



***Need to mainstream resource efficiency
and 3Rs towards Sustainable Cities***

**Rio+20 Side Event on Zero Waste Strategies and Actions towards
Sustainable Cities**

**Rio Centro, Major Groups Pavilion, T-4
Rio de Janeiro, Brazil, 19 June 2012,**

**CRC Mohanty,
Environment Programme Coordinator, UNCRD**

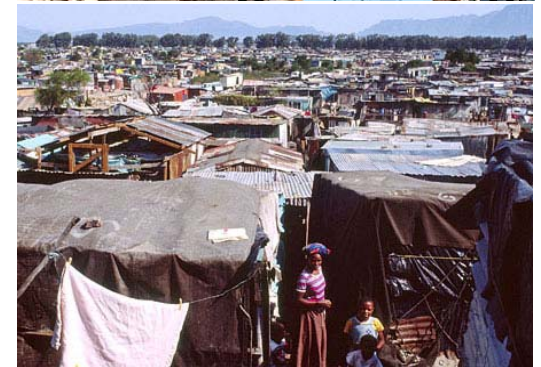
Urbanization trend and its impacts

Facts and figures

- ✓ Half of humanity – 3.5 billion people – live in cities today.
- ✓ By 2030, almost 60 per cent of the world's population will live in urban areas.
- ✓ 95 per cent of urban expansion in the next decades will take place in developing world.
- ✓ 828 million people live in slums today and the number keeps rising.
- ✓ The world's cities occupy just 2 per cent of the Earth's land, but account for 60-80 per cent of energy consumption, 75 per cent of carbon emissions, approximately 70% of global GDP, and consume 70% of all resources.
- ✓ Rapid urbanization is exerting pressure on fresh water supplies, sewage, the living environment, and public health.

Source: United Nations 2012

<http://www.un.org/en/sustainablefuture/cities.shtml#overview>



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Direct exposure of children to emission from open burning
Source: Annepu, 2011, *Sustainable Solid Waste Management in India*.



Source: <http://crunkish.com/top-10-pollution-causes/>



Source: <http://surfingindia.net/>



Source: <http://www.thehindu.com/news/cities/Delhi/article236710.ece>

People living in a place 20 times above safe level of lead, arsenic, nitrogen.....



Matthew Westfall

Conventional waste management and the consequences



Highly contaminated leachate seeps untreated into groundwater, a source of drinking water....

Water availability is an emerging issue in many countries and some are already heading towards water stress, but water quality deterioration because of industrial discharges and municipal sewage, agrochemicals will further accelerate the issue!

Source: ADB (2004)

Kitakyushu Eco-Town Project (Largest recycling society model in Japan)

The first “Eco-Town” project in Japan for building a recycling society has contributed to environmental preservation and industrial development.



Experimental study area



Comprehensive Environmental Complex;
Hibiki Recycling Park

Outline: Research facilities: 16; Business facilities: 29

Project achievement: Environmental preservation and economic development

Environment: Reduction of environmental load, resource saving and energy saving

Economic: Invested amount: approx. 66 billion yen (City: Nation, etc.: Private = 1:2:7)

No. of persons employed: approx. 1,300 (including part time workers)

Visitors for inspection: approx. 1 million (1998 – Oct. 2011)

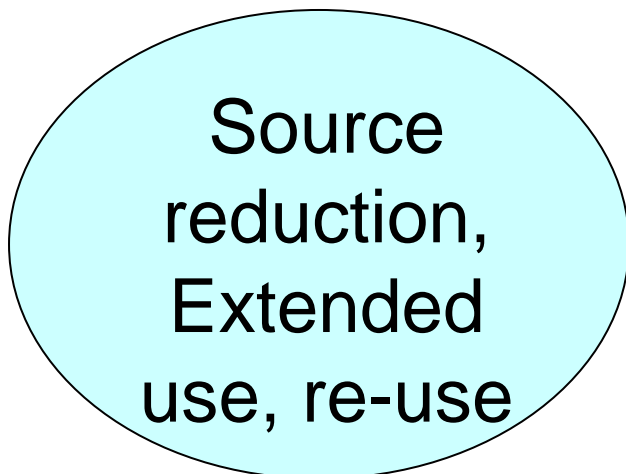
What is a sustainable city?

A sustainable city is a city where achievements in social, economic, and physical development are made to last. A sustainable city has a lasting supply of the natural resources on which its development depends (using them only at a level of sustainable yield). A sustainable city maintains a lasting security from environmental hazards which may threaten development achievements (allowing only for acceptable risk).

UN Habitat, (United Nations Human Settlements Programme)

What should be the priority for government authorities?

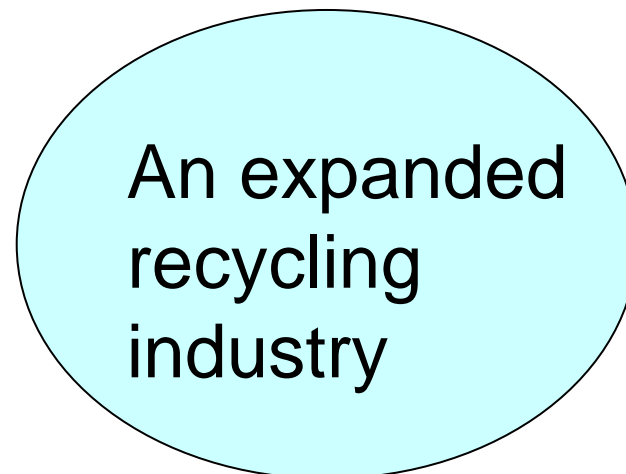
UPSTREAM MEASURES



(Product policy
towards resource
efficiency)

versus

DOWNSTREAM FOCUS



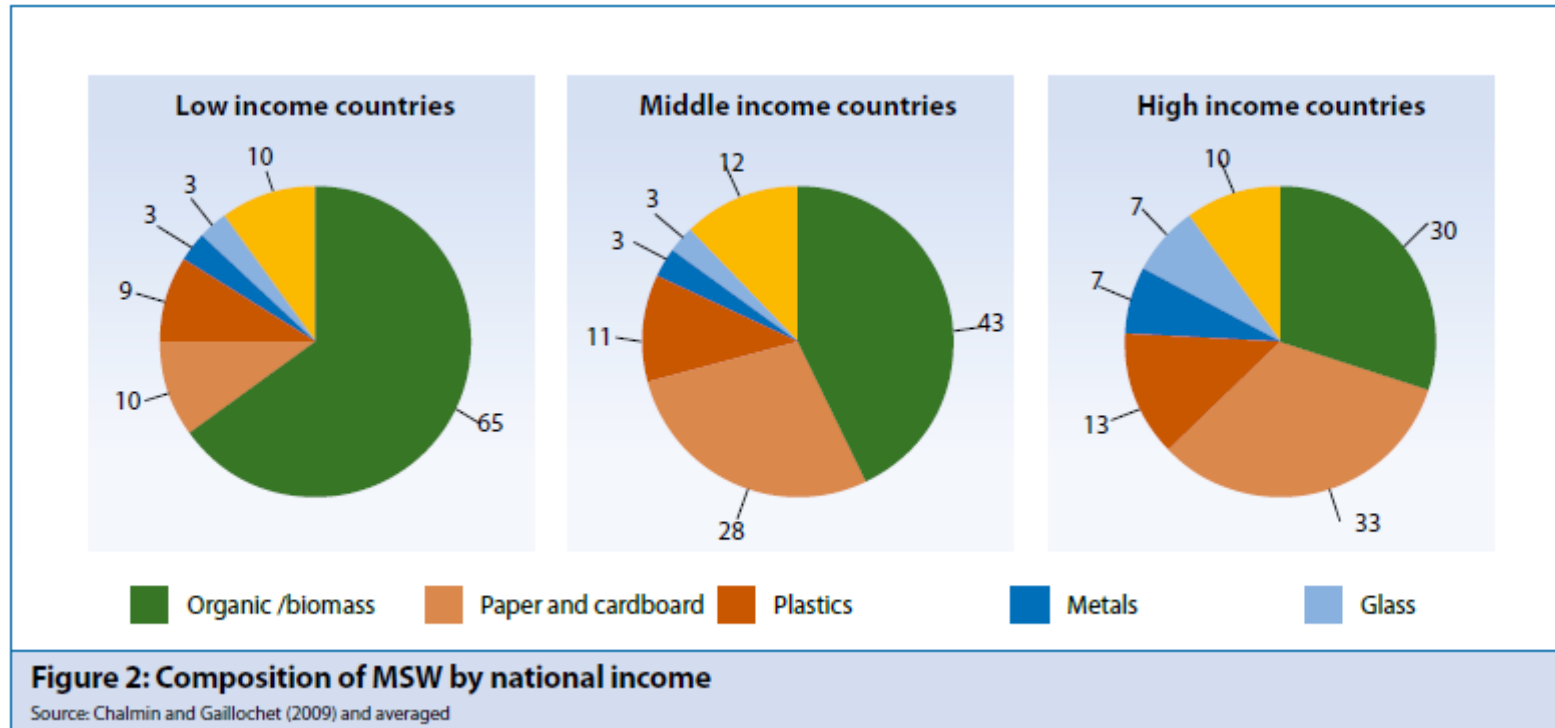
(Resource intensive
and hazardous
production of
expanding markets)

Many government policies and programs tend to focus on conventional waste management solutions such as sanitary land filling or incineration – mainly downstream disposal, which is expensive, while failing to pursue upstream measures to reduce the actual waste load

Waste disposal is expensive – financially and in lost resources

- Requires substantial inputs of labour (for collection/processing)
- Substantial materials input (construction of facilities for wastewater treatment, landfilling, incineration)
- Energy input (collection, treatment, incineration)
- Land resources (land-filling, incineration, treatment facilities)

Composition of waste becomes more complicated as the economically & industrially grow...

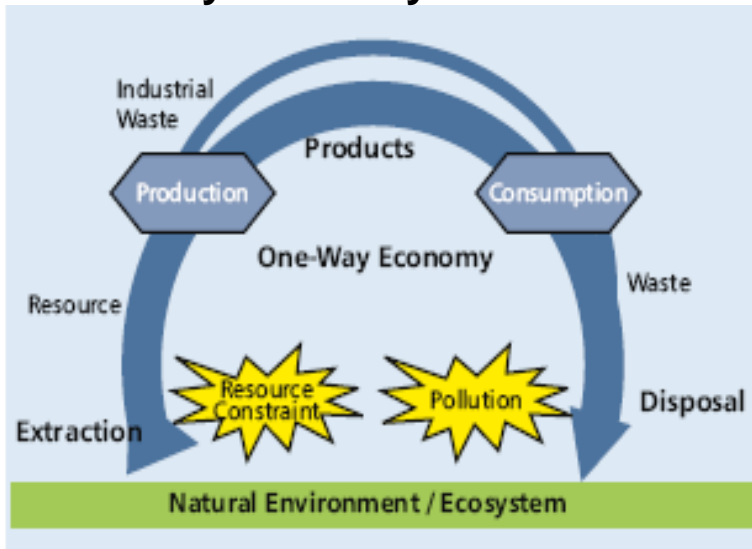


Source: UNEP, 2011, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.

- New emerging waste streams such as **e-waste, and industrial wastes (including hazardous waste construction and demolition waste, end-of-life vehicles, healthcare waste, etc.)** further compound the pressure to the local environment

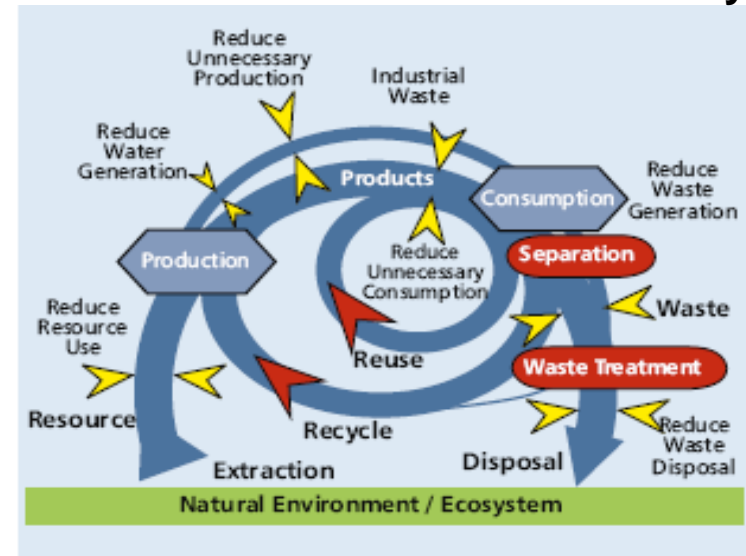
Where should the governments be heading?

1. One-way Economy



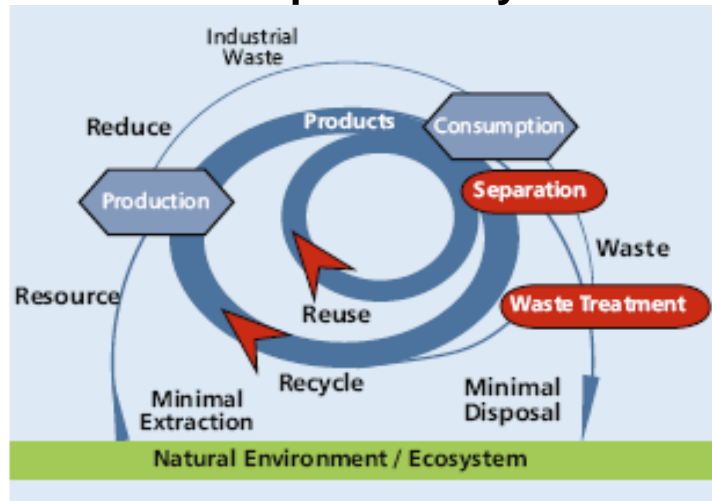
Source: ADB.

2. More resource efficient economy



Source: ADB.

3. Closed Loop Economy

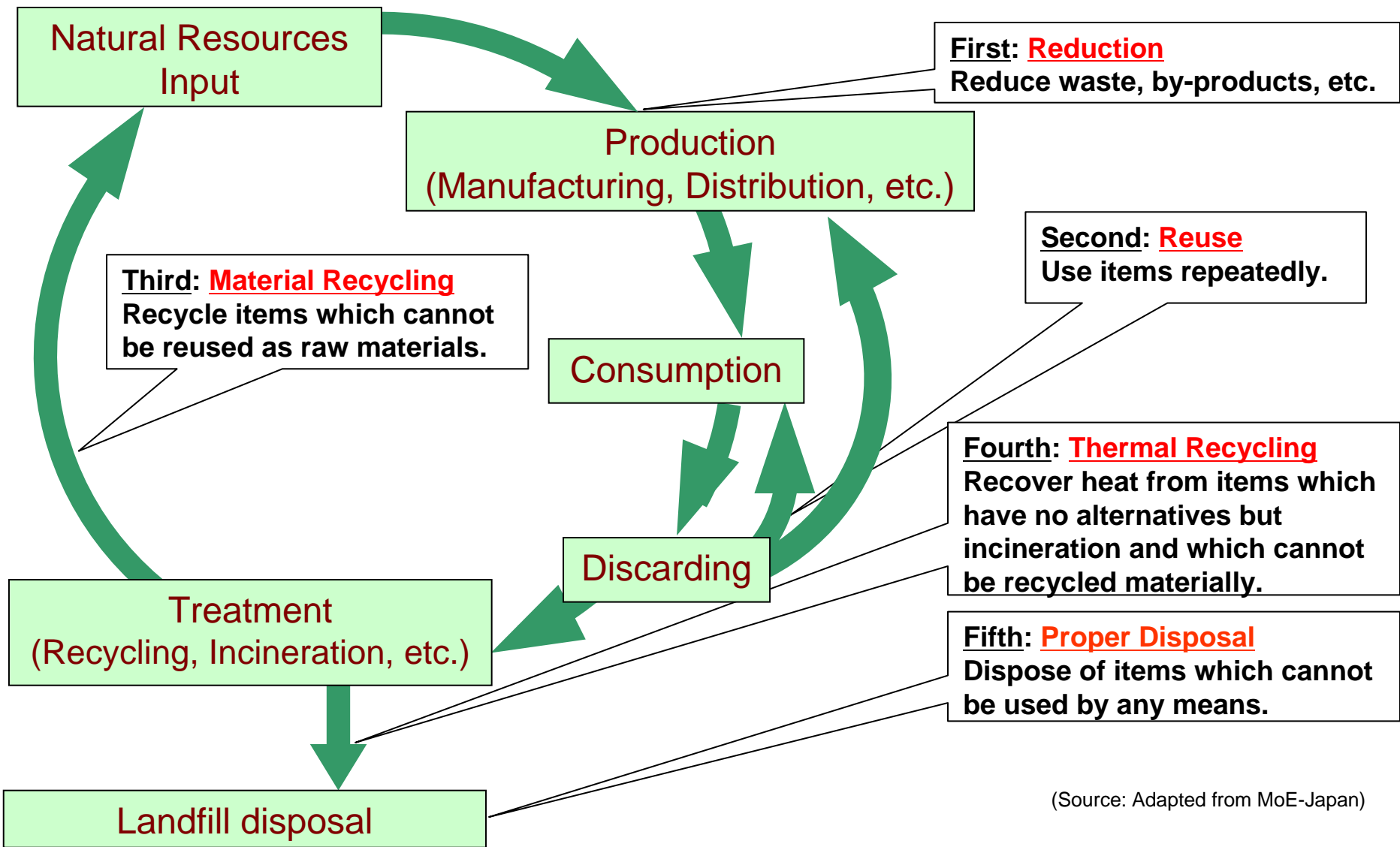


Source: ADB.

Resource efficiency => minimize per unit product or services

- Raw material input ↓
- Water input ↓
- Energy input ↓
- Emission, pollution, waste generation ↓

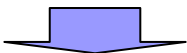
3Rs offer an environmentally friendly alternatives for moving towards zero waste society and to deal with impact of growing wastes on human health, economy and natural ecosystem



(Source: Adapted from MoE-Japan)

Income level is a powerful driver of waste generation

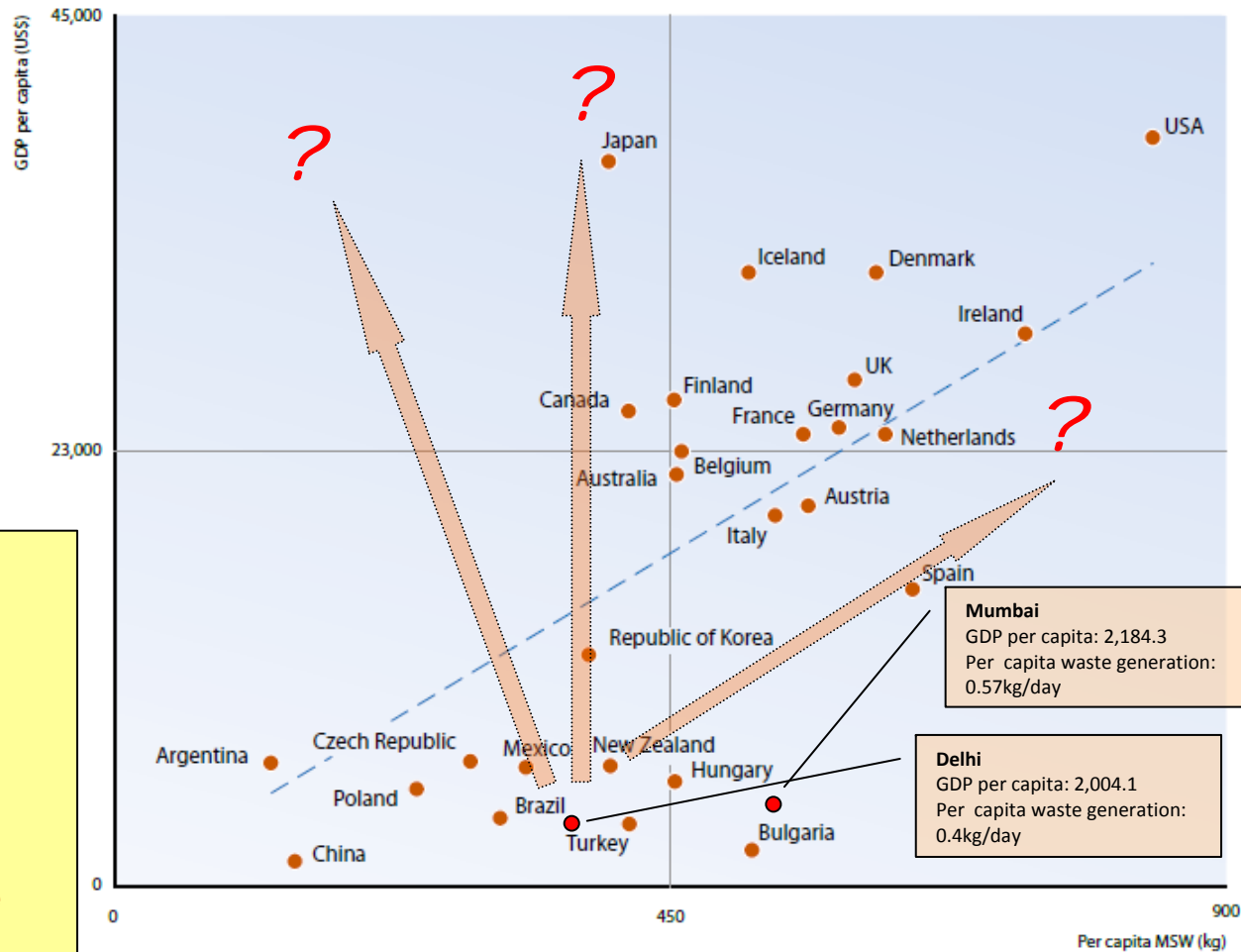
In high-income countries, per capita waste generation can be as high as 0.8kg per capita per day, whereas in the low-income countries the figure can be a quarter of this level, or around 0.2 kg per capita per day.



Question:

As the countries develop, do they have to follow the same wrong path?
 – grow now and clean up later?

Can the countries develop while stabilizing (or reducing) waste generation ~ smart or green growth?



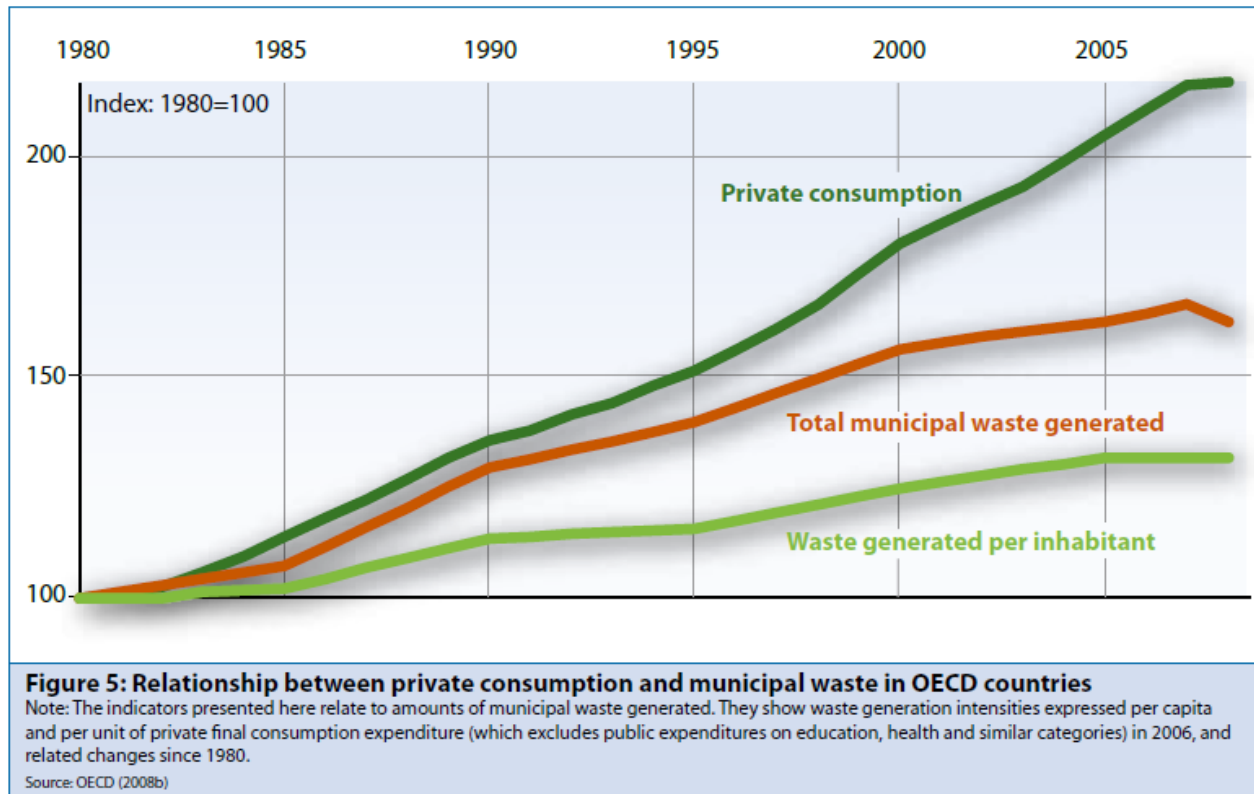
Mumbai
 GDP per capita: 2,184.3
 Per capita waste generation: 0.57kg/day

Delhi
 GDP per capita: 2,004.1
 Per capita waste generation: 0.4kg/day

Correlation between MSW generation and GDP

Source: Adapted from UNEP, 2011, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.
 (Data for Delhi and Mumbai: Siemens AG, 2011. Asian Green City Index-Assessing the environmental performance of Asia's major cities. http://www.siemens.com/entry/cc/features/greencityindex_international/all/de/pdf/report_asia.pdf)

Relative decoupling has begun in OECD countries



Source: UNEP, 2011, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.

What can the developing and emerging economies do to decouple waste generation from economic development?



KEY FACTORS

- Political will/A vision towards zero waste
- Awareness/Change in lifestyles

Commercializing 3Rs

- Global e-waste recovery market holds enormous revenue potential and is expected to reach **\$21 billion by 2020**, growing from **\$6.9 billion in 2009**. In China alone, the volume of e-waste is expected to reach 5.1 million metric tons in 2020, an increase of more than 150% from 2005. (GBI Research, 2010)
- The revenue generated from the e-waste management market is expected to **grow from \$9.15 billion in 2011 to \$20.25 billion in 2016** at a compound annual growth rate (CAGR) of 17.22% from 2011 to 2016. (marketsandmarkets.com, 2011)



E-waste management and job creation

- In the US, for every 1,000 tons of electronics:

- **Landfilled** - less than 1 job is created
- **Recycled** - 15 jobs are created
- **Repaired** - 200 jobs are created

- In Japan, it is estimated that the introduction of the Home Appliances Recycling Act contributed to creating 2,000 new jobs.



★ Caution ★



- E-waste management provides lots of jobs, but needs to be practiced in such a way that the environment and human health are protected through appropriate practices.

- Even in developed countries, there has been a reported incidence in which workers at an electrical waste recycling facility suffered from mercury poisoning, generated by recycling of eco-light bulbs containing mercury, due to poor work practices (ILO, 2012).



“Waste as resources” in the context of e-waste

How much are there inside?

<p>a) Mobile phones: </p> <p>1200 Million units</p> <ul style="list-style-type: none"> x 250 mg Ag ≈ 300 t Ag x 24 mg Au ≈ 29 t Au x 9 mg Pd ≈ 11 t Pd x 9 g Cu ≈ 11,000 t Cu <p>1200 M x <u>20 g/battery*</u></p> <ul style="list-style-type: none"> x 3.8 g Co ≈ 4500 t Co <p>* Li-Ion type</p>	<p>b) PC & laptops: </p> <p>255 Million units</p> <ul style="list-style-type: none"> x 1000 mg Ag ≈ 255 t Ag x 220 mg Au ≈ 56 t Au x 80 mg Pd ≈ 20 t Pd x ≈ 500 g Cu ≈ 128,000 t Cu <p>≈100 M <u>laptop batteries*</u></p> <ul style="list-style-type: none"> x 65 g Co ≈ 6500 t Co <p>* Li-Ion type is > 90% used in modern laptops</p>	<table border="1"> <thead> <tr> <th>World Mine Production</th> <th>a+b share</th> </tr> </thead> <tbody> <tr> <td>Ag: 20,000 t/y</td> <td>▶ 3%</td> </tr> <tr> <td>Au: 2,500 t/y</td> <td>▶ 3%</td> </tr> <tr> <td>Pd: 230 t/y</td> <td>▶ 13%</td> </tr> <tr> <td>Cu: 16 Mt/y</td> <td>▶ 1%</td> </tr> <tr> <td>Co: 60,000 t/y</td> <td>▶ 15%</td> </tr> </tbody> </table>	World Mine Production	a+b share	Ag: 20,000 t/y	▶ 3%	Au: 2,500 t/y	▶ 3%	Pd: 230 t/y	▶ 13%	Cu: 16 Mt/y	▶ 1%	Co: 60,000 t/y	▶ 15%
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- Combined unit sales of mobile phones and personal computers in 2007 add up to 3% of world mine supply of gold (Au) and silver (Ag), 10-13% of palladium (Pd) and to 15% of cobalt (Co).

Source: UNEP and UNU, 2009.

... and how much are recycled?

	Electronics	Industrial applications
Palladium (Pd)	5-10%	80-90%
Silver (Ag)	10-15%	40-60%
Gold (Au)	10-15%	70-90%

Estimated end-of-life recycling rates for precious metals from the electronics are very low.

Source: UNEP, 2011.

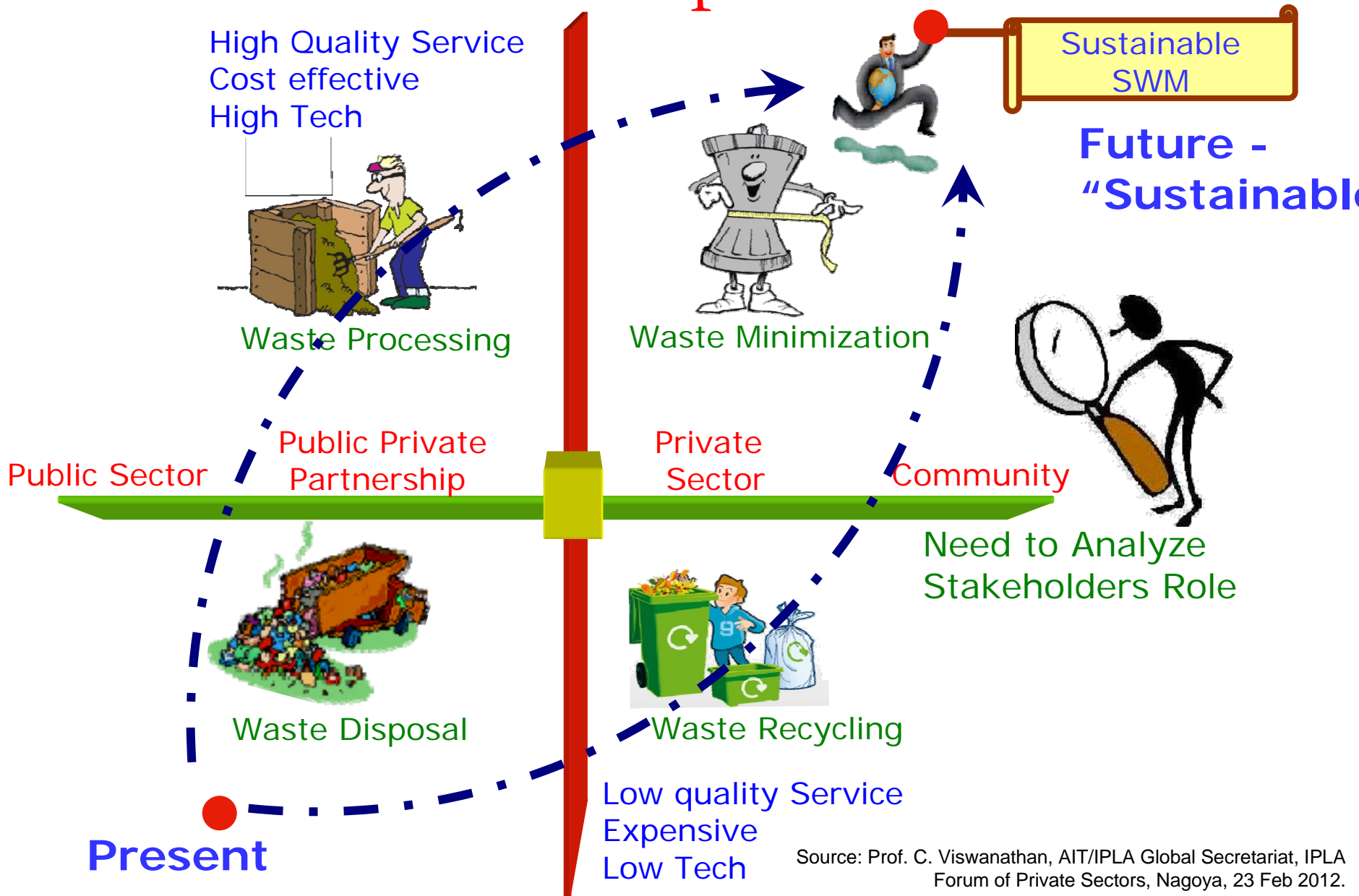
Pursuing resource efficiency will help countries -

- **Tackling local environmental problems** → in efficient use of resources lead to environmental burdens;
- **Addressing climate change** → resource efficiency is key strategy for low carbon path by reducing GHG emissions from energy generation and use, material extraction, processing, transportation, and waste disposal;
- **Ensuring energy security** → through energy efficiency measures, WtE;
- **Preserving natural capital and avoiding resource conflicts**
- **Improving economic competitiveness of firms and nations** → better respond to volatility of oil prices, metal prices, etc; improvement of production process brings financial benefits to the producer as well as improvement of product quality;
- **Minimizing disposal costs by minimizing wastes** → land fills and incinerators are very expensive methods; end-of-pipe disposal is a sunk cost with no financial return;
- **Developing new business opportunities** → resource recovery, recycling, WtE schemes can create green jobs; biotechnology, nanotechnology, renewable energy;
- **Pursuing social benefits** → environment industry as potential source of employment and long term natural asset protection; reducing environmental impacts from harmful wastes;

What different stakeholders can do in promoting resource efficiency/3Rs?

National Government	Develop policies, programs, and institutions, innovative financing for resource efficiency / 3R infrastructures (eco-towns, eco-industrial parks, R&D facilities (Environment, 3Rs, Nano-Technology, IT, Biotechnology) etc.), create conducive policy framework to encourage PPPs, capacity building programs/facilities for SMEs, awareness programme for citizens, green procurement, develop and institute EPR system, foster triangular cooperation (government-private/industry-R&D/Universities) for , circular economic approach, green growth, technology transfer, information clearing house, etc.
Local Government	Integrate resource efficiency in urban development policy and strategy (energy, transport, water, industry), innovative financing for resource efficient infrastructure (eco-towns, eco-industrial parks, R&D facilities, etc.), realize PPPs, awareness programs for citizens, green procurement
Private / Industry Sector	Develop strategies to commercialize 3Rs, Environmental performance reporting, R&D (3R technologies, green products, waste recycling, waste exchange, green purchasing, PPP, in-house capacity building programs, CSR,
Banks / Financial institutions	Investment/loan schemes for eco-town projects and green industries
Scientific and Research Institutions / Universities	Provide back up for science based policy making at government level, develop dedicated R&D projects on resource efficiency/3Rs in collaboration with government and business/industry sector, create human resources and experts in the field of resource efficiency/3Rs, look for international collaboration (University-University, University-Multi-national corporation), catalyst for decision makers, technology evaluation.
Citizens / NGOs	Promote green consumerism, community awareness raising on house-hold waste segregation and its contribution to resource efficiency/3Rs, knowledge dissemination (Source: C.R.C. Mohanty, 2012)

Calls for Partnerships...



UNCRD's approach towards Zero Waste through Resource Efficiency

