Bruhat Bengaluru Mahanagara Palike

KUIDFC

STRATEGY FOR A CLEAN BENGALURU

A COMPREHENSIVE APPROACH TO SOLID WASTE MANAGEMENT

स्वच्छ भारत
एक कदम स्वच्छता की ओर

SWACHH BHARAT IN ACTION

> As prosperity grows so does garbage. 62 million tonnes of garbage is generated annually by the 377 million people living in urban India - world's 3rd largest garbage generator.

What a Waste: A Global Review of Solid Waste Management
The World Bank, 2012

> However, it's not the amount of waste generated that's as much of an issue as the fact that more than 45 million tonnes, or 3 million trucks worth, of garbage is untreated & disposed of by municipal authorities everyday in an unhygienic manner leading to health issues & environmental degradation.

Improving MSW in India
The World Bank, 2012

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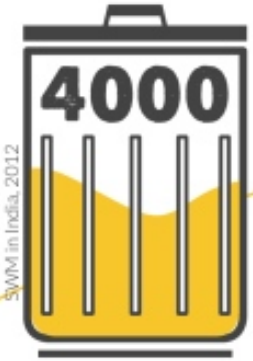
ACKNOWLEDGMENTS

BENGALURU

Source: Census 2011

18.4 BOMBAY
16.3 DELHI
4.5 SURAT
1.6 TRIVANDRUM

POPULATION



Source: Sustainable SWM in India, 2012

7500 BOMBAY
6500 DELHI
1565 SURAT
171 TRIVANDRUM

WASTE GENERATION

AN URBAN CHALLENGE

Managing solid waste, an obligatory function of the Urban Local Body (ULB), is a growing concern among several cities in India. It is not only about managerial and technical pathways, but also needs to integrate social pathways that include the large informal economy. The increasing effects of urbanisation along with population growth have left several cities struggling with their Solid Waste Management (SWM) system. Therefore, there is a need to develop an indigenous approach that addresses:

- **RAPID URBANISATION**
- **POPULATION GROWTH**
- **ACCESSIBILITY & COVERAGE**
- **IMPACT ON PUBLIC HEALTH & ENVIRONMENT**
- **INTEGRATION OF A LARGE INFORMAL ECONOMY**
- **IMPROPER HANDLING OF WASTE**
- **UNHYGENIC WORKER CONDITIONS**

Bengaluru's crisis in waste, resulted in the formulation of the Kasa Muktha programme, which was launched in 2013, at ward level. Supported by the city movement called Wake Up Clean Up, the program aimed at streamlining the collection and transportation of segregated waste at ward level, to enable stream-wise processing.

A program launched by the Hon'ble CM of Karnataka, Sri. Siddaramaiah in 2013

KASA MUKTHA

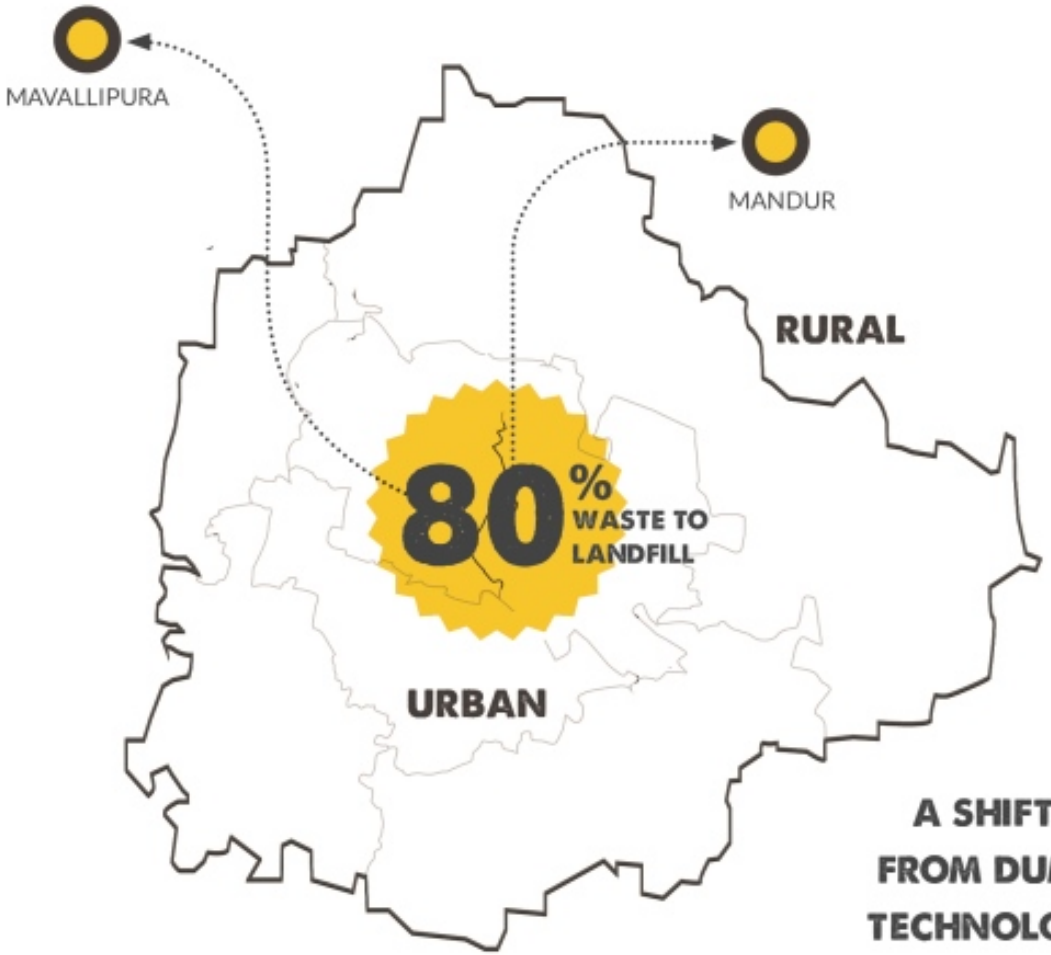
BENGALURU'S HOLISTIC APPROACH

Dumping lakhs of tonnes of MSW in landfills, is not only a potential environmental hazard but also unsustainable.

FROM DUMPING TO PROCESSING

The accumulation of waste over the years in dumping sites near villages, has resulted in health hazards. In addition to this, environmental impacts like air pollution, water& soil contamination have left the land damaged. Trash fires in the city alone are known to emit 10,000 grams TEQ (toxic equivalents) of carcinogenic dioxins/furans everyday.

The closing of the landfills led to a movement - 'Wake Up, Clean Up Bengaluru!', where the city pledged to move away from a system of dumping to that of processing.



A SHIFT IN ATTITUDE - MOVING AWAY FROM DUMPING TO PROCESSING, USING TECHNOLOGY WITHIN CITY BOUNDARIES

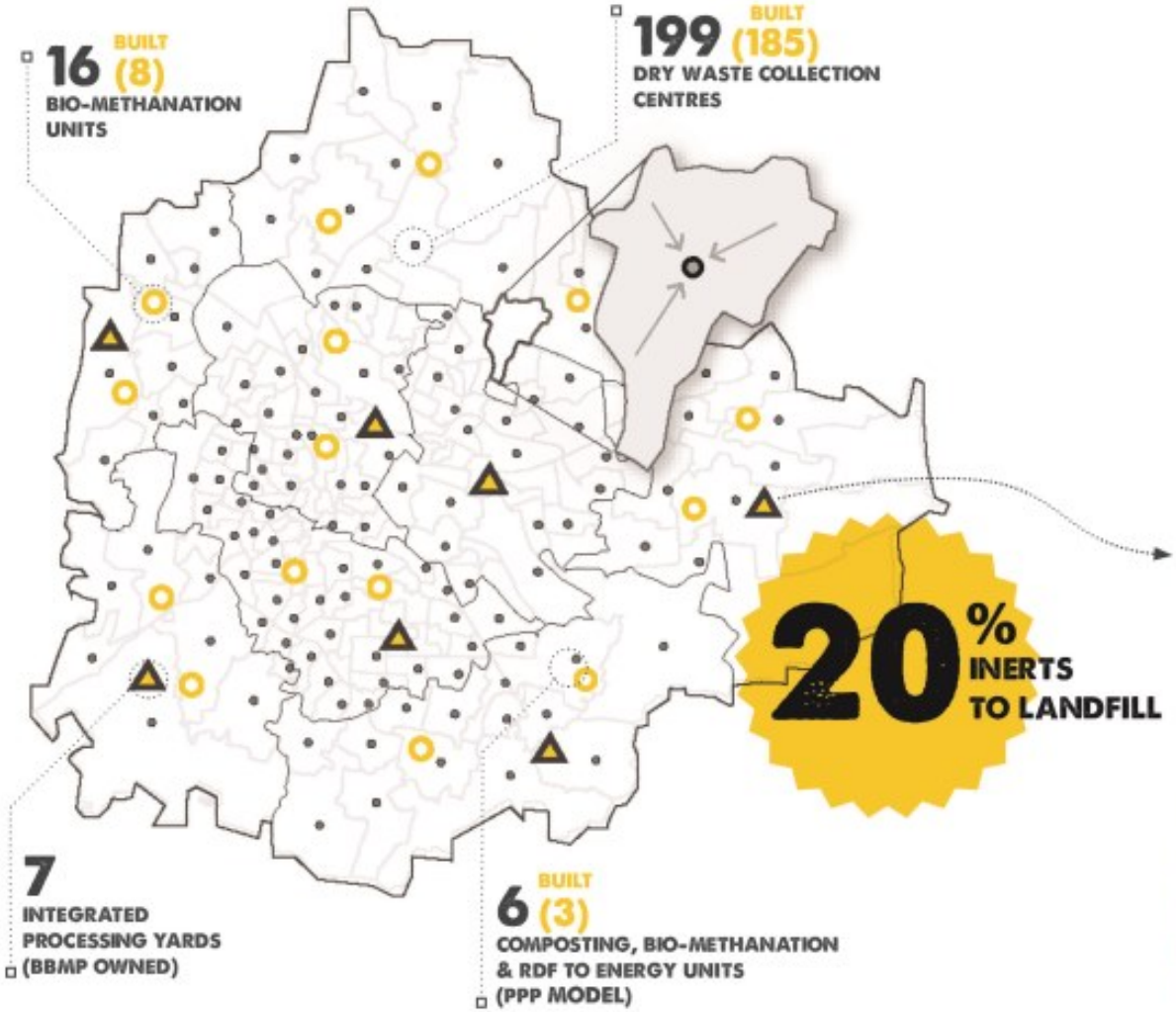
6000 TPD
PROCESSING CAPACITY

350
CRORES

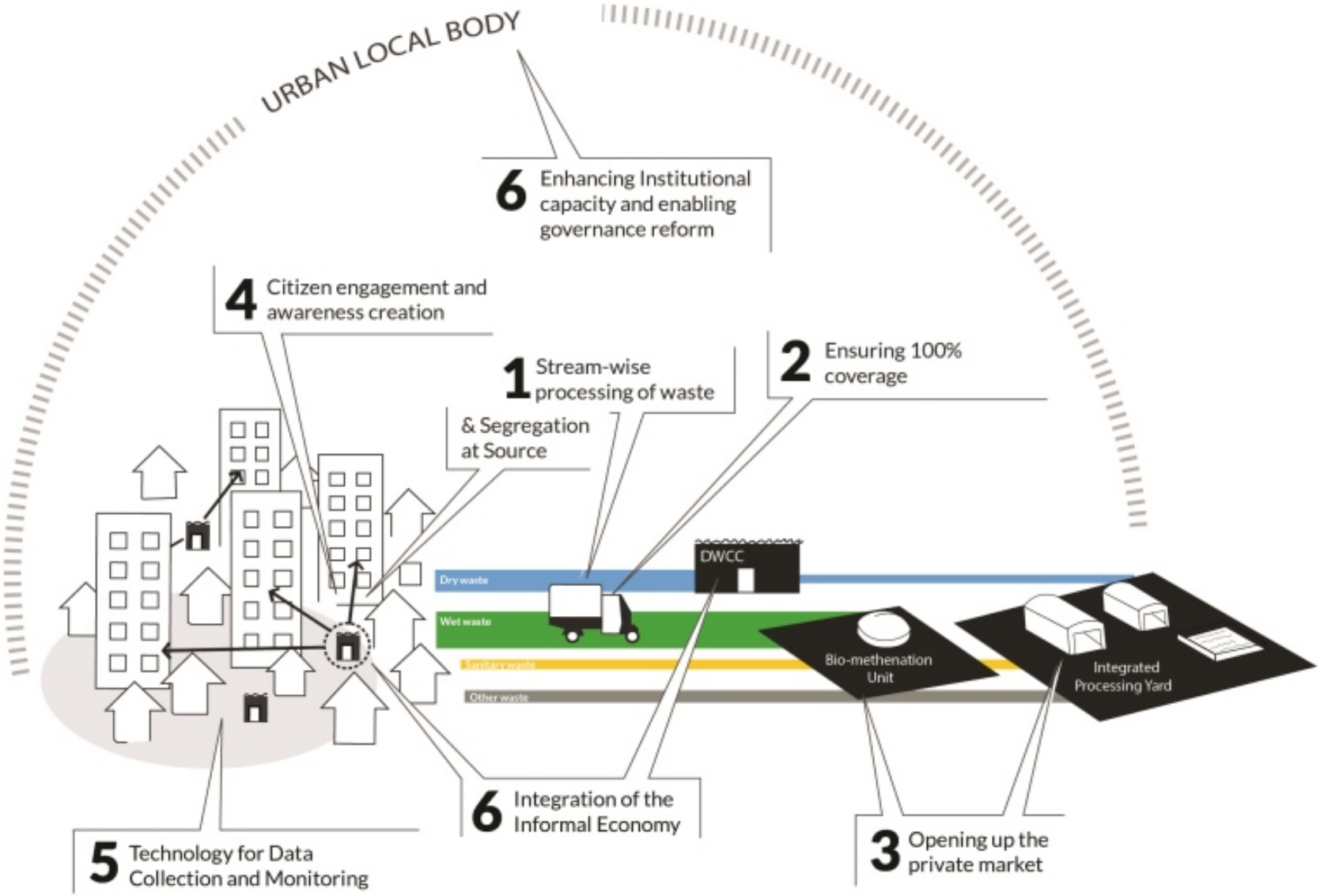
A CITY IN TRANSITION

The city has already set up infrastructure facilities to process waste by stream at ward level. At the Zone level, 350 crores have been invested over a duration of 8 months, to set up facilities to process over 2300 tonnes of waste per day. In addition to this, several other processing facilities are in the pipeline using the PPP framework. The total infrastructure capacity planned is set to process over 6000 tonnes of waste per day.

150% PROCESSING CAPACITY PLANNED



500TPD INTEGRATED PROCESSING YARD


URBAN LOCAL BODY
6 Enhancing Institutional capacity and enabling governance reform
4 Citizen engagement and awareness creation
1 Stream-wise processing of waste
& Segregation at Source
2 Ensuring 100% coverage
DWCC
Dry waste
Wet waste
Sanitary waste
Other waste
Bio-methenation Unit
Integrated Processing Yard
6 Integration of the Informal Economy
5 Technology for Data Collection and Monitoring
3 Opening up the private market

6 STRATEGIES ADOPTED BY BENGALURU

1

INVESTING IN STREAM-WISE PROCESSING OF WASTE
segregation at source, collection & transportation, infrastructure & technologies for processing

2

DATA DRIVEN APPROACH FOR ESTIMATION & PLANNING
reassessing normative standards, ensuring stream-wise collection & transportation

3

ENABLING MARKET DYNAMICS - CREATING NEW ECONOMIC OPPORTUNITIES
polluter pay model for bulk generators, empanelment of authorised service providers

4

AWARENESS CREATION & ENABLING BEHAVIORAL CHANGE
training programs, large-scale events, clean up drives, adverts & posters, citizen monitoring programs.

5

USE OF TECHNOLOGY FOR DATA COLLECTION & MONITORING
creation of data repository, GIS mapping, control room & app usage

6

CREATING INSITUTIONAL CAPACITIES & ENABLING LEGISLATIVE REFORMS
reforms in legislation & new notifications, extended producer responsibility, SWM cell, expert committee, intensive training programs

STREAM-WISE VALUE EXTRACTION

1

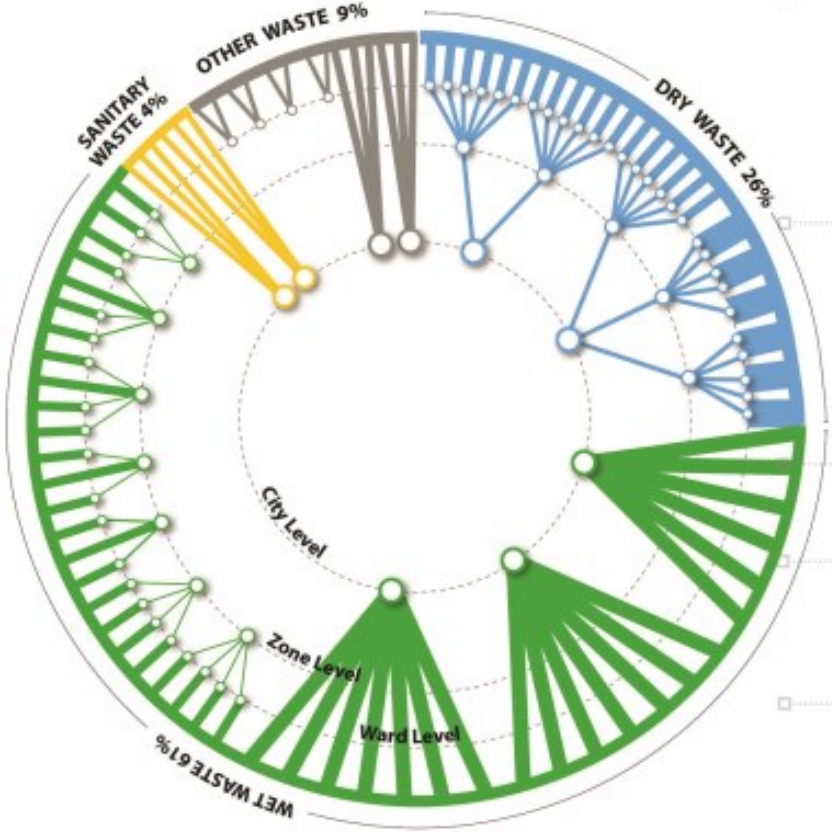
The Kasa Muktha program pilot worked towards creating 22 zero waste wards in the city based on the mandate of segregation at source. This learning has enabled the city to set up processing units for different streams of waste at the ward & zonal levels. It not only cuts down the cost of transportation, but also creates self-sustaining clusters within the 8 zones. The benefits of this decentralised model are:

- **CREATION OF VALUE FOR WASTE**
- **TRANSPORT DISTANCE REDUCED FROM 40 KMS TO 10-15 KMS**
- **EASY TO MANAGE & MONITOR**
- **REDUCTION OF CARBON FOOTPRINT**
- **SELF-SUSTAINING SYSTEM CREATED**

NOTIFICATIONS FOR PUBLIC INVOLVEMENT

Segregation at Source
Collection of Dry Waste
Collection of Sanitary Waste

MAXIMISED BY SEGREGATION



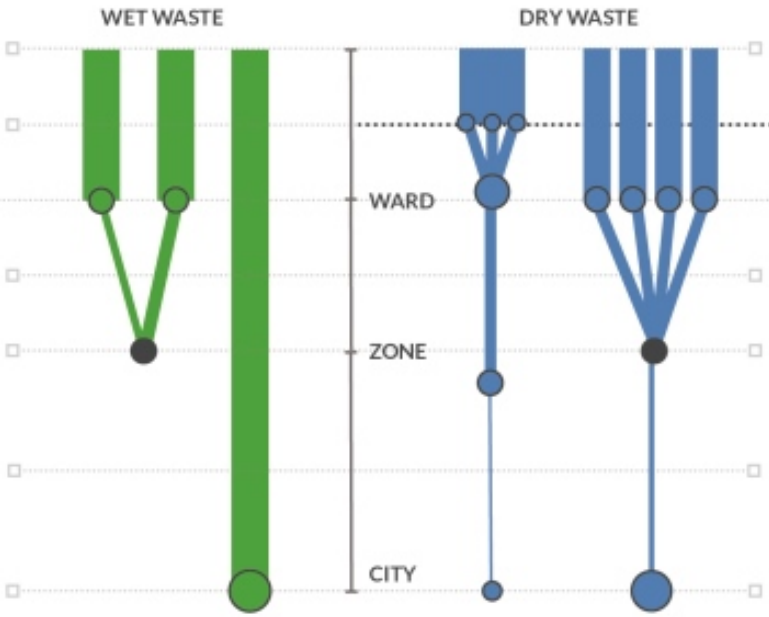


Illustration by: *Ankit Bhargava*

5% WASTE
REMOVED BY
INFORMAL ECONOMY

- **16 BIO-METHANATION UNITS**

Having a capacity to receive 5 tonnes of wet waste daily, these units have been set up at various locations in the city. 8 of the 16 are already commissioned. The future plan is to set up one per ward.

- **199 DRY WASTE COLLECTION CENTRES**

DWCCS are the face of Bengaluru decentralsiation & are equipped with appropriate infrastructure capable of purchasing, collecting, aggregating & selling both high-value & low-value dry waste.
They also serve as drop off points for citizens to bring in special waste streams - E waste, Sanitary waste, old furniture etc.

- **7 INTEGRATED YARDS**

COMPOSTING & RDF

AGGREGATION

SANITARY LANDFILL

These scientifically designed, hi-tech decentralised waste management facilities have been mapped to each of the zones in the city. The total waste management solution includes mechanical segregation, composting of wet waste, RDF creation from coarse rejects and landfilling of inerts. The city has four 200 TPD Yards (Lingadheeranahalli, Subbarayanapalya, Doddabidarakalu, Seegehalli) and three 500 TPD Yards (Kannahalli, Chikkanagamangala, KCDC).

INTEGRATED YARD

SIX SUCH UNITS HAVE BEEN SETUP BY THE BBMP, TWO OF WHICH RECIEVE 500TPD & FOUR RECIEVE 200TPD. IN ADDITION TO THIS THE CURRENT COMPOSTING FACILITY AT KCDC HAS BEEN UPGRADED. THE TOTAL PROCESSING CAPACITY OF THESE UNITS IS 2,300TPD.

BIO-METHANATION UNIT

A 250TPD UNIT SETUP THROUGH A PUBLIC-PRIVATE PARTNERSHIP WITH NOBLE EXCHANGE. IS ALL SET TO RECIEVE WET WASTE FROM HOTELS IN THE CITY. THE PROCESS CONVERTS THE WASTE INTO BIO-GAS WHICH IS THEN SOLD AS CNG.

RECOVERING VALUE FROM SPECIAL STREAMS

Much of the waste produced today can be recycled & in some cases upcycled to genereate value. Some of the special streams that we have found solutions for, include Leaf Waste (Composted), Coconut Waste (Briquettes & Pellets), Construction & Demolition Waste (Re-used & Quarried), Sanitary Waste (Incinerated & Autoclaved) & Dead Animal Waste (Incinerated).

We have already installed and evaluated pilots to scientifically process different waste streams. The plan is to replicate many such units based on need, throughout the city. We are already seeing a ROI in the units set up, along with cleaner working environments & the potential growth of an economy that is still nascent.

COCONUT WASTE

A briquetting unit has been running for the last year to process coconut & sugarcane waste. It has independently geo-tagged members and collects waste of over 20 tonnes per day. The waste received is shredded, dried and compacted to create briquettes and pellets of superior quality, that are being used as an alternative fuel to fossil fuels.

LEAF WASTE

Bengaluru the Garden City has heavy foliage & in 3-4 months of the year we have streets covered with leaves & flowers. Shredding of branches & twigs, along with a mulching process to decompose leaves, collected separately in neighborhoods is gaining momentum. Burning of leaf litter has been banned & the pollution caused being monitored carefully. Sieving & packaging of Compost for sale in BBMP gardens has made this effort sustainable.

80+
VALUABLE
OUTPUTS TARGETED

DWCC DROP-OFF

BAILING

SHREDDING

ALTERNATIVE FUEL
& PELLETIZATION

Low value plastics & laminates, an area of concern have now found innovative solutions. Low value plastics collected in the city are being converted to fuel (diesel, kerosene & furnace oil) through Pyrolysis. Laminates and other combustible fractions have been planned to be sent for co-incineration in cement plants.

BINDING AGENTS
FOR TARRING

Road laying with bitumen mix blended with Plastic waste has been in operation for over 20,000 Km of road length. It improves the life of the road surface by 2-3 times. This is an operation for low value plastic that Bengaluru is encouraging as a win-win for all.

ROOFING SHEET
WITH TETRA PAKS

Tetra Pak began a pilot for collecting tetrapaks 3 years ago through an Extended Producer Responsibility mandate. Today Bengaluru collects amongst the largest quanta of tetra pak in India & sends it to the Processing / recycling yards. The material is re converted into roofing, desks chairs & recycled paper. EPR needs further adoption & sanction in law, to give research & design a push and the recycling industry a boost.

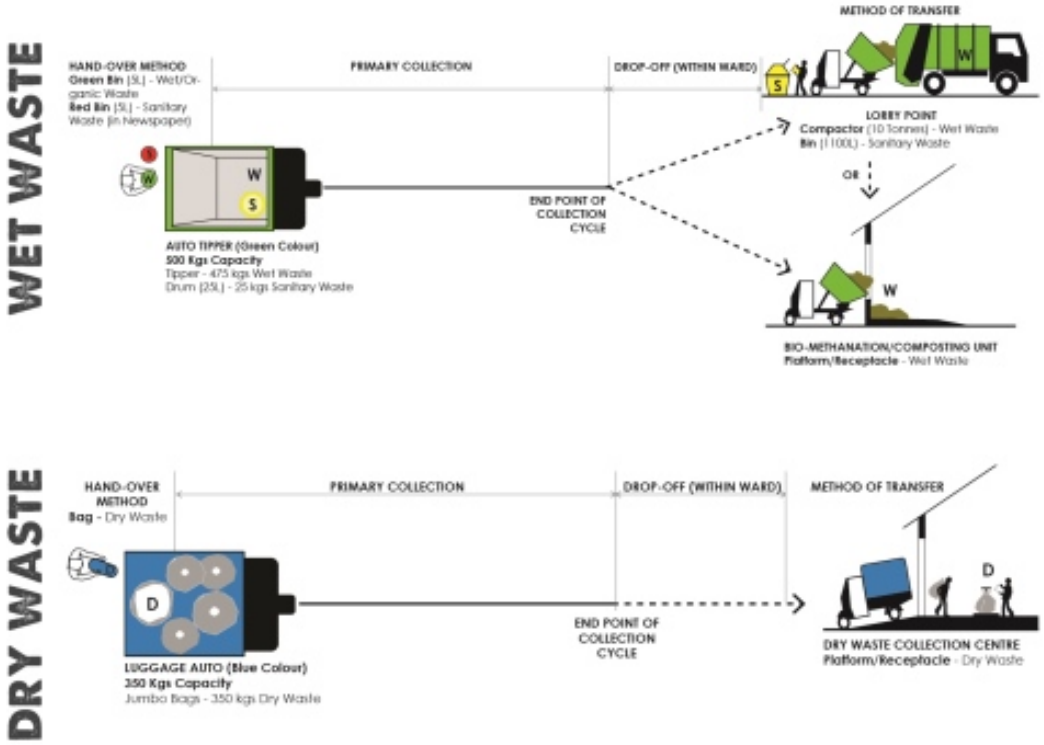
DATA DRIVEN APPROACH FOR ESTIMATION & PLANNING

2

MSW has suffered the one size fits all theory & failed.

Lack of any reliable data to plan or estimate has been lacking & hence Bengaluru has conducted studies to establish scientific standards. We have normative standards now for coverage, generation, hand-over method & process of collection & transfer. These vary based on the generator typology and the stream of waste collected. This therefore allows for accurate planning & estimation.

This then led to the new tender approach which channelised collection into two cycles - Wet & Dry. Data was also collected from ward officials to capture the realities on ground. A data repository is under way & that will form the basis for performance as well as future investments!



ENABLING MARKET DYNAMICS

3

A key requirement to improve the state of SWM is the need to professionalize the sector by opening it up like IT or Renewable Energy! This required a mechanism to link bulk generators with authorized empaneled service providers. Kasa Vilavaari Seva Dararu was launched with a back-end IT enabled portal to create an open market with accountability. A waste disposal accounting method is envisaged to ensure a transparent system of reporting of segregated waste handled by the individual generator.

PUBLIC NOTIFICATIONS

Empanelment of Service Providers for Bulk Waste Management in Bengaluru
Bulk Generators to handle their own waste

IN-SITU WASTE MANAGEMENT **20%**

VENDORS EMPANELED **120**

40% BULK GENERATORS
CONTRIBUTION TO CITY QUANTA

- HOSPITALS
- HOTELS
- RESTAURANTS
- GOVT. OFFICES
- RELIGIOUS INSTITUTES
- EDUCATION INSTITUTES
- GATED COMMUNITIES
- APARTMENTS
- MALLS
- CORPORATE CAMPUSES
- IT TECH PARKS

INTERFACE: IT PORTAL (B2C)

WASTE STREAMS

- DRY WASTE
- WET WASTE
- SANITARY
- E-WASTE
- COCONUT
- ANIMAL
- LEAF
- OTHERS

EMPANELED VENDORS

- COLLECTION/TRANSPORT
- AGGREGATION
- PROCESSING
- SYSTEM FOR IN-SITU
- REJECTS (LANDFILL)
- INTEGRATED SERVICE PROVIDERS

Normative standards for pricing

WAKE UP, CLEAN UP BENGALURU!

4

BLACK SPOT ELIMINATION & CLEAN-UP DRIVES

EXPERIENCING A LANDFILL IN YOUR BACKYARD

POWER NASHTAS - 100 CORPORATES ON BOARD

EDUCATING CHILDREN THROUGH ACTIVITIES

12000
PARTICIPANTS
residents, school children, experts, government officials, etc.

7
DAYS
of workshops, activities, meetings & education

68
EXHIBITORS
demonstrating technology & processing options

A seven day expo to educate citizens. Raising awareness amongst students, apartments, corporates, hospital administrators, Pourakarmikas, & decision makers to segregate, reduce & recycle. Unleashing the power of the Collective to set in motion a focused time-bound action plan.

STREET PLAYS STRESS THE NEED FOR SEGREGATION

CITIZENS PLEDGE FOR A CLEAN BENGALURU

USE OF TECHNOLOGY FOR MONITORING

5

GIS
MAPPING

Using Census 2011, Property tax & field data, enabled the spatial mapping of generators, infrastructure, routes & specific needs of wards, which help in precise estimation. These also become base maps for route mapping and enable monitoring.

GRIEVANCE REDRESSAL
& CITIZEN MONITORING

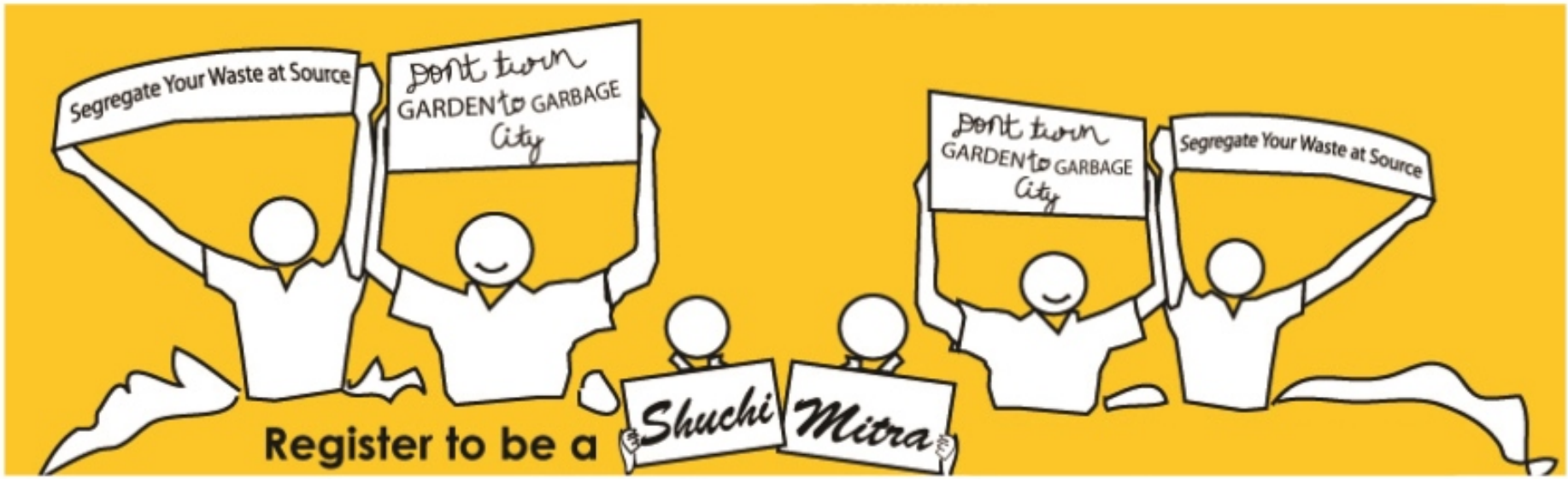
BBMP has a web enabled interactive platform to record multiple complaints made through various modes including social media & an in-built back-end system integrating multi modal technologies to trigger a redressal mechanism with escalations defined for non-compliance.

CONTROL
ROOM

Control room would act as a hi-tech center that will enable route monitoring, coverage mapping, citizen complaints, attendance record & vehicle tracking to ensure transparency, efficiency & accurate payment.

CAPACITY BUILDING & GOVERNANCE REFORMS

6



CITIZEN VOLUNTEER PROGRAM

SHUCHI MITRA

As friends of cleanliness, these Citizen Volunteer s have defined geographical foot print & clear roles which can be used as input for performance of duties allocated for the contractor. They are also the bridge to other skeptical residents to resolve issues. The report is then used for third party checks to release payments.

INTEGRATING THE INFORMAL

SAMARTHA INITIATIVE

Bengaluru has an estimated 15,000 rag pickers & a robust kabadiwalla & scrap dealer network. ID Cards have been issued to around 5000 rag-pickers in the city. Intensive training, re-skilling & other efforts have been made to ensure better hygienic work conditions in addition to access to financial instruments.

INSTITUTIONAL CAPACITY & GOVERNANCE REFORM

SWM CELL

The SWM Cell is a structure set up within the BBMP dedicated to efficiently manage MSW. In addition to this the High Court & GoK constituted an Expert Committee that is supporting the government & citizens to achieve one goal - that of a clean city.

एक कदम स्वच्छता की ओर

SWACHH BHARAT IN ACTION

A CITY ALIGNED WITH THE NATIONAL MISSION

- Comprehensive Plan & Strategy
- Behavioral change & IEC
- Enabling environment for Private sector participation
- Capacity building
- Integration of Special focus groups

CREDITS:

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