

Global Waste Challenge

Situation in Developing Countries



Solid Waste Management Worldwide

Management of Municipal Solid Waste (MSW) is one of the major challenges worldwide. Inadequate collection, recycling or treatment and uncontrolled disposal of waste in dumps lead to severe hazards, such as health risks and environmental pollution. This situation is especially serious in low and mid-income countries.

Cities, which are hubs of rapid economic development and population growth, generate thousands of tons of MSW that must be managed daily. Low collection coverage, unavailable transport services, and a lack of suitable treatment and disposal facilities are responsible for unsatisfactory solid waste management, leading to water, land and air pollution, and for putting people and the environment at risk.

The amount of waste generated is often linked directly to income level and lifestyle – a problem also faced by industrialised economies, which have to find ways to avoid, minimise or recycle the generated waste.

Newly industrialised countries like China and India are confronted with enormous solid waste management problems that will severely strain municipal financial resources and the handling of the ever-increasing waste volumes. An ecologically compatible management of natural resources, environmental education, as well as a sustainable and integrated waste management must be pursued together with cleaner production processes and a change in consumer behaviour and habits.

The socio-economic, cultural and institutional context in the developing world requires special consideration of appropriately adapted technologies, capacity building, including improvement of skills and know-how at local government level. Innovative and integrated collection, recycling and disposal systems of MSW, involving community participation, public-private partnerships, micro-enterprises, and scavenger cooperatives, are steps in the right direction.



Why collect global data on Municipal Solid Waste?

This booklet aims at raising the awareness of the appalling situation related to Municipal Solid Waste Management in developing countries. Data on MSW reveals the differences between high-income countries and the developing world. We believe that bilateral and multilateral development cooperation has an important role to play, as it can catalyse solid waste management efforts if treated on a higher priority level.

Data on MSW was obtained from international organisations, scientific journals, and unpublished reports and documents, covering the time period from 1997 to 2006. Reliable data collection was difficult as:

- Only fragmentary data sets were available
- Definitions differed between country and author
- No clear system boundaries could be drawn
- In most cases, the informal sector was entirely neglected
- Data of a 9-year time period could not be realistically compared
- And finally, figures can always be interpreted in different ways.

We are aware of this difficulty and advise the reader to account for this potential inaccuracy when using the data presented here.

What is Municipal Solid Waste?

Municipal waste covers all the waste generated, collected, transported, and ultimately disposed of within the administrative boundary of a municipal authority. MSW is composed of food waste and rubbish from residential areas, street sweepings, commercial and institutional waste, as well as construction and demolition debris. Industrial waste and faecal matter, though formally not always considered part of municipal waste, are often found in the municipal waste stream and thus handled by the same services.

Municipal waste management comprises aspects of waste generation, waste composition, collection, recycling, treatment, and disposal. These management functions are embedded in a site-specific socio-economic, behavioural, cultural, institutional, and political framework involving a variety of interacting stakeholders.



Generation

Higher incomes lead to increased consumption and thus more waste.

The MSW volume generated depends on the local standard of living, consumption pattern as well as on the level of institutional and commercial activities. Higher economic standing is directly related to an increase in MSW volume. Furthermore, there is a clear trend that the average lifespan of many consumer products is increasingly reduced.

As shown in Fig. 1, there is a strong correlation between gross national income (GNI) and generated municipal solid waste. The large rural population in India and China is reflected by a low national waste average. However, two factors can contribute to the dramatic increase in waste volume: rapid economic growth (which translates into higher income and consumption levels) and high migration from villages to cities (increase in urban growth). Adequate municipal solid waste management along with an extension of services must follow to prevent environmental degradation.

Furthermore, a similar correlation exists between gross domestic product (GDP) in cities of different sizes and their MSW generation rates (Fig. 2). Prospering metropolises with a high commercial activity produce large MSW quantities.

Income classification

The World Bank's income classification, based on gross national income per capita, is an indication of the national consumption level. The income groups, classified according to the gross national income (GNI) per capita in 2006, are the following: low income, US\$ 905 or less; middle income, \$ 906 to \$ 11,115; and high income, \$ 11,116 or more.



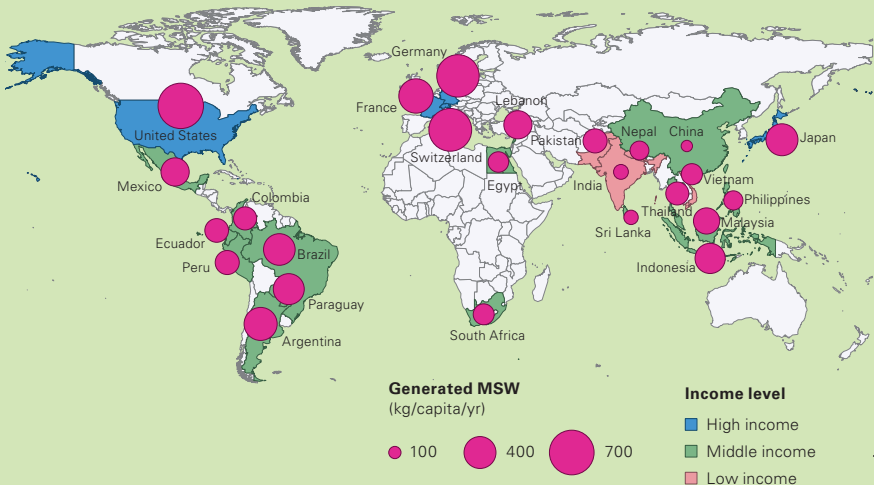


Figure 1: Municipal solid waste generation (kg/capita/yr) in 25 countries grouped according to their gross national income (GNI).

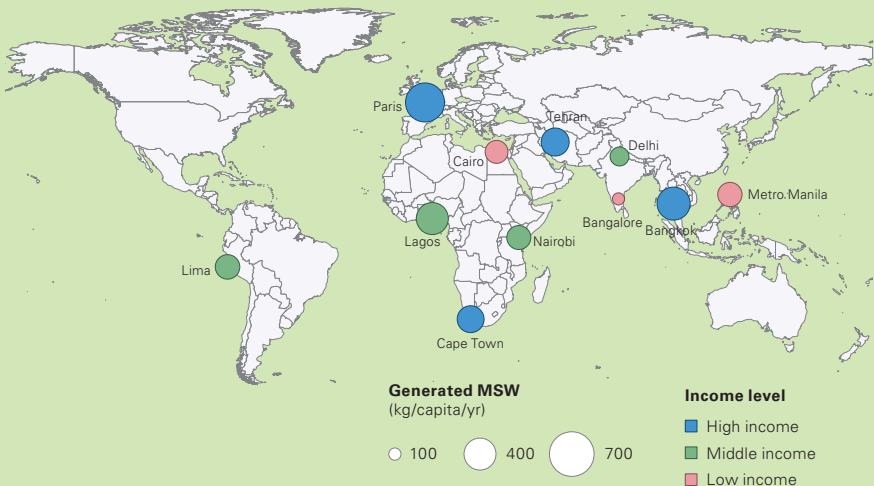


Figure 2: Generation of MSW (kg/capita/yr) in 11 cities and their GDP in 2005 (in US\$, using *purchasing power parity* exchange rates) per capita according to the World Bank's income classification of 2006.

Composition

Higher income, economic growth and changing lifestyle lead to a change in waste composition.

In general, most of the generated MSW contains high fractions of organics and paper, compared to the lower amounts of plastics, glass and metals.

However, income level, economic growth, lifestyle, and location strongly influence MSW composition. Poor households, for example, generate higher fractions of organic waste than wealthy ones. A similar difference is also observed between rural and urban households. High fractions of organics lead to a dense and humid waste that affects not only the collection and transport system but also its recycling potential.

In high-income countries, however, consumption of processed food and packaged products results in a higher percentage of inorganic materials such as metals, plastics and glass. In Europe, almost half of the generated municipal solid waste originates from packaging material.

Larger waste volumes and changing waste composition have a far-reaching impact on waste management practices. Recycling opportunities may be significantly enhanced and gain economic importance. In Dhaka's slums, for example, organic matter (80 % of the total waste generated) is being composted and sold as fertiliser.

Collecting and recycling waste close to its source of generation reduces the remaining amount of waste to be handled further and alleviates the municipal burden.



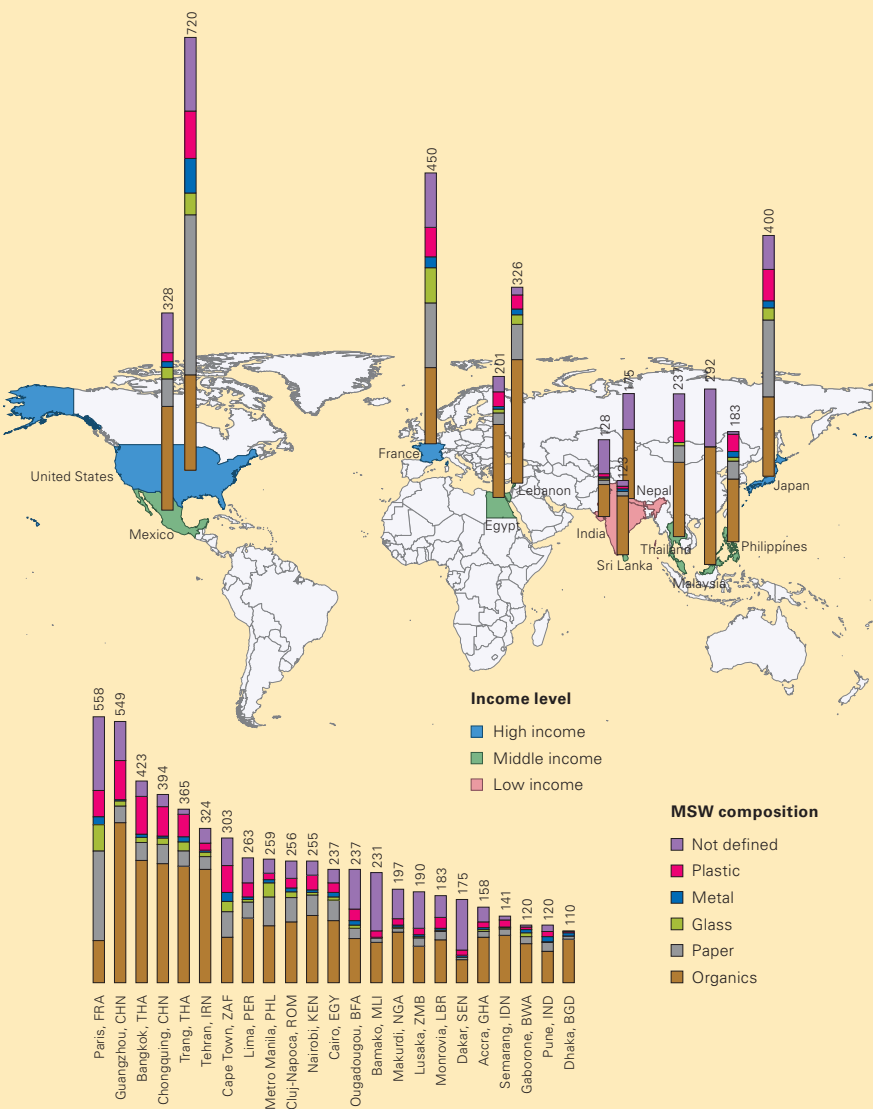


Figure 3: Top: Composition of the MSW (kg/capita/yr) in 12 countries grouped according to their gross national income (GNI). Bottom: Composition of the MSW (kg/capita/yr) in 23 cities.

Collection

Full waste collection coverage is a key to a hygienic environment. Uncollected waste remains in the neighbourhood, attracts pathogens and pollutes waterways. This situation leads not only to health risks but also constitutes a public eyesore and negatively affects economic development. Furthermore, the waste collection systems used have a significant effect on the quality of recovered materials, which in turn influence the recycling economy – a key aspect for a sustainable and integrated waste management system.

In developing countries, collection and transport activities account for most of the municipal solid waste management budget. Despite this high expenditure, only a small fraction of the waste generated is collected. In Sri Lanka and in the Philippines, for example, only 40 % of the total waste generated is collected. In Vietnam and Paraguay, waste collection coverage is around 50 % and in India 70 %.

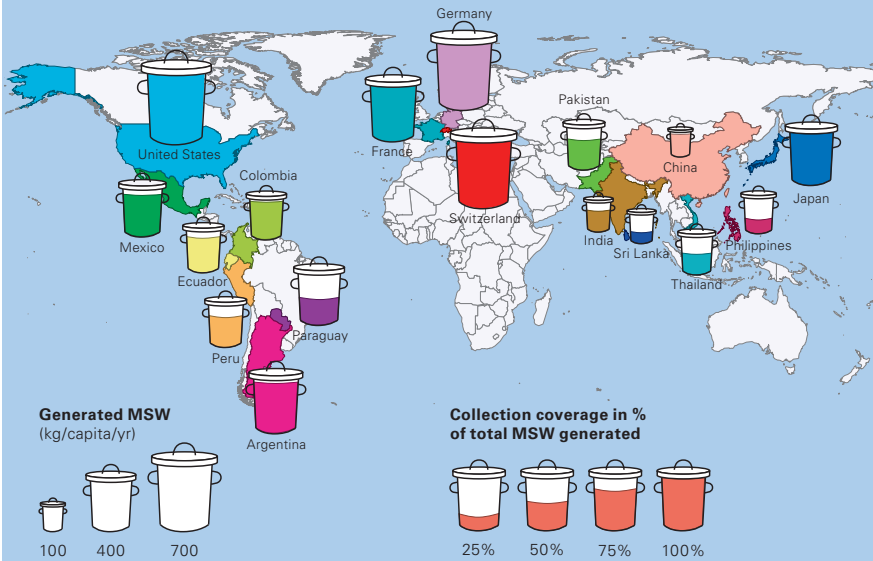


Figure 4: Total MSW generated (kg/capita/yr) and collection coverage in % in 17 countries.

Most cities in the developing world collect only part of the overall waste, and only a tiny fraction of the collected waste is treated or properly disposed of.

In low-income countries lacking waste collection, households tend to either dump their garbage on open plots, in low-lying areas, public spaces and rivers, or simply burn it in their backyards. Uncollected waste may also accumulate on streets, thus clogging the storm-water drainage system. In hilly, unpaved or densely populated areas, large collection trucks tend to break down frequently or are often not capable of accessing the narrow and winding roads.

The urban poor in slums and squatter settlements are generally those who suffer most from the lack of collection services. These areas are often totally neglected by the authorities due to their illegal status and lack of political voice.

In Monrovia, Liberia, for example, illegal slum areas with thousands of inhabitants are formed every year. There the authorities manage to collect only 15 % of the generated waste.

Bangkok's collection system

The important investments in truck fleets in the early 1990s, coupled with the introduction of waste management fees and significant improvement in management skills and capacities throughout Bangkok's district offices, contributed to achieving an almost 100 % waste collection coverage. The Public Cleansing Division of each district is responsible for primary collection from the households. Waste is collected at night to avoid traffic jams, and small, modified «Tuk-Tuk» (three-wheel) vehicles are used to access the narrow roads. 9,000 tons of waste are collected in this manner every day. Moreover, every morning thousands of waste pickers roam the city in search of recyclables.

The collected waste is delivered to transfer stations, where it is loaded onto large hauling trucks for transport to the disposal site. Public-private partnerships have been established for this secondary collection.

Treatment and Disposal

In most developing countries, the use of appropriate treatment technologies is rare. Some commonly used disposal and treatment technologies (from all over the world) are listed hereafter:

Dumping is the disposal of waste at an uncontrolled, uncovered site of minimal or no structural design. Degrading waste in such dumps emits greenhouse gases (methane), toxic leachates pollute subsurface and surface waters and enhance the risk of disease transmission to nearby residents. In many African and Asian countries, open, uncontrolled disposal is the most common method of treating MSW.

Sanitary landfills are engineered disposal sites where waste is spread in layers, compacted and covered with soil or other materials to minimise air and water pollution. Modern sanitary landfills collect and treat leachate and methane gas.

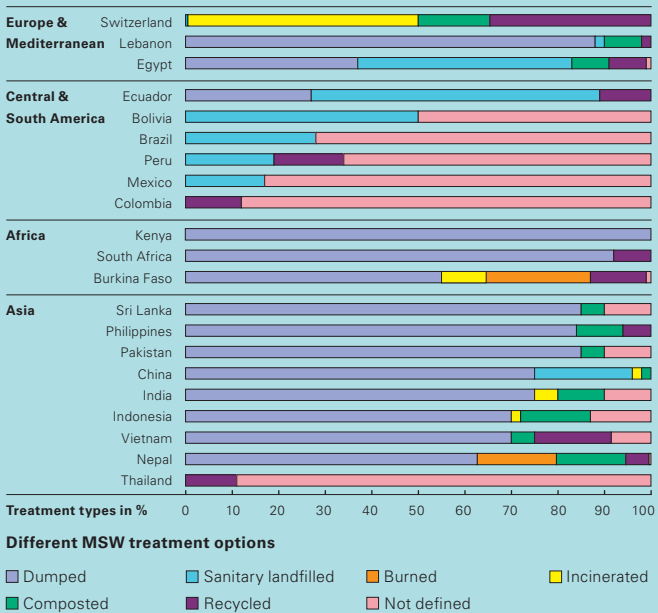


Figure 5: Percentage of the commonly used MSW treatment and disposal technologies in 21 countries.

Burning is unfortunately a widespread method used in developing countries to reduce the volume or odours of dumped or uncollected MSW. Open burning is the major source of toxic gas emission such as dioxins and furans. High-tech **incinerators**, as used in many European countries, are engineered to prevent toxic emissions and make use of the excess heat to generate steam for power production or for residential heating.

Composting, which is a controlled aerobic degradation of organic material, can reduce waste volumes by about 50 to 80 %. The resulting soil-like product can be used in agriculture. Biodegradation of organic waste is commonly practised in many Asian countries.

Recycling is the separation and collection of secondary materials for remanufacturing. In many developing countries, recycling is an important economic factor providing income opportunities for poor, unemployed or disabled individuals. Recycling significantly reduces the amount of waste to be collected, transported and disposed of.

Scavengers' recycling activities

In developing countries, the informal sector plays a major role in recovering secondary materials. The World Bank estimates that about 2 % of the population in developing countries are scavengers whose livelihood consists in collecting and selling recyclable materials.

Waste picking is often driven by poverty, high unemployment rates, low education level, and demand for secondary materials. Before the waste is transferred to collection vehicles, scavengers recover recyclables from the streets and bins and even at the disposal sites where the collected materials are unloaded. Paper, cardboard, plastic, glass, and a few metals are the main materials recovered and sold to larger distributors or directly to recycling companies. Scavengers often suffer from health problems due to bad living conditions and exposure to waste.



Supporting Organisations

Eawag: Swiss Federal Institute of Aquatic Science and Technology is a Swiss-based and internationally linked aquatic research institute committed to an ecological, economical and socially responsible management of water. It carries out research, teaching and consulting and forms a link between science and practical application.

Sandec: Department of Water and Sanitation in Developing Countries at Eawag. Sandec's activities centre on problems of sustainable development in economically less developed countries. Its mandate is to assist in developing appropriate and sustainable water and sanitation concepts and technologies adapted to the different physical and socio-economic conditions prevailing in developing countries. Sandec is financially supported in solid waste activities by the Swiss Development Cooperation (SDC).

This booklet is the outcome of a project conducted by Sandec's Municipal Solid Waste Group. The data used and links to its sources are available from: www.sandec.ch/swm

CWG: Collaborative Working Group on Solid Waste Management in low- and middle-income countries supported the production of this booklet through a co-financing grant from the Netherlands' Ministry of Foreign Affairs. The CWG is an international network of people and organisations who are interested in improving standards of solid waste management in developing countries through advocacy, knowledge sharing and capacity development. For more information, visit www.cwgnet.net.

