11 Best practices

A number of Asian countries have introduced national recycling targets:

Japan: Fundamental Plan for Establishing a Sound Material Cycle Society
- Cyclical Use Rate [cyclical use amount/(cyclical use amount + amount of natural resource input)]

Philippine: Ecological Solid Waste Management Act
- Diversion Rate: 25% of all solid waste, through re-use, recycling and composting, and other resource recovery activity by 2004

Malaysia: Tenth Malaysia Plan (2011-2015)
- Increased household recovery of waste from 15% to 25% by 2015

Singapore: A Lively and Livable Singapore: Strategies for Sustainable Growth 2009
- Recycling rate = Total Waste Recycled/Total Waste Generated (70% in 2030) 56% in 2008

Viet Nam: National Strategy for Integrated Management of Solid Waste Up to 2025
- To collect and treat, within environmental standards, 100% of daily life solid waste in urban centers, 90% of which will be recycled, reused as recovered energy or used as input for organic fertiliser production

12 Conclusion

Recycling rate is one of the representative indicators of 3R policy performance, thus many governments in Asia have incorporated it into national 3R targets. However, caution must be taken if inter-country comparisons are made solely based on one definition or interpretation of recycling, since policy priorities vary.

Reference documents and existing guidelines

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For Further Information

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Ministry of the Environment

Recycling Rate and Target

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01 Outline of indicator

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 products. High figures usually imply progress in recycling activities. The indicator has several different aspects: 1) Ratio of recycled materials used in a certain product at the production stage (rate of utilisation of recycled materials); 2) Ratio of materials recycled or recovered from end of life or waste products; 3) Ratio of collected used materials for recycling purpose (collection rate); 4) Waste diversion rate; the rate or percentage of a potentially recyclable material that has been diverted out of the waste disposal stream and therefore not entering landfills.

02 Type of indicator

Quantitative Indicator, Response Indicator

03 Policy goals to be monitored by this indicator

The overall recycling rate and target attempts to monitor progress in recycling and resource saving activities. The policy goals related to this indicator are to achieve, via policies and measures, waste minimisation before final treatment (such as incineration and landfill) as well as reducing amounts of virgin materials used by increased use of recyclables (e.g., plastic, paper, metal). This is usually achieved via financial mechanisms and institutional frameworks involving relevant stakeholders.

Factsheets Series on 3R Policy Indicators
This project is conducted by the Asia Resource Circulation Policy Research Group, a collaborative research group focused on policy research on 3R promotion in Asia; coordinated by IGES with input from researchers from IGES, IDE-JETRO, NIES, University of Malaya, Asia Institute of Technology, Bandung Institute of Technology, Tokyo Institute of Technology and UNCRD.

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04 Definition

The most common method to calculate the recycling rate is as follows:
Recycling rate = Annual total waste recycled/ Annual total waste generation

In reality, based on the lifecycle of materials and products as shown in figure 1 below, the definition of the recycling rate and target may differ according to the goals of policies requiring calculations of such indicators.

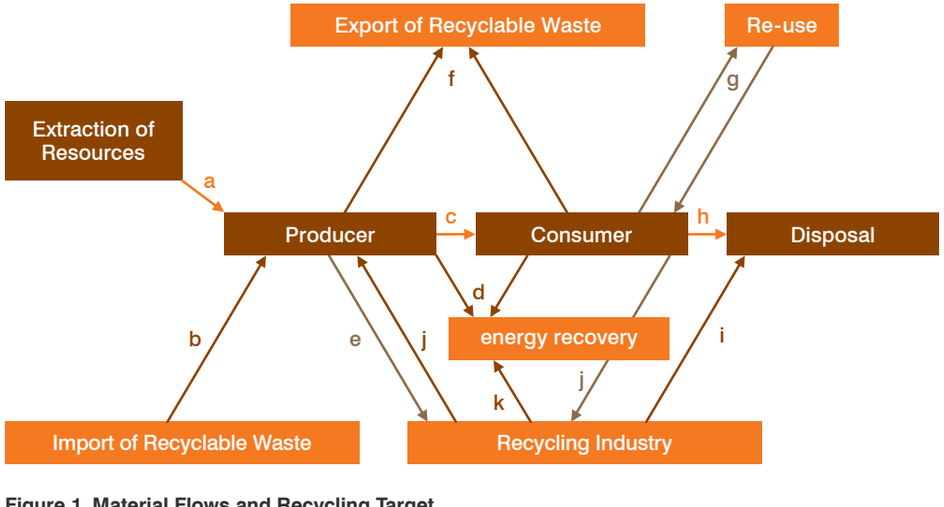

Figure 1. **Material Flows and Recycling Target**
Source: Michikazu Kojima (2012)

1) Cyclical Use Rate or Ratio of Recycled Materials used in a Certain Product

If the inclusion of recyclables into product manufacture is an important factor, i.e., as a replacement for virgin resources, the resource recycling rate (cyclical use rate in Japan's Fundamental Plan for Sound Material Cycle Society) should be used:
Cyclical Use Rate: (b+e)/(a+b+e)

Similarly, this can be calculated as a ratio of recycled materials used in a certain product:
Ratio of recycled materials used in a certain product (one product): (b+e)/(a+b+e)

2) Ratio of materials recovered from end of life/waste products

If emphasis is placed on efficiency of resource recovery of existing recycling systems or facilities, then this indicator can be used:
Original definition of recycling rate (= Total waste recycled/Total waste generated), approximated by: (e+k)/(j+h)

The resource recovery from the collected items can be calculated as:
Recovery Rate: (e+k)/(e+k+i)

09 Appropriate data management by stakeholders

- Central government: Aggregation of existing information, conducting surveys on recycling industry
- Local government: Amount of waste transported, understanding of waste characterisation and conducting surveys on collectors
- Industrial Associations: Conducting surveys on member industries or non-member industries
- Information derived from manifest/consignment notes
- Academia and knowledge hubs

10 Direct and indirect impact

As a governmental policy, development of recycling follows two stages:
Initially, recycling is integrated into government policy for solid waste management, which is followed by awareness-raising campaigns, governmental regulation and legislation on specific recyclables before actual start of formal collection of recyclables. Recycling is considered to be an integral part of solid waste management operations of local government or local public utilities. This stage of recycling at the local governmental level aims to reduce the amount of solid wastes proceeding to intermediate treatment or final disposal, such as incineration and landfill, and to reduce or stabilise solid waste management costs for local governments. Also, such initiatives could extend the life of final disposal sites. Conventional 3R campaigns for municipal solid waste management, such as reduction of plastics used for packaging and containers are part of such initiatives. In other words, this stage aims at reducing the amount of final disposal, re-use of waste products and materials, and recycling (the 3Rs) as a part of integrated solid waste management.

The second stage is to facilitate a transition to a resource-efficient society by national governmental response to consumption and waste generation en-masse, by establishing national mechanisms for recycling. In this case, in addition to simple promotion of recycling, introduction of a cost-sharing mechanism and systematic infrastructure-building for resource circulation is required. An example of such effort can be seen in Japan's policy of 'Sound material cycle society'. The policy concept behind this is to bring about social change, in which the consumption of natural resources is minimised and the environmental load is reduced to the extent possible. A route towards this is to prevent products from becoming waste, promoting appropriate recycling of products, and securing appropriate disposals of waste that are not recycled. At this stage, recycling starting from waste management becomes a part of sustainable resource and materials management.

3) Ratio of collected used materials for recycling purpose (collection rate)
If emphasis is to be placed on efficiency and coverage of collection of recyclables, the following can be used as an indicator:
Collection Rate: (j+f)/(d+h+j+f)

4) Waste diversion rate
If emphasis is on extension of life of landfills as well as improved waste management, the waste diversion rate can be used. This is the rate or percentage of a potentially recyclable material that has been diverted out of the waste disposal stream and therefore not landfilled:
Waste diversion rate: (j+f+d+g)/(h+j+f+d+g)

05 Policy instruments that can be used for improving recycling

The purpose of recycling is to improve the recovery of useful resources from used materials, which aims to minimise the materials proceeding to final treatment such as incineration and landfills and to minimise both environmental and economic costs associated with waste management. For this purpose, several policy instruments can be applied:

- Waste separation and sorted collection of recyclable resources
- Community-based collection of recyclables
- Awareness raising on the need for sorted collection
- Waste discharge fee
- Deposit-and-refund
- Extended Producer Responsibility (EPR)-based recycling policy
- Industrial Symbiosis, waste exchange programs, CPs
- Voluntary initiative or green purchasing for prioritised use of recycled goods
- Financial support for recycling businesses and industries

06 Merits of implementation

Recycling is a key component of waste management and resource efficiency strategy, both for municipalities and for industrial processes. Improving the recycling rate lowers the amounts of materials requiring final treatment, and by extension lowers the costs for final treatment, extending the useful life of landfill sites. Theoretically, promotion of recycling has multiple benefits, such as greenhouse gas (GHG) reduction, energy and material saving, lowered impacts on human health and job creation. A case study of a municipality in Thailand concluded that recycling can reap jobs at the rate of 7.5 labour days per tonne of generated recyclables (Menikpura et. al. 2012). Other merits are the separation of hazardous substances from landfill-destined waste, which avoids air, water and soil contamination and reduced use of virgin material extraction and production. From a life-cycle accounting perspective, production processing from virgin materials usually consumes more energy, leading to higher emissions of GHGs compared to recycling of used materials.

07 Similar indicators and supporting indicators

- Cyclical Use Rate
- Ratio of recycled materials used in a certain product
- Ratio of materials recovered from end of life/waste products
- Ratio of collected used materials for recycling purpose (collection rate)
- Waste diversion rate

See the definition for the details of these indicators.

- Amount of virgin resource saving: This refers to utilisation of recycled materials in place of virgin resources. Translating the use of recycled materials into this indicator indicates resource saving potentials from recycling activities and contribution to resource efficiency.
- Estimation of amount of recyclable materials handled by informal recycling market or estimation of size of informal recycling market: Estimation of the informal sector's contribution to recycling would raise the awareness in recycling activities conducted by waste-pickers, junkshops, recycling, and repair and refurbishing activities. This indicator reflects both the contribution of the informal sector in recycling activities and waste diversion as well as reduction in potential environmental and health risks from such activities.

08 Challenges and concerns

Regarding the definition

- How the recycling rate is defined differs according to the goals of the related policy.
- In the equations, factors affecting the numerator side are use of energy recovery, collection or utilisation of waste, and import and export; the factor affecting the denominator is use of total input of resources or waste generation.
- The definition also depends on what constitutes recyclables, i.e., whether materials are attributed with positive or negative economic value.

Regarding interpretation

- The term 'recycling' can cover material recycling and recovery activities, and can also embrace energy recovery.
- The indicator is affected by what constitutes the 'weight' of waste, i.e., whether dry or wet weight is used. The diversion rate varies with the weight of the waste streams; heavier waste streams tend to have lower diversion rates.
- Recycling activities in developing countries are often dependent upon informal recycling markets such as waste-picking, sales of recyclables from households or offices to junk buyers, small-junk shops and back-yard recycling. Thus, where informal recycling activities are prevalent, the actual amount of recycled materials or recycling rate would be larger than the official statistics indicate.