Regional Workshop on Sustainable Development Benefits of Decentralized Municipal Solid Waste Management in Asia-Pacific Region,
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Integrated Resource Recovery Center Approach of Solid Waste Management and Its Sustainable Development Benefits

Presented by: Iftekhar Enayetullah

WASTE CONCERN
Presentation Outline

I. Current Practice of SWM in Asia and the Pacific Region
II. Problems From Present Practice of Solid Waste Management
III. What is Waste to IRRC Approach?
IV. Opportunities from IRRC Approach
V. Sustainable Development Benefits of IRRC Approach
VI. Keys Lessons from Implementation of IRRC Approach
Context of SWM in Asia: Rapid Urbanization

- 60% of the global population lives in the Asia and Pacific.
- Asia is expected to reach 50% urbanization by 2018.
- Bulk of the Asia’s urban population live in small and medium cities.
- Small and medium cities have limited human, financial and organizational resources.

Waste Generation Worldwide and in Asia Pacific Region

It is estimated that 5.2 million tons of solid waste are generated daily worldwide, of which 3.8 million tons are from developing countries.

5.2 million tons/day Worldwide

3.8 million tons/day Developing Countries

60-70% organic Waste Generation

### Global Perspective on Urban Solid Waste Characteristics

<table>
<thead>
<tr>
<th>Composition of Raw Waste (by wet weight)</th>
<th>Low Income Country</th>
<th>Middle Income Country</th>
<th>High Income Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable/Putrescible %</td>
<td>40 to 85</td>
<td>20 to 65</td>
<td>7 to 55</td>
</tr>
<tr>
<td>Paper and Carton %</td>
<td>1 to 10</td>
<td>15 to 40</td>
<td>15 to 50</td>
</tr>
<tr>
<td>Plastic %</td>
<td>1 to 11</td>
<td>2 to 13</td>
<td>2 to 20</td>
</tr>
<tr>
<td>Metal %</td>
<td>1 to 5</td>
<td>1 to 5</td>
<td>3 to 13</td>
</tr>
<tr>
<td>Glass %</td>
<td>1 to 10</td>
<td>1 to 10</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Rubber, Misc.%</td>
<td>1 to 3</td>
<td>1 to 5</td>
<td>2 to 12</td>
</tr>
<tr>
<td>Fines % (sand, ash, broken, glass)</td>
<td>15 to 50</td>
<td>15 to 40</td>
<td>5 to 20</td>
</tr>
</tbody>
</table>

### Other Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Low Income Country</th>
<th>Middle Income Country</th>
<th>High Income Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>40 to 80</td>
<td>40 to 60</td>
<td>20 to 35</td>
</tr>
<tr>
<td>Density in Trucks, Kg/C.M</td>
<td>250 to 500</td>
<td>170 to 330</td>
<td>120 to 200</td>
</tr>
<tr>
<td>Lower Heating Value, K Cal/Kg</td>
<td>800 to 1100</td>
<td>1000 to 1500</td>
<td>1500 to 2700</td>
</tr>
</tbody>
</table>

Turning Challenges to Opportunities

The current paradigm focused on end-of-pipe solution is not sustainable and overlooks the enormous potential of turning waste into resource.

The informal sector recovers some valuable materials downstream, but the majority organic waste does not have a chance to be recovered without leveraging appropriate technology and systems.
Approach to Waste Management

Conventional Approach (End of Pipe Solution)

- Mixed Waste
  - Waste Bins
  - Demountable Containers
  - Transfer Stations

Collection

Transportation

Landfill

PROBLEMS

Approach of IRRC (Resource Management)

- Source Separated Waste
  - House-to-House Collection
  - House-to-House Collection
  - Vegetable Markets

Integrated Resource Recovery Centre (IRRC)

Only 10-14% going to landfill site

Landfill

OPPORTUNITIES
An Integrated Resource Recovery Center (IRRC) is a facility where a significant portion (80-90%) of waste can be processed in a cost effective way, in proximity to the source of generation, and in a decentralized manner. The IRRC concept is based on 3R principles. It is suitable for small and medium sized towns.

**Integrated Resource Recovery Centers (IRRCs)**

- **Collection**
  - 100% Collected with user fee
  - House-to-house waste collection method
  - 86% RECYCLED

- **IRRC**
  - 80% Compost
    - Agriculture
  - Biogas
    - Energy
  - RDF
    - Energy
  - 6-10% Recyclables
    - Local market
  - 10-14% Non-compostable
    - Landfilled
  - GHG Reduced
    - CER

- **Waste**
  - 100% Collected with user fee
ESCAP IRRC cities in 6 countries

Legend:
- Baseline survey
- IRRC and baseline survey

Pakistan
- Mardan
- Islamabad
- Karachi

Bangladesh
- Kushtia

Sri Lanka
- Matale
- Rathnapura

Cambodia
- Ta Khmao
- Battambang
- Kampot

Viet Nam
- Ha Tinh
- Hoi An
- Kon Tum
- Quy Nhon

Indonesia
- Probolinggo
- Malang City
- Malang Regency
- Jambi City
Integrated Resource Recovery Centres (IRRCs)

- Based on 3R principles
- Recovers 80 percent of waste as resources
- Promote separation at source (organic/inorganic)
- Decentralized, close to generated waste
- Capacity can range from 2-20 tons/day (manual)
- Uses appropriate technologies
- Employs waste pickers and other urban poor
- Reduces GHG emissions
Different Scale of IRRC Model

- Large & Regional Scale
  More than 21 ton/day upto 250 ton/day

- Medium Scale
  3 to 20 tons/day

- Small Scale
  Upto 3 tons/day

• The flexibility of Waste Concern's IRRC model is such that it can be adapted to any situation both in urban and rural areas.

• Moreover, it can be implemented in slum areas. It can be implemented on a small scale, medium scale, or large scale. The small scale model allows for 3 tons of organic waste to be processed daily, while the medium scale model permits processing 3 to 20 tons of organic waste per day. More than 21 tons of organic waste can be processed daily using the large scale model.

• Apart from Production of Compost/Biogas/RDF, this model is reducing Green House Gas
Recycling Technique Used in IRRC Approach

Sources of Waste

**Input**
- Organic Waste
- Organic Waste Fish & Meat Waste
- Recyclables
- Used Cooking Oil
- Waste with high Calorific Value
- Faecal Sludge

**Process**
- Organic Waste
  - Sorting
  - Composting
  - Maturing
  - Screening
  - Bagging
  - Aerobic composting
  - Anaerobic digestion
- Organic Waste Fish & Meat Waste
  - Grinding
  - Mixing
  - Digesting
- Recyclables
  - Sorted
  - Compacting
  - Baling
- Used Cooking Oil
  - Collecting
  - Filtering
  - Processing
- Waste with high Calorific Value
  - Sorting
  - Shredding
  - Extruded
- Faecal Sludge
  - Drying
  - Composting
  - Maturing
  - Screening
  - Testing
  - Co-composting

**Product**
- Compost
- Biogas Slurry
- Plastic Paper, Glass
- Biodiesel
- Refuse derived fuel
- Compost
Baseline Situation vs. IRRC model

<table>
<thead>
<tr>
<th>Input</th>
<th>Technology</th>
<th>Produce No Methane Emission</th>
<th>Climate Change Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Waste</td>
<td>Composting (Aerobic Process)</td>
<td>Compost (Diverted organic waste from landfill and replacing use of chemical fertilizer)</td>
<td>Generates Carbon Credits by avoiding methane from Landfill and reduce CO2 to produce chemical fertilizer</td>
</tr>
<tr>
<td>Human Excreta</td>
<td>Co-composting (Aerobic Process)</td>
<td>Compost (Diverted organic waste from landfill and replacing use of chemical fertilizer)</td>
<td>Generates Carbon Credits by avoiding methane from Landfill and reduce CO2 to produce chemical fertilizer</td>
</tr>
<tr>
<td>Organic Waste (non-compostables)</td>
<td>Refused Derived Fuel (RDF)</td>
<td>Fuel in Pellet form (replacing diesel or coal used in boilers or brick kilns)</td>
<td>Avoids methane from landfill and reduces CO2 emission by replacing grid power</td>
</tr>
<tr>
<td>Organic Waste</td>
<td>Biogas Plant (Anaerobic Digestion)</td>
<td>Biogas to Electricity (replacing fossil fuel based electricity)</td>
<td>Avoids methane from landfill and reduces CO2 emission by replacing grid power</td>
</tr>
<tr>
<td>Used Cooking Oil</td>
<td>Bio diesel Plant</td>
<td>Bio diesel (replacing diesel as fossil fuel)</td>
<td>Replace use of fossil fuel</td>
</tr>
</tbody>
</table>

Baseline situation (organic waste dumped in landfill sites becomes anaerobic and generates methane)

IRRC model converts waste into resource and reducing greenhouse gas methane (CH4)
**Different Economic Outputs from IRRC**

1 ton Organic Waste

- **Composting**
  - Produce 1/4 ton (0.25 tons of Compost)

1 ton Organic Waste

- **Composting**
  - Reduce 1/2 ton Green House Gas

1 ton Organic Waste

- **Biogas Digester**
  - Produce 20-50 M3 Biogas
  - Produce 24-60 kWhr Electricity

1 liter Used Cooking Oil

- **Bio diesel Plant**
  - 95% of the input as Bio diesel & Glycerine

1 ton Inorganic Waste (high calorific value)

- **Refuse Derived Fuel**
  - 95% of the input Refused Derived Fuel (RDF)
1995
Waste Concern Initiated the model of Decentralized Community based composting Initiative in Bangladesh

2005
ESCAP started to replicate the model of Waste Concern in Vietnam, Sri Lanka.
Replications of this model in cities/towns of Bangladesh

2008
Waste Concern Established Globally first compost plant based on carbon trading in Dhaka, Bangladesh

2009
ESCAP in partnership with Waste Concern launched a regional project called Pro-Poor and Sustainable Solid Waste Management in Secondary Cities and Small Towns in Asian-Pacific.

2012
ESCAP in partnership with Waste Concern launched a project entitled Co-composting of Municipal Solid Waste and FS for Agriculture in Kushtia city, Bangladesh

2014
ESCAP, Waste Concern, South Pole Carbon and the UNFCCC secretariat took the initiative of quantifying and monetizing the co-benefits of recycling of waste.

2016
ESCAP in partnership with Waste Concern initiated co-composting and biogas to electricity general project using organic waste and Faecal sludge in Malang Regency and Jambi city, Indonesia.
Asian Development Bank financed a Regional Landfill with Recycling facility having composting, biogas to electricity, faecal sludge recycling, controlled landfill using concept of IRRC
Example of Recycling Training Center in Katchpur, Greater Dhaka Using IRRC Approach

Name of the Project:
Recycling Training Center (RTC) at Katchpur, Narayanganj, Greater Dhaka (2005)

Project Partners:
GoB, UNDP, UNESCAP, WASTE CONCERN

Land Area: 1440 sq.m

Capacity to Manage Waste:
- Municipal Waste: 10 Tons/day
- Biogas: 500 kg/day
Box Method Composting Used in IRRC/RTC in Dhaka

Name of the Project:
Recycling Training Center (RTC) at Katchpur, Narayanganj, Greater Dhaka

Project Partners:
UNESCAP, WASTE CONCERN

Land Area: 1440 sq.m

Capacity to Manage Waste:
- Municipal Waste: 10 Tons/day
- Biogas: 500 kg/day
Biogas & Electricity Generation from Organic Waste in IRRC, Dhaka
At Recycling Training Center, Katchpur, Greater Dhaka

Name of the Project:
Recycling Training Center (RTC) at Katchpur, Narayanganj, Greater Dhaka

Project Partners:
GOB, UNDP, UNESCAP, WASTE CONCERN

Land Area: 1440 M2
Capacity to Manage Waste:
- Municipal Waste: 10 Tons/day
- Biogas: 500 kg/day
**Types of raw materials used:**
1. Kitchen waste
2. Market waste
3. Vegetable waste
4. Slaughterhouse waste
5. Fish market waste
6. Industrial waste

**Research Conducted in Bangladesh with Municipal Waste**
1. Since early 2009, Waste Concern in partnership with UNESCAP initiated biogas initiative from municipal waste

**Electricity Production From 1 M3= 1.2 Kwt hr**

**Biogas Production:** 20-50 M3=1 ton of input
Bio-Diesel Plant from Used Cooking Oil in IRCC

Name of the Project:
Recycling Training Center (RTC) at Katchpur, Narayanganj, Greater Dhaka
Project Partners:
GOB, UNDP, UNESCAP, WASTE CONCERN
Land Area: 1440 sq.m
Capacity to Manage Waste:
-Used Cooking Oil Recovery Plant: 400 L/day
Co-composting of Faecal Sludge with Organic Waste in Kushtia City, Bangladesh

Name of the Project:
Co-Composting of Faecal Sludge with Solid Waste in Kushtia Municipality

Project Partners: UNCRD, UNESCAP, WASTE CONCERN, KUSHTIA MUNICIPALITY (2007/2012)

Land Area: 4 Acres
Capacity to Manage Waste:
- Municipal Waste 2-3/day
- Faecal Sludge: 3M3/day

Faecal Sludge Collected by Vaccu-Tug and Discharged in the Drying Bed and later Co-composted with organic waste to Produce Compost
Total amount of municipal solid waste brought to the plant amounts to 2 to 3 tons/day.

Under this project, faecal sludge is directly collected from the septic tanks or pit latrines of households using mechanical vacuum-tugs.

Total amount of faecal sludge collected per day is between 2-3 cubic meter/day.

The collected sludge is directly sent to the treatment facility.
Composting for Medium and Large cities (Large Scale)

Name of the Project: Globally First CDM Based Composting Project (capacity 130 tons/day) In Dhaka (2008).

Project Partners: WWR Bio Fertilizer Bangladesh, WWR bv., Waste Concern.

Land Area: 1.4 Hectare

Capacity to Manage Waste:
-Municipal Waste: 130 Tons/day
Composting for Medium and Large cities (Large Scale)

Name of the Project: Globally First CDM Based Composting Project (capacity 130 tons/day) In Dhaka (2008).

Project Partners: WWR Bio Fertilizer Bangladesh, WWR bv., Waste Concern.

Land Area: 1.4 Hectare

Capacity to Manage Waste:
- Municipal Waste: 130 Tons/day
Composting & AD Plants (IRRC) Implemented Under Government of Bangladesh Financed the Project

Programmatic CDM using organic Wastes of Urban Areas Municipalities) throughout Bangladesh (in 64 Districts):
Government used its Climate Change Trust Fund.

- Rangpur City Corporation
  Capacity: 16 tons/day
- Mymensingh Municipality
  Capacity: 8 tons/day
- Kishorganj Municipality
  Capacity: 10 tons/day
- Narayanganj City Corporation
  Capacity: 22 tons/day
- Feni Municipality
  Capacity: 10 tons/day
- Cox’s Bazar Municipality
  Capacity: 12 tons/day
Name of the Project:
Programmatic CDM using organic Wastes of Urban Areas Municipalities) throughout Bangladesh (in 64 Districts)

Project Partners:
Department of Environment (DoE) Government of Bangladesh

Land Area:
Capacity to Manage Waste:
-Municipal Waste: 22 Tons/day

Status: Operated by Private Sector

Technical Support:
Waste Concern Consultants

Narayanganj Municipality
64 District CDM Project in Waste Sector Through Composting & AD by Department of Environment

Compost Plant at Mymensingh Municipality

Name of the Project:
Programmatic CDM using organic Wastes of Urban Areas Municipalities) throughout Bangladesh (in 64 Districts)

Project Partners:
Department of Environment (DoE) Government of Bangladesh

Land Area:

Capacity to Manage Waste:
-Municipal Waste: 8 Tons/day

Status: Operated by Private Sector

Technical Support:
Waste Concern Consultants

Source Segregation of Waste being Promoted
Regional Approach: Integrated Landfill and Resource Recovery Facility for Jessore

Name of the Project: Regional Integrated Landfill & Resource Recovery Facility At Jessore Municipality Under City Region Development Project

Project Partners: City Region Development Project
Implemented by LGED
Supported by ADB
Consultant: Waste Concern Consultants

Land Area: 13 Acres
Capacity to Manage Waste: 50 tons/day
Municipal Waste: 50 Tons/day
- Compost plant 20 Ton/day
- Biogas 20 Ton/ day
Faecal Sludge- 10M3/day
Status: Under Construction to be Operated by Private Sector
Estimated Date of Operation: Feb, 2018
Regional Approach: Integrated Landfill and Resource Recovery Facility for Pirojpur Town

Name of the Project: Coastal Towns Environmental Infrastructure Project
Project Partners: City Region Development Project
Implemented by LGED
Supported by ADB
Consultant: Waste Concern Consultant and BORDA Ltd.
Land Area: 4 Acres
Capacity to Manage Waste: 10 tons/day
Municipal Waste: 10 Tons/day
Compost Plant: 5 Tons/day
Faecal Sludge: 5M3/day
Status: Under Construction will be operated by private sector.
IRRC Replicated In Asia Pacific Countries by UNESCAP with the Technical Support From Waste Concern

<table>
<thead>
<tr>
<th>Name of the Project:</th>
<th>Proposed Design of 2 TPD Capacity Biogas Plant and 0.75 TPD Capacity Compost Plant at Malang Regency, Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Partners:</td>
<td>UNESCAP, UCLG, WASTE CONCERN</td>
</tr>
<tr>
<td>Implemented by:</td>
<td>Malang and Jambi City</td>
</tr>
</tbody>
</table>

| Land Area:           | Malang (812.11 M2) & Jambi (812.11 M2)                                                                    |
| Municipal Waste:     | 2.75 Tons/day                                                                                             |
| Compost Plant:       | 0.75 tons/day                                                                                             |
| Biogas Plant:        | 2 tons/day                                                                                               |
| Status:              | Under Construction                                                                                        |

IRRC in Malang Regency, Indonesia

IRRC in Jambi, Indonesia
By recycling one ton of waste:

- Create 2 new jobs for the waste pickers;
- Produce 0.25 tons of good quality compost;
- Produce 40-80 cubic meter of biogas (clean energy which can be used for cooking purpose or electricity generation);
- Save 1.1 cubic meter of landfill area;
- Reduce 0.5 tons of green house gas emissions
- Provide door-to-door service to 2,000-3,000 households
  - Reduce the risk of 40 diseases linked with unmanaged municipal solid waste;
  - Increase crop production between 25-30% and reduce use of chemical fertilizer by 35-40% increasing food security;
  - Contribute to both climate change mitigation and adaptation.
  - Reduces risk of fire at landfills
Social benefits from IRRCs

- Better job opportunities
- Reduced disease
- Improved living conditions
- Improved environmental awareness
Environmental benefits from IRRCs

- Reduced greenhouse gas emissions
- Improved soil quality
- Reduced pollution
- Low-carbon fuel
The term co-benefits is defined as all the potential developmental benefits of climate change mitigation actions in areas other than GHG mitigation.

Reduce **0.5 tons of co2eq** GHG emissions by recycling 1 (one) ton of organic waste. Aerobic treatment of waste avoids methane generation.
## Potential Co-benefits by Reducing 1 (One) Ton of CO2e

### 2 Tons Organic Waste if Processed into Compost

<table>
<thead>
<tr>
<th>Type of Benefit</th>
<th>Sector of Benefit</th>
<th>Co-Benefits/ GHG emission reduction</th>
<th>Value of Co-benefits/ GHG emission reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public and Private</td>
<td>Social Sub sector: Employment generation</td>
<td>Creation of additional income for four waste pickers by working in the compost plan <strong>Consideration:</strong> 4 jobs created to process 2 tons of organic waste to reduce 1 ton CO2eq</td>
<td>US $ 7.53</td>
</tr>
<tr>
<td>Public</td>
<td>Economic Sub-sector: urban/municipal</td>
<td>Cost saved for the municipality from disposal of waste <strong>Consideration:</strong> 1.1 cubic meter of landfill area per ton of organic waste composted. US$ 23.36 saved by avoiding 2 tons of organic waste to be land filled. Presently USD 11.68/ton spent for (transportation and land filling cost)</td>
<td>US $ 23.36</td>
</tr>
<tr>
<td>Private</td>
<td>Economic Sub-sector: agriculture</td>
<td>25% saving in chemical fertilizer usage by use of compost <strong>Consideration:</strong> 25% savings in use of chemical fertilizer resulting in savings of Taka 1515/ha.</td>
<td>US $ 9.71</td>
</tr>
<tr>
<td>Public</td>
<td>Economic Sub-sector: Agriculture</td>
<td>25% less subsidy on chemical fertilizer <strong>Consideration:</strong> At present Government of Bangladesh (GOB) is giving BDT 7793.17/Ton on chemical fertilizer.</td>
<td>US $ 4.13</td>
</tr>
<tr>
<td>Private and Public</td>
<td>Environmental and Economical</td>
<td>Increase in crop yield of 0.21 ton per of rice per half ha <strong>Consideration:</strong> from 2 tons of waste 0.5 ton of compost can be produced</td>
<td>US $ 49.09</td>
</tr>
</tbody>
</table>

**Total value of co-benefits per ton of GHG emission reduction through composting** | US $ 93.82
### Value of Co-benefits Generated by Composting Projects in 3 (three) Countries

<table>
<thead>
<tr>
<th>Co-benefit</th>
<th>Type</th>
<th>Value (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bangladesh</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td><strong>Job creation: additional income for waste-pickers employed in compost plants</strong></td>
<td>Social/Economic – Public &amp; Private</td>
<td>7.53</td>
</tr>
<tr>
<td><strong>Cost savings for the municipality for avoided landfilling of waste</strong></td>
<td>Economic – Public</td>
<td>23.36</td>
</tr>
<tr>
<td><strong>Savings in chemical fertilizer use (25% reduction)</strong></td>
<td>Economic/Environmental – Private &amp; Public</td>
<td>9.71</td>
</tr>
<tr>
<td><strong>Savings in subsidy to chemical fertilizers</strong></td>
<td>Economic – Public</td>
<td>4.13</td>
</tr>
<tr>
<td><strong>Increase in crop yields (</strong>*)**</td>
<td>Economic – Private &amp; Public</td>
<td>49.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>93.82</td>
<td>114.29</td>
</tr>
</tbody>
</table>
Impact of IRRC

- SDG Goals
- Paris Agreement (emission reduction target)
- SDG Goals (8 out of 17 goals)
- New Urban Agenda (ensure environmental sustainability & resilient urban devt.)
- NDC

- Environmental Benefit
- Social Benefit
- Economic Benefit
Issues for Scaling up IRRC Approach

**Policy/Rules/Strategy**
- Ministry of Agriculture
- Ministry of Local Govt.
- Ministry of Urban Dev.
- Ministry of Environment
- Ministry of Energy
- Relevant Ministries
- Municipalities

**Fiscal Incentives**
- Ministry of Finance
- Central Bank
- Tax Department
- Local Banks

**Capacity Building/Awareness Raising**
- International Agencies
- Government, Research Institutions (local & international)
- Educational Institutions
- International NGOs
- Local NGOs and CBOs
- Private Sector

**Activities**
- Promotion of compost/ biogas/ appropriate technologies, RDF
- Promotion of source separation of waste
- Standardization products
- Feed in Tariff/Support to Compost (subsidy)
- Tipping fee/waste collection fee
- Land for the Facility
- PPP Rules

- Low interest rate financing
- Less/ reduced tax for private sector operator
- No VAT
- Green Financing

- Operation & Maintenance of IRRC
- PPP Agreement
- Technology Selection
- Monitoring of Emission Reduction
- KPI development for IRRC
Way Forward to Sustainable Waste to Resource Solution

NATIONAL POLICY LEVEL

• Changing the Mindset/Paradigm Shift
• High lighting Co-benefits
• Updated Baseline Information
• Incorporation of 3R (reduce, reuse and recycling) in National Policy, Strategy & Action Plans related to waste
• Inter Ministry Coordination
• Independent Technical Committee for Technology Choice
• Incentives for Recycling initiatives

Waste to Resource Facilities

• Source Separation
• Mass Awareness
• Informal Sector
• Public Private Partnership
• Land Issue
• Soft Loan, TAX & VAT incentives)
• Free Delivery of Waste/Fee for collection of Waste by Recyclers.
• Technology Choice
• Informal Sector

Products

• Level Playing Field
• Proper feed in tariff incentives (i.e., Subsidy in energy and compost)
THANK YOU
## Comparative Financial Aspects of Different Technologies to Manage Waste

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Incineration (Thermal) Utilizing 100% use of total generated waste</th>
<th>AD* Utilizing 70% use of total generated waste</th>
<th>Composting Utilizing 70% use of total generated waste</th>
<th>RDF** Utilizing 21.22% use of total generated waste</th>
<th>IL&amp;RRF*** Utilizing 100% use of total generated waste</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPEX</strong> US$/ton</td>
<td>120,000 - 175,000</td>
<td>30,000 -60,000</td>
<td>20,000-30,000</td>
<td>60,000- 75,000</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>Land Required Hectar/ton</strong></td>
<td>0.5 ha/100 ton</td>
<td>1.5 ha/100 ton</td>
<td>1.1 ha/100 ton</td>
<td>1 ha/100 ton</td>
<td>2.25/100 ha</td>
</tr>
</tbody>
</table>

*AD - Anaerobic Digestion (Biogas to electricity)  
**RDF - Refuse Derived Fuel  
***IL&RRF - Integrated Landfill and Resource Recovery Facility
Issues for Scaling up IRRC Approach

National Government
Policy Support/ Rules/ Strategies/ Financing

- Promotes low carbon path
- Sustainable Development
- Green Growth
- Resource Efficiency

Local Government
Land/ Tipping fees/ Promotion of 3R

- Reduce Cost of SWM
- Reduce environmental pollution & risk

Projects (IRRC)
Intervention: Reducing Emission/ Promoting Sustainable Development/ Improved SWM

- Cleaner communities
- Improves soil condition
- Create job for poor
- Reduce pollution and improves health situation

Ward/ Community

IRRC: Integrated Resource Recovery Center
SWM: Solid Waste Management