

# III. WASTE MANAGEMENT

Economic growth, urbanisation and industrialisation result in increasing volumes and varieties of both solid and hazardous wastes. Globalisation can aggravate waste problems through growing international waste trade, with developing countries often at the receiving end.

Besides negative impacts on health as well as increased pollution of air, land and water, ineffective and inefficient waste management results in greenhouse gas and toxic emissions, and the loss of precious materials and resources.

An integrated waste management approach is a crucial part of international and national sustainable development strategies. In a life-cycle perspective, waste prevention and minimization generally have priority. The remaining solid and hazardous wastes need to be managed with effective and efficient measures, including improved reuse, recycling and recovery of useful materials and energy.

The 3R concept (**Reduce, Reuse, Recycle**) encapsulates well this life-cycle approach to waste.



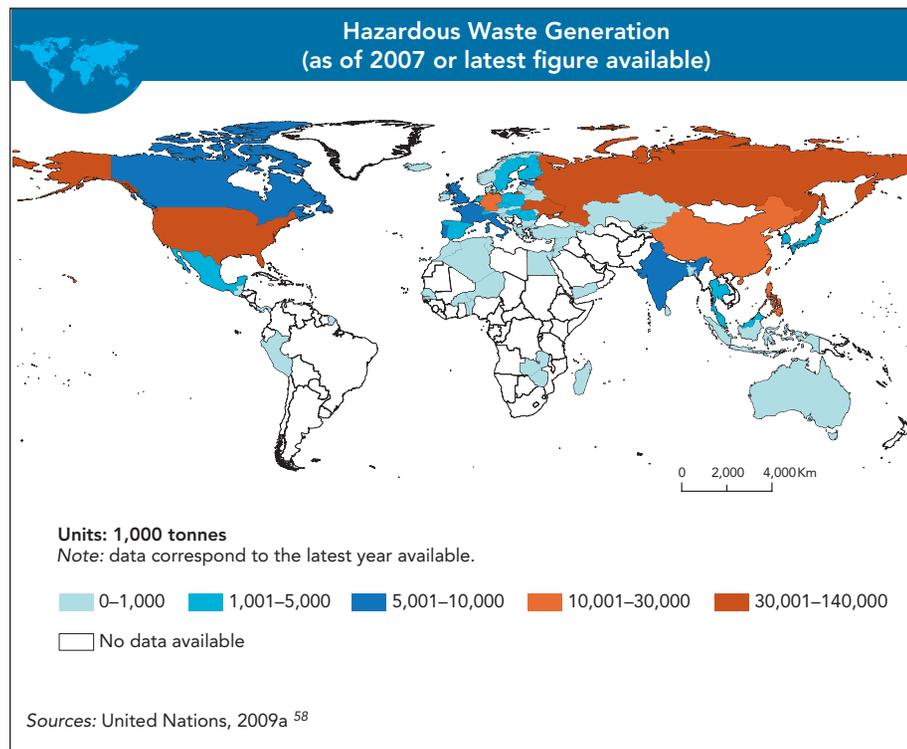
“Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we’ve been ignorant of their value.”

— R. Buckminster Fuller  
Scientist (1895–1983)

## Hazardous waste

Hazardous waste, owing to its toxic, infectious, radioactive or flammable properties, poses an actual or potential hazard to the health of humans, other living organisms, or the environment.

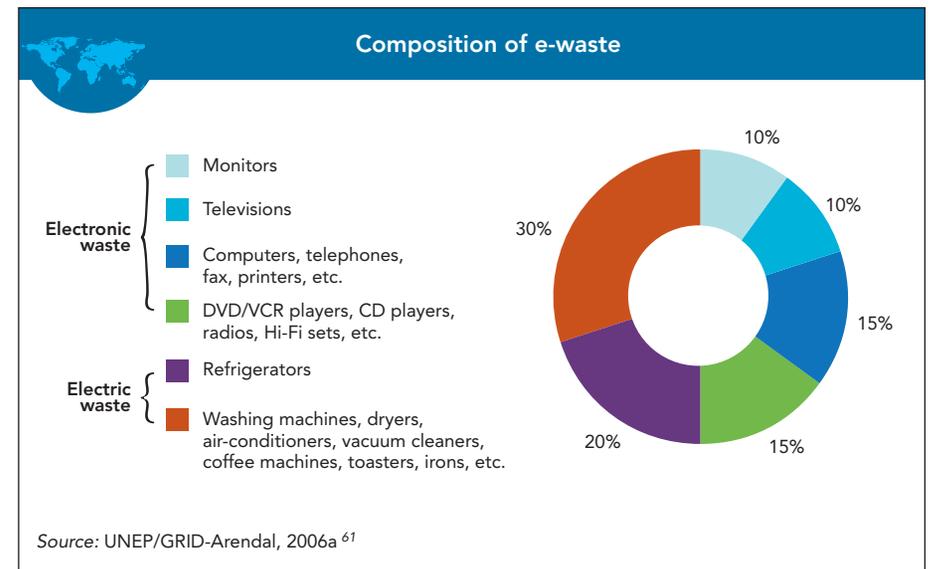
No data on hazardous waste generation are available for most African, Middle Eastern and Latin American countries. This is due in part to absence of proper waste management, lack of awareness about the health hazards from wastes and insufficient financial and human resources. The United States of America and Russia generate the greatest amounts of hazardous waste.



## A growing share of municipal waste contains hazardous electronic or electric products. In Europe e-waste is increasing by 3–5 per cent per year.

According to UNEP, some 20 to 50 million metric tonnes of e-waste are generated worldwide every year. Other estimates expect computers, mobile telephones and television to contribute 5.5 million tonnes to the e-waste stream in 2010, a figure which could rise to almost 10 million tonnes in 2015.<sup>59</sup> Already in 2005 it was estimated that waste electrical and electronic equipment (WEEE) constitutes about 8 per cent of municipal waste in developed countries and is one of the fastest growing waste components.<sup>60</sup>

More than 90 per cent of discarded computers from the developed world are exported to developing countries such as China, Ghana, Pakistan, and India, purportedly for recycling. Many end up, however, in toxic wastelands where the heavy metals and toxic chemicals are released into the soil, atmosphere and water supply.



**A study in India showed that 95 per cent of e-waste is segregated, dismantled and recycled in the informal sector based in urban slums<sup>62</sup>**

Mumbai is the financial and commercial hub of India and most of the country's imports and exports flow through the city. In addition, the Greater Mumbai Metropolitan Region is an important manufacturing hub for all industries, including the electrical and electronics sectors. Hence, Mumbai has a large base of manufacturers, government users and companies who use office electronics such as PCs, that become e-waste at their end-of-life. There is also a large market of household users of electronic and electrical products.

At the moment there are no set procedures or legislation regulating e-waste in India. The e-waste is mostly taken by scrap dealers, either collected from various users and scavengers or bought at auctions from large companies. The re-usable parts are sold as spares and the rest is used to recover various metals. The biggest environmental and health hazards come from the recovery of metals such as gold, silver, copper etc. The residues which contain heavy metals and toxic organic traces are often dumped in the open.

Source: Toxics Link, 2009

One of the most important legislative options available to both developed and developing countries to reduce the amount of e-waste is the adoption of extended producer responsibility, which makes manufacturers responsible for recovery and recycling or safe disposal of their products at the end of their useful lives. Market-based certification programs such as the e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment<sup>63</sup> assure consumers of sound disassembly of electronic products and prohibit exportation of e-waste.<sup>64</sup>



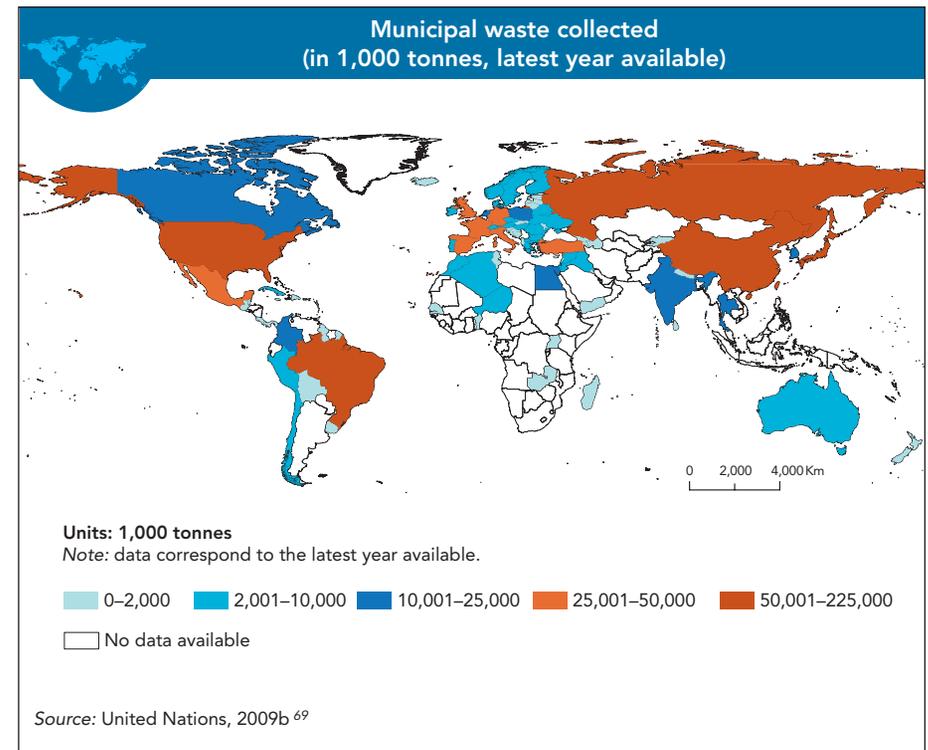
## Solid waste

The overall generation of municipal waste per capita in western European countries has stabilised since 2000 at a high level. The average amount of municipal waste generated per capita in many western European countries still exceeds 550kg per year.

Since 1980 the quantity of municipal waste generated in the OECD area has risen and in 2006 exceeded 650 million tonnes (560 kg per inhabitant). "Generation intensity per capita has risen at a lower rate than private final consumption expenditure and GDP, with a significant slowdown in recent years" (OECD, 2008e). The EU-12 group — minus new member states — has seen a steady decrease in per capita generation over the same period albeit with a slight increase between 2005 and 2006.

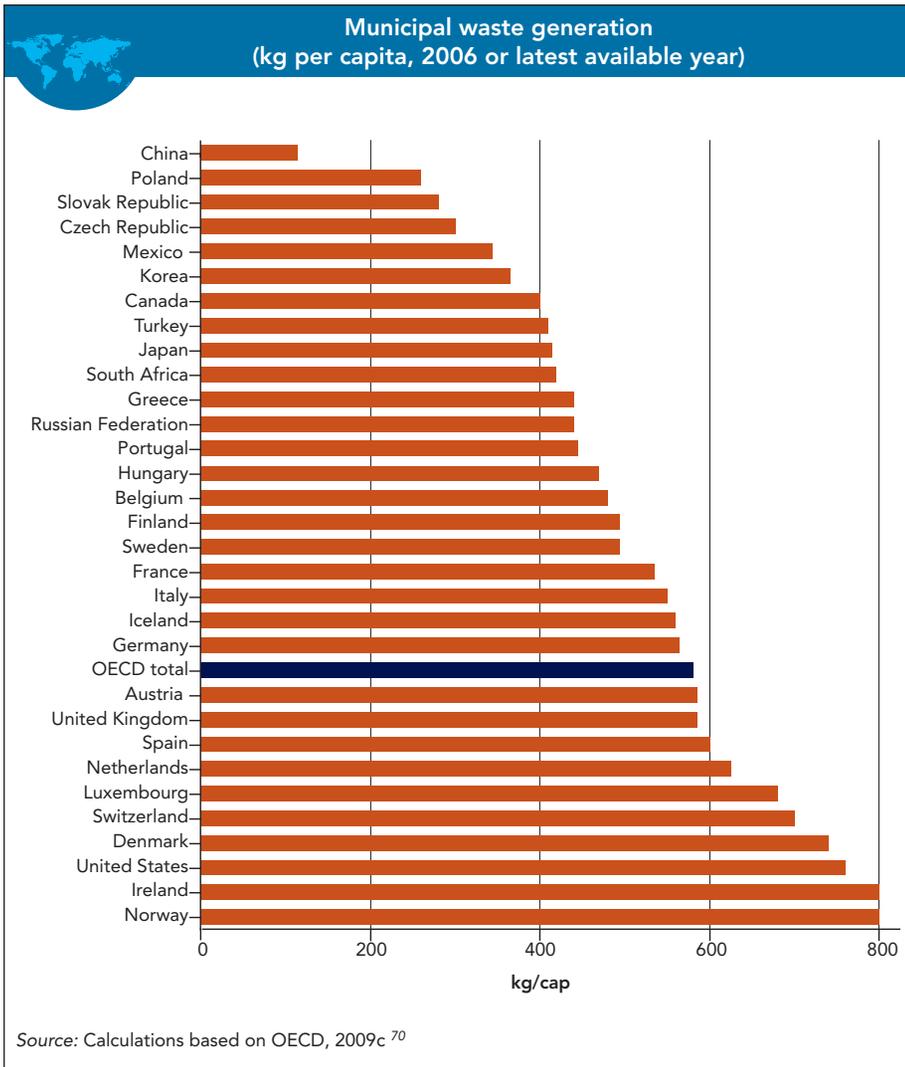
Urban areas in the Caribbean and Latin America generate a large amount of solid waste per day and projections are that the region's municipal solid waste will increase from 131 million tons in 2005 to roughly 179 million tons in 2030.<sup>66</sup> Given the continuation of urbanization and economic growth, the projected amount of solid waste generation appears conservative. There is need for engineered landfills as a waste disposal solution that is more environmentally acceptable than open dumpsites and uncontrolled burning of waste.<sup>67</sup>

Urbanization and economic growth are also the main drivers of increasing waste generation in Africa and Asia. Of the approximately 200 million tonnes of waste generated annually in Africa, an estimated 30–50 per cent is not properly disposed and presents a severe health and environmental hazard.<sup>68</sup>

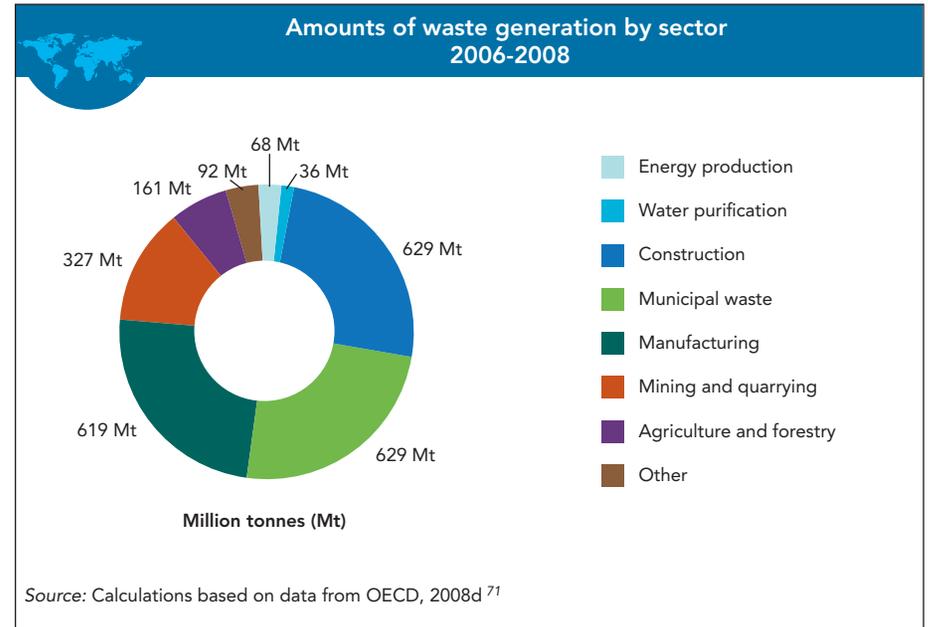


**“To waste, to destroy, our natural resources, to skin and exhaust the land instead of using it so as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them amplified.”**

— Theodore Roosevelt  
26th President of the United States of America



Municipal waste data are patchy, but for those countries with data per capita municipal waste generation varies by almost an order of magnitude, from around 100 kg per capita in China to around 800 kg in Ireland and Norway.

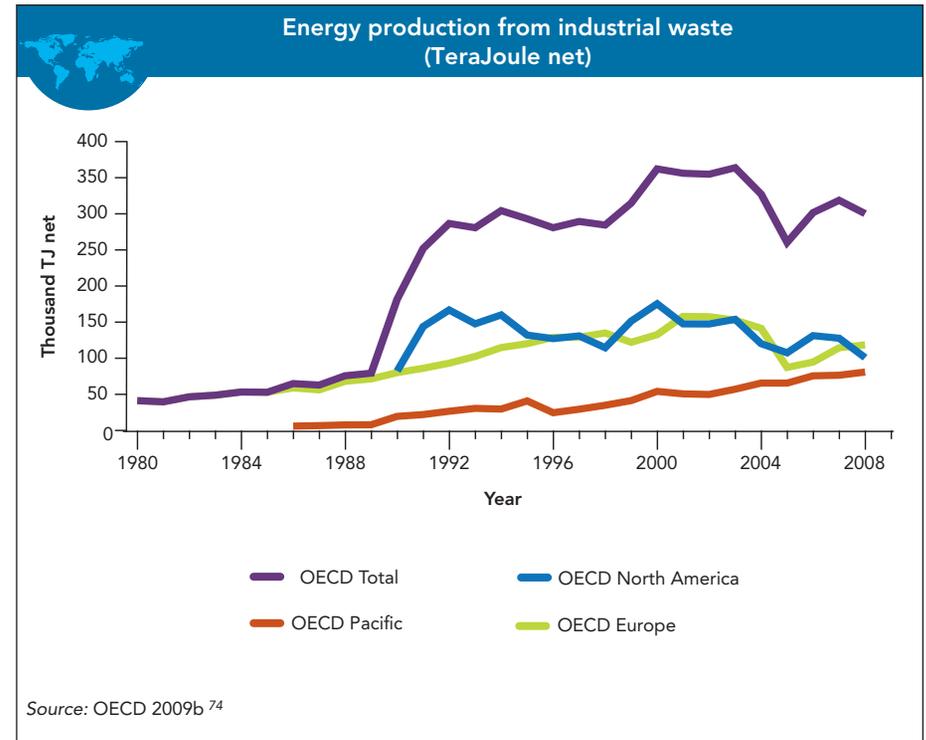


In OECD data, construction is a major source of waste, equal in volume (629Mt) to municipal waste. Manufacturing waste is only marginally smaller. The mining sector ranks next with an amount of waste a little over half the size of construction or municipal waste (327Mt). These wastes can constitute a serious health and safety hazard. European Environment Agency's member countries alone account for 29 per cent of total mining waste generated.

**Waste-to-energy is a growing field. The EU considers waste-to-energy as the preferred method of waste disposal. The facilities in Europe can provide 32 million inhabitants with heat and 25 million with electricity.**

Energy recovery from industrial waste in OECD countries has shown no clear trend since the early 1990s, though OECD Pacific energy recovery has been increasing steadily from negligible levels.

Energy recovery from renewable and non-renewable municipal waste has, by contrast, shown a steady increase since the late 1980s, particularly in Europe. This is an explicit result of government policies: e.g. continuous support for the currently 420 waste-to-energy plants across Europe<sup>72</sup> and working towards binding targets in 2020 under the EU Renewable Energy Directive<sup>73</sup>.



### Partnerships for solid waste management in Matale, Sri Lanka

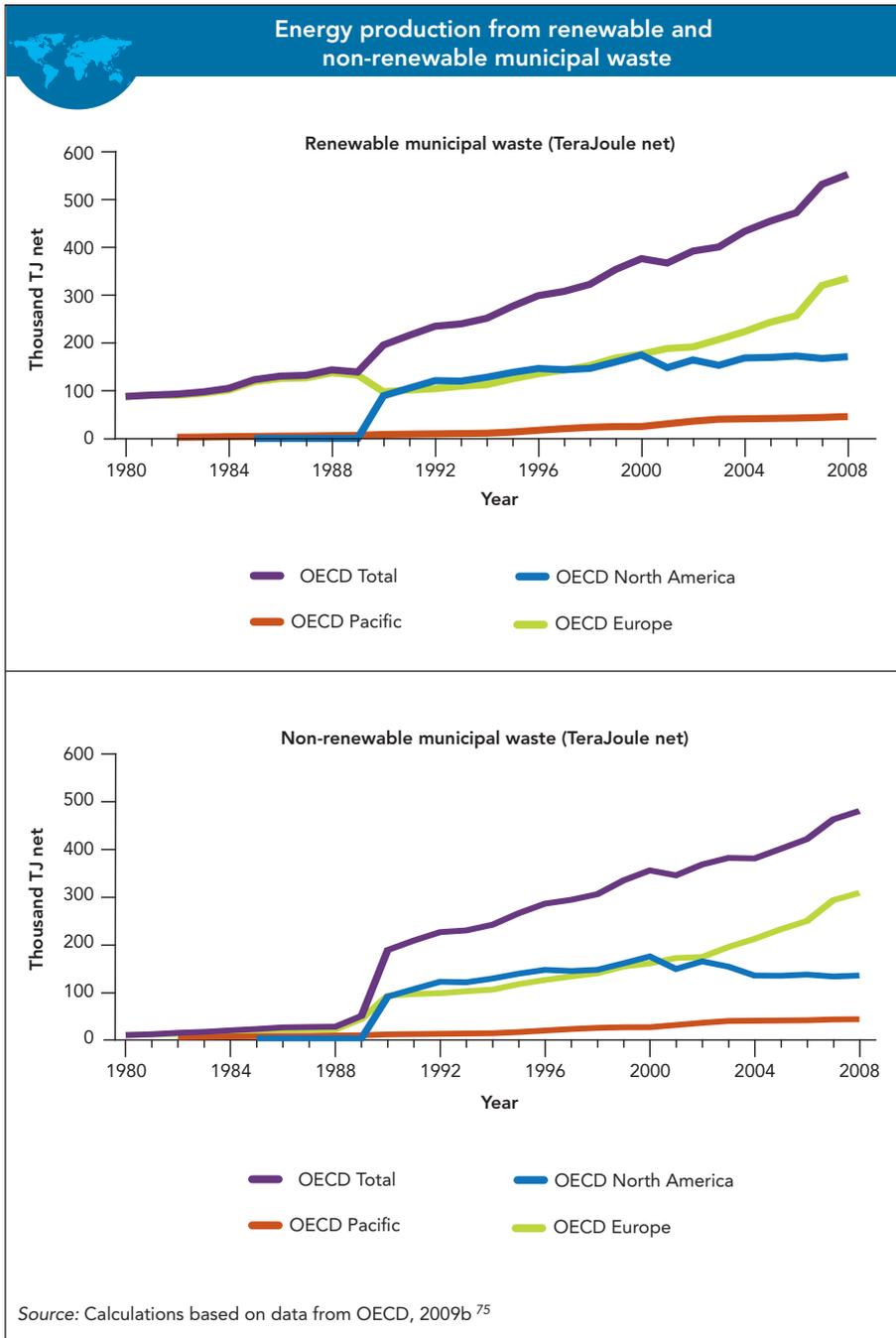
When the landfill site in Matale, a town of 40,000 people in Sri Lanka, was full, local authorities approached SEVANATHA, an NGO, for advice. As 80 per cent of the solid waste in Matale is organic, SEVANATHA suggested individual barrel composting and the creation of a recycling/composting centre. The municipality provided the barrels to households and built a recyclable goods processing centre. SEVANATHA trained households on how to separate waste. This solution turned out not to be ideal as households soon stopped separating their waste and continued dumping on landfills.

In 2004 SEVANATHA proposed a new approach under which waste is treated as a resource, waste collection services are improved and waste pickers provided with better income and working conditions. Among other measures, Matale decided to build a new composting plant adjacent to the old recycling centre. Operational since 2007, the plant serves about 1,000 households and treats 3 tons of organic wastes

per day. Households pay a collection fee and separate the waste into wet and dry waste which is collected by hand carts. Since the waste collection takes place daily, this means that the organic waste does not get contaminated, which leads to high quality compost. At the plant it is sorted for a second time and the organic waste is composted and used by spice gardens around Matale. The plant meets its operating costs. Composting organic waste rather than just dumping it means avoiding methane formation and release into the atmosphere.

As of 2009, the waste management approach was further developed into decentralized 'Integrated Resource Recovery Centers' (IRRCs). Besides composting, IRRCs will have bio-digesters, recyclable material processing centers and vacu trucks to collect sludge from septic tanks and pit latrines.

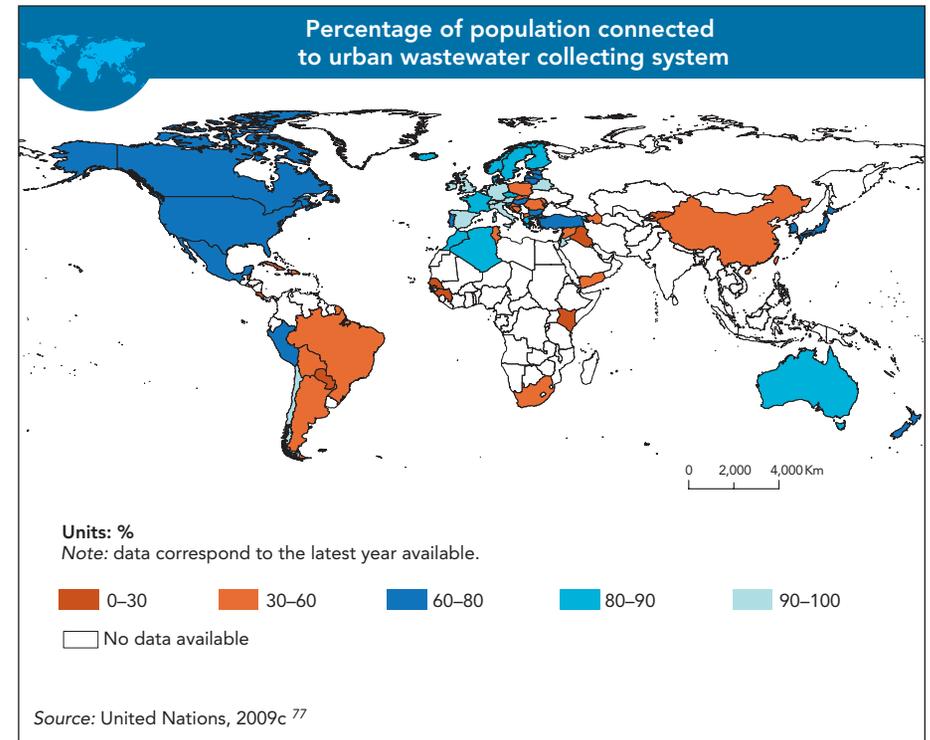
Source: UNESCAP Sustainable Urban Development Unit, 2009 (Unpublished)



## Waste Water

The percentage of population connected to an urban wastewater collection system is lowest in Africa and Asia. It is highest in Europe partly because of the European Council's Directive (91/271/EEC) on urban waste-water treatment. The objective of this directive, adopted in 1991, is to protect the environment and health from the adverse effects of untreated municipal waste water and industrial waste water discharges.

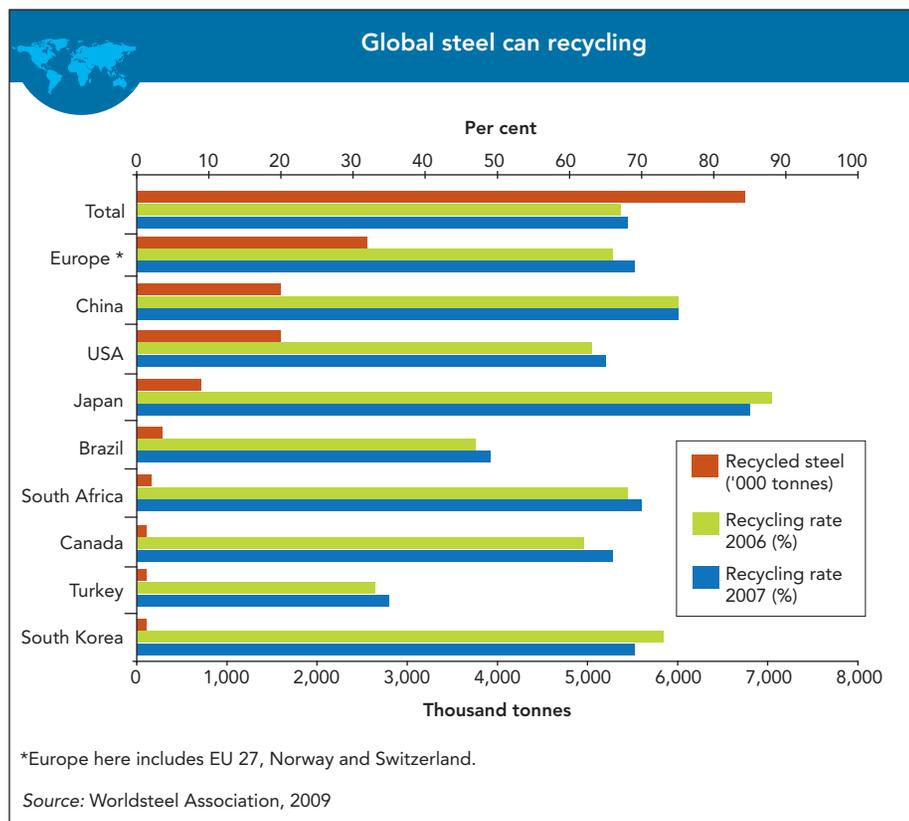
Chile is an example of good waste water management and connectivity achieved through a modern regulatory system put in place in the late 1980s and leading to privatization of water and sanitation in the late 1990s. An innovative feature of the policy is an effective subsidy to satisfy water demand of the poor.<sup>76</sup>



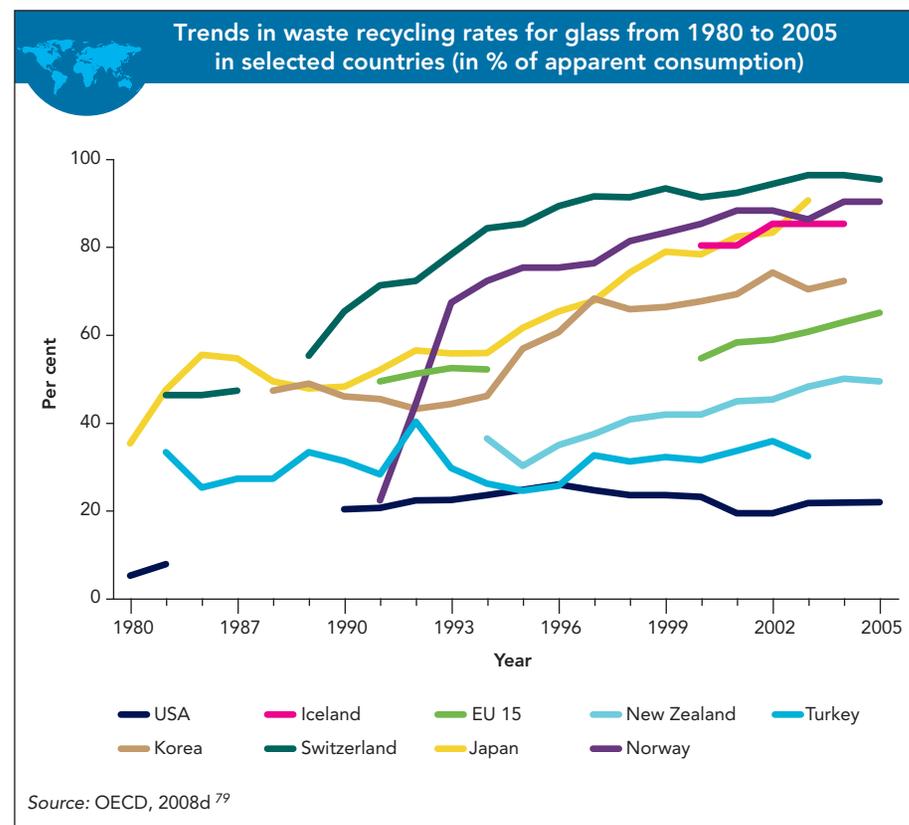
## Recycling

### Recycling is an effective means to reduce energy use, CO<sub>2</sub> emissions and waste at the same time.

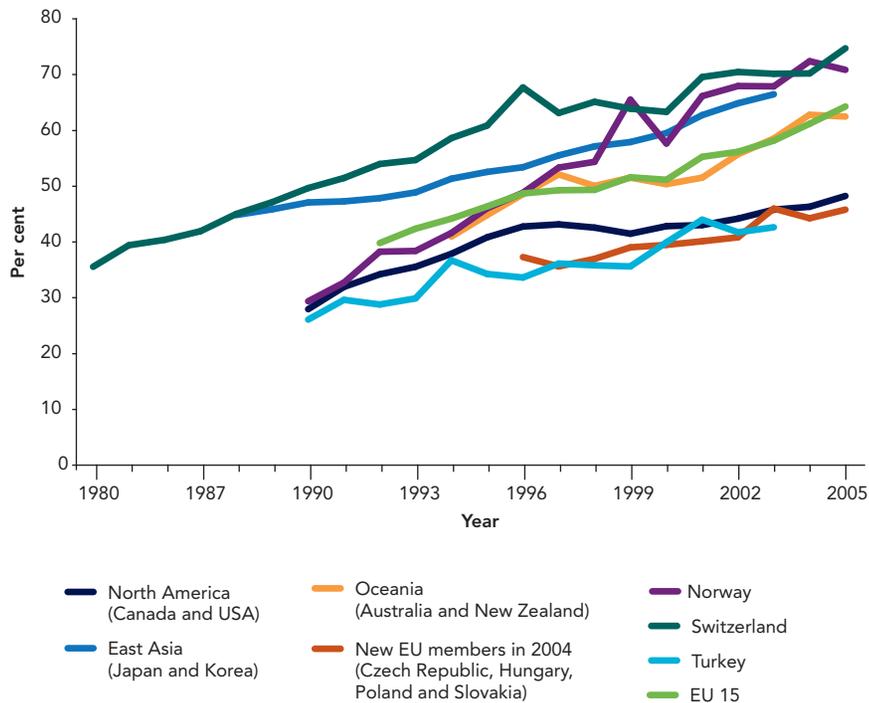
The global recycling rate for steel cans was 68 per cent in 2007. The recycling of 7.2 million metric tons of steel cans across 37 countries reporting to the World Steel Association avoided approximately 13 mmt of CO<sub>2</sub> emissions in 2007. In many OECD countries, steel can recycling rates on the national level have increased substantially. Belgium and Germany achieve the highest steel can recycling rates of 93 per cent and 91 per cent, while the United States of America reached a rate of 65 per cent in 2007 and South Africa 70 per cent.<sup>78</sup> The recycling rates in Asia have either remained constant (in China with 75 per cent) or decreased as in Japan (from 88 per cent to 85 per cent) and South Korea (from 73 per cent to 69 per cent).



Many countries around the world have developed national policies and strategies in line with a 3R approach to waste (reduce, reuse, recycle). The 3R policy in Germany has stabilized waste volumes over the past 15 years and the country hopes to end landfilling by 2020. The Brazilian government promotes separated garbage collection in municipalities and in the private sector the aluminium can recycling rate has reached 95 per cent. This puts Brazil among the ranks of the world's recycling leaders such as Japan. With the establishment of the "Containers and Packaging Recycling Act", Japan promotes recycling as good citizenship behaviour, while Brazil uses economic incentives to encourage recycling. In addition, the size of a country and to some extent the population density matter: large total land area (e.g. the United States of America) means that the costs for landfills and waste disposal are on average lower than in countries with smaller total land area (e.g. Japan).



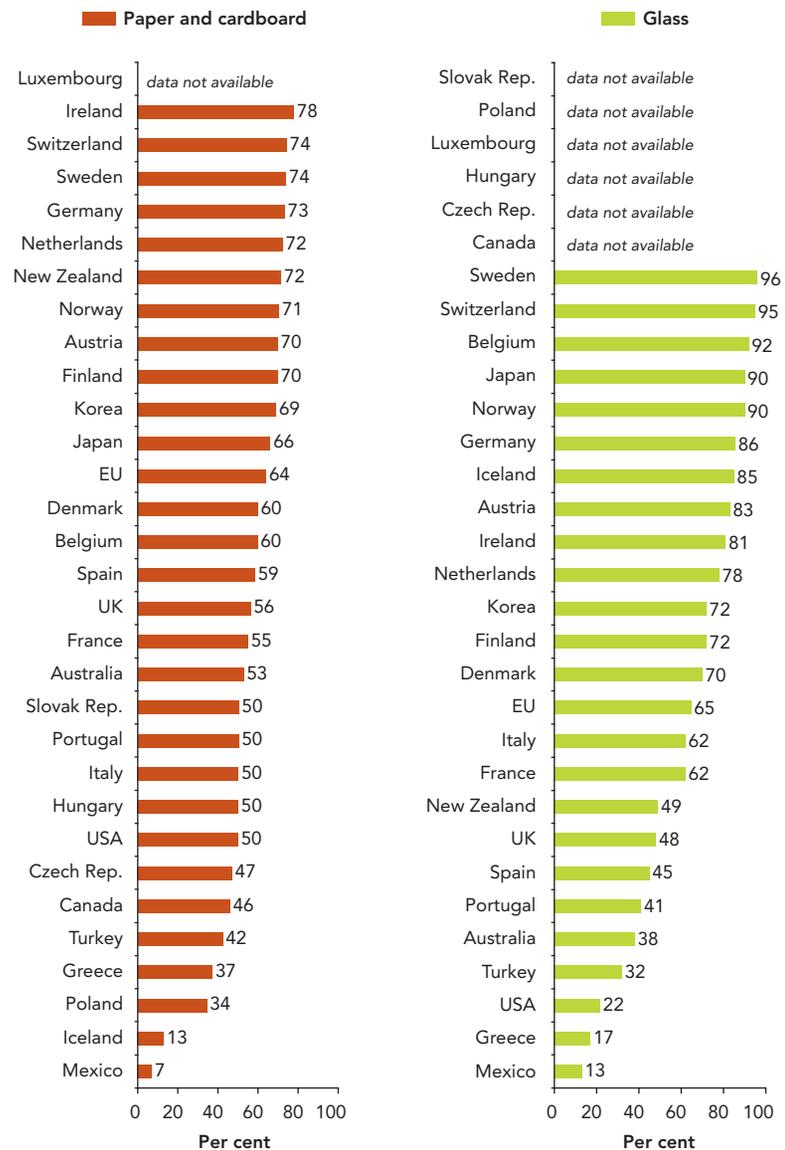
Trends in waste recycling rates for paper and cardboard from 1980 to 2005 (in % of apparent consumption)



Source: OECD, 2008d <sup>80</sup>

Ireland (81 per cent of glass and 78 per cent of paper and cardboard), Sweden (96 per cent of glass and 74 per cent of paper and cardboard) and Switzerland (95 per cent of glass and 74 per cent of paper and cardboard) lead the countries with the highest rates of waste recycling. Norway and New Zealand follow. Even though New Zealand has a low population density and is a large country in terms of total land area, its citizens appear relatively environmentally conscious. The general trend throughout the last 25 years indicates a growth in recycling rates with the exception of the United States of America and Turkey for glass recycling.

Status of waste recycling in 2005 (or latest year available) (in % of apparent consumption)



Source: OECD, 2008d <sup>81</sup>

## Los Angeles, a case for Zero Waste

As defined by the Grass Roots Recycling Network, Zero Waste includes recycling but goes beyond to address the reduction of “upstream” waste created through mining, extraction, and manufacturing of products. Zero waste maximizes recycling, minimizes waste, reduces consumption and encourages the development of products that are made to be reused, repaired or recycled back into nature or the marketplace.

Achieving zero waste by 2030 is an expressed goal of Los Angeles and is consistent with its goal to be a sustainable city. For the first time in the history of solid waste planning within the city, Los Angeles is developing a Solid Waste Integrated Resources Plan. This plan seeks input from stakeholders representing a broad section of the community, from diverse cultural backgrounds and income levels, and will result in the development and implementation of a 20 year master plan for the City’s solid waste and recycling programs.

Currently the city diverts 62 per cent of its waste from landfills and the goal set by the Mayor and City Council is 70 per cent by 2015 and 90 per cent by 2025. Los Angeles aims to, for example, encourage the establishment of small, local processing centers and will convert 80 to 90 per cent of trash into energy or reuse. Its restaurant industry will be green in ten years and government services will be paperless.

Source: <http://www.zerowaste.lacity.org>

**“The parties to this convention are convinced that States should take necessary measures to ensure that the management of hazardous wastes and other wastes including their transboundary movement and disposal is consistent with the protection of human health and the environment whatever the place of disposal.”**

*— Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992)*