

Waste is an unavoidable by-product of most human activity. Economic development and rising living standards in the Asian and Pacific Region have led to increases in the quantity and complexity of generated waste, whilst industrial diversification and the provision of expanded health-care facilities have added substantial quantities of industrial hazardous waste and biomedical waste into the waste stream with potentially severe environmental and human health consequences. The Chapter discusses the generation, treatment, disposal and management of the growing volume of waste, which poses formidable challenges to both high and low-income countries of the region.

A clear appreciation of the quantities and characteristics of the waste being generated is a key component in the development of robust and cost-effective solid waste management strategies. Although amongst some of the more developed countries within the region the quantification and characterization of waste forms the basis for management and intervention, elsewhere little priority is given to the systematic surveying of waste arisings and the quantities, characteristics, seasonal variations and future trends of waste generation are poorly understood. Although there is a lack of comprehensive or consistent information, at the country level, some broad trends and common elements are discernible.

In general, the developed countries generate much higher quantities of waste per capita compared to the developing countries of the region. However, in certain circumstances the management of even small quantities of waste is a significant challenge. For example, in the small islands of the South Pacific subregion, small populations and modest economic activity have ensured that relatively low quantities of waste are generated. However, many of these countries, particularly small atoll countries such as Kiribati, Tuvalu and the Marshall Islands, face considerable waste management challenges due to their small land areas and resultant lack of disposal options.

The composition of municipal solid waste varies significantly across the region (see Figure 8.3) with some middle and low income countries generating waste containing over 70 per cent organic content, with a corresponding moisture content in excess of 50 per cent. Differences in the characterization and reporting of waste types also differ with some municipal authorities including construction and demolition waste and industrial waste as part of the municipal waste stream.

Some inter-urban differences relate to climate and fuel use. The cities where heating is needed in winter such as Beijing, Shanghai, Seoul and Tokyo and where coal is the main source of energy, have much greater amount of ash in the waste in those

Industrial solid waste in the Asian and Pacific Region, as elsewhere, encompasses a wide range of materials of varying environmental toxicity. Typically this range would include paper, packaging materials, waste from food processing, oils, solvents, resins, paints and sludges, glass, ceramics, stones, metals, plastics, rubber, leather, wood, cloth, straw, abrasives, etc. As with municipal solid waste, the absence of a regularly up-dated and systematic database on industrial solid waste ensures that the exact rates of generation are largely unknown.

Industrial solid waste generation varies, not only between countries at different stages of development but also between developing countries

Expanding agricultural production has naturally resulted in increased quantities of livestock waste, agricultural crop residues and agro-industrial by-products. Table 8.3 provides an estimate of annual production of agricultural waste and residues in some selected countries in the region (ESCAP 1997); the implications of liquid and slurry waste for receiving inland and coastal waters is examined in Chapter 4.

Among the countries in the Asian and Pacific Region, People's Republic of China produces the largest quantities of agriculture waste and crop residues followed by India.

With rapid development in agriculture, industry, commerce, hospital and health-care facilities, the Asian and Pacific Region is consuming significant quantities of toxic chemicals and producing a large amount of hazardous waste. Currently, there are about 110 000 types of toxic chemicals commercially available. Each year, another 1 000 new chemicals are added to the market for industrial and other uses.

The availability of robust data on the generation of hazardous waste for the Asian and Pacific Region is limited by the reliability of information on the quantities and types of hazardous waste produced at the country level.

Most hazardous waste is the by-product of a broad spectrum of industrial, agricultural and manufacturing processes, nuclear establishments, hospitals and health-care facilities. Primarily, high-volume generators of industrial hazardous waste are the chemical, petrochemical, petroleum, metals, wood treatment, pulp and paper, leather, textiles and energy production plants (coal-fired and nuclear power plants and petroleum production plants). Small- and medium-sized industries that generate hazardous waste include auto and equipment repair shops, electroplating and metal finishing shops, textile factories, hospital and health-care centres, dry cleaners and pesticide users.

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18

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The economic growth and urbanization experienced in many parts of the Asian and Pacific Region over the past 10-15 years, has significantly escalated the quantities of MSW being generated in many cities, including Bangkok, Beijing, Mumbai, Calcutta, Colombo, Dhaka, Hanoi, Jakarta, Kuala Lumpur, Manila and Shanghai (United Nations 1995, Koe and Aziz 1995). Uncontrolled, open dumping on the peripheries of many of the region's cities has resulting in the degradation of valuable land resources and the creation of long-term environmental and human health problems.

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For much of the Asian and Pacific Region, the incineration of MSW remains an expensive and technically inappropriate waste disposal solution. The development of waste incineration facilities has been constrained by the high capital, operating and maintenance costs and by increasingly stringent air pollution control regulations (UNEP 1998). In addition, the combustible fraction of much of the MSW generated in the low and middle-income countries of the region is relatively low, with high organic and moisture contents.

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At a slightly larger scale, the composting of organic MSW with agricultural waste and sludge from municipal sewage treatment plants is being piloted in Australia, Bangladesh, People's Republic of China, India, Philippines and Thailand. However, land availability, high operational, maintenance and transportation costs and incomplete waste material segregation remain major constraints to the adoption of co-composting.

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See also & with in ALEGATO (18)