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SUGGESTED CORE SET OF 3R POLICY INDICATORS

(Background Paper for Plenary Session 1 of the Provisional Programme)

Draft as of 12 Feb 2014

Background Paper

Suggested Core Set of 3R Policy Indicators

The 5th Regional 3R Forum in Asia and the Pacific

Surabaya

Draft as of February 12, 2014

Asia Resource Circulation Policy Research Group

Coordinated by

Institute for Global Environmental Strategies, Japan

Authors:

Agamuthu Pariatamby, University of Malaya

Yasuhiko Hotta, Institute for Global Environmental Strategies

1. Background

In developing Asia, policies and legislations to promote *reduce, reuse and recycling* (3Rs) of waste have gained much traction over the last 10 years. Henceforth, the focus of governmental efforts on the 3Rs should be to improve policy implementation and manage policy progress. To these ends it is essential to set clear policy targets and review them regularly, which necessitates a set of policy and performance indicators for monitoring their efficacy.

Regional 3R Forum in Asia and the Pacific, an international forum to discuss and confirm significance of 3R policy implementation towards resource efficient Asia, adopted Ha Noi 3R declaration at its 4th meeting held in Ha Noi from March 18-20, 2013. It agreed on a set of priority goals for thematic areas related to waste management and the 3Rs and proposed to list sample indicators which can be useful in monitoring these goals.

To further elaborate these sample indicators, the delegates to the 4th Regional 3R forum in Asia and the Pacific requested the working group of 3R policy indicator coordinated by Asia Resource Circulation Policy Research Group to come up with a "core set of indicators" which can be useful for reporting and monitoring of 3R policy implementation in the region in the future.

This background paper was prepared by experts of the Asia Resource Circulation Policy Research Group to showcase a choice of core set of policy and performance indicators on the 3Rs and resource efficiency with explaining reason, challenges and practical advantages for using these indicators.

2. Asia Resource Circulation Policy Research Group and 3R Indicator Working Group and Progress of the work

This is a collaborative research group focused on policy research on 3R promotion in Asia. The group is contributed to by researchers from Institute for Global Environmental Strategies (IGES), Institute of Developing Economies – Japan External Trade Organization (IDE-JETRO), National Institute for Environmental Studies (NIES), University of Malaya(UM), Asia Institute of Technology (AIT), Institut Teknologi

Bandung(ITB), Tokyo Institute of Technology (TOKYO TECH) and United Nations Centre for Regional Development (UNCRD).

In 2012, the group formed a working group on performance indicators on the 3Rs and resource efficiency and closely examined the goals proposed in the Draft Ha Noi 3R Declaration and sample list of indicators proposed by UNCRD.

The group believes that, although a set of data for evaluating 3R policy performance is important, 3R policy goals, targets and indicators should be flexibly set by the users (central government, local government, or sometimes private sector for environmental reporting systems) of such goals and indicators, owing to national differences in policy priorities. Nevertheless, in the five priority areas proposed in the draft, namely "3Rs in municipal solid waste", "3Rs in industrial sector (including SMEs)", "3R Goals in Rural Areas", "3R Goals for New and Emerging Wastes", and "3R Goals for Cross-cutting Issues", the group decided that factsheets of sample and representative indicators would be helpful. Such factsheets provide an overview, definition, policy goals to be monitored by the indicator, merits of implementation, similar or supporting indicators, existing good practices, and reference documents or existing guidelines related to the policy areas and indicators. In March 2013, the group published eight factsheets for 3R policy performance indicators at the 4th Regional 3R Forum in Asia and the Pacific.

The delegates to the 4th Regional 3R forum in Asia and the Pacific requested the working group of 3R policy indicator of Regional 3R Forum to come up with a "core set of indicators" which can be useful for reporting and monitoring of 3R policy implementation in the region in the future.

Then, in December 2013 and January 2014, the group gathered again and discussed about a core set of indicators which would be useful for reporting and monitoring of 3R policy implementation in the region in the future. The working group reviewed the sample indicators with factsheets and come up with possible core set of 3R policy indicators to start working with Regional 3R Forum in Asia and the Pacific.

In the following section, we will review possible core set of 3R policy indicators by suggesting reasons behind for selecting these possible core set.

3. Possible Core Set of 3R Policy Indicators for Regional 3R Forum in Asia and the Pacific

The working group reviewed sample 3R policy indicators presented by the group at the 4th Regional 3R Forum in Asia and the Pacific, with reason for choosing as a core set of indicator as well as practical advantages of using this indicator. In relation to goals highlighted by Ha Noi 3R Declaration, we recommend the following 9 issues to be monitored with indicators. The working group does not evaluate priorities among different goals but issues to be monitored with indicators. When more than two indicators are suggested, the working group tried to show the priority by stating primary, secondary and optional. Also, we have discussed about the challenges associated with developing these indicators.

Along with this background paper, the group has developed and published a discussion paper titled *3R Indicators Factsheets ver. 1* which containing information on 11 different 3R-related indicators. The discussion paper contains most of hands-on and more detailed information related to the suggested indicators below.

Table 1: List of Suggested core set of Indicators

Indicator	Overview	Related Goals of Ha Noi 3R Declaration
Indicators for 3Rs in municipal solid waste		
1. *Total MSW Generated and Disposed and MSW Generation Per Capita (by weight)(Primary Indicator)*	MSW generation is a fundamental indicator since municipalities usually prepare annual budgets on MSW management based on annual MSW generation (collection). The use of total MSW generation and MSW generation per capita indicators would enhance governmental planning and decision-making capacity in MSW management.	Goal 1: Significant reduction in the quantity of municipal solid waste generated.
2. *Overall Recycling Rate and Target (%) and Recycling Rate of Individual*	The overall recycling rate and target attempts to monitor progress in recycling and resource saving activities. Recycling rate and target of MSW can show how recycling activities can contribute to reduce waste going to final disposal sites.	Goal 3: Significant increase in recycling rate of recyclables

Components of MSW (Primary Indicator)		
Indicators for 3Rs in Industrial Sector		
3. *Amount of Hazardous Waste Generated and Disposed in Environmentally Sound Manner (Primary Indicator)*	For proper management of hazardous waste a country need to standardize the hazardous waste classification and to establish a comprehensive inventory of hazardous waste data. Proper management of hazardous waste can ensure legal recycling activities. Thus, this indicator can indicate a country's capacity in hazardous waste management.	Goal 9: Develop proper classification and inventory of hazardous waste
4. *Indicators based on macro-level material flows (Secondary Indicator)*	Material Flow Analysis/Accounting (MFA) is one of the analytical tools that make it possible to monitor countries' resource consumption trend and efficiency in resource use at the macro level. This indicator can show image of industrial structure and material balance of the country. It can show material footprint of the country.	Goal 5: Encourage the private sector to increase resource efficiency and productivity Goal 17: Improve resource efficiency and resource productivity by greening jobs nation-wide in all economic and development sectors.
Indicators for 3Rs in Rural Areas		
5. *Amount of agricultural biomass used (Primary Indicator)*	The indicator can help to identify level of utilization of agricultural biomass and may help to identify proper intervention point for promotion of reuse and recycling of agricultural biomass to maximize use	Goal 11: Promote full scale use of agricultural biomass waste and livestock waste through reuse and/or recycle measures
Indicators for 3Rs of New and Emerging Wastes		
6. *Marine & coastal plastic waste quantity (Primary)*	Quantification of plastic waste will give a correlation on the pollution intensity in marine environment. At the same time, there is a necessity for integrated action among countries to curb cross-border	Goal 12: Strengthen regional, national, and local efforts to address the issue of waste, in particular plastics in the marine and

		migration of wastes.	coastal environment.
7.	*Amount of E-waste Generation, Disposal and Recycling. Existence of policies and guidelines for E-waste management (Primary)*	With this indicator, health and safety of stakeholders engaged in e-waste recycling could be monitored. Recycling of e-waste could be regulated to avoid illegal and environmentally unsound activities.	Goal 13: Ensure environmentally sound management of e-waste
8.	*Existence of policies, guidelines, and regulations based on the principle of extended producer responsibility (EPR)*	This indicator can be used to monitor to what extent EPR is reflected in national recycling policies in encouraging manufacturers, importers and retailers to share the financial and physical responsibilities of collecting, recycling, and disposal of recyclable wastes. Sharing information on good practices and lessons on policy implementation would constitute a useful tool to promote effective policy implementation.	Goal 15 Progressive implementation of EPR
9.	*GHG Emission from waste sector*	In general, the discussion on GHG emission reduction from solid waste management are avoided landfilling of organic waste, maximized used of organic waste, captured landfill gas for energy use, and avoided burning of plastic waste. Indicator of implementation of the 3Rs for climate co-benefits would be an important step in sustainable waste management since this initiative can directly contribute to improved waste management and targeting GHG reductions.	Goal 18: Maximize co-benefits from waste management technologies for local air, water, oceans and soil pollution and global climate change

3-I. Indicator for 3Rs in municipal solid waste

1. **Total MSW Generated and Disposed and MSW Generation Per Capita (by weight)(Primary Indicator)**

   Overview: MSW (municipal solid waste) generation and MSW generation per capita are indicators of environmental pressures humankind exerts on the environment (OECD, 2003), and by extension, environmental pressures caused by the use of natural resources. Proper disposal of MSW represents response in place to such pressure. Currently, 340 million tons of MSW is generated in Southeast Asia every year, 26% of the world total, and this is expected to rise to about 888 million tons by 2025 (World Bank, 2012). MSW generation is a fundamental indicator since municipalities usually prepare annual budgets on MSW management based on annual MSW generation (collection). Thus, we can assume reliable data exists for MSW generation. This can reflects the real situation on physical pressures to municipal solid waste management.

   Methodology to estimate total MSW generated and disposed of is described in Factsheet of 3R Policy Indicator titled: *Total MSW generation and MSW generation per capita.* Definition of MSW in a country should be clearly stated.

   Interpretation of the results such as increasing volume of MSW is important. It may mean wider coverage of waste management collection or increase in population.

   Practical advantages of using this indicator: The use of total MSW generation and MSW generation per capita indicators would enhance governmental planning and decision-making capacity in MSW management. This indicator can visualize trend in MSW management. Reliable figures for total MSW generation would also raise the precision of the national inventory on waste sector greenhouse gas emissions.

   Goals of Ha Noi 3R Declaration related to this indicator
   Goal 1: Significant reduction in the quantity of municipal solid waste generated.
   Goal 25: Protect public health and ecosystems, including freshwater and marine resources, by eliminating illegal activities…and controlling open burning
   Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

   Related Factsheets: Kawai, K. and Tasaki, T. (2013), Total MSW generation and MSW

generation per capita, in *3R Indicators Factsheets ver. 1*. Available at:
http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

2. ***Overall Recycling Rate and Target (%) and Recycling Rate of Individual Components of MSW (Primary Indicator)***

Overview: The overall recycling rate and target attempts to monitor progress in recycling and resource saving activities. The Recycling Rate and Target is often presented as a proportional value (%) and reflects the proportion of materials recycled or recovered from waste or the rate of inclusion of recycled materials in certain products. High figures usually imply progress in recycling activities. Recycling rate of MSW can be calculated as: recycling rate = total MSW recycled/ total MSW generation. If we include recycling activities, such as informal recycling, conducted for other than MSW collected by municipalities, then, recycling rate = {total MSW recycled + total amount of recyclable materials from household (recyclables such as cans, papers, bottles collected or bought by junk dealers)} / {total MSW generation + total amount of recyclable materials from household}*100.

Caution must be taken if inter-country comparisons are made solely based on one definition or interpretation of recycling, since policy priorities vary. Thus, information on how a government account and calculate the recycling rate is essential information.

Practical advantages of using this indicator: Recycling rate is one of the representative indicators of 3R policy performance, thus many governments in Asia have incorporated it into national 3R targets. Recycling rate and target of MSW can show how recycling activities can contribute to reduce waste going to final disposal sites. If activities of informal sector are involved in definition of recycling, recycling rate may also be able to show contribution of informal recycling activities to reduce burden of MSW management to local governments.

Supporting indicators
- Policy/ Regulations on recycling including sectorial regulations, if any. (secondary indicator)
- Number of stakeholders (licensed actors engaging in waste management services) and informal sector involved (optional indicator)

Goals of Ha Noi 3R Declaration related to this indicator

Goal 3: Significant increase in recycling rate of recyclables

Goal 1: Significant reduction in the quantity of municipal solid waste generated

Goal 2: Full-scale utilization of the organic component of municipal waste

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Related Factsheets: Hotta, Y., Kojima, M., and Visvanathan, C. (2013), Recycling Rate and Target, in *3R Indicators Factsheets ver. 1*. Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

3-II. Indicators for 3Rs in Industrial Sectors

3. *Amount of Hazardous Waste Generated and Disposed in Environmentally Sound Manner (Primary Indicator)*

Overview:

If hazardous waste is dumped or recycled without environmentally sound technology, serious environmental problems and health hazards may result. Policy goals on hazardous waste are to minimise environmental and health risks due to hazardous substances contained in hazardous waste and to utilise hazardous waste as resources via environmentally sound technologies.

In most Asian countries that have ratified the Basel Convention, national legislation follows the

convention's definition, i.e., it is defined as hazardous waste if it is within the category of wastes listed in Annex I of the Convention and exhibits one of the hazardous characteristics contained in Annex III such as explosive, flammable, toxic or corrosive. Annex VIII also lists up typical hazardous wastes. The Basel Convention allows parties to formulate individual definitions but requires such parties to report their definitions to the secretariat, which then disseminates such to the other parties.

Amounts hazardous waste generation and disposal is to assess a country's hazardous waste treatment and disposal capacity, imports and exports of hazardous waste should be taken into account. Many Asian countries have ratified the Basel Convention and compile the required data for submission to the convention secretariat every year. Such data covers information on hazardous waste regulations, existing facilities, generation and import and export.

Practical advantages of using this indicator:

For proper management of hazardous waste a country need to standardize the hazardous waste classification and to establish a comprehensive inventory of hazardous waste data. Proper management of hazardous waste can ensure legal recycling activities. Thus, this indicator can indicate a country's capacity in hazardous waste management.

Supporting indicators:
- **Existence of regulations controlling hazardous waste (Primary Indicator)**
- **Rate of Hazardous Waste Recycled (Secondary Indicator)**

Goals of Ha Noi 3R Declaration related to this indicator

Goal 9: Develop proper classification and inventory of hazardous waste

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Related Factsheets: Kojima, M., and P. Agamuthu (2013), Hazardous Waste Management, in *3R Indicators Factsheets ver. 1*. Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

4. *Indicators based on material flow analysis/accounting and resource productivity*

Overview:

Material Flow Analysis/Accounting (MFA) is one of the analytical tools that make it possible to monitor countries' resource consumption trend and efficiency in resource use at the macro level. It uses already available production, consumption and trade data in combination with environmental statistics (OECD 2008). In principle, MFA can show not only types and amount of natural resources flowing into the economy, but also reveals what happens to materials as they move inside and out of the economy, and how they relates to resource productivity as well as environmental burden (OECD 2008).

Economy-wide MFA can indicate direct and quantitative evaluation of resource consumption and resource efficiency of a country. For example, resource efficiency of an economy can calculated: Resource Productivity = GDP/{Amount of natural resources extracted domestically + Amount of imports}. For developing economies, more direct evaluation of size of material economy based on population indicator such as DMC/capita may be useful. MFA-exercise is quite data-intensive. Thus, the purpose and benefits of macro-level MFA should be carefully considered. Also, it is necessary to take step-wise approach to establish the information basis.

For most of countries in Asia-Pacific region, CSIRO and UNEP Asia-Pacific Material Flows online database provides estimates of national-total domestic extraction, domestic material consumption (amount of materials consumed by domestic economic activities of a country), and physical trade balance (amount of import – amount of export) with indicators related to resource efficiency (GDP per DMC etc.) as well as four and eleven different categories of material-related data for extraction, DMC, and PTB between 1970-2008.

http://www.cse.csiro.au/forms/form-mf-start.aspx

Practical advantages of using this indicator: This indicator can show image of industrial structure and material balance of the country. It can show material footprint of the country.

Goals of Ha Noi 3R Declaration related to this indicator

Goal 5: Encourage the private sector to increase resource efficiency and productivity

Goal 17: Improve resource efficiency and resource productivity by greening jobs nation-wide in all economic and development sectors.

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Related Factsheets: Hotta, Y. and Visvanathan, C. (2014), Indicators based on Material Flow Analysis/Accounting (MFA) and Resource Productivity in *3R Indicators Factsheets ver. 1*. Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

3-III. Indicators for 3Rs in Rural Areas

5. *Amount of agricultural biomass use (Primary Indicator)*

   Overview:

   Agricultural biomass residue and livestock waste are readily found in rural areas, with manure left exposed and biomass burnt in the open. These materials can be used to improve farm productivity—specifically, produce food and energy, generate incomes and reduce environmental impacts. Unfortunately, these residues and waste are not being fully utilised.

   The practice of burning agricultural biomass residue to reduce the risk of uncontrolled fires and prevent insects and pathogen outbreaks is widespread. Promoting full-scale use of agricultural biomass residue can contribute significantly to successful implementation of policies geared towards ending open burning, and also reduce the risk of health and environmental impacts, and more importantly, life and property loss due to uncontrolled fires.

   In general, estimation of on-farm use of agricultural biomass residue and livestock waste is challenging, especially where only a portion of the residue and waste is utilised and farmers

do not keep records. In this case, farm residue and waste generation can be estimated based on area and productivity of crops or number of livestock. The amount of agricultural biomass residue and livestock waste used can be measured by scale at the plant or site level. Measurement of the amount of agricultural biomass residue and livestock waste used by entrepreneurs can be monitored via keeping records of residue and waste inputs to facilities.

Practical advantages of using this indicator:

The indicator can help to identify amount of unused agricultural biomass and may help to identify proper intervention point for promotion of reuse and recycling of agricultural biomass to maximise use This would bring about a number of co-benefits, including GHG emission reduction, energy security, poverty reduction, sustainable livelihoods in rural areas, investment mobilisation, regional economic gains and public health improvements. With this indicator, one can calculate GHG emission reduction potential from biomass utilization.

Supporting indicators:

● Rate and types of biomass used (Secondary Indicator)

Goals of Ha Noi 3R Declaration related to this indicator

Goal 11: Promote full scale use of agricultural biomass waste and livestock waste through reuse and/or recycle measures

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Related Factsheets:

Sang-Arun, J. and Menikpura, N. (2013), Promoting full-scale use of agricultural biomass residue and livestock waste in *3R Indicators Factsheets ver. 1*.   Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

3-IV. Indicators for 3Rs of New and Emerging Wastes

6. ***Marine & coastal plastic waste quantity (Primary)***

   Overview: Marine debris which is mainly of plastic component has been reported to cause many problems in the coastal environment. International Coastal Cleanup carried out around the globe, on September 21, 2012 had collected 4,600 tonnes of marine debris of which more than 60% are plastic-based. Among the most commonly found plastic debris are food wrappers and containers, plastic bottles and bags, disposables cutlery (spoon, knife, forks etc.) and caps and lids. Its light weight nature caused its dispersion throughout the globe, transported from continent to another by the waves while its non-degradable character made it persistent in the environment without undergoing any biological alteration. Thus, these plastics debris has a very high tendency to be converted into smaller and minute size via physical degradation. In its micro sizes of less than 5 micrometre, it is normally mistaken as plankton that enables it to enter into the aquatic food chain. Other than that, intact plastic debris too particularly plastic bags are commonly ingested by sea animals namely seabirds and turtles mistaking it as sea grass. This will result in death to the infected animals. Plastic debris including fishing lines, nets, six-packs ringlets and many more can also act as death traps via entanglement. This will cause serious implications to the animals as food scavenging and predator escaping movement would become very constrained. Six of seven sea turtle species have been reported to be threatened or endangered by the impacts from this anthropogenic marine debris. Thus, it is crucial that significant actions are implemented at the global scale to curb these threatening situations. The most effective solution is through the implementation of good waste management practices including 3R. Recycling particularly may diminish this problem as these materials namely plastic would be collected through a proper system, thus preventing it from ending up in the marine environment.

   Practical advantages of using this indicator:
   Cleaner beaches, resource conservation for tourism, conserving biodiversity, identify potential sources of wastes and call for collaboration with source countries

   Supporting indicators:
   - National policies on marine and coastal environment
   - Cross-border pollution (Secondary)

Goals of Ha Noi 3R Declaration related to this indicator

Goal 12: Strengthen regional, national, and local efforts to address the issue of waste, in particular plastics in the marine and coastal environment.

Goal 13: Protect public health and ecosystems, including freshwater and marine resources by eliminating illegal activities..

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Goal 30: Pay special attention to issues and challenges faced by developing countries including SIDS

Related Factsheets: to be developed soon.

7. *Amount of E-waste Generation, Disposal and Recycling. Existence of policies and guidelines for E-waste management*

Overview:

Global sales of electrical and electronic equipment (EEE) have been rising significantly over the last few years. The rapid uptake of information technology as well as electronic home appliances around the world, coupled with frequent design and technology updates in the EEE manufacturing sector is causing the early obsolescence of many of these EEEs, resulting in a rise in electrical and electronic waste (e-waste). The annual amount of global waste generated is estimated at 20–50 million tonnes, most of which derives from Asia. There are thus growing concerns that most of the e-waste generated in developed countries ends up in economically-challenged developing countries that lack the infrastructure for dealing with it properly.

First of all, to estimate amount of e-waste generation, definition of e-waste in each country should be specified. For countries with policy for regulation of e-waste, it may be easier to estimate amount of e-waste generation regulated under such policy. Thus, existence of policies and guidance for e-waste management would be more practical indicator for some countries. In addition, it is a challenge to estimate e-waste going to informal sector for recycling and reuse purpose.

With this indicator, health and safety of stakeholders could be monitored. Recycling of e-waste could be regulated to avoid illegal and environmentally unsound activities.

Practical advantages of using this indicator:

Proper management of e-waste can reduce environmental and health impact associated with improper recycling activities and facilitate recovery of some precious materials contained in these products. The indicator would help countries to facilitate cross-boundary collaboration to prevent illegal recycling and promote environmentally sound management (ESM) of e-waste.

Supporting indicators:

● Number of legally licensed e-waste recyclers (secondary)

Goals of Ha Noi 3R Declaration related to this indicator

Goal 13: Ensure environmentally sound management of e-waste

Goal 27: Promote data collection, compilation and sharing, public announcement and application of statistics on waste and the 3Rs

Related Factsheets: Herat, S. (2013), Standards for Collection, Storage, Transport, Recovery, Treatment and Disposal to Ensure Environmentally Sound management of E-waste in *3R Indicators Factsheets ver. 1*.   Available at: http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

8. *Existence of policies, guidelines, and regulations based on the principle of extended producer responsibility (EPR)*

   Overview:

   The EPR indicator refers to the existence or strengthening of policies on recycling and waste management targeting specific end-of-life products or waste streams, and involves producers in recycling or waste management activities. This kind of qualitative indicator, which suggests the existence of proper policy and its implementation, is also useful information, especially when shared between countries. The element of EPR that obliges produces to provide information on environmental features and composition of their products to consumers and recyclers is also important. Many countries in the region, including Japan, Republic of Korea, PR China, and India, have introduced EPR-based legislation. Some countries are considering EPR-based legislation.

   Practical advantages of using this indicator:

   This indicator can be used to monitor to what extent EPR is reflected in national recycling policies in encouraging manufacturers, importers and retailers to share the financial and physical responsibilities of collecting, recycling, and disposal of recyclable wastes. Sharing information on good practices, challenges faced by governments and lessons on policy implementation would constitute a useful tool to promote effective policy implementation.

   Supporting indicator:
   - List of products and/or product group targeted by recycling legislations nationally.(Primary)
   - Collection rate and recycling rate of targeted used products under the specific recycling legislation. (Secondary)

Goals of Ha Noi 3R Declaration related to this indicator:

Goal 15 Progressive implementation of EPR

Goal 20 Strengthen multi-stakeholder partnerships among governments, civil society and the private sector

Related Factsheets: Hotta, Y., Tasaki, T., and Kojima, M. (2013), Recycling Legislation based on the Concept of Extended Producer Responsibility in *3R Indicators Factsheets ver. 1*. Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

3-IV. 3R Goals for Cross-cutting Issues

9. GHG Emission from waste sector

Overview:

Greenhouse gas (GHG) from the waste sector is estimated to account for almost 5% of the total emission, and it is predicted to increase due to increasing waste generation and upgrading of final disposal site from open dumping to sanitary landfill without gas recovery system in developing Asian countries.

The amounts of GHG emissions from municipal solid waste can be minimized through the 3Rs (reduce, reuse and recycle). However, it is very difficult to quantify the contribution of the reduce and the reuse. Therefore, generally the discussion on GHG emission reduction from solid waste management are avoided landfilling of organic waste, maximized used of organic waste (e.g. as animal feed, soil amendment, biogas for alternative energy), captured landfill gas for energy use, and avoided burning of plastic waste, etc. Good examples of local actions on mitigating climate change from the solid waste management can be seen in most of the countries but mainly on a voluntary basis. Furthermore, many of those cities do not have a clear understanding about their contribution of improved waste management on this issue.

The indicator "co-benefits of the 3Rs (reduce, reuse, recycle) of municipal solid waste on climate change mitigation" aims to maximize use of resources which can significantly contribute not only to reduce GHG emissions but also to receive other co-benefits such as creating green jobs, improving social well-being, reducing health risks, enhancing economic development, saving landfill space, minimizing environmental loads from landfill of fresh waste or incineration, etc.

Practical advantages of using this indicator:

This indicator can be used as a tool to motivate national and local movement on improving waste management aligned with climate change mitigation. It can attract increasingly available climate-related funding for improved waste management. However, capacity building is required for both national and local governments on estimation and reporting of GHG and climate benefit.

Supporting indicator:
- Amount of annual GHG emission reduction from municipal solid waste as compared to the base year (need to be discussed) – based on direct emission reduction (secondary)
- Amount of annual GHG emission reduction from municipal solid waste compare to base year (need to be discussed) – based on a lifecycle perspective (secondary)

Related Factsheets: Sang-Arun, J., Menikpura, N., and Agamuthu, P.   (2013), Co-benefits of the 3Rs (reduce, reuse and recycle) of municipal solid waste on climate change mitigation in *3R Indicators Factsheets ver. 1*.   Available at:

http://pub.iges.or.jp/modules/envirolib/taglist.php?tid=108

10. Other Indicators:

In addition to possible core set of indicators, the working group has developed factsheets on the following issues. The factsheets contains overview of the indicator, simple explanation of methodology to develop those indicators and list of references and guidance documents useful for development of such indicators.

- Measuring Waste Reduction, Reuse and Recycling through Industrial Symbiosis
- Measuring Public Awareness and Actions for the 3Rs
- Structure, content and implementation of green procurement

In addition to related factsheets to the suggested core set of indicators, factsheets for the above indicators are available as IGES Discussion Paper *3R Indicators Factsheets ver. 1*.

4. Conclusion

Ideally, 3R policy indicators should cover the entire cycle of recyclable materials as well as recycling markets and technologies from generation, collection, transportation, storage, treatment and market for recyclables. Also, considering linkages with resource efficiency and the green economy, possible targets and indicators related to the 3Rs

should not be limited to downstream issues, but rather issues related to resource productivity and efficiency or decoupling.

However, for this proposal of possible core set of indicators, we took more practical approach to identify basic indicators to identify trends in waste management and the 3Rs in Asia and the Pacific region. We believe these indicators are related to some of priorities or well-discussed issues in the region. Of course, there are many challenges related to data availability or difference in definition of terminology among countries to really able to compare among countries. Nevertheless, we believe that for these indicators there are available data in many of countries or target or policy has been set as a priority in each country. These possible indicators are not full set of indicators to be implemented in full-fledge manner from the starting point but rather we recommend step-wise approach from each country's priority area.

The use of the indicators can not only contribute to particular issue areas but also provide reliable data to support linkages on issue nexus, such as waste issues and climate issues. For example, reliable total MSW generation can contribute to improving the national inventory on greenhouse gas emissions from the waste sector.

An increasing number of countries are introducing 3R-lreated legislation and policies, thus many governments in Asia have started to use indicators and targets related to 3R promotion, such as the recycling rate. However, care needs to be taken in defining these targets and indicators. Comparisons of the same or similar indicators among countries requires caution due to the differences in definition based on differing policy priorities.

Promotion of the 3Rs also requires a market for green products and recycled products and materials. Sharing information on related policies and economic incentives would enhance and expand economic incentives for promoting 3R-related goods and services in the region.

Efforts to develop a harmonised information system related to the 3Rs would be a useful step in promoting resource efficient society in Asia, as would concerted efforts towards sustainable consumption and production.

APPENDIX: List of Factsheets submitted to the 4th Regional 3R Forum in Asia and the Pacific (Not core set of indicators)

Priority Thematic Areas	Goal	Sample indicator for factsheets	Type of indicator
3Rs in municipal solid waste	Goal 1: Significant reduction in the quantity of municipal solid waste generated	Total MSW generation and MSW generation per capita	Quantitative Pressure
	Goal 3: Significant increase in recycling rate	Recycling rate and target	Quantitative Response
3Rs in Industrial sector	Goal 5: Encourage private sector, including small and medium-sized enterprises (SMEs), to implement measures to increase resource efficiency and productivity	Measuring Waste Reduction, Reuse and Recycling through Industrial Symbiosis	Qualitative and Quantitative set of indicators Response
	Goal 9: Develop proper classification and inventory of hazardous waste as prerequisite towards sound management of hazardous waste.	Hazardous Waste Management	Existence of regulation to control hazardous waste: Qualitative Response Amount and rate of generation of hazardous waste: Quantitative Pressure
3Rs in Rural Areas	Goal 11: Promote full-scale use of agricultural biomass waste and livestock waste.	Promoting full-scale use of agricultural biomass residue and livestock waste	Quantitative
3Rs for New and Emerging Wastes	Goal 13: Ensure environmentally sound	Standards for Collection, Storage,	Qualitative Response

		Transport, Recovery, Treatment and Disposal to Ensure Environmentally Sound Management of E-waste	
	Goal 15: Progressive implementation of extended producer responsibility	Recycling Legislations based on the Concept of Extended Producer Responsibility (EPR)	Qualitative Response
3Rs for Cross-cutting Issues	Goal 17: Improve resource efficiency and resource productivity by greening jobs nation-wide in all economic and development sectors	Indicators based on Material Flow Analysis/Accounting (MFA) and Resource Productivity	Quantitative Pressure/response
	Goal 18: Maximize co-benefits from waste management technologies for local air, water, oceans and soil pollution and global climate change	Co-benefits of the 3Rs (reduce, reuse and recycle) of municipal solid waste on climate change mitigation	Quantitative Pressure/response
	Goal 20: Strengthen multi-stakeholder partnerships in raising public awareness and advancing the 3Rs.. leading to behavioural change of the citizens.	Measuring Public Awareness and Actions for the 3Rs	Qualitative/Quantitative Response
	Goal 23: Promote green procurement.	Structure, content and implementation of green procurement	Qualitative Response

Member of Working Group of 3R Policy Indicators of Asia Resource Circulation Policy Research Group

Dr. Naoya Abe, Tokyo Institute of Technology

Prof. Enri Damanhuri, Institut Teknologi Bandung

Dr. Yasuhiko Hotta, Institute for Global Environmental Strategies

Dr. Kosuke Kawai, National Institute for Environmental Studies

Mr. Michikazu Kojima, Institute for Development Economies-JETRO

Dr. Nirmala Menikpura, Institute for Global Environmental Strategies

Mr. CRC Mohanty, United Nations Centre for Regional Development

Mr. Kazunobu Onogawa, Institute for Global Environmental Strategies

Prof. Agamuthu Pariatamby, University of Malaya

Dr. Janya Sang-Arun, Institute for Global Environmental Strategies

Dr. Tomohiro Tasaki, National Institute for Environmental Studies

Prof. Chettiyappan Visvanathan, Asian Institute of Technology