

3R as an Economic Industry ~ Outcomes of Maldives 3R Forum



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United Nations Centre for Regional Development

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 We Want

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**

**3R as an
Economic
Industry**

**Tokyo 3R
Statement**

Singapore Recommendation

Surabaya 3R Declaration

Ha Noi 3R Declaration (2013-2033)
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



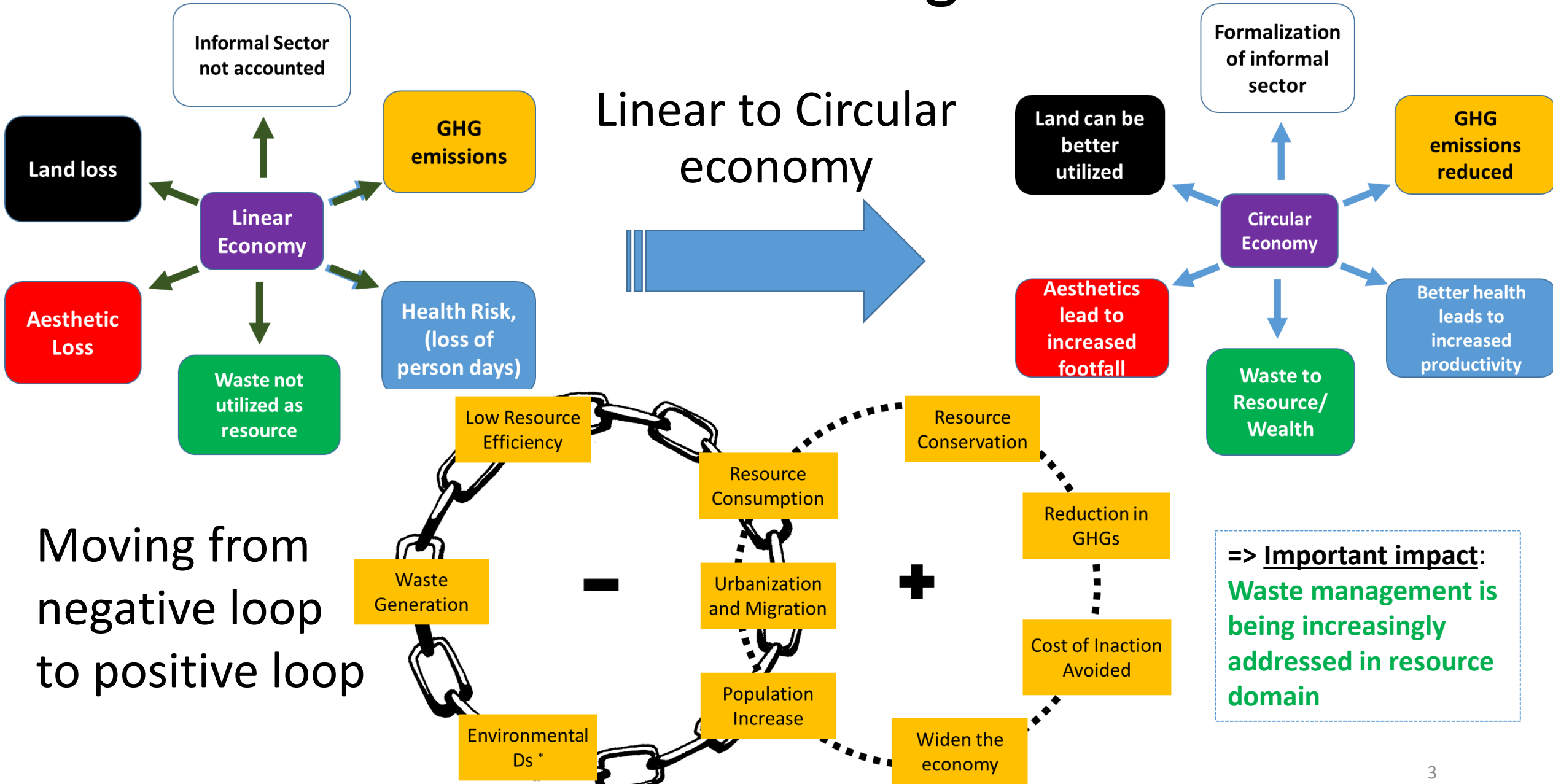
3R for Green Economy

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

3Rs for Costal & Marine Ecosystem

Needs for Innovative Partnerships

Acts and achievements: Regional 3R Forum

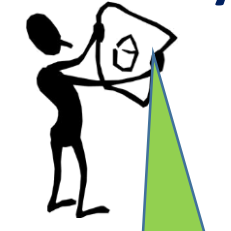


Creating Economic Opportunities in 3Rs by connecting "People-Environment-Technology-Business"

R & D/Engineering



Energy Efficiency



Energy service companies (energy audit, energy efficient system design /equipment manufacturing, specialty engg. services, etc.)

Nano tech market: more than US\$1 trillion



Green Chemistry & Nano Technology

- cosmetics, baby lotion, computer chips, paints, medical equipments, etc.

Water Efficiency

- Water saving devices
- distribution efficiency
- Zero leakage,
- Waste water treatment,
- Rain water harvesting, etc.



Waste-Water-reuse for urban agriculture practices



- Water purification technologies, waste water treatment (ecological engineering: constructed wetlands for pre-treatment of urban run off water & river water)
- Distributed sewage treatment systems, etc.

Green Buildings

- Engineering, design & construction materials



Sustainable Transportation

- ITS, IFS, BRT, Railways, walkways & bicycle ways
- Fuel efficiency measures
- Vehicle I/M
- Alternative fuels, PPP for urban transport. etc.



Bio-economy (high value processing/conversion of biomass)



- Bio-products
- Bio-energy
- Bio-Engineering
- Landscape trimming, etc.

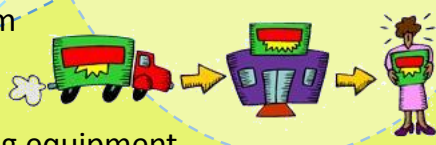
Synthetic fibers/oil, bioplastics, materials from fiber by-products, composts, animal feeds, bio-chemical

Resource Recovery/3R



Sustainable Farming Support Companies

- Efficient water & nutrient management system
- Water & nutrient delivery system
- Biomass energy company
- Energy efficient cultivating, harvesting, hauling equipment
- Compost industry (e.g. Dhaka Community-based Composting System)
- Roof top agriculture (urban greening) for food security

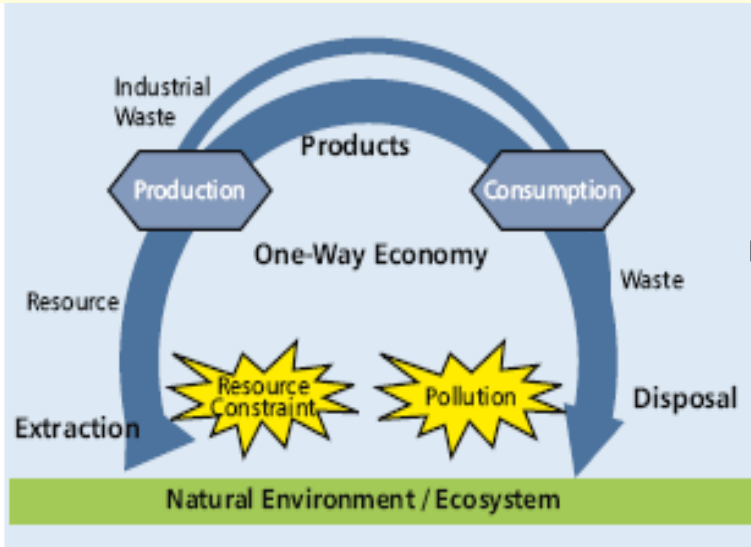


CH4 & fertilizer from animal manure /sewage sludge with anaerobic or aerobic digesters, refused-derived fuel (RDF), etc.

Urban Services and Supplies

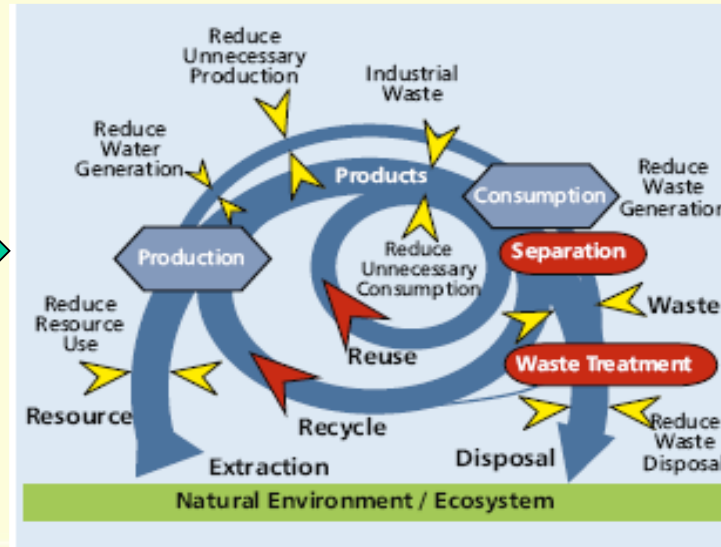
Nature of economy is a key driver behind 3R as an economic industry....

1. One-way/conventional Economy



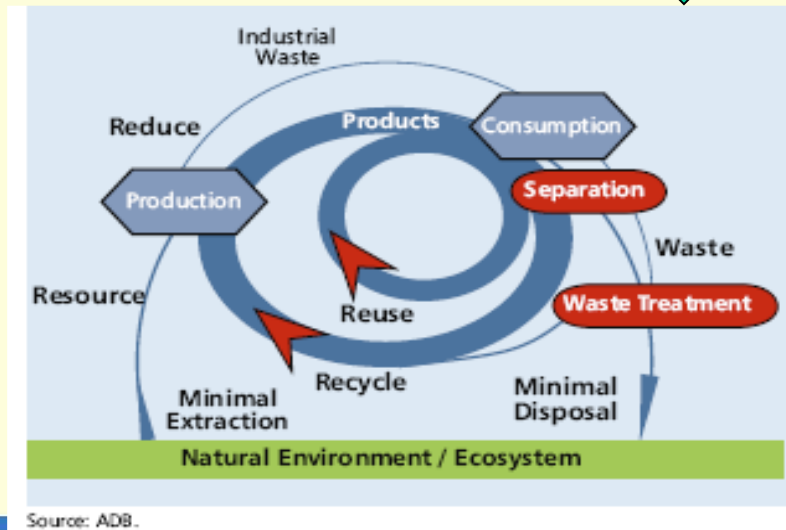
Source: ADB.

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.
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.
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, e.g, a closed-cycle processing plant takes in freshwater and does not discharge any liquid effluents. Rather, the water is constantly recycled and possibly utilized in the final product itself.

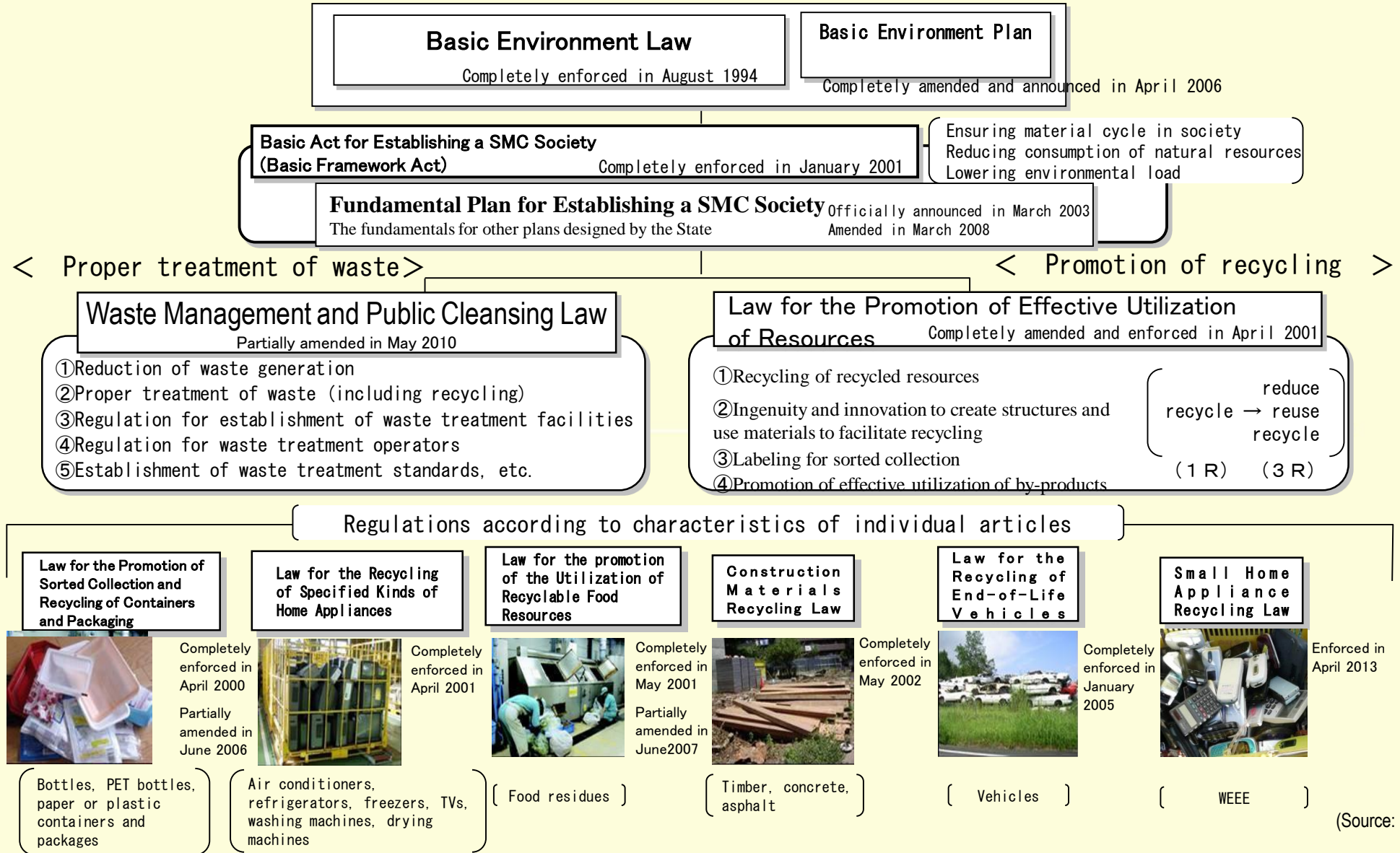


A Major Driver => Macro-Economic/Development Policies Integrating Resource Efficiency and 3Rs

- **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



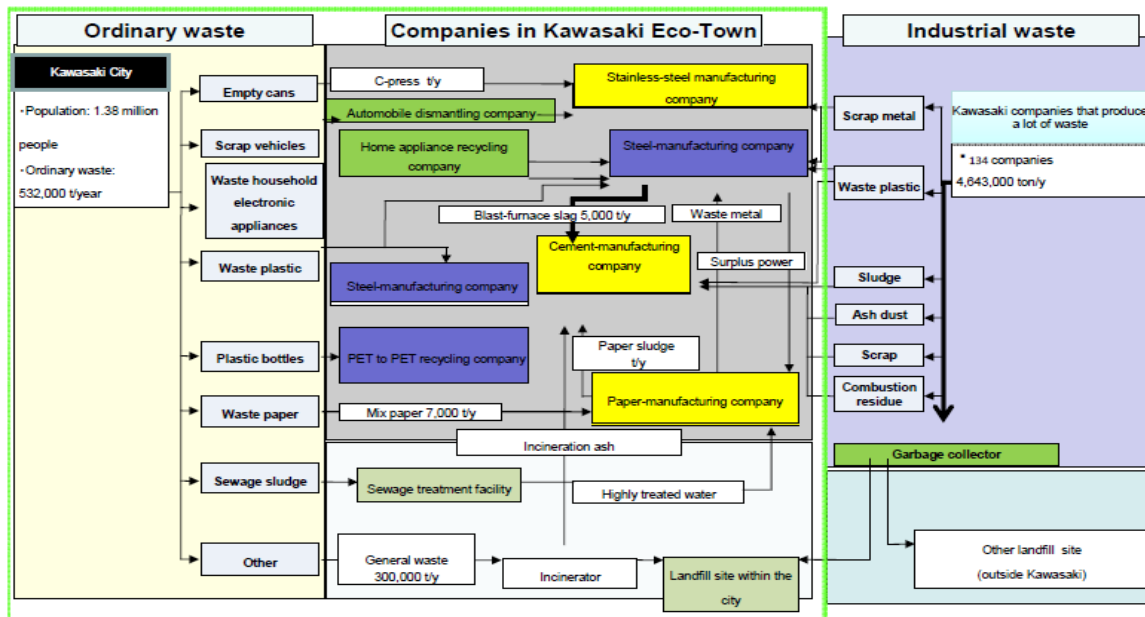
Japanese Legal framework for establishing a sound material-cycle (SMC) society



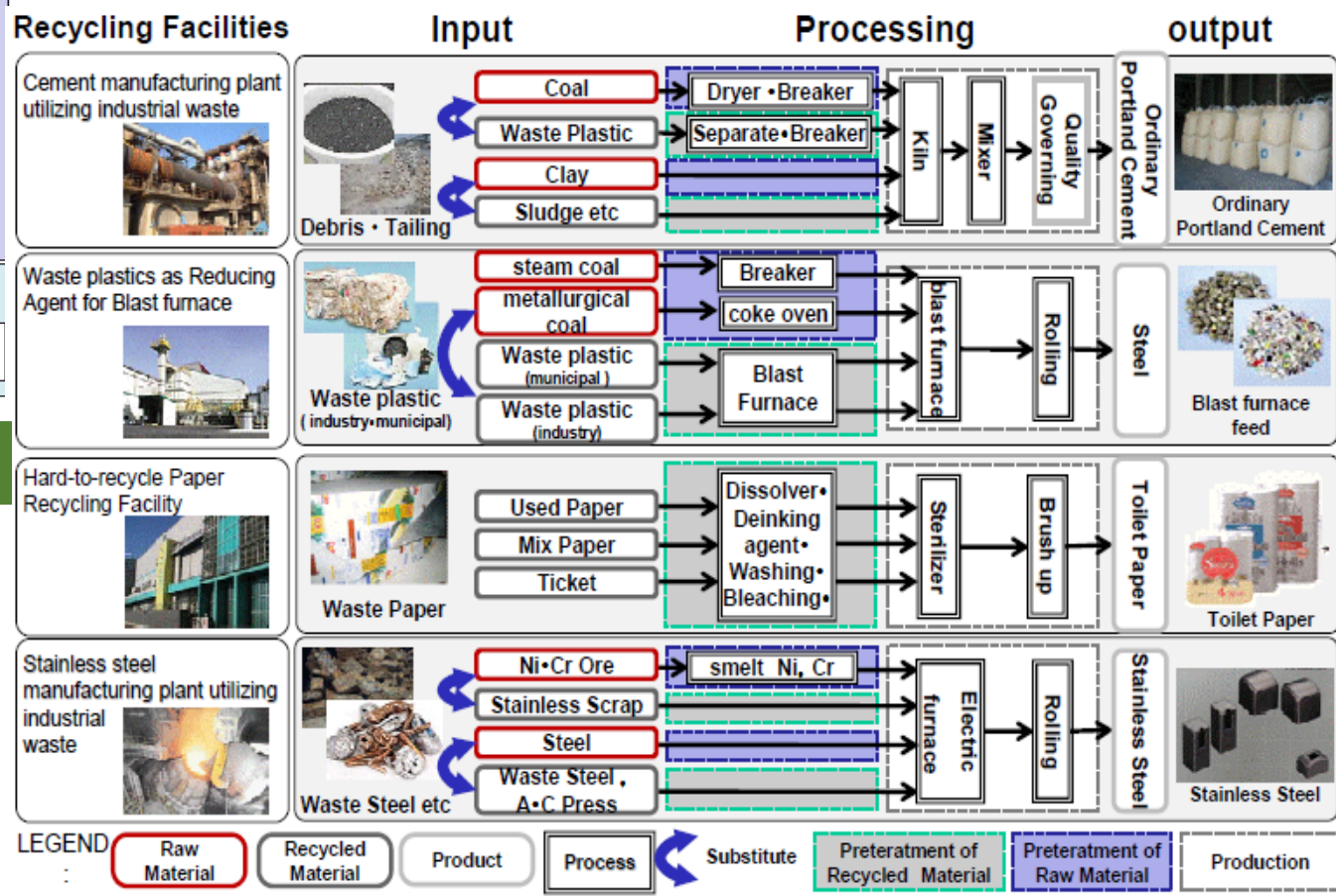
(Source: Courtesy of MoE-Japan)



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



Formation of a Regional Network for Resource Recycling



Key Features of Kawasaki Eco-Town

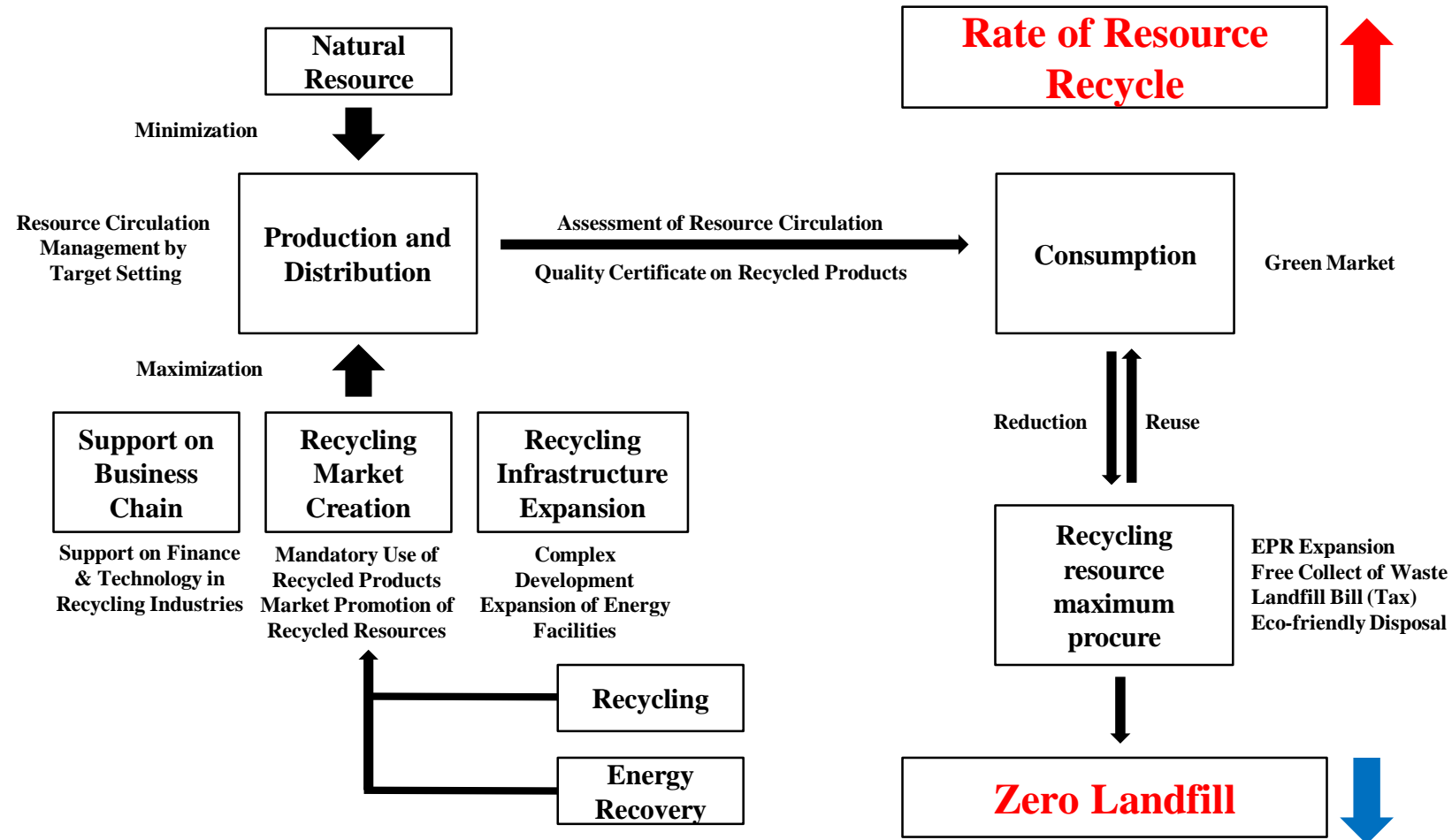
1. revitalization through environmental technologies accumulated in traditional industries
2. Industrial symbiosis through a regional network for resource reuse/recycling
3. local private companies take their own initiative in environmentally sound business operations and contribute to preventing local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

Quantified material accounting for Symbiosis in Kawasaki

Korean Prospect of Waste Management in Future

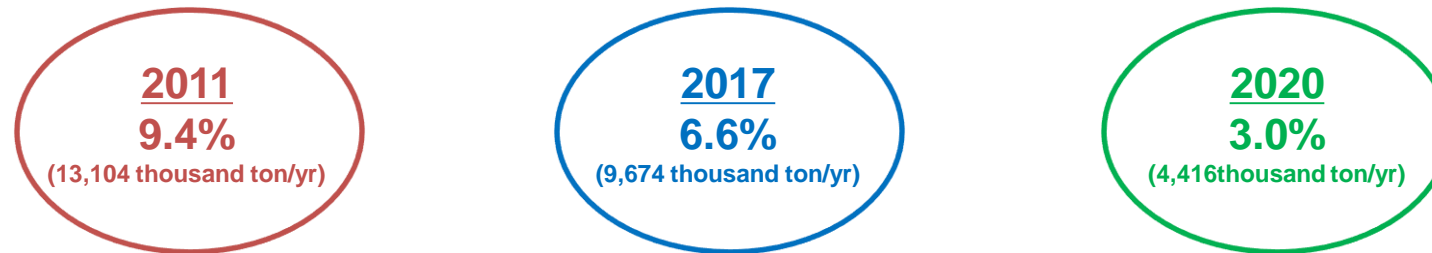
▪ New Waste Management Policy

▪ Structure of Resource Circulation Society (RCS)



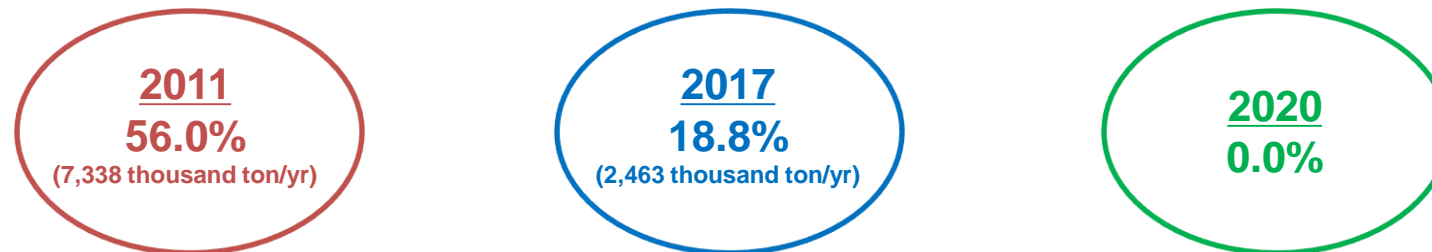
- **New Waste Management Policy (Goals)**

- **Landfill Rate of Waste in Overall**

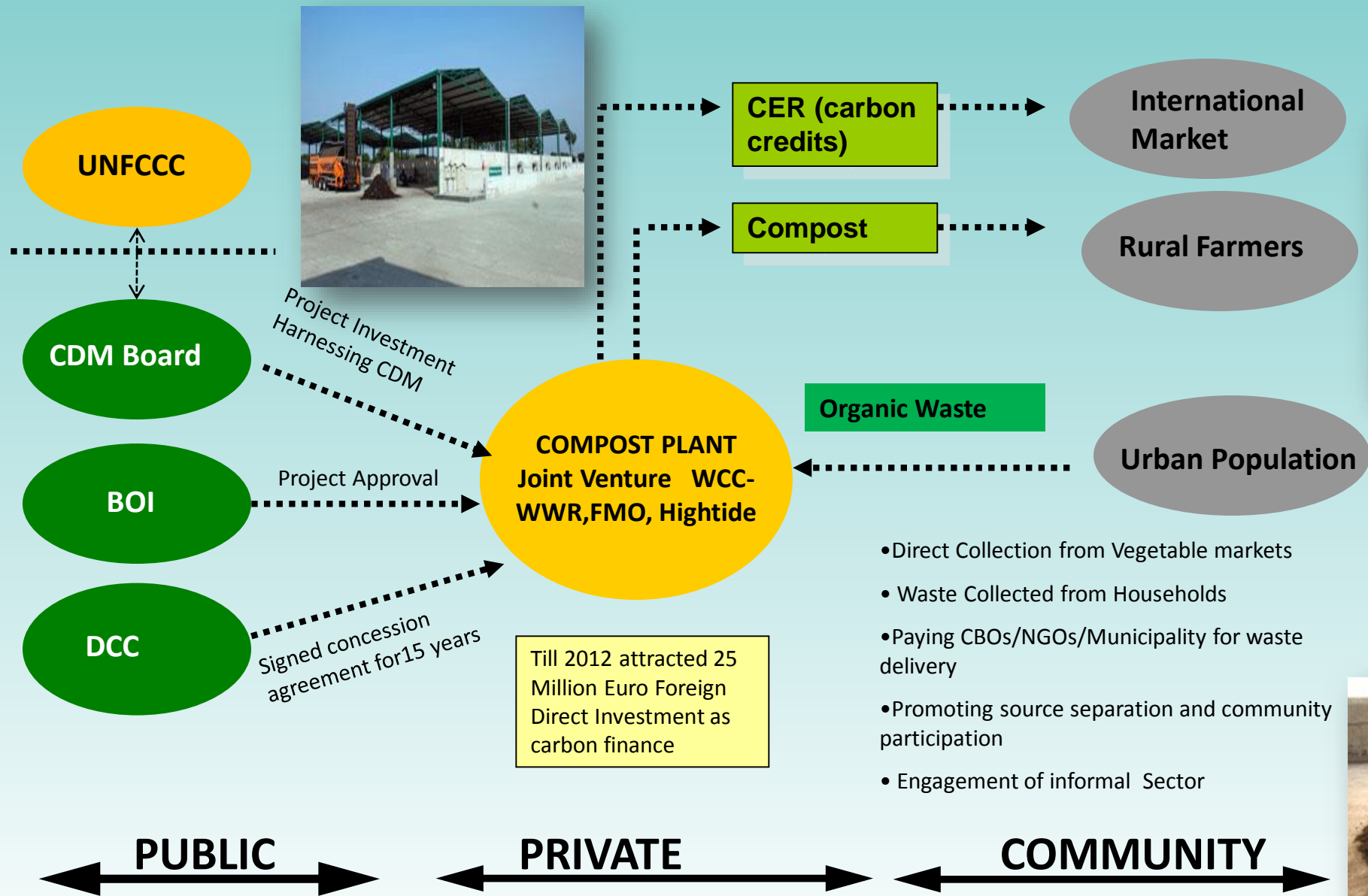


※ Landfill rate of household waste of developed country is 0.42% in Germany, 0.97% in Sweden, 3.8% in Japan based on 2010
So, those countries actually achieved the landfill zero of recycling available resource

- **Landfill Rate for Recyclable Waste**



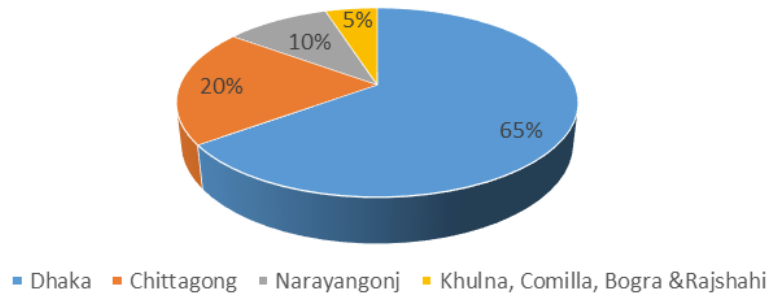
PPP Model for Centralized Community Based Composting in Dhaka



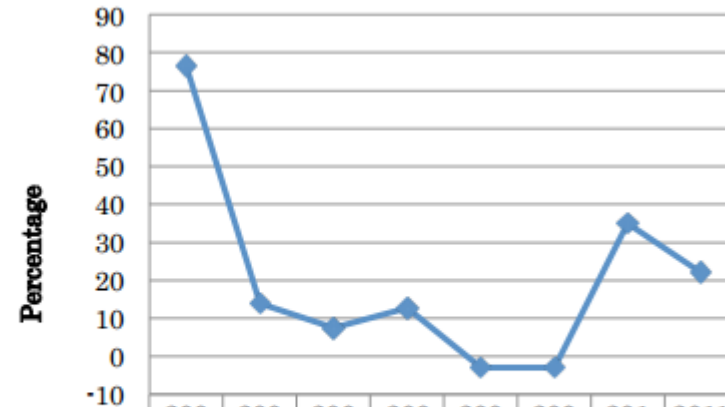
Source: Waste Concern, Dhaka, Bangladesh

Business opportunity: Recycling of plastic waste in Bangladesh

Plastic Industries in Bangladesh



Plastic waste is ranked **12th** in terms of **export oriented sectors** of the country



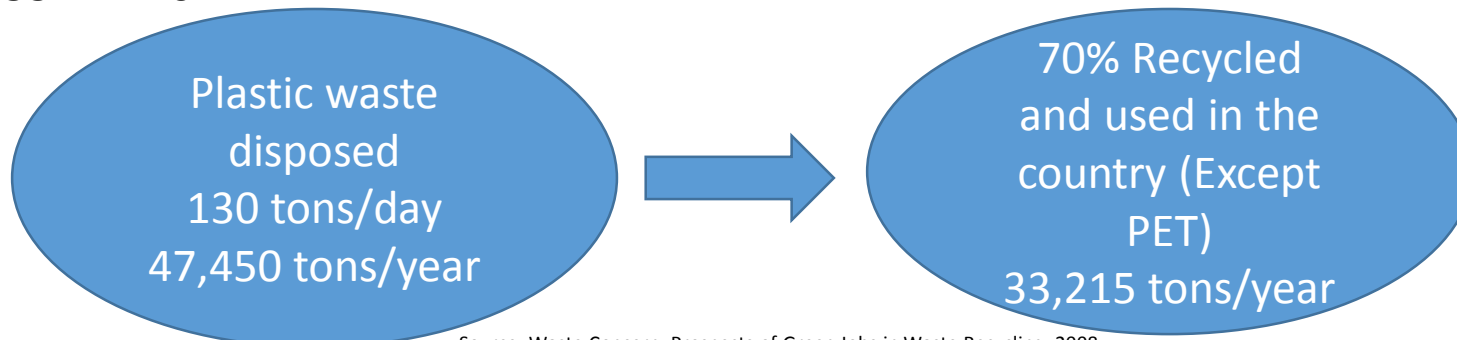
Growth rate of plastic export



Plastic waste recycling follows direct economic benefit

- (a) **Less landfilling** requirement
- (b) **Large recycling industry jobs and economic output**
- (c) **Direct savings** of foreign currency

❖ Per capita consumption of plastics in Bangladesh is 5 kg per year. The plastic sector constitutes **1.0 of GDP** and provides **employment for half a million people**. Total export earning for both direct and deem exports is about US \$ 337 million.



- ❑ **Generating 21,000 jobs**
- ❑ **Saving expenditure** of Tk3.08 crore by avoiding plastic waste
- ❑ **Saving Foreign currency** of US \$51 million/ year by avoiding import of virgin plastic.

Source: Waste Concern, Prospects of Green Jobs in Waste Recycling, 2008.

Business opportunity: Recycling of Lead acid battery in Bangladesh

- ❖ Recycling of lead acid batteries are taking place in an **environmental sound manner** to adopt public policy for **economically efficient** and also keeping in view the **health hazards arising from exposure to lead**.
- ❖ Lead acid battery has more than **ten parts** such as, plates, separator, hard rubber container, lead, bitumen, battery cap, cork, connectors, electrolyte, electrical accumulator, negative plate or anode positive plate or cathode, sealant and chemical compound: CFCs, carbon tetrachloride, halons, methyl chloroform, lead, Sulphuric acid.
- ❖ Approximately, **3,420 tons of lead are recovered per year** from ULABs in Bangladesh. This allows to meet **60%** of the total lead requirement of the country **from secondary lead**.

In recycling process, the price of used battery is increasing by about 100% in each stage of transfer.

Small buyers → Broker → Separator → Re-builder/Smelter

❑ **Recovered Lead:** 6000 ton/Year

❑ **Savings:** 4.73 million US\$/year

(avoiding lead import using foreign currency (60% recycling rate at present)

❑ **Jobs Created:** 6000 new jobs



Waste-Freshwater Nexus in India – offer many business opportunities in waste sector for water security 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.



3R Developments in Asia: Informal Resource recovery and recycling



- ❑ 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....

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

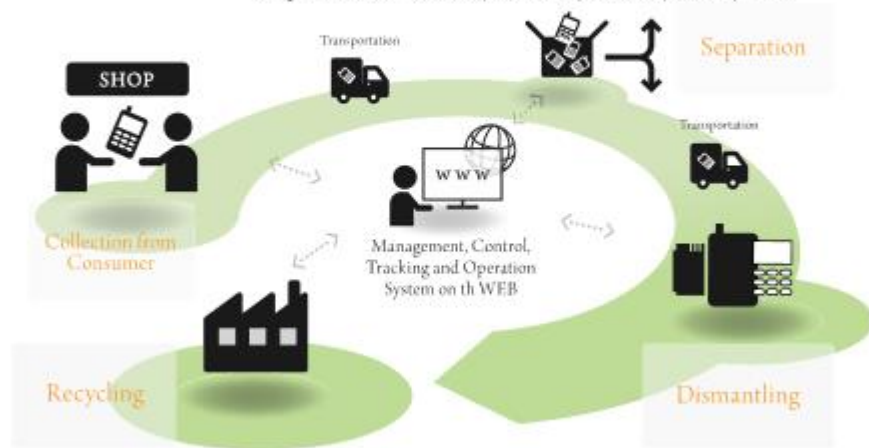
Economic opportunities in

waste electrical and electronic equipment (WEEE)

- ❖ E-waste is estimated to reach 50 Mt by 2018, with a growth rate of up to 5 per cent per year.
- ❖ The top three Asia-Pacific countries with the highest e-waste generation in absolute quantities are PR China (6 Mt), Japan (2.2 Mt) and India (1.7 Mt).
- ❖ E-waste can provide an alternative source of raw materials for the manufacturing industry, thus reducing the need for extraction of natural resources and at the same time reducing associated environmental impacts.

Domestic Mobile Phones Recycling Business in Japan

A Japanese mobile phones carrier has a program to recycle used mobile phones, which are collected directly from end users with the following system. Recycling technology and logistics management from 2,400 collection points in this system are all provided by JEPLAN.



A. Community Public

1. To promote household waste sorting
2. To encourage community organizations to promote recycling activities

D. Recycling Fund

1. To be paid by responsible enterprises
2. To subsidize the recycling and disposal system



Major Recommendations & Outcomes of Maldives 3R Forum

Economic Opportunities through 3Rs – A Win-Win Strategy (1)

- ❖ Cities and industries need to move from a linear or “one way” economy to a resource-efficient and even *closed-loop or “circular” economy*.
- ❖ Economic opportunities may exist, among others, in *green chemistry* and *nanotechnology, sustainable transportation, energy and water efficiency, sustainable farming, bio-economy, green buildings* and *wastewater reuse* for *urban green spaces* and *urban agriculture*.
- ❖ Public private partnerships were identified as critical for realizing business opportunities, and critically depend on *macroeconomic and development policy* settings such as, for instance, a *circular economy policy*.

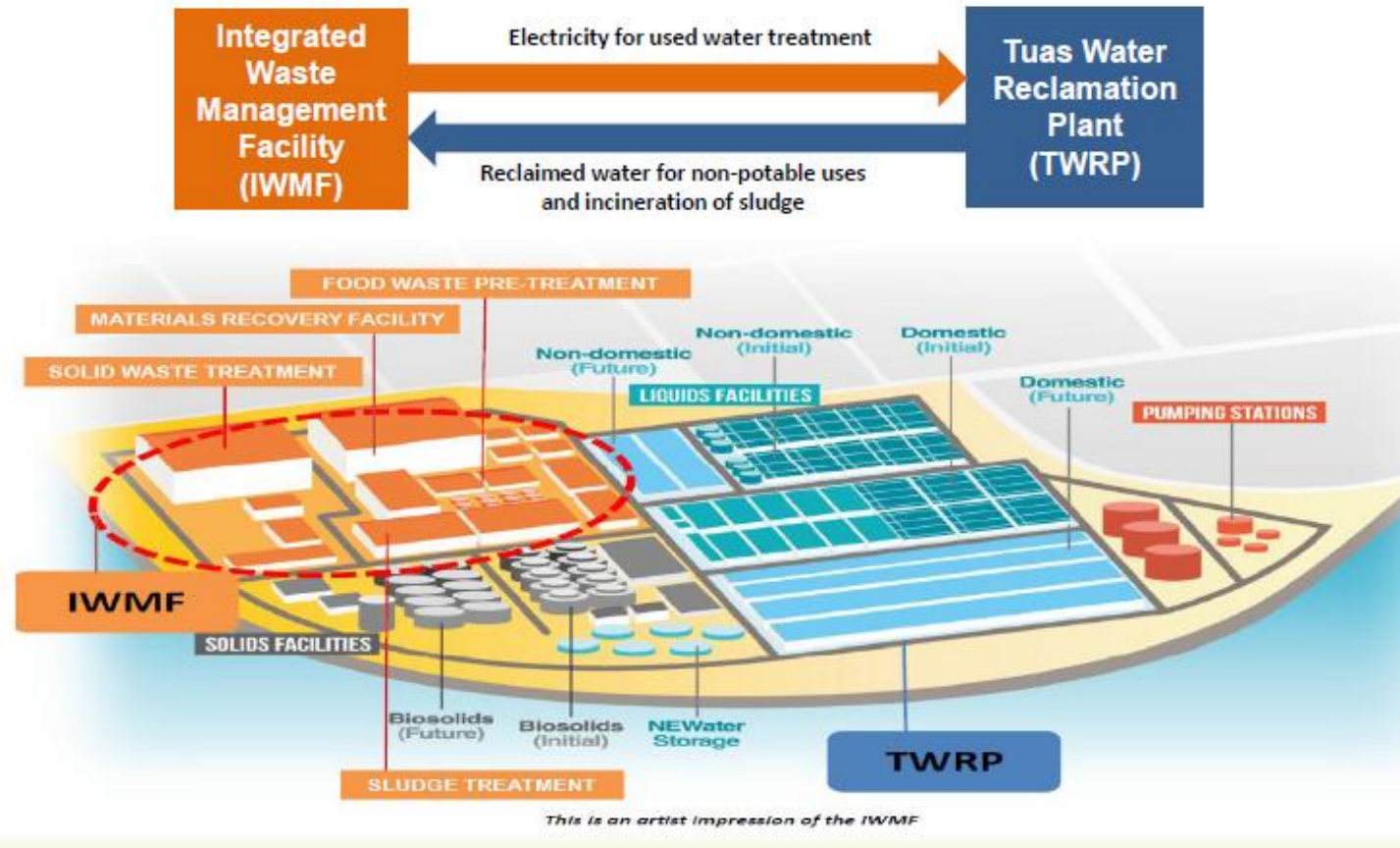
Proliferation of sustainable urban business opportunities in 3R areas (2)

- 3R as an economic industry offers competitive solutions to many urban environmental issues, provided 3Rs and resource efficiency are integrated into *macroeconomic development policies* (e.g. the circular economic policy of China);
- *Eco-towns, eco-industrial parks and industrial symbiosis* could significantly contribute to regional development as has been demonstrated by Japanese cities such as Kawasaki, Kitakyushu;
- City governments and urban local bodies should recognize and publicize the excellent performance of private companies that *carry out environmentally-sound operations*;
- R&D oriented industrial structure and environmental efforts by companies are critical to fostering sustainable urban businesses; and
- Consumers' awareness (green consumerism) is a critical driver of sustainable urban practices and related green business opportunities

Enabling framework for 3R Science-Policy-Business interface is key to realize Smart, Resilient, Inclusive, Low Carbon and Sustainable Cities (3)

□ At the macro level, the *Singapore Sustainable Blueprint 2015* provides a road map to realize the vision of a liveable and endearing home, a vibrant and sustainable city, and an active and gracious community.

□ An Integrated Waste Management Facility will help to realize the **waste-water-energy nexus** for maximum efficiency and potential of economic and business opportunities



Potential of Economic and Business opportunity

Economics of Biomass Utilization/ Business opportunity (4.1)

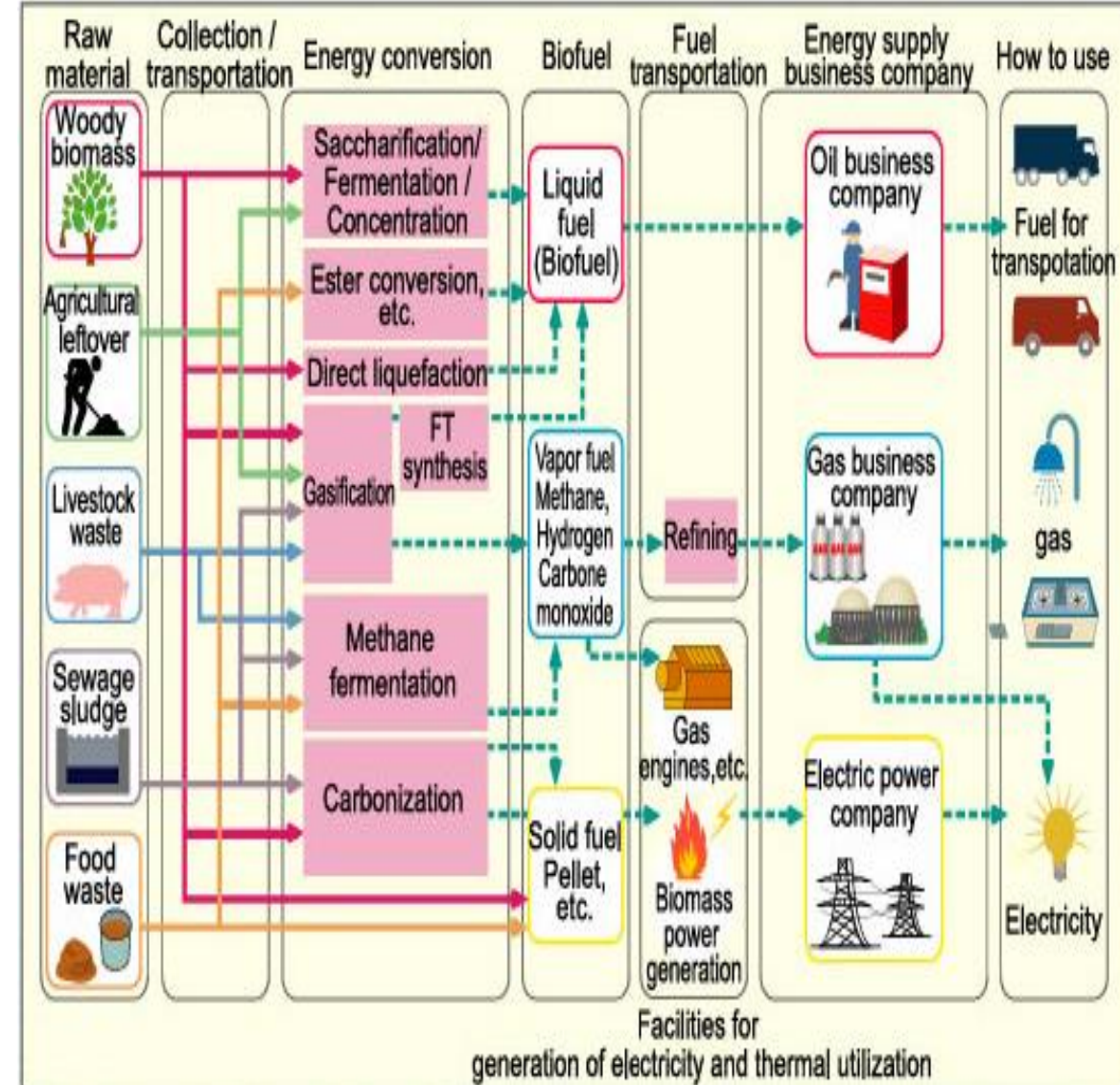
- ❑ The agriculture sector contributes *between 0.7% and 30% of total GDP* for Asia-Pacific countries
- ❑ Economic potential of the *biomass economy* → 17 trillion US dollars globally
- ❑ Based on a 2013 estimate, Asia-Pacific countries generated 673,694,540 tonnes of agriculture biomass waste only from the one major agriculture commodity. Some studies say that there was an estimated potential of 153 million tonnes of briquettes (worth USD 23,000 million) from the Asia-Pacific region in 2013.

❖ Increase interest of utilizing of biomass for power generation as an **alternative to fossil fuels**. Generally, there are two types of biomass utilization:

- energy utilization
- material utilization

In Asia Pacific region biomass is often left unused.

❖ It is estimated the Southeast Asian biomass and **waste-to-power market** produced nearly 230 million tonnes of feedstock annually.



Economics of Biomass Utilization/ Business opportunity (4.2)

❖ Thailand

- Formulated policies to encourage biomass projects
- Very Small Power Producers (VSPPs) scheme (2001)

❖ Malaysia

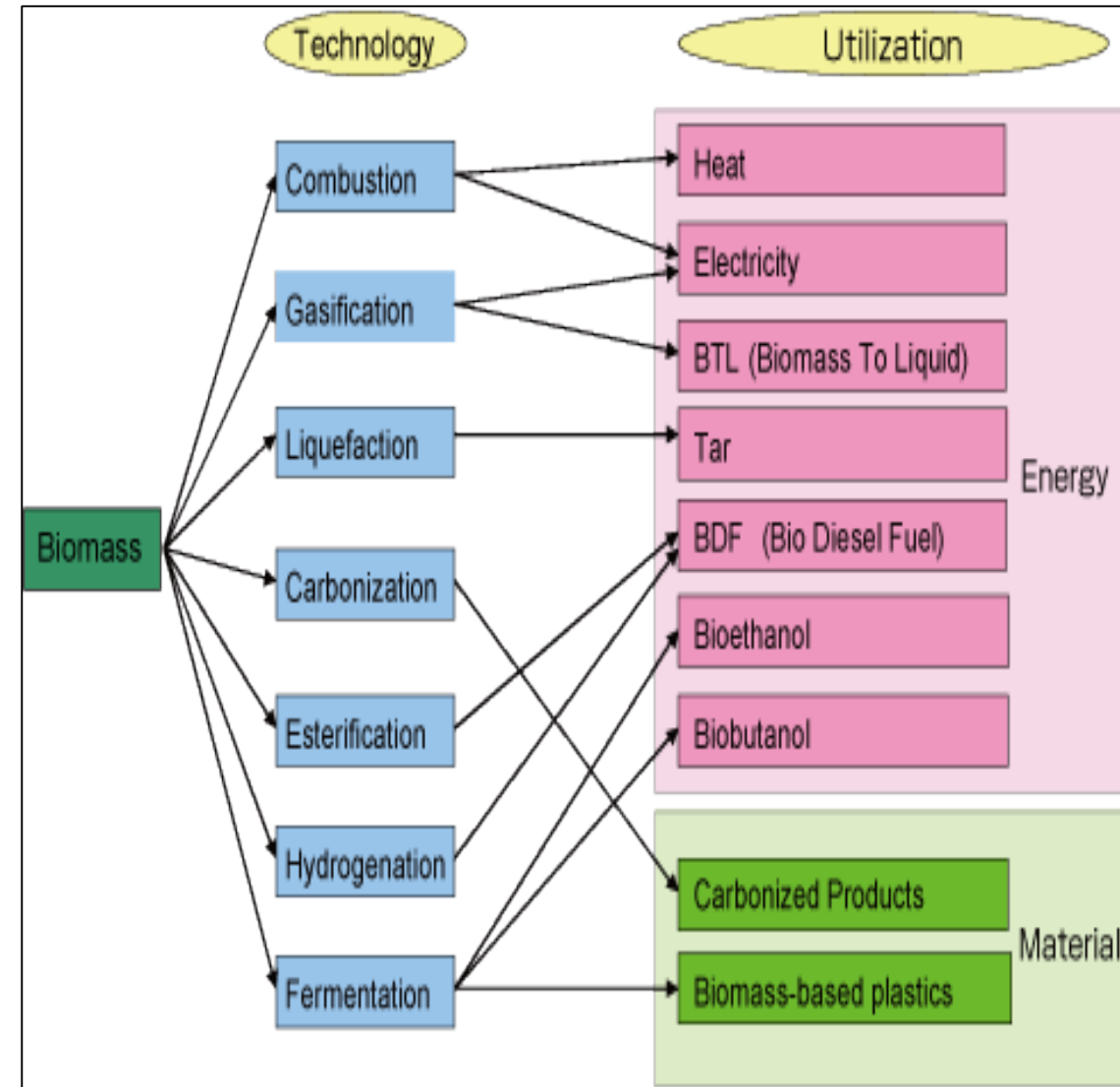
- Palm oil industry contributed to RM 90 billion GNI
- 83 million dry tonnes of biomass (2012)

❖ Singapore

- Woody biomass and steam cogeneration plant on Jurong Island (60 tonnes of process steam per hour).

Effective utilization of agriculture and biomass waste---> global mitigation potential of 5,500-6,000 megatons CO₂e/yr by 2030

Agriculture waste is of high value with respect to material and energy recovery



Extended Producer Responsibility (EPR) is an important mechanism for management of waste electrical and electronic equipment (WEEE) (5.1)

- EPR is considered globally as one of the *most powerful policy mechanisms* in dealing with the e-waste problem;
- Asia-Pacific countries need to develop *national e-waste management strategies* based on 3R concepts. Such strategies should address not only the environmental and health impacts of e-waste (end-of-pipe) but also look at the reduction of e-waste through green design (up-the-pipe);
- Should create enabling conditions for *relevant stakeholders to develop business and economic opportunities* to recover materials from e-waste; and
- Strategies should take into account *the financial, institutional, political and social aspects* of e-waste management, including due consideration to the activities of the vast informal sector in the region.

EPR as an Innovative Policy Option for 3R promotion ~

Some experiences (5.2)

- EPR paves the way for resource recycling towards **closing the material loop**;
- The EPR approach is expanding, especially targeting products with high recyclability and high environmental impacts, e.g. electronics and packaging;
- Recycling policies have played an important role in reducing waste generation at source and promoting the **circulation of recyclable resources in the Republic of Korea**;
- In Japan, **Sound Material-Cycle Society** initiative → progress towards three major indicators – (1) resource productivity, (2) recycling rates and (3) final waste disposal volume.
- EPR on home appliances, small appliances and batteries, were gradually introduced. The recycling rate has been increasing for all home appliances except CRT TVs. **To date, approximately 60% of all municipalities in Japan already take measures or are preparing to implement EPR for small appliances.**
- ❖ A successful EPR requires multi-stakeholder involvement, the inclusion of the informal sector, the presence of a sustainable financial mechanism, and sound legal and institutional frameworks.

Reduce, reuse, recycle and recover (the 4Rs) best option in order to minimize waste.

SIDS and Coastal Region:

Important nexus between Environment-Tourism-Economy (6)

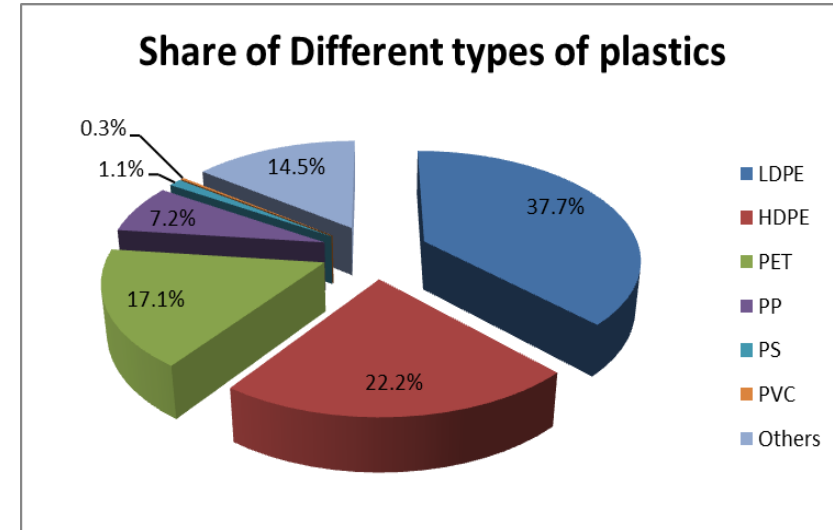
- ❑ for Small Island Developing States (SIDS) and coastal cities of the region:
 - ✓ The state of their environment, ocean ecosystems, tourism potential and business opportunities are closely tied to each other in mutually beneficial ways.
 - ✓ Limited availability of land, resources and technology combined have become major drivers for waste management problems and related health and environmental degradation.

3R and Resource Efficiency are key towards Sustainable Tourism Developments in SIDS (7.1)

- ❑ Important *nexus between the environment, marine ecosystem protection and the tourism industry*;
- ❑ Sustainable tourism development contributes *significant inputs to economies*, especially in SIDS, and application of 3R concepts in reducing plastic pollution and promoting sustainable tourism development is crucial;
- ❑ Environment, tourism and the economy are *intricately linked* with each other; Tourism generates tax revenue, jobs and trade; and
- ❑ *Decoupling of economic gain and environmental degradation* could result in enormous economic opportunities in sustainable tourism development.

Sustainable Tourism Developments in SIDS- Case study ~ Management of plastic wastes, Mauritius (7.2)

- Mauritius initiated a PET bottle recycling programme in 2001, which is running successfully;
- About 416,000 tons of MSW was landfilled in 2014 and this figure is expected to reduce as composting and other 3R initiatives take shape;
- Regulatory policies, such as clean-up campaigns prior to cyclonic and summer seasons, have added strength to the implementation of various 3R programmes;
- Mauritius will introduce new legislation banning certain plastics in 2016 and is expected also to convert existing transfer stations into Material Recovery Facilities



- ❖ To promote the recycling sector in Mauritius
- ❖ Reduction on reliance on landfill or on other ultimate disposal facilities Savings on waste transportation and disposal of waste
- ❖ New economic activities and hence green jobs are created



Waste and Freshwater Nexus ~ 3R is key for Water Security (8.1)

❖ 3Rs (reduce, reuse and recycle) strategies and principles provide a holistic solutions to ensure water security:-

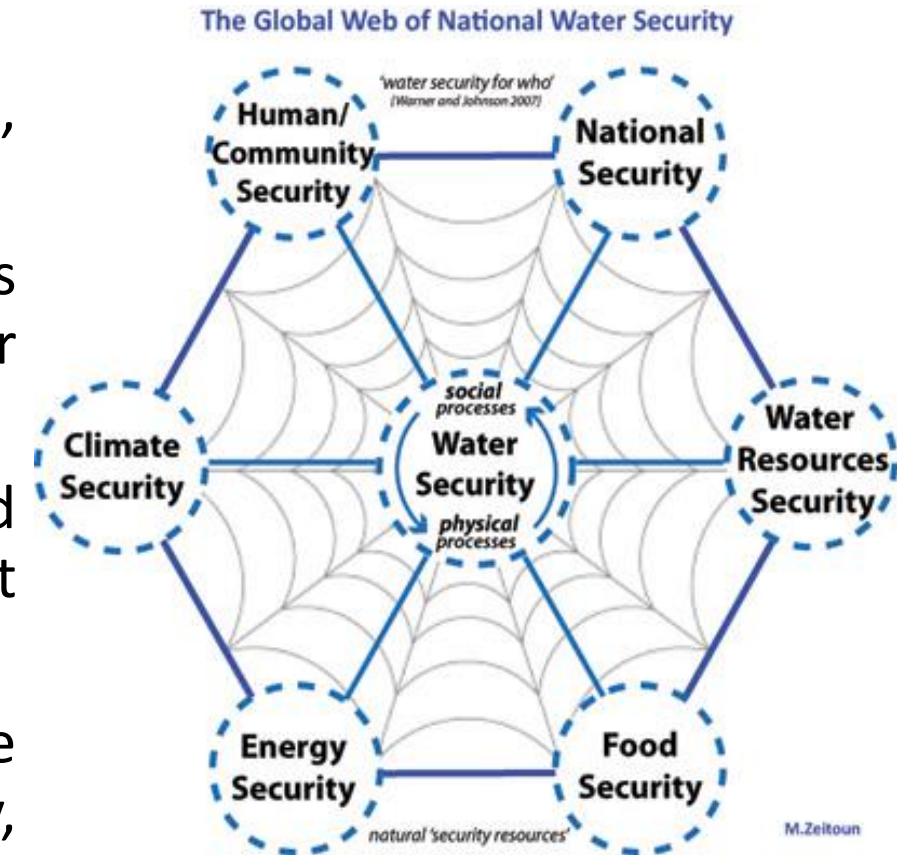
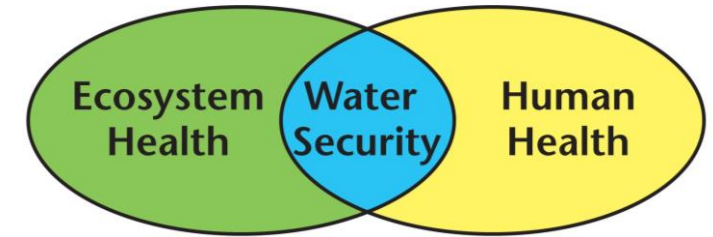
❑ First R-Reduce: efficiency of water usage/reducing water footprint;

❑ Second R-Reuse: reuse of treated wastewater in municipal, industry, and agricultural sector; and

❑ Third R- Recycling: Implementing recycling technologies for handling and treatment of wastewater for reuse and/or safe discharge to the environment

❖ Supply side management practices include recycling and reusing wastewater and improving wastewater treatment capacity by employing advanced treatment technologies.

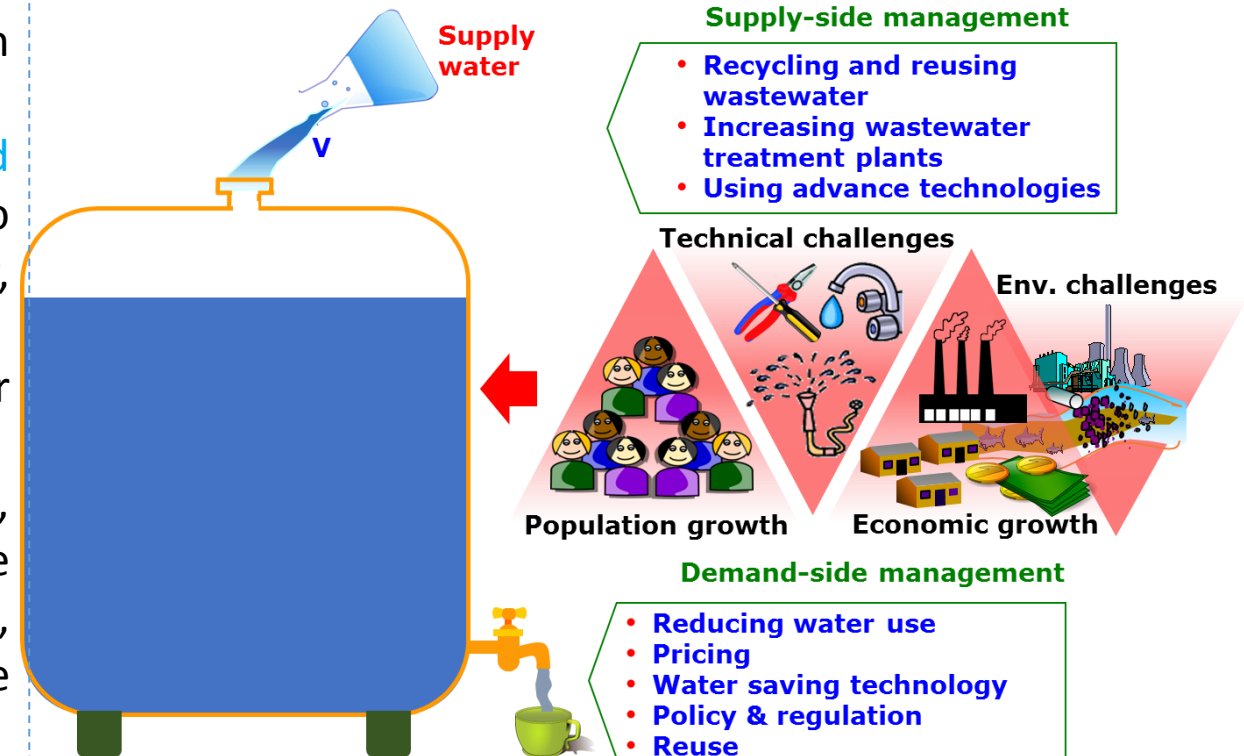
❖ For demand side management, 3R strategies include reducing water use, water pricing, water saving technology, policy and regulation.



Response for both Water-Demand and Supply Side Issues (8.2)

- ❑ Water **drives the economy** (food-energy-transport-manufacturing/production-as well as service sector like tourism) is dependent on water;
- ❑ Water is the resource **used across all supply chains**, but wastewater is the largest untapped waste category in industries;
- ❑ Water security **policies should promote investing and incentivizing the “reduce, reuse, recycle”** systems, and has to cover the holistic urban water cycle inclusive of water supply, treatment, reuse application;
- ❑ Requires **closed-loop system technological innovations** for water saving and reclaiming and reuse of wastewater;
- ❑ **Installation of a recycling and reuse infrastructure** (for example, construction of new wastewater treatment plant, dual pipe system for distributing recycled wastewater in houses, retrofitting of water saving appliances etc.) may also be promoted via these institutions;
- ❑ Expanding a range of **financial services opportunities** -both public funding and private financing; and
- ❑ Solutions for **smart wastewater management** must be socially and culturally appropriate.

3Rs in the context of water, offer effective tools for both demand and supply side management



Evolving 3R Trends and Development in Asia and the Pacific and their relevance in the post-2015 development context (9)

- ❑ Large *potential for resource efficiency and waste minimization* that exists in many economic sectors and the need for transformational policies
- ❑ The policy initiative was implemented through a process of stakeholder participation, *sound government policy* and establishment of incentives, and underpinned by mature technology such as waste to energy
- ❑ *Economic opportunities* exist in all sectors of the economy across many systems of provision and in many regional contexts. *Creating wealth from waste will become a new business opportunity.*

spasibo.....спасибо.....