

European Commission DGXI.E.3

**European Packaging Waste
Management Systems**

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ARGUS in association with ACR and Carl Bro a/s

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Executive Summary

Introduction

The Directive 94/62/EC on Packaging and Packaging Waste aims at harmonising national packaging legislation with the twin objectives of preventing or reducing the environmental impact caused by packaging and packaging waste, and ensuring the functioning of the internal market so as to avoid obstacles to trade, as well as the distortion of or restrictions to competition. This study was commissioned to evaluate the packaging waste management systems in Member States.

The objectives of this study are:

- to provide an overview of the different management systems in operation in each Member State,
- to identify the managerial, technical and economic problems involved in packaging waste management systems, and
- to draw up scenarios for each Member State for the years 2006 and 2011.

Packaging waste management systems

Member States have established distinct systems to comply with the requirements set out in Directive 94/62/EC, both in terms of legislative provisions and implementation strategies, taking existing national waste policies into account.

Preventive measures and reuse systems

With regard to prevention and reuse the Packaging Directive contains provisions that leave certain latitudes for regulation to Member States. The Netherlands, Finland, Spain and Belgium have introduced targets for the prevention of packaging. However, different approaches were followed, aiming at quantitative prevention through either the reduction of packaging consumption growth or the packaging waste arising. Percentage of prevention and the reference year differ from country to country.

Reuse targets are introduced in Denmark, Germany, Portugal, Finland and Austria. The scope and extent of these targets, mainly referring to beverage packaging, and generally aiming to support and/or protect already existing reuse systems, vary widely. A combination of reuse-recycling-recovery targets exists in Finland and Austria. Germany has set a refill quota for beverage packaging and in Portugal different reuse targets for different types of beverage packaging are in force. In Denmark voluntary agreements include the increase of reuse or recycling of PET bottles, transport packaging of cardboard, paper and plastic, as well as of glass and PVC. Furthermore, beers and soft drinks may only be marketed in Denmark in refillable packaging. Although Member States are explicitly required and encouraged to adopt preventive measures and to introduce reuse systems the question remains what room for manoeuvre the Member States actually have for setting up systems such as mandatory quotas, deposits or eco-taxes on disposable packaging.

Mandatory global and material specific recycling targets

Member States have introduced different material specific recycling targets and different concepts of "global targets" which cover different packaging waste flows such as municipal packaging waste, sales packaging and drink packaging. Recycling targets applying to specific packaging waste materials (e.g. PET-bottles, aluminium cans, transport packaging made of cardboard) have been introduced in the majority of Member States, however these targets and the packaging materials affected differ between Member States.

Targets for different packaging waste streams, in particular for municipal packaging, have a fundamental effect on expenditure for compliance. The collection and processing of municipal packaging waste is more cost intensive than from industrial sources, and, for some materials, results in lower quality of secondary material. In countries where no provisions exist regarding the recovery of

packaging waste from domestic sources, the compliance with recovery obligations is met primarily by the recovery of industrial packaging waste, which is usually cheaper.

In summary, the national quantitative recovery and recycling objectives impose different requirements on economic operators responsible for packaging.

Systems of compliance

In all Member States economic operators within the packaging chain (manufacturer, packer/filler, distributor, importer) are responsible for packaging waste management, and for providing data on the amount of packaging put on the market. Except for Denmark, the industry has build up organisations in all Member States to comply with the obligations imposed by national packaging regulations on behalf of the individual businesses affected. However, economic operators generally have the option of transferring their obligations to an external organisation (hereafter called compliance scheme) or fulfilling their obligations by themselves.

In eight Member States a "green dot" system has been established. By contracting with the green dot system, the companies responsible for producing packaging entrust their take-back obligation to the scheme in return for an annual fee based on the types of packaging materials used, and on the amount of packaging put on the market.

The UK has adopted a unique approach to fulfilment of the European Union's packaging waste recovery and recycling targets. The UK concept of "shared producer responsibility" for packaging waste refers only to the industries which produce or use packaging. Responsibility for recovery and recycling of packaging waste is divided among the commercial enterprises which form part of the "packaging chain": raw material producers, packaging manufacturers, packer/fillers and sellers. The recovery and recycling targets are to be met according to a certain percentage obligation associated with the economic activity.

Collection systems

Separate collection of municipal and industrial packing waste is carried out in all Member States, but to a very different extent. With regard to municipal packaging waste, the systems established vary widely, the main differences being the extension of the system and the materials focussed upon.

The collection of municipal plastic packaging is still in the process of development. With the exception of Austria and Germany, Member States usually restrict the collection to bottles and flasks made of PEHD, PET and PVC. In Austria and Germany, all sorts of plastic packaging are collected, even small items. However, as this approach is very cost-intensive, collection and recovery modalities are currently being discussed.

The major part of paper/cardboard packaging in terms of quantity is used for grouped and transport packaging in industry. Most countries concentrate their recycling activities on these materials, as the collection is more cost-effective than collection from households and the quality of the collected material is higher.

In all Member States collection of disposable glass packaging is done mainly through bottle banks. An essential prerequisite for efficient glass recycling is the source-separation according to colour, and a low content of disturbing materials such as ceramics, porcelain, metals and others. Most Member States have therefore established systems where glass is at least sorted according to non-coloured and coloured glass.

Metal packaging is recovered by separate collection, by deposit-based take-back systems or magnetic separation from incineration feed or slag or from composting plants. Separate collection is constantly increasing especially in Southern Europe and Scandinavia.

In order to improve the quality of separate collection the collected and/or sorted packaging materials have to comply with technical specifications in most countries, mainly regarding the contents of impurities, and non-compliance results in lower reimbursements. Another regulative encouraging high quality of collected materials is the market price for these materials. While the collected materials are

sold to reprocessors according to market price in the **UK** generally, different mechanisms are applied in other countries. These are subsidies or reimbursements for sorting and recycling, and contracts with guarantors to take over predefined amounts of packaging.

In general, it has to be considered that Member States started from vastly different waste management conditions. While in some Member States national regulations on packaging waste were already in place, separate collection of certain materials had a long tradition, and waste incineration capacities were available, in other countries landfilling was the predominant waste management option. Accordingly, some Member States had “merely” to adopt their existing waste management infrastructure, whereas other countries had to establish a new system.

Share of activities and costs

With regard to definite packaging waste management activities, the responsibility is shared in the majority of Member States between municipalities and industry. While collection and sorting of municipal packaging waste is predominately undertaken by the public sector, the collection of industrial packaging waste and the recovery and recycling of both municipal and industrial packaging waste is a privately organised domain.

In Austria and in Germany, obligated economic operators are explicitly required to organise the collection and sorting of domestic packaging waste and to comply with recycling targets for this waste stream. The packaging regulations in these countries set out criteria for the collection system, inter alia capacities and distances between collection points, extensions of the collection system. The compliance schemes in Austria and Germany conclude contracts with municipalities (and private operators) for the services necessary in the context of separate collection and sorting of municipal packaging waste.

In other countries the collection (and sometimes also sorting) of municipal packaging waste is either not explicitly regulated or the targets to comply with are less high. In practice, separate collection is exclusively carried out by municipalities, and the compliance schemes negotiate the conditions and extent of separate collection, and the reimbursement per material and per region with the municipalities.

The work of the compliance schemes is financed by fees collected from companies wishing to transfer the obligations imposed on them to the scheme.

In UK, the Packaging waste Recovery Note (PRN) concept was developed as a means of providing evidence of compliance and as an economic instruments to stabilise the recycling market. The reprocessors sell the PRNs to compliance schemes and individually obligated producers. In principle, the Packaging Recovery Notes, to be purchased by obligated businesses, should cover all costs incurred for the collection, recovery and reprocessing of the various packaging materials.

Comparison of costs between Member States is very difficult due to lack of transparency of costs particularly with regard to collection. There are a number of factors which influence the economical impact of compliance with the Packaging Directive and by the same time impede the direct comparison of costs, such as:

- general approach of packaging waste regulation
 - industrial value-based approach (e.g. the Netherlands),
 - market-based approach (e.g. the UK),
 - administrative approach (e.g. Germany)
- scope of national targets
 - material specific recycling targets
- scope of regulation of different packaging waste flows - recovery targets applicable to
 - household packaging,
 - sales packaging,
 - drink packaging,
 - all packaging

Generally, three different types of systems can be broadly distinguished regarding the financing of non-industrial packaging waste management activities:

- Industry is fully responsible for covering all costs; municipalities can be involved in separate collection on behalf of the industry Austria, Germany, Sweden
- Industry and municipalities share responsibility, the industry covers costs of sorting and recycling; municipalities are in charge of separate collection and their costs are (completely or partially) reimbursed. Belgium, Denmark, Finland, France, Ireland, Italy, Luxembourg, Portugal, Spain,
- Industry and municipalities share responsibility, the industry covers the costs of recycling; municipalities are in charge of separate collection and receive revenues through selling the collected materials. United Kingdom, the Netherlands

Differences in the extent of implementation of the concept of producer responsibility arise mainly with regard to the financial responsibility for packaging used by households. It ranges from covering the costs for recovery of glass and paper-cardboard only, to systems where industry is bearing the complete costs of collection, sorting, recycling/ recovery for municipal packaging waste. The coverage of costs between private actors (compliance scheme) and public sector (municipalities) is mainly a result of the balance of power between these actors.

Consumption and Recovery of Packaging Material

Availability and quality of data

The data on consumption and recycling of packaging material as shown in this report are based on the reports of Member States submitted to the Commission according to Commission Decision 97/138/EC for the year 1997. As Greece, Ireland and Portugal have not yet delivered their reports, and the report for Luxembourg was not available to the project group, the consumption data for these countries are derived from information provided by European material associations (APME, CEPI, FEVE), from relevant surveys, or are extrapolated from data of comparable countries. In the following the term EU-11 refers to Member States except Greece, Ireland, Luxembourg and Portugal.

The lack of accuracy and comparability of data from Member States has already been analysed in other studies (e.g. PricewaterhouseCoopers, 1998, BIPE & ADEME, 1998) and shall not be discussed in depth in this study. However, the most important facts that have to be considered in the discussion and interpretation of the reported data are:

- data on wood packaging, which constitute a relevant portion of transport packaging, are only reported by 7 of the 11 countries which have submitted reports
- data on "other packaging" are provided by 5 of these Member States
- data on imports and exports of packaging waste as well are incomplete

Further uncertainties arise from the different methods of data collection and compilation in Member States, which are described insufficiently in several of the country reports to the EC. The implementation of a comprehensive accounting system is still under way in some Member States and statistics reported by these countries needs further consolidation. In addition, inconsistencies in data are caused by different understanding of the definition of reuse, recycling and energy recovery. For example, commonly defined criteria for the minimum thermal efficiency treatment plants must achieve to be distinguished from common incineration plants are lacking. With regard to feedstock processes clarification seems to be necessary which of these processes are considered as recycling activities. Finally, a common concept has to be developed on how prevention of packaging at source is to be measured and considered in the context of quantitative compliance with the Directive.

Total packaging

The total quantity of packaging put on the market in the EU in 1997 amounted to about 58 million tonnes. As described above, data on wood packaging and "other packaging" is partially not available. Thus, it can be assumed that total packaging consumption as well as the share of wood packaging are underestimated in these figures.

Consumption according to Member States ranges between 74.4 kg/cap.a in Greece and 189.2 kg/cap.a in France, the EU-15 average amounting to 155.2 kg/cap.a. The overall recycling and recovery rates in Member States amounted to 46.3 % and 52.6 % respectively on average in EU-11 (without Greece, Ireland, Luxembourg and Portugal). These rates were achieved mainly by the recycling/recovery of paper/cardboard and glass. Whereas the share of paper/cardboard and glass amounted to 64 % of the total packaging consumption, they constituted 79 % of the recycled material. Since recycling targets are expressed in weight, lower recycling/recovery rates for plastic, metals and composite are preferably compensated by glass and paper/cardboard.

According to the reported data, the minimum recycling target of the Directive of 25 % was already exceeded in 1997 by 11 of the 12 Member States who have to fulfil this target by 2001¹. This is mainly due to the recycling rates for paper/cardboard and glass packaging. However, some of these Member States (Italy, Spain and UK) have to increase their recovery rates to achieve the overall recovery target of 50 % in 2001.

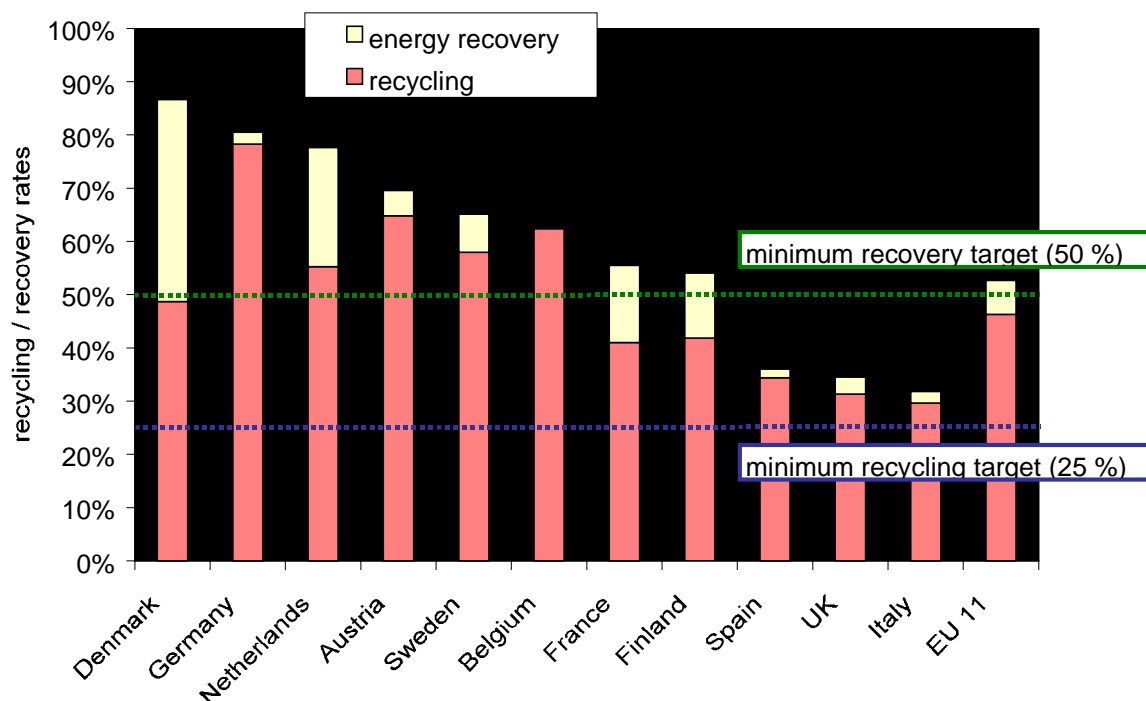


Figure 1: Overall recovery and recycling results of packaging waste by Member States (in %)

Generally, recycling/recovery rates are lowest in those countries where waste management strategies and regulations aiming at separate collection and recycling hardly existed before the transposition of the Packaging Directive, and where landfilling was the predominant waste management option. These countries still have large deficits to make up with regard to establishing collection systems and building up recycling and recovery capacities.

¹ Data on Luxembourg are not available

Plastic packaging

In 1997, the average recycling rate (EU-11) for plastic packaging waste amounted to 15.5 %, which corresponds to 1.4 million tonnes of recycled packaging. A closer look at the data shows that Germany contributed significantly to this result with 731,000 tonnes (corresponding to 53% of the total recycled amount of plastics). With the exception of Austria, Belgium and Germany, the recycling rates in 1997 fell below the material specific recycling target of the Directive of 15 %. In Denmark, France, Italy, Spain and UK the recycling rates even fell below 10 % in 1997.

The main barriers to an increase in recycling plastic packaging are the low collection rates, the lack of competitive pricing compared with virgin materials, and the restricted markets for secondary raw materials. Therefore, subsidies and the development of new products and markets are afforded to guarantee the recycling of plastic packaging. In detail, the situation differs between the Member States and can be characterised as follows:

- Sufficient reprocessing capacities but the plastic materials are not available
- Availability of capacities only for certain plastic materials
- No reprocessing capacities

Paper/cardboard packaging

The average recycling rate for paper/cardboard packaging in 1997 amounted to 59% in EU-11. All Member States, with the exception of Italy, achieved recycling rates exceeding 50%. Selective collection and recycling are well established activities and standards are in place for secondary raw materials. Recycling rates are growing and paper industry may rather easily adapt their infrastructure to the global supply of separated paper waste and to the demand of recycled paper.

Glass packaging

The average recycling rate for glass packaging in EU-11 amounted to 52.2 % in 1997. Estimations by FEVE for the year 1999 give a total recycling rate of 55 % for the whole European Union.

The crucial point in increasing recycling rates is the extension of collection as well as the improvement of the collection quality, with regard to colour-separation and impurities. From a technical point of view, a further increase in glass recycling is possible provided that collection is carried out with colour-separation and the level of impurities is low.

However, some Member States (e.g. UK, Finland, Ireland) suffer from an import/export imbalance concerning quantities and/or colours (e.g. surplus of imported green glass). Other countries lack national glass production capacities (e.g. Belgium and Luxembourg). These countries have either to export some of their collected glass or to use it for other applications, both of which may lead to lower sales prices or to additional costs.

Metal packaging

With an EU-15 average consumption of about 11.2 kg/cap,a the share of metal packaging amounts to 7 % of total packaging consumption. The predominant part of metal packaging is used for sales packaging and ends up in household/municipal packaging waste. As ferrous packaging and especially aluminium packaging is in demand as a second raw material, and recycling capacities are available in excess, recycling rates are generally restricted by collection.

In 1997 the average recycling rate in EU-11 amounted to 46.0 %. The only countries falling below a recycling rate of 15 % in 1997 were Italy and Finland. As Italy collects increasing amounts of metal packaging and Finland just starts to build up a collection scheme, it is assumed that both countries will meet the Directive's recycling target. Due to the low consumption of metal packaging, Finland faces the problem of low material waste flows combined with a low population density, which hinders cost-effective collection.

Scenarios

Methodological approach

Based on available information of the present situation, for each Member State scenarios are developed for 2006 and 2011. Prerequisites for the assessment of the further evolution are the:

- **Anticipation of the recovery targets** which may be fixed by the European Commission in the course of the revision of the Packaging Directive
- **Estimation of the development of packaging consumption** according to materials for each Member State for the year 2006 and for the year 2011

Recovery targets for 2006

In the discussion paper published in December 1999 the European Commission presented two options for the revision of the Packaging Directive in 2001. Option 2 was used as basis for the scenarios up to 2006, the suggested targets to be achieved by mid-2006 are listed below. For Greece, Ireland and Portugal we assume for 2006 the achievement of the current recovery targets applicable for the other Member States.

- no targets for recovery
- a minimum of 60 % by weight of total packaging waste to be recycled
- differentiated minimum recycling targets for specific packaging materials contained in packaging waste,
 - ↳ 75 % by weight for glass
 - ↳ 65 % by weight for paper and cardboard
 - ↳ 55 % by weight for metals
 - ↳ 20 % by weight for plastics, exclusively by mechanical recycling

Recovery targets for 2011

For glass, metals and paper/cardboard it appears very likely, that the recycling targets will be raised in the long term to a level which is technically achievable and economically reasonable. The potential of plastics recovery is discussed more controversial and a lower target to be achieved by both mechanical and chemical recycling was assumed. For Greece, Ireland and Portugal we assume for 2011 the achievement of the 2006 recovery targets.

- no targets for recovery
- a minimum of 70 % by weight of total packaging waste to be recycled
- differentiated minimum recycling targets for specific packaging materials contained in packaging waste,
 - ↳ 75 % by weight for glass
 - ↳ 75 % by weight for paper and cardboard
 - ↳ 75 % by weight for metals
 - ↳ 60 % by weight for plastics, by chemical or mechanical recycling

Estimation of packaging consumption

As projections of packaging consumption are hardly available we have based our estimations of future packaging consumption on the development in the previous years as reported by the European materials associations and e.g. National Environmental Agencies, and on general trends in packaging consumption. Beverage cartons, wood packaging and other packaging were not considered separately due to lacking or incomplete information. Two growth rates are assumed for each material, one assuming a rather slow development or a decrease (lower limit: scenario 1) and one assuming a stronger development (upper limit: scenario 2). These growth rates, shown in table 1, were estimated for the period 1997 to 2011.

Table 1: Assumed annual growth rates for scenarios from 1997 to 2011 according to materials

Packaging material	Scenario 1 annual growth rate in %	Scenario 2 annual growth rate in %
Glass	-2 %	1 %
Paper cardboard	1 %	3 %
Plastics	2 %	4 %
Metals	-1 %	1 %
Total	~ 0.3 %	~ 2.5 %

With regard to packaging consumption development it seems arguable whether growth rates as assumed will continue up to 2011. Furthermore, the development of total consumption of packaging as assumed in scenario 2 is for most Member States not very likely, because presumably the development of consumption of different packaging materials will be influenced and compensated by each other.

Future development of packaging consumption within the European Union

According to our assumptions the consumption of total packaging will range in 2006 from 53.4 to 64.7 mill tonnes and in 2011 from 54.4 to 73.5 mill tonnes. It has to be stressed that the development of packaging consumption is most likely to oscillate between the two figures for 2006 and 2011 mentioned above.

The development of packaging consumption per material and the estimated recycling capacity requirements according to scenario 1 and scenario 2 is shown below in figure 1 and figure 2.

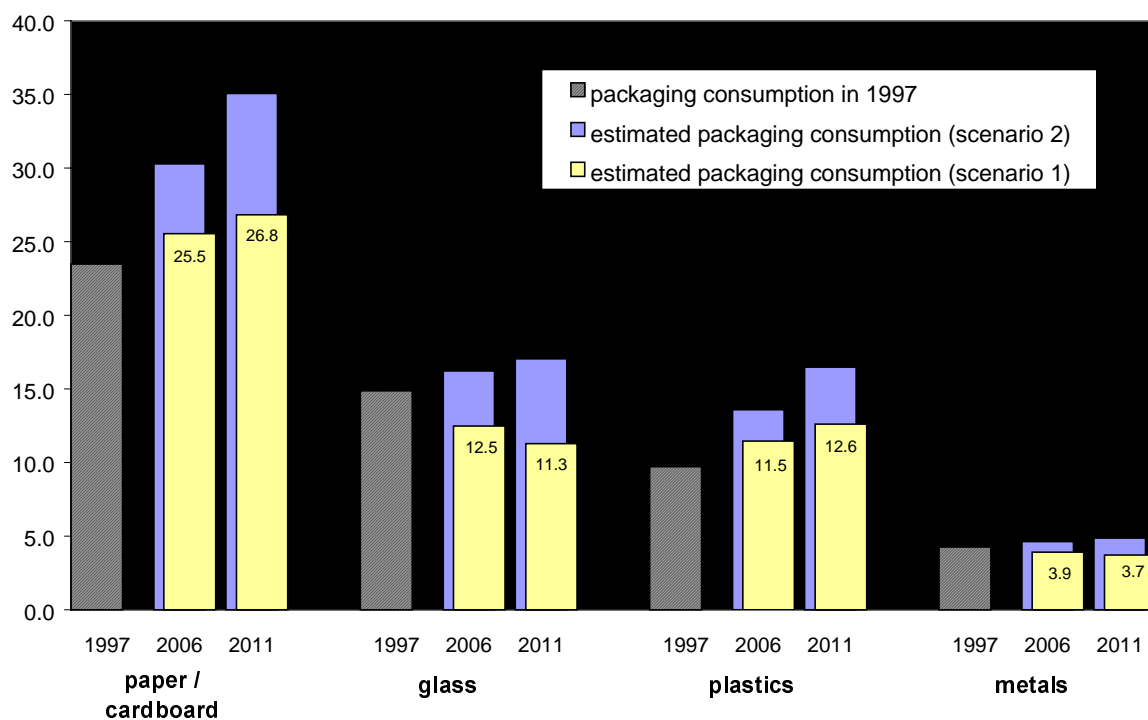


Figure 2: Estimated development of packaging consumption in 2006 and 2011 in EU according to material (million tonnes)

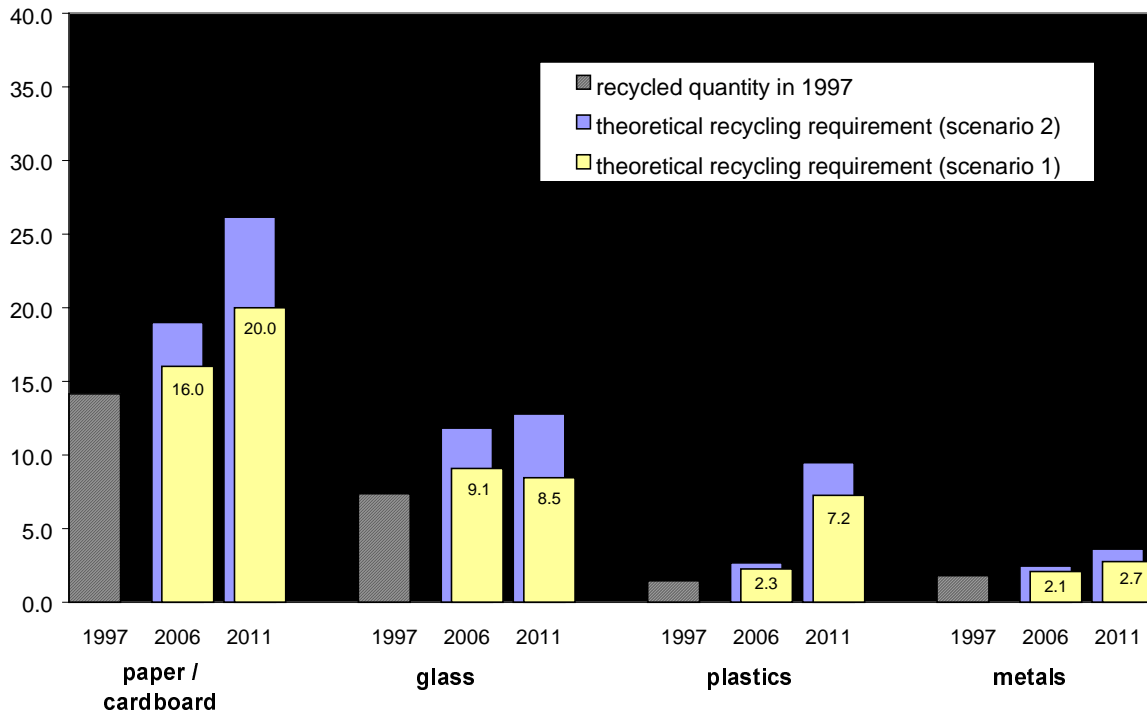


Figure 3: Estimated recycling capacity requirement in 2006 and 2011 in EU according to material (million tonnes)

A considerable increase in packaging consumption can be expected for paper/cardboard and for plastics. The development of glass and plastic packaging consumption is, as long as beverages are concerned, interdependent from each other. The metal packaging market is regarded as being rather stable.

With regard to future recycling capacities the highest extension of reprocessing capacity would be necessary for the recycling of plastics from 1.5 mill tonnes to a range of 7.2 to 9.5 mill tonnes in 2011.

The potential for mechanical recycling is limited and the achievable rates are hotly debated. The highest mechanical recycling rates which were achieved in only three Member States in 1997 ranged from 20 to 25%. It can be expected that new sorting and reprocessing techniques will increase the share of plastic packaging feasible for mechanical recycling. A significant strengthening of recycling targets would probably only be possible if feedstock processes are considered as a recycling option.

As ferrous packaging and especially aluminium packaging is in demand as a secondary raw material and recycling capacities are available in excess, recycling rates are only restricted by collection.

For paper/cardboard and glass, the material specific recycling target of the Directive was exceeded by far by all Member States as early as 1997, the average recycling rates amounting to 59.0 % and 52.2 % respectively. Selective collection and recycling are well established activities and standards are in place for secondary raw materials.

In summary, an increase of targets in the course of revision of the EU Packaging Directive is feasible from the technical point of view and a number of Member States already achieve recycling rates higher than the current EU targets. Furthermore, global growth of packaging production means that recycling targets will have to be increased or prevention/reuse targets will have to be introduced in order to maintain the current level of packaging waste to be disposed of. In most of the other Member States the particular challenge is the extension and qualitative improvement of packaging waste collection which at present hampers the efficiency of the systems. However, as mentioned above there are a number of other aspects namely the prevention and reuse of packaging, and definition, which needs further consideration when aiming at a harmonised legislative framework for packaging waste management.