SOLID WASTE MANAGEMENT IN ARUNACHAL PRADESH
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M/Secy.DUDA

with special reference to the Solid Waste Management Project implemented in the CAPITAL COMPLEX, ITANAGAR
Map Of Arunachal Pradesh

Source: DIPR, Naharlagun
Challenges of MSW in Arunachal Pradesh

- There are 30 urban census towns in Arunachal Pradesh
- These urban Towns has a floating population Ranging from 10000 to 150000
- Due to Rapid Urbanization & changing of living conditions of the people, solid waste management has always been a big challenges for us.
Earlier Systems of Disposal

- Solid waste management was an unattended subject before 2000 in the state of Arunachal Pradesh.
- No Street sweepings
- No Collection, storage, lifting and disposal system.
- No identified Sanitary landfill/ dumping ground etc.
Systems of Disposal since 2000

- Street sweepings
- Collection and storage in dustbins/collection points
- Collection & lifting from the dustbins/collection points
- Finally dispose off to the dumping ground but in an unscientific manner along the road side
Experiences & problems being faced in Solid waste management, in Arunachal Pradesh

- Lack of awareness or ignorance of people
- Stray animals
- Lack of sewerage and proper drainage system
- Topography & vegetations
- Lack of involvement of community base organizations in the region
- Rapid urbanization & Migration
- In-adequate experts personals in the field of Solid waste management.
- Financial constraints
Focusing MSW in an organized & scientific manner

- Govt. of Arunachal Pradesh started giving emphasis on MSW in the year 2000 onwards.
- All District headquarters & urban towns have been provided with man power & machineries
- Special emphasis has been given to the state capital, Itanagar & availed project from the GOI in the year 2007 under JnNURM
Sources of Municipal Solid Waste

Domestic Waste
- Households
  - Kitchen Waste
  - House Waste
  - Old Papers
  - Garden Trimmings
- Packing
- Bottles
- Crockery
- Broken Furniture

Institutional Waste
- Educational Institutions
- Offices
- Shops
- Hospitals
- Hotels/Restaurants
- Markets
- Community Halls
- Religious Places

Street Sweeping
- Unconcerned Throwing
- Litter by Pedestrians
- Litter by Vehicular Traffic
  - Paper
  - Leaves/Branches
  - Rubbish from Drains
  - Plastic Bottles
  - Debris
  - Broken Furniture
  - Dead Animals

Industrial Waste
- Manufacturing Units
- Processing Units
  - Metals
  - Ash
  - Unused Chemicals

Offal Waste
- Slaughter Houses
- Food Processing Units
- Vegetable Waste
- Rotten Food
- Animal Remains

Biodegradable Waste

Recyclable Waste

Hazardous Waste

Category of Waste
WASTE COMPOSITION

- Paper: 53%
- Textiles and Leather: 7%
- Plastics: 6%
- Metals and Glass: 7%
- Ash, Fines & Others: 15%
- Compostables: 3%
## Source of Waste Generation

<table>
<thead>
<tr>
<th>Source of Waste</th>
<th>Quantity Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>34.35%</td>
</tr>
<tr>
<td>Institutional</td>
<td>20.51%</td>
</tr>
<tr>
<td>Commercial</td>
<td>28.83%</td>
</tr>
<tr>
<td>Industrial</td>
<td>7.10%</td>
</tr>
<tr>
<td>Agricultural</td>
<td>3.18%</td>
</tr>
<tr>
<td>Natural</td>
<td>5.33%</td>
</tr>
</tbody>
</table>
KEY COMPONENTS OF SOLID WASTE MANAGEMENT

- Generation
- Collection
- Transportation
- Processing
- Final Disposal
THE APPROACH ADOPTED:
INTEGRATED end-to-end solution
Interventions at each stage:

1. **Generation Stage**
2. **Collection Stage**
3. **Transportation Stage**
4. **Disposal Stage**
Problems being solved in the GENERATION STAGE...

Problem:
Waste generated disposed off haphazardly

Solution taken:
- No good waste management practices – reduce, reuse, recycle
- Source Segregation of waste
- Storage at source before collection
- Trade Waste not collected systematically
- Construction Debris not collected
- Bio-Medical Waste mixed with MSW.
MSW MANAGEMENT AT THE CAPITAL COMPLEX

Interventions at each stage:

1. • Generation Stage
2. • Collection Stage
3. • Transportation Stage
4. • Disposal Stage
GARBAGE GENERATION

Total Population of Capital Complex (Itanagar & Naharlagun) as per 2011 census

\[ = 1,70,000 \]

Garbage Generation Rate \[= 0.450 \text{ Kg per person per day} \]

Total Garbage Generated \[= 0.450 \times 1,70,000 \]

\[= 76,500 \text{ Kg} = (76.5 \text{ MT}) \]
Name of the Project: **Setting up of Municipal Solid Waste Management in a Scientific Way for Capital Complex, Itanagar.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity of Treatment plant</td>
<td>50.00 MT. per day and 50MT of secured landfill</td>
</tr>
<tr>
<td>Production of manure</td>
<td>15% of treated garbage i.e. 7.50 MT. per day</td>
</tr>
<tr>
<td>Source of funding</td>
<td>UIG components of JNNURM</td>
</tr>
<tr>
<td>Date of Sanction of project</td>
<td>23/02/2007</td>
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<tr>
<td>Date of start of the project</td>
<td>05/04/2009</td>
</tr>
<tr>
<td>Date of completion (compost plant)</td>
<td>07/03/2013(Inaugurated by HCM,AP)</td>
</tr>
<tr>
<td>Project area:</td>
<td>13.61 acres</td>
</tr>
<tr>
<td>Built-up area:</td>
<td>2.0 acres</td>
</tr>
</tbody>
</table>
Problems being solved in the Collection and Transportation Stage...

- **PROBLEM**: Inadequate Collection infrastructure
  - **SOLUTION ADOPTED**:
    - Segregated waste collected separately
    - Alignment of collection system in terms of numbers and type of waste generated
    - Door to door collection
    - Adequate tools like long handled brooms and protection gears provided for street sweepers
    - Manual handling of waste obviated
    - Multiple handling at various stages reduced
    - Community involvement and private participation

- **PROBLEM**: Waste transportation not rationalized
  - **SOLUTION ADOPTED**:
    - Route plan - secondary roads can be catered.
    - Systematic analysis of requirement – type and number
    - Closed Container Vehicles instead of Open Vehicles
Primary Collection Vehicles
A. **Primary Collection System**

- Door to door collection of the garbage from 7 AM to 2 PM has been adopted.
- Sweeping of roads & streets of each colonies/Sectors is being done on daily basis.
- Segregation at source has been adopted by providing two bins for “Dry-Waste” & ‘Wet-Waste” separately.
- Twin bins Litter Boxes to collect garbage at public places, parks and so on installed
- Bio-medical waste has not been allowed to mixed with Municipal Solid Waste. Installation of separate incineration in the respective Hospital/Clinical Complex.
Side Loaders for Street Sweeps
Dumper Placer Containers
B. Secondary Collection System

- Temporary waste collection stations like dumper placer containers being provided at convenient or strategic places through which door to door collection of garbage is being deposited.
- The stored depot has been provided for both Bio-degradable & non Bio-degradable separately.
- Waste Collection Infrastructure like refuse collection bins, dumper placers with hydraulic system, twin litter box etc. has been placed.
PPPP-Community Involvement
Interventions at each stage:

1. Generation Stage
2. Collection Stage
3. Transportation Stage
4. Disposal Stage
C. Transportation Collection System

- Rationalization of type and number of waste transportation vehicle undertaken.
- Waste collected at the temporary storage depot of secondary collection system are being transported to the plant site.
- Waste collected through door to door collection are being transported directly to the plant site.
- The transportation system like refuse collector specially designed for Street Sweeping having 8 cum, closed container vehicles like garbage tipper trucks, dumper placers along with containers are being used.
<table>
<thead>
<tr>
<th>Ward No</th>
<th>Population</th>
<th>Projected Pop</th>
<th>Waste Generated in Kgs</th>
<th>Waste Generated per Zone in Kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Sector</td>
<td>714</td>
<td>2077</td>
<td>945</td>
<td></td>
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<tr>
<td>A Sector</td>
<td>1395</td>
<td>4058</td>
<td>1846</td>
<td></td>
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<tr>
<td>P Sector</td>
<td>240</td>
<td>698</td>
<td>318</td>
<td></td>
</tr>
<tr>
<td>Raj Bhavan</td>
<td>2750</td>
<td>7999</td>
<td>3639</td>
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<tr>
<td>M Gate</td>
<td>235</td>
<td>684</td>
<td>311</td>
<td></td>
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<tr>
<td>N Lapang</td>
<td>330</td>
<td>960</td>
<td>437</td>
<td></td>
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<tr>
<td>Adi Bosti</td>
<td>375</td>
<td>1091</td>
<td>496</td>
<td>7992</td>
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<tr>
<td>O Point</td>
<td>2075</td>
<td>6035</td>
<td>2746</td>
<td></td>
</tr>
<tr>
<td>M Colony</td>
<td>245</td>
<td>713</td>
<td>324</td>
<td></td>
</tr>
<tr>
<td>C House</td>
<td>241</td>
<td>701</td>
<td>319</td>
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<tr>
<td>Air Road</td>
<td>2675</td>
<td>7781</td>
<td>3540</td>
<td>6929</td>
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<td>Daily Market</td>
<td>2099</td>
<td>6105</td>
<td>2778</td>
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<tr>
<td>C Sector</td>
<td>2449</td>
<td>7123</td>
<td>3241</td>
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<td>C-1 Sector</td>
<td>699</td>
<td>2033</td>
<td>925</td>
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<td>C -2 Sector</td>
<td>1049</td>
<td>3051</td>
<td>1388</td>
<td>8332</td>
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<tr>
<td>D Sector</td>
<td>1420</td>
<td>4130</td>
<td>1879</td>
<td></td>
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<td>RWD Colony</td>
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<td>3051</td>
<td>1388</td>
<td></td>
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<tr>
<td>ESS Sector</td>
<td>2350</td>
<td>6835</td>
<td>3110</td>
<td></td>
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<tr>
<td>MLA Cottage</td>
<td>1675</td>
<td>4872</td>
<td>2217</td>
<td>8594</td>
</tr>
</tbody>
</table>
## PRIMARY COLLECTION - ITANAGAR

### VEHICLE REQUIREMENT ANALYSIS

| ZONE | Location          | E    | F    | Div IV | G Sector | G Market | G Extension | U/V Vihar | H Sector | L/v Vihar | Poly College | Police Colony | Chandranagar | KV School | G Tiniali | WE & S Colony | Bank Tinali | MOWB -1 | MOWB - 2 | M Bungalow | Niti Vihar | Driver Colony | Senki View | Total |  |
|------|-------------------|------|------|--------|---------|---------|------------|-----------|----------|-----------|-------------|---------------|--------------|-------------|----------|----------|----------------|------------|--------|--------|-----------|-----------|--------------|----------|-------|------|
| ZONE 5 | E Sector          | 4898 | 14246| 6482   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | F Sector          | 1193 | 3470 | 1579   | 8061    |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Div IV            | 1399 | 4069 | 1851   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | G Sector          | 1667 | 4849 | 2206   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | G Market          | 2113 | 6146 | 2796   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | G Extension       | 478  | 1390 | 633    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | U/V Vihar         | 1191 | 3464 | 1576   | 9063    |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
| ZONE 6 | H Sector          | 1905 | 5541 | 2521   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | L/v Vihar         | 1925 | 5599 | 2548   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Poly College      | 1230 | 3578 | 1628   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Police Colony     | 245  | 713  | 324    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
| ZONE 7 | Chandranagar      | 1430 | 4159 | 1892   | 8913    |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | KV School         | 714  | 2077 | 945    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | G Tiniali         | 720  | 2094 | 953    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | WE & S Colony     | 238  | 692  | 315    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Bank Tinali       | 2799 | 8141 | 3704   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
| ZONE 8 | MOWB -1           | 1399 | 4069 | 1851   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | MOWB - 2          | 699  | 2033 | 925    | 8694    |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | M Bungalow        | 974  | 2833 | 1289   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Niti Vihar        | 952  | 2769 | 1260   |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
|       | Driver Colony     | 715  | 2080 | 946    |         |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
| ZONE 9 | Senki View        | 720  | 2094 | 953    | 4448    |         |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
| Total  |                  |      |      |        | 156103  | 71024   |             |           |          |           |             |               |              |            |          |          |                |            |        |        |           |          |              |          |       |      |
MSW MANAGEMENT AT THE CAPITAL COMPLEX

Interventions at each stage:

1. • Generation Stage
2. • Collection Stage
3. • Transportation Stage
4. • Disposal Stage
**Problems being solved in Disposal System...**

**PROBLEM:** Present Disposal system not scientific

**SOLUTION ADOPTED:**

- Open dumping system with attendant negative effects due to open dumping like breeding of disease vectors
- Requirement of area continue to increase
- No Resource Recovery hence system was unsustainable in the long run
- Development of Recyclable market
D. Compost Plant

- The Bio-degradable waste from the secondary collection system are being sent to compost plant for undergoing treatment process in a scientific way after the segregation.

- Bio-culture components call Bio-cullum (inoculants) which is composition of herbal extracts, Bio-enzyme & additives of Bio-nature are mixed with the garbage to convert the garbage into a manure.

- Non Bio-degradable waste are being segregated at the trommel screen chamber which are being dispose off to landfill site with other unwanted waste products in a scientific manner.

- 15% of the waste treated are being converted to manure per day.
Interventions made for Disposal

- Disposal Plant being established scientifically:
  - Aerobic Composting Plant
    - Biological Process
      - Windrow Platform
    - Mechanical Process
      - Screening with 35mm, 16mm until - 3mm
      - Gravity Separator
    - Biological Refining Process
  - Integrated Engineered Sanitary Landfill
    - HDPE Liners, Clay Liners, Drainage Layer
    - Leachate Collection Pipes
  - PPP mechanism for effective operation
Old View of Site at Chimpu
Over View of Municipal Solid Waste Management Plant

- Finished good store & Others
- Process Tower
- Semi-finished good store
- Trome
- Window Platform
Over View of Municipal Solid Waste Management Plant
Semi finished Platform of Municipal Solid Waste Management Plant
Internal Roads of Municipal Solid Waste Management Plant
Internal Roads of Municipal Solid Waste Management Plant
Composting in process
Tilting in process
Technology adopted for treatment of Biodegradable Waste: Aerobic Microbial Composting

- Bio-degradable component of waste is composted
- High organic matter, suitable moisture content and low calorific value of waste makes composting viable
- Finished compost can be classified as a 100% organic fertilizer
Process Flow - Block Diagram

Windrow → Trommel 35,16 mm → Semi-finished storage

Loose Storage → Fortification → Destoner → VibroScreen 6mm → VibroScreen 3mm

Bags
Secured Landfill

COMPONENTS OF COVER, DRAINAGE & VENT SYSTEM

Liner system for bottom
Environmental Impact Assessment (EIA)
Environmental Management Plan (EMP)

☐ Some Mitigation Measures adopted:

- Water: Leachate Treatment Plant
- Windrow runoff: Separate drain to take runoff to Leachate sump which is finally drained to the Leachate Treatment Plant
- Air: Closed Container Vehicles, Regular schedule for inspection of vehicles
- Green Belt Development with trees with high foliage density to form a dense canopy around the disposal area
Other Interventions under way...

- **Financial**
  - Inadequate resource base to support high costs of Solid Waste Management so a self-supporting and sustainable system with adequate community participation adopted.
  - Zone-wise collection to be outsourced under the purview of the UD&H Department.

- **Institutional**
  - Capacity building required to develop human resources to develop good waste management practices at the locality level.

- **Social**
  - Lack of awareness towards segregation at source and good waste management practices especially 3R’s – Reduce, Recycle and Recover.
  - Funding for IEC and manpower being made available to the UD&H Department.
Other Interventions under way... Cont’d

- Social ... Continued
  - Community sensitization will require continual and sustained efforts and resources
  - Integration of public and private sector efforts in waste management

- Market Development of end-products
  - Support for recyclables market development and Plastic and Paper recycling Plants
  - Market support for compost – Subsidies, Promotion by Agriculture, Horticulture, Soil Conservation, Fisheries and other Departments
SUMMARY OF PROJECT INTERVENTIONS

- **Generation**
  - Segregation at Source
  - Storage at Source
  - Good waste mgmt. practices: Reduce, Reuse and Recycle

- **Collection and Transportation**
  - Community Involvement
  - Private Participation
  - Door to Door Collection
  - Secondary Collection through dumper containers
  - Routing and Rationalization
  - Final Transportation to Disposal Site.

- **Treatment and Disposal**
  - Compost Plant for biodegradable waste
  - Secured Sanitary Landfill for non-recyclable waste
  - Recyclables disposed through existing market mechanisms
MSW Plant in other towns of Arunachal Pradesh

- With the successful commissioning & operational of Compost plant at Itanagar, The Govt. of Arunachal Pradesh is planning to establish MSW plant in another 10(ten) towns of Arunachal Pradesh.

- Project shall be submitted or being submitted to the GOI for sanction.
Thank YOU