

## 07 Supporting indicators

To characterise the waste streams shown in Fig.1, the following indicators would assist in waste management:

- Amount of recyclables and ratio thereof against MSW generation (collection)
- Amount of self-disposed waste and the percentage of self-disposal over collected MSW plus self-disposed waste
- Population associated with MSW collection service expressed as a percentage of the total population

## 08 Appropriate data management by stakeholders

- Central governments in charge of MSW management compile data from municipalities.
- Municipalities in charge of MSW management collect reliable data from localities and report such to central government.

## 09 Conclusion

The use of total MSW generation and MSW generation per capita indicators would enhance governmental decision-making capacity in MSW management. Reliable figures for total MSW generation would also raise the precision of the national inventory on waste sector greenhouse gas emissions.

### References

- Kawai, K., Osako, M., Matsui, S., Dong, N.T. (2012), Identification of junk buyers' contribution to recycling of household waste in Hanoi, Vietnam, through a physical composition analysis. *Waste Management and Research* 30: 681-688.
- Ministry of the Environment of Japan (2012), Environmental statistics 2012. Ministry of the Environment of Japan. <[http://www.env.go.jp/en/statistics/contents/index\\_e.html](http://www.env.go.jp/en/statistics/contents/index_e.html)>
- OECD (2010), OECD factbook 2010: Economic, environmental and social statistics. Municipal waste. OECD.
- OECD (2003), OECD environmental indicators: Development, measurement and use. Reference paper. OECD.
- World Bank (2012), What a waste: A global review of solid waste management. World Bank, Washington.
- UNEP, CalRecovery Inc. (2005), Solid waste management. UNEP.

No parts of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without prior permission in writing from Ministry of the Environment of Japan (MOEJ).

Although every effort is made to ensure objectivity and balance, the publication of research results or translation does not imply MOEJ endorsement. MOEJ maintain a position of neutrality at all times on issues concerning public policy. Hence conclusions that are reached in this publication should be understood to be those of the authors and not attributed to officers of MOEJ or to MOEJ itself.

### **i** For Further Information

#### **IGES** Institute for Global Environmental Strategies

2108-11, Kamiyamaguchi, Hayama, Kanagawa, 240-0115, JAPAN  
TEL: +81-46-855-3720 FAX: +81-46-855-3709  
Email: [iges@iges.or.jp](mailto:iges@iges.or.jp) URL: <http://www.iges.or.jp>



# Total MSW generation and MSW generation per capita

**Kosuke Kawai** National Institute for Environmental Studies, Japan  
**Tomohiro Tasaki** National Institute for Environmental Studies, Japan

## 01 Outline of indicators

MSW (municipal solid waste) generation and MSW generation per capita refer to indicators of environmental pressures humankind exerts on the environment (OECD, 2003), and by extension, environmental pressures caused by the use of natural resources. Currently, 340 million tons of MSW is generated a year in South Asia, East Asia and the Pacific Region, 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, MSW generation should be reliable data.

## 02 Type of indicator

Quantitative Indicator, Pressure Indicator

## 03 Policy goals to be monitored by this indicator

As a key indicator, total MSW generation can help identify the required capacity of waste management facilities and personnel, and aid in designing countermeasures.

MSW generation per capita represents the intensity of waste generation and can be used to assess progress in waste prevention activities (reducing and reusing) and shifts in consumption patterns towards resource efficiency, and MSW generation per capita can be used to make projections of total MSW generation in the future.

## 04 Definition

How MSW generation is defined varies from country to country, and while such definitions do not need to be consistent across all countries, they should be of sufficient clarity to enable calculations of total MSW generation and MSW generation per capita.

### Waste

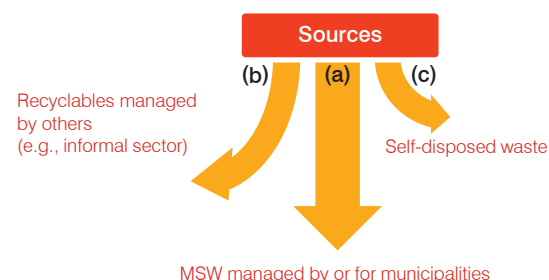
Waste includes all materials discarded from households, offices, restaurants, hotels, schools, hospitals, factories, construction, agriculture and so on, i.e., items of no material value for people or businesses. In another sense, waste refers to the material that is discarded without being resold to other persons or companies, and is costly to collect, transport and dispose of. Under such definition, recyclables (salables) are not defined as waste since they can be traded in the informal sector in developing countries, with economic incentives (Kawai et al., 2012).

### MSW

MSW is the solid waste collected and disposed of by or for municipalities; however, the nature of MSW varies from region to region (UNEP et al., 2005). Some countries define “MSW” as “ordinary solid waste” or “urban solid waste” managed by or for municipalities; the OECD (2010) states “municipal waste covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste”, but this definition excludes waste from municipal sewage networks and treatment, as well as from construction and demolition activities. However, the definition by the World Bank (2012) includes industrial waste, and construction and demolition waste into MSW streams. Malaysia, Vietnam and Cambodia, on the other hand, have no definition of MSW, and the Philippine definition of municipal waste refers to wastes produced from activities within local government units, including domestic, commercial, institutional and industrial wastes and street litter (Republic Act No.9003). Japan defines MSW simply as waste other than industrial waste, all of which shall be managed by or for municipalities (Waste Management and Public Cleansing Law). However, such narrow definition excludes recyclables that are managed by others and waste self-disposed at source.

### MSW generation

Total MSW generation and MSW generation per capita can vary according to the definition of MSW. Following the above-mentioned definition in a narrow sense, MSW generation refers to the waste described as (a) in Fig.1 only. Then, MSW collection substitutes for MSW generation, excluding two waste streams as follows. One is recyclables generated and managed by anybody but municipalities, such as the informal sector, which is described as (b) in Fig.1. Most developing countries still depend on the informal sector for recycling. The other is waste to be self-disposed of at source described as (c) in Fig.1, which can be seen



**Fig.1 Waste streams and definition of MSW generation**

in the region where population with the MSW collection service is relatively low. Burning, composting, burying on the ground and disposing into rivers are examples of self-disposal regardless properly or improperly. The Japanese Government tries to estimate amounts of (b) and (c) separately, and to the extent possible, despite the difficulty involved, because such could flow into the MSW stream of (a) in the future and improper handling of such is identified and regulated by government. Moreover, 3R efforts for (a) to (c) in Fig.1 should be promoted, and monitoring all the flows provides visibility of the effectiveness of these 3R efforts.

## 05 Methodologies to estimate total MSW generation

Each country should adopt an appropriate way from the followings to estimate total MSW generation according to a country's capacity to collect data

### Tier 1

Total MSW can be simply estimated by multiplying MSW generation per capita of selected areas by the country's total population. This involves collection of MSW per capita from as many areas and with as much variety as possible (at minimum, urban and rural).

### Tier 2

MSW generation for unreporting areas can be estimated by multiplying reported MSW generation per capita and population and added to the total amount of reported MSW generation from municipalities.

### Tier 3

MSW generation is reported from all municipalities to the central government. The Ministry of the Environment of Japan established a data collection system on MSW management, including MSW generation, and all municipalities (1,719 as of January 2013) are obligated to report the related data annually to the Ministry (Ministry of the Environment of Japan, 2012).

## 06 Methodologies to estimate MSW generation per capita

MSW generation per capita is estimated by dividing MSW generation of a certain area by that area's population. When MSW collection substitutes for MSW generation, the total population associated with such MSW collection should be used instead of the total population of the demographic area, as this avoids underestimating MSW per capita. The population associated with the MSW collection service must be less than the demographic data in developing countries, where MSW collection service is lacking, unless the demographic data is unreliable. Most central urban areas are covered by MSW collection services; while such coverage rates drop in suburban and rural areas.

MSW generation per capita from households can be measured by sampling and weighing household waste and counting the number of occupants in households. The figures of waste generation from an individual source are useful in revealing the intensity of material use by source and to monitor progress in 3R efforts. It is, however, difficult to identify MSW generation per capita from other individual sources.

3R efforts relating to the flows of (b) and (c) in Fig.1 should be promoted as well, thus preferably the per capita indicator monitors not only (a) but also (b) and (c).