3R and Resource Efficiency as the Basis for Moving Towards Zero Waste Societies

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What is Zero Waste?

Defines zero waste as “a goal that is *both pragmatic and visionary*, to guide people to emulate *sustainable natural cycles*, where all discarded materials are resources for others to use.

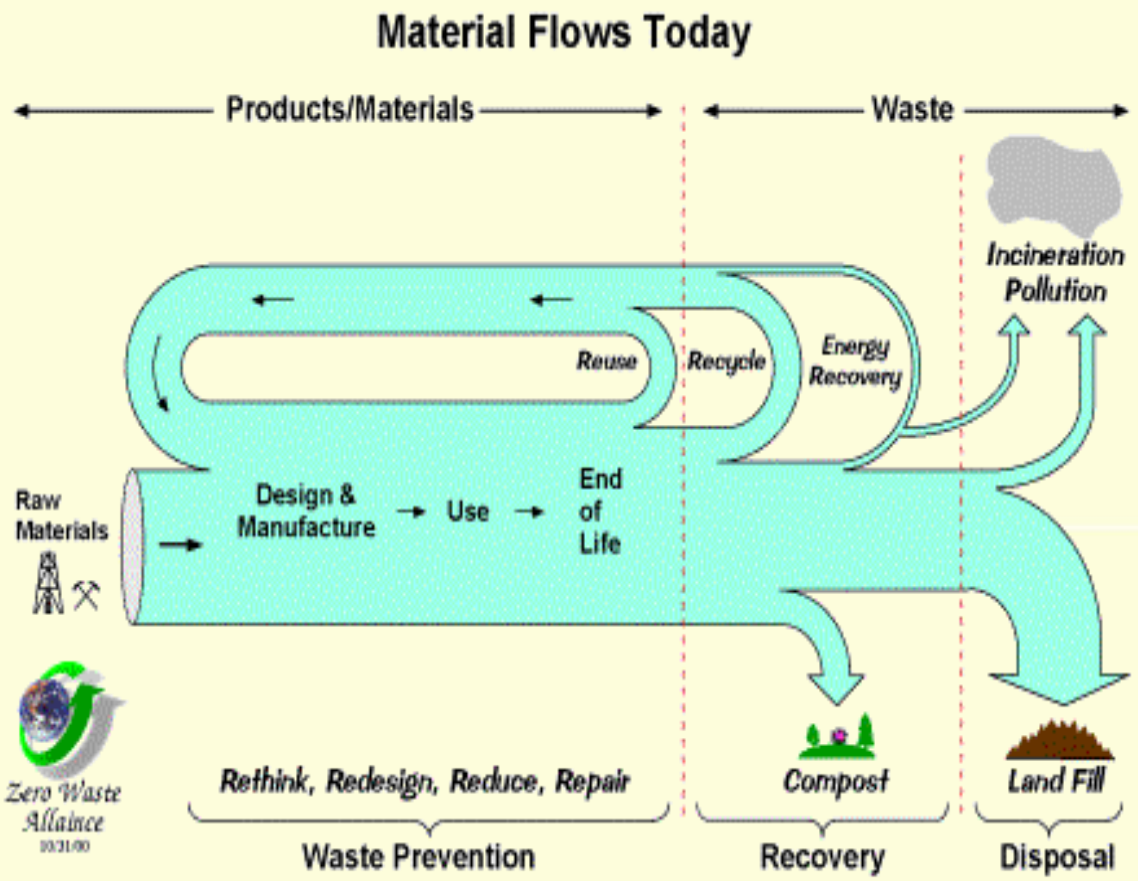
Zero waste means *designing and managing products* and processes *to reduce the volume and toxicity* of waste and materials, *conserve and recover all resources*, and *not burn or bury* them.

Implementing zero waste *will eliminate all discharges to land*, *water and air* that may be a threat to planetary, human, animal or plant health”.

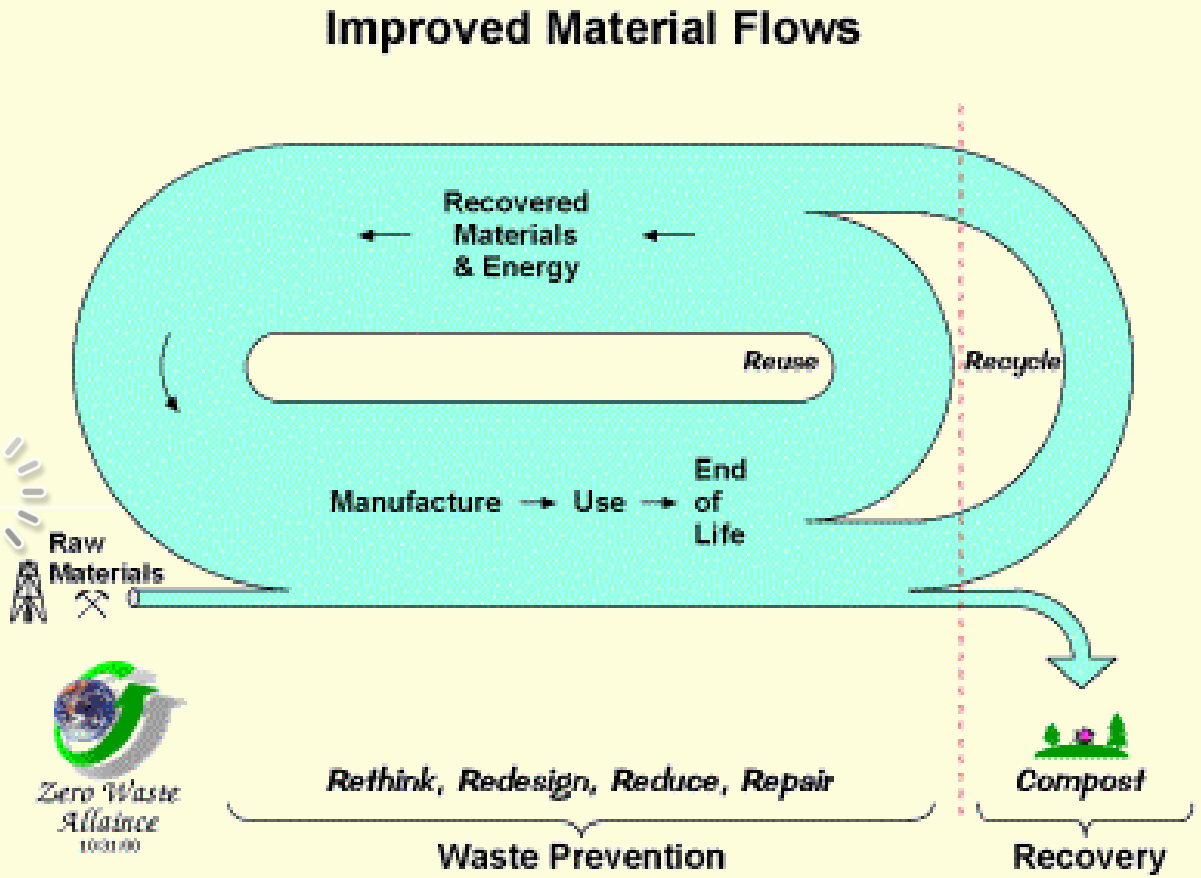
3Rs (Reduce, Reuse and Recycle) offer an environmentally friendly alternative to moving towards a zero waste society and to deal with impact of growing wastes on human health, economy and natural ecosystem

Source: Adapted from ROAD MAP FOR ZERO WASTE AHMEDABAD A Visionary Document to Guide Ahmedabad towards becoming a ‘Resource Efficient and Zero Waste City’ by 2031

Defining "Zero Waste"

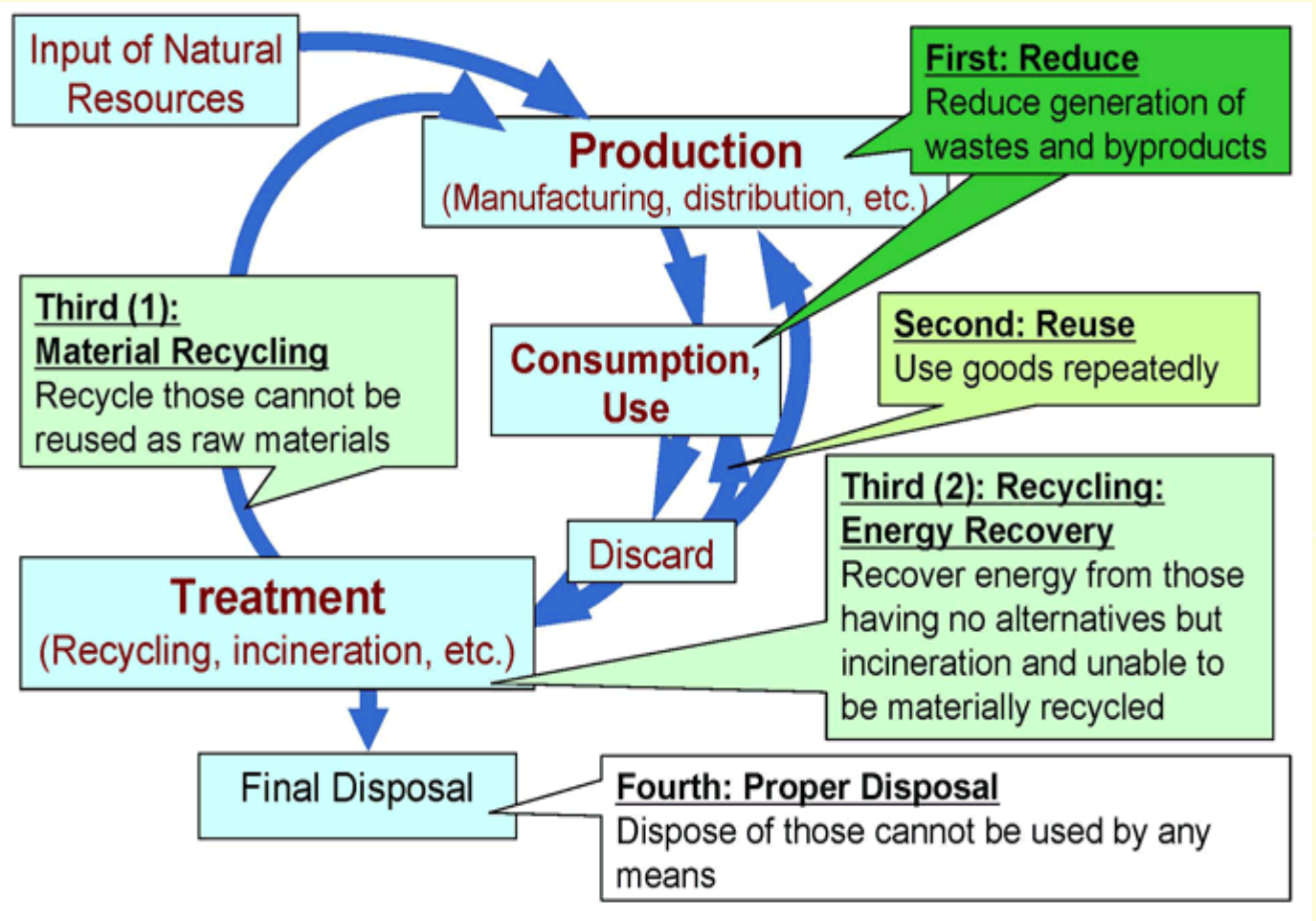


Source: http://www.zerowaste.org/case.htm#virtual_tour



Source: Presentation by Solid Waste Management Department, Ahmedabad Municipal Corporation Ahmedabad – Gujarat - India

3R and Resource Efficiency towards Zero Waste Society



Source: http://www.env.go.jp/recycle/3r/en/concept_paper_e/concept_paper_e04.html

Source: ROAD MAP FOR ZERO WASTE AHMEDABAD A Visionary Document to Guide Ahmedabad towards becoming a 'Resource Efficient and Zero Waste City' by 2031

Both resource consumption and waste generation & diversification would be driven by rapid urbanization…

✓Today > 50% of the world population already live in cities & urban areas; expected to be > 70% by 2050, with almost all the growth occurring in the developing world.

✓ 95 per cent of urban expansion in the next four decades will take place in developing world, with Asia and African alone contributing > 86%.

✓Over next four decades, Africa's urban population will soar from 414 million to over 1.2 billion & Asia from 1.9 billion to 3.3 billion

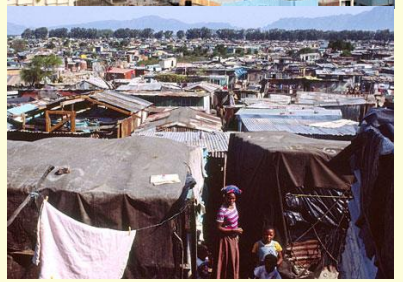
✓Over the next four decades, India will add another 497 million to its urban population, China – 341 million, Nigeria – 200 million, the US – 103 million, and Indonesia – 92 million

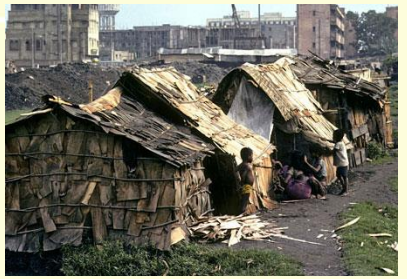
✓828 million people live in slums today and the number keeps rising.

✓ The world's cities occupy just 2 per cent of the Earth's land, but account for approx. 60-80 % of energy consumption, 70% GHG emissions, 70% of global GDP, consume 70% of all resources, generate 70% of global waste.

✓ Rapid urbanization is exerting pressure on fresh water supplies, sewage, the living environment, and public health.

✓Growing vulnerability of coastal cities due to climate related disasters such as floods, storms and sea level rising





Sources: compiled from UN DESA, 2011 & United Nations, 2012, UN HABITAT, 2016
http://www.un.org/en/sustainablefuture/cities.shtml#overview

Major 3R Policy and Institutional Gaps in Developing Countries

•*Prevailing economic system* does not provide adequate incentives for resource conservation and efficient resource allocation / 3Rs & resource efficiency are not part of macro economic policies as waste is conventionally thought of having no *"economic" value*.

•*Prevailing production and consumption patterns do not effectively* integrate resource efficiency, contributing to growing quantities of wastes that must be managed for final disposal.

•As countries industrially grow, more and more toxic chemicals & hazardous wastes coming from industrial, agriculture, and manufacturing processes, however, current *waste management policies are not strong and not linked* with bio-diversity conservation, protection of ecological assets– fresh water, coastal & marine ecosystem, etc.

•Required *institutional arrangements* and *interagency coordination* around resource efficiency and circular economic development.

•*Weak national and local level cooperation and partnerships* (e.g., national urban development policy on resource efficient and zero waste cities)

Source: ADB (2004)

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)

A prevalent policy dilemma - what should be the priority for government authorities?

UPSTREAM MEASURES

Source reduction, Extended use, re-use

(Product policy towards resource efficiency)

versus

DOWNSTREAM FOCUS

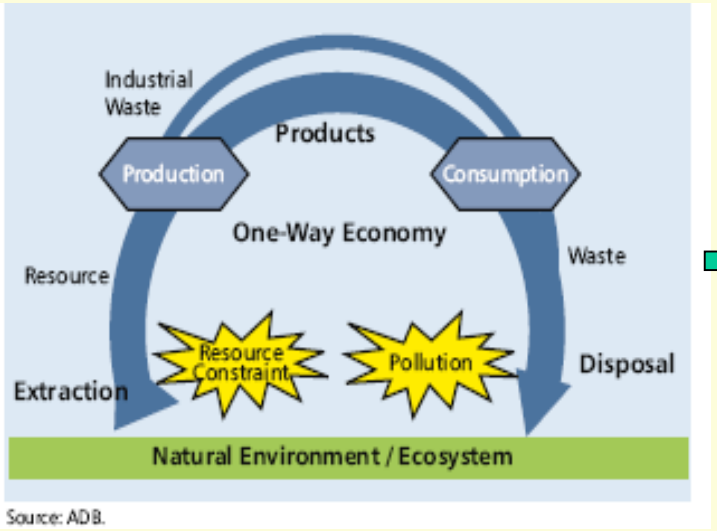
An expanded recycling industry

(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

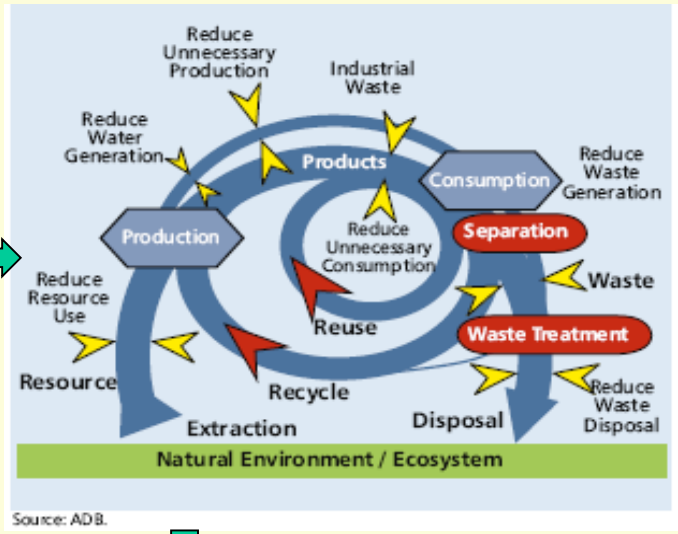
Linear or one-way/conventional to Closed loop economy

1. One-way/conventional Economy



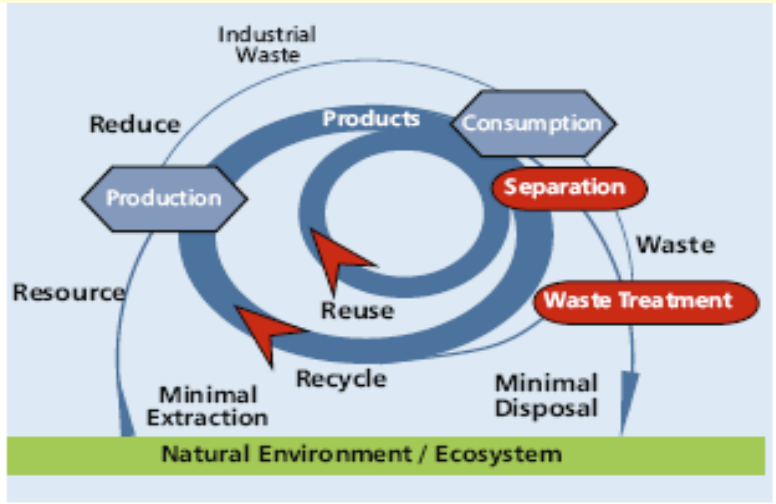
Source: ADB.

2. More resource efficient economy



Source: ADB.

3. Closed Loop Economy



Source: ADB.

1. **One way economy** -> a little effort is made to reduce the amount of materials consumed in production and hence the wastes are produced. Also little effort is made to reuse or recycle those wastes which mainly go for landfill.

   => *Absence of a science based policy for resource efficient economic development;*

2. **Greater resource efficiency** -> by reducing consumption and waste of materials, and by reusing and recycling waste/byproducts minimize (per unit of product or services) – quantity of input raw material/energy /water as well as pollution /emission/environmental impact of the residual materials flow that flow to disposal sites.

⇒ *science based policy for resource efficient economic development*

3. **Closed-loop economy** -> nearly all waste/outputs either become inputs to other manufacturing processes or are returned to natural systems as benign emissions rather than as pollutants.

⇒ *science based policy for resource efficient closed-loop economic development with a high level of cooperation between science-policy-business-community*

Source: Adapted from ADB, 2011

Consequences of linear economy: Plastics issue – vast implications on coastal and marine environment

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Source: http://surfingindia.net/

© Still Pictures

- Plastics carry hazardous chemicals in marine environment (e.g., PCBs)
- More than 200 species of animals are known to have ingested plastic debris, including birds, fish, turtles and marine mammals.
- Transfer of chemicals from ingested plastics to biological tissue has been confirmed (bio-magnification).
- Micro-plastics (size < 5 mm) in coastal and marine environments is a critical problem, including bio-accumulation of hydrophobic persistent organic pollutants (POPs) like PCBs, DDTs, HCHs and others from the plastics through ingestion or food-chain (fist to fish and fish to people),

(Source: Prof. Hideshige Takada and 6th Regional 3R Forum in AP, 2015)

Source of photos: UNEP, http://www.unep.org/regionalseas/marinelitter/publications/gallery/default.asp

Consequences of linear economy: Plastics waste and resilience

Unclogging Jakarta's Waterways

- Estimated population of over 10 million people:
  - 20% of city's daily waste ends up in local rivers and canals

- City administration is dredging its 17 rivers and canals for the first time since 1970s due to waterways being 70% blocked, a central contributor to the city's chronic flooding problems

(Source: The New York Times, October 2016)

Consequences of linear economy: Waste and Freshwater Nexus in India

- The Energy and Resources Institute in New Delhi has estimated that **by 2047**, waste generation in India's cities will increase **five-fold to touch 260 million tones per year**.
- The CSE survey, released earlier this year, shows that **70-80 percent** of India's wastewater was ending up in its rivers and lakes. "***We are drowning in our excreta***," Sunita Narain, Director of CSE.

- Nearly **80 percent** of the river's pollution is the result of raw sewage. The river receives **more than three billion liters of waste per day**.
- **Highly contaminated** leachate seeps untreated into groundwater, a source of drinking water….

3R Developments in Asia: Informal Resource recovery and recycling

Clean India Mission (Swachh Bharat Abhiyaan) and 100-smart cities programme by Prime Minister Narendra Modi offer tremendous business opportunities in waste sector for water security of India

Need for change and attitudes to view "Waste" as "Resource"

- Link between "waste" and "resource" is not well understood /waste is traditionally thought of having no value.
- Too much emphasis on "downstream" waste management limiting many business opportunities.
- Limited efforts on "upstream" resource management and waste reduction aspects

Source: Article: Make wealth from waste, Satwik Mudgal, New Delhi, Down to Earth Magazine (1-15 Nov. 2014)
Source: ADB and IGES (2008) Source: http://knowledge.allianz.com/environment/pollution/?511/saving-waste-the-lives-of-indias-rag-pickers Source: http://www.theguardian.com/environment/2012/aug/01/india-cities-drown-sewage-waste

Success stories - Macro-economic/Development Policies Integrating Resource Efficiency and 3Rs

- **Japan**: Fundamental Law for Establishing a Sound Material Cycle Society (2001); New Growth Strategy (2010) which places green innovations as top of seven strategic areas; Finance initiatives to build a Low Carbon Society (providing grants, investments, financing, interest subsidies for – (i) promotion of Green Buildings, (ii) development of Low Carbon Cities, (iii) bilateral offset Credit Mechanism, and (iv) enhancement, commercialization, and R&D of Low Carbon Technologies;

- **Republic of Korea**: New Waste Management Policy towards Resource Recirculation Society (Sep'2013);

- **PR China**: Circular Economic Law (2009) led by NDRC-China; Long Term Renewable Energy Development Plan (2007); Chinese Circular Economic Law offers a long term plan for transformation that seeks to integrate economic, environmental, and social strategies to achieve high resource efficiency as the way of sustaining improvement in quality of life within natural and economic constraints; circular economy is now a trillion dollar opportunity

- **India**: National Solar Mission (3% of India's total electricity demand from solar power projects by 2022); National Mission on Enhanced Energy Efficiency;

- **Malaysia**: National Green Technology Policy (2009); Green Building Index (2009; National Renewable Energy Policy and Action Plan (2010);

- **Singapore**: Green Mark Incentive Scheme for buildings (2005); Water Efficiency Fund (2008);

- **Thailand**: Alternative Energy Development Plan and Target (2008); Thailand Climate Change Master Plan (2012–2050), etc.

- **EU:** Waste Framework Directive (2008); waste management is a public health priority as well as an economic industry, e.g., in Germany

Japanese Legal framework for establishing a sound material-cycle (SMC) society

Basic Environment Law — Completely enforced in August 1994

Basic Environment Plan — Completely amended and announced in April 2006

Basic Act for Establishing a SMC Society (Basic Framework Act) — Completely enforced in January 2001

- Ensuring material cycle in society
- Reducing consumption of natural resources
- Lowering environmental load

Fundamental Plan for Establishing a SMC Society — Officially announced in March 2003, Amended in March 2008

The fundamentals for other plans designed by the State

< Proper treatment of waste >

Waste Management and Public Cleansing Law

Partially amended in May 2010

①Reduction of waste generation
②Proper treatment of waste (including recycling)
③Regulation for establishment of waste treatment facilities
④Regulation for waste treatment operators
⑤Establishment of waste treatment standards, etc.

< Promotion of recycling >

Law for the Promotion of Effective Utilization of Resources

Completely amended and enforced in April 2001

①Recycling of recycled resources
②Ingenuity and innovation to create structures and use materials to facilitate recycling
③Labeling for sorted collection
④Promotion of effective utilization of by-products

reduce
recycle → reuse
recycle

（１Ｒ） （３Ｒ）

Regulations according to characteristics of individual articles

Law for the Promotion of Sorted Collection and Recycling of Containers and Packaging

Completely enforced in April 2000

Partially amended in June 2006

Bottles, PET bottles, paper or plastic containers and packages

Law for the Recycling of Specified Kinds of Home Appliances

Completely enforced in April 2001

Air conditioners, refrigerators, freezers, TVs, washing machines, drying machines

Law for the promotion of the Utilization of Recyclable Food Resources

Completely enforced in May 2001

Partially amended in June2007

Food residues

Construction Materials Recycling Law

Completely enforced in May 2002

Timber, concrete, asphalt

Law for the Recycling of End-of-Life Vehicles

Completely enforced in January 2005

Vehicles

Small Home Appliance Recycling Law

Enforced in April 2013

WEEE

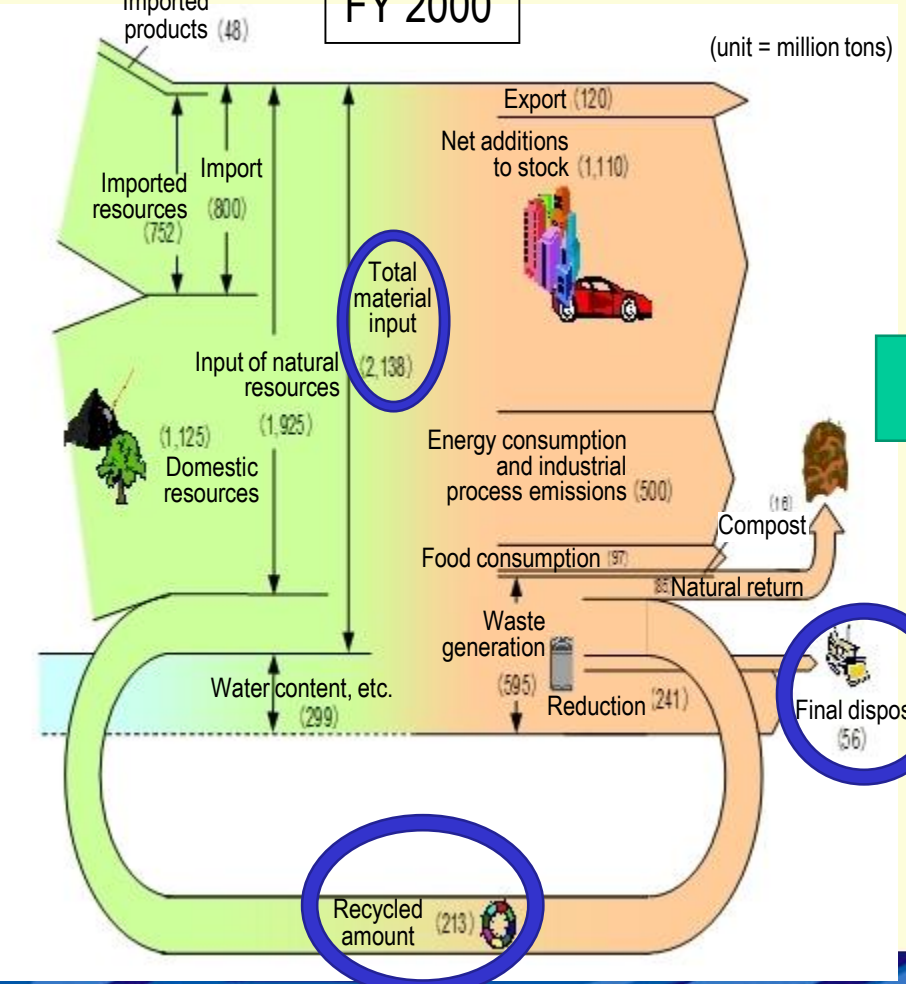
(Source: Courtesy of MoE-Japan)

Green Purchasing Law (The State takes the initiative to promote the procurement of recycled items) — Completely enforced in April 2001

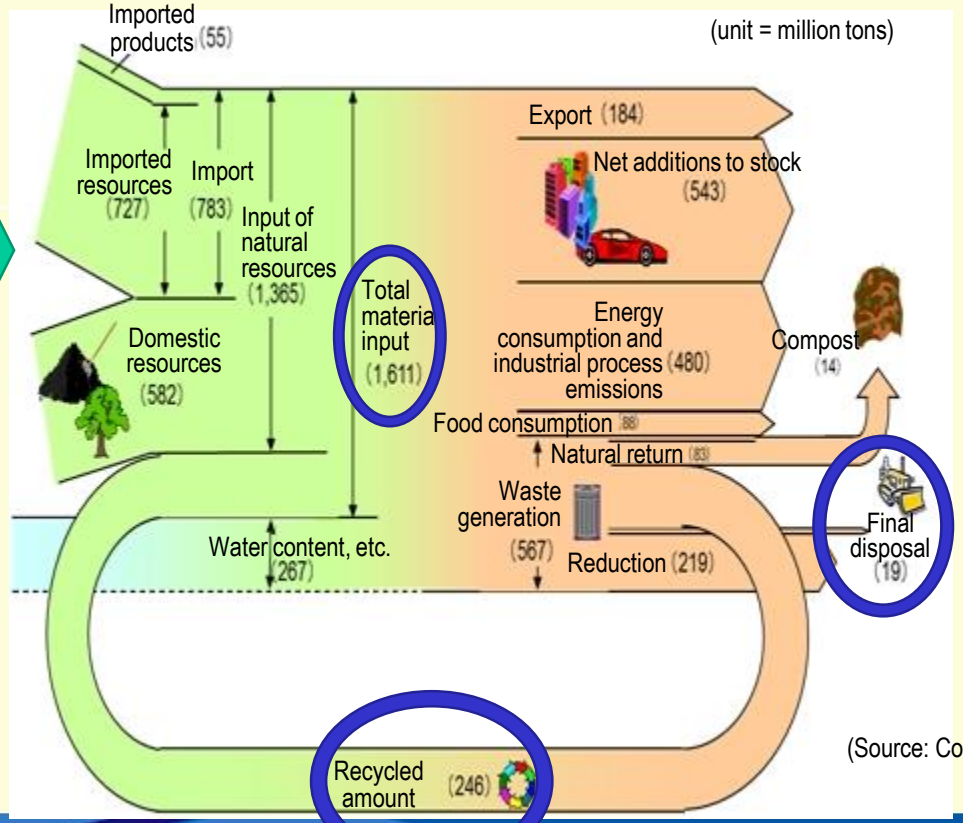
Material Flow in Japan

- Total material input: 2.138 → 1.611 (billion tons)
- Final disposal: 56→19 (million tons)
- Recycled amount: 213→246 (million tons)

FY 2000



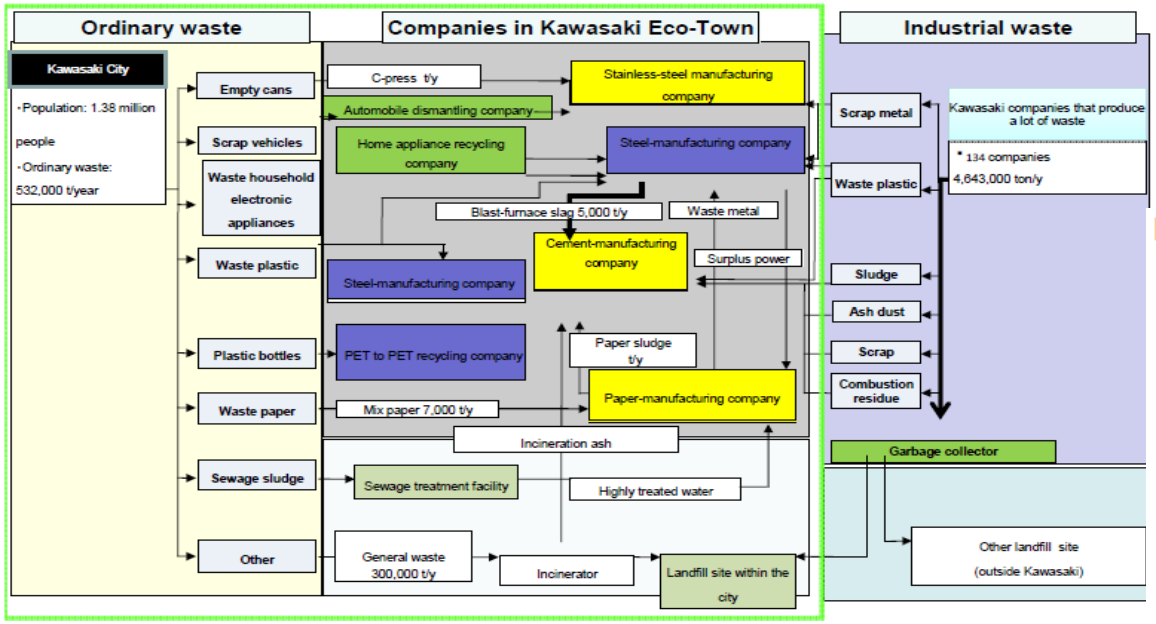
FY 2010



(Note: Water content: water contents of wastes (sludge, livestock's waste, night soil, waste acid, waste alkali) and sludge contingently dumped in the process of economic activities (sludge in mining, construction and in waterworks as well as slag)

(Source: Courtesy of MoE-Japan)

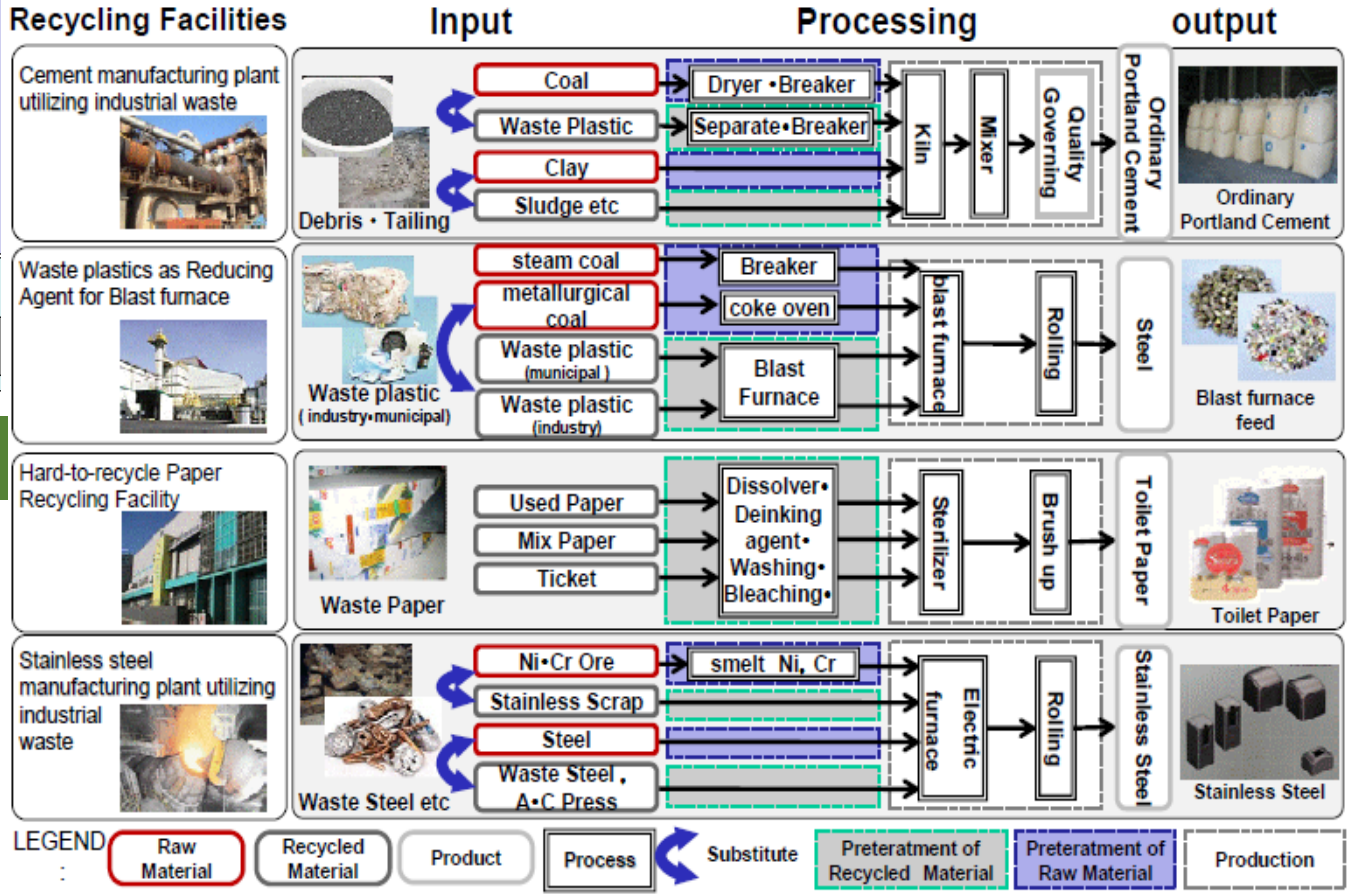
Kawasaki Eco-Town where economy and environment are integrated to create sustainable business opportunities…



Key Features of Kawasaki Eco-Town

1. revitalization through environmental technologies accumulated in traditional industries
2. Industrial symbiosis through a regional network for resource reuse/recycling
3. local private companies take their own initiative in environmentally sound business operations and contribute to preventing local and global environmental pollution.
4. strong collaboration between R&D industries and private companies on environmental technologies
5. international cooperation in technology transfer

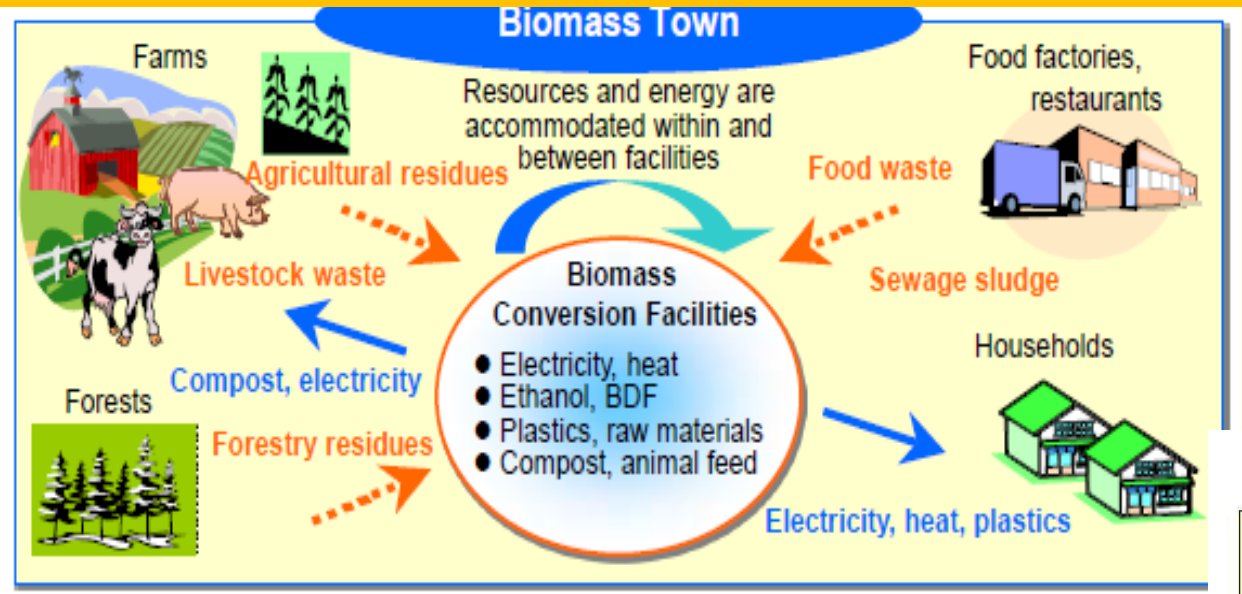
Formation of a Regional Network for Resource Recycling



Quantified material accounting for Symbiosis in Kawasaki

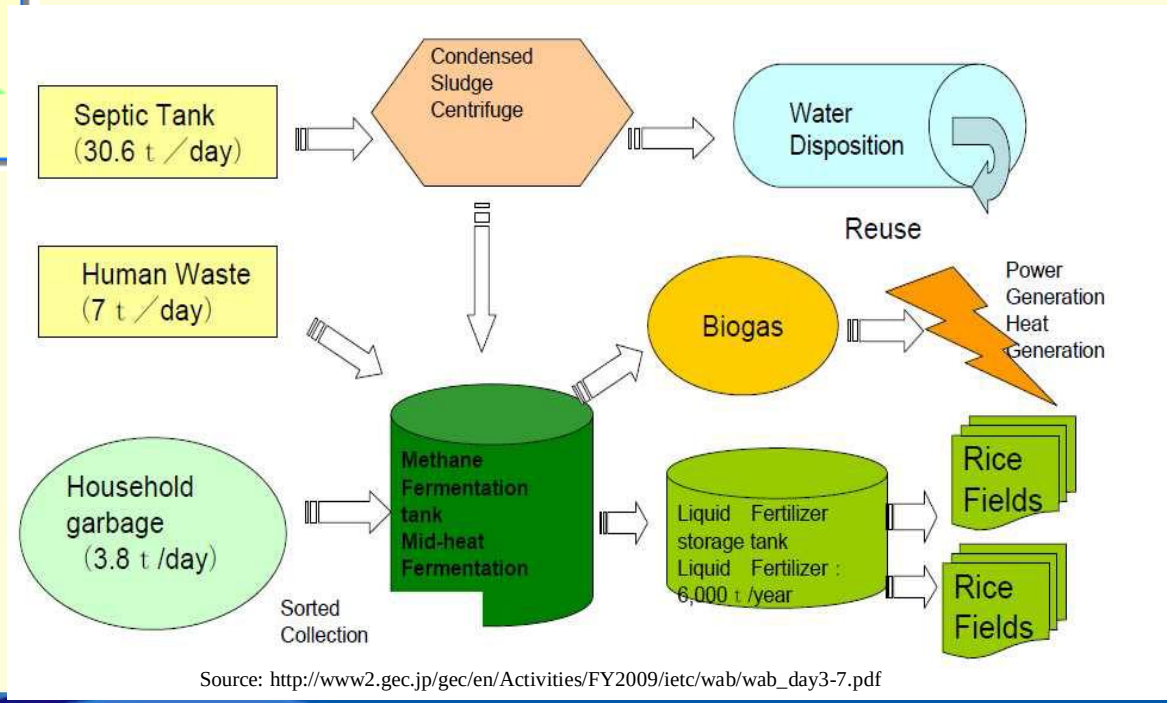
Source: SABURO KATO, Special Advisor to the Mayor of Kawasaki for International Environmental Policy, President of Research Institute for Environment and Society
http://nett21.gec.jp/Ecotowns/data/et_b-kawasaki.html R.V. Berkel and T. Fujita et. al. ; Environmental Science & Technology(2009)

Zero waste system – Example-Biomass Town Concept, Oki Town, Japan



Case study: Oki town / Fukuoka Pref. (17,500 inhabitants):

- Methane fermentation from household garbage
- 166,209 kWh for self utilization
- Production liquid fertilizer: 6000 tons per year
- Fertilizing 100ha of paddy field
- Reduction of 44% in house hold waste generation
- Reduction of 20 million yen in incineration cost (Approx. 205,000 US$) per year
- Generating new green jobs



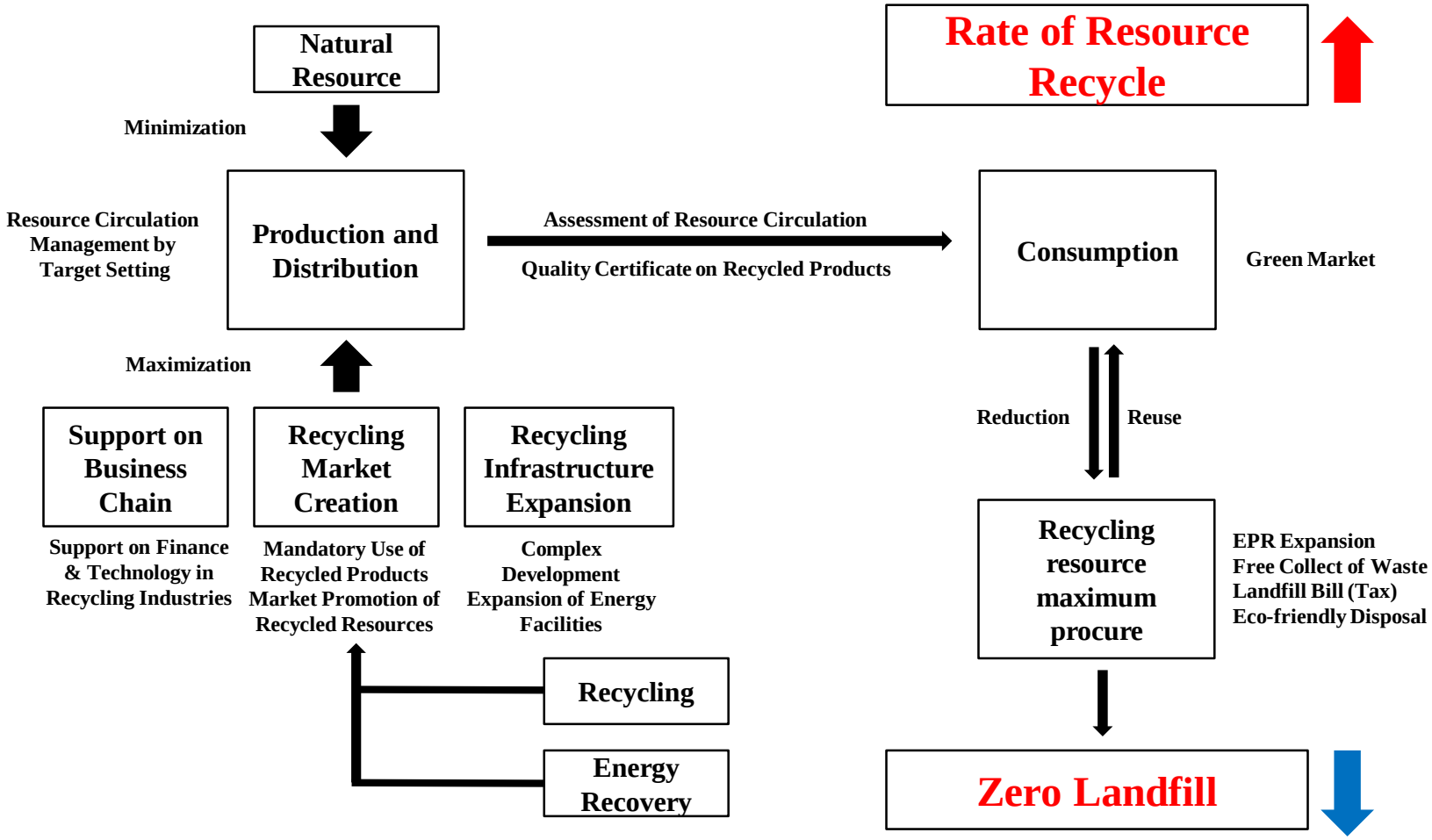
Source: http://www2.gec.jp/gec/en/Activities/FY2009/ietc/wab/wab_day3-7.pdf

MAFF Japan 2005; MAFF 2011

Korean Prospect of Waste Management in Future

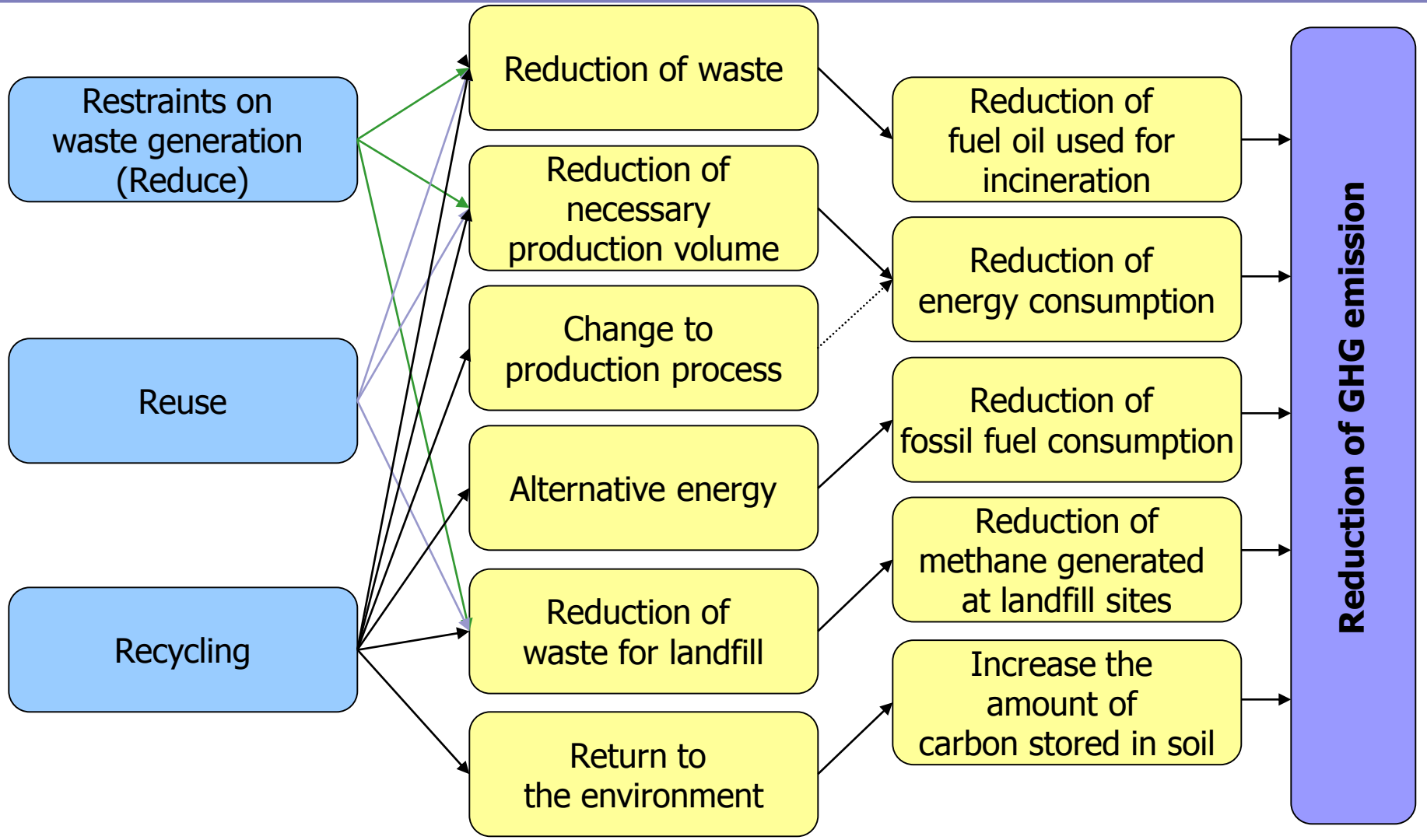
▪ New Waste Management Policy

▪ Structure of Resource Circulation Society (RCS)



Source: Korean Ministry of Environment / Presented by Prof. J. Hyun at Maldives 3R Forum, 16-19 August 2015, Maldives

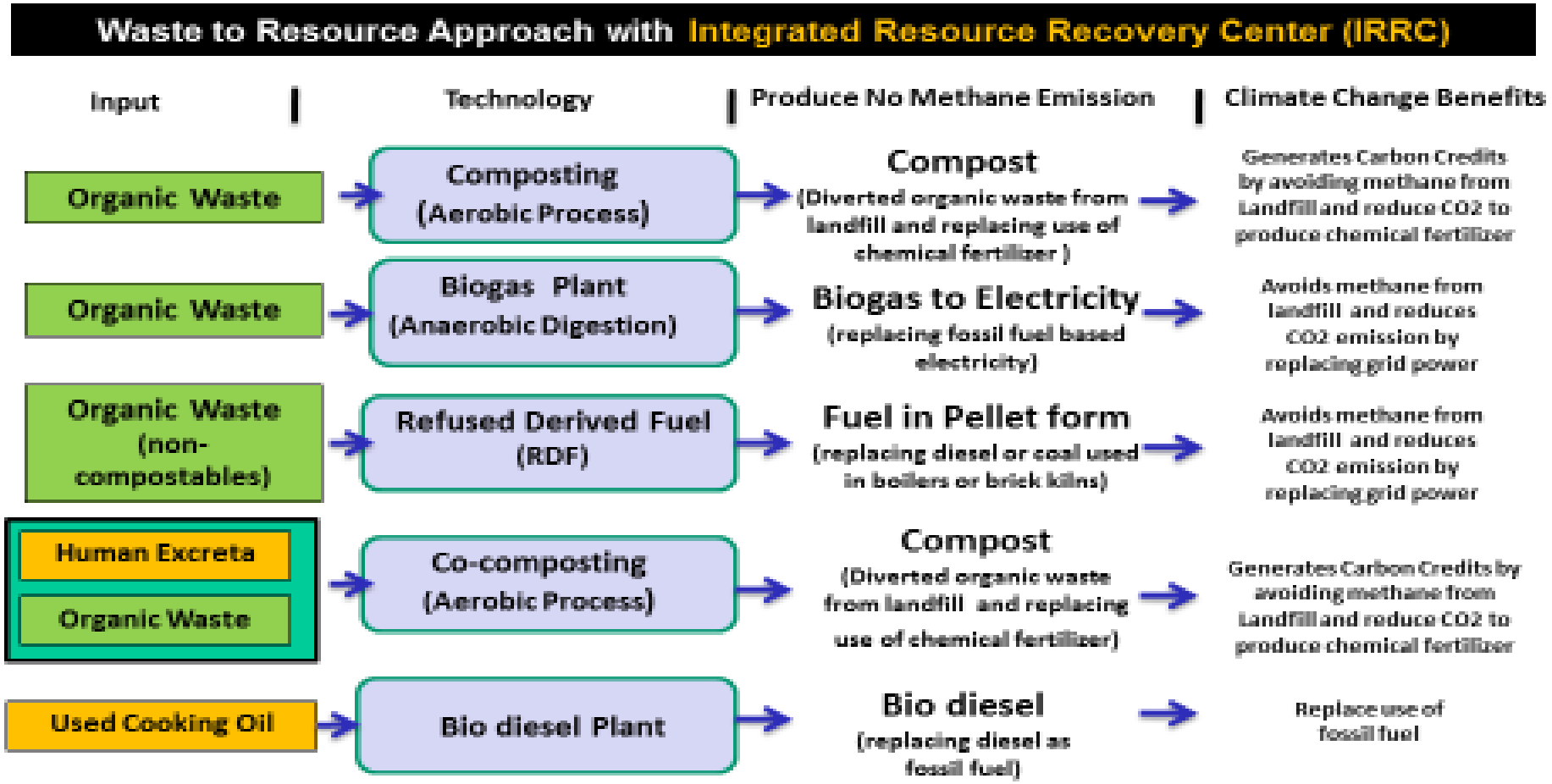
Every production, consumption, and waste management practice generates GHG from the process (directly) and through energy consumption (indirectly), but waste management policies do not often integrate climate consideration?



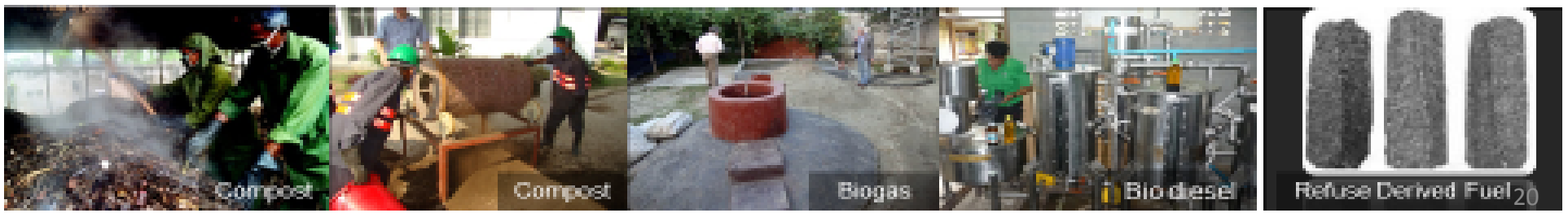
Source: MoE-Japan

3R approach: Waste to Resource to Economy

Best Example of Replicate model developing countries

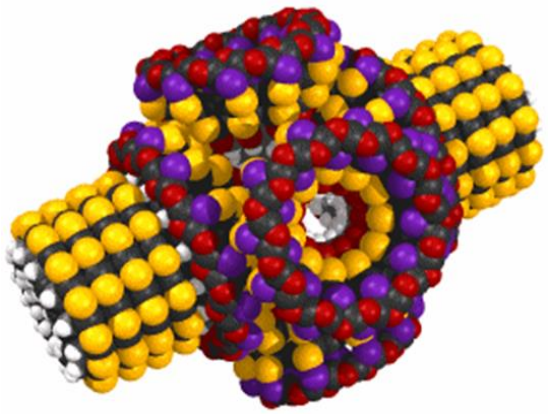


In Partnership with UNESCAP, Waste Concern is Replicating the Model in Asia Pacific Countries



Adapted from Mr. Sinha, Waste concern presentation, Presented at Sixth Regional 3R Forum in Asia and the Pacific 2015

Advanced business opportunities in Nanotechnology (waste prevention/treatment/3Rs)



Macroscopic
Microscopic
NANO
Molecular

Nanotechnology is the **second coming of the industrial revolution** that seizes the initiative of **technology capital** in the world. One of the main obstacles to achieving the goal will be **to control, reduce,** and ultimately **eliminate environmental and environmental related problems** associated with this technology; the success or failure of this new use may well **depend on the ability to effectively and efficiently address these environmental issues**.

Nano-remediation has been most widely used for groundwater treatment, with additional extensive research in wastewater treatment.

Nanotechnology – the promise

(nano market growth to 1 trillion € over the next 10 years)
Fields of application potential:

- **Membrane filtration** (drinking and wastewater)
- **Anti-microbial nanoparticles** for disinfection and microbial control
- **Removal of arsenic and heavy metals**
- **Nano sensors** for water quality monitoring

Nanomaterials Waste Streams

- Pure Nanomaterials Manufactured (e.g., Carbon Nanotubes)
- Nano By-products with organic or inorganic
- Liquid Suspensions Containing Nanomaterials
- Items Contaminated with Nanomaterials (e.g., Wipes/PPE)
- Solid matrixes with Nanomaterials

Nanomaterials during disposal/recycling

- Intrinsic Toxicity (for example Arsenic or Cadmium)
- Recyclability Properties such as thermal, mechanical, chemical properties of nano composites.

Source: Musee, N. Nanowastes and the environment: Potential new waste management paradigm. Environment International, 37: 112-128, 2011.

Source: Theron, J.; J. A. Walker; T. E. Cloete (2008-01-01). "Nanotechnology and Water Treatment: Applications and Emerging Opportunities". Critical Reviews in Microbiology 34 (1): 43–69. doi:10.1080/10408410701710442. ISSN 1040-841X. Retrieved 2014-07-29

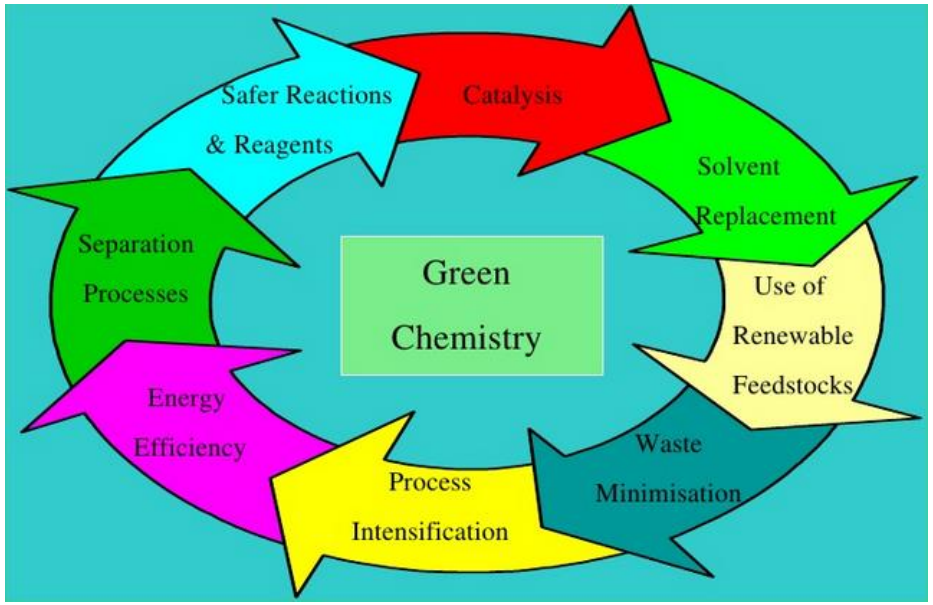
Source: Dr. Lou Theodore, July 2006 Symposium on Nanotechnology and the Environment: Waste Management of Nanomaterials: Biography

Advanced business opportunities in Green Chemistry (waste prevention/treatment/reduce)

Green chemistry, also called **sustainable chemistry**, is a philosophy of **chemical research and engineering** that encourages the design of products and processes that **minimize the use and generation of hazardous substances** in the manufacturing process.

Aiming

- ❑ Making chemical products that do not harm either our health or the environment,
- ❑ Using industrial processes that reduce or eliminate hazardous chemicals, and
- ❑ Designing more efficient processes that minimize the production of waste materials and decreases the amount of non-renewable energy used.



- ❖ Prevent waste rather than treating it
- ❖ Use renewable source of energy

Reducing lead pollution

- Replacing lead in paint with safe alternatives, and
- Replacing tetraethyl lead with less toxic additives (e.g., “lead-free” gasoline).

Chemical foams to fight fires

- A new foam called **Pyrocol FEF** has now been invented to put out fires effectively without producing the toxic substances found in other fire-fighting materials.

Source:https://www.google.co.jp/search?q=green+chemistry+picture&rlz=1C1CAFB_enJP599JP599&espv=2&biw=1366&bih=643&tbm=isch&tbo=u&source=univ&sa=X&ei=oS6zVMiWJ4TMmwW4h4CQBg&ved=0CBwQsAQ#tbm=isch&q=green+chemistry+waste+management&imgdii=_&imgrc=KwaCBTS5Fh6KpM%253A%3B91_Mvy0GgJyXeM%3Bhttp%253A%252F%252Fgreenchemistry.yale.edu%252Fjavascript%252Ftinymce%252Fplugins%252Fimagemanager%252Ffiles%252FLogo_Greenchem__3.JPG%3Bhttp%253A%252F%252Fgreenchemistry.yale.edu%252Fupcoming-events%3B686%3B568

Principles of IPLA – a SDG partnership

- ***Partnerships*** offer alternatives in which governments and private companies assume co-responsibility and co-ownership for the delivery of solid waste management services. Waste disposal is expensive – financially and in lost resources (substantial inputs of labour, material, energy, land resources for land filling, etc.).
- ***Partnerships*** combine the advantages of the private sector (dynamism, access to financial resources and latest technologies, managerial efficiency, and entrepreneurial spirit, etc.) with social concerns and responsibility of the public sector (public health and better life, environmental awareness, local knowledge and job creation, etc.).
- ***Partnerships*** (PPP) are indispensable for creating and financing adaptation measures towards resilient cities which in turn are more attractive for private investments.
- ***Partnerships*** provide win-win solutions both for the public utilities and private sector—if duly supported by appropriate policy frameworks. Such partnerships could lead to savings in municipal budgets where waste management usually consumes a large portion. The private sector, on the other hand, may use this opportunity to convert waste into environmentally friendly products and energy that could also serve as income generating opportunities.

Partnership for capacity development against hazardous and chemical waste: Obstacles

Collaboration	Challenges bringing together the capabilities embedded in ***industry, academia, and regulators*** that are needed to improve hazardous waste treatment facilities.
Business Incentives	Benefits of new green chemical industry may flow to society, they **don't necessarily flow to the industry**.
Funding	**Provide funds for new research** on green chemical industry, such as, Governmental research agencies and Research institutes

Partnership for capacity development against hazardous and chemical waste: Solutions

- Green Chemistry: ***Partnership between public*** (waste generator) ***and chemical industry*** (private sector-treatment facility), and Strategic alignment and shared vision between companies.
- Green Chemistry: Focuses on the reduction, recycling, and/or ***elimination of the use of toxic and hazardous chemicals*** in production processes by finding creative, alternative routes for making the desired products that minimize the impact on the environment.
- Applications of Green Chemistry: Source of Reduction & ***Prevention of Chemical Hazards, Design of chemical products*** which are less hazardous to human health and the environment.

Best solution: Use of Green Chemicals

Source: Adapted from Background paper of Karin Rumar, 7th Regional 3R Forum 2016

*3Rs in the context of **Green Economy***

***3Rs in a broader context** - not just about municipal waste management, but is intrinsically linked with **resource efficiency** in a wide range of sectors with an objective to reduce or eliminate the waste load for final disposal towards transitioning to a resource efficient and green economy*

Multilayer Partnerships and Coalition as the Basis for 3R's Promotion

*3Rs in the context of **Rio+20 outcome – The Future WeWant***

Pacific countries join 3R Forum

1st Regional 3R Forum in Asia
Japan/2009

2nd Regional 3R Forum in Asia
Malaysia/2010

3rd Regional 3R Forum in Asia
Singapore/2011

4th Regional 3R Forum in Asia
Viet Nam/2013

5th Regional 3R Forum in Asia-Pacific
Indonesia/2014

6th Regional 3R Forum in Asia-Pacific
Maldives/2015

7th Regional 3R Forum in Asia-Pacific
Australia/2016

Tokyo 3R Statement

Singapore Recommendation

Surabaya 3R Declaration

3R as an Economic Industry

Adelaide 3R Declaration on Circular Economy

Ha Noi 3R Declaration (2013-2023)

33 Goals for Urban/Industrial areas, Rural areas/Biomass, New and Emerging Wastes, Cross-cutting issues

2nd East Asia Summit - Environment Ministers Meeting (EAS EMM), Brunei, 2010 → **Endorsed Regional 3R Forum in Asia**

RIO+20 United Nations Conference on Sustainable Development

2030 Agenda for Sustainable Development / SDGs

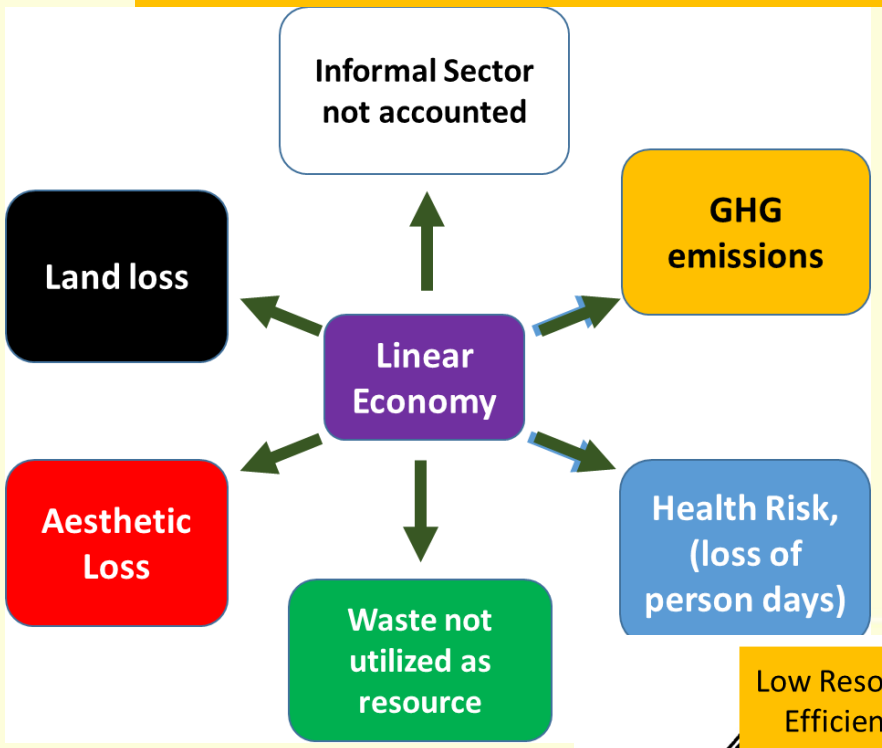
3R for Green Economy

3Rs for Sustainable Cities and Human Settelment (Healthy & Safe)

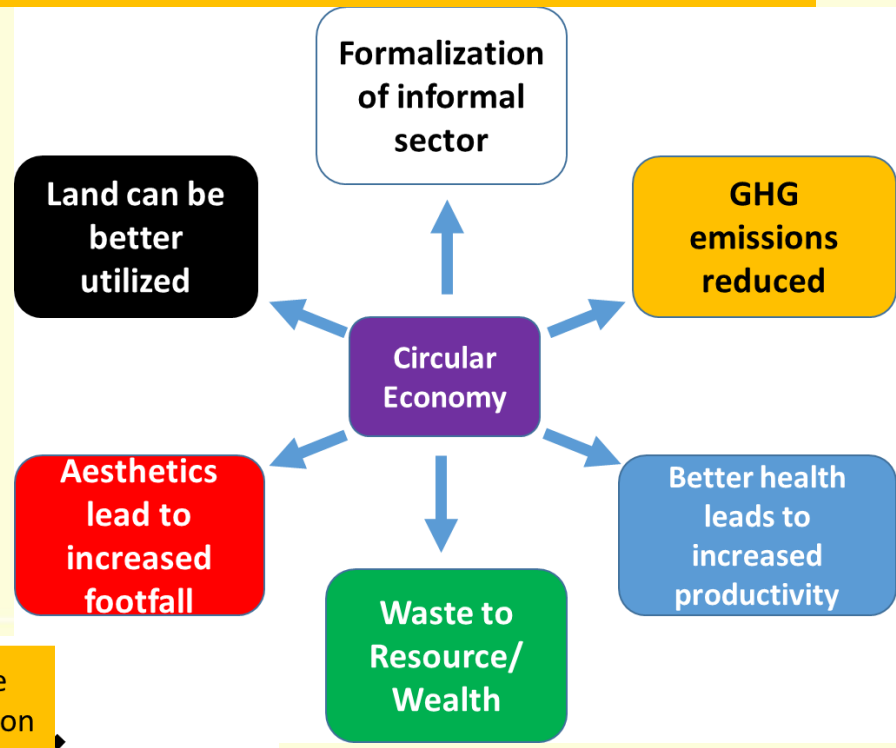
3Rs for Costal & Marine Ecosystem

Needs for Innovative Partnerships

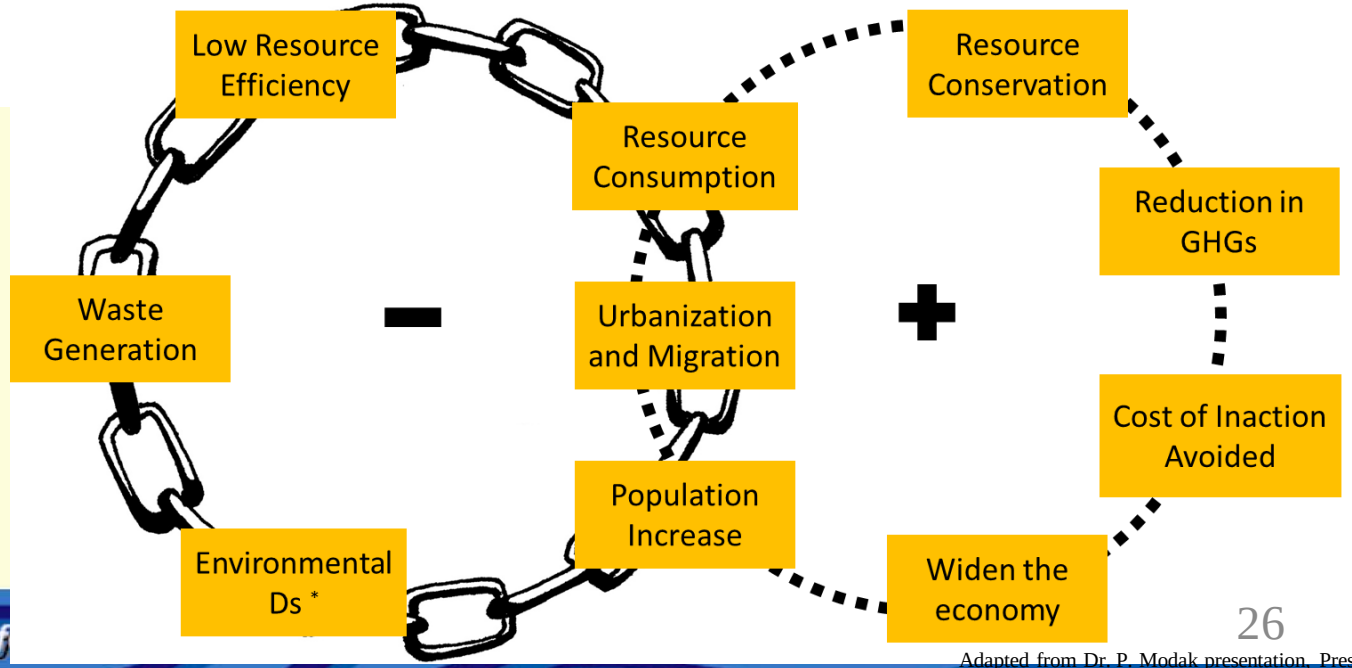
Acts and achievements: Regional 3R Forum in Asia-Pacific



Linear to Circular economy



Moving from negative loop to positive loop



=> **Important impact**:
Waste management is being increasingly addressed in resource domain

Source: Co-Chairs' Summary of Sixth Regional 3R Forum 2015

Adapted from Dr. P. Modak presentation, Presented at Sixth Regional 3R Forum in Asia and the Pacific 2015

Key Findings of the 7th Regional 3R Forum in Asia and the Pacific 2016

Triangular Cooperation

Countries need to recognize the importance of ***triangular cooperation*** (government-private sector-scientific and research organizations) in advancing 3R research and development (R&D), technology transfer and technology evaluation;

Policy transformation

Need for insight to ***policy transformation*** towards resource efficient vis-à-vis circular economic development in Asia and the Pacific;

SMEs

Governments need to assist ***SMEs to integrate resource efficiency*** in their entire supply chain through appropriate policy, institutional and financial measures and partnership mechanisms;

Resilient cities and communities

3R and resource efficiency measures can provide many complimentary benefits in making the ***cities and societies resilient***;

Technologies

3R technologies are key enablers for creating sustainable ***business opportunities towards economic*** success of the Asia and the Pacific;

Resource Efficiency

3R and resource efficiency measures can provide many ***complimentary benefits*** in making the cities and societies resilient;

Rural Development

Biomass waste in rural economy: 3R programmes and practices can provide circular economy opportunities in rural areas of Asia and the Pacific;

Circular Economy Opportunity

Need to harness multiple benefits of ***circular economic development*** approach in achieving the SDGs under the 2030 Agenda for Sustainable Development;

Source: Chair's summary of 7th Regional 3R forum 2016

Adelaide 3R Declaration

Towards the Promotion of Circular Economy in Achieving Resource Efficient Societies in Asia and the Pacific under the 2030 Agenda for Sustainable Development

❖ Promote inter-municipal or city-city cooperation

Creating circular economic opportunities, green and new employment opportunities, ultimately contributing to the well-being of the local communities

❖ Provide necessary capacity building and support

Human resource development, financing, knowledge and technical know-how for instituting circular economic development approaches

❖ Facilitate environmentally-sound management of wastes

Appropriate treatment of disaster wastes, e-wastes, medical wastes etc.

Adelaide 3R Declaration

Towards the Promotion of Circular Economy in Achieving Resource Efficient Societies in Asia and the Pacific under the 2030 Agenda for Sustainable Development

❖ Science and Innovation Technology

Technology based culture in overall policy setting and development agendas

❖ Private sector and sustainable business opportunities

3R technologies are key enables for creating sustainable business opportunities

❖ Collaborative Research-Development and Projects

To address resource efficiency related problems in industry sector, Government and international collaborative research projects in the areas of strengthening basic statistics, material flow and waste accounting and analysis, and material and waste footprint analysis and resource productivity analysis and **Bilateral/multilateral cooperation**

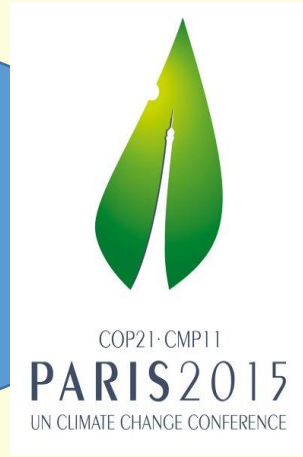
The 2030 Agenda for Sustainable Development ~3R / resource efficiency measures can provide many direct/indirect benefits to many SDGs

Source: Adapted from United Nations, 2015

2030 Agenda for Sustainable Development

New Urban Agenda 2016

Paris Agreement 2015



Nairobi Mandate 2016

Addis Ababa Action Agenda 2015

Source:
https://www.google.co.jp/search?rlz=1C1CAFB_enJP726JP726&espv=2&biw=1366&bih=638&tbm=isch&sa=1&q=paris+agreement+2015&oq=paris+agreement+2015&gs_l=img.3...29174.29974.0.30231.0.0.0.0.0.0.0.0..0.0....0...1c.1.64.img..0.0.0.M3oYmouCebY#imgrc=U5U27HmOEEMNtM:
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Welcome to
8th Regional 3R Forum
in Asia and the Pacific

Theme: Achieving Clean Water, Clean Land and Clean Air through 3R and Resource Efficiency – A 21st Century Vision for Asia-Pacific Communities

Venue: *International Convention Centre, Hyderabad, India*

Date: *18-21 December 2017*

Co-organizers: *Ministry of Urban Development (MoUD), Government of India;*
Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India;
Ministry of the Environment, Japan; and
UNCRD