

2.3.6 Eco-efficient solid waste management

Change the way solid waste is managed: Turn waste from a cost into a resource

As prices for raw materials rise, the recovery of resources from waste will be crucial. Municipalities spend significant portions of their operating budgets on waste collection. Reducing the volume or weight of waste can save on operating costs, and recovering recyclable materials can generate revenues from their resale. The policy focus for solid waste management has to shift from disposal to the 3R approach (reduce, reuse, recycle).

Key points

Rapid urbanization and economic growth in the Asia-Pacific region has resulted in a corresponding increase of solid waste that municipal governments are finding difficult to dispose. Existing dumpsites have reached capacity, and finding land for new dumpsites is becoming increasingly difficult due to a scarcity within the municipal boundaries and because surrounding rural communities and towns are refusing permission for dumpsites in their vicinity. Investments in sanitary landfills are necessary but expensive. Making sure that the lifetime of constructed landfills can be extended is of utmost importance.

Local governments spend a large share of their budgets on solid waste management. For many local governments, the expense of collection, transport and disposal of solid wastes consumes a large portion of their annual budget. One main reason for this is

that the traditional approach to solid waste management focuses on end-of-pipe solutions that are capital and technology intensive and therefore expensive to build and difficult to maintain. Reducing the amount of waste that needs to be disposed at the landfill can save municipalities operating expenses, and recovering recyclable materials can generate revenue from the resale of them. This revenue could be reinvested into pro-poor programmes and into such critical areas as health or education.

Growing and changing waste streams, such as e-waste, pose great challenges. In spite of the expenditure, collection is often insufficient and waste is often disposed of in crude open dumps that pollute the atmosphere and water sources. This puts human health at great risk. New waste streams from electrical and electronic equipment (e-waste) also present a considerable challenge,

especially in developing countries, given that they contain new and complex hazardous substances that can be dispersed into the environment.

Properly managing solid waste can reduce greenhouse gas emissions. When biodegradable waste is deposited in a landfill it produces methane. Methane can either be captured or burned to produce energy or avoided through aerobic composting. Between 60 and 80 per cent of municipal solid waste in Asia's developing countries consists of organic material. This waste is currently sent to landfills and dumps where it contributes to a large amount of greenhouse gas emissions every year. Reducing the amount of food waste going to landfills thus provides great potential for reducing landfill waste volume as well as decreasing methane emissions. In addition, compost can help reduce the use of chemical fertilizer in agriculture, landscaping and nurseries and alleviate related environmental problems.

Waste can be turned into profit and a source of employment. The global waste market, from collection to recycling, is valued at an estimated US\$410 billion a year, not including the large informal segment in developing countries.¹⁵⁵ The recycling industry is expected to grow steadily – waste picking can become an important sector in terms of employment. The United Nations Environment Programme estimates that employment in the waste sector would be 10 per cent higher than in a business-as-usual scenario by 2050 if the recycling industry were promoted.¹⁵⁶

Providing decent employment in the recycling industry can help reduce poverty. Estimates from several cities and towns of developing countries in the Asia-Pacific region indicate that as much as 20–30 per cent of the waste generated is recycled by

the informal sector, which includes waste pickers, junk dealers and recyclers. In Delhi, India, for example, as many as 170,000 informal workers (or 1.3 per cent of the total population) are engaged in solid waste management.¹⁵⁷ For them, trash is cash. The amount of waste that is recycled could be significantly increased if municipal solid waste management systems were re-engineered to incorporate the informal waste recycling industry. In Dhaka, Bangladesh, a social business enterprise, Waste Concern, has provided 800 waste pickers with a formal job, health insurance and other benefits through the establishment of integrated resource recovery centres.

Projects that reduce greenhouse gas emissions from the waste sector can tap into available carbon financing sources. Among the Clean Development Mechanism (CDM) projects registered with the UNFCCC, about 17 per cent are from the waste sector. Projects in the waste sector can be registered both as large and small scale. Small-scale projects can be bundled together using a programmatic approach.

Policy options

Low carbon green growth requires a shift in perspective on waste. It requires seeing waste as a resource rather than a cost. Low carbon green growth necessitates shifting from an end-of-pipe approach for solid waste management to one that focuses on minimizing the waste that goes to final disposal by reducing, reusing and recycling it.

Policies are as important as infrastructure. While the main responsibility for the collection and treatment of waste may lie with municipalities, it is essential that national policymakers implant the appropriate legal framework to stimulate an eco-efficient approach to solid waste management. Of

course, lack of resources and capabilities often hampers the implementation of 3R policies. Thus, top-down policies need to be supplemented with bottom-up approaches.

Promote the reduce, reuse, recycle approach

The reduce, reuse, recycle approach is a practical policy tool for decoupling resource consumption from economic growth and promoting sustainable production and consumption. The 3R approach proposes a hierarchy of preferences to manage resources. “Reduce” asks that products be designed with an awareness of the full life cycle of the materials used, thus reducing the potential amount of waste generated. If the amount of materials cannot be reduced, products should be “reused” as much as possible, thereby decreasing the demand for new production. If materials cannot be reduced or reused, the materials contained within the products should be “recycled” or used as source materials for new products.

Many countries have introduced national legislation related to the 3R approach. Japan, for example, set up a comprehensive legal framework to promote the 3R approach. In 2000, five milestone laws were passed, including the Fundamental Law for Establishing a Sound Material-Cycle Society and the Law for the Promotion of Effective Utilization of Resources. Laws for promoting specific waste recycling were also passed in subsequent years, such as the End-of-Life Vehicle Recycling Law and the Containers and Packaging Recycling Law. China has also taken steps towards a 3R approach and in 2008 adopted a law to promote a circular (recycling) economy. However, many developing countries are still facing implementing difficulties and require assistance and ideas on how to bridge the policy enforcement gap.

Several upstream policies are focused around the concept of extended producer responsibility. Such policies place responsibility for a product's end-of-life environmental impacts on the original producer and seller of that product. They provide incentives to producers to consider environmental issues in the design of their products and to reduce the materials used, thus improving the product's recyclability and reusability and decreasing waste management costs.



Common policies and instruments that fall under the concept of extended producer responsibilities include the following:

- **Mandated product take-back schemes** require producers and vendors to be responsible for the collection of products and packaging at the end of a product's useful life. In addition, governments may require each producer to meet specific recycling rate targets. This encourages producers to take into account the concepts of waste reduction and material reuse and recycle in designing products because they ultimately will be responsible for them. In Japan, for example, the Home Appliance Recycling Law requires the manufacturers and importers of air conditioners, televisions, electric refrigerators and electric washing machines to take back the end-of-life equipment and recycle it.
- **Deposit and refund schemes** are a type of product take-back policy and refers to a payment (deposit) made by manufacturers and importers of certain products into a fund. Consumers are given a refund when returning the products to the dealer or treatment facilities. The physical responsibility for operating these schemes is delegated to manufacturers of the products who need to agree on

administrative arrangements with retailers. Deposit and refund schemes have been mostly used on beverage containers. It incentivizes reduction of material inputs, contributes to increased collection and recycling rates and encourages the reuse of the products.

- **Advanced disposal and recycling fees** are paid by manufacturers to cover the cost of recycling or disposing of products. Fees may be assessed by weight or per unit of product sold. In some cases, this policy may be changed from producer responsibility to consumer responsibility; the increased costs are transferred to consumers and the tax is displayed as a

separate line item on the bill. In Australia, for example, a National Used Tyre Product Stewardship Scheme was instituted to divert end-of-life tyres from landfills.¹⁵⁸

Positive outcomes can be achieved by applying downstream policies on consumers and waste handlers. These types of policies have the ability to capture some specific types of waste, such as food waste or clothing and other fabric waste that upstream policies may not address. However, downstream policies have less ability to differentiate charges based on the relative hazards imposed by different materials in the waste stream.

BOX 30: Dealing with the challenge of e-waste in the Republic of Korea

Waste from electrical and electronic equipment (WEEE or e-waste) is one of the fastest-growing waste streams in both industrialized and developing countries. Given the potential health and environmental impacts from the toxic materials they contain and the increasing volumes produced, e-waste has become a major issue of concern for local authorities. Several countries around the world enacted legislation to deal with the e-waste, notably in the European Union and Japan.

In April 2007, the Republic of Korea adopted the Act on Resource Recycling of Electrical Electronic Equipment and Vehicles to target the amount of e-waste going to landfills. The law imposes an extended producer responsibility approach, obliging producers to take financial responsibility for the collection, recycling and disposal of old equipment and appliances. The law covers a range of products, including home appliances (refrigerators, washing machines and air conditioners), information technology and telecommunication equipment (computers, printers, mobile phones) and consumer electronic devices (televisions, audio equipment, video cameras). The equipment is collected three ways: suppliers take an old product from consumers free of charge when they purchase similar new products; local governments collect items from households at designated areas near residential complexes; and private collectors pay consumers for the discarded items. The e-waste is then treated and recycled in privately run facilities.

Source: Yong-Chul Jang, "Waste electrical and electronic equipment (WEEE) management in Korea: Generation, collection and recycling system", *Journal of Material Cycles and Waste Management* (2010), vol. 12, No. 4, pp. 283-294.

- **Unit charging programmes or “pay as you throw” (PAYT) schemes** charge households a fee, either per unit or per weight, based on the waste collected. The fees are usually recovered in property taxes or utility bills. Pay-as-you-throw schemes encourage source separation, material recovery from recycling and reduction of transportation costs for collection and disposal. In the **Republic of Korea**, for example, households are required to separate recyclable items from non-recyclable waste. These separate waste streams must be disposed in government-issued plastic bags that households are required to buy. The amount of waste generated is measured by the size of the bags. After the adoption of the programme, the total amount of waste has decreased about 24 per cent between 1994 and 2004. Economic benefits accrued from 1995 to 2004 are more than 8 trillion won (US\$8 billion) resulted from avoided waste treatment and market value of increased recycling products. The amount of recycles in 2004 was 2.8 times higher than in 1994.¹⁵⁹ In Japan, a number of municipalities have also implemented the pay-as-you-throw systems, leading to a reduction of waste of between 20 and 30 per cent.¹⁶⁰



operated at low cost. They directly benefit the urban poor, providing waste pickers with better, more stable incomes and safer working conditions. By limiting the amount of waste going to dumpsites, the centres also help the environment.

An IRRC can be initiated and operated by municipalities, private-sector enterprises and civil society organizations, or a combination of all three, through partnership models. The capacity to process waste can vary from 2 to 20 tonnes per day. IRRCs can be established within neighbourhoods, in several areas in one city or on the outskirts of a city.

An IRRC carries out three primary activities: collection of segregated waste, processing of waste and selling of resources produced from the waste. Income streams can include: i) collection fees from serviced households; ii) sale of compost; iii) sale of recyclables to junk dealers and iv) income from carbon financing.

IRRCs use the following systems to recover resources from waste:

- **Enriched compost:** Through compost enrichment, the IRRC produces different types of fertilizer for specific soil and crops by varying the quantities of nitrogen, phosphorus and potassium and other nutrients that are added. Unlike chemical fertilizer, organic fertilizer returns organic matter to the soil, thus replenishing it and reducing the amount of fertilizer needed, reducing costs and reducing the pollution from excess chemicals in the soil.
- **Biogas plant:** Fish and animal waste cannot be used for compost, but it can be made into biogas using a digester, which can be installed on farms. The biogas can be used for cooking and generating electricity.



Integrated resource recovery centres

Integrated resource recovery centres (IRRC) recover valuable resources from waste. This approach can turn 80–90 per cent of waste into resources, leaving only 5–10 per cent of total waste to be disposed in a landfill.

Through their simple, non-mechanical technology, recovery centres can be built and

- **Recyclable materials:** Inorganic wastes, including plastics and metals, are sorted, cleaned, compacted and stored before being sold to bulk buyers.
- **Used cooking oil recycling unit:** In an IRRC, used cooking oil can be converted into biodiesel, which can run in an unmodified diesel engine. This is an environment-friendly alternative to

higher-emission petroleum diesel and can be sold or used in vehicles operated by the IRRC. This process addresses the problem of used cooking oil being disposed into the drainage system of many developing cities.

ESCAP is currently promoting the uptake of IRRCs in the Asia-Pacific region together with Waste Concern, an NGO from Bangladesh (box 31).

BOX 31: Integrated resource recovery centres solve the waste challenge in Matale, Sri Lanka

As with many cities in the region, solid waste management was a challenge in **Matale**, a medium-sized urban centre in central Sri Lanka, with a population of almost 37,000. The city generated 21 tonnes of municipal waste per day, which was disposed into an open dumpsite. Although 20 per cent of the Municipal Council's budget was spent on solid waste management, there was no town-wide collection. Since 2006, the solid waste management situation has improved through a pilot project initiated by ESCAP with the Municipality of Matale and the NGO Sevanatha Urban Resource Centre to set up an integrated resource recovery centre. The objective was to reduce costs for the municipality while providing a business opportunity for local entrepreneurs, improving services to households and managing waste in a more eco-efficient manner. Building on the success of the pilot project, the Matale Municipal Council opted in 2010 to treat all of the town's waste in the same way. The approach is scaling up to treat 20 tonnes of waste per day, as part of a regional ESCAP project on pro-poor and sustainable solid waste management.



FACT SHEETS

- Extended producer responsibility
- Integrated resource recovery centre

CASE STUDIES

- Republic of Korea's volume-based waste charging scheme
- Sri Lanka's community-based decentralized solid waste management