

3Rs in the Context of 21st Century Cities

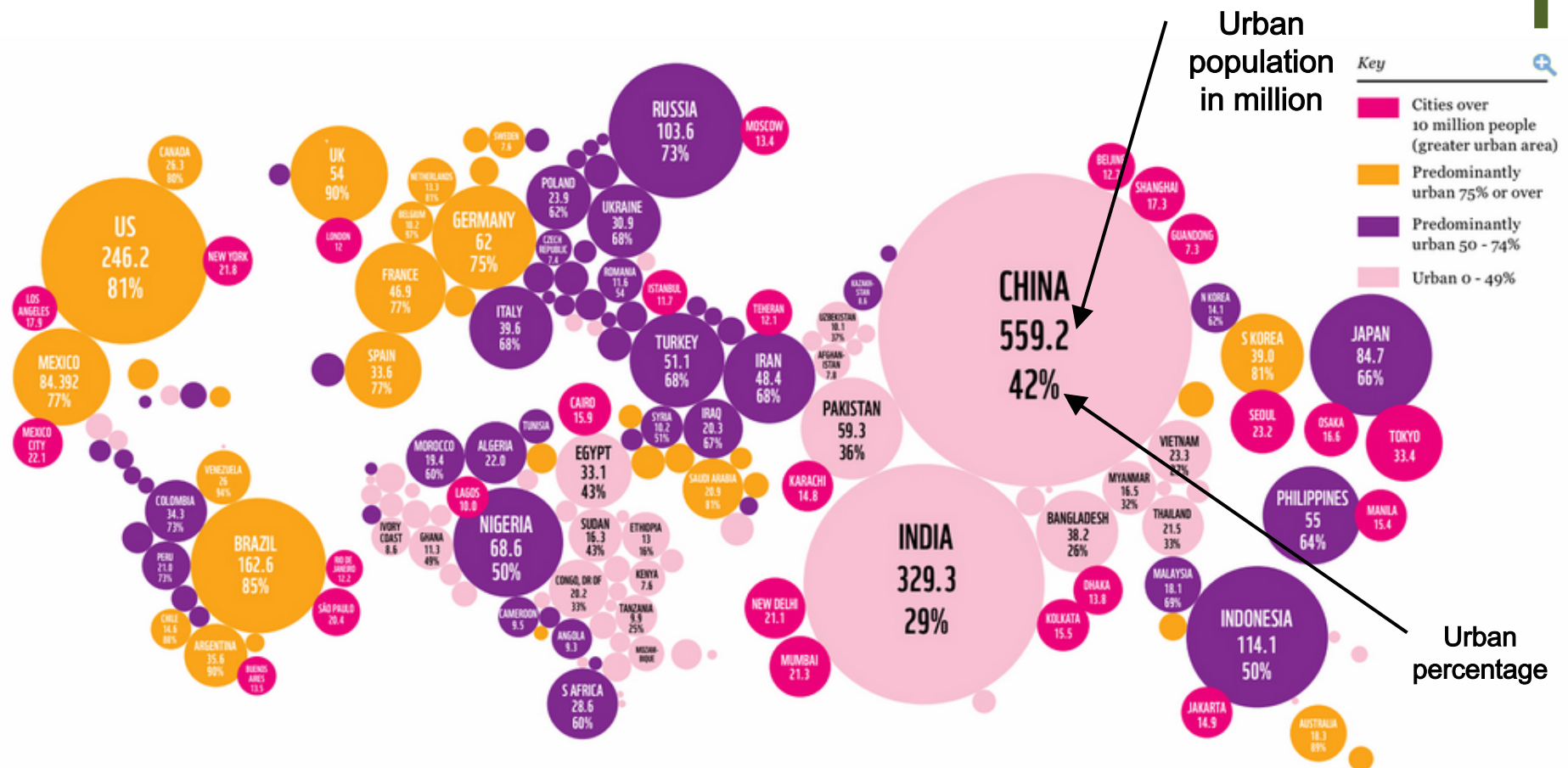
Better City, Better Life, And Resource Efficient Society

Dr. Prasad Modak

Environmental Management Centre LLP, India



Balloons of Urbanization

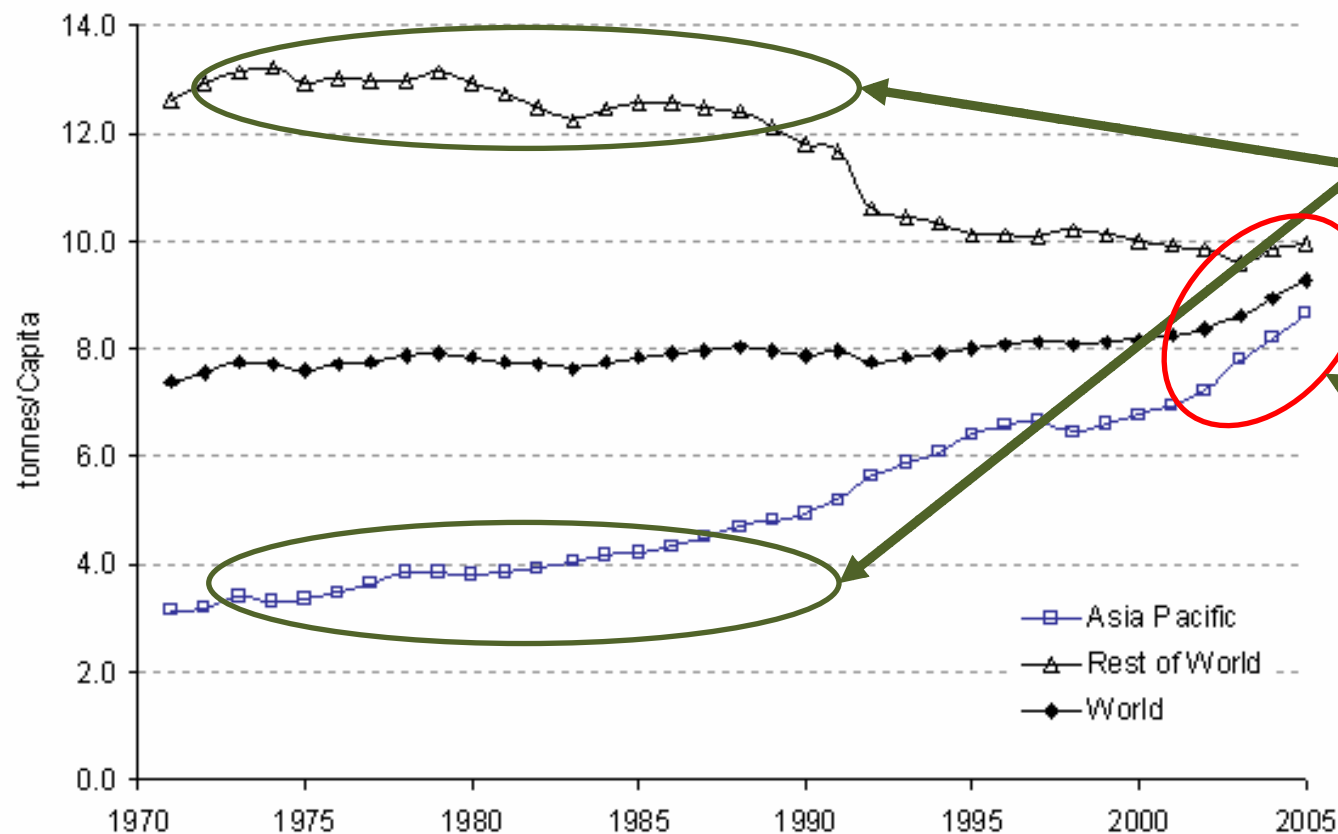


The number of people living in cities in each country of the world in 2010, together with the percentage of the population in countries with large urban populations

Source: WWF Living Planet Report 2012



Resource Consumption Tonnes/Capita



Asia Pacific was using resources just one third of the Rest of the World (1970-1990)

Asia Pacific is now consumes as much as the Rest of the World (Post 2000)

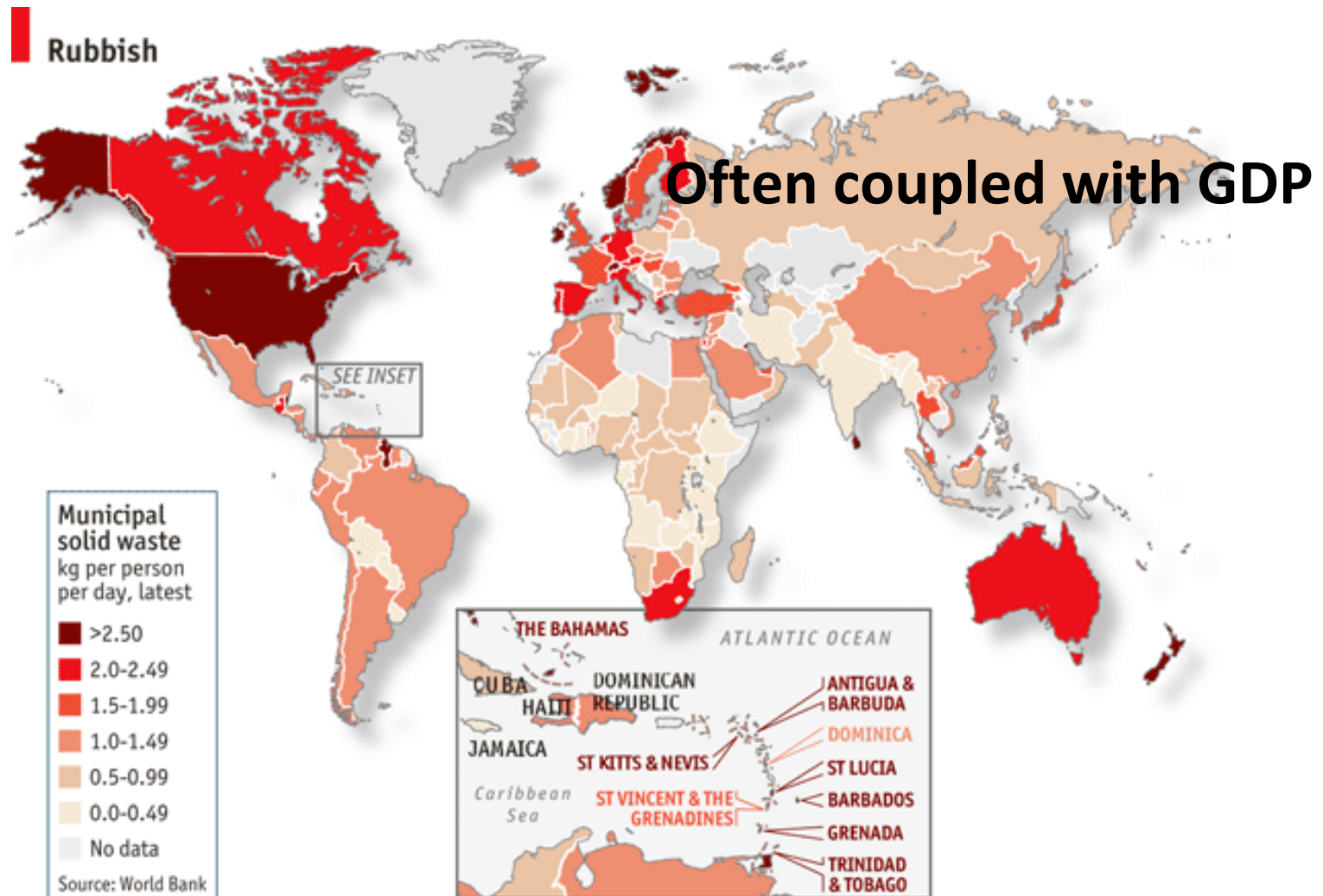
Per Capita Resource Use for the Asia-Pacific, Rest of World and World, for the years 1971 – 2005.

(Total Domestic Material Consumption)

Source: UNEP and CSIRO (Forthcoming)



Rising Per Capita Waste Generation



Source: <http://www.economist.com/blogs/graphicdetail/2012/06/daily-chart-3>

New Waste Streams We need to Worry about

- Construction & demolition waste
- E-waste
- End-of-life vehicles
- Hazardous domestic waste
- Bio-medical waste

- Of 2003, bio-medical waste to 8% of general waste and 20% hazardous material that may be infectious, toxic or radioactive. By 2020, waste from used computers in Germany, UK, France, Spain and Italy are responsible for approximately 7-10% of waste generated in the EU-25

Source: EMC (2009) End-of-life vehicles (ELV), Reuse and Recovery
<http://www.hopkinsmedia.com/factsheets/factsheet/ELV.pdf>

- Incinerated waste release dioxins and furans and other toxic pollutants as emissions. Paints & Solvents
- Exposure to these may lead to the impairment of the immune system, the impairment of the development of the nervous system, the endocrine system and the reproductive functions. Oil & Antifreeze



Health Risks

Taking waste for 82 years, Deonar is the oldest and largest dump site in Mumbai.

The reasons for the deaths included lung ailments like **chronic obstructive pulmonary disease (COPD)** and **asthma**



Proof is in the death register

	Total deaths (2007-2008)	Deaths caused by respiratory illnesses	Per cent
Chembur	3,195	802	25.10
Matunga	5,103	21	0.41

Poison in the air

Locality	PM ₁₀ (µg/cum)	PM _{2.5} (µg/cum)	Formal-dehyde (ppm)
Acceptable level	100	35	No standard for ambient air

SUDHA PARK

Day 1	306	136	26
Day 2	375	161	29

SHIVAJI NAGAR

Day 1	405	142	56
Day 2	445	197	63

Note: Sudha Park and Shivaji Nagar abut Deonar landfill
Source: NEERI and KEM Hospital, Mumbai, March 2009



Waste Extents



Can we have cities of 21st century without landfills?



Waste as Resource

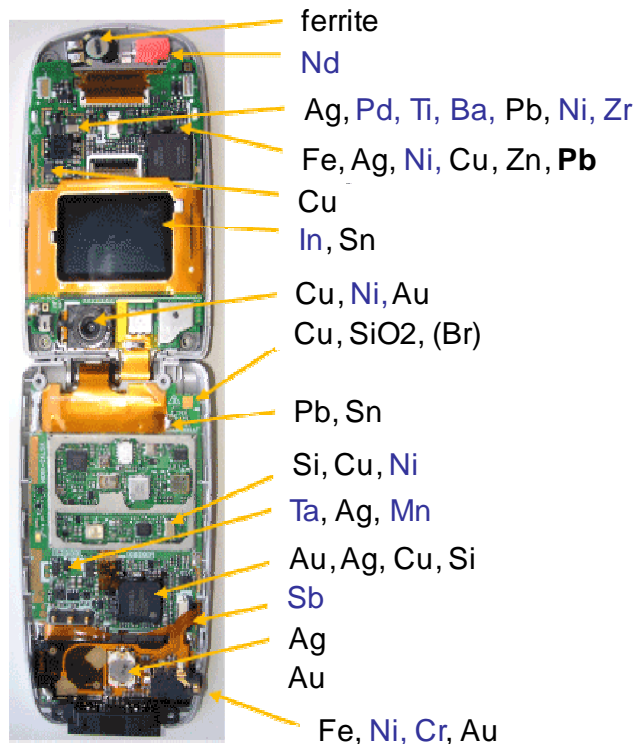
Type of waste	Recycled products	Recycling potential
Biomass	Composts	Future of compost depends on its environmental and agronomic quality and the dynamism of its market.
Paper and cardboard	Recovered paper (recycled paper)	Increasing demand in Asia, particularly in PRC.
Plastics	Recovered plastics	Increasingly stringent regulations and growing demand for recovered plastics in Asia, favoring development and internationalization of this market. Cost of collection system and volatile prices are limiting factors.
Ferrous Metals	Steel	In 2004, world production of scrap metal rose to 450Mt and consumption reached 405.5Mt. Can be recovered from MSW, construction waste, etc.
E-wastes	Recoverable materials	Estimated that 10million computers contain 135,000 metric tons of recoverable materials, such as base metals, silicon, glass, plastic, and precious metals.

Source: Adapted from ADB and IGES (2008), Toward Resource-Efficient Economics in Asia and the Pacific: Reduce Reuse Recycle, Asian Development Bank, Manila



Mobile Mines!

Valuable Metals That Could be Recovered from a Mobile Phone



Quantity of Non-ferrous Metals Included in One Mobile Phone (Unit: g)

Gold	0.028
Silver	0.189
Copper	13.71
Palladium	0.014

Source: <http://www.rieti.go.jp/jp/events/bbl/05060701.html>

Resource Recovery Rate

	Average %	Formal %	Informal %
High-income	54	54	0
Middle-income	22	8	13
Low-income	27	3	24

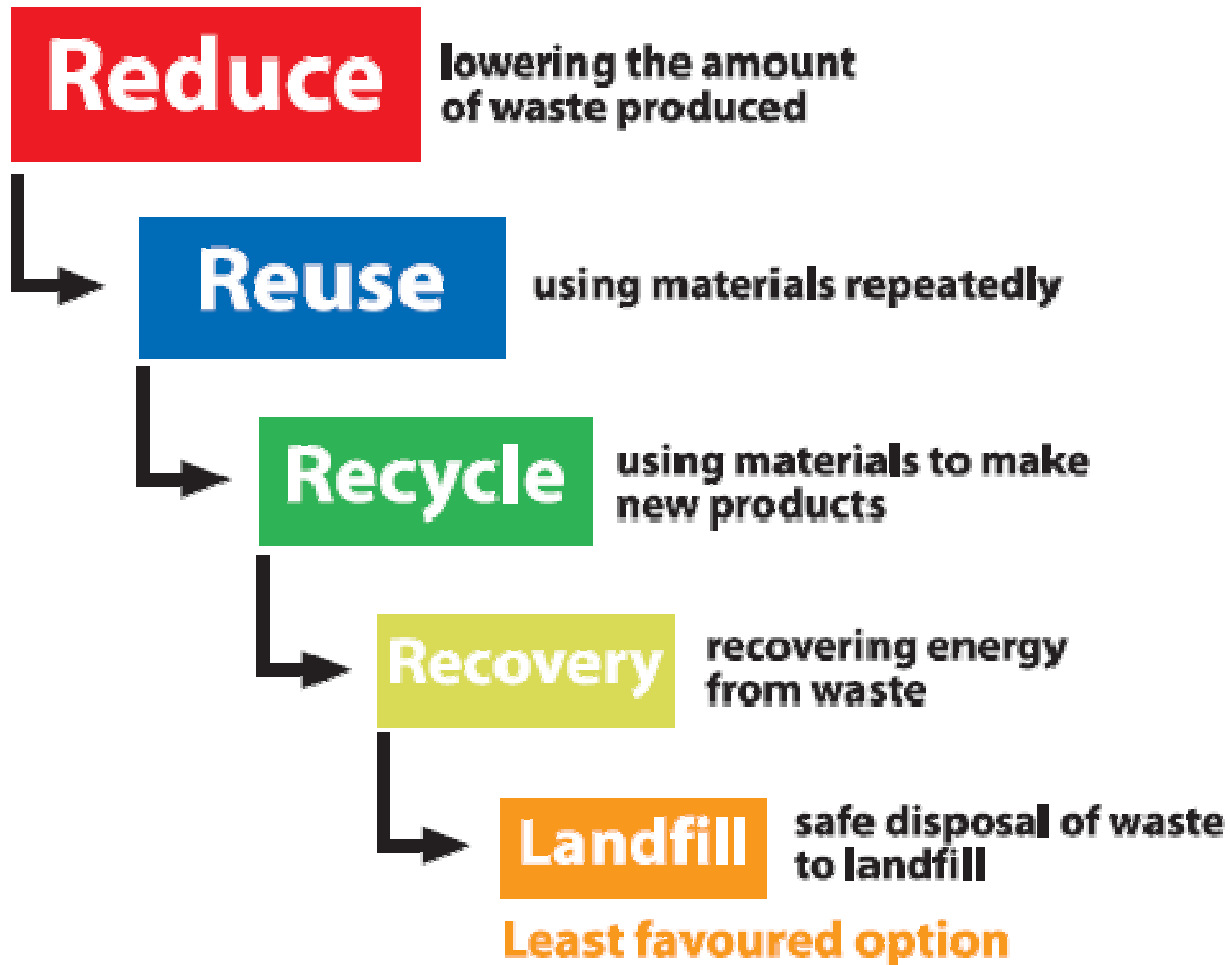
Source: <http://www.coden.jp/rare-metal/use.html>



- Institutional Coordination – Waste and Resource Managers don't talk!
- Poor Legal Enforcement
- Low Technical Capacities of ULBs
- Infrastructure deficiencies
- Financial Constraints
- Low Technological Innovations
- Lack of Informal sector integration

3R as the Strategy

Most favoured option



Improved Resource Security

Reduced Risks
Humans and Ecosystems

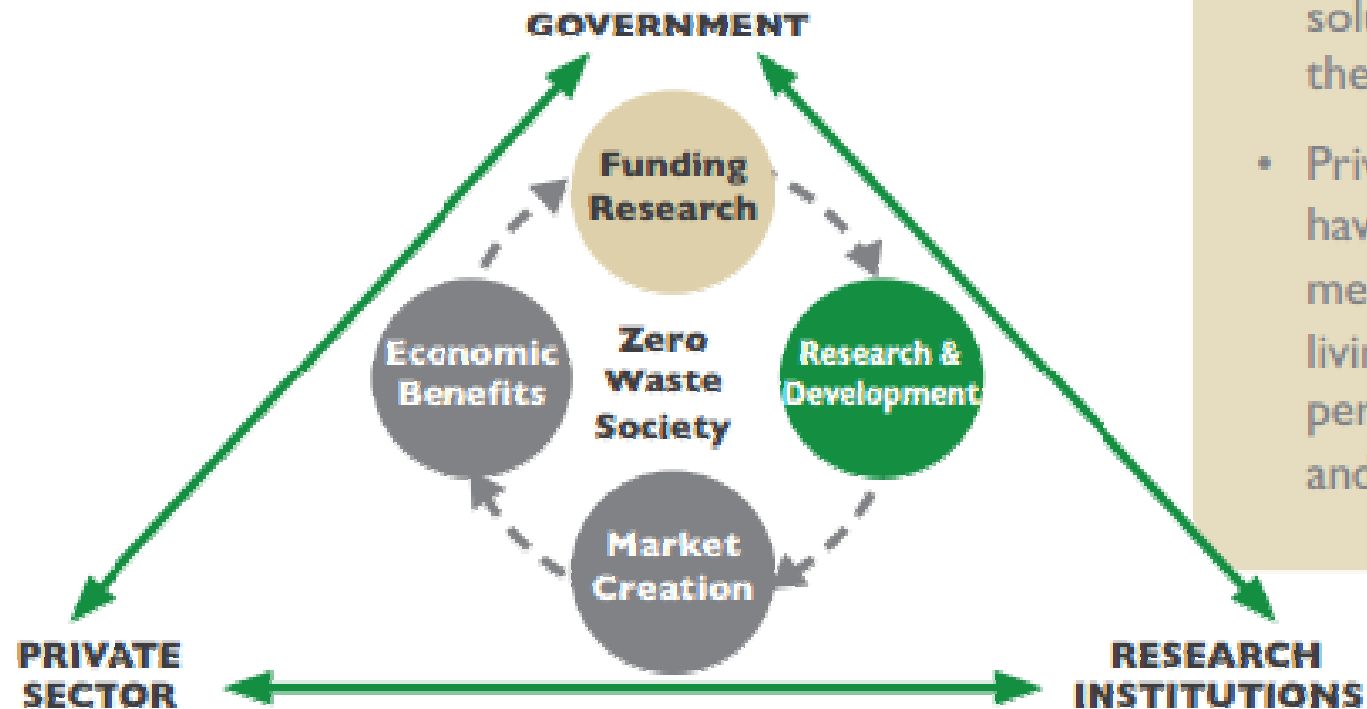
Green Investments
and Green Jobs

Product Innovation

Reduced Life Cycle Costs

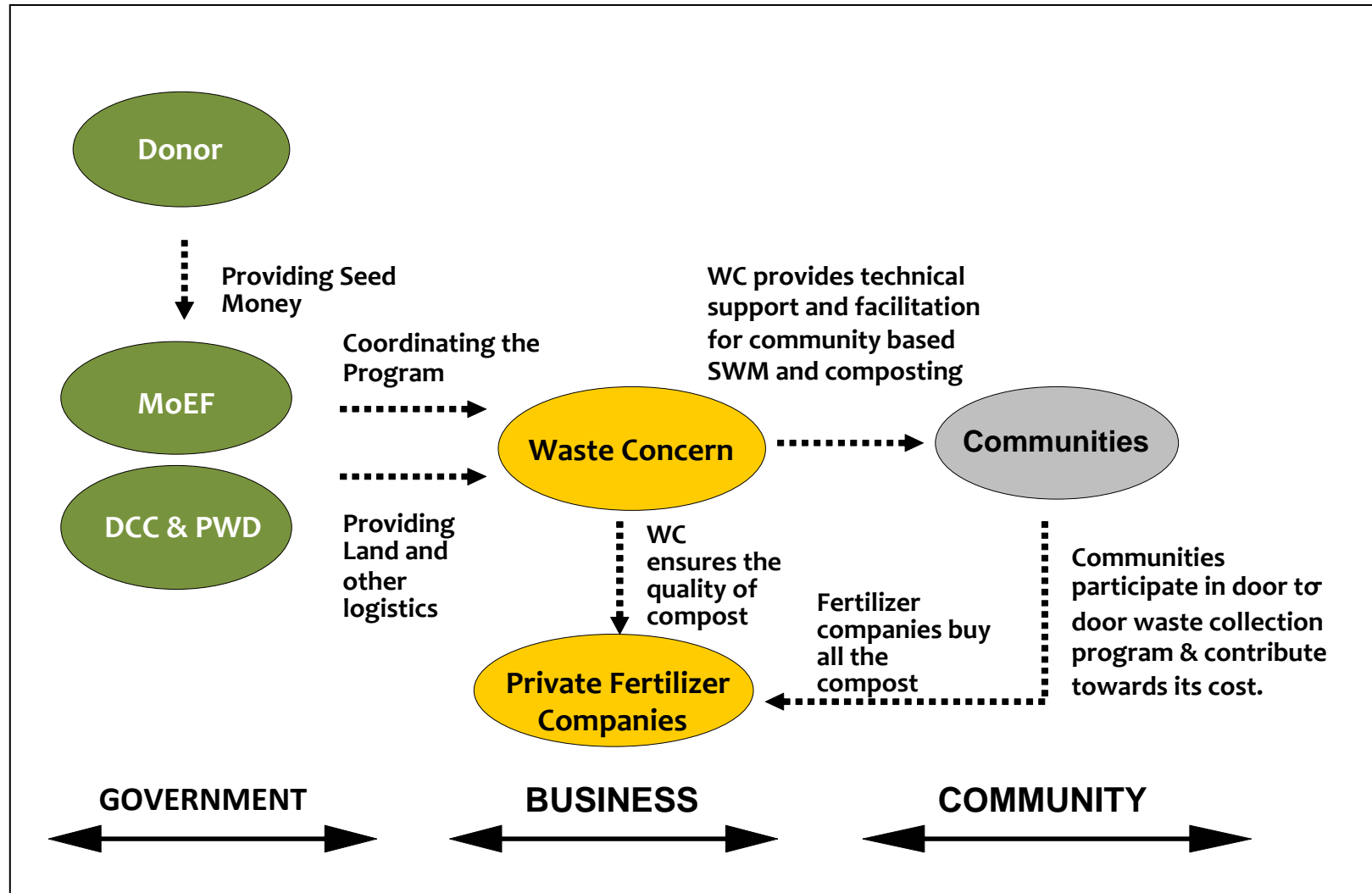


Partnerships is the Way



**Waste Management not as Obligation but
as a Business for Turning Waste to Resources**

GBC Model for composting in Dhaka



Wongpanich Recycling, Thailand

- Recognized as a model for recycling business in Thailand and neighboring countries
- Provides important benefits such as
 - poverty reduction
 - create job opportunities
 - market value for waste
 - educate people
 - and increase awareness within community

<http://www.swlf.ait.ac.th/data/Case%20studies/Wongpanich%20Presentation.pdf>



Wongpanich Waste Recycling Factory, Thailand



Recyclable transportation



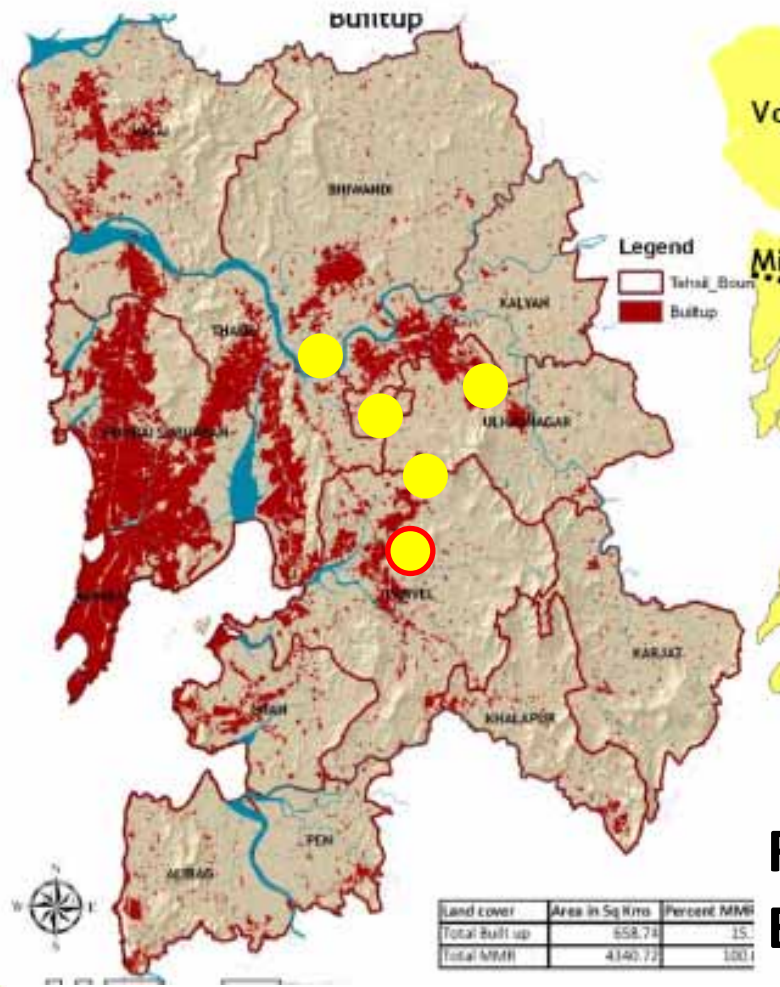
Storage of Separated & Cleaned Plastic Containers



Factory Building



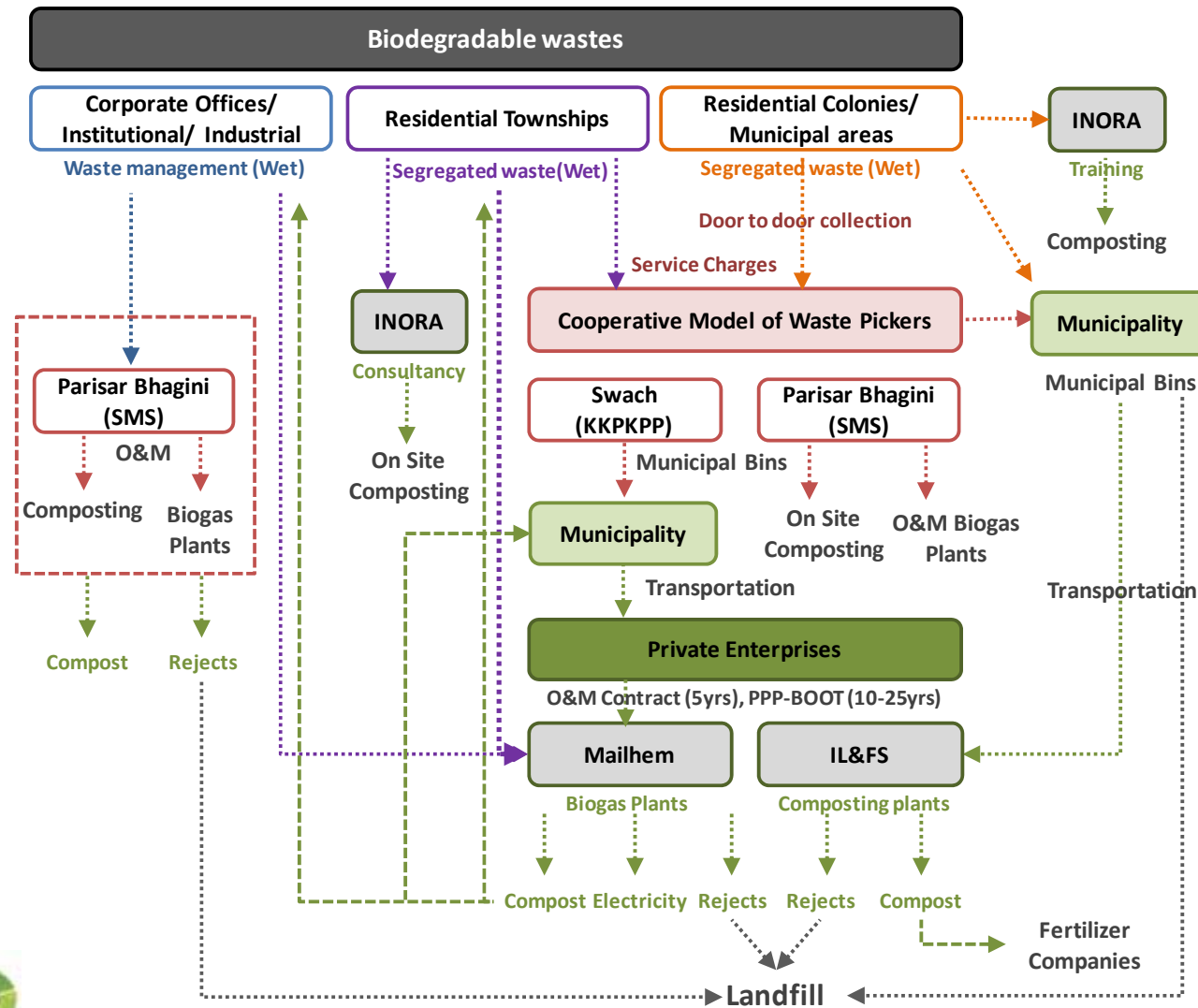
Regional Landfill Sites : Mumbai, India



- ULB clusters chosen in Mumbai Metropolitan Region
- Existing **ULB dumpsites** to become **transfer stations**
- **Processing and Sanitary Landfill** at a Regional Landfill
- 15 sites examined and **5 chosen** (2300 ha.)
- **Taloja** taken up in ph-1, 117 ha. govt. land
- To serve 6 ULBs, 2000 MTPD
- PPP as implementation model.

**Realizing Material Recovery on a Scale
Entry of New Technologies**

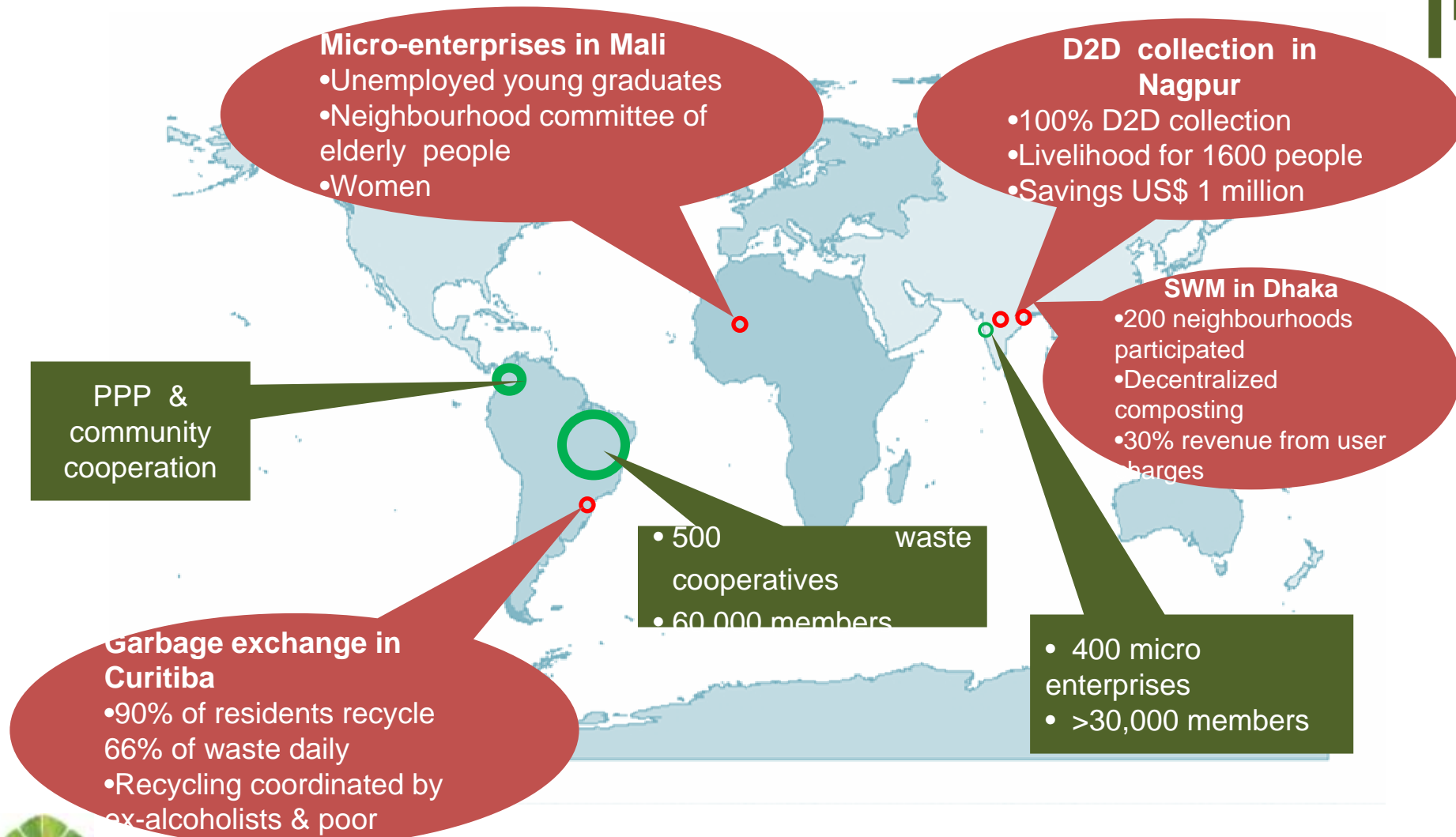
Decentralized Solutions– Integrating informal sector



Using Technologies on Smaller Scale engaging informal sector with Private sector – supported by ULBs
Case of Pune, India



Decentralized initiatives - Worldwide



Technology Challenges

- Miniaturizing 3R solutions at the household
- Addressing Household hazardous waste
- Improving Waste sorting and collection
- Supporting informal sector
- Handling Urban Infrastructure Waste – C&D
- Millions of tonnes of Waste is Waiting in Cities to be Released through Urban Metabolism



Moving Upstream

- Product Design to increase recycling rates – Designing for Sustainability
- Extended Producer Responsibility
- Planning and Investing in Technological Innovations – Anticipatory R&D



Product Design for Sustainability

Design for Disassembly

- Automobiles
- Household appliances
- Office equipments
- Airliner disassembly
- Cell phones that virtually disassemble themselves

Benefits

Redesigning EPSON Printers



RX 600

44% volume reduction to earlier models
34% packaging reduction



RX 690

Design for Environment

- Green buildings
- Lead-free solders
- Safer flame retardants



Extended Producer Responsibility

Take Back Programs

- German Packaging Ordinance 1991 - Packaging waste recycled through Duales System Deutschland (DSD)
- British Columbia Recycling Regulation 2004 - Left over paint returned at 100 depots operated by Product Care. Eco-fees or eco-taxes collected



Packaging Criteria

- Finland – Reducing ratio of packaging waste to product by 6% from 1995 to 2001
- South Korea – Reducing empty space ratio
Limiting no. of layers in packaging



Deposit Refund Systems

- South Korea – Food containers, tires, batteries, lubricants, pesticide containers, and plastics
- Bottle bills in U.S



Waste Resource Linkages in the National Economy

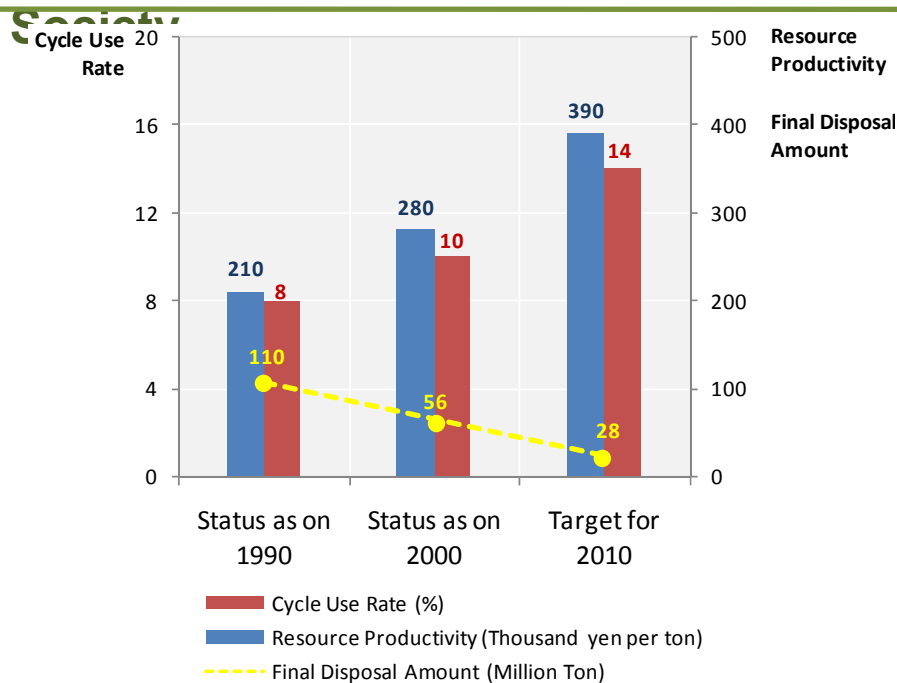
Policies, Regulations and Governance

Sound Material Cycle Society in Japan

One of the four goals of the country's Basic Environmental Plan launched in 2003



Material Flow indicators of Japan's Sound Material Cycle Society



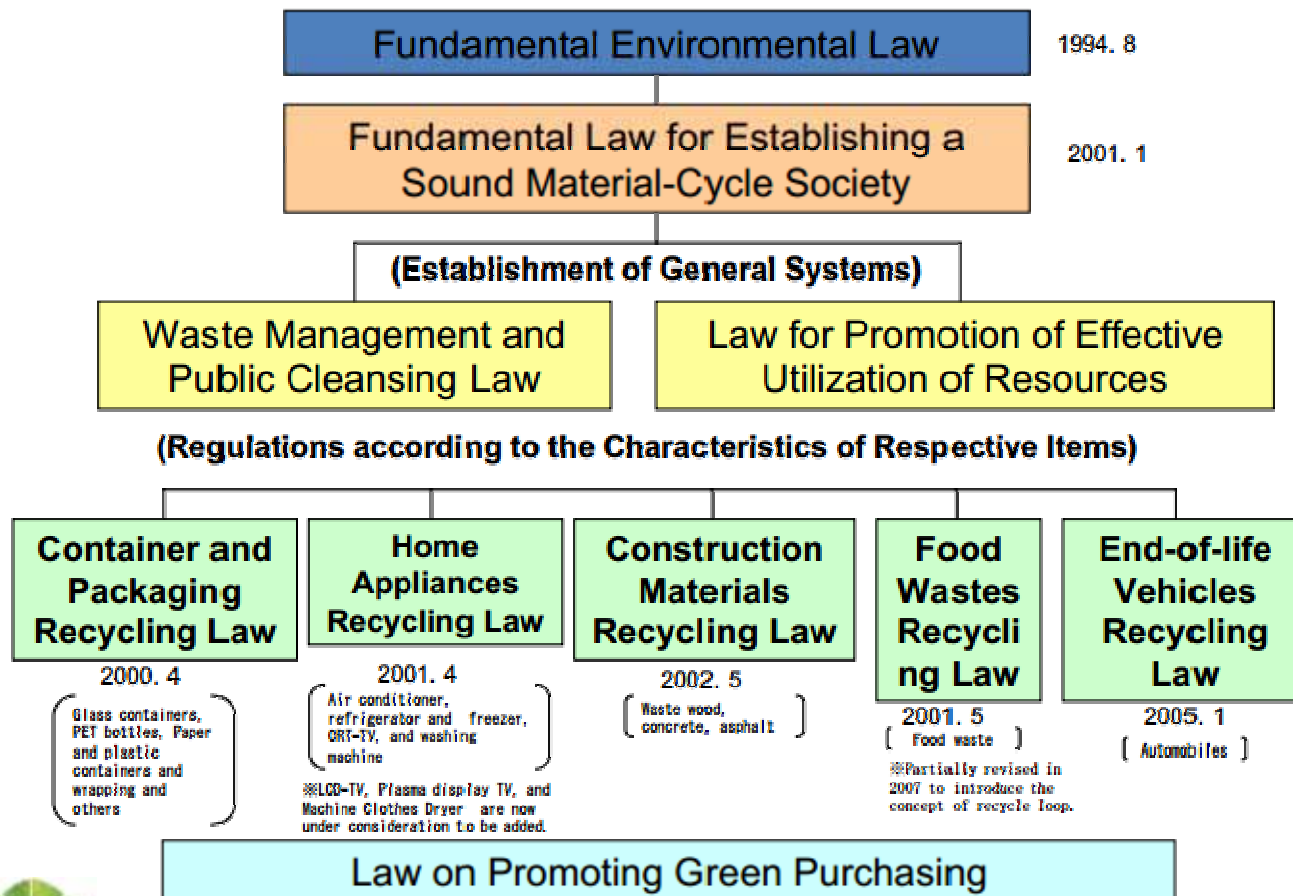
Indicator	Calculation
Resource Productivity (in yen per ton)	$GDP \div \text{amount of natural resources, etc., invested}$
Cycle Use Rate	$\text{Cyclical use amount} \div [\text{cyclical use amount} + \text{amount of natural resource input}]$
Final Disposal Amount (in tons)	Amount of waste landfilled

<http://www.env.go.jp/recycle/3r/en/approach.htm>



Sound Material Cycle Society in Japan

Legislative Framework to Establish a Sound Material-Cycle Society



Natural resources conserved and environmental load reduced, by preventing or reducing the generation of wastes, by promoting proper cyclical use of products, when these products, have become **circulative resources**, and by ensuring proper disposal of **circulative resources** not put into use

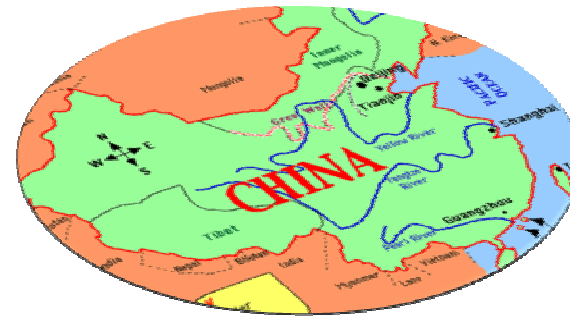


China's Circular Economy

Circular Economy approach in People's Republic of China (2008)

Two targets for IWM set by the 11th Five Year Plan:

- Rate of comprehensive use of solid industrial waste up from 55.8 % in 2005 to 60 % in 2010.
- Total discharge of major pollutants down 10 % in 5 years



Indicators for Circular Economy

INPUT INDICATORS

1. Direct Material Input (DMI)
2. Total Material Requirement (TMR)

OUTPUT INDICATORS

1. Domestic Processed Output (DPO)

CONSUMPTION INDICATORS

1. Domestic Material Consumption (DMC)
2. Total Material Consumption (TMC)

BALANCE INDICATORS

1. Physical Trade Balance (PTB)
2. Net Addition to Stock (NAS)



Green Growth in Republic of Korea

- Vision for national development in the next 60 years
- Dedicating 80 % of the total (\$38 billion) fiscal stimulus package (3% of GDP) to green measures
- Actively formulating the National Strategy on Green Growth and a Five-year action plan
- **Increasing the percentage of waste regeneration from 1.8% in 2007 to 31% in 2010**



Requires major shift in our Lifestyles

Life cycle thinking needs to be brought back in our
DNA

May be we need to move back to our Traditions

and

Rediscover ourselves by
showing our sensitivity and dignity towards
the Earth we live in
by Practicing 3Rs!

THANK YOU !!!

prasad.modak@emcentre.com