

Science-policy-community cooperation in  
promoting smart business solutions  
towards efficient resource recovery and  
minimum landfilling

**IPLA Global Forum 2015**

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environmental  
management  
centre LLP

# Contents

## Brief Outline

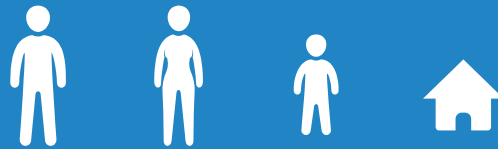
- Importance of Cooperation and Partnerships
- Waste to Resource Technologies
- Business models



1.

# Importance of Cooperation & Partnerships

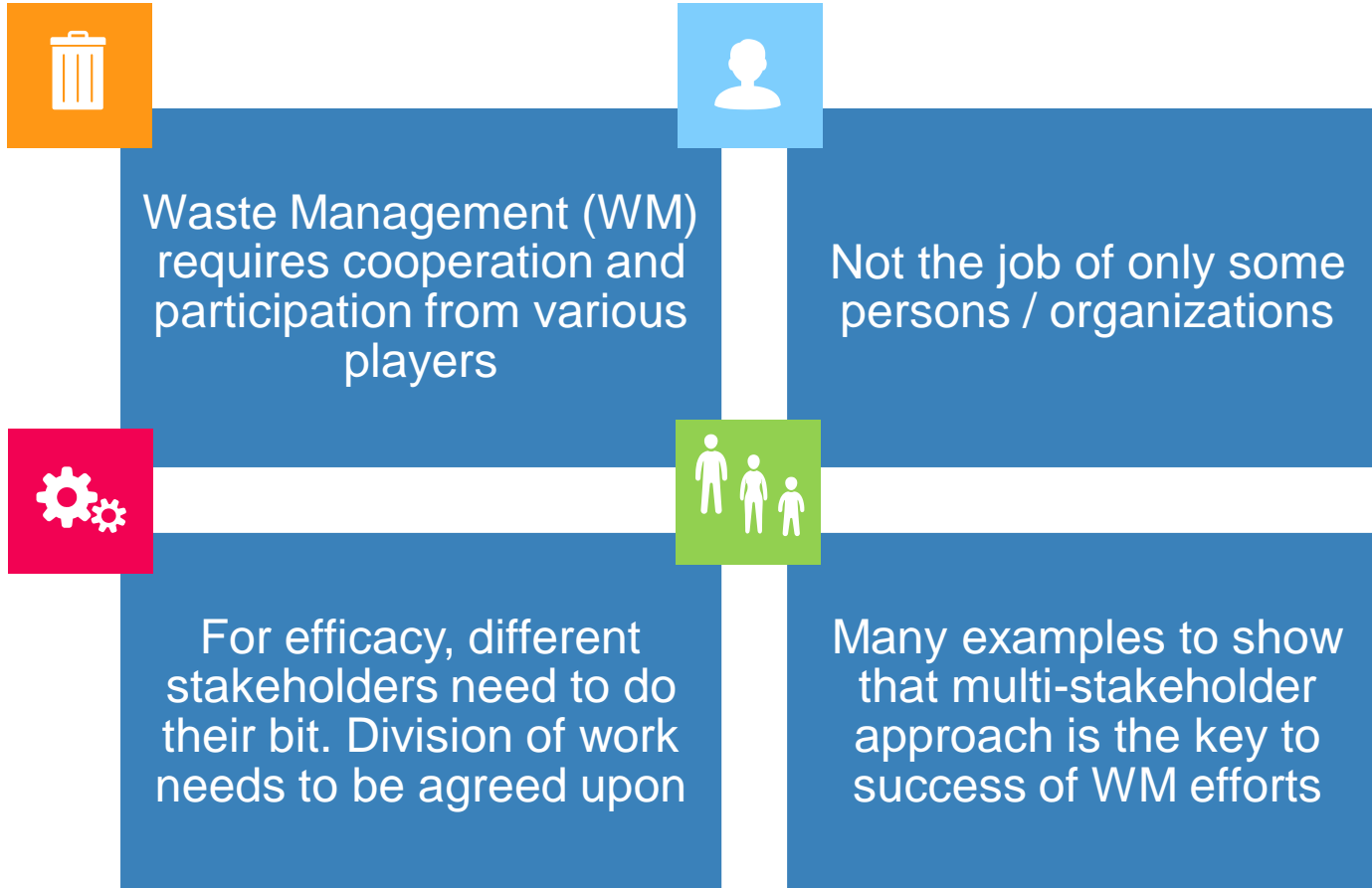
Waste and Resource Management





*Teamwork divides the task and  
multiplies the success*

# Need for cooperation





Stakeholders, roles, responsibilities,  
perspectives, dimensions

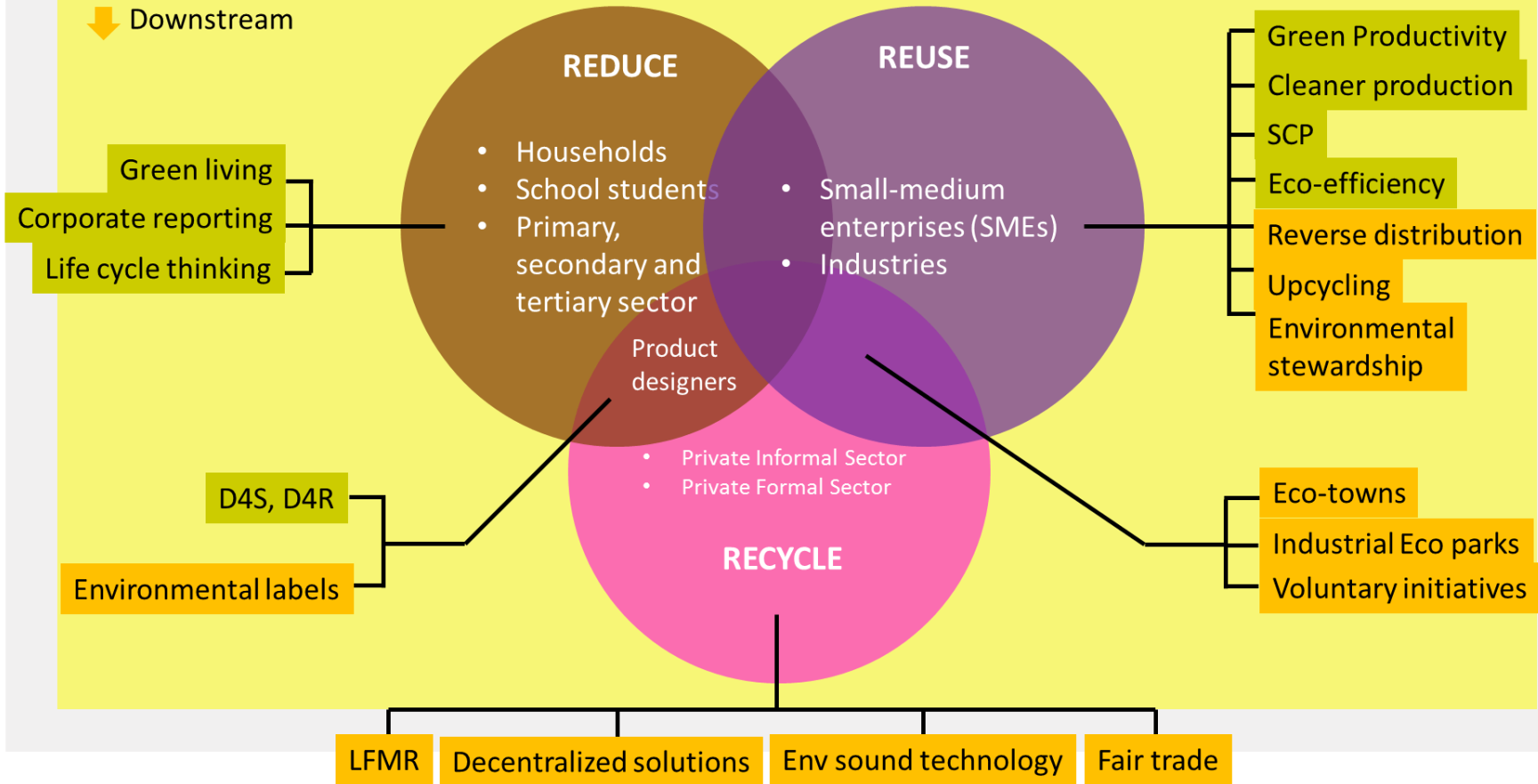


*Centre of all action*

# NGOs/CBOs, Media, Donor Agencies

↑ Upstream  
↓ Downstream

## Government, Local Authorities, Policy Makers



Working together

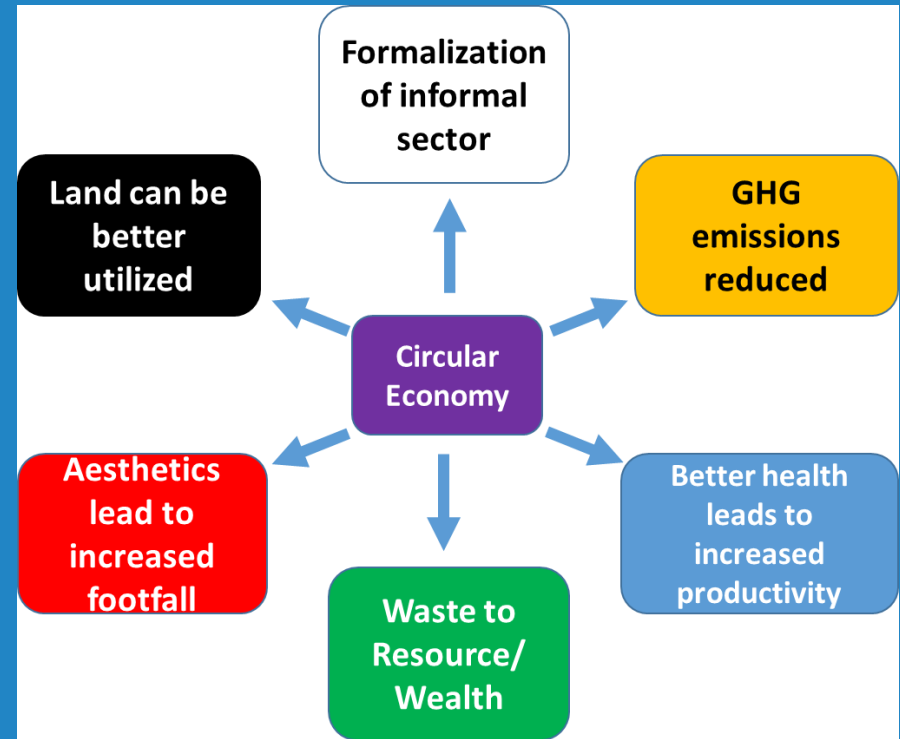
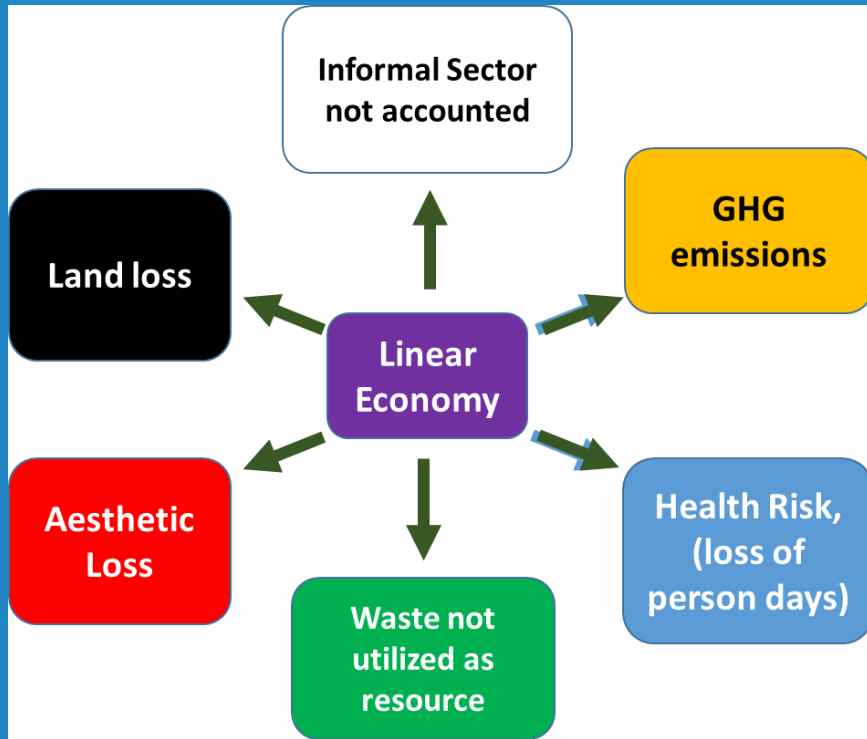


2.

# Waste to Resource Technologies

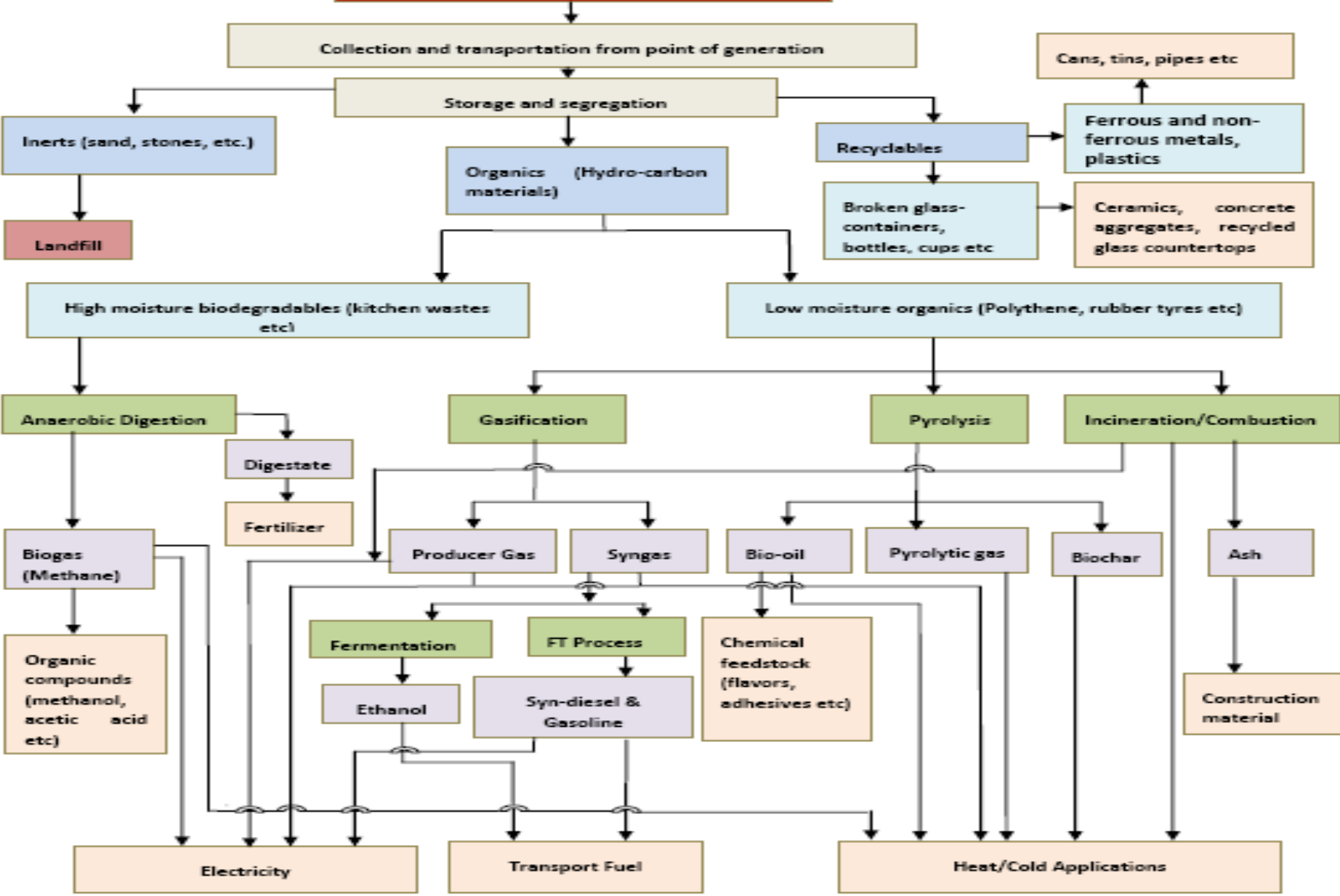
Waste is Wealth





→ *Linear to Circular Economy*

# Municipal Solid Waste (MSW)



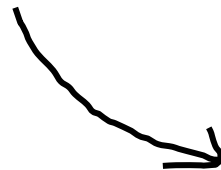
# Centralised vs. Decentralised

## Big Cities

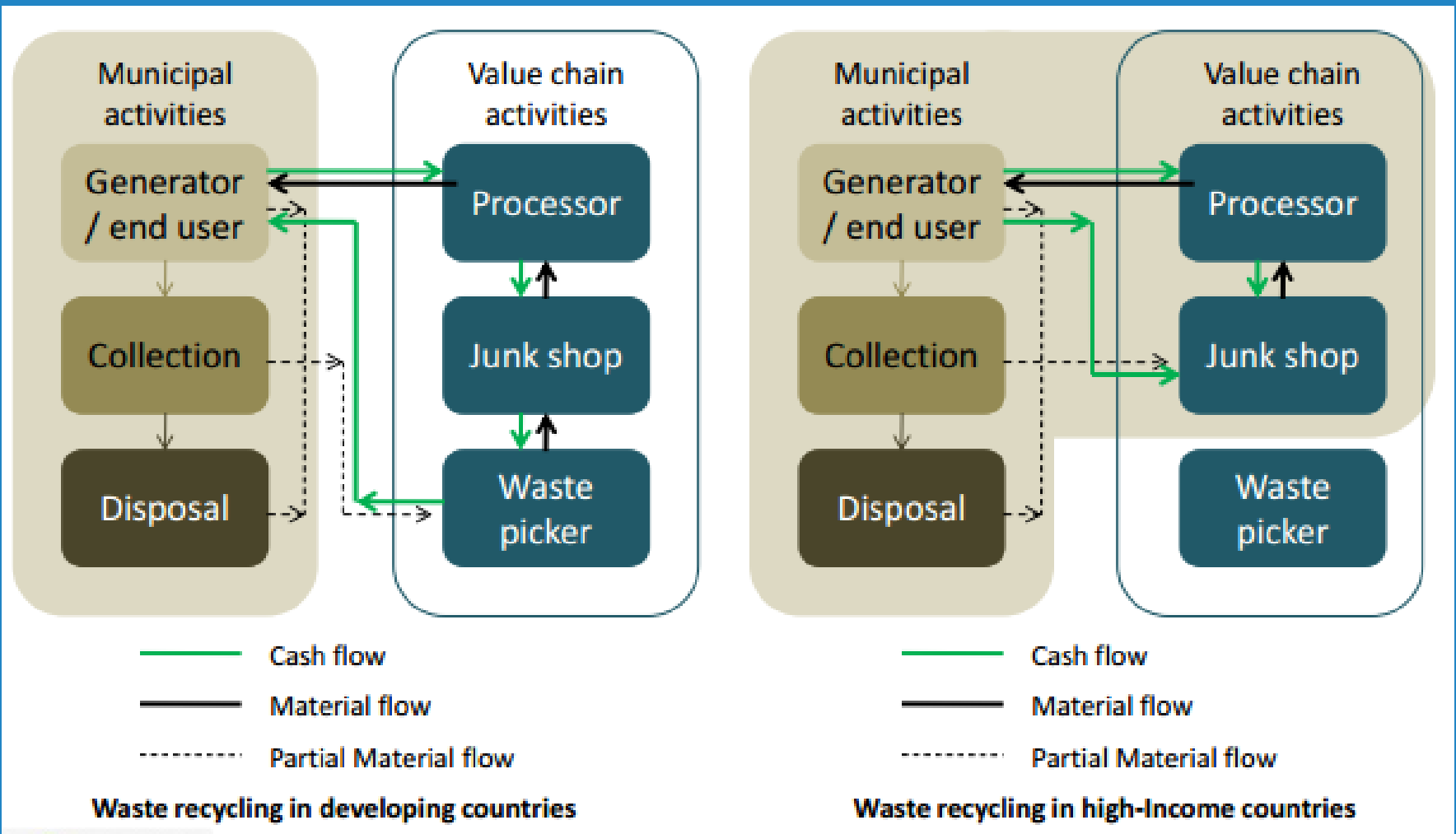
Cities with population above 2 million and cities generating more than 300 TPD or more of combustible fraction of MSW are suitable for setting up W to E power projects.

## Small Cities

Composting, Bio-methanation, RDF making  
Setting up of Regional facilities should be explored



*Non recyclable dry  
combustible MSW  
usage  
maximization for  
RDF, where  
feasible*



# What went wrong with centralized solutions?

1

Large scale, centralised and mechanised compost plants based on foreign technologies and designs

2

Plants unable to sustain operations due to high maintenance and operational costs

3

Low quality compost resulting from mixed waste

4

Technical difficulties and problems in marketing and selling the low quality compost derived

# What works?

1

Simple technology

2

Reducing operational  
and maintenance cost

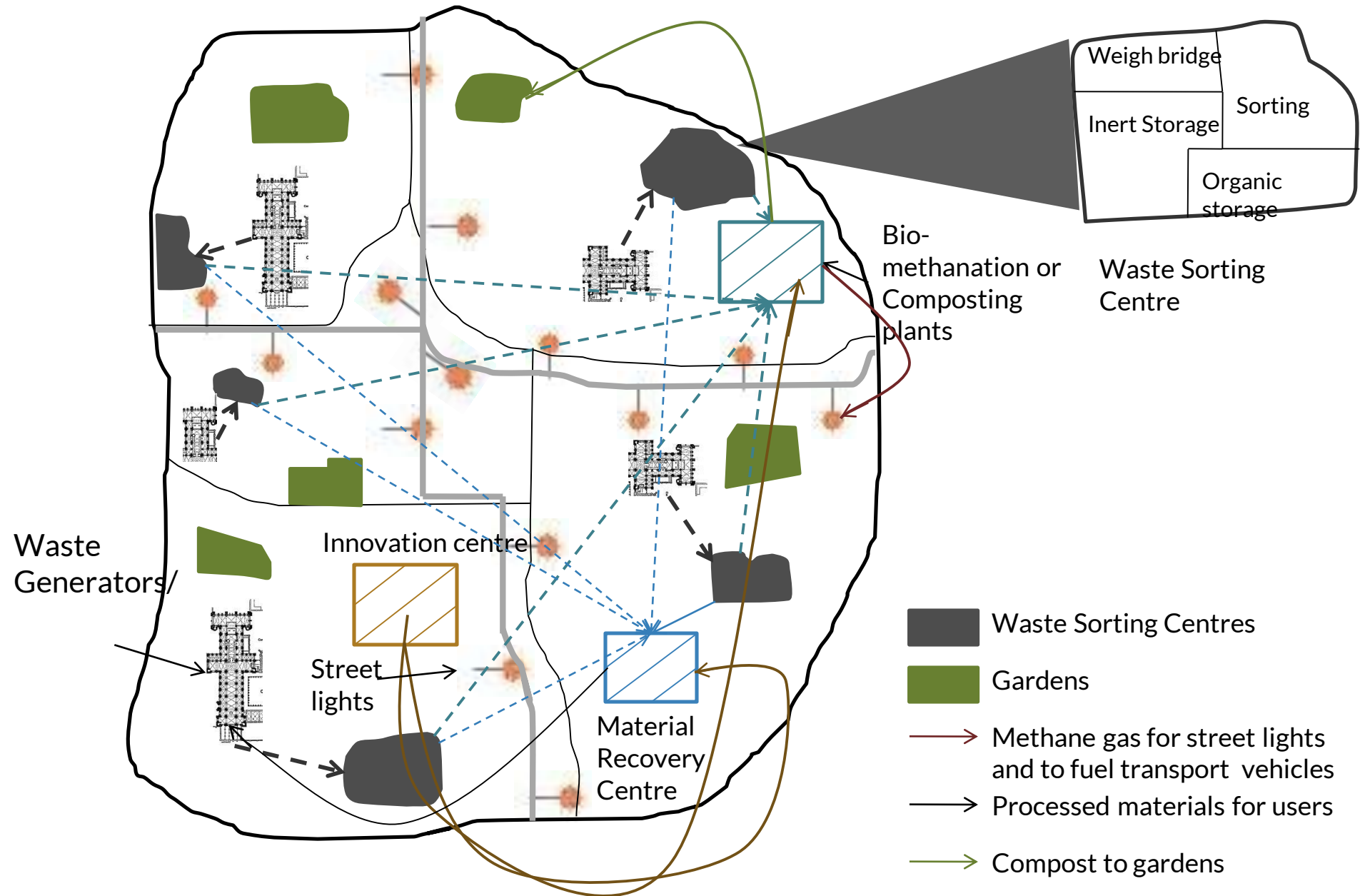
3

Aim at source  
separation of waste  
to produce good  
quality compost

4

Decentralized  
composting system  
suits the socio  
economic and  
physical conditions in  
low and middle  
income countries in  
Asia, and especially in  
secondary cities and  
small towns

# Decentralized Integrated Eco-system





# Why some decentralized solutions fail?

- ▷ Waste from other wards is not being allowed to be brought/treated in the plants
- ▷ No water/electricity is provided at plant site
- ▷ Payments are not being made on time
- ▷ Local corporator does not co-operate for such projects
- ▷ Local corporator insists on employing his people, who are not used to work at such projects



 **Biogas plant at Yerwada, Pune, India**

# What can the government do?

- ▷ use carrot & stick policy
- ▷ be strict with NOC norms
- ▷ % rebate in property tax with yearly monitoring
- ▷ benefits of by-product to societies/townships only
- ▷ dry waste collection only twice a week
- ▷ Viability Gap Funding + BOOT
- ▷ subsidy
- ▷ space to be allotted
- ▷ waste to be provided

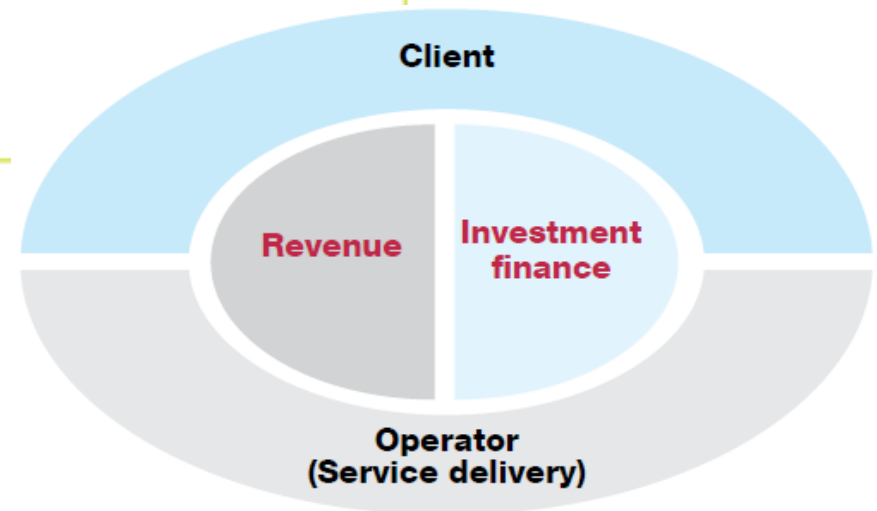
# 3.

## Business models

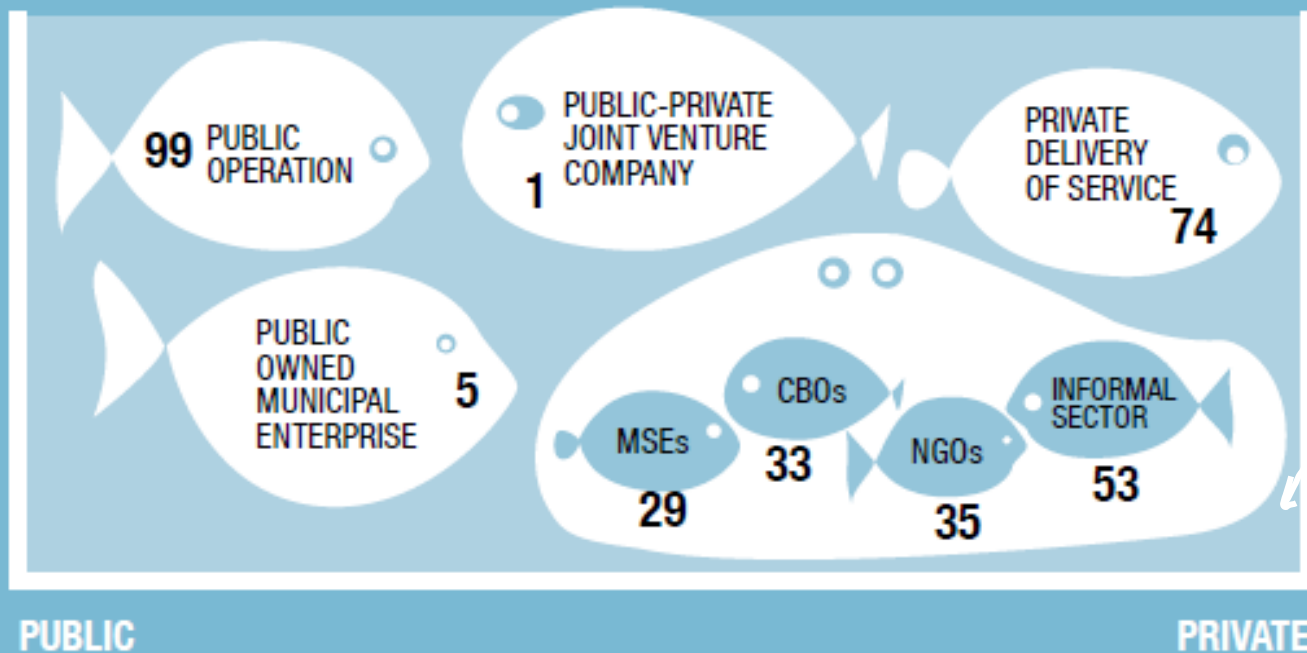
No one-size-fits-all solutions



Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
	Key Resources		Channels	
Cost Structure			Revenue Streams	

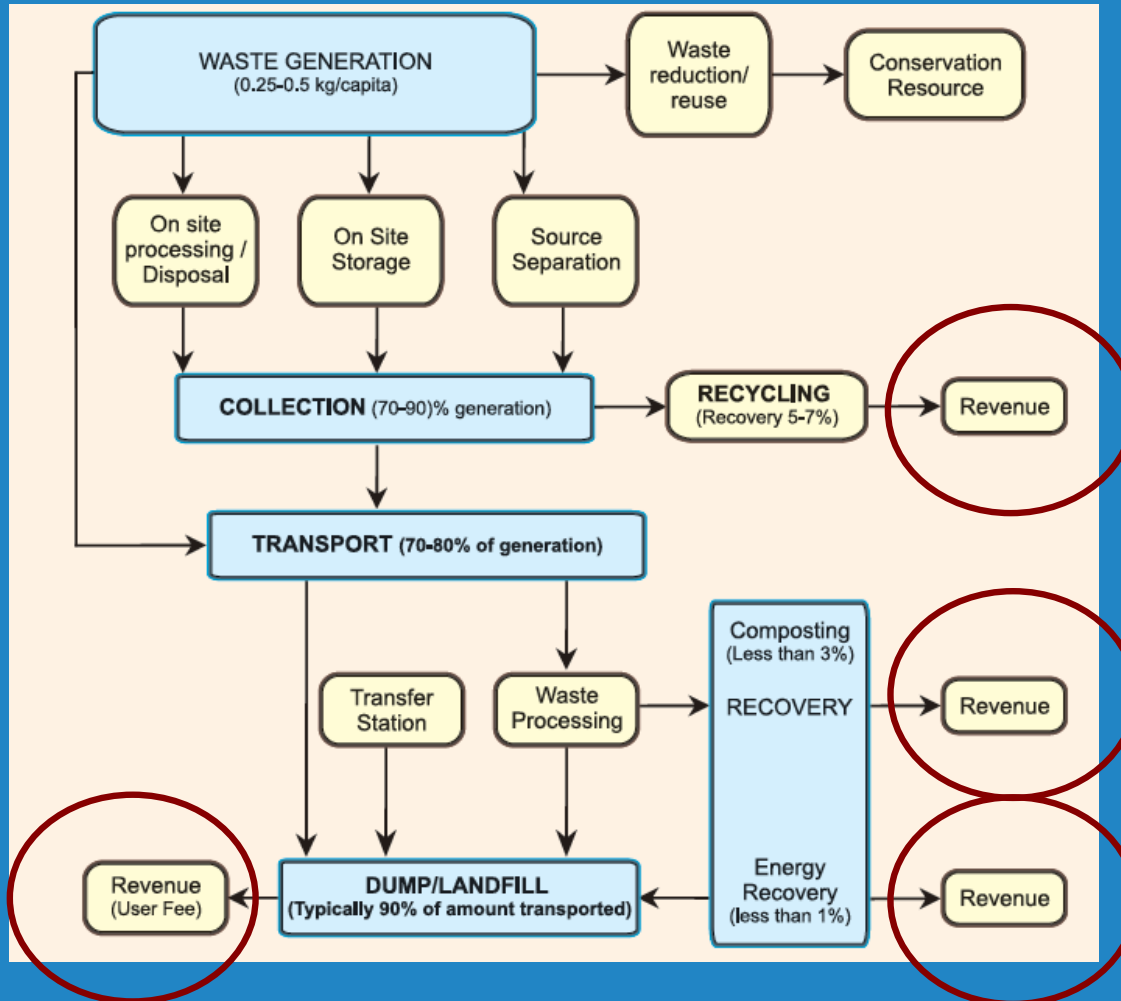


## Business model canvas and components of waste management financing model



Numbers indicate the frequency of different models in 134 case studies identified in the literature in 2011. The case studies were chosen primarily from low- and middle-income countries. The average number of service delivery models per city was 2.5

Continuum of options between public and private service delivery models in cities in low and middle-income countries

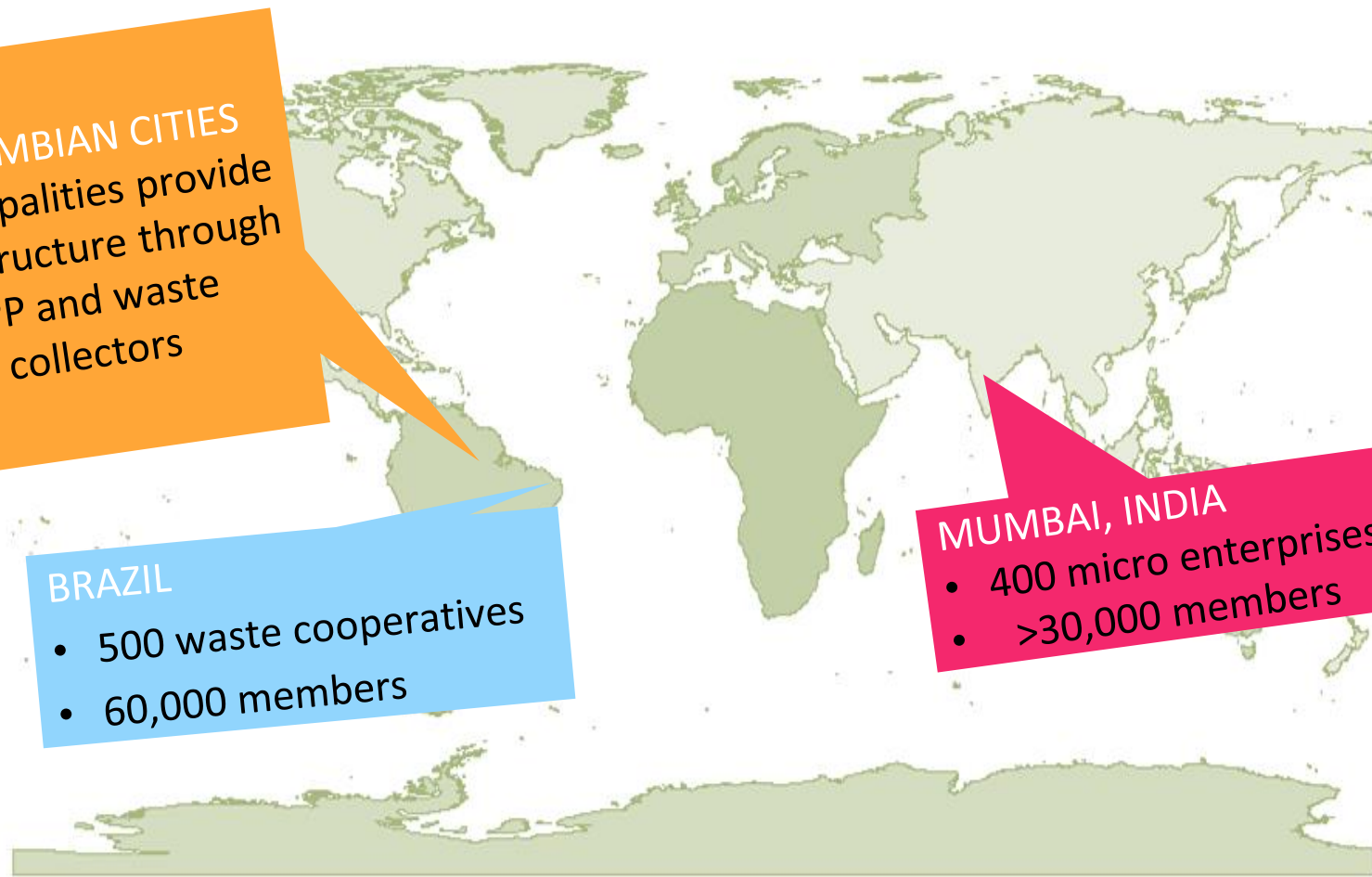


- Waste management fees – Municipal monopoly on MSW from households
- Waste management income – Competition for handling industrial and commercial waste
- Income from sales (material, energy, material and consulting)

## Overview of main components of MSW and three types of revenues

# Business Models

- Cooperatives
- Microenterprises
- Through Public-Public and Public-Private Partnerships



**COLUMBIAN CITIES**  
Municipalities provide infrastructure through PPP and waste collectors

**BRAZIL**

- 500 waste cooperatives
- 60,000 members

**MUMBAI, INDIA**

- 400 micro enterprises
- >30,000 members

# Zabbaleen Environment and Development Program - Cairo, Egypt

- ▷ Zabbaleen, minority community in Cairo
- ▷ Informal waste picking from 1930s
- ▷ Zabbaleen Environment and Development Program in 1981
- ▷ Support from Ford Foundation, the World Bank, Oxfam and others

- ▷ Franchise system - paying a license fee to Cairo and Giza Cleansing and Beautification Authorities from 1990s
- ▷ Collecting US\$ 0.3 to 0.6 fees directly from households
- ▷ Primary school, paper recycling project, weaving school, health centre, small industries project established

**Two Zabbaleens can collect waste from 350 homes using a horse cart & can earn 3 times the average income of a person**





# Kagad Kach Patra Kashtakari Panchayat (KKPKP) - India

▷ Association of waste pickers founded in 1993 in Pune, India

▷ Secretariat of the National Alliance of Waste pickers in India

▷ Turnover of US\$ 35000

▷ Works in partnership with municipality to extend services for door to door collection and recycling of segregated MSW

▷ 6266 members as of February 2007 - 80 % women from socially backward communities.

▷ Annual membership fee – US\$ 0.44, small monthly fee paid by households and businesses and the revenue from recycling meet the staff salary.

▷ Group insurance policies to cover accidental and natural deaths and disabilities, social security covers at an annual premium of US\$ 1.55 per member and medical insurance



# Recycling Centre in Western Africa

▷ Recycling Centre in Ouagadougou in Burkina Faso

▷ Managed by 30 women, 2 technicians

▷ 2000 employees – come from poorest of Ouagadougou communities

▷ Earning US\$69 per month

Special plastic mill provided by the Italian NGO LVIA to granulate plastic waste



Women working in the Recycling Centre



Recycled Materials



# Green Exchange Program – South America

▷ In Green Exchange Program, food is given in exchange for recycled garbage

▷ Participation rate >70% of households

▷ 90% of residents recycle 2/3rd of waste daily

▷ School for children making toys from waste

▷ Recycling coordinated by workers who were ex-alcoholists and poor



# Waste Concern in Bangladesh

▷Waste Concern (WC) a “not-for-profit” social business enterprise was founded in 1995 in Dhaka, Bangladesh with the motto “waste is a resource”

▷Over the time of the business is expansion, Waste Concern Group was formed and which has now both for-profit and not-for-profit enterprises.

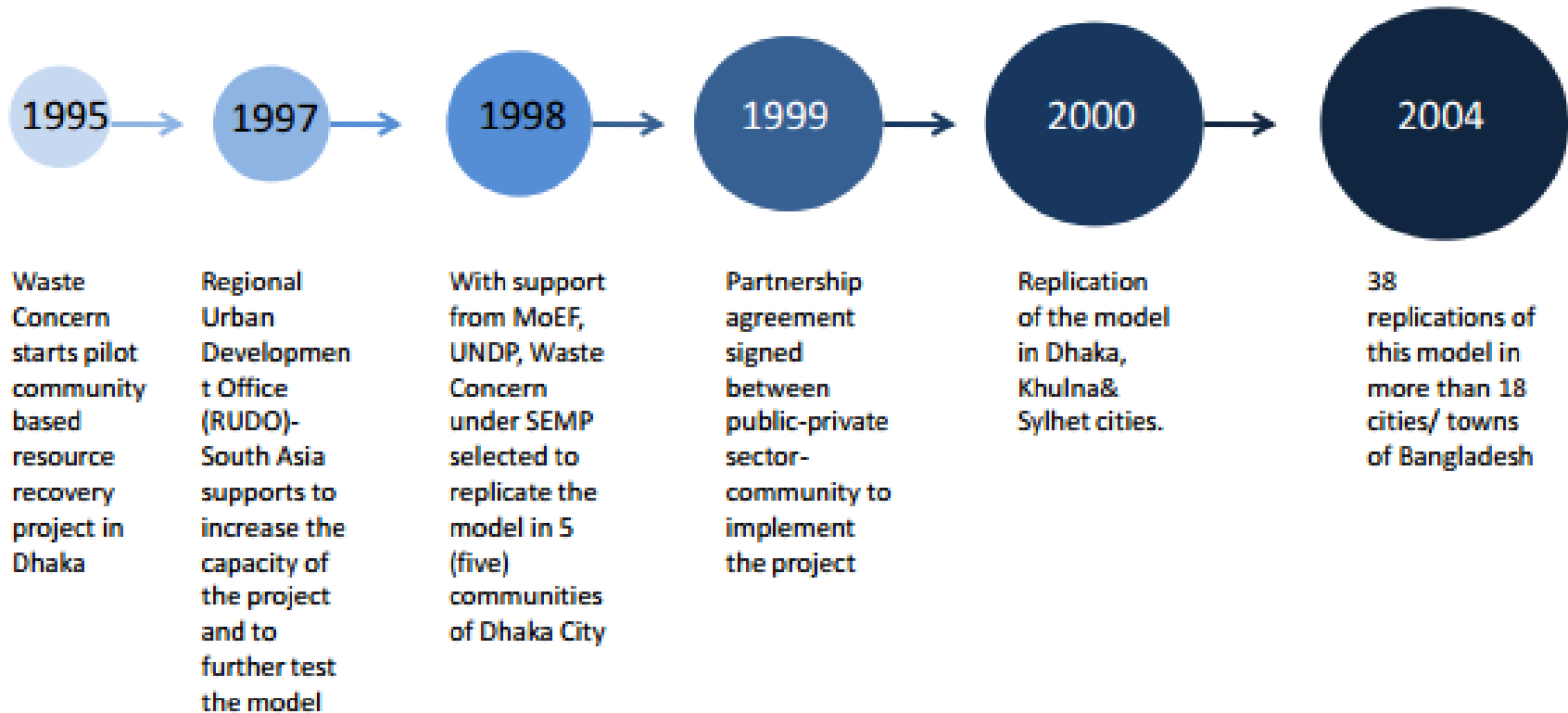
▷WC primarily deals with a specific waste stream such as organic waste of the daily household waste.

▷Household waste are collected by community collection systems, collected waste are then transported to WC’s composting plant, organic wastes are sorted out and processed for composting.

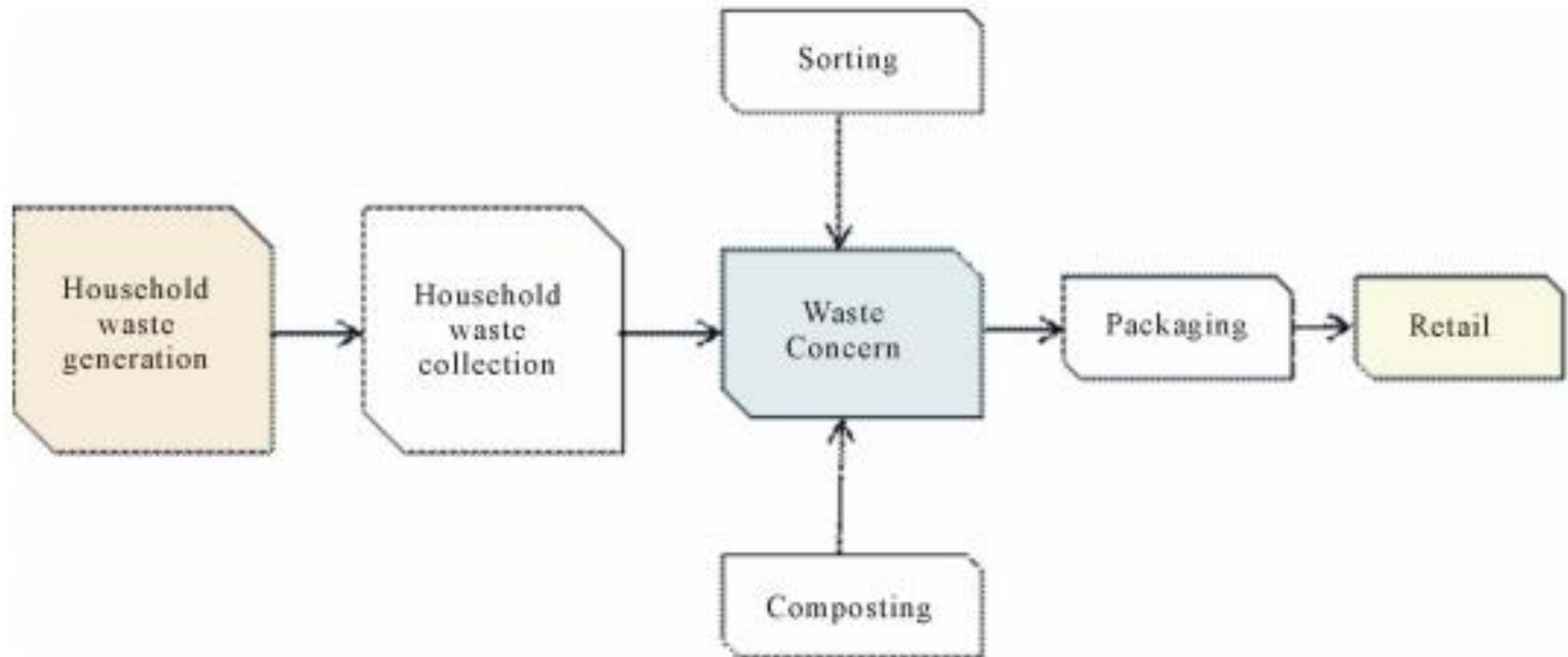
▷Finally, the composted organic fertilizers are sent for retail to the local farmer.



# Evolution of Waste Concern



# Resource flow of Waste Concern's Business Model

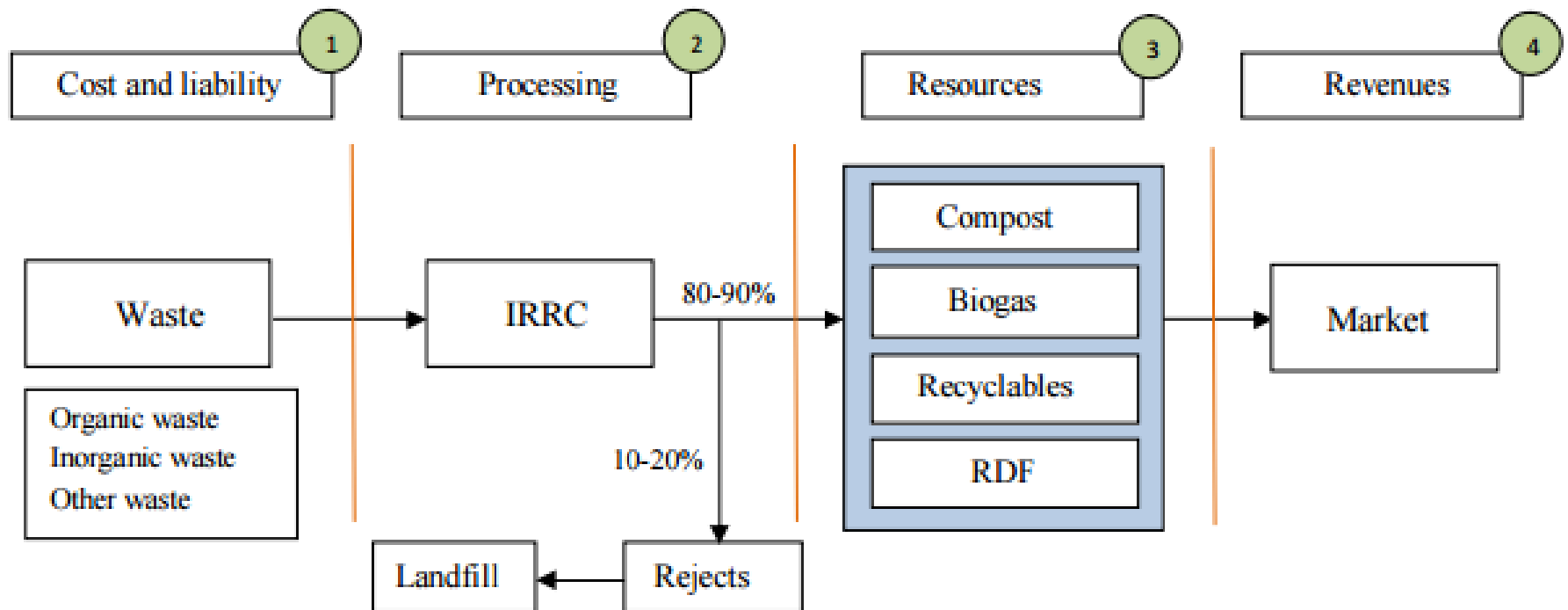


# The Integrated Resource Recovery Center (IRRC) Model

- ▷ The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) has been promoting decentralized and IRRC in seven secondary cities across five countries in the Asia-Pacific region as a demonstration project
- ▷ Since 2007, with technical support from Waste Concern



# Resource flow of IRRC Business Model





# Benefits of IRRC Model

## Social benefits

- Creates 2-4 green jobs for urban poor/waste pickers
- Provides steady source of income and better working conditions to urban poor/waste pickers
- Reduces the spread of vectors, diseases and odours
- Directly benefits 1,500 - 2,000 people through better hygiene and improved urban environment
- Increases the awareness of the community on sustainable solid waste management and 3R

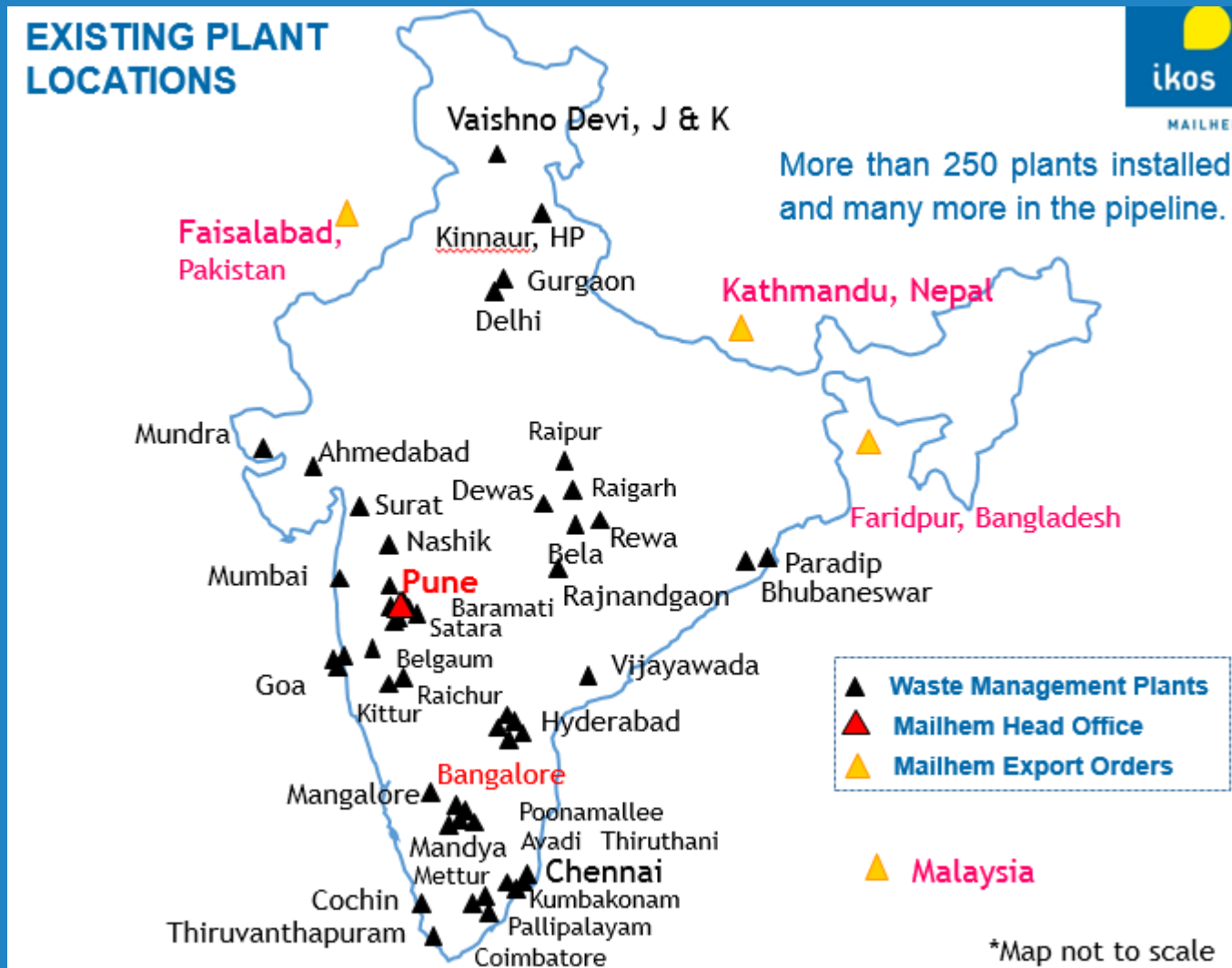
## Economical benefits

- Produces 0.2 ton of good quality compost
- Produces 40-80 m<sup>3</sup> of biogas (480-240 kwh)
- Requires only 150-200 m<sup>2</sup> of land, saving 2.2 m<sup>3</sup> of landfill volume
- Promotes sustainable consumption and production through closed loop material cycles
- Saves fuel costs as waste need not be transported to the landfill which are usually far from the city

## Environmental benefits

- Avoids 0.2-0.3 m<sup>3</sup> of leachate water
- Avoids the emission of 0.5 ton of CO<sub>2</sub>e
- Compost offers multiple benefits to the environment as it
- re-establishes soil fertility by returning organic matter to soil
- is a source of valuable nutrients and minerals to the plants
- improves soil structure by creating a better plant root environment
- improves the water holding capacity of soil in drought prone areas

# Mailhem's WM plants across India





📍 Arcot, Tamil Nadu, 3 ton/day segregated organic MSW



📍 Katraj, Pune, 5 ton/day segregated organic MSW



📍 BBMP, Bangalore, 5 ton/day segregated organic MSW



📍 Mettur, Tamil Nadu 5 ton/day segregated organic MSW

# Holistic WM for private sectors

▷ Many waste or water management companies are opting for providing holistic solutions to all forms of waste ---looking for a holistic solutions to their clients ( i.e., municipalities)

▷ Companies are putting ‘Circular Economy’ at the center stage of their business operation



- the management of the extended water cycle,
- the recycling and reuse of waste,
- water treatment solutions and
- consulting services for sustainable urban and regional development

# Wonders of waste disposal in Kanpur, India

▷ In June 2008, KNN gave a BOOT (build, own, operate, transfer) contract for processing and disposing of solid waste to A2Z Infrastructure.

▷ 46 acres of land was given free on a long lease of 30 years for the project.

▷ Plant to process 1500 tonnes per day capacity of solid waste was set up

**Pre-segregation unit**

**Composting unit**

**RDF (Refuse Derived Fuel) unit**

**Plastic segregating unit**

**Briquette manufacturing unit**

**Secured landfill in place**

# New model: Resource management contracting/product service systems

▷ incentivizes innovation in the fundamental redesign of the product and service combination of a business and its suppliers in order to reduce life cycle impacts

▷ the contractor is paid for a service package rather than a tariff per tonne of waste handled, which provides a strong incentive to minimize resource usage, extend product lifetimes, regenerate and reuse products and minimize wastage

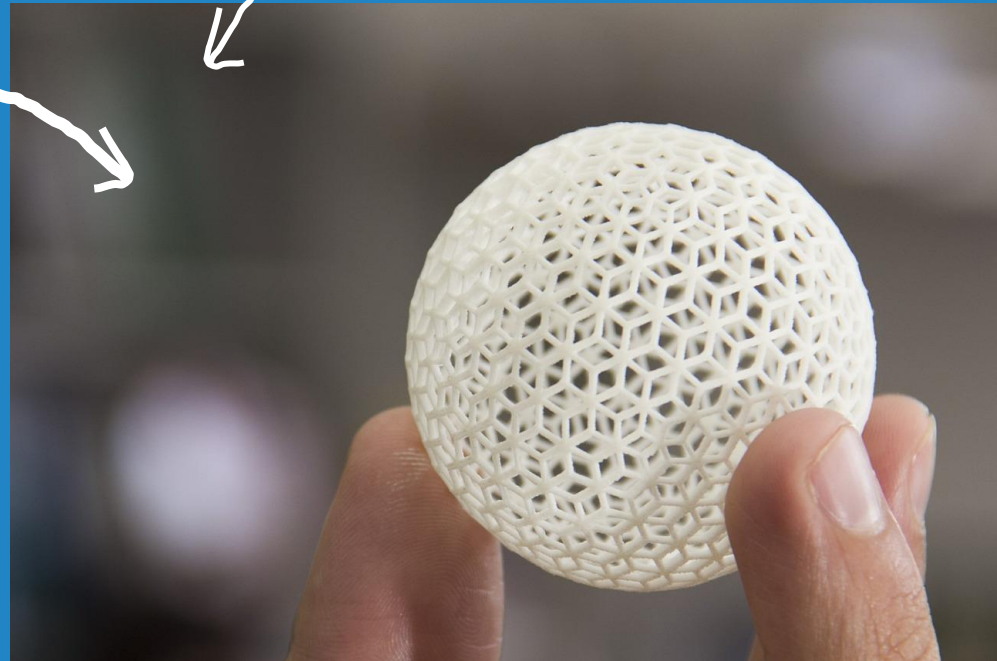
▷ suitable for manufacturing facilities, institutions, school districts and property managers



Holistic GM by-products management system

*Protoprint empowers urban waste pickers to produce 3-D printer filament themselves from the plastic waste they collect.*

- *greater efficiency of design*
- *local production*
- *additive manufacturing instead of injection molding, therefore less waste*
- *bottom-up approach*



Breakthrough 3R Technology: 3D Printing



The Levis Case: Waste<Less



Adidas plans to use these fibers in their products by early 2016

## Breakthrough 3R Technology: Plastic to fibre



# Fabric from Plastic

## Arora Fibres

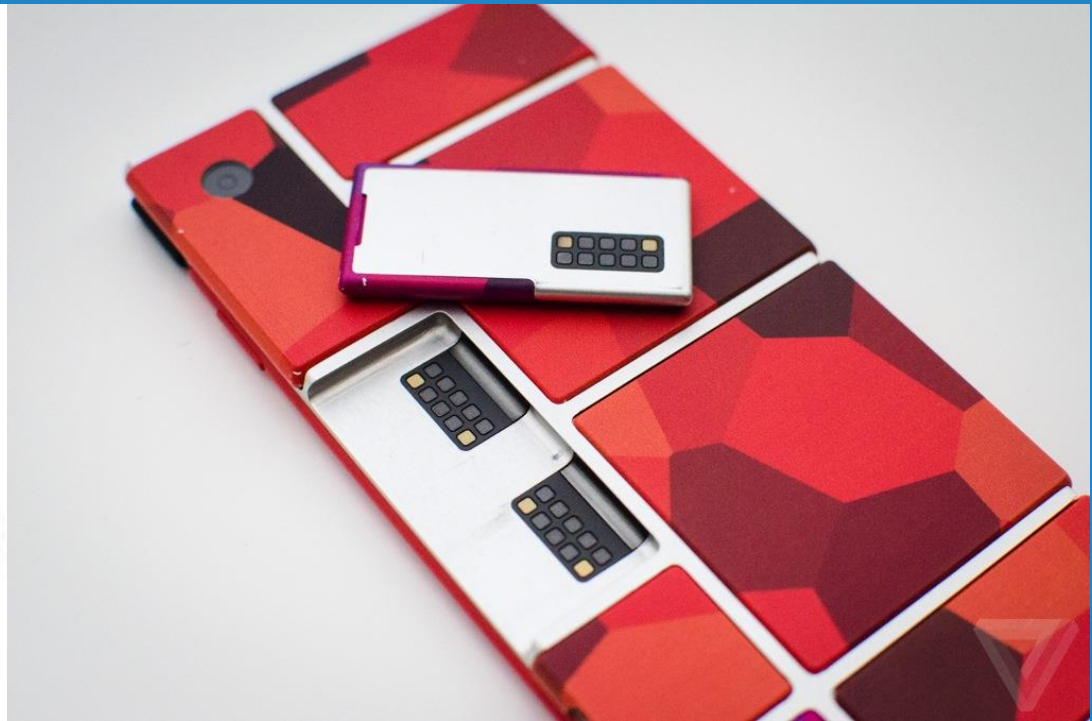
- ▷ Since 1994
- ▷ Recycles discarded plastic bottles into polyester used as packaging material
- ▷ Factory with the capacity to process 18,000 tonnes of plastic a year and plans to increase that to 48,000
- ▷ The industry depends on rag pickers for raw material.
- ▷ Applications: Industries like automobiles, used as packaging material for beverages, food products, pharmaceuticals, and consumer and industrial products.

## Levis

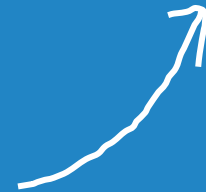
- ▷ Life Cycle Analysis (LCA) approach.
- ▷ At least 20% post-consumer plastic recycled content.
- ▷ Plastic bottles and food trays are collected from municipal sites, cleaned, sorted, crushed into flakes and made into a polyester fibre.
- ▷ More than 3.6m bottles and food trays for 300,000 Waste < Less jeans.

## Adidas

- ▷ A concept sneaker made almost entirely out of plastic waste and discarded fishnets taken from the sea.
- ▷ Some of these nets were even confiscated from poachers by Sea Shepherd environmental activists
- ▷ The nets and ocean trash are turned into fibers that can be used in various garments



*Project Ara, Google's Advanced Technology and  
Projects group*



Breakthrough 3R Technology: Repurposing phones

# Case of Landfill Mining and Reclamation (LFMR) – US, 2013



- ▷ PPP based business model: waste Gasification To Biofuel Project To Mine Landfill In Maryland
- ▷ the County has partnered with waste gasification specialist, America First Inc (AFI), in a revenue sharing public/private partnership.
- ▷ Under the partnership Washington County will provide the land and the municipal waste feedstock, but will bear no upfront financial risk.
- ▷ Under Phase I, full production of RDF is anticipated to take place between six to eight months after ground breaking.
- ▷ Under Phase II, which will commence between 12 and 18 months after ground breaking, fuel production is expected to begin within 90 days of commissioning.

# LFM applications around the World



# Case of Landfill Mining and Reclamation (LFMR) – India, 2013



▷ BBMP (Bangalore Municipality) has identified seven land parcels of 112 acres belonging to Bangalore Metropolitan Transport Corporation and various private lands within a 100-km radius, to be developed on outright purchase basis and on public private partnership model.

<b>Name of the site</b>	<b>Technology proposed</b>
Mandur–North	Bio-mining, RDF and Remediation
Mandur- South	Bio-mining, RDF and Remediation
Mavallipura	Bio-mining, RDF and Remediation
Cheemasandra	Bio-mining, RDF and Remediation

▷ 4 sites selected for biomining.

# Concluding Remarks

- ▷ Partnerships is the way to address the challenge and opportunities of waste to resources
  - ▷ Science & Technology are important but equally important are business models that promote innovation
  - ▷ Decentralized approaches play an important role and promise success
- 

# Thanks!

## Any questions?

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