SWACHH SURVEKSHAN 2019

Ministry of Housing and Urban Affairs
Government of India

150 YEARS OF CELEBRATING THE MAHATMA

स्वच्छ भारत
एक कदम स्वच्छता की ओर

2019 Innovations &Best Practices

TABLE OF CONTENTS

SECTION 1: INTRODUCTION 1

SECTION 2: ULB LED INNOVATIONS 4

SECTION 3: CITIZEN LED INNOVATIONS 26

SECTION 4: INITIATIVES BY CIVIL SOCIETY AND CORPORATES 31

Introduction

Innovation and best practices in context of waste management

Waste management essentially involves activities associated with generation, storage, collection, transfer and transport, processing and disposal of wastes in a manner which is environmentally compatible, adopting principles of economy, aesthetics, energy efficiency and conservation. India need to leapfrog its learning curve in the area of waste management by translating science into technology, knowledge into implementation and focus on mitigating negative impacts or adapting to unavoidable negative impacts. For this to happen, best practices should have public participation so that the time lag between research and innovations and its scaling up into projects for public welfare is reduced. "Soft" components of a project are as important as "hardware" component. Therefore, focus of monitoring waste infrastructure should not be in numbers alone but also in terms of outcome. For example, monitoring health productivity of sanitation scheme compared to merely monitoring number of toilets constructed. There is a need to document lessons from past actions to develop the right interface between policy and practice. Capacity building at various levels including Municipal Councils is an important activity in this endeavour.

In India, no significant initiatives are seen for strategies to reduce waste generation. Traditionally India had low per capita waste generation rate compared to developed and many developing countries, however, with changing lifestyle, this may not be the case. *Public awareness* for 'reducing or refusing' to generate waste and storing of waste in a manner to allow downstream interventions is a good practice in this context. Innovations in the area of 'sustainable production and consumption' is required in a big way. Behavioural changes among citizens would promote reduction in waste or source segregation and utilization within the household, for instance, through innovative engagement with ULBs.

Scientific literature has established that energy use and emissions are involved in waste transportation. Decentralised management of waste and concept of zero campuses is also a good practice to be followed and replicated for low carbon and low energy-based management of waste.

Waste management measures should include strategies for urban mining and a shift from primary to secondary resource use (re-use and recycling). Impact of such strategies will be that on one side urban mining and re-use/recycling strategies will reduce energy requirements and emissions for material production. For example, aluminium production from scrap requires about 20 times less energy than from bauxite ore. But on the other side recycling of materials from end-of-life products will face significant quality challenges as the share of old scrap rises, may create quantitative limits to recycling. This is because current recycling strategies are largely based on downgrading (e.g., accumulation of alloying elements due to incomplete separation of scrap types, which limits the range of applications) and dilution (mixing of scrap with more clean primary metals). New technologies and strategies are required for closing the loops based on old scrap.

Later half of previous century has focused on taking away of waste from habitat area and land dumping/SLF on the outskirts of the city. A shift towards adequate mix of technological options for waste processing is best for sustainable cities. About 50% of the waste is biodegradable. Hence, bio-methanation and use of bioenergy is good option followed by composting and use of manure for agriculture. Recovery of plant nutrients such as Nitrogen and Phosphorus will close the nutrient cycle retaining these scarce resources for longer duration on land. Resource and energy recovery will make these technologies fiscally sustainable.

There are not enough evidences of the negative impact of septic tanks and soak pits and therefore they continue to enjoy main stay in public policies specially in the context of decentralised lavatories. Huge target, PPP and CSR funding resulted in the focus on "low hanging fruits" completely ignoring the high hanging fruits which could be dangerous for long term sustainability. For example, the word sanitation itself is liberally interpreted as construction of toilets, completely ignoring the whole cycle of water and sludge management. Decentralised treatment systems like soak pits and septic tanks shift the problem of pollution from surface to below grounds that can have long-term irreparable damage. Initiatives that

blends sanitation practices in the context of cultural and social traditions is important to achieve objectives of cleaner India.

Indicators 7.1 and 7.2 in Swachh Survekshan 2019 measure initiatives led by ULBs and citizens respectively for innovation and best practices in the field of waste management. Innovation is defined based on the interpretation of newness of the service and the value it creates not just for the developer (in this case ULBs), but also the customers (in this case the citizens)[1]. The European Union defines innovation as "*the successful production, assimilation and exploitation of novelty in the economic and social spheres*".[2] For the purpose of this report, best practices are those initiatives where the ULB or citizens have taken a lead in scaling up projects thus reducing the learning curve for others to emulate or have significant impact in terms of health outcome.

City-level Innovations and Best Practices

ULBs and citizens across the country have undertaken various initiatives supporting Swachh Bharat Mission, which focus on innovative ways of community engagement to bring behavior changes as well as technological interventions to strengthen existing waste management practices. We have endeavoured to showcase but a few of these shining examples in this report.

ULBs and citizens across the country undertook various initiatives supporting Swachh Bharat Mission, which focus on innovative ways of community engagement to bring behaviour changes as well as technological interventions to strengthen existing waste management practices. Some of these initiatives have ben highlighted in this report.

Management of solid waste, including waste to energy

A review of the evidence submitted by ULBs reveal a clear trend towards source segregation of organic waste at household or at community level providing opportunities for converting waste to energy, and also for cooking fuel at home through biogas generation and processing biogas as transportation fuel. Benefits through

monitoring the performance at a central level.

composting and minimizing dependence on chemical fertilizers are utilized across the country and community composting projects or home composting is widely practiced. Source segregation of waste and its decentralized management at city level can reduce the pressure on ULBs to manage the same. Inorganic wastes have been segregated and recycled across the country. For instance, innovative use of waste plastic for pavement blocks, or construction of walls reduces plastic waste reaching landfill or dump sites.

Management of liquid waste, including faecal sludge management

Faecal sludge management continues to remain one of the biggest challenges among the ULBs and a robust faecal sludge management is yet to be seen. While prompt desludging and removal of overflowing waste through tankers are practiced by many ULBs, few ULBs are also in advanced stages of construction of faecal sludge treatment plant.

Site remediation

Several ULBs have provided beautifully transformed areas to their citizens, which existed as big garbage dumping yards or Garbage Vulnerable Points (GVP). These points have been converted into parks or play areas for senior citizens and children. With community engagement, its upkeep and maintenance are joint responsibility of ULB and citizens. Scientific bio-remediation of landfill sites are also been taken up. These initiatives have helped transform an unscientifically managed dumping yard into open areas for common use by the citizens.

Employee motivation and compliance

The assessment revealed that several ULBs have taken the help of local self-help groups (SHGs) to encourage source segregation and other good practices in waste management among citizens. In addition, monitoring of door-to-door collection of waste through radio frequency identification (RFID) based garbage collection systems and mobile app enabled online attendance and movement through GPS-driven tracking have been can be helpful in enhancing employee motivation as well as

Some initiatives have been taken at individual household level in the community, for instance, maintaining gardens

[1] Witell, L., Snyder, H., Gustafsson, A., Fombelle, P., & Kristensson, P. (2016). Defining service innovation: A review and synthesis. Journal of Business Research, 69(8), 2863–2872. https://doi.org/10.1016/j.jbusres.2015.12.055

[2] EU (1995), "Green paper on innovation. December 1995", European Commission, available at: http://europa.eu/documents/comm/green_papers/pdf/com95_688_en.pdf (accessed January 17, 2019)

Community engagement in awareness programs

Solid waste generation at city level is influenced by the lifestyle of its citizens. Bringing a change in the behavior of citizens, whether it is for avoiding open defecation, avoid use of plastics, segregation of waste, is an important effort. Almost every participating ULB had submitted documents to confirm the awareness rallies conducted by them for promoting change towards better waste management. Door to door collection is being carried out by ULBs, they have also distributed two bins for segregating the waste at source. Innovative programs like rewarding a house where segregated waste is collected through coupons are also found effective for behavioral change among citizens. ULBs have also engaged schools and students in these awareness programs given the fact that these students can be the catalyst for change for the entire family in the city.

Citizen-led Innovations and Best Practices

Many citizen-led innovation and best practices are related to awareness rallies and demonstrations for ban of plastics, door-to-door waste collection, composting and other recognized better waste management practices. actful way. These initiatives were mostly conceptualized at school level. Involvement of students in these awareness programs can have a cascading effect on the entire family that could be transformed towards lifestyle that manages its waste better or use of toilets to avoid open defecation.

Apart from these awareness programs, it was also found that some RWAs have transformed their residential colonies into zero waste societies, thus becoming a role model for neighbouring residential colonies. Zero waste has been achieved through composting or biogas generation of organic waste at the community level and use of segregated non-renewable waste in a manner conducive for waste management facilities at city level.

Another common initiative undertaken in many cities was the transformation of Garbage Vulnerable Points (GVPs) collectively by citizens to beautiful parks and gardens or other facilities for community use, such as play area for children.

using compost from their own kitchen waste or use of waste plastic bottles for plantation purposes, thus promoting minimum waste generation from respective individuals. It was also observed that some initiatives were taken at a sector level, for instance, poultry waste from restaurants are being sent to pig farming industry or fish ponds as feed. Similarly, several groups have also helped in converting the floral waste from religious institutions into incense or compost, which could be sold in the market to make these financially sustainable. Such innovations and best practices have proved to be useful at city level for decentralized management of waste.

Along with ULB, involvement of corporates using their CSR funds to convert waste to energy have also been highlighted.

Finally, it must be stated that within the confines of a single report, it was never going to be possible to do justivce to all the innovations being undertaken across the country by ULBs, citizens and civil society alike. This document is merely an attempt to showcase the fact that people from all walks of life and from all corners of the country, in their individual and collective capacity, have come forth and answered the clarian call made by the Honourable Prime Minister from the ramparts of Red Fort in 2014, for realising the dream of a Swachh India.

ULB-LED INITIATIVES

AMBIKAPUR

Bali Vashiya

After the implementation of Mission Clean City in Ambikapur, the ULB decided to take its solid waste management activities to one step further by enhancing the quality of compost prepared through bio-degradable waste and promote home composting to yield better results and increase the sale of compost.

The concept of Bali Vaishya has its roots from ancient India with a basic ideology of giving back to nature, i.e. the bio-degradable waste which we generate from natural resources should be given back to nature by means of composting. The need to take a fresh look at composting was as follows:

- The quality of compost prepared was not of exceptional quality also the smell which was coming out from the process was causing great hindrance.
- Due to the space constraints in traditional methods home composting was not a success
- The time required to prepare compost was on the higher side.

As the ULB was striving to find a solution to above mentioned problems, it was realized that going for bio-methanation is not financially viable, nor does it fulfil the requirement of home composting. They also found that most bio-cultures were either too costly or have to be imported from other places. Hence the need to develop a local bio-culture arose.

Bali Vashiya is nothing but a short form of *havan*

A home composting campaign

To give back to nature

The main strategy behind Bali Vaishya was to develop an in-house bio-culture which gives best quality of compost and also is financially viable so that it can be used to promote home composting by developing a mechanism which can be easily done by a normal citizen in its own kitchen. With the help of Bio-tech lab training and Demonstration Centre, strategically it was decided to use only waste products to develop this culture.

The raw material used to prepare this bio culture is wood dust and cow dung, both are waste items. The ease it provides to local citizens to practice home composting in their own premises due to almost no requirement of space and secondly a very simple methodology to adopt. At expense of just 25-30 rupees it generates compost of approximately 12-15 kg worth 50 rupees. (Input waste 30 Kgs) hence it is financially very sustainable.

The time taken by this bio culture to convert wet waste to compost is only 21 days which is much less than the traditional concept. By this method, Ambikapur has been able to reduce its wet waste collected to almost 5-7% due to home composting. Further, the container provided for home composting (made of recycled plastic waste granules at SLRM centre) is at present one of the cheapest but best quality 30 Kg containers and at Rs.345, is far cheaper than the 8 kg containers available in the market for Rs.1000. The compost tea generated form this method of composting is one product which is highly beneficial as it has high nutritional value.

Within a short time the number of Household practicing home composting have increased drastically after implementation of this campaign. Solid waste management which seen as cost incurring work of ULB is now turned into revenue generating work for the ULB. The Bio-culture has already applied for patent.

DELHI

Waste to Wonder

With aid from South Delhi Municipal Corporation (SDMC), the capital's waste has been turned into a unique state of the art recreation spot- a **Waste to Art Park**, in New Delhi. Created from waste materials like old benches, typewriters, and scrap metal retrieved from Delhi's landfills, seven artists have worked for five months to create replicas of some world's famous monuments in the 'Waste to Wonder' Park.

An amount of **110 tonne** of waste was taken up from MCD yards and stores all over the capital to recreate these monuments. It took Rs. 5 crore to construct this park, with Rs. 1.16 crore only for the Taj Mahal Replica.

This park is located at Rajiv Gandhi Smriti Van occupying an area of 6 acres. It has replicas of all the Seven Wonders-of-the World the Taj Mahal, The Eiffel Tower, The Leaning Tower of Pisa, The Great Pyramid of Giza, Rome's Colosseum, Christ the Redeemer of Rio de Janeiro and The Statue of Liberty. Since the clones are made from scrap metal, anti-rust enamel is being applied on them. To give out details of monuments, there will be stone plinths with every replica, providing information about both – original and duplicate of the wonder.

The construction of each are unique in themselves. For instance, the 35 feet tall replica of the Statue of Liberty has been created using seven to eight tonnes of waste. While the pedestal has been created using old pipes, metal railings and angles, giving the look of bricks, circular rings on it have been created using car rims. In her left hand, Roman liberty goddess holds a tablet carved from a MCD bench and metal sheets and

…7 wonders pave the way for recycling

metal sheets and in the right hand, she holds a torch fabricated from old bike and its chain. Lastly, her hair has been made using cycle chains.

35 feet tall replica of the Statue Of Liberty has been created using seven to eight tonnes of waste by 31-year-old Zakir, a Delhi based artist. While the pedestal has been created using old pipes, metal railings and angles, giving the look of bricks, circular rings on it have been created using car rims. In her left hand, Roman liberty goddess holds a tablet carved from a MCD bench and metal sheets and in the right hand, she holds a torch fabricated from old bike and its chain. Lastly, her hair has been made using cycle chains.

Similarly, the replica of the Taj Mahal, a symbol of love, was created in five and a half months with the help of 24 labourers and 30 tonnes of waste. The beautiful metal structure has been crafted using 1600 cycle rings, electric pole pipes, old pans, park benches, swings, angles, truck springs and sheets. While domes have been created using 2" pipes (cut into pieces), truck sheets have been used to create intricate design and window and door frame has been made using benches.

Delhi, one of the world's oldest and largest cities, seeped in history, home to some of the world's best monuments, is today grappling with many modern day problems of massive population, chaotic traffic, life threatening pollution and mounting garbage. In this context, this new landmark in our nation's capital is expected to be a strong statement in favour of recycling and Swacchta.

INDORE

Waste to Wealth Generation

Ahilya bai Holkar Fruit and Vegetable Mandi (Choithram Mandi) is largest Fruit & Vegetable Mandi of Madhya Pradesh and generates around 20 TPD organic wastes. IMC used to incur a cost of around 3 crore per annum in transferring the waste generated at Choithram Mandi to the centralized organic waste processing plant at Devguradia. It was projected that this transportation cost itself would increase up to Rs. 7.2 crore per year in next 5 years. Therefore, to reduce the transportation cost and processing cost IMC developed an ultra-modern bio-methanation processing plant to generate Bio-CNG and Compost on VGF Model in partnership with Mahindra Waste to Energy Solutions Ltd. on a PPP model. The plant utilizes 20 MT per day of fruit and vegetable waste generated from the mandi and converts it into Bio-CNG, compost and electricity from Bio-CNG for captive purpose. For the first time in the country, indigenous biogas cleaning and separation unit was established to purify methane up to a purity level of 95%. Purified methane is compressed at 210 bar pressure and filled into cylinders and about 1000 kgs of Bio-CNG is generated daily and dispensed in city buses.

ISCDL signed an agreement with Indore Public Transport System Company (AICTSL) and as per the provisions of this agreement, the company produces Bio-CNG and supplies it at a subsidized rate of Rs. 53/kg as against the market rates of Rs. 63/Kg. This project is a uniquely successful PPP model helped IMC to reduce transportation cost of Municipal Solid Waste and generates green fuel used in public transportation which leads to reduction in carbon foot-print. This plant has operational since last one year.

...Integration of waste management to public transport

After the success of this plant IMC decided to establish a more decentralized plant. Thereafter IMC has installed 15 TPD Capacity Bio-methanation Plant on EPC Model at Kabitkhedi for processing of wet waste to generate clean energy to use in public transport and has started establishment of 50 TPD Capacity Bio-methanation plant on public-private partnership model. This will lead to running of all 100 CNG Buses of public transport through Bio- CNG generated from MSW by December 2019.

IMC adopted State of the Art technology Reverse Vending Machines for in-situ conversion of plastic bottles to flakes. The machine can crush 90-120 bottles per hour. It can handle bottles up to the size of 2000 ml. It can store flakes up to 10 or 500 bottles of different sizes. The machine has been installed at 10 different public places across the city. This innovative idea was adopted to reduce plastic bottle waste at public places and also reduce transportation cost of bottles, if they are collected and transported to recycling units.

To encourage the use of public transportation and to create awareness among citizens on disposal of plastic bottles through Reverse Vending Machines, a unique concept of incentivisation was included under this intervention. The users can get an incentive of Rs. 5/- per bottle as cash back through PayTM or Rs. 5/- discount coupon to be used in public transport buses both within city and inter-city. To further promote the usage of plastic vending machines, IMC has planned to introduce SWACHH CARD, which is linked to about 1500 shops of Indore, where the user can redeem the obtained points to get the benefit.

KORBA

Plastic to Paver blocks

Korba city is located in the state of Chhattisgarh India. A population of over 3.6 lakhs generates a total of 145.5 MT of waste, out of which 51.0 MT is dry waste and 94.50 MT is wet waste & inert materials. The wet waste is converted into compost and dry waste is further segregated and sold, but due to unavailability of recyclers which can recycle polythene having thickness less than 50 micron, disposal or recycling of this plastic waste became a huge problem for Korba Municipal Corporation.

After proper research on properties of plastic, it was decided to construct interlock paver block with the fixed mix proportion of C&D using this plastics which had no resale value. This idea was further strengthened due to two factors, firstly an indigenously built melting machine which costed only Rs.40,000, and secondly, the fact that high demand of paver blocks in construction activities.

The complete capital cost in setting up a unit to make this paver blocks is as low as INR 54,000, which includes melting machine, compactor, mould and some miscellaneous cost. The cost of using paver blocks for construction works out to be Rs.530/m^2. Quality and specification of this paver block is similar to a concrete paver tiles and conform to IS-15658: 2006. Most importantly, the process is very simple and has the potential to be taken up by many SHGs in the state and beyond as a sustainable income earning source.

LUCKNOW

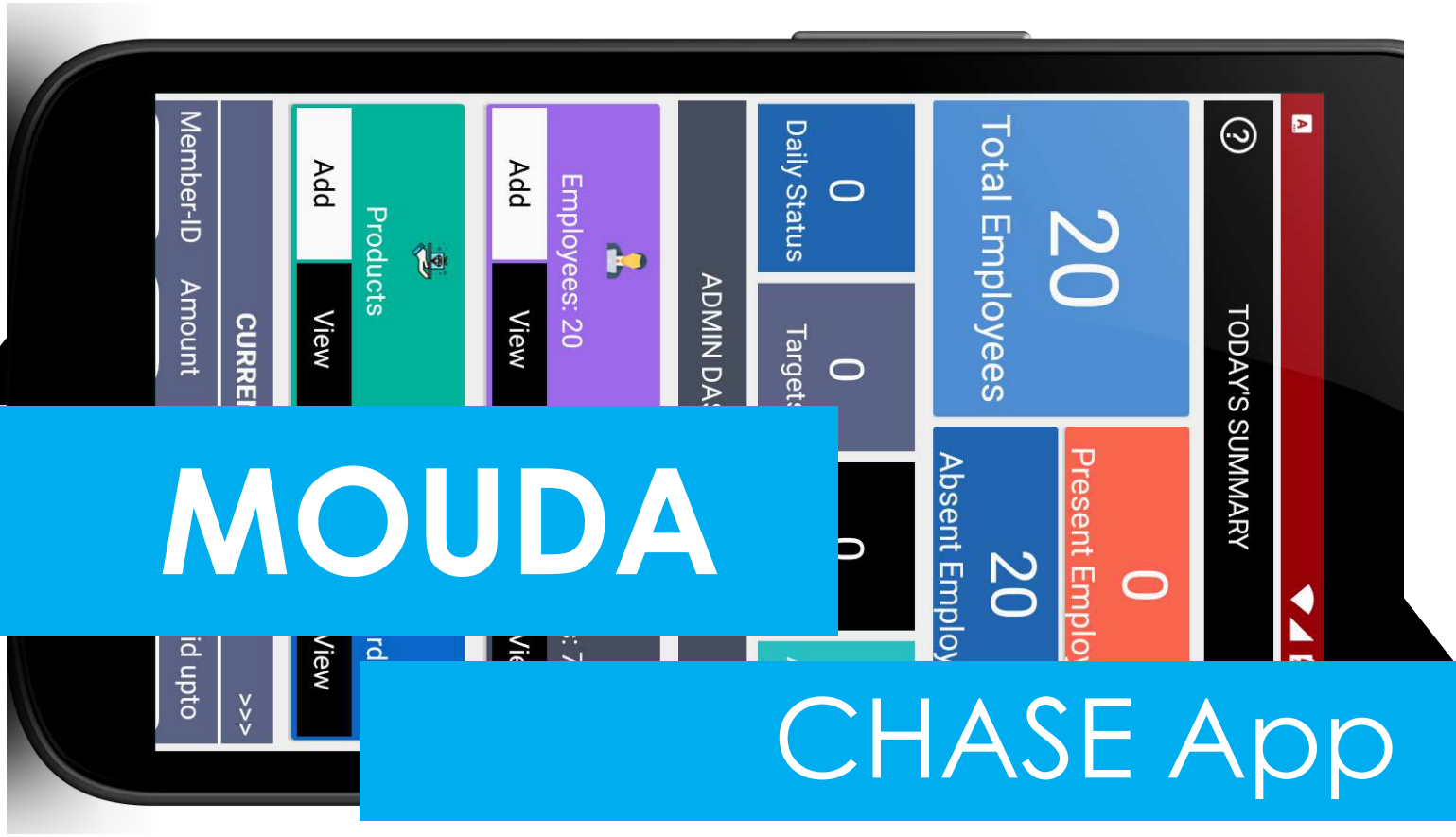
People living in kuccha houses of Lucknow's slum area of Nirala Nagar have been part of the initiative of Municipal Corporation of Lucknow. The initiative explored the use of floral waste into incense sticks and composting. Approximately 100 households in the slum area were introduced to this unique opportunity of making a living. Along with Mango Foundation, the project utilized the opportunity of diverting floral waste from the religious institutions, which was earlier polluting the river in the region.

The project has converted over 150 Kgs of floral waste into 1.2 lakh incense sticks. Packaged as 'Happiness Incense Stick', the aim is to economically empower women of the community. The Incense sticks promises to be 100% natural, toxic chemicals free and lasts for over 50 minutes each.

INCENSE OF WASTE

Livelihood option for marginalised women

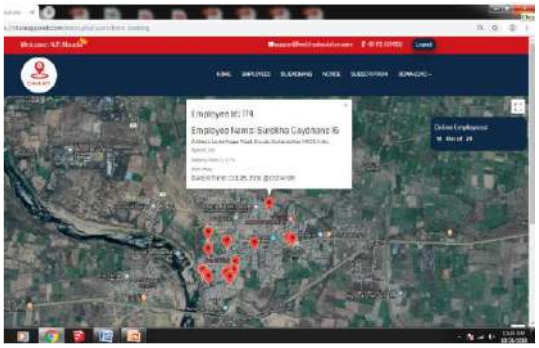
With the engagement of women in the initiative, it showcases the scope for empowering women and improving their employability skills. These can be easily replicated and scaled up in other cities where religious institutions could be an active player in ensuring better management of waste generated at their level.



MOUDA

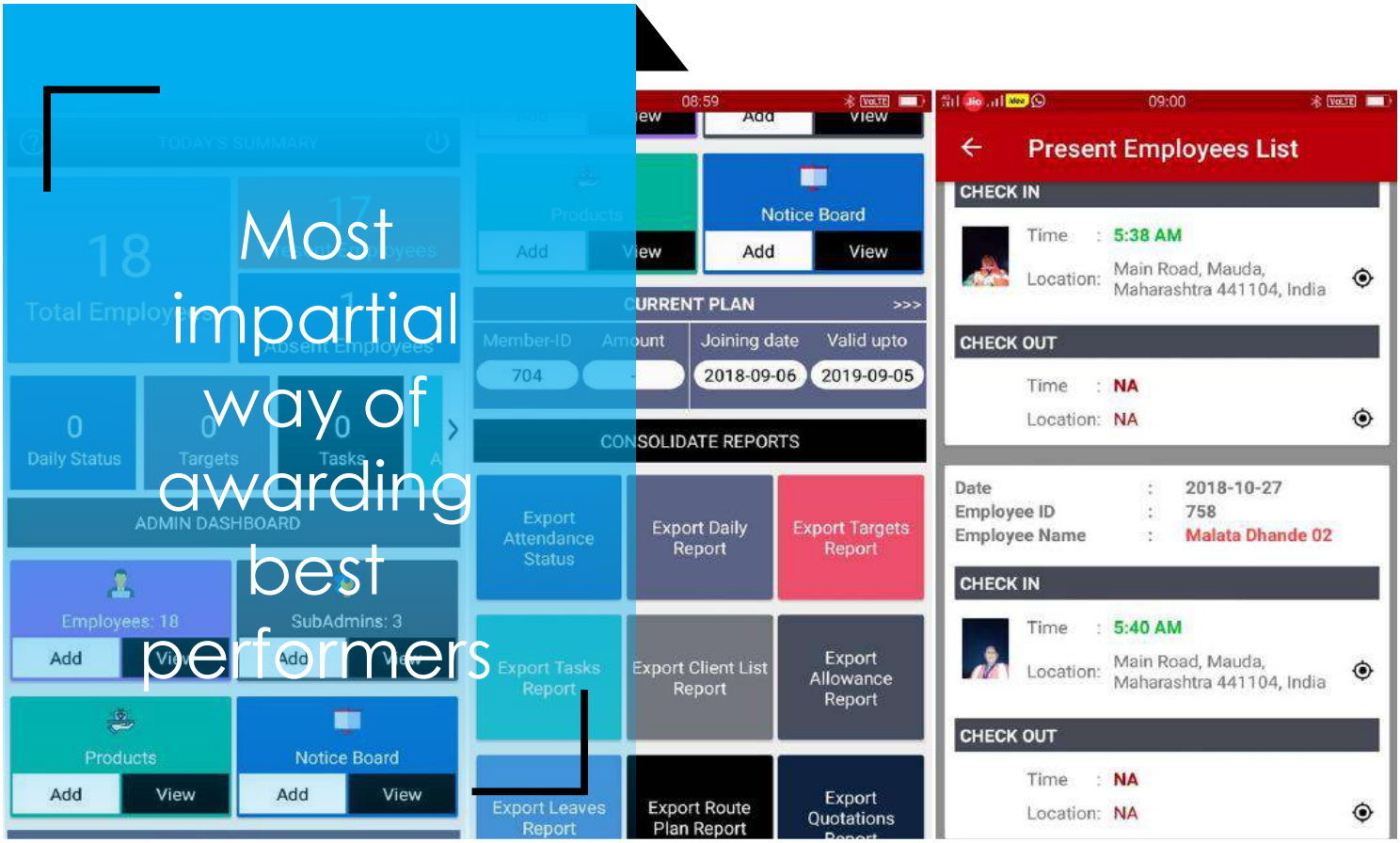
CHASE App

Like many ULBs, Nagar Panchayat Mouda too used to have difficulty in performing its administrative task of monitoring the activity of the available human resources engaged in SWM manually. Maintaining different activity books like attendance book, activity book, monthly chart preparation, etc. and then analysing the chalked out data in itself is a time taking activity. After doing all this still it remains a fact that the management did not have real time data. In order to avoid all these issues, NP Mouda has taken initiative to involve technological intervention in the name of **Chase** application.



Firstly detailed data of all the employees like name, designation, email I'd, mobile no registered into this application. Every one of the SWM employees have been provided with a GPS and GPRS enabled instrument / mobile which they have to carry with themselves while they are on duty.

While the duty time starts, the manager's application shows no. of employees on duty, the status of each employee as online or offline. So in case if some employee is seen as offline, it can be identified that the particular employee is absent.



Smart

Monitoring of workers

The application also has a feature which gives real time location of its employees, so as to check whether the online employee is following the specified route or not. At the same time it can be understood that it would be difficult to check which each employee every day what route each are following. Therefore, through this application movement history map of each employee is stored and checked at the end of each day.

In case of any issues, employees and employer can communicate through the chat feature of the app. The app is also used for notices and announcement so that employees get them immediately. In NP Mouda all the employees related to solid waste management have been registered with this application and day today monitoring is taken up by the administration using this application. While starting and ending of the work each day every employee is supposed to take selfie with surrounds to give idea about his/her presence a work.

The clear advantages that this innovation has brought can be summarized as follows:

- Human resource working on solid waste management can be efficiently managed
- Daily admin activities like attendance, allotting routes, allotting task, notices, etc. can be completed in no time as it's present on the fingertips
- There is track of all the activities carried out by admin and employees within the day and same can be continued to months and years.
- This data can be analysed for the purpose of reviewing the performance of the employees.
- This avoids waste of time and efforts to collect people at one point and give certain instructions on daily basis.
- This application can be used on website as well as mobile, so no need to be present at office to manage the employees.
- Employees do not have to visit duty at the same time they can even apply for leave through this application.
- Employees working in early morning and late night at remote places can communicate with admin in case of any mishap.

NARKHED

Transforming Madar

Narkhed is a small town some 84 km north-west of Nagpur. Being located in "orange belt", it is a major centre for fruit trading. The Madar River is the lifeline of the town as well as surrounding villages. The Madar River is seasonal and flows only in rainy season with heavy flood. In 1991, due to heavy flood through Madar River, the neighbourhood town of Mowad was completely inundated and 264 people lost their lives. The same condition happens in Narkhed during the rainy season. After the flood water recedes, both the banks of the river become very dirty and contaminate the water, because of which epidemic disease spread for whole year. Further, all the sewage drains directly flow into the river. The sewage water is stored in scattered patches making them breeding grounds for mosquitoes. When someone enters into the city the first impression about Narkhed was very dirty town.

To overcome this critical situation, Municipal Council Narkhed decided to clean up the Madar River. This was started on 21st of October 2018 with volunteers and all officials and staff from the Council, working tirelessly from 6 am in the morning till 10 pm at night. The work started with digging up/dredging the river using heavy machinery, breaking the non-porous rock bed that was obstructing the water flow, and released all the contaminated water. The machines then increased the depth of the river by 3-5 feet and also width by 10-15 feet. The team then cleaned both the banks of the river by *shramdan* voluntarily given by ordinary citizens of the town.

When residents stood up
to restore lost pride

After cleaning, 200 coconut trees were planted for 1 km stretch on one site and on the second site, flowering plants were planted along a jogging track which was created for a stretch of 500m, along with construction of a fountain.

As all the sewage drained directly opens into the river, it was decided to collect sewage drain water by PVC pipe into the Hume pipes which are laid both sides of the river. The distance cover by the Hume pipe is up to 2kms which collects all the sewage. There is a plan to construct 4 sewage treatment plants (STP) and as per government norms, 50% treatment water will be released back into the river to maintain the water level and balance 50% treatment water would be used for watering the plants which are planted on both banks of the river.

All the retaining walls of the river are painted with messaging on saving the river, stopping water pollution, against open defecation, SWM, preserving wild life, etc. Further, ornamentals plants have been planted on both the side of bridge. Due to the cleanliness and beautification of the Madar River and both the banks, the face of Narkhed has totally changed. The entrance of the city is became so beautiful, OD spots are totally eliminated and citizens, who tirelessly contributed to this change, can now take pride in their town.

NAWANSHAHR

TITLE GOES HERE

In 2011, Punjab followed a cluster based approach for managing its solid waste wherein the waste generated by different clusters was brought to one central facility for processing. Unfortunately, lack of technical and financial feasibility along with faulty planning on the part of contractors soon brought to the fore the inadequacy of the cluster based approach. The need of the hour was a financially viable, technically feasible and an environmentally sustainable solid waste management (SWM) model for the state.

The Punjab Municipal Infrastructure Development Company, the SWM division of the Department of Local Government, Punjab, realized early on that the decentralized processing of waste along with a massive behavioural change campaign targeted at citizens was the key to a successful and sustainable waste management model. One of the first Municipal Councils to adopt this strategy turned out to be Nawanshahr. This small town, with a population of 46,024 (as per Census 2011) generated around 14 tonnes of waste per day of which approximately 60% was biodegradable and around 40% non-biodegradable.

Since September 2017 Municipal Council of Nawanshahr (MCN) adopted a decentralized and cost-effective approach to solid waste management with the participation of community members and other stakeholders. The integrated approach included a three-pronged focus on development of infrastructure, intensive citizen engagement and integration of waste workers in the solid waste management chain.

Cost effective solid waste management model

While the administration focused on source segregation of waste, door-to-door collection and transportation of segregated waste, placement of litter-bins at strategic locations, and setting up infrastructure for the processing of waste - what set them apart was the strong willingness of the political leadership at all levels to transform the landscape of the town along with the active support of citizen groups. Within a short span of one year, with **100% source segregation** and a system of robust door-to-door collection, the city has **become almost bin-less and garbage vulnerable points have been transformed.** Through its processing facilities, the Council converts around 8.5 tonnes of wet waste into valuable compost every day while approximately 4 tonnes of recyclable wastes is being recovered by waste collectors.

Moreover, the Council has taken steps to integrate the Safai Sewaks (rag pickers) into the formal SWM chain by organizing capacity building workshops and providing them with free health check-ups. Another feather in the cap for the Council has been the remediation of its existing dumpsite of two acres which now boasts of a composting unit and a material recovery facility. **70% of the remediation process, which commenced in 2018, has already been successfully completed**. This has been achieved through a locally designed mechanical separator ***(Picture 5)*** which sieves the legacy waste leading to its separation into two parts- soil/ compost which is further sold to farmers at a cost of Rs.2,000 per trolley while the combustible material/plastic is handed over to the nearest cement industry for Refuse Derived Fuel (RDF). This machine design has not just been adopted by 15 Urban Local Bodies (ULBs) of Punjab but also 25 ULBs of the neighbouring state of Himachal Pradesh.

The town is also rigorously practicing on-site composting of horticulture waste being carried out in parks, schools and offices. Citizen participation is also evident in the practice of home composting in around 500 households. Citizens have come forth and donated tricycles and safety equipment for Safai Sewaks, corporate houses donated waste bins and NGOs joined the war against plastic by coming forward and distributing cloth bags.

PANCHGANI

Bids Adieu to its Landfills

Lush strawberry fields, boarding schools teeming with students from all over the country and picturesque locales serving as the site for legendary Bollywood scenes. That is what summarizes Panchgani for most of us. However, this tiny hill-station in the Satara district of Maharashtra is now in the news for something else. This clean town has successfully converted **a dumping ground into a tourist attraction.** Rightly rechristened as the Swachh Bharat Point, this is really a joint effort between Panchgani Municipal Council, women SHG members, citizens, students, and ordinary citizens.

The Municipal Council of Panchgani was faced with the twin challenge of tackling 5 -7 tonnes of wet waste everyday as well as clear the landfill site which had been serving as the dumping ground for thousands of tons of old garbage. It was disheartening to see this beautiful valley being turned into a mountain of garbage. The Council therefore began the task of clearing this landfill with limited resources.

A major obstacle for the team was the tackling of plastic waste that had mixed with the naturally formed compost in this landfill. Thinking out of the box, the Municipal Corporation decided to use red mud on heaps of naturally made compost. This served as the perfect foundation for the planting of trees in this area. Thanks to the abundant rainfall that Panchgani naturally receives, the spot boasted of green lawn and lush trees in a span of just four months!

…and says hello to Swachh Bharat point

Simultaneously, the Municipal Council focused on the processing of the wet waste into compost through a simple and cost-effective machine installed in this very place that once served as a garbage dump. A machine usually used in farms and fitted with a conveyor belt was installed. Alongside, instead of using any other inoculum, the Corporation used ash obtained from sugar factories nearby – a cheaper and better option because of its carbon content. This machine was capable of handling the entire bulk of organic of the town with processing of waste beginning at five in the morning and getting completed by two in the afternoon and roughly a ton of compost being produced from the waste every day.

The very idea of turning a processing plant into a beautiful tourist spot is in itself a novelty. Today, a landfill site is made into a beautiful garden which is visited not only by tourists but also by school students. This, in turn, becomes a practical classroom for them which inculcates in them good habits on cleanliness, health and positive behaviour. Moreover, since the project required very little set-up and running cost, the model is capable of being replicated all over the country. The model is also financially viable with compost made from the green garbage being sold at INR.1500 per ton.

With 100% source segregation being followed in this town, the dry waste is further segregated into seven different categories while the menace of plastic is effectively controlled by using it for the making of roads and furnace oil.

The town is also completely litter-free and in order to keep it that way, it has also come up with an innovative way to manage the waste generated by tourists. Every tourist entering Panchgani is politely intercepted by a Swachh volunteer and handed over an eco-friendly bag wherein they can collect all their trash generated during the visit. A small deposit fee is charged which is refundable when the tourist hands over the trash bag during their return journey.

RAJKOT

Trash to treasure

1. Processing

The city has introduced state of the art innovations which further boost the city's capability to derive wealth out of waste. Rajkot boasts the foll owing infrastructure:

- ***Material Recovery Facility for Dry Waste***

  MRF Facility extracts the reusable & valuable part of the dry waste an d reintroduces it back into the manufacturing supply chain. This further helps in reducing the load on processing infrastructure and landfills. MRF generates a revenue of INR 1500 per tonne leading to savings of 20% on transportation of waste.

- ***Biomethanation for West Waste***

  Rajkot being a majorly wet waste producing city has installed a bio-methanation plant installed in partnership with Bhabha Atomic Resear ch Centre (BARC) to derive value from wet waste by producing meth ane out ofit, which is used to further power street lights in the city.

- ***Waste to Composting for Wet Waste***

  A major portion of wet waste produced in commercial areas and HHs is taken to the Waste to Compost installed in strategic locations. The compost generated from wet waste which is further sold to the agricultural market.

Surat and Rajkot are among the cleanest train stations in India

Holistic approach
to waste management

2. Construction & Demolition Waste

Construction activities carried out in Rajkot city such as new construction, demolition of old construction, repairs to old construction through which waste like bricks, stones, concrete, clay etc. is produced. This waste is reused for making paving block, divider block, *chapaniya*, bricks, etc. Almost 40 TPDs of C&D Waste segregated, sorted and managed by 2 treatment centers, transport by 4 dedicated vehicles for collection services. Contractors are promoted to sort and utilize usable material in Road Projects, Pavements for Gardens, Pathways, Housing Projects and Interlocking Tiles.

3. Reverse Vending Machine

To avoid people from throwing plastic bottle, pet bottle on the road and public places, Rajkot has planned to install reverse vending machine at various 10 locations in Rajkot city. People can get coupon in return by depositing old, used plastic bottle into vending machine. The said coupon can be used for discount in restaurant or hotel. Each RVM has the capacity of 1500 Bottles. This method of recycling will get boosted upon installation of RVM and shall help in improving the beauty of the city.

4. Beautification through waste

International NGOs in collaboration with citizens has led to mass beautification of civil infrastructure, Slum areas and major traffic intersection, making Rajkot a beautified city. These have been beautified with statues made of industrial waste. Along with the beautification of city infrastructure, slum beautification efforts were also taken by city in collaboration with the International NGOs.

TRICHY

Green Report Card

The Trichy Municipal Corporation is not just tapping school students to spread the idea of waste management in the city but is also incentivizing them for the job in an innovative manner. This academic year, the city school students will receive a green report card, an assessment of the work they have done to adopt solid waste management practices. As part of this exercise, the civic body in association with the respective school managements will grade students based on the support shown by their respective households to adopt solid waste management (SWM) practices. Also, based on the grades, a top-performing student from every school in the city will be awarded a prize.

On the occasion of World Environment Day on June 5, 2017, the Trichy Municipal Corporation launched its ambitious plan to segregate solid wastes at source across the city. Through the implementation of waste segregation at source, the civic body has managed to collect and process 416 million tonnes of waste per day. The city with 2.3 lakh households in the city generates about 436 million tonnes of waste per day.

School students

managing city's waste

According to the civic body's statistics, three-fourth of the city's households have school going children. Segregation of waste as biodegradable and non-biodegradable at source needs more sensitisation, especially among the children, so they can be drivers in motivating their family members to adopt source segregation. It is expected that such initiatives creating awareness on segregating waste at source among school students will eventually compel all residents of the city to comply with the solid waste management practices. A total of 205 schools including private and government institutes has been part of this initiative to distribute green report cards to students from June 2018 through the respective school managements.

"The green report cards has two questions – one will be on whether segregation of waste at source is being practiced at home and the second will be on the availability of two separate bins each for biodegradable and non-biodegradable waste. The month long evaluation was conducted in mid-2018 with parents, sanitary workers and sanitary supervisors recording their findings in the card. The evaluation process was held every day and by the end of the month the green report card carrying the signatures and findings of parents, sanitary workers and sanitary supervisors were handed over to the school management. A system has been put in place wherein among the top performers, a computerised lot system selects a student from every 205 schools to award the prize.

In April of 2018, the civic body had distributed nearly 20,000 bins among 10,000 households to encourage source segregation, and also launched a social media challenge named "My Trichy, My Responsibility Challenge", wherein people were asked to record one minute waste segregation video and post on social media to win attractive prizes.

VIZIANAGARAM

Swachh Sainik Brigade

The Vizianagaram Municipality has taken an initiative to actively engage the students in implementation of Swachh Bharat Mission. All the 8th and 9th standard students of Municipal High Schools are designated as "*Swachh Sainiks*" of the town and trained on door-to-door garbage collection, segregation, ODF and other Swachh Bharath concepts. Each student selects 10 houses of his or her choice near their home to create awareness as well as assists the municipal sanitary worker in the morning at the time of garbage collection. For every 10 Swachh Sainiks, the most active one is appointed as a 'captain'. Further, the team of 40 Swachh Sainiks are monitored by a teacher called as 'major'. The Head master of the school acts as 'brigadier' and the Municipal Health Officer supervises the activity as a Commander. The Municipal Commissioner commands the Swachh Sainik Brigade as 'Commander – in – Chief' of the force. With such a defined structure and close monitoring and supervision, the students can facilitate the behaviour changes at the community level.

The initiative introduces the participatory mode of social service and real time field experience for the school children to create healthy and hygienic premises in their neighbourhoods. In the city, at present 800 students from three Municipal Schools are engaged in 'Swachh Sainik Brigade'. Through this brigade, the Municipality is concentrating on 8000 households to drive them towards the realization of sustainable Swachh Bharat goals.

CITIZEN LED INNOVATIONS

BHOPAL

Next Generation e scavengers

The ongoing era of startups and the desire of achieving something had led the youngsters of Bhopal to come up with new and innovative ideas. Amongst these ideas an idea emerged with the motive of doing something for the people and environment. With the aim of giving services to the people to dispose off their 'raddi' or old products at a fair price a firm was started by Mr. Anurag Asati, an engineer by Profession.

With an intention to provide smart waste management solution working on SaaS (Software as a Service) model, **Kabadiwala.com** was developed. This platform is a doorstep service that works on organizing the waste sector for individual households to improve clean environment. The platform maps collection of post-consumer waste, schedules efficient & cost-effective pickups, and incorporates them into recycling/vendor network. The initiative promotes implementation of cashless digital transaction of wallet, earn Green Points that users could accumulate by recycling of scrap as well as create employment for the unorganised sector by "**Best Out of Waste Concepts**".

The initiative encourages various tie-ups in the value chain, for instance, with the traders & recyclers (sending paper to Khanna Paper Mill, Punjab), segregated metal to Bansal Mill in Madhya Pradesh, while plastic is being directed to the granule manufacturer in Bhopal. Hence, end-to-end solution is provided for promoting a circular economy.

With more than 40,000 registered users with them, the initiative has organized the waste sector in the city. Currently also active in Indore, Ahmedabad and Aurangabad cities, the platform is adding clients daily. Diverse client profile ranging from corporate to educational institutions and individual households, the initiative helped in managing substantial amount of scarp material and organized them into a recycling industry over a period of time.

EDIBLE BAGS

Tackling plastic waste

Ashwath Hedge from Bengaluru has developed a line of bags that takes less than 180 days to biodegrade and dissolve in water in a matter of seconds. These bags look as if that they are made of plastic, instead they made from natural starch, vegetable oil derivatives and vegetable waste. Thanks to these natural ingredients now these bags won't harm cows who rummage through garbage for food. His product contains no toxins, dissolves in boiling water in 15 minutes, in water at room temperature in a day and in 'the environment' in about 180 days. And the best part: THEY'RE EDIBLE! So, if they ever do end up in an animal's stomach, they just get digested!

It took four years of research for Hedge to come up with such marvelous innovation. To commercialize his work and innovation Hedge found his company Envigreen in 2016, which he plans to launch by the end of 2018. These kind of innovations no doubt would help India to solve the massive plastic problem resulted by the generation of 15000 tonnes of plastic waste in the country every day. Several Indian cities and states have tried to tackle the issue by banning single-use plastic items, but people find it hard to live without them. With Envigreen, the solution might be in the bag.

India being a devotional country generates over 950,000kgs of temple waste annually. This has manifested itself in a major problem of the endless stream of flowers entering India's rivers each day through offered by devotees at temples. '*Ankit Agarwal*', a Kanpur based entrepreneur, not only set out to clean India's rivers of temple flowers, but along with it he aims to fanuate economy which consigns millions to injustice and poverty that Ankit tries to tackle through HelpUsGreen. The social enterprise didn't start out with the purpose of empowering Dalit women, but also to tackle the problem of temple waste by reusing it. Wanting to prevent the pesticide and chemical-ridden flowers from adding to the water pollution, they began tinkering in their kitchens, looking for ways to turn unwanted flowers into useful products.

This social enterprise has made it clear that such initiatives could also do more by empowering marginalized women. By 2020, Ankit and Karan, co-founder of HelpUsGreen and Ankit's childhood friend, want to employ 3,700 women (compared to 79 now) while recycling at least 50 tonnes of waste flowers every day. Aside from ***Phool*** incense and compost, HelpUsGreen is launching a line of eco-friendly packaging material made from waste flowers, which they call **Florafoam** — akin to Styrofoam, but biodegradable.

Beginning with the humble compost, moving on to create incense sticks and cones — with harmful chemicals like arsenic and lead removed, using a formula they cooked up. They have also dreamed up of creating a brand for these products named as Phool, which is Hindi for 'flower'.

PLASTIC HOUSES
…a 2 crore enterprise

33 year old "*Prashant Lingam*" of Hyderabad started out with an aim of reducing the environmental impact of plastic by reusing it in construction, thereby helping to tackle the problem of the growing mountains of plastics in landfills. Plastic houses, including walls and windows made of waste and recyclable plastics, involves 2.5 tons of plastic waste to construct it with a fact that unlike a brick house it doesn't get hot during summers.

Parshant believes "Recycling of plastic is obviously a wonderful business opportunity. First thing is you know plastics cannot be stopped so either you reuse or it goes to landfill". He works closely with rag pickers and provides them with monetary benefits, by paying to separate plastic waste from other waste. The only challenge he faces in this process is convincing home buyers, since these plastic houses are 25% more expensive than traditional houses. But Prashant has found more success with plastic paver tiles. The Hyderabad city council is using the tiles to pave pedestrian walkways. Each tile is made from 600 polybags and costs less than a dollar. And it could be a solution to India's plastic problem. Prashant hopes higher demand will help him turn his garbage into gold.

ACTION BY CIVIL SOCIETY AND CORPORATES

AMBAJOGI

NGO partnership in vermicomposting

Ambajogi Municipal Corporation converts several tons of organic waste generated in the city into valuable compost by applying vermicompost technology. This agriculture practice can be used in pots as well as in home gardens. NGOs of the city guided citizens in implementing the composting project. Jayprabha Gramin Vikas Mandal and MANAVLOK Sevabhavi Sanstha gave the technical inputs and guidelines, which helped in proper selection of implementation unit and species of earthworms. Implementation was done at various levels, including centralized level with 6 units of 2 tonnes capacity each with a packaging unit also installed at the same location. The unit of decentralized level utilizes garden waste and is situated in Borula Talav Garden and Yogeshwari Garden with a capacity of 1.5 ton each. Community level participation is done with residential waste located at Dhor Galli, Sahyog Nagar and Municipality Swimming Pool with a capacity of 2 Tons each. Individual household level vermicomposting is also implemented as a part of the project.

Vermicompost samples are tested in the laboratory to confirm quality parameters. The compost is purchased by the ULB. With 35 tonnes of total production capacities at various levels, the project reduces the waste transportation and processing load for the ULB. At the same time, it reduces the chemical fertilizer requirement, which is replaced by the organic compost. Hence, sustainable agriculture practices are encouraged as part of the project.

DEWAS PPP MODEL

Revenue from Garden Waste

Dewas Municipal Corporation, with the help of partner agency Green Corp Biocam and Fertilizer, started this project to manage garden waste at source and to reduce the waste load of the central processing site, transport cost, and man-hours of work of the corporation. Fifteen gardens of the corporation were identified for this project where 32 compost pits were constructed using NADEP method. Land and all the construction cost was borne by the corporation and all the technical support was provided by Green Corp.

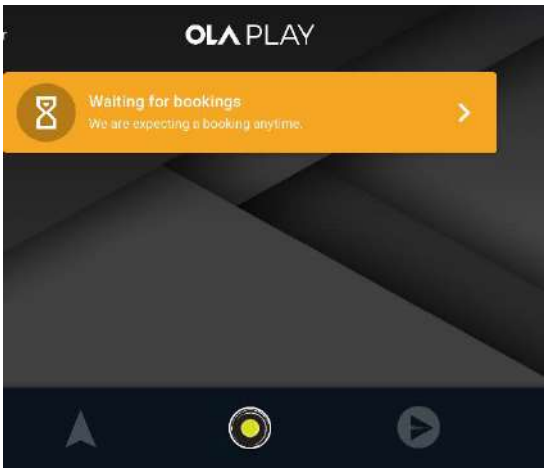
The project is being implemented since January 2018 as a PPP model under solid waste management activities. The Corporation owns the gardens, constructed the pits, and provided the caretakers to do the task of collecting and dumping and other logistics. Green Corp has provided the technical expertise, does the monitoring and supervision of the composting process and its related activities, viz. making the compost, packaging and branding, and selling it commercial. The Corporation gets Rs.500 per ton as revenue.

The NADEP method was chosen over others as it was most cost effective, not requiring any machines, equipment or power supply to do the composting. The project did not require any additional manpower as garden caretakers were given the necessary training. And the biodegradable waste of the gardens itself are being used as input materials thus requiring nor transport expenses to be incurred. Recognising the PPP model as a replicable idea that can be scaled up and adopted elsewhere, the SKOCH Group have it the national SKOCH Pilot Award in the year 2018 under 'Composting through Wet Waste Category'. As a demostration effect, over 2600 hoiuseholds have also started home composting using this method in the city.

Ola took a positive step forward and contributed to the Swachhata mission to help improve cleanliness of the surroundings and the community. Hundreds of thousands of driver partners work with Ola across 110 cities of india, and fulfill mobility needs of millions of Indians every day. Cars are the workplace for these drivers. Therefore, access to safe and clean toilets is an issue for them when on road, due to which they are prone to defecate in the open at unhygienic places.

NAVIGATION FACILITY TO NEARBY PUBLIC TOILETS

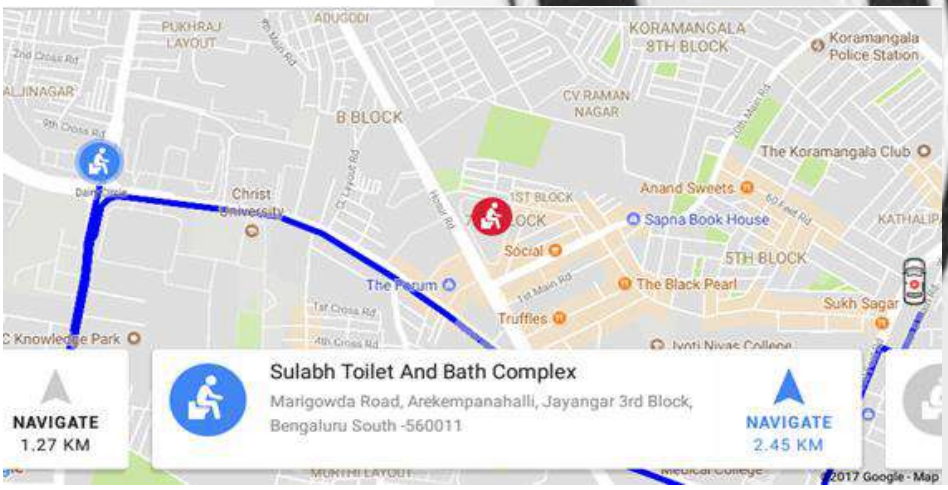
for their driver partners and passengers by Ola Cabs



On October 2nd, the day of Gandhi Jayanti, Ola integrated technology in the in-car devices of their 800,000+ driver partners, to help them with easy access to public toilets around them when on road. With this Ola aimed to improve their personal hygiene and quality of life. This is particularly useful for women drivers who entering the Ola fold.

Steps under this technology:-

1) Driver partners click on the ***Navigate*** icon in between bookings to locate the nearest Public Toilets.
2) The screen will display the public toilets in their current vicinity.
3) Driver partners can then choose the nearest/most convenient option and navigate to that toilet.



Varanasi PPP model

An IOCL CSR initiative

Varanasi Nagar Nigam and Indian Oil Corporation Ltd, (IOCL) jointly commissioned a decentralized waste to energy plant of 5 tonne per day capacity in I.D.H, Varanasi in February 2018. The project has been executed under the Corporate Social Responsibility scheme of IOCL. IOCL has engaged M/s Organic Recycling Systems Pvt. Ltd (ORSPL) for designing, commissioning and operations of the plant. Varanasi Nagar Nigam (VNN) allotted the land for installation of the plant. The unit is designed to produce biogas/manure through bio-digestion of organic component of municipal solid waste using Continuous High Solid Thermophilic Anaerobic Digestion Technology (DRYADTM), producing zero effluent and leachate in the process. Biogas is combusted, and the energy is used for lighting. This plant produces nearly 800 Kwh (units) of energy per day from feed of 5 tons organic waste. After captive consumption, unit is designed to ensure 400 units of energy per day to electrify the city's water treatment plant. This plant also produces 35 kg of manure per day in the process.

The project has small land requirement for waste processing and caters to wide range of organic waste into biogas and compost.

Combustion of biogas generates electricity, which is used for captive use as well as lighting of the surrounding areas. The plant also provides high quality organic compost, which is being used by the horticulture department of Varanasi Nagar Nigam in city parks. Installing these plants at ward level also helps in reducing the waste transportation costs by the ULB.

The initiative showcases the success of public private partnerships in the sector and demonstrates how CSR funds could be used at decentralized level to address the challenges at city level. Proven technologies that just need financial support could be scaled up with such partnerships and emerge as sustainable solution for waste management at ground level.

“Be the Change you want to see in the World”