

[118] *http://unfccc.int/secretariat/momentum_for_change/items/7098.php*

8.3. Traffic Transit & Management Centres by Bangalore Metropolitan Transport Corporation, Bangalore, Karnataka

8.3.1. Introduction – Brief description of practice

What is the main Green Growth message or lesson or 'take away' from this project?
Role and capacity of the local government is critical in redirecting financial resources towards more eco efficient transportation system. The formulation of Comprehensive Transport Plan for the city by BMTC with a vision to develop an efficient public transport system leads to the emergence of TTMCs - a pioneering concept in India. BMTC's capacity in articulating the vision and realising it through construction of TTMCs was critical in enhancing the ridership of public transport system.

What specific 'urban challenge' does this practice address? A challenge relevant to other Indian cities.
The modal share in transport sector in Indian cities is a glaring example of conflicting social and individual preferences. Current trend of private vehicle centric mobility preferences are generating many economic, social and ecological costs through chronic congestion, energy consumption, carbon emission, pollution, accident etc. Cities need to enhance the quality of public transport to compete with private vehicles in terms of connectivity, convenience and comfort.

Who were the main actors involved?
The initiative was implemented by Bangalore Metropolitan Transport Corporation (BMTC). It was funded under Jawaharlal Nehru National Urban Renewal Mission (JnNURM). M/s Infrastructure Development Enterprises of Karnataka (IDEK) was appointed as the Project consultant for the preparation of Detailed Project Report and project management services. M/s Civil Aid Techno Clinic Pvt. Ltd, a unit of Tar Steel Research Foundation of India (TRFI) was appointed as third party to inspect the construction work of the TTMCs.

What is unique about the way that this practice addresses the challenge?
The initiative has made public transport attractive by creating an integrated transport hub that allows seamless travel between different modes. The TTMCs are not only bus terminals but integrated facilities comprising of park and ride facilities to address first and last mile connectivity, passenger amenities, maintenance facilities for buses, commercial and office areas etc.

What is this practice?
BMTC formulated a "Vision Plan" under JnNURM with an outlay of INR 30,000 million spread over five years emphasizing development of urban transport infrastructure. The construction of Traffic Transit Management Centres (TTMCs) is part of this vision plan. TTMCs are focussed on enhancing efficiency of public transport through integration of different modes of travel.

Why is this practice relevant to other cities in India?
Lower investment in public transport in Indian cities has led to its decreased modal share and in return lower financial viability of public transport system in the cities. By constructing TTMCs, BMTC has increased the ridership of buses and created a sustainable source of revenue. This has led to the emergence of public transport system that is both ecologically and economically efficient. This sets a positive approach for other Indian cities to follow.

8.3.2. Green Growth Good Practice

Why is this practice relevant to a Vision for Green Growth in the Urban Transport Sector for Indian cities?

Green growth requires the development of ecologically efficient transport infrastructure that can contribute in enhancing economic opportunities in the city. The TTMCs with state of the art passenger amenities and park and ride facilities have been instrumental in increasing the ridership of buses and creating sustainable source of revenue while contributing to less congestion, less fuel consumption and lesser pollution. This approach of minimising the negative externalities of transport sector has manoeuvred the development of the city on the tracks of green growth.

Why is this practice a good demonstration of Green Growth principles?

Green growth requires development of high quality public transport system that can compete with the private vehicles in terms of connectivity, convenience and comfort so as to minimise the negative externalities of private vehicle centric transport system. BMTC's effort to reverse the trend of increased dependency on private vehicle and decreased ridership of public transport by providing good quality public transport services sets a positive approach for creating transport infrastructure that can trigger the development of the city in the tracks of green growth.

What specific Green Growth benefits does this practice demonstrate?

As per BMTC officials the initiative has increased the ridership of BMTC by providing park and ride facilities that has efficiently addressed the first and last mile connectivity concerns. By promoting public transport the initiative has been instrumental in saving fuel and reducing pollution. But exact figures for these parameters attributable to the TTMCs are unavailable.

VIEW OF YASHWANTAPURA BUS STAND, BAGALORE

The TTMCs have eased traffic movement in and around their location by diverting the BMTC Bus stops which were earlier located along the roads to pathways inside the TTMC complex. TTMCs have reduced congestion or disturbance to traffic along the main road by ensuring smooth flow of all types of traffic to and from the complex. The regularised bus movement inside the complex and separate vehicular and pedestrian movement has enormously enhanced the passenger safety and reduced accident risks.

The allocation of commercial and office spaces, renting of hoardings and advertisement spaces on TTMC's rental or lease basis have created a sustainable source of revenue for BMTC.

8.3.3. Good Practice Narrative Details

What was the current state in the city before the practice, and what was the state afterwards?
Prior to the construction of TTMCs there was no provision for integration of various transportation modes in the city. Due to lack of first and last mile connectivity, people preferred to travel by their own vehicle. The initiative was undertaken to mobilize people to shift to public transport system by providing a convenient, comfortable and safe transit option. TTMCs which are designed with park and ride facilities and state of the art passenger amenities have successfully increased the ridership of buses in the city.

How did this practice tie into specific city development objectives?
The initiative was part of the Comprehensive Transport Policy for the City under which BMTC identified priority areas of intervention for transport sector and formulated a Vision for improving public transport in the city. The initiative was part of this vision.

How did the main actor(s) make this happen?
BMTC identified ten prime locations for construction of pilot TTMCs - Jayanagar, Shanthinagar, Vijayanagar, Yashawanthapur, Koramangala, ITPL, Bannerghatta, Domlur, Kengeria and Banashankari. An outlay of INR 479 crores was sanctioned under JnNURM for these TTMCs. These were funded with the Government of India grant (35 per cent), Government of Karnataka grant (15 per cent) and BMTC contribution of 50 per cent of the project cost. All the TTMCs were made operational by December 2011. These buildings are state of the art passenger amenities centres that have the following facilities:

FACILITIES AVAILABLE AT TTMCS	
Passenger Amenities	Bangalore One centers, Information Centre, Reservation counter, Waiting lounge, Drinking water facilities, Public Toilets, ATMs, Shopping facilities, Eateries, etc.
Park and Ride Facilities	Multi level parking, Car lift etc.
Bus Terminal	Bus bays, Platforms, Seating & lighting, Public conveniences, Information systems, Safety and security.
Bus Maintenance Depot	Maintenance bays, Washing platform, Bus parking, Services and Utilities, Fuel filling station, Amenities for crew.
Space on Rent or lease	Office and Commercial Areas

Source: BMTC

BUS STAND, BANGALORE

What were the main barriers? How did they overcome the barriers?

With the end of JnNURM BMTC is facing financial constraints for constructing the new TTMCs in the city. To overcome this challenge BMTC is planning to take-up the construction of TTMCs on PPP basis. The private partner will construct the TTMCs as per BMTC proposal and recover the cost from the revenue generated by the various commercial activities proposed in the TTMC complex.

What are the main considerations for other cities? (Governance, Financing, Planning, Decision making, Legal, Infrastructure, etc)

Cities need to develop an integrated framework to develop an efficient transport system. BMTC did this by formulating the Vision Plan for transport sector in the city under which it identified certain priority areas of intervention and prepared action plan for improving the public transport system accordingly.

Cities need to effectively address the first and last mile connectivity issues to promote public transport. The park and ride facilities provided in the TTMCs are one the major reason for enhanced bus ridership.

Are/were there additional follow up phases or stages planned?

BMTC is planning to introduce Intelligent Transport system by utilizing GPS to provide real time information on arrival of buses at the TTMCs. It is also planning to construct 35 more TTMCs in the city. In the future some of these TTMCs are also planned to act as multimodal transport hub for the proposed rail based transit facility in the city.

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