

**Recommendations of the Singapore Forum on
the 3Rs in Achieving a Resource Efficient Society in Asia
(Annex to the Chair's Summary)**

- Preamble -

Resource efficiency aims to minimize: net resource inputs (raw materials, energy, water, etc.) to unit production and services; and pollution and waste at the same time. By improving resource efficiency, countries can tackle local environmental problems, address climate change, ensure energy security, preserve natural capital, improve economic competitiveness, and pursue social benefits. **The 3Rs** calls for a shift of focus from end-of-pipe solutions and disposal practices, and promotes waste minimization and cyclical use of materials in the economy. The 3Rs and resource efficiency, together would envisage a thriving society that exists within nature's resource constraints and its ability to assimilate waste – ultimately contributing to the promotion of green economy¹.

Recommendations of the Singapore Forum on the 3Rs in Achieving a Resource Efficient Society in Asia is a comprehensive set of recommendations, covering a wide range of sectors and issues relevant to the 3Rs and resource efficiency. It is based on the fundamental understanding that the 3Rs is not just about waste management, but is intrinsically linked with resource efficiency in a wide range of sectors such as agriculture, industry, and energy, among others, towards transitioning to a resource efficient and green economy.

It is also envisaged that the Recommendations of the Singapore Forum would provide a meaningful basis for advancing the 3Rs principles and technologies towards achieving a resource efficient society in Asia.

*- Recommendations of the Singapore Forum on
the 3Rs in Achieving a Resource Efficient Society in Asia -*

A. 3Rs in the Urban/Industrial Areas

1) 3Rs in municipal solid waste (MSW)

With the rapid growth rate of urban population and with the growing economy, the Asian region will be generating an immense amount of MSW in the coming decades. While the quantity of MSW is increasing, the composition of MSW is getting more diverse and complex due to presence of new

¹ While there is no unique, internationally agreed definition of the concept of “green economy,” the concept broadly carries the promise of a new economic growth paradigm that is friendly to earth's ecosystem and can also contribute to poverty alleviation (UN DESA, UNEP and UNCTAD, 2011). Green economy is “an economy that not only improves human well-being and lessens inequality but also reduces environmental risks and ecological scarcities,” i.e., an economy that is “low carbon, resource efficient and socially inclusive” (UNEP 2011).

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and emerging waste streams such as e-waste, chemical and hazardous waste. Wide scale open dumping of waste without being properly segregated causes a wide range of health and environmental problems adding a critical dimension to the urban management issues, such as water supply, sanitation, wastewater treatment, sewerage system, and drainage.

While the primary focus should be laid on waste prevention and minimization in the first place, MSW offers a significant source of material recycling, renewable energy, waste-to-energy and composting with involvement of low cost and affordable technologies and integrated systems. By utilizing waste as resource, MSW could bring various co-benefits (e.g., GHG reduction, waste-to-energy, improvement of the soil condition, employment creation by thriving recycling industry, etc.). Countries could consider the following.

- Introduce economic instruments that provide incentives to reduce the waste (e.g., volume-based collection fee systems, landfill taxes, and deposit-refund schemes).
- Utilize organic waste as a valuable resource with an objective to reduce landfill requirements; resource efficiency and energy recovery; and reduction of GHG emissions. To reap these co-benefits, promote segregation of MSW at source and minimization of household hazardous waste that will ensure safe handling, biodegradability and more effective use.
- Going green can be profitable through the expanding market of environmental goods and services. Government authorities should promote recycling markets which could reduce landfill areas and investment on waste processing plants.
- Set up institutional and financing mechanisms and required infrastructure for recycling specific materials, with the involvement of citizens, recycling industry, and end-users of the recycled products. Promote entrepreneurship to stimulate waste recycling as a business.
- When introducing recycling systems/technologies, assess economic and technical feasibilities, adaptability, as well as the market demand of a particular recycled material or product to be made from waste.
- As a third of the world population is affected by water scarcity, the critical importance of improving water availability and use, which is central to all the other dimensions of sustainable development, should not be ignored. Government authorities should put concerted efforts to develop waste policies linked to issues of freshwater resources.
- In harmony with international labour and health standards and required working conditions, develop policies, programmes, and regulatory measures to ensure decent work and livelihood security of workers in the informal sector by mainstreaming them into modernized, safe and environmentally sound waste management systems.
- Introduce, implement and enforce quality, occupational and environmental health and safety (EHS) standards for recycling processes and recycled goods to ensure safety and health of the workers as well as consumers/users. This will also help in establishing a market that is under regulation.

2) 3Rs in industrial sector

The industrial sector is a major contributor to the Asian economy and its contribution to GDP is growing. The region's industry sector is characterized with micro, small and medium enterprises, which typically lack required resources, environmentally friendly technologies, and skilled human resources. This results in consumption of large amounts of input raw material, energy and water, together with large amounts of waste and pollution per unit volume of production. In many Asian countries, current industrial policies and regulations do not adequately take into account resource efficiency as a measure to prevent and minimize waste and pollution, including GHG emission in the first place. The countries could consider the following.

- Develop policies and provide necessary support and incentives that encourage the private sector to implement resource efficiency measures. Such efforts will be advantageous for the industries, including small and medium enterprises (SMEs), as it will result in cost savings and better international competitiveness. Through the coordinated effort of the Ministry of Environment, the Ministry of Industry, and other related ministries, mainstream resource efficiency into the national industrial policies and programmes, set specific targets and create legal frameworks.
- Governments should promote recycling of waste from one industry as a resource for another (industrial symbiosis), through, for example, supporting the establishment of eco-industrial parks, science parks, and research/university networks. More R&D, knowledge sharing, including technology transfer among various actors is needed to enhance learning and knowledge transfer on 3R related technologies.
- Develop local capacity, including capacity of employers' organizations and trade unions, to implement energy and resource efficient technologies in industry sector, including capacity for conducting technology assessments/evaluations of appropriate technologies as well as the capacity for practicing such technologies.
- Specific curricula should be developed for universities and business schools to provide the next generation of practitioners with the necessary technical skills and future business leaders and policymakers, in-depth knowledge to help foster green industry.
- Encourage market development for eco-products through various incentives that ultimately promote sustainable production and consumption.
- Encourage industries to not only address their own environmental practices but also that of their associated suppliers and vendors to ensure that the environmental standards they have adopted internally are consistently maintained/followed by their suppliers, thus promoting the greening of the supply chain.
- Encourage the establishment of industry code of practices that provide broad guidelines to firms for a management approach that addresses issues of resource efficiency, thereby environmental sustainability, as part of core business decision making. Implement awareness campaigns to sensitize industries and private sector on corporate social responsibility (CSR).
- Develop proper classification and inventory of hazardous waste as a prerequisite towards sound management of hazardous waste.

3) New and emerging wastes

New and emerging waste streams, such as e-waste and plastics in the marine environment require special attention, and must be addressed through appropriate programmes, multi-stakeholder partnerships and environmentally sound technologies to promote material and energy recovery. There is a growing concern on plastic waste, which is not biodegradable, accumulating in coastal and marine environment, causing threats to the marine species and ecosystem. The countries could consider the following.

- Consider addressing plastic and hazardous waste issues as part of integrated coastal zone management (ICZM), through coordinated efforts among local government and administrative authorities, coastal zone management authorities, and tourism authorities.

Large amount of e-waste generated in the world ends up in a few numbers of developing countries for the purpose of reuse, refurbishment, recycling, and recovery of precious materials. E-waste has become an important health and environmental issue, as recycling electronic goods involves exposure to dangerous heavy metals such as lead, mercury, cadmium etc. which can be toxic to human and ecosystems. The countries can consider the following.

- Establish proper institutional infrastructures for collection, storage, transportation, recovery, treatment and disposal of e-waste at regional and national levels. Such infrastructure should be integrated into existing waste collection schemes. Develop public-private-community partnerships to encourage the establishment of formal e-waste recycling and disposal enterprises.
- Establish appropriate regulatory procedures to control illegal exports of e-waste and to ensure their environmentally sound management. In this regard, proper testing of used or end-of-life electronics and electrical equipment prior to export should be encouraged to declare the presence of hazardous components as well as the functionality of the equipment.
- Introduce awareness raising programmes and activities at all levels on issues related to health and safety aspects of e-waste in order to encourage better management practices.
- Establish formal standards, certification systems and licensing procedures for recycling and disposal enterprises to ensure safety and environmentally sound processing of e-waste.
- Implement 'extended producer responsibility' (EPR) mandating producers, importers and retailers with the cost of collecting, recycling and disposal of e-waste. Thorough investigation into the problems and challenges of implementing EPR should be conducted to overcome any obstacles.

B. 3Rs in the Rural Areas

4) 3Rs in the agricultural sector

Though agriculture is the key economic sector in many Asian countries and utilizes around half of the land area, biomass waste generated in the agriculture sector remains largely underutilized. Given the poverty, food security, and issues like heavy dependence on carbon fuels in many Asian countries, the efficient utilization of agriculture as well as livestock waste can provide a number of opportunities, and socioeconomic and environmental benefits. The countries could consider the following.

- Improve infrastructure to reduce losses in the entire food supply chain (production, post harvesting and storage, processing and packaging, distribution), thereby increasing the quantity and improving the quality of products that reach the consumers.
- Promote efficient use of biomass and reuse of agriculture biomass waste involving minimal or no processing. For example, rice husks can be applied directly for soil mulching instead of burning, to achieve a number of co-benefits (reduced GHG emission, food security, low labour input and investment).
- Promote recycling of agriculture biomass waste and livestock waste. Where appropriate, waste-to-energy technologies, including anaerobic fermentation, should also be explored through partnerships at various scales, which will not only contribute to energy security but also to sustainable livelihoods in rural areas.
- Promote, where appropriate and feasible, the production of high-value products from biomass. The use of other organic waste together with biomass could also be promoted in order to produce value-added products, such as animal feed.
- Assess economic and technical feasibilities, adaptability, as well as the market demand of a particular product to be made from biomass and livestock waste (e.g., compost).
- Promote agricultural policies in harmony with the 3R principles. Through the coordinated effort of the Ministry of Environment, the Ministry of Agriculture, Ministry of Energy, and other related ministries, develop national waste management strategies, policies and programmes with effective link to sustainable agriculture (including livestock and fisheries), food security, and rural employment generation.

C. Cross-cutting Issues

5) Partnerships for moving towards zero waste

Moving towards zero waste is inherently a multi-stakeholder process, which calls for partnerships within and between communities, businesses, industries, and all levels of government. With the diversification of waste streams as well as the growing presence of chemical and hazardous and toxic elements in the general waste stream, the complexity and daunting nature of waste

management challenges therefore require a more extensive collaboration and partnerships among those stakeholders. 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.). The countries could consider the following.

- Promote partnerships as the basis for sustainable waste management and as an alternative in which governments and private companies assume co-responsibility and co-ownership for the delivery of solid waste management services.
- Governments should develop appropriate policy frameworks and conducive climate for fostering partnership that provide win-win solutions for public utilities and the private sector. Such partnerships could lead to savings in municipal budgets, while the private sector may use this opportunity to convert waste into environmentally friendly products and energy.
- Use international partnerships and mechanisms, such as the International Partnership for Expanding Waste Management Services of Local Authorities (IPLA), effectively, as means to share knowledge, technologies, best practices and models in the area of 3Rs, integrated solid waste management, and resource efficiency.

6) Enhance knowledge base(KB) & research network

Governments can play an instrumental role in linking the scientific community and the private sector to encourage collaborative relationships, interactive learning, information exchange, and coordination in the area of the 3Rs and resource efficiency, which will contribute to stimulating innovation and transfer of knowledge and technologies to achieve international competitiveness. By supporting and strengthening such networks, Governments can, in turn, receive suggestions and input from these key stakeholders for developing and improving national policies and programmes in the area of the 3Rs/resource efficiency. Local and national networks can be further strengthened by effectively linking them with existing international networks related to the 3Rs/resource efficiency. The countries could consider the following.

- Facilitate an effective and dynamic linkage among government, private sector, and scientific community to enhance national and local knowledge base and research network on the 3Rs, through the provision of, for example, support for joint collaborative research and development, conference and seminars, introduction of policies to encourage mobility of researchers between the public and private sector, etc.
- Set up mechanisms whereby government can receive constructive feedback from citizens, private sector, and scientific community for developing and improving policies to support 3R technology development, transfer, adaptation, and implementation.
- Support and strengthen local and national networks by effectively linking them with existing international networks and forming regional networks to leverage the wealth of expertise available.

7) Public awareness

Sustainable consumption can be a powerful driver to encourage sustainable production by industries. Public awareness is therefore critically important, to improve the citizens' understanding on the beneficial aspects of the 3Rs leading to their active participation in the 3R activities. On the other hand, consumer behaviours are largely affected by the waste management system. The countries could consider the following.

- In collaboration with NGOs and local governments, improve public awareness on the beneficial aspect (health, environment and employment) of 3Rs, and the potential negative impacts of improper waste management on global climate and local environment.
- Introduce the concepts of the 3Rs, sustainable production and consumption, and resource efficiency as part of environmental education programmes at all levels, including primary, secondary and higher education.
- To support the behavioural change of the citizens, promote 3R actions by, for example, introducing economic instruments that encourage waste minimization, and introducing/improving recycling systems for segregated waste.

8) Institutional arrangement

The 3Rs is a concept that goes beyond conventional waste management; it is a holistic approach for resource management and resource efficiency in production, distribution and service. The potential benefits of the 3Rs could be reaped by mainstreaming and integrating the 3Rs into the policies and programmes of relevant ministries and agencies. In most cases, the 3Rs are often being dealt with by one single or focal ministry (e.g., the Ministry of the Environment, the Ministry of Local Government or Ministry of Urban Development). The countries could consider the following.

- Integrate the 3R concept in relevant policies and programmes of key ministries and agencies such as the Ministry of Agriculture (including Forestry and Fisheries), Ministry of Industry, Ministry of Energy, Ministry of Transport, Ministry of Finance, etc., towards transitioning to resource efficient economy.
- Strengthen inter-ministerial coordination to avoid inconsistencies among sectoral policies in promoting the 3Rs and resource efficiency.
- Promote green procurement across all line ministries, thereby creating and expanding markets for environmentally friendly goods and products.
- Work towards a gradual phase out of subsidies that favour unsustainable use of resources and energy, in order to free the funds of the national budget which can in turn be used in support of efforts to improve resource/energy efficiency and in implementing the 3Rs.
- Integrate the 3Rs into new economic development models such as circular economy, by promoting indicators of resource efficiency.