Presentation on Solid Waste Management in GHMC

Presented to IAS Officers at MCR

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GHMC

GHMC

MCH transformed into GHMC in April 2007 by merging 12 municipalities and eight gram panchayats

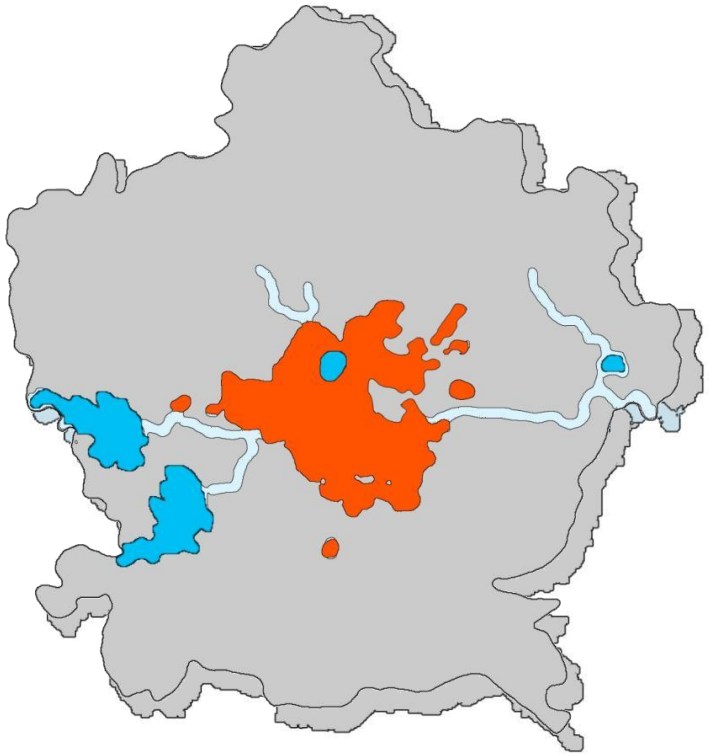
Area is 625 km^2 which is geographically bigger than many of the Asian countries

Limits cover 0.28% of the State's geographical area

Witnessed unprecedented economic growth over the last decade due to emerging as a hub for many IT and ITes

Hub for National and Multinational companies attracting qualified people from all over the country and the World

Growth of the City



Year – 1687, Area – 32 sq km

Year – 1787, Area – 53 sq km

Year – 1887, Area – 69 sq km

Year – 1959, Area – 149 sq km

Year – 1990, Area – 463 sq km

Year – 2010, Area – 625 sq km

Population has increased from 0.2 m in 1750 to 8.46m in 2011

- No. of Zones: 5
- No. of Parliamentary Constituencies: 5
- No. of Election Wards: 150

No. of Circles: 24

No. of Assembly Constituencies: 24

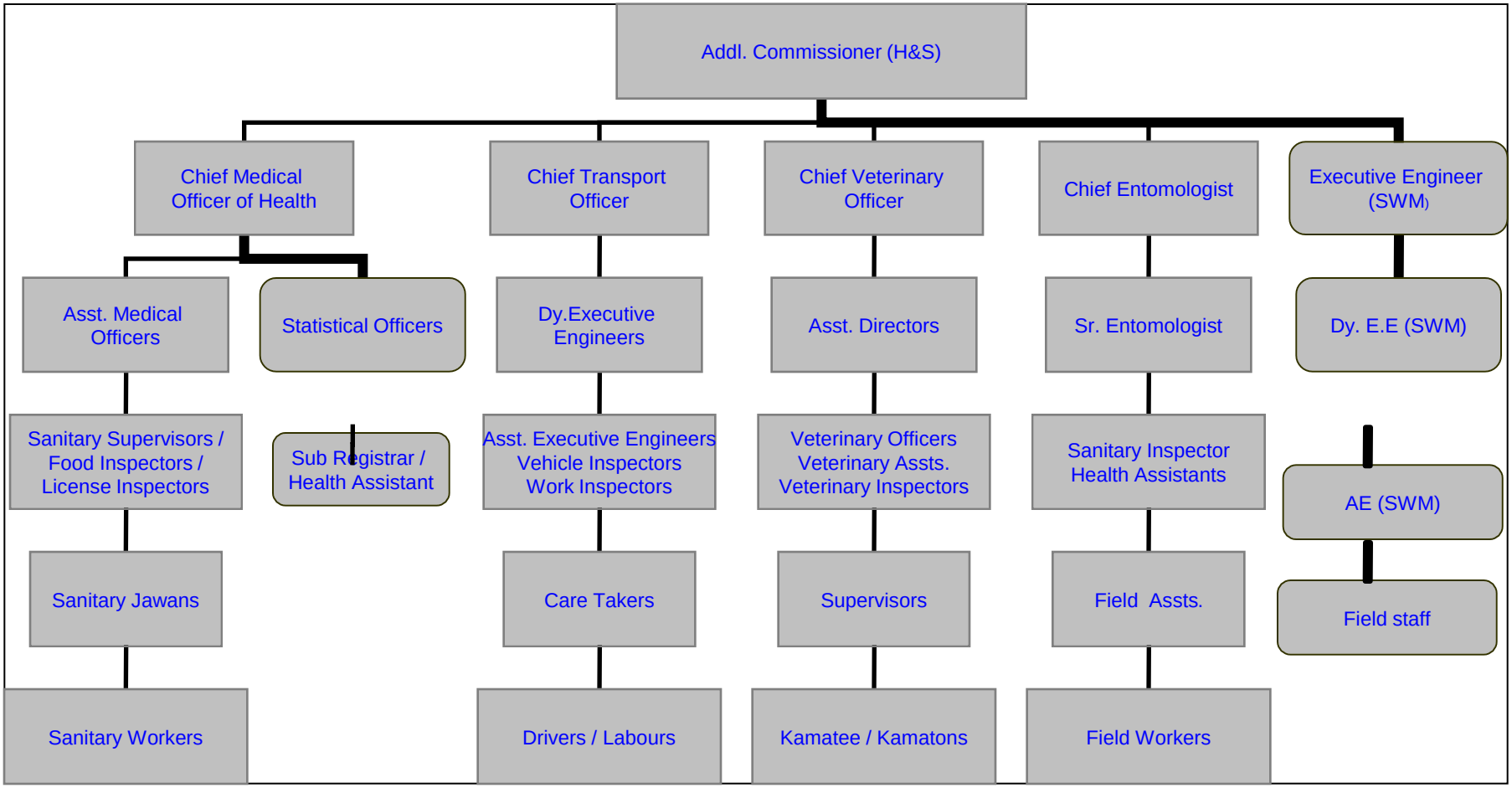
MSW Generation: ~ 5000 TPD

GHMC Budget 2012-13 to 2015-16

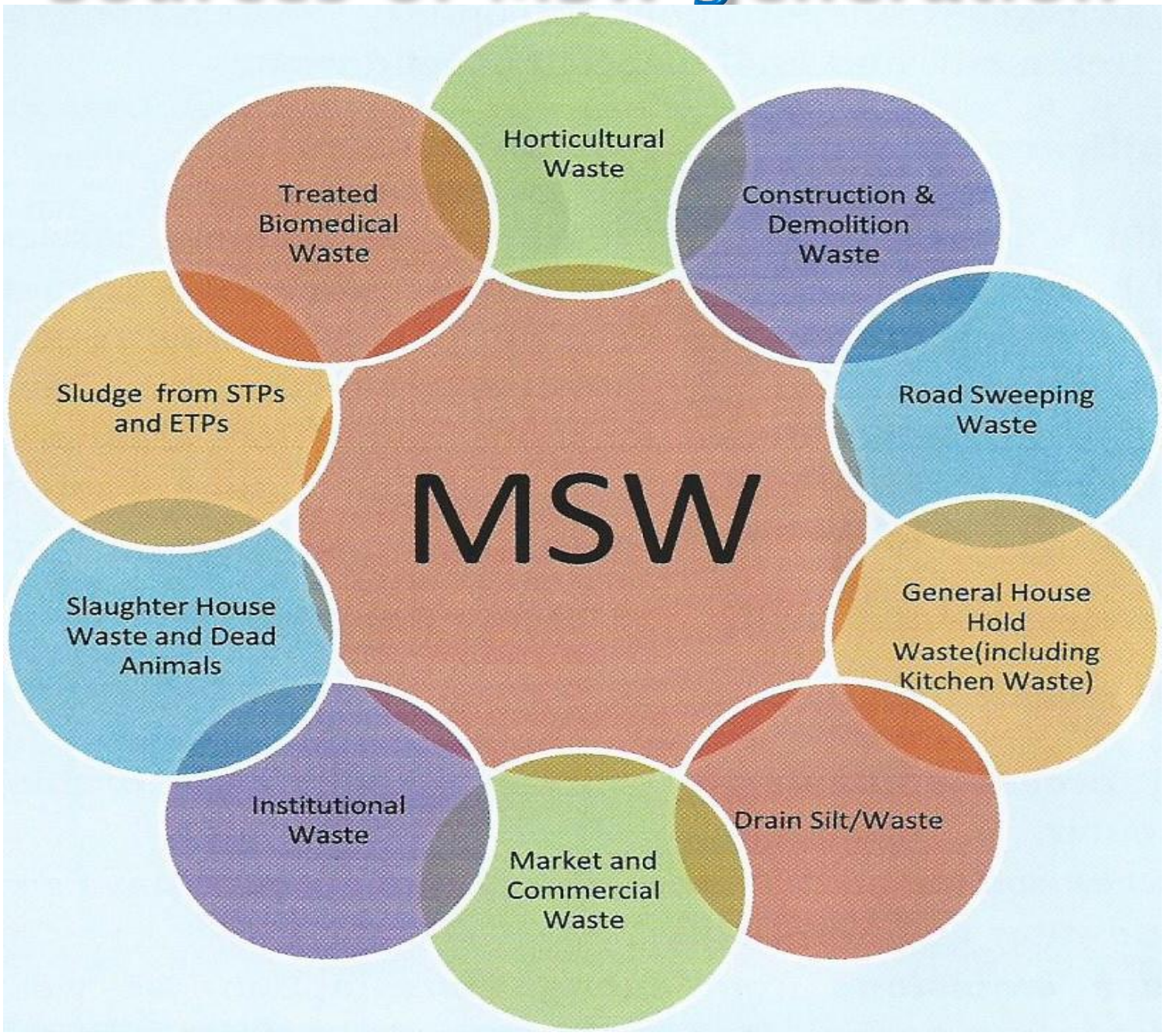
Rs. in Crores

Head of Accounts	Actual 2012-13	Actual 2013-14	Actual 2014-15	Budget 2015-16
Revenue Income	1,915.48	2,196.70	2,357.35	2,578.00
Revenue Expenditure	1,257.59	1,370.08	1,472.44	1,732.00
Revenue Surplus	657.89	826.62	884.91	846.00
Capital Receipts	617.01	419.89	808.74	3,818.00
Capital Expenditure	697.10	1,028.71	1,357.79	3,818.00
Total Budget (Revenue Expenditure + Capital Expenditure)	1,954.69	2,398.79	2,830.23	5,550.00

ORGANISATION SET UP OF HEALTH & SANITATION



Sources of MSW generation



Reasons for MSW generation

- Rapid urbanisation
- Rise in population
- Change in life styles
- Rise in household income
- Use and throw culture
- Increase in consumerism
- Emergence of shopping malls and super markets

WASTE GENERATION IN GHMC

Year	2009	2011	2016
Population (in lakhs)	74.76	84.86	90.14
Waste Quantity (TPD)	3800	4393	5100
Waste Qty (TPD) (including C&D Waste)	4350	5030	5850

Present per capita generation : 508 gms/ day

GHMC – PRESENT SCENARIO

- **Clean swept roads**
- **Partly mechanised sweeping**
- **Pin point programme for lifting of dumper bins**
- **Night sweeping of main roads**
- **Out sourced activities**
- **Marching towards clean city**

GHMC – PRESENT SCENARIO…

- No segregation of waste at source & insufficient collection points
- Absence of public awareness on solid waste management, significance of recycling, reuse and of MSW
- Direct handling of waste leads to spilling and various infectious & safety problems - waste workers most vulnerable
- Recyclables including newspapers, plastics and metals are collected by rag pickers
- Secondary collection through Dumber Bins
- Transportation of waste up to Transfer Stations through Dumper Placers and open Tippers
- Most of vehicles are old and suffer with frequent breakdown
- Transfer Stations with poor infrastructure – Safety & Hygiene issues

SANITATION

COMPONENTS OF SANITATION

- SWEEPING
- COLLECTION OF WASTE
- TRANSPORTATION OF WASTE
- DISPOSAL OF WASTE

SANITATION - SWEEPING

- (3) Shifts Sanitation
- Night Sanitation - 11.00 PM to 6.00 AM
- Day Sanitation - 06.00 AM to 2.00 PM
- Afternoon Sanitation – 2.00 PM to 10.00 PM

Details of Sanitation Workers

- Sanitation Workers Group (SWG) implementing from 01.06.2012.
- No. of (SWG) at present – 2626 with 7 members in each group
- OSRT (Off Site Real Time) through mobile phone cameras – started from Oct'ber 2010 for close monitoring
- No. of outsourcing -- 18382 nos.
- No. of regular employees –2588 nos.
- Payment for (1) SWG – Rs. 1,03,565/- per month (@14,795/- each) {w.e.f 16.07.2015}
- (1) Supervisor for (3) SWGs is called – Sanitation Field Asst. (SFA) -- 948 nos. – Rs.15,386/- + Rs.1000/- allowance and one OSRT mobile phone

  (including Employee Provident Fund(EPF) – 13.61% & Employee State Insurance (ESI) – 4.75%)

Details of Vehicle Fleet

Particulars	GHMC	Hired
Dumper Placer	151	28
6 Tonners	145	11
25 Tonners	41	46
10 Tonners	51	0
JCB	11	13
BOBCAT	12	11
Big Compactors	08	0
Sweeping Machines(Small) 1 Cum Hooper capacity	25	0
Sweeping Machines(Big) 6.5 Cum Hooper capacity	06	0
Front end loaders	10	0

Sanitation Photos - Night

Sanitation Photos - Day

SWEEPING MACHINES

SWEEPING MACHINES

GHMC – PRESENT SYSTEM OF COLLECTION & TRANSPORT

Leachate leaking from dump sites polluting water bodies

MSW Rules, 2000

Realizing the seriousness of the problem of waste management, the Supreme Court of India directed the GoI to regulate the management and handling of waste scientifically with a minimum impact on the environment

1996 PIL filed in the Supreme Court against State Governments and Municipal authorities their failure in managing the MSW by Mrs.Almitra Patel.

→

Govt. of India notified the MSW Rules in September, 2000 under EP Act, 1986 and these rules are called as MSW (M&H) Rules, 2000 applicable to all the ULBs.

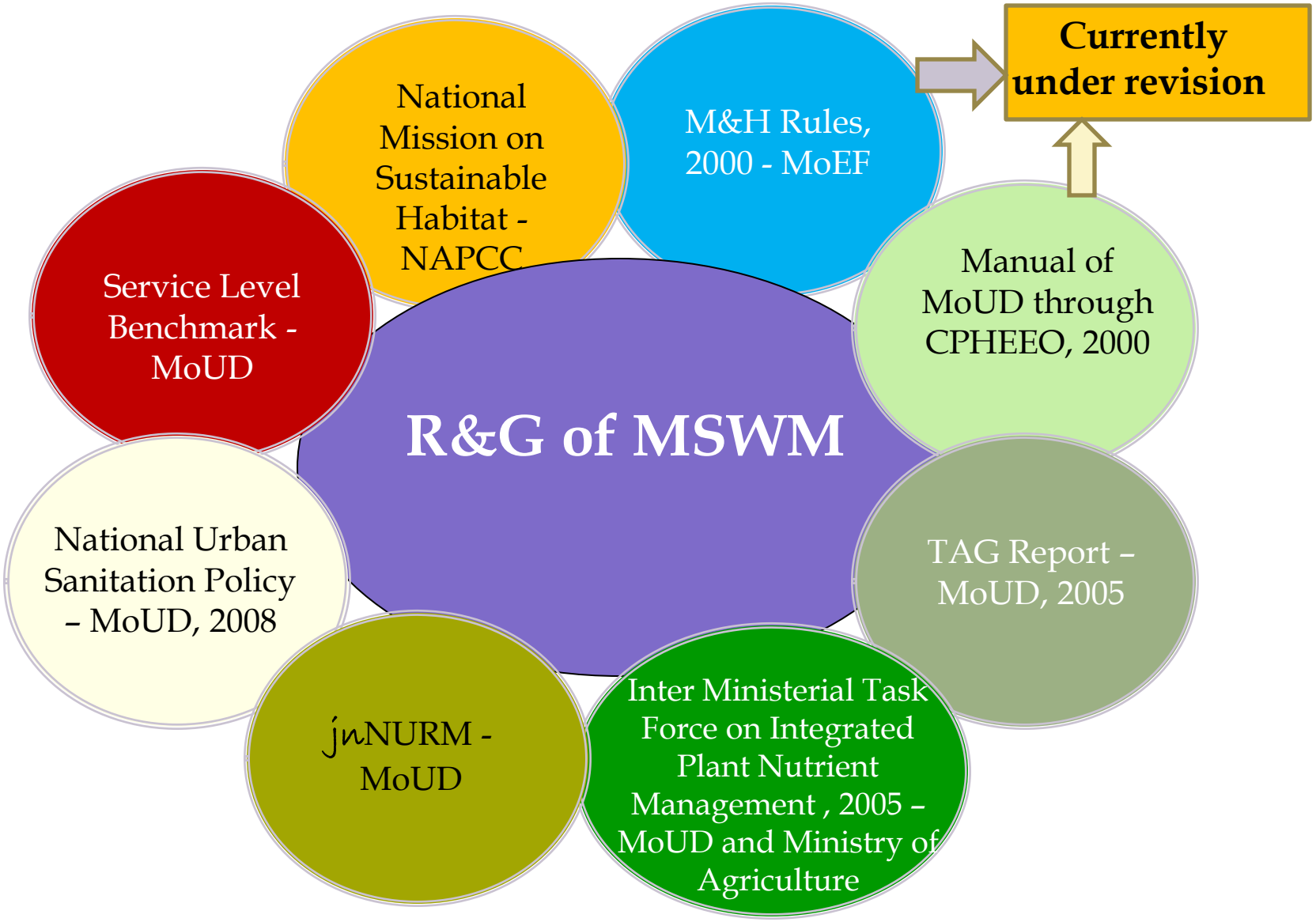
Schedule I – Implementation Schedule by 2003

Schedule II - Compliance Criteria -- Collection , Segregation, Storage, Trarsportation , Processing & Disposal of MSW

Schedule III - Specifications for landfill sites -- Life to be 20-25 years away from habitation clusters, forest areas, water bodies monuments, National Parks, Wetlands and places of important cultural, historical or religious interest , 20 kms away from Airport & Buffer Zones to be maintained.

Schedule IV – Standards for composting treated leachates and incineration

Important Rules and Guidelines for MSWM



GHMC's efforts on MSWM to comply with the MSW Rules, 2000

- Making serious efforts since 2000 to keep the city clean by way of -
  - Out sourced the sanitation work upto 75%
  - Taken up voluntary garbage disposal schemes in association with RWAs
  - Commissioned a separate collection system of waste from bulk waste generators
  - Unit system with contract
  - Set up WTE and vermi-composting plant as early as 2000
  - Presetnly GHMC generating around 5000 TPD and has the potential to produce 91 MW power. This will substituted the coal 10,12,526 tons per year

Situation Before 2010 at Jawaharnagar

Dump at Compost Plant Area

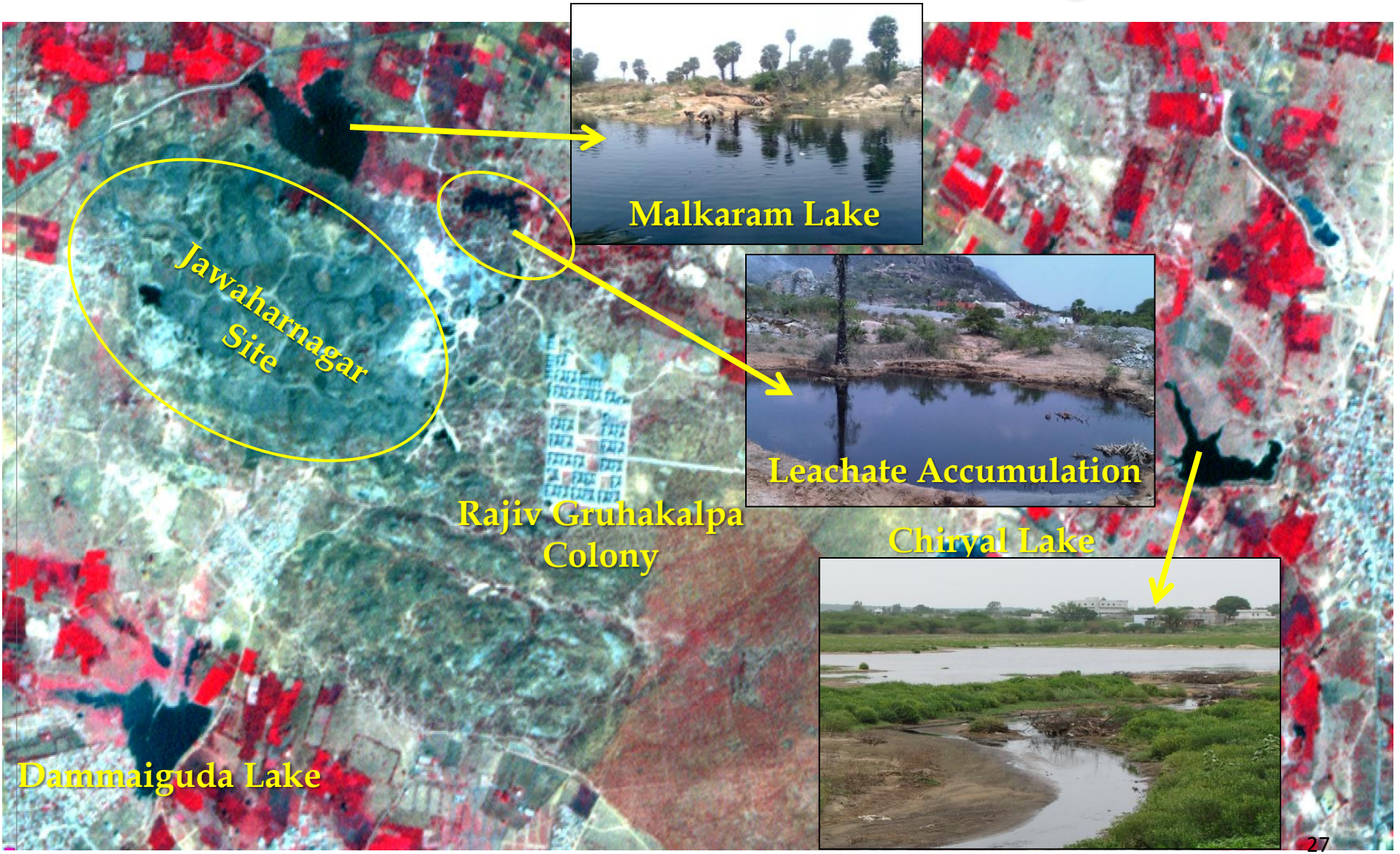
Burning of Waste

Situation Before 2010 at Jawaharnagar

Polluted Malkaram Lake

Uncontrolled flow of Leachate

Situation Before 2010 at Jawaharnagar



Need for IMSWM

- GHMC is not able to meet the compliance standards prescribed in MSW (M&H) Rules, 2000 – for the last 13 years
- Public out cry on the open dumping
- Legal interventions
- Land scarcity
- Problems in land acquisition
- Arrest further environmental degradation due to open disposal
- Enhance the asthetic value of the city
- Creating healthy environment for the people to live in
- GHMC spending around Rs. 1200 – 1500 TPD for collection, transportation and open disposal
- MSWM remains one of the most neglected area of urban development services

IMSWM project on PPP mode

- GHMC decided to implement an environmentally sustainable and socially acceptable project which would scientifically collect, transport, process and dispose of MSW through PPP mode
- Carried out competitive bid process for identification of a private developer as per the existing rules in force
- REEL has been selected as Concessionaire
- Executed CA between GHMC and REEL on 21.2.2009
- Term of the project is 25 years from the date of CoD – T&D and extendable thereafter on a mutual agreement of both the parties
- Post closure period of landfill is for 15 years after expiry of the active landfill period of 25 years

Reasons for opting PPP mode

- Easily hire the qualified staff and pay salaries as per demand
- Adjust the salaries and bonuses based on performance
- Easy for termination of employees in case of unsatisfactory service
- Effective administration with less bureaucratic delays
- Clear job responsibilities
- Faster in decision making
- Easy access to financial, technology and experties
- Flexibility to adopt the technology
- Full cost accounting and incentive for a lower unit cost
- Less bureaucratic and political influence

Scope of IMSWM project

- The Concession Agreement signed on 21st February, 2009
- Project scope
  - Door to door Collection
  - Secondary Transportation up to Transfer Station
  - Transportation from Transfer Station to Treatment & Disposal Site.
  - Treatment & Disposal at allotted Site.
  - Transfer Stations
    - Upgradation & Management of existing 3 Transfer Stations
    - Construction of 5 New Transfer Stations
  - Reclamation and Alternative Use of Existing 4 Dump Sites.
  - IEC with an objective of achieving dustbin free city
  - Interfacing with existing organised and un organised waste collection and management system

Scope of IMSWM project

- Up-liftment of Transfer Stations
  - Imlibun Transfer Station
  - Tankbund Transfer Station
  - Yousufguda Transfer Station
- New Transfer Stations
  - Kapra
  - Uppal
  - Kukatpally
  - Sherilingamaplly
  - Rajendra Nagar

IMSWMP advantages

- Compliance with MSW Rules, 2000
- Protection of human health and environment
- Convert the waste into wealth
- Employment generation
- Reduce the land requirement
- Attract the tourists and investments
- City looks clean, green and safe to live
- Hyderabad become environmentally sustainable and livable city with low carbon growth
- Model is replicable and scalable for elsewhere in the country

The project

- Weigh Bridge Plaza
- Waste Receiving Platform and Pre-Segregation Facility
- Compost Plant
- Coconut shredding Unit
- Plastic bailing Unit
- Recyclables Processing Unit
- RDF Storage Unit
- Scientific Landfill
- Leachate Storage and Treatment Facilities
- RDF Manufacturing(Under development)
- Waste to Energy(Under development)

The project

Contd.

The supporting infrastructure like .

- Internal approach roads
- Administrative Building
- Laboratory
- Canteen
- Workers Change Rooms and Toilets
- Material Stores
- Maintenance Facilities for Vehicles and other mechanical equipments
- Vehicle Wash Facility
- Transformer Yards – 2Nos (Power supply of 800KVA and 200KVA)
- DG and Electrical Panel Room

The project

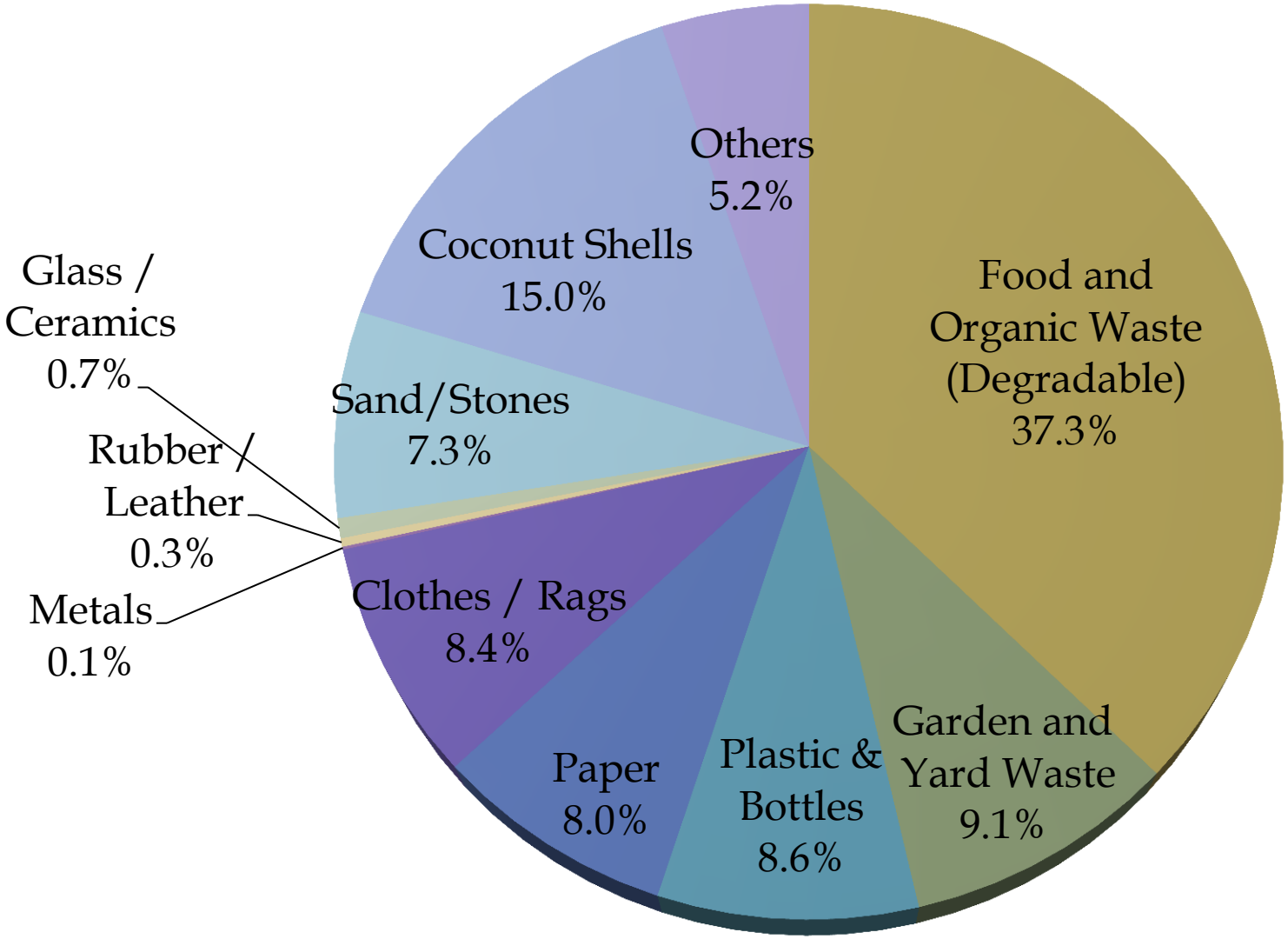
Contd.

- Reception and Weighment
- Pre- Segregation / Sorting
- Composting (through Biological Processing)
- Waste to Energy (Thermal Processing)(Proposed)
- Leachate Management
- Landfill (Disposal of Rejects / Process Inerts)
- Laboratory (Waste Characterization, Compost Quality)
- Environmental Monitoring

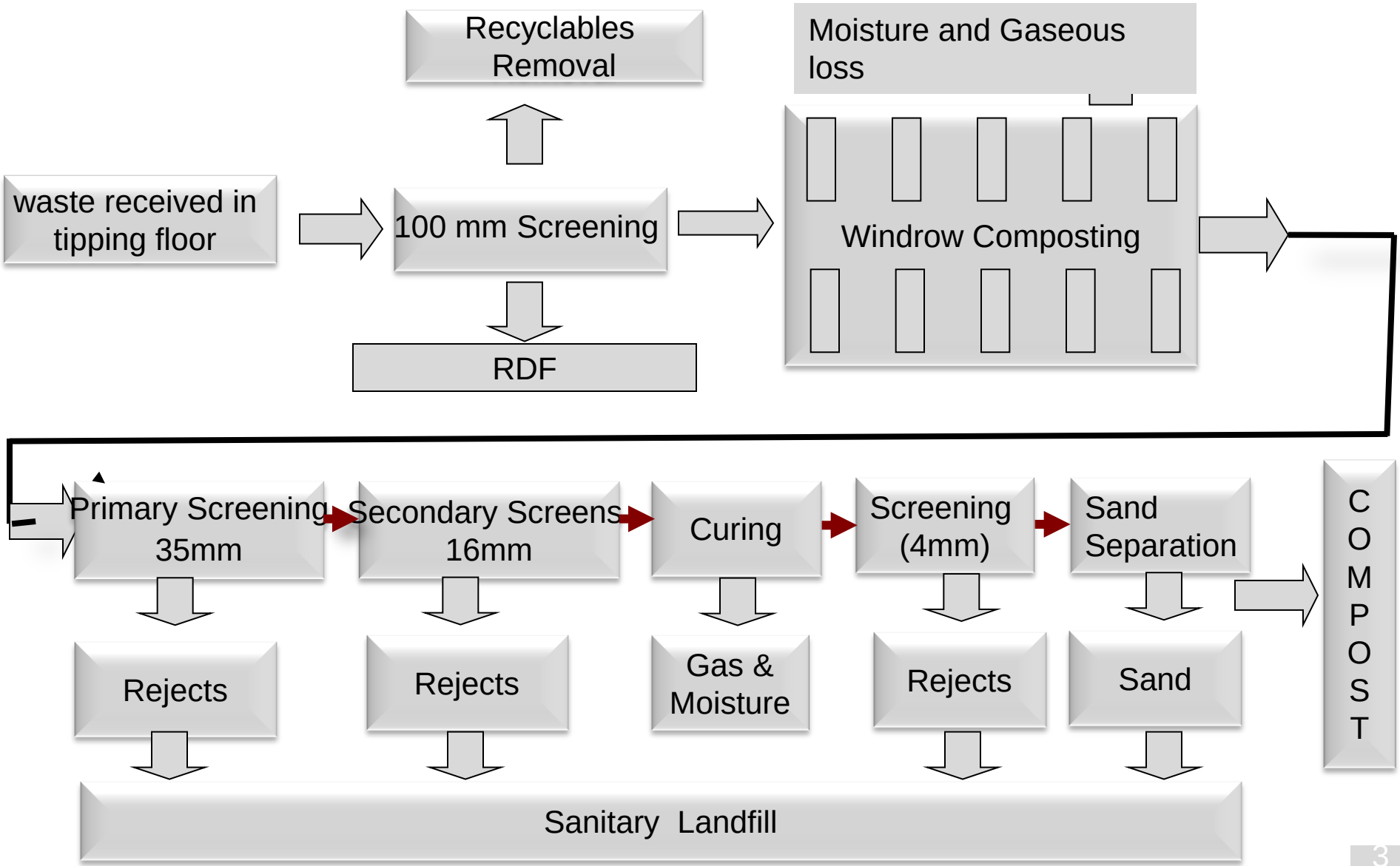
MSW Weighment

- Weigh Bridges operate in 3 Shifts
- Each weigh bridge capacity is 50 MT
- 4 Weigh Bridges Commissioned
- Registering and Weighment process is carried with the help of fully automated software to synchronize the data logged in different weighbridges

Waste Characteristics of the MSW Received at Jawaharnagar



Compost Operations Flow Chart



Pre – Segregation / Sorting

Waste Receiving

- Weighed consignments will be unloaded at Waste Receiving Platform
- SFRC paved platform developed in the area of 5000 Sq.mts (i.e 5 days MSW storage capacity).

Pre – Segregation / Sorting

Pre – Sorting

- MSW segregated through mechanical sorting machinery and machinery Consists with
  - Feed conveyor
  - Trommel (100mm dia)
  - Unders and Overs conveyors
  - Manual Sorting conveyor
- Having 2 sections with 6 machines (Capacity of each ~30 ton / hr)
- Material passed through 100mm dia is sent to Windrow through unders conveyor

Manual Sorting

- Recyclables will be recovered from the material passed on Manual sorting conveyor through semi mechanical process.

Re-cyclable Sorting

Sorted Recyclables

Compost

Composting process takes place in various stages like

- Windrow (Aerobic decomposition)
- Coarse Segregation (through 35 and 16 mm Trommel) .
- Curing and Refinement
- Blending and Packing

Windrow (aerobic decomposition)

- Windrow is the piles / heaps formed in rows for aerobic decomposition.
- Aerobic decomposition is controlled aerobic microbiological process that decomposes organic matter into carbon dioxide, water, minerals and stabilized organic matter
- Impermeable Platform developed with SFRC in the area of 28,125 sqms

- Windrow Composting done in 2 stages
  - Windrow formation
  - Windrow Turning
    - ✓ Each turning made on 6th day of formation / previous Turning (Total 3 turnings)
- Decomposed material shifting to Monsoon Shed (Aprox. after 26 days)

Monsoon Section & Coarse Segregation

- Decomposed material allowed 7 – 10 days for natural drying / removal of moisture in a covered shed
- Monsoon section built with PEB sheds in the area of 9000 sqm .
- Section consists of 3 Nos of mechanised coarse segregation machinery with 35mm and 16mm Trommels.(Capacity of each machinery is ~30 ton/hr)

Monsoon Section

Coarse Segregation Machinery

Monsoon Section & Coarse Segregation

Contd.

- Each machinery consists with
  - Feed conveyor
  - Trommels (35 & 16 mm dia)
  - Unders and Overs conveyors (Each 2 Nos)
- Material passed through 16mm trommel sent to curing section
- Material retained in the 35 & 16 mm screen sent for Disposal in Landfill

Material Before Screening

35 & 16mm Rejects

Curing and Finishing

- Curing is an essential stage of the composting process and important in terms of compost stability and maturity.
- Coarse segregated material allowed 10 – 15 days for curing
- Curing section built with PEB sheds in the area of 7875 sqm .

- Cured material passed through Finishing machinery with 4mm screen.
- Section consists of 3 Nos of mechanized finishing machinery with 4mm Trommels.(Capacity of each machinery is 15 ton / hr)

Blending and Packing Section

- Finished product will be added with additives to get the comost with required quality
- Blending and Packing shed built in the area of 9000 sqm

Coconut Shredding

- Coconuts are being used for production of coconut fibre and coir pith and generating 15 ton per day (i.e; the total coconuts receiving in incoming garbage)

Recyclable Processing

- Plastic recyclable shed of capacity 5 TPD have been installed at the site to convert the plastics to pelletes. Though the civil works were going on the production has been started.

RDF Storage

- Material retained in the pre-sorting machinery (>100mm) will be used as RDF for thermal process.
- Generated RDF material is being stored in the HDPE lined storage units build in an area of 3 acres

- RDF will be used at various thermal processes like Cement Kilns, Power Plants and other Boilers.
- To use the material in various industries, getting permissions from APPCB is under process for
  - M/s. Vasava datta cements
  - M/s. Zuari cements
  - M/s. Bharathi cements

Waste to Energy (Thermal Processing)

- Propose to build waste-to-energy plant using the state of the Pusher Grate technology
- Based on waste characteristic assumption, the plant is capable to produce ~ 48 MW of renewable power
- Sophisticated air pollution control (APC) system for treatment of flue gases
- Continuous online monitoring of air emission will be included
- Reduce volume of waste up to 90% which leave only 10% of inert / ashes need to be land filled

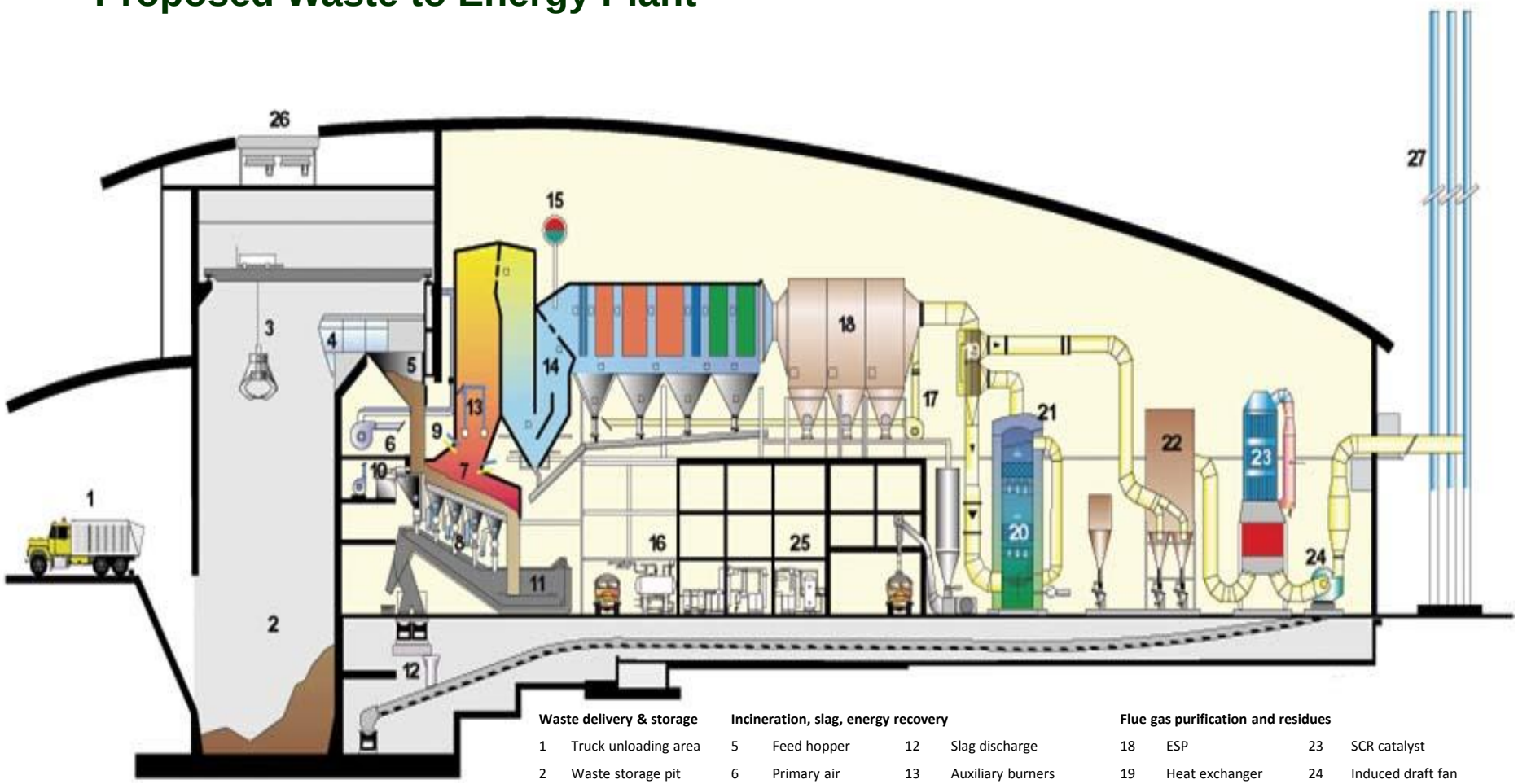
Waste to Energy (Thermal Processing)

Contd.

- The combustion process destroy all odour-emitting substances in the waste
- Conversion of bottom ashes into bricks or construction materials
- Recovery of metals through magnetic separation from bottom ashes
- Control room with PLC controlled system
- Dual-fired boiler – MSW and Methane Gas

Waste to Energy (Thermal Processing) Contd.

Proposed Waste to Energy Plant



Waste delivery & storage

1	Truck unloading area
2	Waste storage pit
3	Overhead crane
4	Crane operator pulpit

Incineration, slag, energy recovery

5	Feed hopper	12	Slag discharge
6	Primary air	13	Auxiliary burners
7	Pusher Grate	14	Steam generator
8	Air distribution	15	Steam drum
9	Secondary air	16	Condensate tank
10	Ram feeder	17	Flue gas recirculation
11	Wet deslagger		

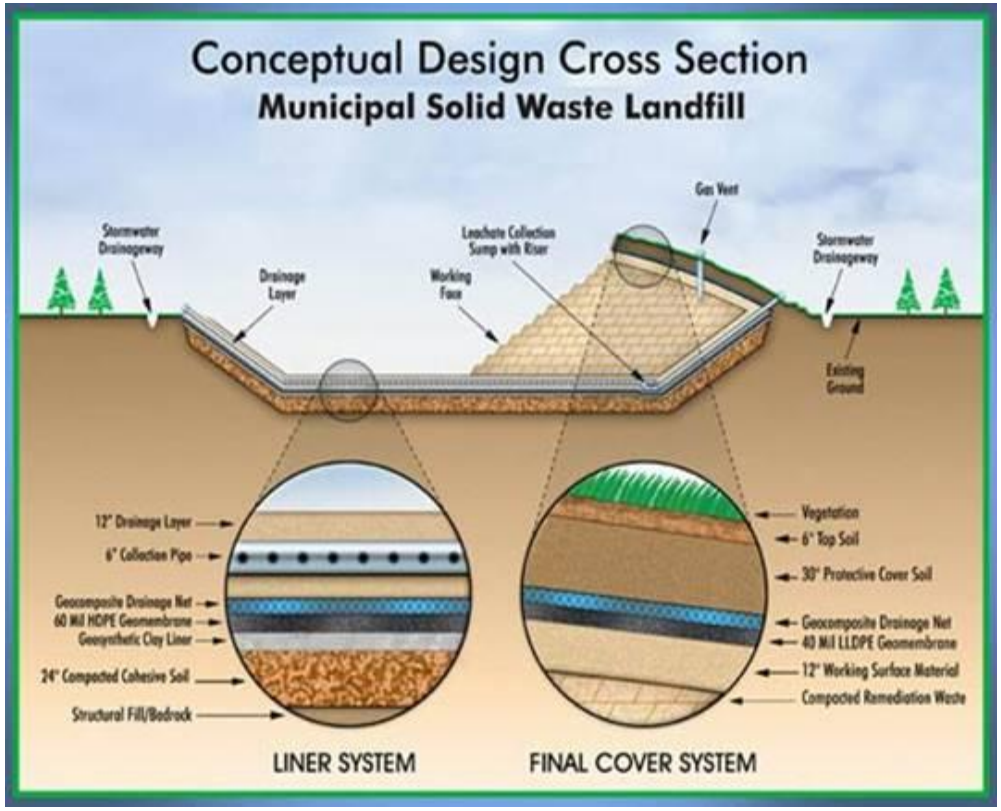
Flue gas purification and residues

18	ESP	23	SCR catalyst
19	Heat exchanger	24	Induced draft fan
20	Acid scrubber	25	Control centre
21	Neutral scrubber	26	Water cooling
22	Adsorbent	27	Stack

Scientific Landfill

- Rejects from the processing like will be disposed in Secured Engineered Landfill to protect the environment.

- Landfill consist of various barriers and leachate drainage media like
  - Clay Liner (900 mm thick ness)
  - HDPE Liner
  - Geo Textile
  - Leachate Drainage Network



Scientific Landfill

Contd.

- Ist phase of Secured Engineered Landfill is constructed in the 4.5 acres to dispose the process rejects and other inert material.
- Landfill capacity developed in modular approach.
- The extension works of the landfill under progress in another 4 acres

Landfill Ready to Receive

Monsoon Cover

Closure / Capping of Existing Dump-yards

Task - 1: Estimation of Waste Quantity

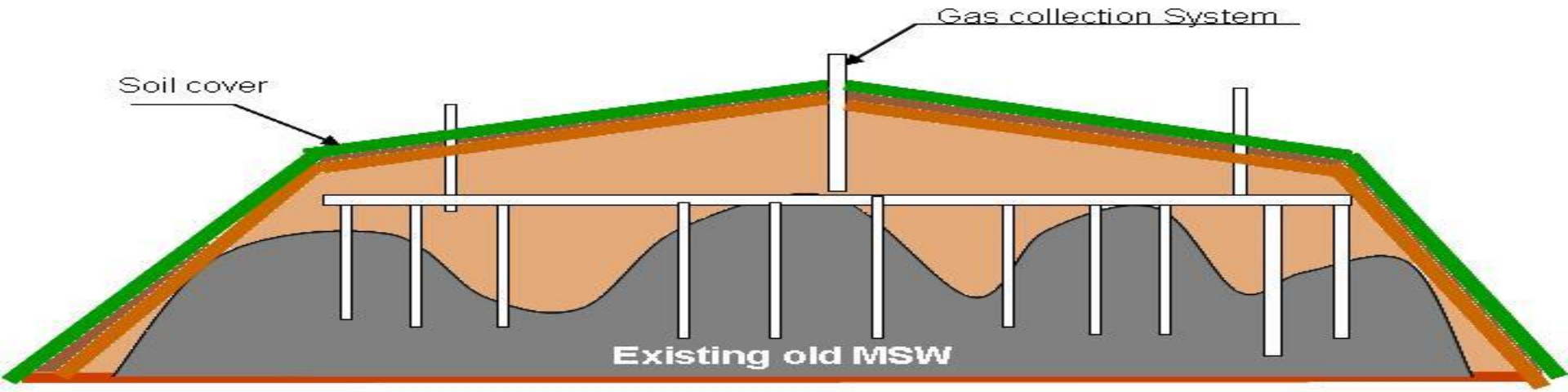
Task – 2: Relocation of waste

Task – 3: Provision of Final Cover System

Task – 4: Drill & Provide gas collection bores for effective flaring

Task – 5: Leachate extraction, collection & Treatment.

Details of Dump Site				
	Name of the Dump site	Available Area In Acres	MSW spread in the Area (Acres)	Accumulated waste at dump site in lakhs of MT
1	**Jawahar Nagar**	**351**	**100.2**	**51.60**
2	**Fathullaguda**	**45.76**	**31.63**	**6.30**
3	**Shamshiguda**	**23.7**	**7.65**	**2.90**
4	**Gandhamguda**	**25.26**	**14.27**	**2.60**
Total		**445.72**	**153.75**	**63.40**



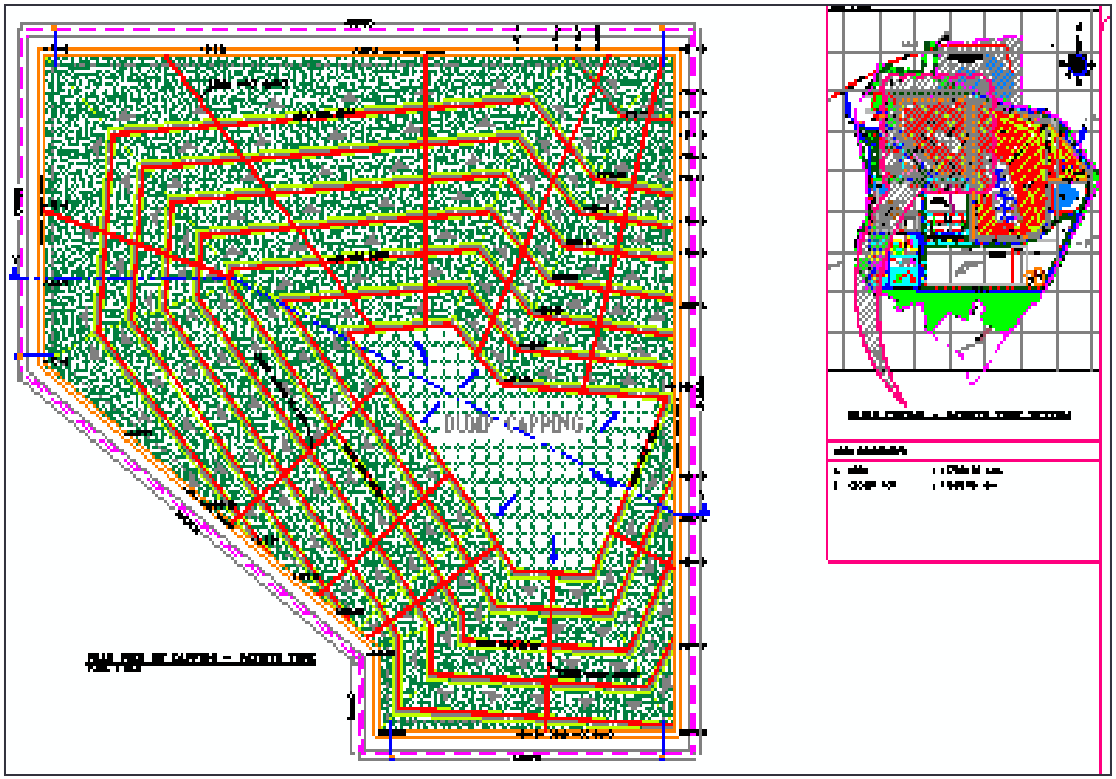
Capping Works

Total Area under the Capping works - 101.20 Acres (including the landfill area)

Area under the Active capping – 73.00 Acres

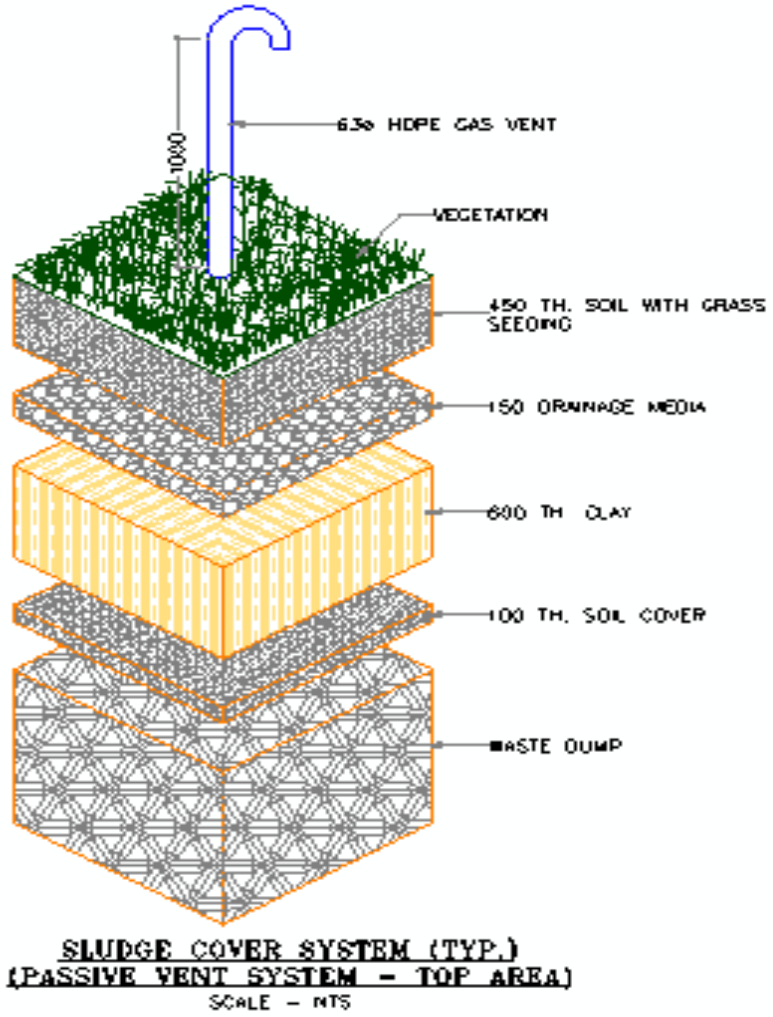
Area under the Passive capping – 28.20 Acres

We are planning to take up passive capping area under the Phase – I consisting of 28.20 acres ~1/3rd of total area



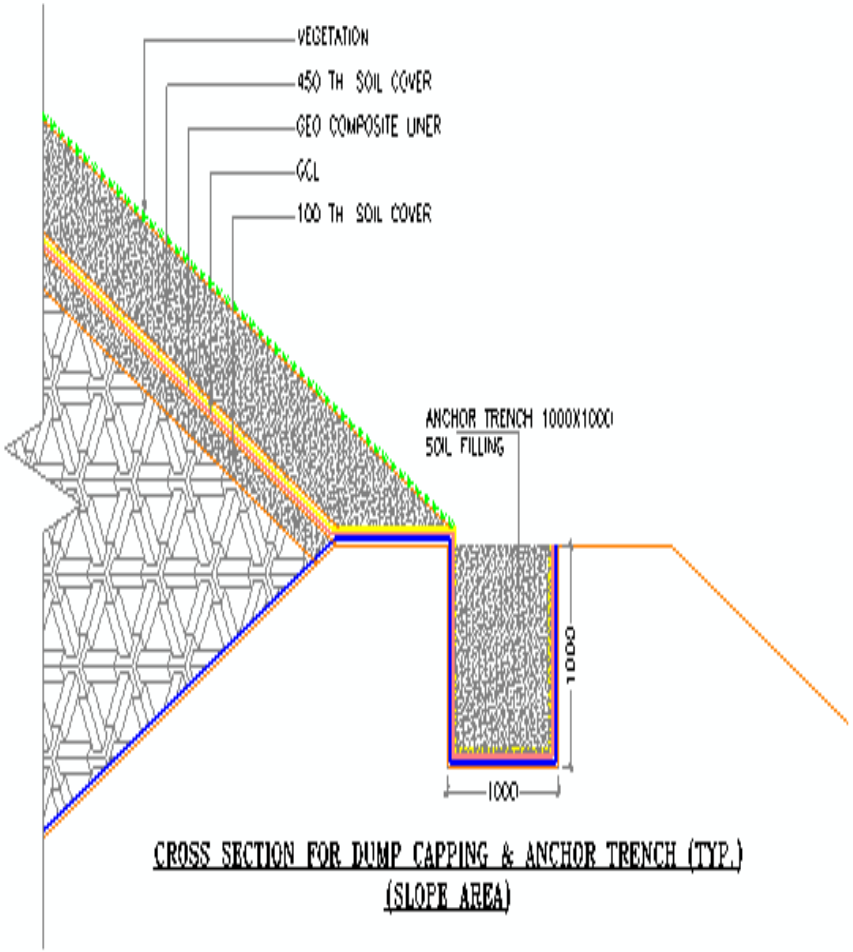
Capping Works

Section of the Passive capping at the top



SLUDGE COVER SYSTEM (TYP.)
(PASSIVE VENT SYSTEM - TOP AREA)
SCALE - NTS

Section of the Passive capping at the slopes



CROSS SECTION FOR DUMP CAPPING & ANCHOR TRENCH (TYP.)
(SLOPE AREA)

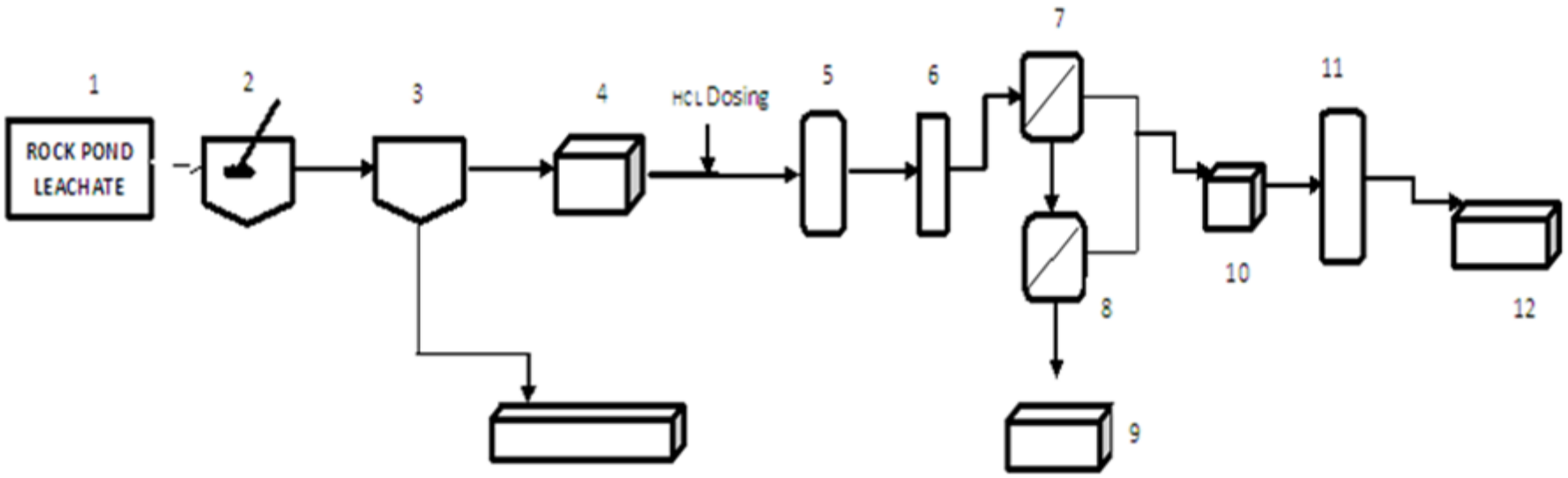
Dump Capping

- Dump Capping works viz., profiling and soil cover are in progress

Outside View

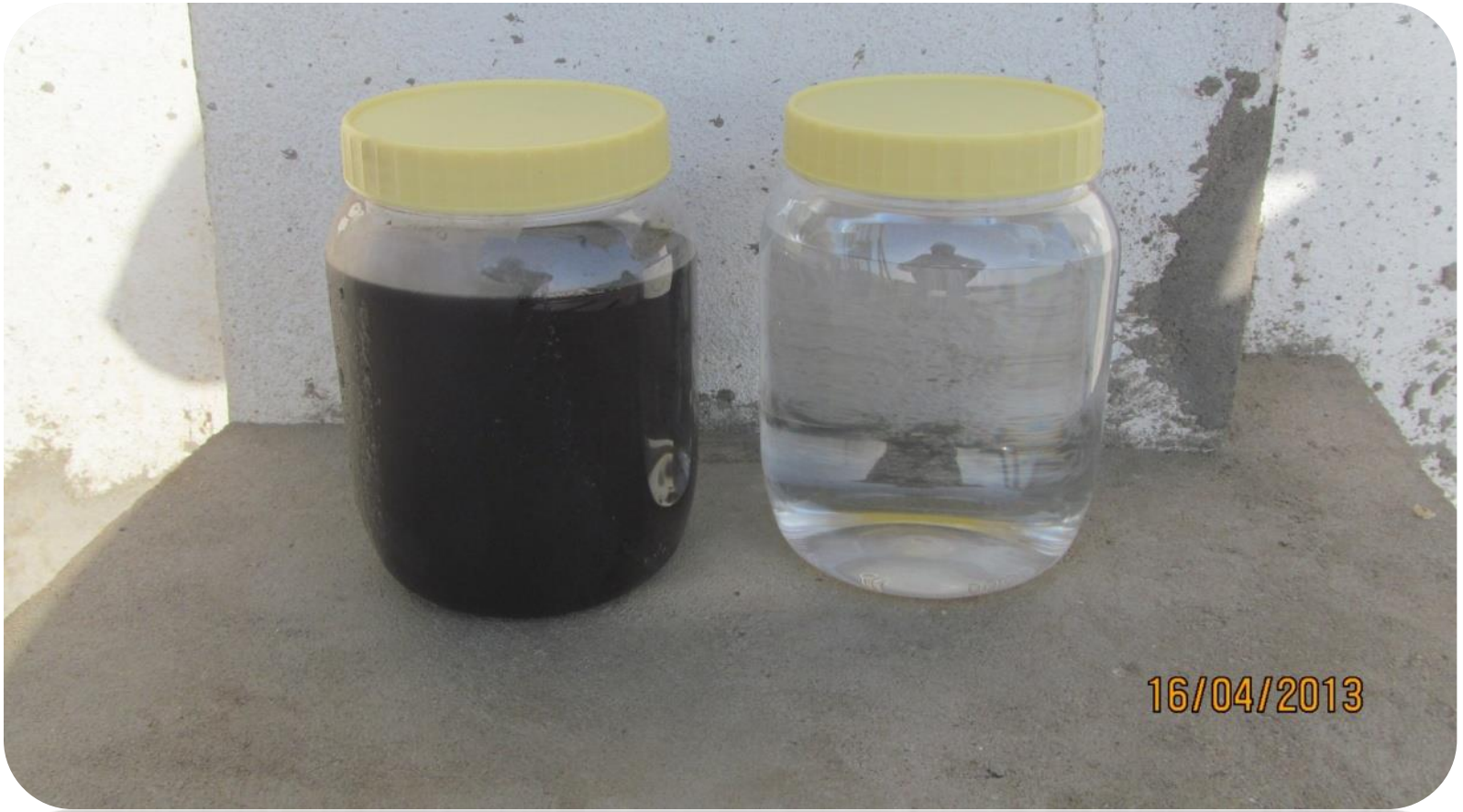
Inside

Process Flow Chart LTP



(1.) Rock Pond Leachate;
(2.) Flash Mixture;
(3.) Lamella Settling Tank;
(4.) RO Feed Tank;
(5.) Sand Filter;
(6.) Cartridge Filter;
(7.) RO Stage I;
(8.) RO Stage II;
(9.) RO Rejection Collection Tank;
(10.) RO Permeate Collection Tank;
(11.) De-gassifier;
(12.) Treated Water.

Inlet and outlet



Raw leachate Treated leachate

Leachate Collection and Storage System

- The leachate storage tanks are constructed at the south east and south west corners of the compost plant to store the leachate generated in the compost plant. The drainage system is established with RCC drains to pass the leachate from the plant to storage tanks.
- The leachate from the landfill is collected in the leachate collection sump of landfill and transferred to leachate treatment pond by means of 15 HP submersible pump.

Leachate Tanks @ Compost Plant

Landfill – Leachate Collection Sump

Leachate Treatment Facility

- Leachate will be transferred to Leachate Treatment Facility for the treatment / aeration
- Leachate treatment facility is established with aeration equipment and the ponds are built with a capacity of 10000 cum

Leachate Spraying on Dump

- The leachate coming from the existing dump is collected at the rock pond and at various ponds near the landfill. The collected leachate is being sprayed on the dump to control of smoke / fire. For spraying around the dump leachate network is established with various pipelines and pump units.
- Pumping units like
  - 100HP Motor at South East Sump
  - 2Nos of 25 HP motors at rock pond
  - 10 HP motor at pond near the landfill

Environmental Quality Monitoring

Environmental Monitoring is carrying as per the CA and MSW Rules 2000

- Ground Water Monitoring
  - Inside the facility - 17 monitoring borewells
  - Surrounding area of the facility - 8 monitoring borewells (3km radius)
- Surface Water Monitoring
  - Surrounding area of the facility - 5 locations (5km radius)
- Ambient Air Quality
  - Inside the facility - 4 locations
  - Surrounding area of the facility 3 locations (5km radius)
- Noise Quality
  - Inside area of the facility - 4 locations
- DG Set stack monitoring
- Leachate Quality

Imliban Transfer Station

Before

After

Kukatpally Transfer Station

Before

After

3D Model of proposed TS at Tank Bund

Entrance Gate and Security

BEFORE

AFTER

Entrance Green Belt

BEFORE

AFTER

Road - Entrance to Weigh Bridge

BEFORE

AFTER

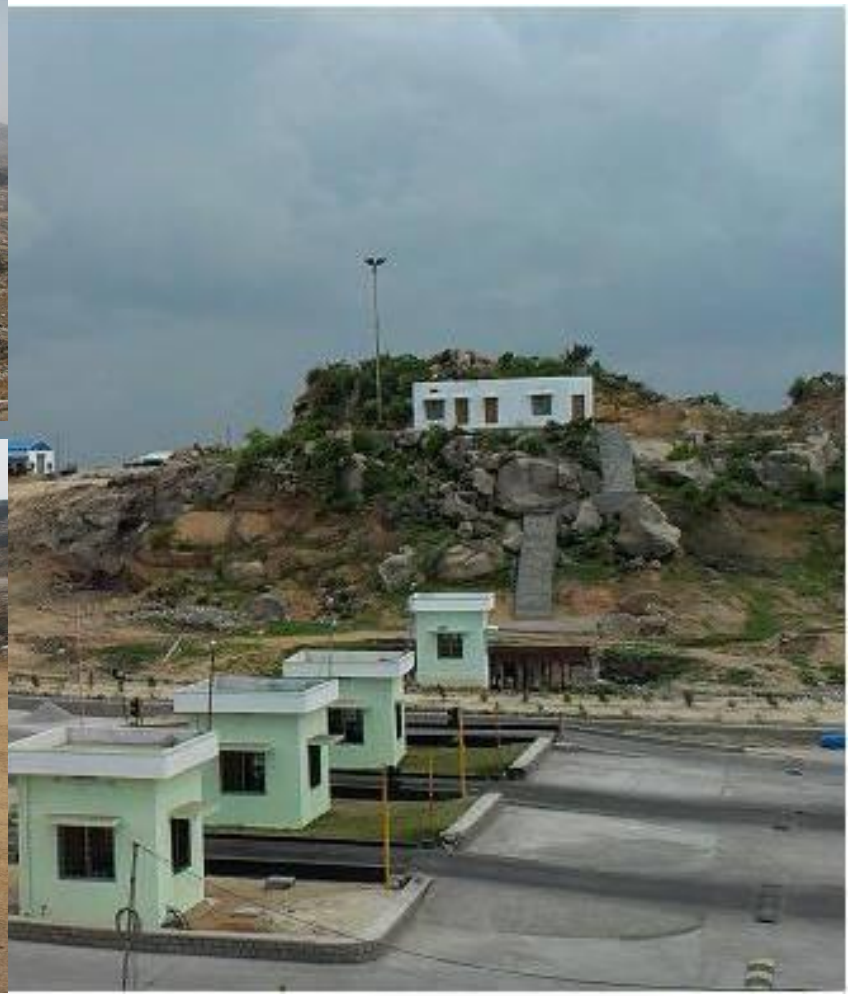
Weigh Bridge Plaza

BEFORE

AFTER

Road - Weigh Bridge to Compost

BEFORE



AFTER

Municipal Solid Wastes (Management & Handling) Rules, 2015

- The responsibilities of Municipal Authorities narrated under MSW Rules, 2015 is from Schedule I to V.

- **Schedule I -** See [Rule 3(1)(xv), 13 (1) (v), 14 (1) (b), 14 (1) (e), 14(4), 15(8) (2)]

  Specifications for Landfill Sites :

  a. Criteria for site selection.

  b. Criteria for development of facilities at the site.

  c. Criteria for specifications for land filling operations and closure on completion of landfill

  d. Criteria for pollution prevention.

  e. Criteria for water quality monitoring

  f. Criteria for ambient air quality monitoring.

  g. Criteria for plantation at landfill Site.

  h. Criteria for post-care of landfill site

Municipal Solid Wastes (Management & Handling) Rules, 2015

- **Schedule II -** See [Rule 14 (1)(b), 14 (1)(e), 14(4), 15(7)(b)
  Standards of processing and treatment of solid waste
  a. Standards for composting:
  b. Standards for treated leachates
  c. Standards for incineration
- **Schedule III -** See [Rule 23]
  Management of Construction and Demolition (C&D) Waste
- **Schedule IV: -** See [Rule 24(a) 25(d)]
  Timeframe for Planning and Implementation
- **Schedule V: - Criteria for Site Selection For Storage And Processing/ Recycling Facilities For C&D Waste**

Launching of the prestigious program on 09.11.2015 for distribution of 2 nos. (for Dry and Wet waste) of 12ltrs plastic garbage bins to some of the households on the hands of the Hon'ble Chief Minister of Telangana

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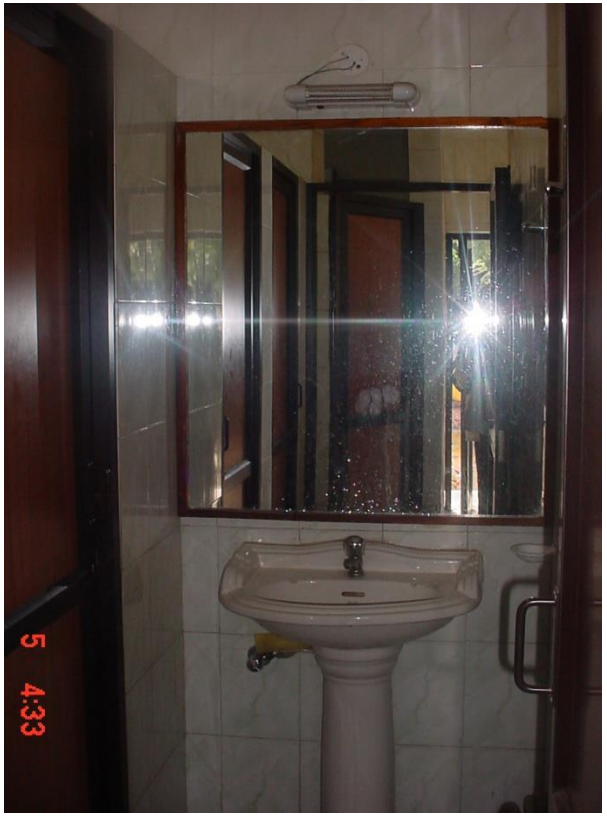
Existing Public Toilets in GHMC

Internal Structure of Existing Public Toilets in GHMC



Model of Pre fabricated Steel Structured Public Toilets in GHMC

Innovative Initiations

The Commissioner & Spl. Officer, GHMC, Dr. B.Janardhan Reddy Garu, I.A.S,

Initiated a programme called **PARICHAY** which aims to introduce the workers of various categories & field supervisory staff with the Resident Welfare Associations / Slum Level Federations to resolve the grievances of the public by the immediate level staff / officer.

This programme will facilitate the Citizens of the GHMC for

Transparency, Accountability, & immediate redressal of the grievances.

This programme launched on 07.11.2015 through the Dy.Commissioners of the GHMC who are the head of the circles. With following inputs --

To prepare the details of the workers of various categories i.e. Sanitation, Entomology, Veterinary, Horticulture, Street Lighting, Sports, Engineering, Sewerage Board by Colony / Slum wise.

They shall ensure that, the particulars of Workers, Field level supervisory staff & Officer with mobile Nos. in that locality shall be made displayed.

Innovative Initiations

They shall make arrangement for Public Address System about the programme in advance.

The formats of different types provided shall be filled up and booklets to be prepared.

They shall provide the Pocket Books to the Workers enabling to get the signature of the public in that locality on completion of their work on daily basis and it has to be counter signed by the Supervisory Officer on Weekly basis.


GHMC

Thank you