

Innovative Approaches and Strategies for Integrated Waste Management

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*International Consultative Meeting on Expanding Waste
Management Services in Developing Countries,
18-19 March 2010, Tokyo, Japan*

Structure of Presentation

- **IWM - Background and Definitions**
- **Policy Instruments for IWM**
- **Policies and Strategies in Developed Countries**
- **Policies and Strategies in Developing Countries**
- **Practicing IWM - Industrial Sector & Communities**
- **Emerging technologies, financing and institutional mechanisms**
- **Role of various stakeholders**
- **International and Regional Cooperation**
- **Concluding Remarks**

The Resource-Waste Link

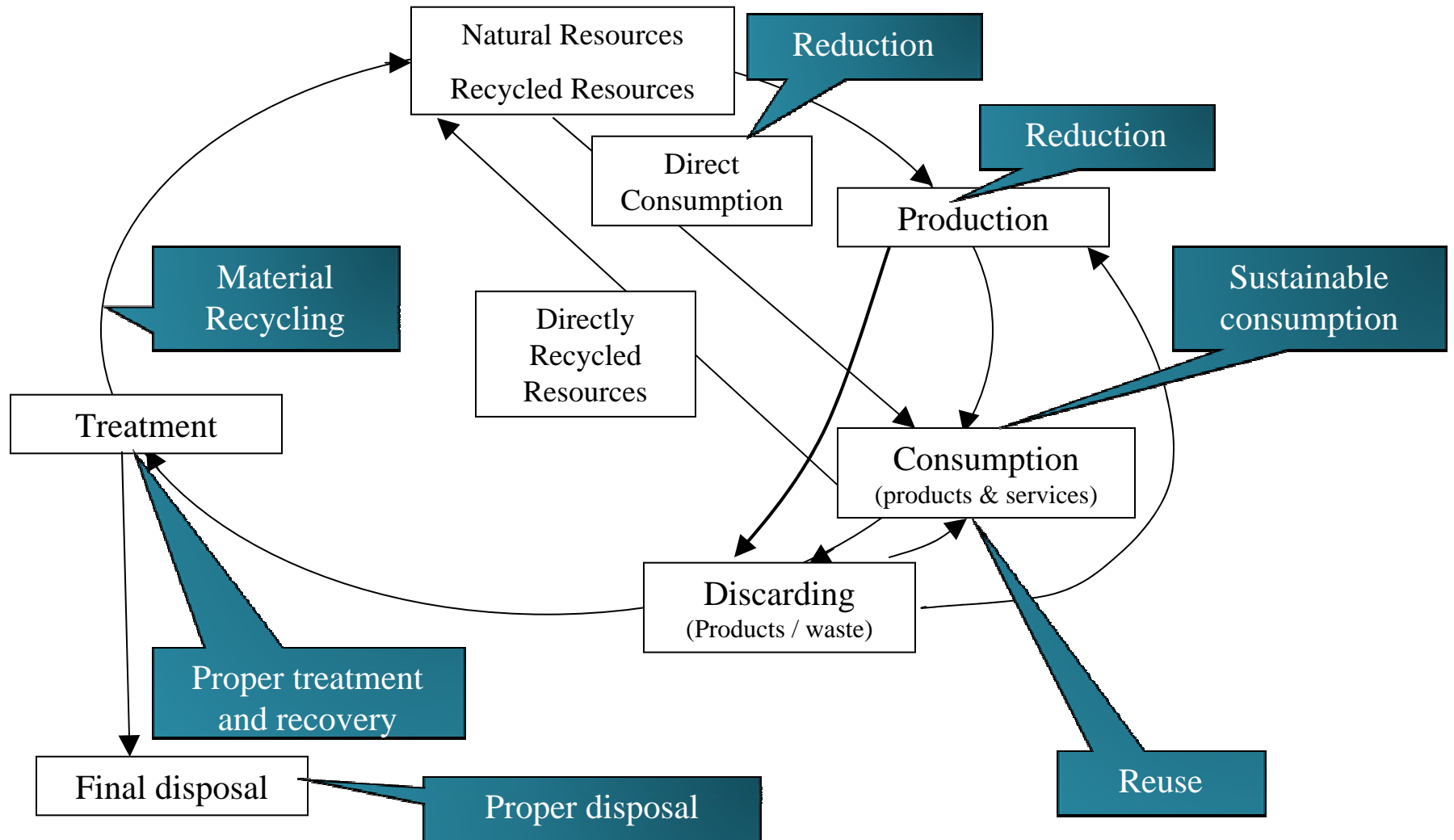
- Issues related to resource and waste management are intrinsically linked
- Involves various stakeholders
- Scale, context and priorities vary from country to country

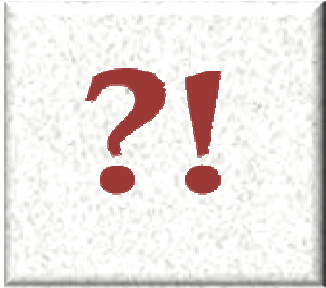
- Solutions cannot be “ad hoc”
- Lifecycle perspective essential
- Integrated Strategic Approach recommended



Integration of Resources and Wastes

A Life Cycle perspective





IWM – Definitions

UNEP in the context of Solid Waste (2009)

“...the strategic approach to sustainable management of solid waste covering all sources and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximizing resource use efficiency.”

Task Force of the Economic Commission of Europe (2005)

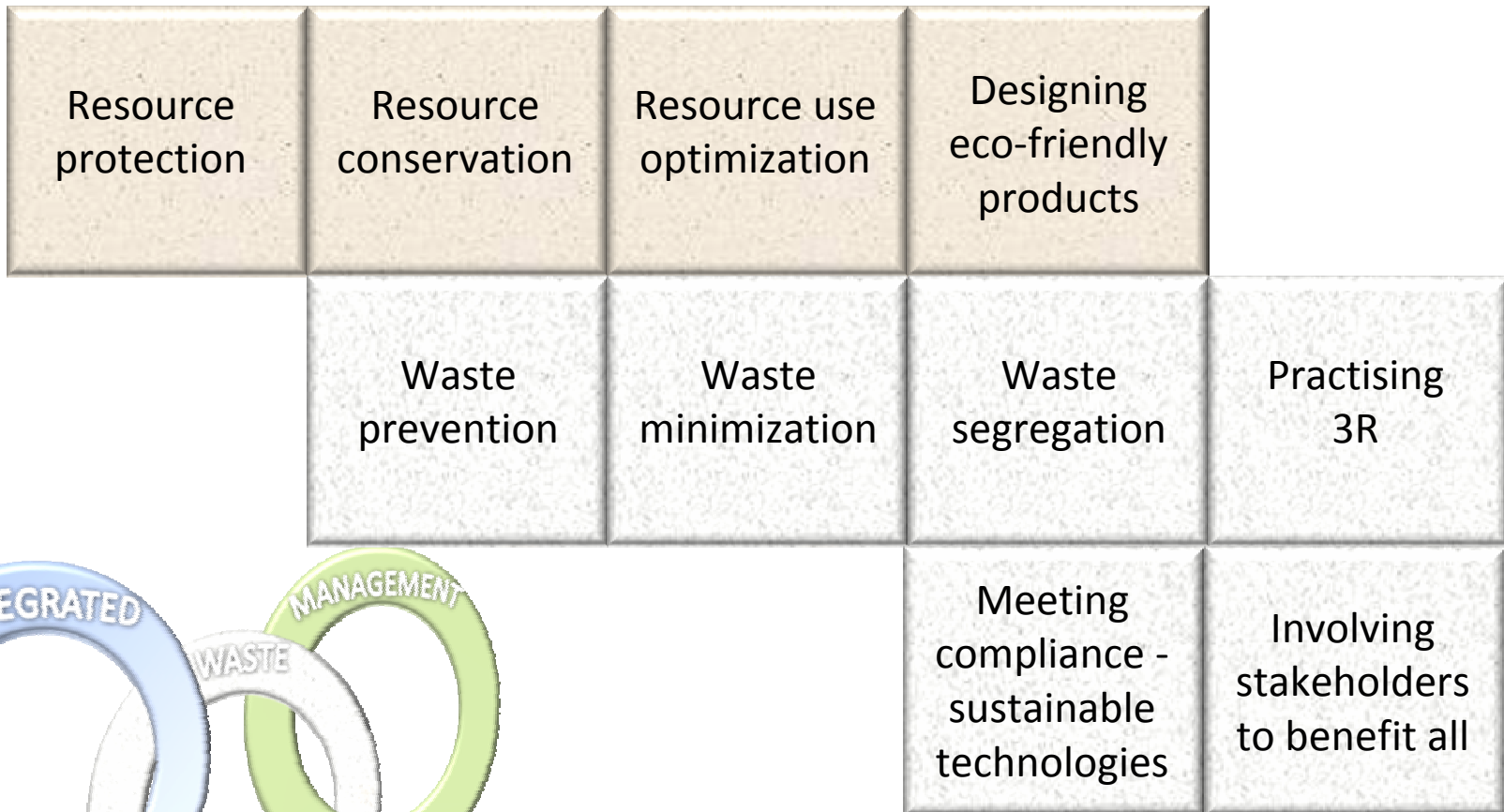
Process of change in which the concept of waste management is gradually broadened to eventually include the necessary control of gaseous, liquid, and solid material flows [resources] in human environment”.



Sustainable Resource and Waste Management



Key principles





Economic Instruments

Landfill tax, waste disposal tax & user fees

- Highly adopted in developed countries
- Fixed user fee - Latin America
- Differentiated charges - Ecuador, Colombia, Venezuela and Chile.
- 55 % of service cost saving in Greater Santiago

Recycling credit scheme

- 50 to 100 US\$ per ton in UK

Deposit Refund Systems

- Voluntary system in Barbados, Brazil, Bolivia, Chile, Colombia, Ecuador, Jamaica, Mexico and Venezuela for products like paper, Cardboard, glass bottles, aluminum cans, tyres.
- Mandatory for batteries in Mexico
- Brazil recorded a return rate of 30% for soft drink bottles

Pay As You Throw

- Seattle, Washington and Portland, Oregon in United States - leaders in developing volume-based pricing systems for disposal of garden waste.



CDM as a Potential Revenue

Latin America and Caribbean

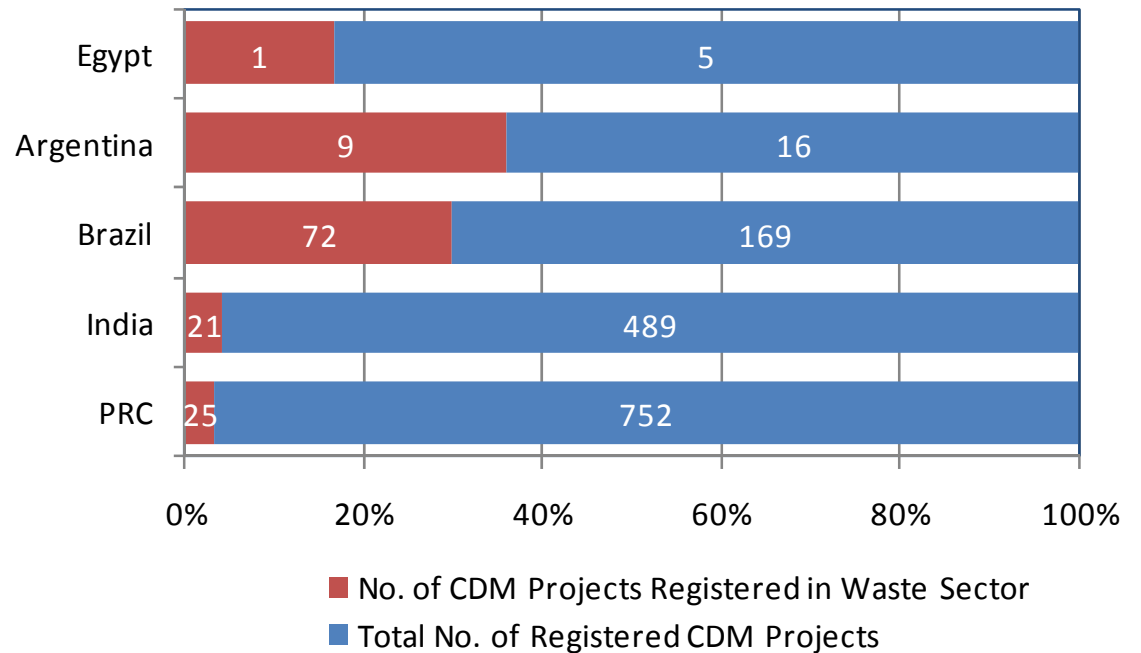
- 10% of Prototype Carbon Fund (PCF) projects involve waste management technologies

World Bank Study

- CER potential of proposed LFGTE projects in 11 landfills from four countries, viz. Brazil (3), Colombia (6), Peru (1) and Uruguay (1), s 16.98 million tCO₂e

BRAZIL TOPS THE LIST!

- 72 projects
- Over 10 million CERs



Policies and Strategies – Developed Countries (1)

- RCRA and Superfund in United States of America (1976)
- Policies and strategies in the European Union
 - Packaging Directive (1994)
 - Waste Strategy Communication (1996)
 - Integrated Product Policy (1997)
 - End of Life Vehicle Directive (2000)
 - Directive on WEEE (2002)
 - Directive on batteries and accumulators (2006)
 - Thematic Strategy on Waste Prevention and Recycling (2005)



Policies and Strategies – Developed Countries (2)

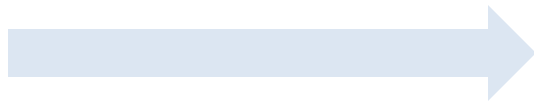
- ⊕ **Sound Material Cycle Society in Japan**
 - One of the four goals of the country's Basic Environmental Plan launched in 2003
- ⊕ **Material Flow indicators of Japan's Sound Material Cycle Society**

Indicator	Calculation	Status as on	Status as on	Target for
		1990	2000	2010
Resource Productivity (in yen per ton)	GDP ÷ amount of natural resources, etc., invested	210,000	280,000	390,000
Cycle Use Rate	Cyclical use amount ÷ [cyclical use amount + amount of natural resource input]	8%	10%	14%
Final Disposal Amount (in tons)	Amount of waste landfilled	110 million	56 million	28 million

Policies and Strategies – Developing Countries (1)

- **Circular Economy approach in People's Republic of China**
- Two most relevant 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 CE



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)



Policies and Strategies – Developing Countries (2)

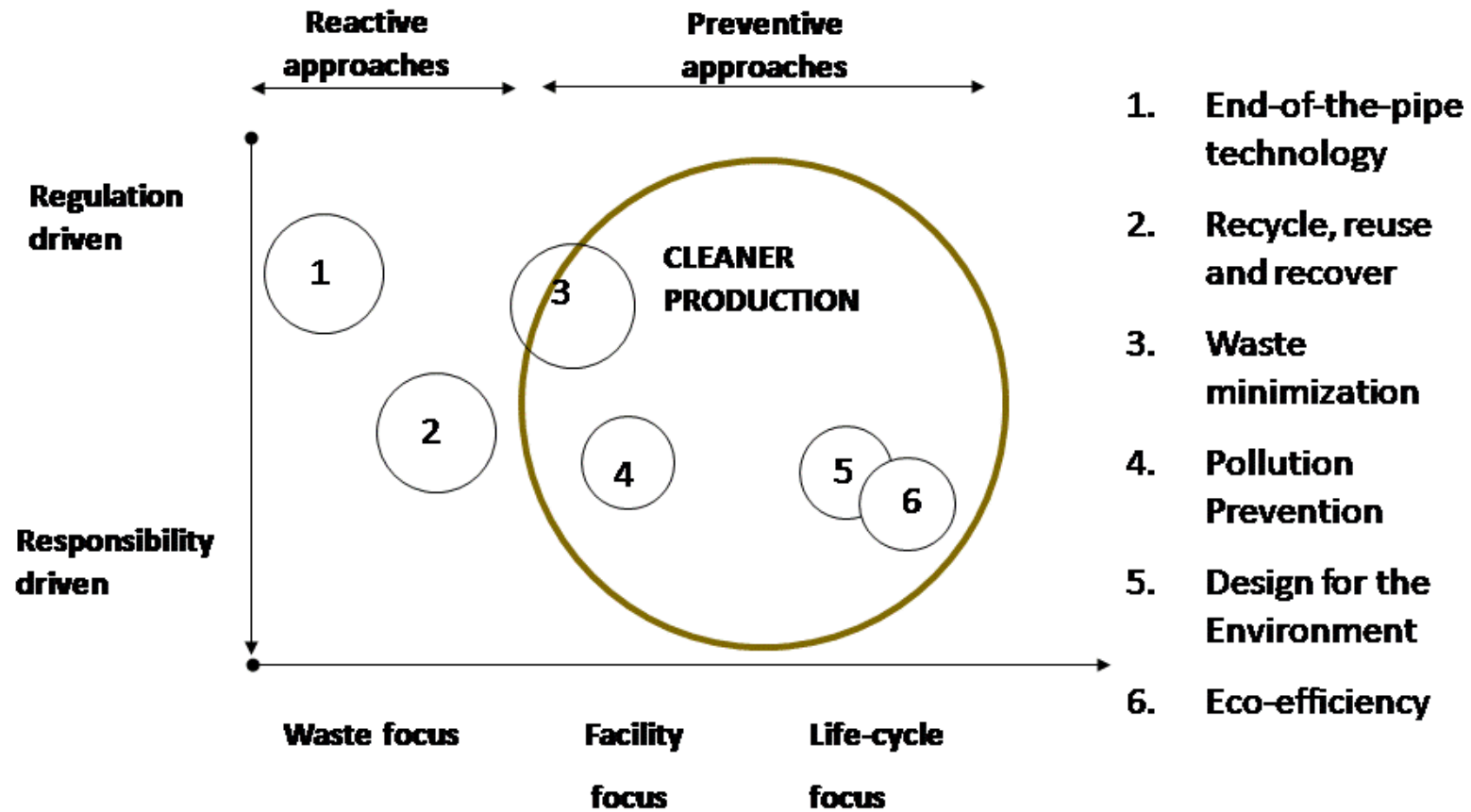
Green Growth in Republic of Korea (2008)

-
- 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



Practising IWM – Industrial Sector (1)

Cleaner Production and related concepts



Modified from Berkel and Meer (1997)

Practising IWM – Industrial Sector (2)

EPR – A policy tool

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



DEPOSIT REFUND SYSTEMS

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

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



Practising IWM – Industrial Sector

Eco-Industrial Parks

- Dalian Industrial Zone, People's Republic of China

- Spreading to 220 sq. km
- Programmatic Cleaner Production
- post-EMS development

- Kitakyushu Ecotown, Japan

- Comprehensive Environmental Industrial Complex
- Hibiki Recycling Area
- Practical Research Area with an Eco-Town Center

- Naroda Industrial Estate, India

- Common ETP
- CP strategy adoption

- Map Ta Phut Industrial Park, Thailand

- Product exchange
- Integrated resource recovery system
- Community enhancement office

- Calabarzon & Bataan Industrial Estates, Phillipines

- Intra- & inter-estate product exchange
- Integrated resource recovery system
- Programmatic EMS
- Green supply chain
- Common ETP

Practising IWM – Industrial Sector

Design for Environment

DESIGN FOR DISASSEMBLY

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

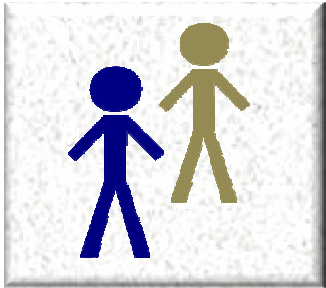


DESIGN FOR ENVIRONMENT

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

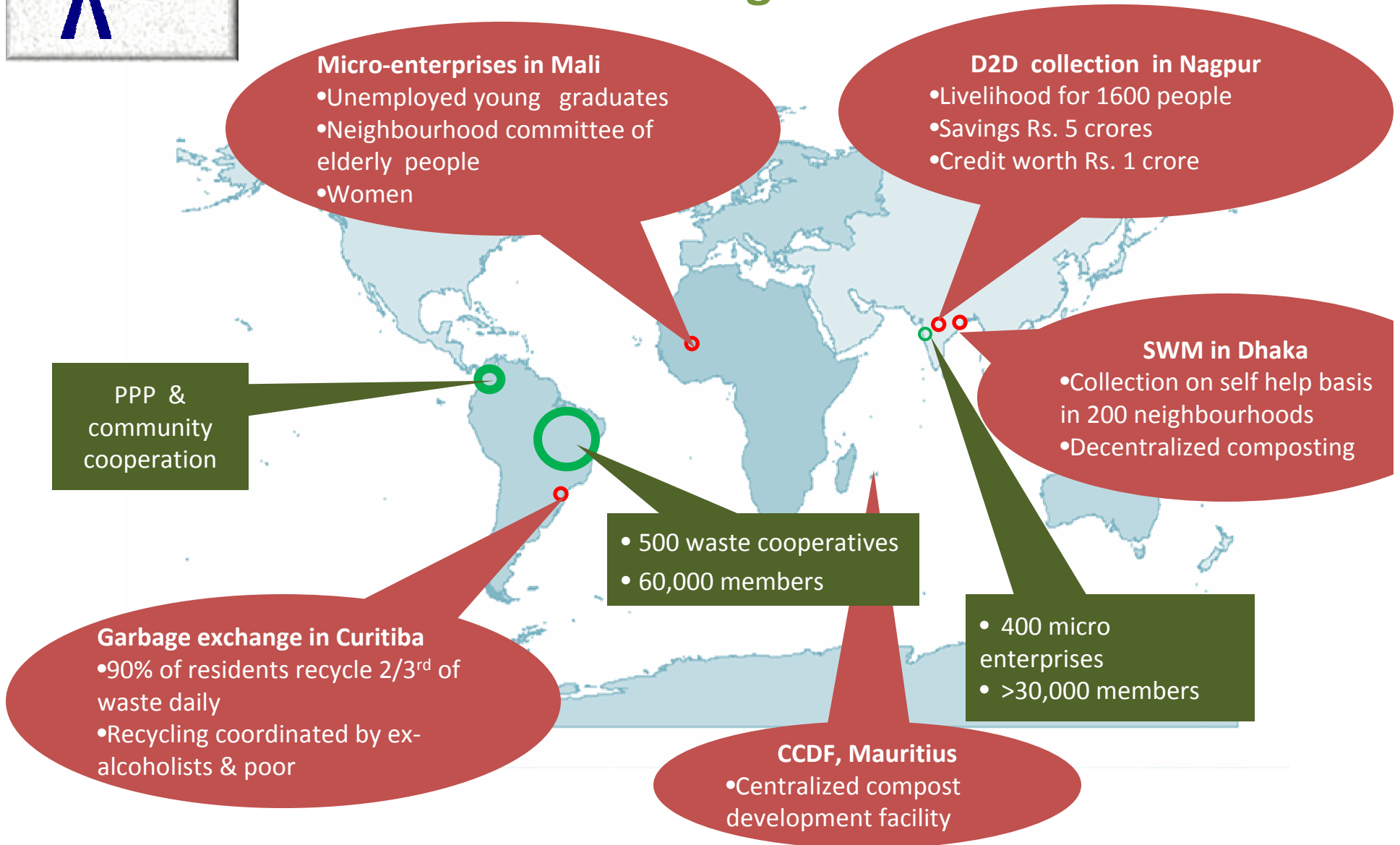


Photo Courtesy:



Practising IWM

Urban Sector involving Communities



Emerging Technology, Financing and Institutional mechanisms for IWM (1)

- Choice of technology differs according to the socio-economic profile and performance of the region.
- Labour Intensive Vs. Capital Intensive technology
- Decoupling government grants, loans and tax fund allocations for long term sustainability
- Appropriate cost benefit analysis
- Innovative financing and institutional models to support the technology

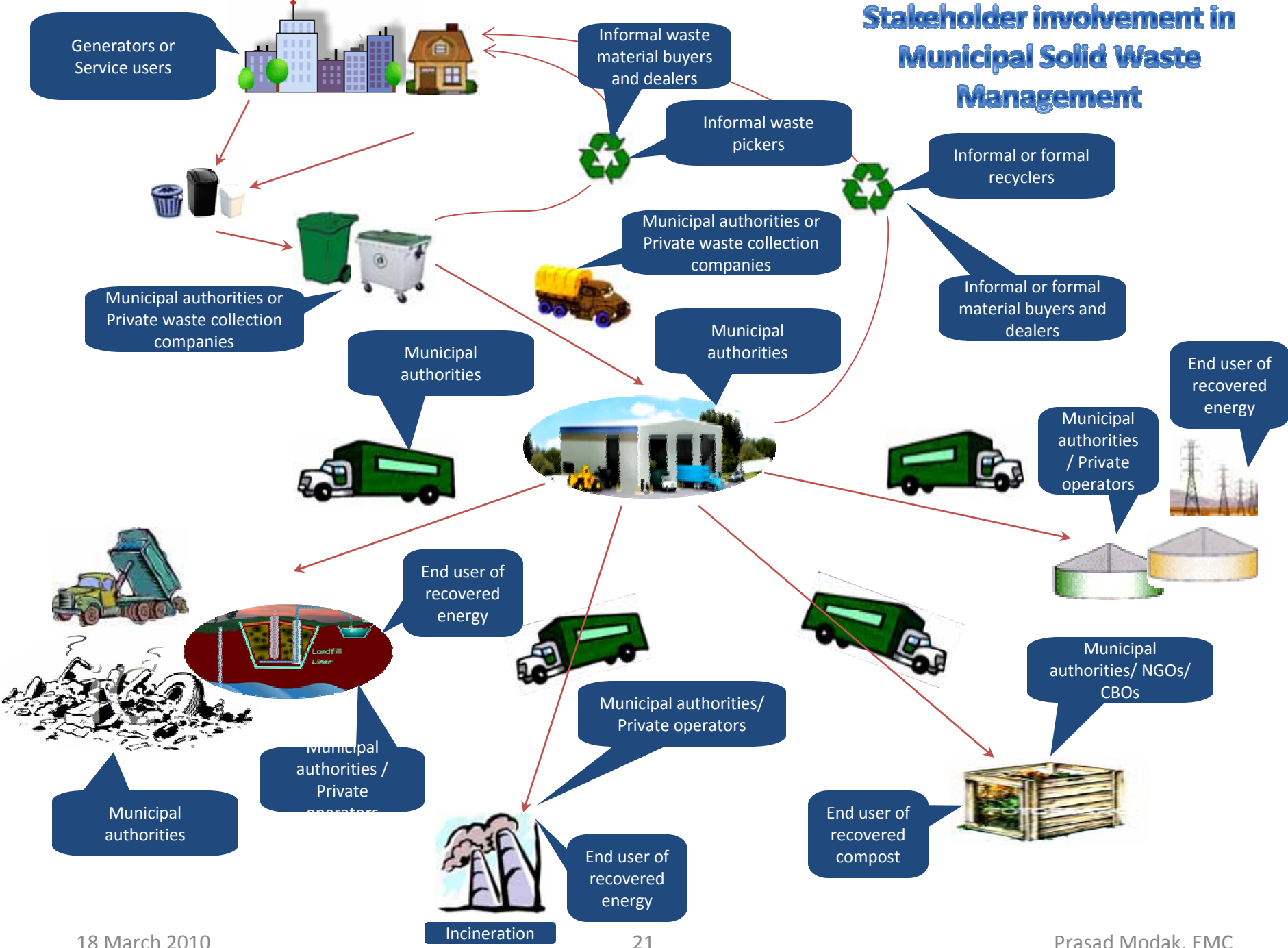
Emerging Technology, Financing and Institutional mechanisms for IWM (2)

	Collection and Transport	Recycling	Treatment with Recovery
Technology	<ul style="list-style-type: none"> • Human-powered or semi-motorized carts • compaction trucks 	<ul style="list-style-type: none"> • Material Recycling Facilities 	<ul style="list-style-type: none"> • Waste to energy • Composting • Incineration with energy recovery
Financing/ Institutional Model	<ul style="list-style-type: none"> • Cooperatives, Micro enterprises in Africa, Asia and Latin America, • PPP 	<ul style="list-style-type: none"> • Private companies • Cooperatives and micro enterprises in Africa, Asia and Latin America • Waste Exchange Programs 	<ul style="list-style-type: none"> • PPP (DBO, BOO, BOOT) • CDM • MDB Support • NGO Support • Industry Support

Role of Stakeholders

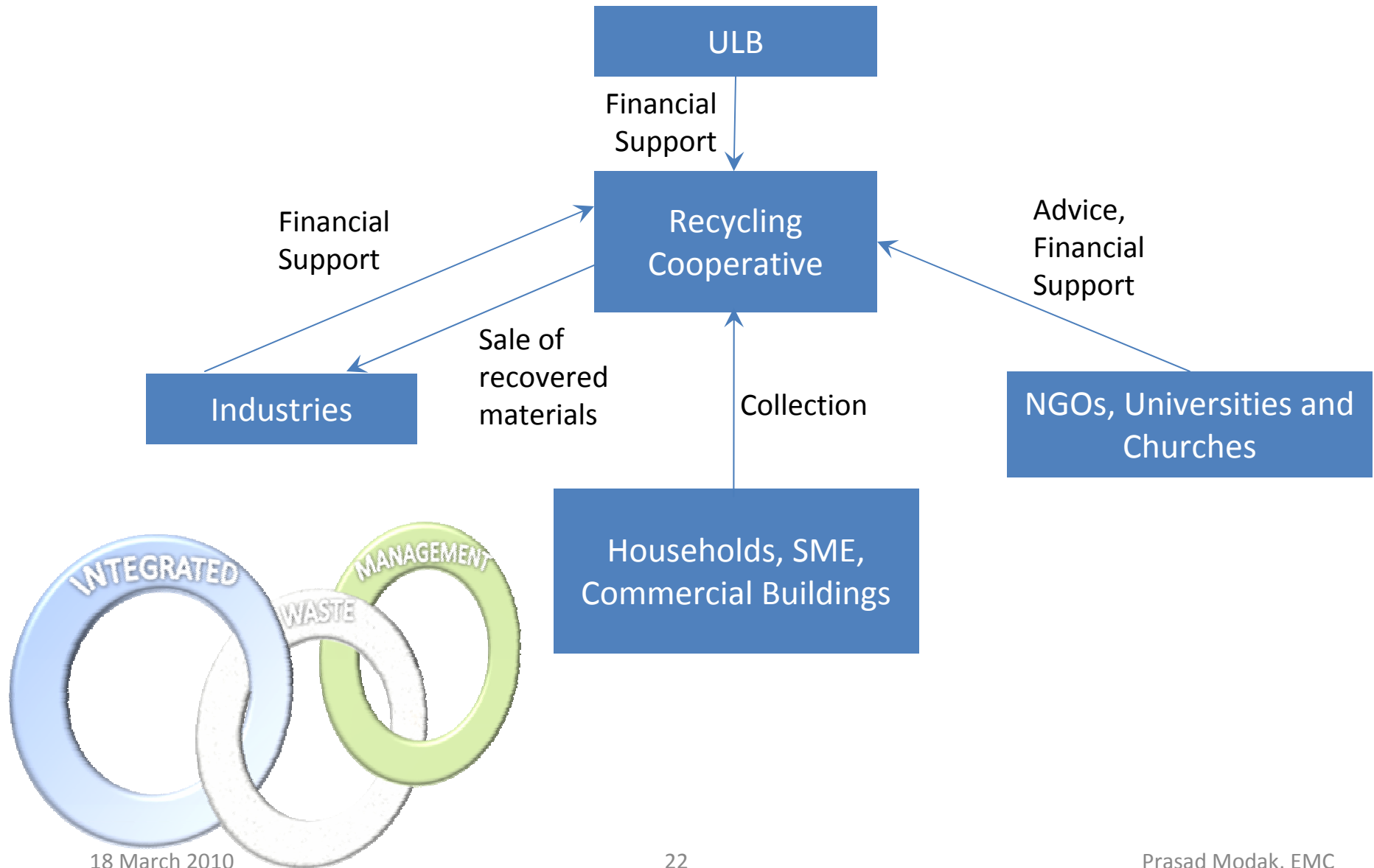
Stakeholder	Role and Responsibility
Government and regulatory organizations	<ul style="list-style-type: none"> • Design policies and regulations related to IWM • Monitoring urban local bodies • Assigning targets to ULBs • Capacity building and training of ULBs and industries on IWM
Urban Local Bodies	<ul style="list-style-type: none"> • Work with the ideal stakeholders at the different stages in IWM
Communities	<ul style="list-style-type: none"> • Source segregation • Educating family and friends
NGOs/ CBOs and Informal sector	<ul style="list-style-type: none"> • Stimulate civic communities through awareness campaigns for source segregation & composting • Monitoring IWM projects in communities
Technology providers	<ul style="list-style-type: none"> • Research and innovation to design environment friendly technologies for IWM
Industries	<ul style="list-style-type: none"> • Sponsor awareness campaigns • Sponsor infrastructure requirements such as bins/handcarts or community recycling units • Collection, Recycling, Marketing of recycled and recovered products such as composts
Financing and Donor Institutions	<ul style="list-style-type: none"> • Support for implementation of IWM projects with social benefits • Support for capacity building and awareness programmes for IWM

Stakeholder involvement in Municipal Solid Waste Management



Stakeholder Cooperation –

Recovery and sales of recyclable materials, Bogota, Colombia



International and Regional Cooperation for IWM

- Agenda 21 of 1992
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste, 1992
- International Declaration on Cleaner Production, 1999
- Marrakesh Process of 2002
- 3R Knowledge Hub in Asia of 2006
- UNEP International Environment Technology Centre
- Global Programmes for Vulnerable Countries
 - Regional 3R Forum in Asia in 2009
 - UNEP's Global Programme for SIDS
 - World Bank support for WM projects



Concluding Remarks

- Integrated approach that emphasizes linkages between “resource” and “waste’ across “life cycle” of products and services.
- Highly region-specific
- Closure of open dumps and formalization of the recycling sector should receive high priority in developing countries
- Good scope for innovation to manufacturers (EPR, CP, D4S)
- Set safety standards for recycled and recovered products to win consumer and/or user’s confidence
- GHG reduction and CDM revenue
- Extensive education and capacity buildings

Finally...

- Attitudinal change towards viewing waste as a resource is necessary
- Strengthening (and not replacing) of the informal waste recycling sector in terms of technology and finance
- Leapfrogging expected when coupled with formal sector and led to Safe employment, Green Economy, Innovations

