






## 12. Waste and material flows

policy issue	indicator	assessment
decoupling resource use from economic activity	total material requirement	
decoupling waste generation from economic activity	total waste generation	
reducing generation and disposal of municipal waste	municipal waste generated and landfilled/incinerated	
effectiveness of the Packaging and Packaging Waste Directive	packaging waste	
reducing generation of hazardous waste	hazardous waste generated and landfilled	

*The resource productivity of the EU's economy is improving and total waste generation appears to be decreasing in some countries. The latter trend is due mainly to the stabilisation or even decrease in the generation of industrial and mining waste in those countries. In contrast, consumer and commercial behaviour is resulting in increases in the generation of municipal waste including packaging waste. In some countries the environmentally-sound move from landfilling to recycling can be observed. However, many countries still have a long way to go to meet policy targets and manage materials and waste streams in a more sustainable way.*

The generation of waste represents a loss of materials and energy. Excessive quantities of waste result from inefficient production processes, low durability of goods and unsustainable consumption patterns. While total waste quantities indicate a loss of resources to some extent, the hazardous substances contained in products and in waste and their release into the environment determine the priorities for effective waste management, so that extensive environmental hazards can be avoided. In EU policy-making this is expressed in the selection of priority waste streams.

The EU Sustainable Development Strategy and the sixth environmental action programme (6EAP) both recognise the link between resource

efficiency and waste generation and mention breaking the link between economic growth, the use of resources and the generation of waste as an important objective. A number of policies and Directives have been put into place in recent years to reduce the generation of waste. In addition, the European Commission is currently preparing a thematic strategy on the sustainable use and management of resources, which will include proposals to reach the 6EAP's objectives.

For wastes that continue to be generated, the 6EAP aims at a situation where:

- the wastes are non-hazardous or at least present only very low risks to the environment and human health;
- most of the wastes are either reintroduced into the economic cycle, especially by recycling, or returned to the environment in a useful (e.g. composted) or harmless form;
- the quantities of waste that still need to go to final disposal are reduced to an absolute minimum and are safely destroyed or disposed of;
- waste is treated as close as possible to where it is generated.

## 12.1. Total material requirement

The total material requirement (TMR) indicator comprises the cumulative volume of primary materials (excluding water and air) extracted from nature for the economic activities of a country. TMR is a highly aggregated indicator, with all resource flows aggregated in tonnes. It indicates a generic pressure on the environment, hence cannot be used to indicate specific environmental pressures. From a systems perspective, any flows of material into the economy will lead to output flows sooner or later, many of them at other locations and with a changed composition. Thus, TMR indicates the total volume of material throughput of the economy, that is, the total amount of products, waste and emissions (EEA, 2001; Eurostat, 2001).

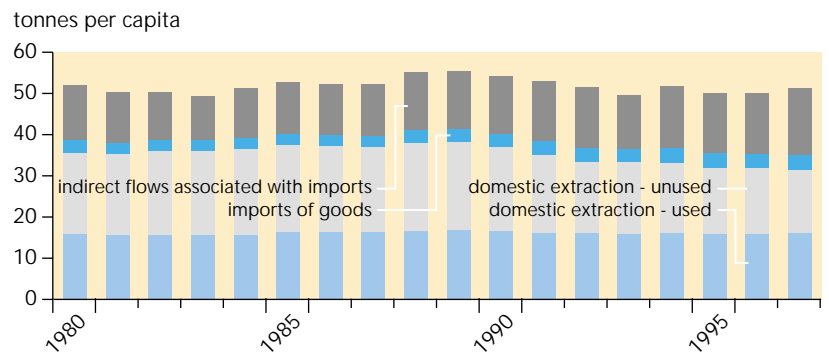
The TMR for the EU economy has remained relatively constant since 1980, fluctuating around 51 to 52 tonnes per capita each year and demonstrating some degree of decoupling from economic growth.

Non-renewable resources dominate the EU's TMR and remain at a high level. With the growing importance of external trade and a reduction of domestic resource extraction, imports and associated indirect (hidden) flows (the 'foreign' part of TMR) have increased from around 15 tonnes per capita during the mid 1980s to 20 tonnes per capita in the late 1990s (almost 40 % of TMR). This trend is also reflected in the fact that the amount of mining waste in European countries is falling (reduction of domestic resource extraction).

Another trend is that the share of 'hidden' flows not directly entering the EU economy (the sum of unused domestic extraction and the indirect flows associated with imports), has been decreasing slightly, indicating a slightly more efficient use of primary resources. However, this effect is based only on reduced domestic 'hidden flows' (unused domestic extraction), while foreign 'hidden flows' (indirect flows associated with imports) have been increasing.

Composition of Total Material Requirement, EU

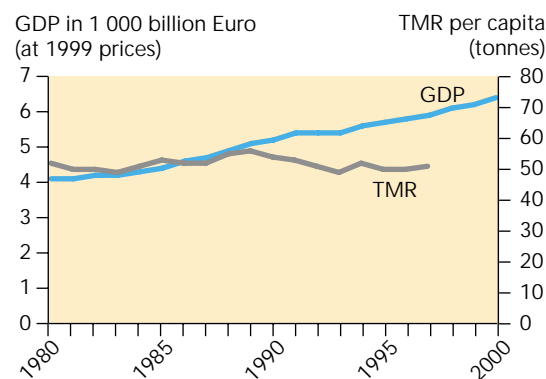
Figure 12.1.



Source: Eurostat; Wuppertal Institute

Total material requirement per capita versus economic growth, EU

Figure 12.2.



Source: Eurostat; Wuppertal Institute



Total use of materials has been relatively de-coupled from economic growth over the past two decades, but the total use of natural resources is still at a high level.

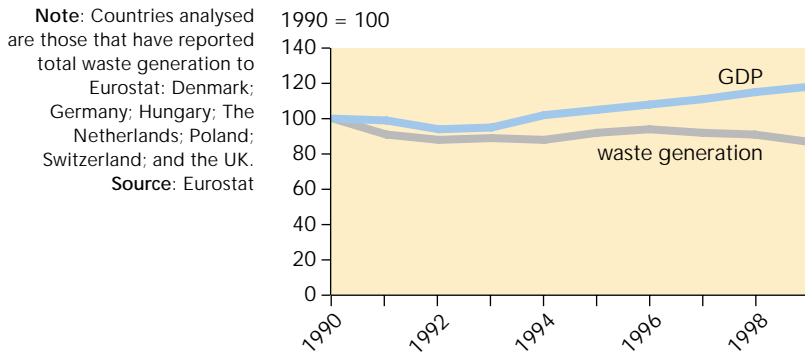
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Figure 12.3.

Waste generation and gross domestic product in selected European countries



## 12.2. Total waste generation

The overall aim of the European waste management policy is to prevent waste being generated and an objective of the 6EAP is to de-couple waste generation from economic growth.

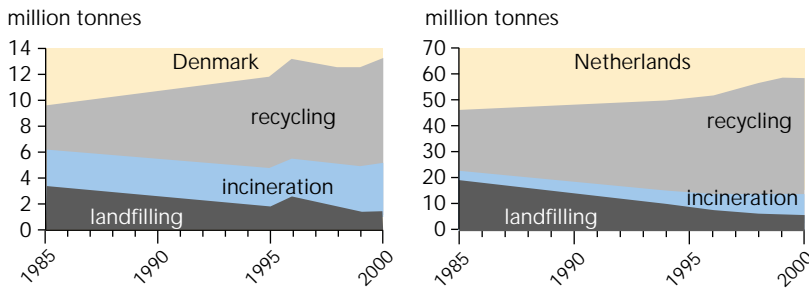
Waste generation seems to be decreasing in some European countries and amounted at the end of the 1990s to about 3.5 tonnes of solid waste per person per year (excluding agricultural waste), originating mainly from manufacturing, construction and demolition, and mining activities.

Waste generation showed a tendency to de-couple from economic growth, in the same way that economic growth in the EU was achieved without an increase in TMR.

Data limitations prevent a comprehensive assessment of most of the waste streams in Europe. Indicators for some waste streams (e.g. municipal waste, construction/demolition waste) point in the direction of increasing waste generation, but for others the trends are more complex. For manufacturing industries, waste generation appears to be stable in the EEA18 countries whereas in the accession countries there has been a considerable increase of generation from basic metal industries and food manufacturing. Municipal waste quantities in the EEA18 countries, but not in the accession countries, are still increasing. Construction and demolition waste quantities are also increasing and are closely correlated with economic growth. New waste streams have also emerged in recent years, namely those generated by environmental amelioration measures in other fields such as sewage sludge from wastewater treatment plants and flue-gas cleaning residues.

Figure 12.4.

Development in treatment of waste



Note: Treatment and disposal of waste causes a number of environmental pressures, such as use of land for landfills; leaching of nutrients, heavy metals and other toxic compounds from landfills; low biodegradation of wastes; emission of greenhouse gases from landfills and other treatment of organic waste; air pollution and toxic by-products from incinerators; air and water pollution and secondary waste streams from recycling plants; increased transport causing indirect effects.

Source: EEA



Limited data indicate that total waste generation seems to be de-coupling from economic growth in the countries analysed.

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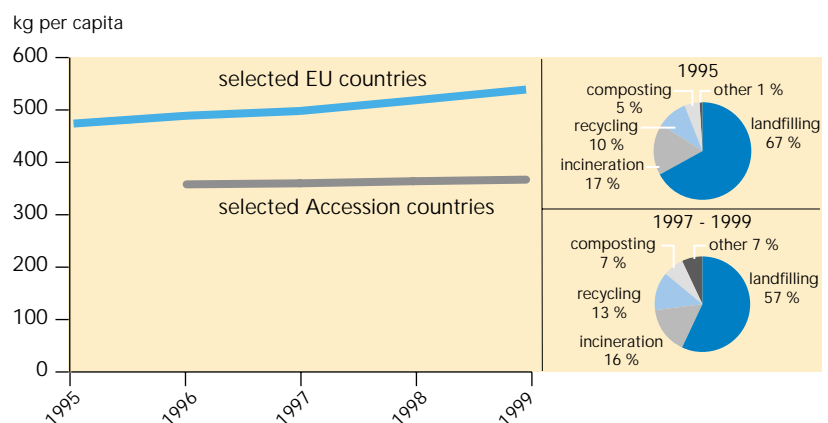
### 12.3. Municipal waste generated and landfilled/incinerated

Municipal waste makes up approximately 14 % of total waste. Meeting the objective set in the fifth environmental action programme (5EAP), to stabilise the generation of municipal waste per capita, has not been realised. The next programme (6EAP) addresses this issue more broadly, with objectives and options for waste prevention and management aiming at the highest possible re-introduction of wastes into the economic cycle and the safe disposal of minimum waste quantities.

Most EU countries have similar levels of waste generation per capita from daily household and commercial activities, despite variations in income level. In accession countries, this appears to be considerably lower than in EU countries, which may be explained by different consumption patterns, systems for municipal waste collection and disposal, and bases for waste classification and reporting.

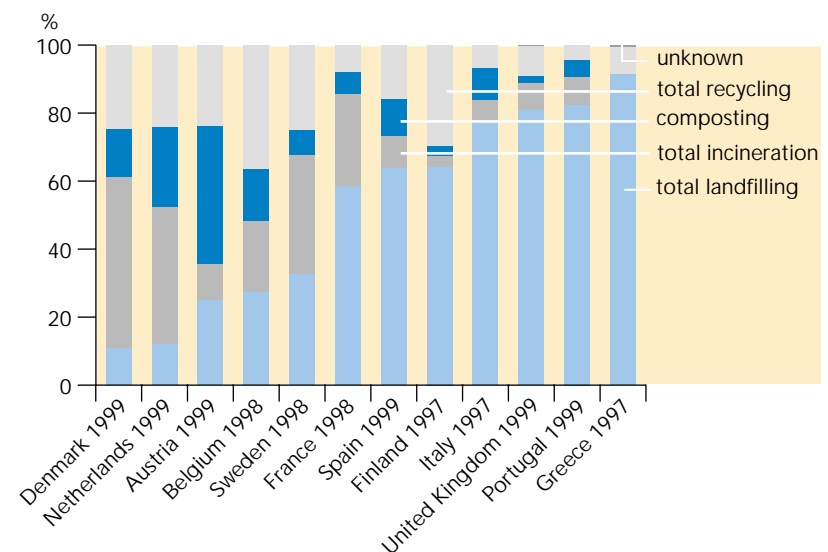
In recent years there has been a reduction in the percentage of waste being disposed of, linked with an increase in recycling rates. However, landfill remains the prevailing option in many EU countries; there is a clear distinction between ‘landfilling’ and ‘non-landfilling’ countries, with the choice of options depending on factors such as traditional practice, public acceptance and the availability of land for landfill sites. The EU Landfill Directive (1999/31/EC) promotes the reduction of landfilled waste by making provisions that the quantity of biodegradable material to be landfilled should be reduced to 35 % of 1995 levels by 2016. Biodegradable waste counts for approximately two thirds of total municipal waste quantities. Only a few EU Member States have reached this target (see *Environmental signals 2001*, Chapter 14) whereas in accession countries the fraction of municipal waste going to landfill is generally more than 90 % and in many cases very close to 100%.

Collection and treatment of municipal waste in selected EU and accession countries Figure 12.5.



Notes: Selected EU countries: Belgium; Denmark; Italy; Luxembourg; Netherlands; Portugal; Spain; and United Kingdom. Selected Accession Countries: Czech Republic; Estonia; Hungary; Lithuania; Poland; and Romania.  
Source: Eurostat

Treatment of municipal waste, EU Figure 12.6.

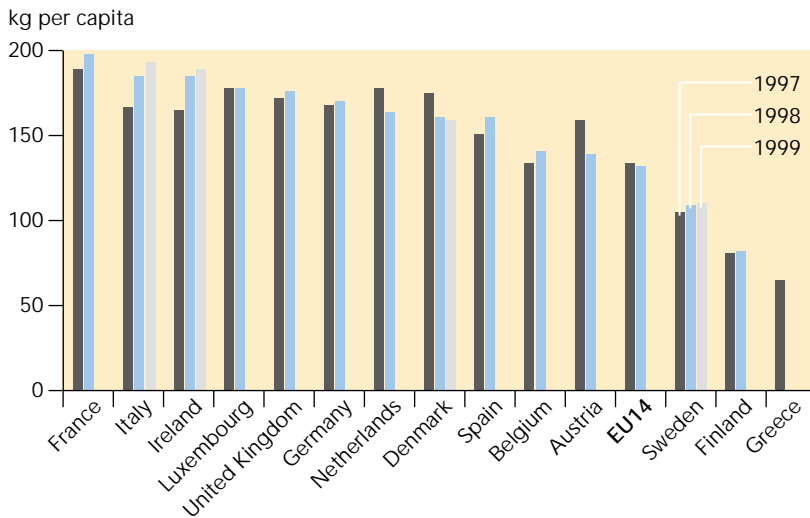


Notes: Using Member States definitions. Recycling schemes are operated in all EU Member States and, on average, 13 % of waste from daily household and commercial activities are collected separately for recycling. The average figure does not reflect the large variations encountered, with an average of 20 % separately-collected waste in the northern part of the EU compared with 5 % in southern Europe.  
Source: Eurostat

☹️ Generation of municipal waste in EU countries continues to increase and averaged 540 kg per capita in 1999.

Quality of information ☆☆☆

Figure 12.7. Packaging material put on the market



Note: reused packaging is only included when new packaging enters the market on first trip. Variations in the reported use of packaging per capita in Member States may be partly explained by different reporting systems (e.g. different estimates of packaging imported with goods, inclusion/exclusion of reused packaging materials, exclusion of materials such as textile and wood from reporting, and different stock accounting).  
Source: European Commission

## 12.4. Packaging waste

Packaging materials have only a short useful lifetime and soon become waste that must be treated or disposed of. Packaging waste is one of ten priority waste streams for the EU. The Packaging Waste Directive (94/62/EC) aims, as a first priority, to prevent the generation of this kind of waste.

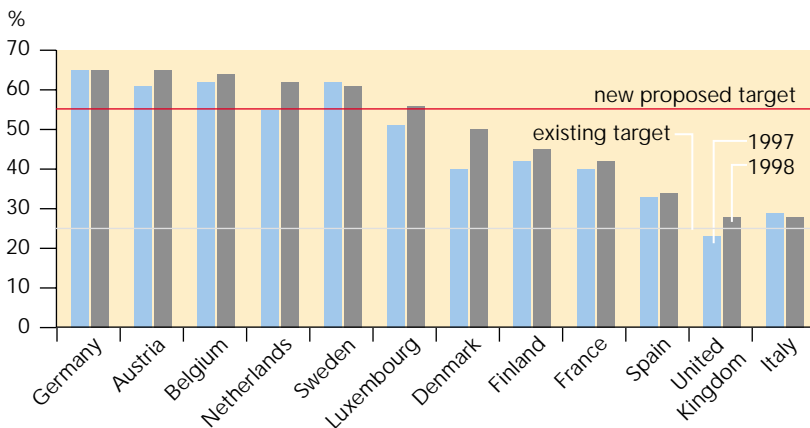
Based on two or three years' data, only from Austria, Denmark, The Netherlands and Luxembourg, the quantity of packaging put on the market has remained constant or been reduced. In countries with a relative success in waste prevention, instruments such as a substantial tax on goods that are quickly disposed of (such as packaging) and schemes for the reuse of packaging have been introduced, but the decrease is still moderate.

Additional measures from the Packaging and Packaging Waste Directive include the reuse of packaging, recycling and other forms of recovery of packaging waste, with a minimum recycling target for all packaging materials of 25 %. This target has been achieved (the average recycling rate in EU12 is around 50 %). The total recycling rate increased from 1997 to 1998 in all the Member States.

The proposed revision of the Packaging Waste Directive includes a new set of more stringent targets for recycling, including a new overall minimum recycling target of 55 %.

The total recycling rate in Member States in 1998 varied greatly and ranged between 28 % in the UK and Italy to 65 % in Germany. In Germany this was achieved through the specific producer-responsibility scheme applied there ('der grüne Punkt'), introduced in the beginning of the 1990s. Several other Member States subsequently introduced various producer-responsibility schemes and packaging recycling companies have been established. Other countries have improved their collection and recycling systems.

Figure 12.8. Recycling of packaging waste



Source: European Commission



The first aim of the Packaging Waste Directive, to reduce the amount of packaging put on the market, has not been achieved. However, the rate of recycling of all packaging materials in the EU is high, averaging 50 %, thus exceeding the target of 25 %.

Quality of information ☆☆☆



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### 12.5. Hazardous waste

Although hazardous waste forms only a small fraction of total waste generated in Europe, it presents a potential risk to human health and the environment if not managed and disposed of safely. It is therefore one of the priority waste streams in EU policy. The Hazardous Waste Directive (91/689/EEC) defines and provides the framework for the management of hazardous waste. Furthermore, a European Council Decision defines the various hazardous waste types in the European waste catalogue (2000/532/CE, amended by 2001/118/CE).


A few conclusions can be drawn from the available information:

- manufacturing industries and extraction activities generate the largest quantities of hazardous waste;
- a higher level of environmental awareness may have led to the recent increase in hazardous waste generation, as a result of increased separation of hazardous waste;
- each country has a limited variation in the types of hazardous waste collected (in the EU approximately 20 waste types represent about 80 % of total hazardous waste generation). However, the main types of hazardous waste collected are not the same in all countries.

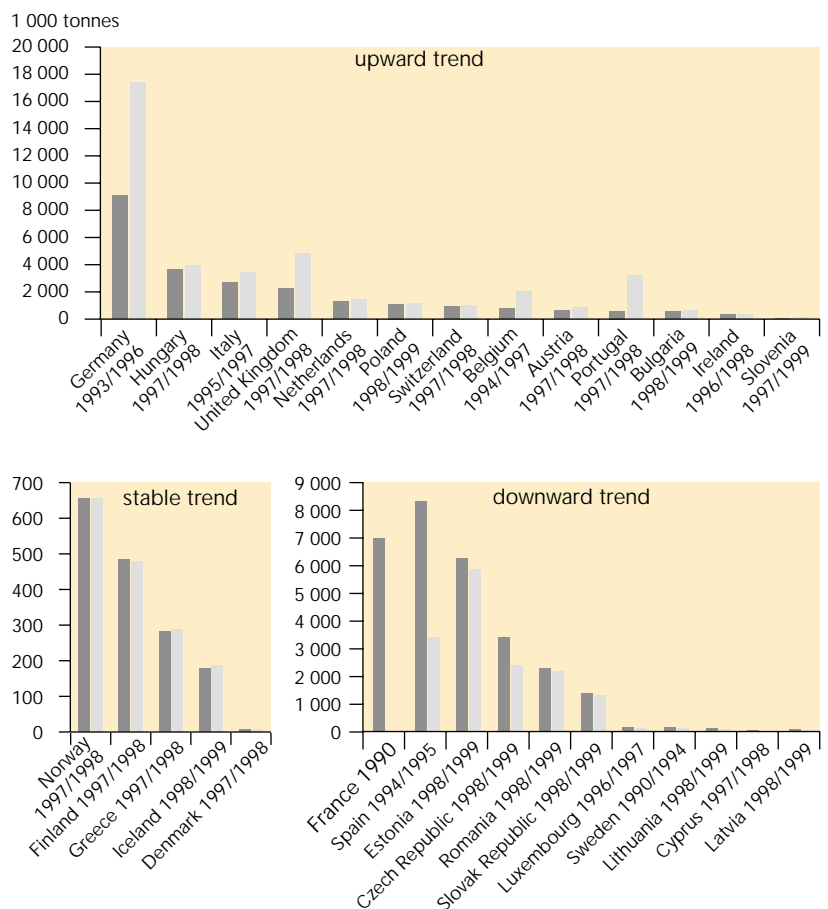
Although recovery, landfill and incineration are the dominant options for hazardous waste management, other methods (physicochemical or biological treatment, permanent storage) are widely used in countries such as Luxembourg, Austria, Italy and The Netherlands.

 Adequate information on hazardous waste management is not available, so a reliable assessment of the prevailing situation in Europe cannot be made. The main source of hazardous waste is manufacturing.

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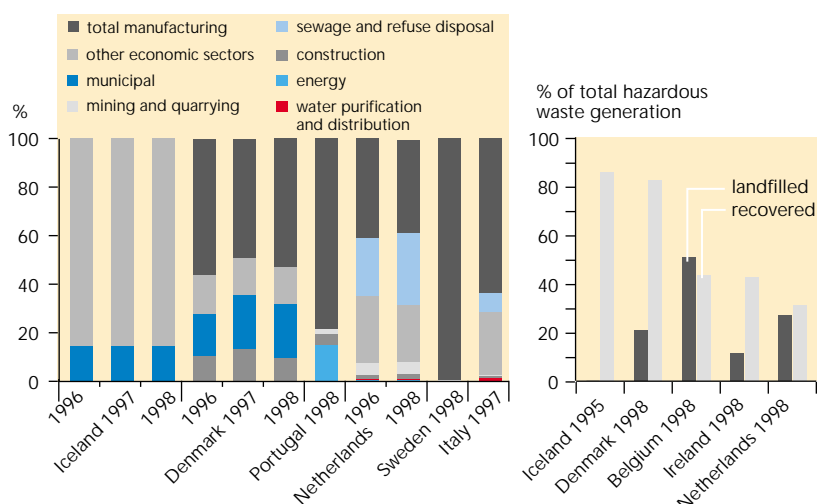
Hazardous waste generation in Europe, 1990–1999 Figure 12.9.



Notes: More data exist for some countries, though scattered through the 1990s. Statistical data on hazardous waste are weak and not yet available or comparable for all EEA member countries. Additionally, differences in definitions and classification systems (some countries use their own national systems, others use the EU hazardous waste list) preclude reliable data comparisons.

Source: Eurostat

Hazardous waste generation by sector and treatment, 1996–1998, in selected European countries Figure 12.10.



Note: 'Other economic sectors' refers mainly to the service sector (including repair and maintenance).  
Source: Eurostat