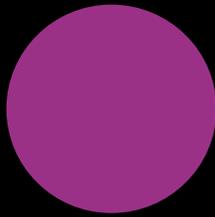
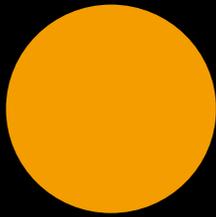
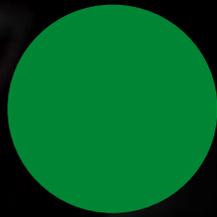


# The Compelling Facts About Plastics

An analysis of plastics production, demand and recovery for 2006 in Europe

Published in January 2008





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## Methodology and changes

This brochure on 2006 production, demand and recovery is the seventeenth annual publication by the manufacturers of plastics in Europe and partners.

The purpose of this brochure is to provide an overview of the development of plastics from production, over their use in a wide variety of applications to the progress made to recover the plastics at their end-of-life phase.

PlasticsEurope's Market Research and Statistics Group (PEMRG) provided the input on production and demand of the plastics raw materials.

The data for the end-of-life phase was for the first time collected in a plastics value chain partnership involving PlasticsEurope, EuPC (the European Plastics Converters), EuPR (the European Plastics Recyclers) and EPRO (the European Association of Plastics Recycling and Recovery Organisations).

Consultic Marketing & Industrieberatung GmbH has complemented the work to assess the waste generation and recovery data for EU25+NO/CH.

For recovery data, official statistics have been used whenever available from European or national authorities and waste management companies or organisations.

Where required research or know how from consultants has been used to complete the picture.

The figures cannot always be directly compared to those published earlier due to changes in the estimates of both market demand and the waste generated. However, the overall differences are small and a revision of earlier estimates has been made to enable the historical progress to be tracked of both the use and recovery of plastics across Europe during the last decade.

Also, as many figures are the result of assessments applying the same definitions across EU25+NO/CH they can deviate from corresponding numbers quoted by other sources, as they may use different definitions or have made alternative assessments.



## 2006 – At a glance

- Plastics continue to be a global success story with Europe (EU25+Norway (NO) and Switzerland (CH) remaining a major manufacturing region, producing about 25% of the total estimated worldwide plastics production of 245 million tonnes.
- For the whole of the plastics industry – producers, converters and machinery manufacturers – the overall turnover in EU25+NO/CH 2006 was in excess of 280 billion euro, with the industry employing more than 1.6 million people.
- The demand by converters for plastics in Europe (EU25+NO/CH) increased from 47.5 million tonnes in 2005 to 49.5 million tonnes in 2006, an increase of 4%.
  - 2006 marks a milestone as the first year when recovery and disposal rates of used plastic were equal. The recovery rate of post-consumer end-of-life plastics now stands at 50% in EU25+NO/CH (up 3% on the previous year) and disposal stands at 50% (down by 3% compared to 2005). The recycling rate for post-consumer plastics has increased to 19.7% - up from 18% in 2005 and energy recovery has increased to 30.3% - up from 29% in 2005.
- A number of Member States have now reached recovery rates of near 100% i.e. they have effectively eliminated used plastics going to landfill. This performance is achieved by adopting an integrated resource management strategy incorporating a range of complementary options, addressing different streams with the best environmental and economic option for each one.
  - The decoupling in EU25+NO/CH of the growth in used plastics and the volume of plastics waste going to disposal continued. Used plastics going to disposal fell by 1%/year to 11.5 million tonnes/year.

# Plastics protect the climate, boost resource efficiency and give us a safer life



Plastics play a significant role across the environmental, societal and economic dimensions of sustainable development. Our modern lifestyle would not be possible without plastics. Plastics meet the demands of society by enabling the eco-efficient manufacture of numerous valuable products such as protective packaging, lightweight and safety components in cars, mobile phones, insulation materials in buildings, medical devices, and key components for renewable energy production, protection in extreme conditions etc.

## **Climate protection**

In cars, around 60% by weight of the plastics used enhance comfort and safety while 40% are used in applications contributing to weight reduction, resulting in considerable fuel savings and a reduction in CO<sub>2</sub> emissions. The weight saving from the plastic in a modern car saves over 500l of fuel over its lifetime.

In an Airbus 380, high performance plastic composites reduce the passenger cost per seat through lower weight and consequently lower fuel consumption.

Homes and buildings are kept warm (or cool!) by plastics insulation. With about 40% of all primary energy consumed globally used in buildings, optimum insulation has become one of the top initiatives to reach the Kyoto targets.

An increasing use of lightweight plastics packaging reduces both the weight of the transport and the proportion of the packaged goods that are wasted – both of which reduce CO<sub>2</sub> emissions.

Plastics enable the rotors in wind turbines to be longer and more effective and components in photovoltaic panels to increase their efficiency.

## **Resource efficiency**

Without plastics packaging, it has been estimated that the tonnage of alternative packaging materials would increase by a factor of 4, emissions of greenhouse gases by a factor of 2, costs by a factor of 1.9, energy use by a factor of 1.5, and waste by a factor of 1.6 in volume. All these factors are based on the current situation. With the use of plastics expected to continue to increase in the future the effect will be bigger year-by-year.

In addition, plastics packaging saves resources by protecting food in its journey from farm to supermarket and into our kitchens. This can be illustrated in a number of ways: in the developing world 50% of food is wasted from farm to kitchen; once they have reached the supermarket loosely-packed fruits and vegetables create 26% more waste compared to pre-packed produce; 1.5g of plastics film extends the shelf life of a cucumber from 3 to 14 days. Some 10g of multilayer film in a MAP (modified atmospheric packaging) package for meat extends the shelf life from a few days to more than a week. The amount of CO<sub>2</sub> used to produce a single portion meat is about 100 times bigger than used to produce the multilayer film.

Innovative design uses plastics for the outer drum of washing machines, reducing both water and energy consumption.

Plastic pipes can secure safe, leak-free and efficient transport of drinking water and sewage without wasting or contaminating this increasingly scarce resource.

**Plastics give us a safer life**

Plastics protect us from injury in numerous ways, whether we are in the car, working as a fire fighter or skiing. Airbags in a car are made of plastics, the helmet and much of the protective clothing for a motorcycle biker is based on plastics, an astronaut suit must sustain temperatures from -150degree Celsius to +120 degrees and the fire-fighter rely upon plastics clothing which are protecting against high temperature, are ventilating and flexible to work in.

Plastics safeguard our food and drink from external contamination and the spread of microbes. Plastics flooring and furniture are easy to keep clean to help prevent the spread of bacteria in e.g. hospitals.

In the medical area plastics are used for blood pouches and tubing, artificial limbs and joints, contact lenses and artificial cornea, stitches that dissolve, splints and screws that heal fractures and many other applications.

In coming years nanopolymers will carry drugs directly to damaged cells and micro-spirals being used to combat coronary disease. Artificial blood based on plastics is being developed to complement natural blood.



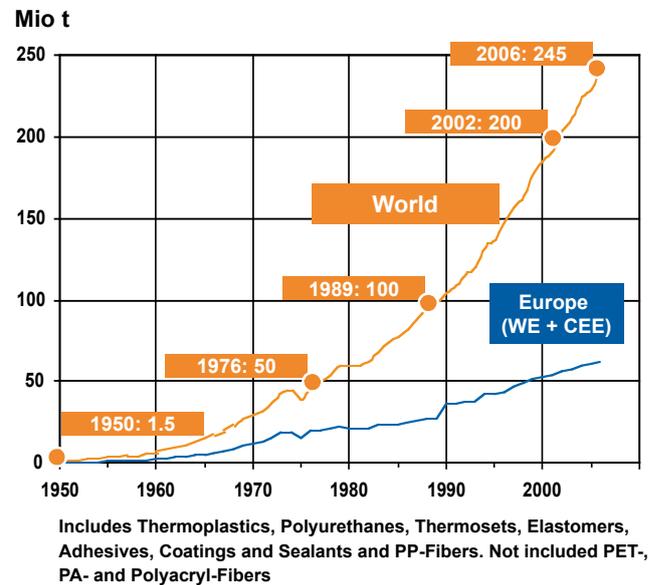
# Production and market demand of plastics in a global context

A track record of continuous innovation has driven a global average increase in production and consumption of almost 10% every year since 1950. From around 1.5 million tonnes in 1950, the total global production of plastics grew to 245 million tonnes in 2006 as shown in Figure 1.

An analysis of plastic materials consumption on a per capita basis shows that this has now grown to approximately 100kg in NAFTA and Western Europe, with the potential to grow to up to 120kg per capita by 2010. The highest potential for growth can be found in the rapidly developing parts of Asia (excluding Japan), where currently the per capita consumption is only around 20kg.

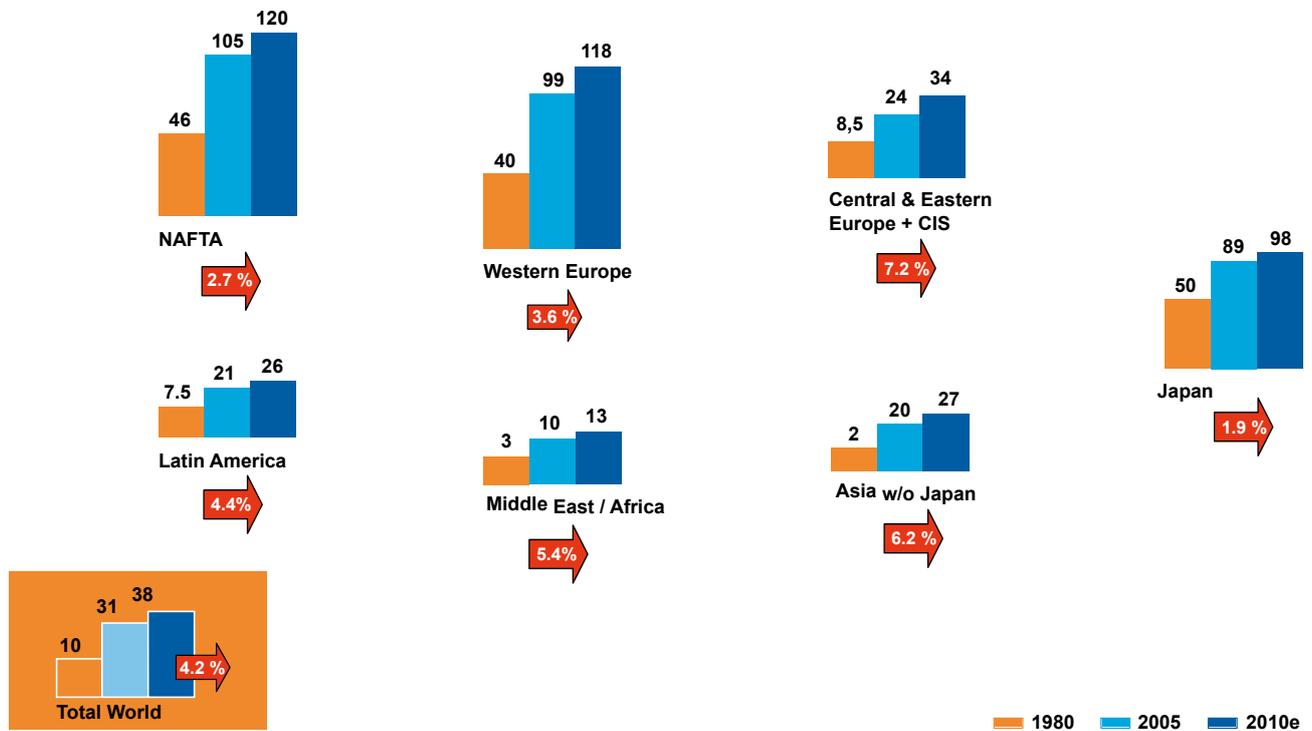
In the European context, it is the new Member States which are expected to see the biggest increase as their economies develop. Their current average per capita consumption of 55kg is a little more than half of that of the old Member States (Figure 2).

Figure 1. World Plastics Production 1950-2006



Source: PlasticEurope Market Research Group (PEMRG)

Figure 2. Plastic demand by converters per capita per region



Source: PlasticEurope Market Research Group (PEMRG)

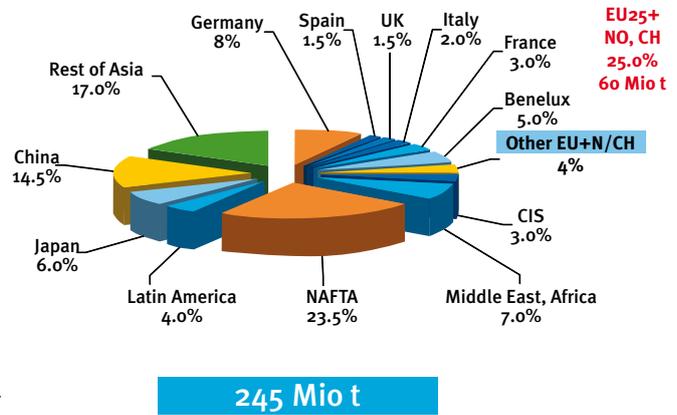
# Production and demand in EU25+NO/CH

EU25+NO/CH represent 25% of the global plastic production with about 60 million tonnes/year, at a similar level to NAFTA at 23.5%. Within Europe, the plastic production facilities are well spread. Germany is the major producer, accounting for 8% of global production, followed by the Benelux (5%), France (3%), Italy (2%) and the UK and Spain (1.5%). (Figure 3)

Plastics demand by converters in EU25 + Norway and Switzerland was 49.5 million tonnes in 2006. The demand expressed as tonnage of virgin resin processed by European converters by country is shown in Figure 4. The major countries are Germany and Italy, which together account for around 40% of the European conversion to plastic products. Of the new Member States, Poland has the highest plastic conversion, currently at about 2.0m tonnes of the European total. The Czech Republic and Hungary are each at about half this. It is expected that the converting industries in most of the new Member States will grow strongly in the coming years.

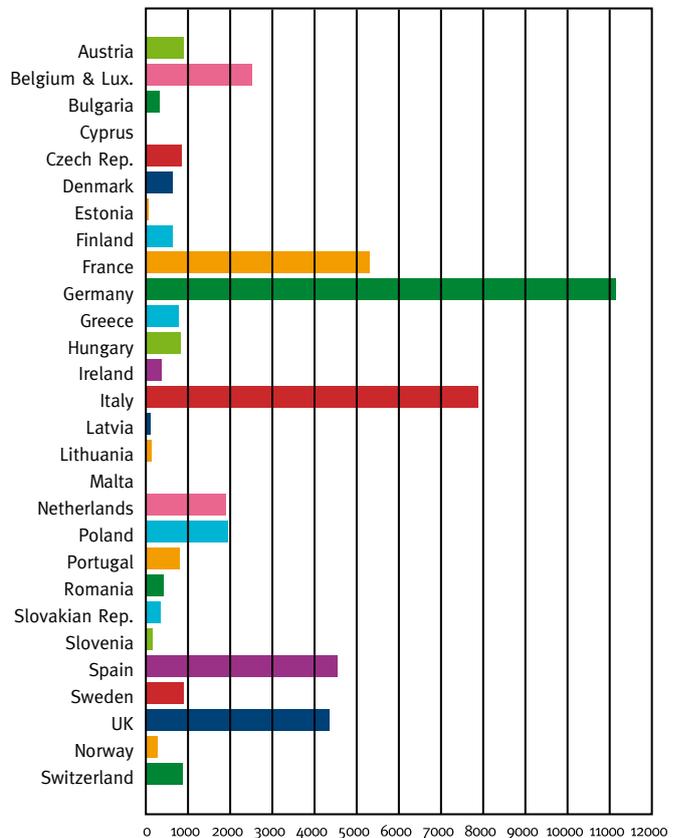
All countries saw a growth in plastics demand in 2006 compared to 2005. In Western Europe (EU-15, Norway and Switzerland) this averaged at 3.5%, but some countries, such as Austria, Germany and Portugal, achieved over 6%. In new Member States such as Poland, the Czech Republic and Hungary the growth was about 12%, reflecting the high growth potential in these countries.

Figure 3. World Plastics Production 2006



Source: PlasticEurope Market Research Group (PEMRG)

Figure 4. Plastic demand by converters per country in Europe (k tonnes/year)

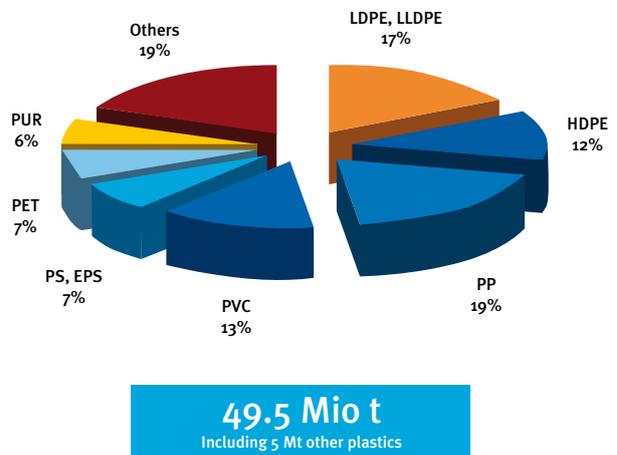


# Production per polymer and per application

There are around twenty distinct groups of plastics, each with numerous grades available to enable the optimum choice to be made for each specific application. There are five high-volume families of plastics. These are polyethylene (including low density (LDPE), linear low density (LLDPE) and high density (HDPE)), polypropylene (PP), polyvinylchloride (PVC), polystyrene (solid PS and expandable EPS) and polyethylene terephthalate (PET). Together the big 5 account for around 75% of all plastics demand in Europe. During 2006, all of the above experienced growth in demand in the range of 3 to 8% (Figure 5).

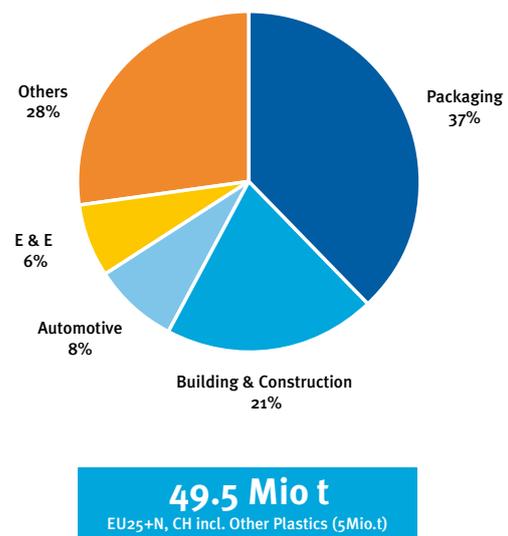
Packaging remains the biggest end use for plastics at 37% followed by Building and Construction at 21%. Automotive and Electric&Electronic use 8% and 6% respectively. Finally medical, leisure and other applications use 28% (Figure 6).

Figure 5. Converter Demand by plastic type



Source: PlasticEurope Market Research Group (PEMRG)

Figure 6. Demand by converter by End Use Segment



Source: PlasticEurope Market Research Group (PEMRG)

# Plastics offer many ways to contribute to sustainable use of resources

## Reduce

Plastics save energy and CO<sub>2</sub> emissions during the use phase. If we were to substitute all plastics in all applications with the prevailing mix of alternative materials, and look from a lifecycle perspective, then 22.4 million additional tonnes of crude oil would be required every year. The corresponding greenhouse gas emissions are equivalent to 30% of the EU15 Kyoto target for 2000-2012.

Plastics contribute to waste minimisation by more and more resource-effective solutions, including less energy to produce plastics, less plastics material to do a particular job and less waste of the contained goods, whether it is food or water or a computer. Examples include ever-lighter bottles for water, soft drinks or detergents or thinner film for packaging.

## Reuse

Plastics are reused in a number of areas. Soft drink bottles of plastics are reused in deposit systems in a number of Member States, many of us reuse the carrier bag for a variety of needs, and plastics trays used in supermarkets offer a clean, robust and cost-effective way of moving vegetables, bread or fish from producer to customer.

## Recycle

The recycling of plastics is increasing year by year. In addition to the well known applications like bottles and industrial packaging film, new important developments are ongoing, like the Recovinyl initiative under the Vinyl 2010 programme of the PVC industry (covering pipes, window frames, roofing membranes, flooring).

This important development must continue and we must drive towards realising the full potential of existing recycling streams as well as opening up new eco-efficient streams for recycling.

## Recover

However even after including these growing applications there will be residual streams which are not appropriate to mechanically recycle for a number of reasons:

- contaminated plastics that require more energy (and water) for cleaning than is contained in the product itself e.g. some food packaging
- mix of different materials (e.g. from an automotive shredder) which makes separation extremely costly
- the fact that plastics are lightweight and extremely diverse means each piece of plastics in e.g. the household waste bin is hard to distinguish and source separate, and in most cases energy intensive and very expensive to collect and separate.

Unlike several traditional materials, plastics offer an additional recovery option – energy recovery. As long as we use fossil fuels for energy production on the earth, plastics will offer an additional value to society for such hydrocarbon molecules on their way from oil well to energy source.

Landfill or disposal must be minimised as it wastes a valuable resource and contributes to greenhouse gas formation. Used plastics do not contribute to GHG emissions in a landfill, as they degrade very slowly, but by adding calorific content they enable waste to be recovered in energy recovery facilities with better energy efficiency.

## The vision of the 4 partners for a forward-looking resource management approach:

- Minimise disposal of plastics waste to landfill
- Use a mix of recovery options for the best environmental and economic result in every situation
- Treatment and recovery of waste should meet the defined environmental standards
- Overall lifecycle impact should be taken into account

## Bioplastics and carrier bags

Bioplastics are important members of the plastics family, adding new features to the diverse spectrum of plastics materials.

Bioplastics moved firmly into the public eye in 2006.

Unfortunately the two aspects of bioplastics – the functional property of degradation and the origin of the feedstock for production – were often mixed-up.

Degradable plastics are welcomed members of the plastics family, providing a functional property which is required for certain applications such as compost bags, mulch film for agricultural application, and packaging for catering and for surgery (to mention just a few).

However the use of degradable plastics must be carefully evaluated e.g. not to contaminate recycling loops like the bottle stream.

Plastics can be made from any feedstock containing carbon and hydrogen. Currently fossil fuels are the preferred feedstock but already today plastics are made from renewable resources e.g. sugar and corn. Plastics production uses only 4% of all oil and gas. Long before our reserves of fossil feedstock will run out, the tightening supply-demand balance will lead to higher prices which will move major fossil users, like transport and heating, to alternative sources.

Increasingly in the future, complementary feedstock to fossil will be used to secure uninterrupted supplies of plastics to society.

An application for plastics which has been particularly in focus in the bioplastics debate is the carrier bag.

In France the Parliament tried to ban non-degradable bags, but eventually overturned their decision. Italian politicians are also looking into ways to limit use of non-degradable bags.

The UK has seen a debate in Scotland around whether to introduce a levy (this was eventually voted down), and more recently we have seen a debate in a number of cities, including London, about whether to ban the freely-distributed thin carrier bag in response to the perceived littering of such bags.

In the public debate the plastic bag has been the victim of irresponsible litter behaviour in society, which has unjustly damaged the reputation of this highly sustainable option for carrying our shopping back home. In several LCA studies the plastic carrier bag, and particularly the thick, multiuse bag – “the Bag for Life” - comes out as the most environmentally-friendly option.



# Plastics supply chain from cradle to cradle

Figure 7 illustrates the flow of plastics from conversion to the end-of-life phase. The data are valid for EU25+Norway and Switzerland.

The converters used 49.5 million tonnes of plastics in 2006, up 4% on 2005. Of all plastics used by consumers, 23.0 million tonnes ended up as post-consumer waste, up 3.2% on 2005.

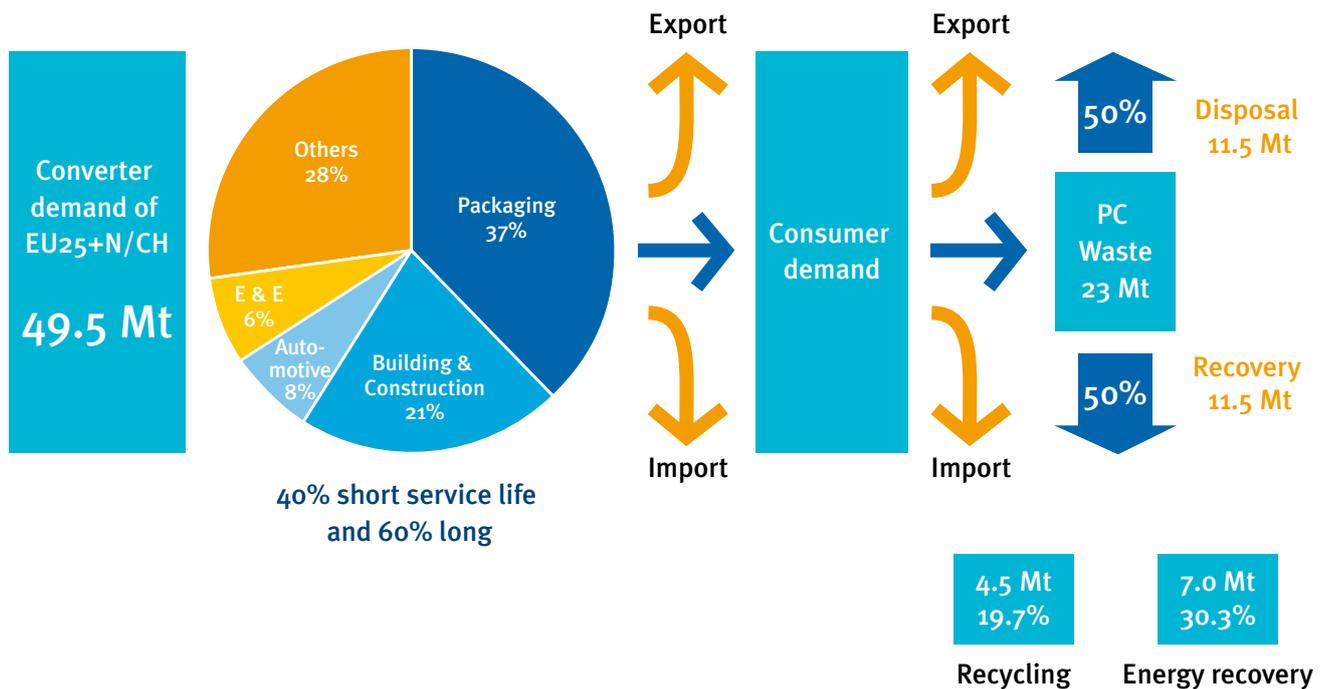
50% of the post-consumer used plastic was recovered and 50% went to disposal. Of the 11.5 million tonnes recovered 4.5 million tonnes were recycled – as material and feedstock – and 7.0 million tonnes were recovered as energy.

The overall material recycling rate of post-consumer plastics in 2006 was 19.7%, with mechanical recycling at 19.1% (up 2.5% point over 2005) and feedstock recycling at 0.6% (down 1% from 2005).

The energy recovery rate was up by 1.5% from 2005 to 30.3%, reflecting the stricter legislation on landfill in several Member States.

In 2006, 11.5 million tonnes of plastics were wasted in landfill. If recovered, the energy saved – either by avoiding the production of more virgin plastic or by replacing fossil fuel for energy production – would be sufficient to cover 50% of the energy demand of Denmark.

Figure 7. Plastic from cradle to cradle (EU25+NO/CH 2006)



# Plastics continue to decouple growth in demand and material to landfill

Despite a 3%/year growth over the past decade for post-consumer waste the quantity going to landfill continues to decline by about 2%/year. Figure 8 shows the history for EU15+NO/CH up to 2005 and for EU25+NO/CH from 2005. The growth of post-consumer plastic waste is the result of several drivers. Plastics continue to substitute alternative materials, economic growth drives greater consumption, smaller households require more packaging per person and more ready-made single-portion meals are consumed.

Figure 9 outlines the growth of both mechanical recycling and energy recovery. Over the last decade the average annual growth rate has been about 10%. Mechanical recycling saw a significant increase in 2006, which is explained by higher plastic prices and improved collection and sorting technology. Feedstock recycling has remained flat over the past 8-9 years but saw a decline in 2006 due to reduced conversion in a gasification plant in Germany. A flexible legal framework, support for innovation and cooperation along the value chain will be key to drive further progress.

Figure 8. Continued decoupling of plastic waste and landfill

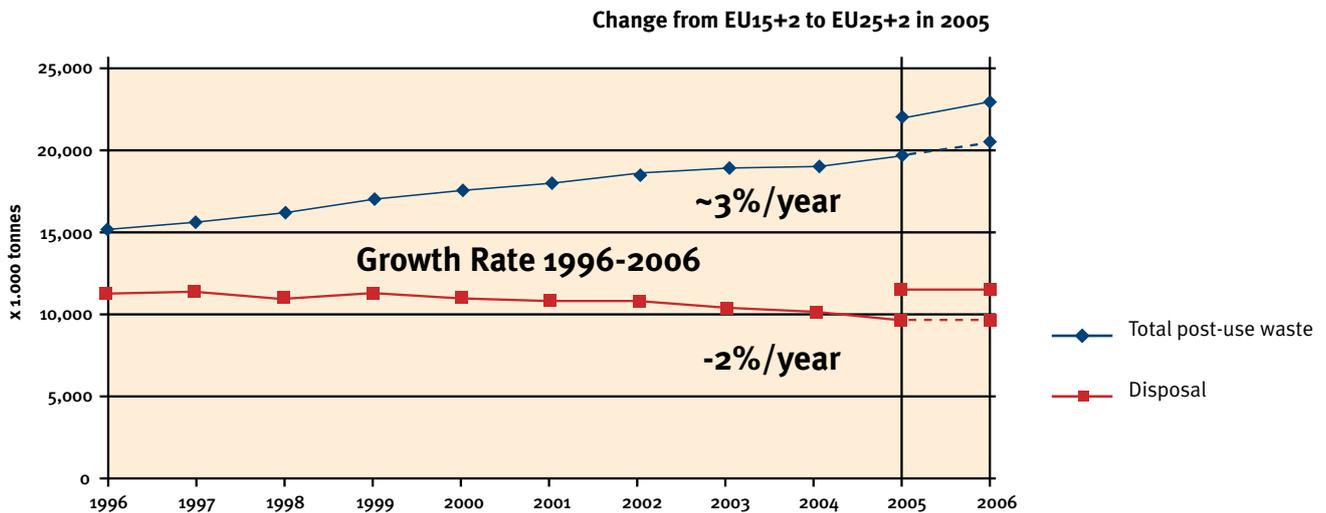
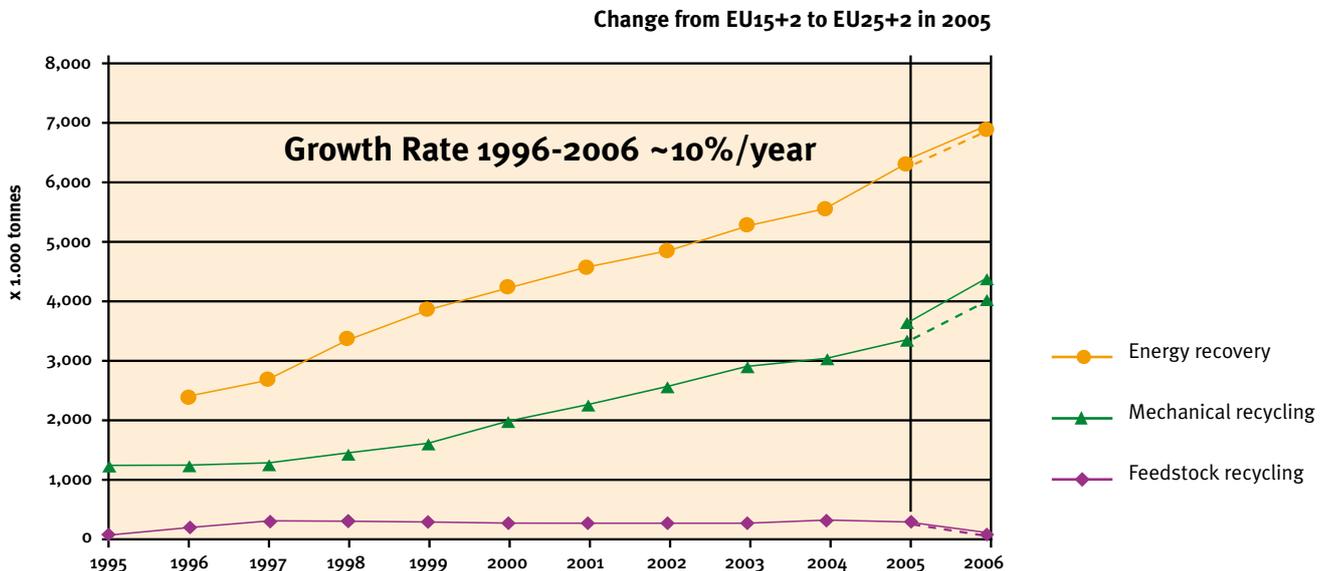


Figure 9. Strong continued growth of recycling and energy recovery



## Progress towards diversion from landfill

The material recycling and energy recovery of post-consumer plastics waste varies significantly by country. In some countries like Switzerland, Germany, Sweden and Denmark there is virtually no landfill – these countries are very close to completing their diversion-from-landfill strategy. Also Belgium, Austria, Luxembourg and the Netherlands recover more than 80% of their post-consumer plastic waste. On the other end of the scale we have several of the new Member States but also the UK, Ireland and Greece, who only recover around 20%.

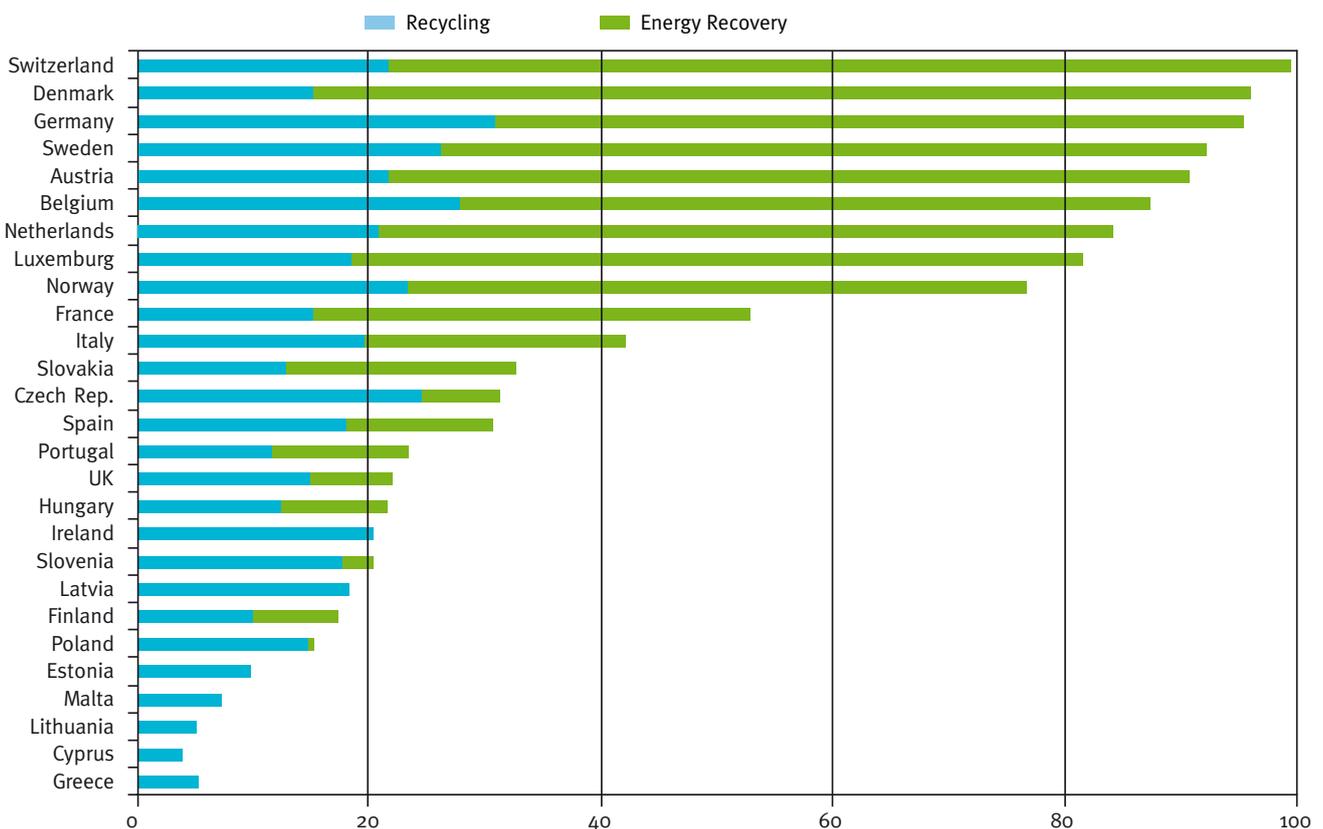
One important observation from Figure 10 is that countries with high recovery rates do well on both recycling and energy recovery. We can therefore confidently state that a strategy including energy recovery is not contradictory to achieving good recycling results. It simply illustrates that a complete resource management strategy needs to address both, as no country has been able or is likely to be able to recycle all post-consumer waste! The other observation that can be drawn is that recycling performance is fairly

similar across most of the EU25+NO/CH countries.

If we exclude some of the new Member States we find the other Member States within a fairly narrow range. This level of recycling can be achieved by setting up systems for recycling bottles and industrial packaging film. Some countries have recently introduced their system while others have operated their systems for some time. Even if there is still potential for growth in e.g. bottle recycling in a number of countries, the fact that countries with long experience have not achieved more suggests that increasing recycling will be increasingly challenging.

Recycling (mechanical+ feedstock) increased from 18 to 19.7% compared to 2005 while energy recovery grew from 29 to 30.4%. Adding energy-from-waste capacity is a very time-consuming activity in most countries with complicated planning permission processes. Recycling, on the other hand, is a smaller scale activity where capacity can be added in small increments, and quite quickly when market conditions are attractive.

Figure 10. Recycling and energy recovery rate per country





## Trends in mechanical recycling

The reporting of recycling performance in this report is done on a Member State level. It reflects the amount of material collected for recycling, whether this material later crosses borders within the EU, or is sent overseas to countries such as China or India, or stays in its country of origin.

Within Europe there is much cross-border movement of material for recycling, which reflects the trade within the EU. For example the proportion of imported waste treated by recyclers in Switzerland, Belgium and the Netherlands is in the range of 35-45%.

Export of post-consumer plastic waste from EU25+NO/CH continued to increase to an estimated total of 0.5 million tonnes in 2006 (up 25% over 2005). This represents 12% of all waste collected for recycling– which is comparable to other materials.

Ensuring that recycling of exported waste takes place in certified and authorised facilities is of the utmost importance for the credibility of the EU as well as for consumer confidence.

The collection rate for mechanical recycling of post-consumer plastics waste increased by 2.5% over 2005 to 19.1% in 2006. This represents an increase of 0.7 million tonnes, giving a EU25+NO/CH total of 4.4 million tonnes. This increase is fuelled by higher polymer prices and improved collection and sorting technology. The recycling capacity of the European recycling industry is estimated to still be higher to enable all collected material to be treated in Europe.

A big part of this increase was achieved through the increase in packaging streams such as PET bottles, industrial packaging film and in PVC products via the programme Vinyl 2010.

As there is still the potential to collect more from the streams mentioned above across Member States, it is important to continue efforts and drive these streams towards their full potential.

In addition countries like the UK are seeking increased recycling of the mixed plastics stream (i.e. the household plastics stream excluding bottles). The plastics industry is engaged in this initiative and supports extended eco-efficient recycling.

However infrastructure and demography varies across Member States, and therefore solutions will not be the same in different countries. For example Austria and the Netherlands have taken the opposite decision to the UK and decided not to collect mixed plastics but instead to recover this stream through energy recovery.

### **Plastic bottles are suitable for recycling**

A packaging application with a good recycling track record is the plastic bottle. Such bottles can be made of PET, PE, PP or PVC.

40% of all PET bottles available for collection were recycled in 2006. This amounts to 1.1 million tonnes/year.

The countries in EU25+NO/CH demonstrate huge variations, from below 10% for some countries to nearly 70% for Austria or Belgium based on no deposit system.

In countries with deposit systems recycling rates of over 90% are being achieved.

If the performance of e.g. Belgium could be matched, then a potential to increase recycling exists of about 1 million tonnes/y across EU25+Norway and Switzerland.

The system in Belgium is based on co-collection of bottles, metal containers and drink cartons. Bottles are separated out in sorting plants. Recyclers then reprocess the separated plastics.

As the quantity of recycled bottles increases, the traditional markets for reprocessed material, fibre and strapping, become saturated. Work is underway in a number of countries to close the bottle loop i.e. to use the reprocessed PET and HDPE for new bottles also for food applications. This bottle-to-bottle recycling will open up a big market for recyclates if the requirements for e.g. food approval can be met.

## Recycling of waste from PVC windows increased by more than 80% in one year

The quantities of recycled window, and window related, profiles being recycled is increasing exponentially each year. The total of 20 ktonnes in 2005 grew to some 37ktonnes in 2006, an increase of 84%.

There are collection and recycling systems for these products in many European countries: Austria, Belgium, Denmark, France, Germany (Rewindo), Ireland, Italy, the Netherlands, Spain and the UK managed by Recovinyl – an initiative operated under the Vinyl 2010 program.

As plastic windows can last for decades without problems, bigger quantities of waste are only expected in the future. Nevertheless, adequate recycling capacities are already being provided for.

In professional recycling all plastic windows, including fittings and glass, are pre-crushed in a shredder. By means of special separators all metal components and glass are excluded from the material flow. Subsequently all PVC, which at first exists as coarse grinding stock of 15-25 millimetres in diameter, is hacked to fine grain size in a cutting mill.

Additional separation – and processing – steps for quality improvement follow in line. The cleaned PVC-grist is subsequently heated, pressed through a screen and granulated. This granulate is then used as raw material for production of new PVC-construction products.



## Trends in feedstock recycling

Feedstock recycling was significantly reduced in 2006. Investment in feedstock recycling facilities remains limited. The most common is the use of treated waste plastics instead of oil or coke as a reducing agent in blast furnaces. This is the practise on a large scale in Germany. In addition Voest Austria has an installation ready to use substituted fuels such as pre-treated waste in the blast furnace (up to 200.000 tonnes).

One interesting recent development has been the use of an integrated non-ferrous metal smelter for the treatment of WEEE plastics which have precious metal content. Again the plastics in used wiring boards act as a reducing agent. Successful trials were also held in Sweden and Belgium (details in references). It is likely that this will be replicated at other integrated non-ferrous metal smelting installations.



Technological development is expected to offer novel ways to recycle the building blocks of plastics. Sectors like packaging, automotive and E&E produce large quantities of mixed plastics in their end-of-life streams. This will attract research and technological development which must be supported.

## Trends in energy recovery

In 2006 7 million tonnes, or 30.3% of the post-consumer plastics waste, was recovered as energy in EU25+Norway and Switzerland, up 1.5% against 2005.

Municipal incinerators remain the most common means of energy recovery.

Capacity has been added as a consequence of the Landfill Directive and countries like Switzerland, Denmark, Germany and Sweden have above 75% of their post-consumer waste treated in energy recovery plants. Austria, the Netherlands and Belgium are all achieving around 60%.

Other countries have less than 20% of their post-consumer waste recovered in energy recovery plants. This includes not only new Member States but also countries such as Finland, Greece, Ireland, Spain and the UK.

There is growing recognition in e.g. Ireland and the UK that the energy recovery capacity should be increased, but the planning process is complex and protracted and planning permission is frequently contested by NGOs and local interest groups.

An additional form of energy-from-waste is the production of solid recovered fuel (SRF) through concentrating high calorific waste and converting it into a material with a defined specification agreed between user and producer. The use of such solid recovered fuels is expected to grow after the introduction of CEN standards for the classification of this type of fuel. This kind of “concentrated” high calorific fuel has a huge potential in partly replacing other fuels in cement kilns, paper mills and power plants. Significant SRF capacity is being built in Germany and progressed in other countries. Ineos - a plastics producer - is in the final stages of gaining permission for an SRF-fuelled power plant in the UK and a Finnish power company is building a new SRF-fed power station.

Spittelau is a combined heat and power incinerator located in the city Centre of Vienna, only 3km from the St Stephen Cathedral. The plant was developed in the late 1980s into a striking design by Friedensreich Hundertwasser. The plant has a capacity of 260.000 tonnes/year and produces 66MW, with an efficiency up to 86%. Of the total output 60MW goes to heating the Vienna district heating system and 6MW is generated as power for the Vienna grid. Plastics make up around 10% by weight of the feed but as much as 50% of the calorific content thanks to their high specific calorific value. When the flue gas leaves the 128m high chimney it has passed through one of the most effective cleaning processes, ensuring full compliance with the Waste Incineration Directive.

In a public poll some years after start-up 3% were against waste incineration and 81% were positive to waste incineration and district heating. The magic recipe of investing in a comprehensive educational campaign, securing the highest technical standards and choosing an outstanding design can surely be copied elsewhere.



# Recovery trends by application

## Packaging

The packaging application has the longest history of recovery and contributes about 62% of end-of-life quantity. Not surprisingly the major part of what is today recycled therefore comes from packaging.

Streams of bottles and industrial film are being mechanically recycled to ~40% across EU25+NO/CH.

Crates and boxes are recycled at well over 90%.

Recycling rates for the remaining mixed plastics are still low – below 10% across EU25+NO/CH.

In total the collection for recycling of post-consumer packaging grew in 2006 to an average of 27.4%, up from 25.8% in 2005.

Fig 11 shows the map over Europe with EU25+NO/CH countries below 15% (current requirement), below 22.5% (requirement from 2008) and those above 22.5%.

Figure 11.

- <15%
- 15-<22,5%
- >=22,5%
- not included



## Agricultural films

Agricultural plastics waste such as silage film is a good source for mechanical recycling as it is made from a limited range of plastics, mostly polyolefins. However often high levels of contamination by earth pose a technical and financial challenge to eco-efficient recycling or recovery.

Two-thirds of the recycled volume in EU25 plus NO/CH comes from the three biggest countries in tonnage terms - Germany, Italy and Spain.

## Automotive

The recycling rate for automotive plastics waste continued to increase to just under 10% in 2006. Volkswagen won an environmental award for their SiCon process - a mechanical process to extract usable secondary raw materials from the residues from vehicles shredded at the end of their useful life. Plants to use this type of technology are being built and starting up in the Netherlands and in Austria.

## Electrical & electronic

Recycling in the electrical and electronic sector is limited by complex products with materials intermingled in a way which makes sorting an intensive and expensive activity. An example of growing recycling in the E&E sector is of the inner liner of a refrigerator. For the majority of waste streams, thermal treatment via feedstock recycling or energy recovery is the most appropriate procedure.

There is also some uncertainty about the actual volumes of discarded E&E equipment. It can be assumed that some is exported outside Europe.

## Construction

Plastics used in construction are for long-term use and hence do not generate as much waste. Nevertheless increased recycling is being achieved in e.g. window profiles and pipes.

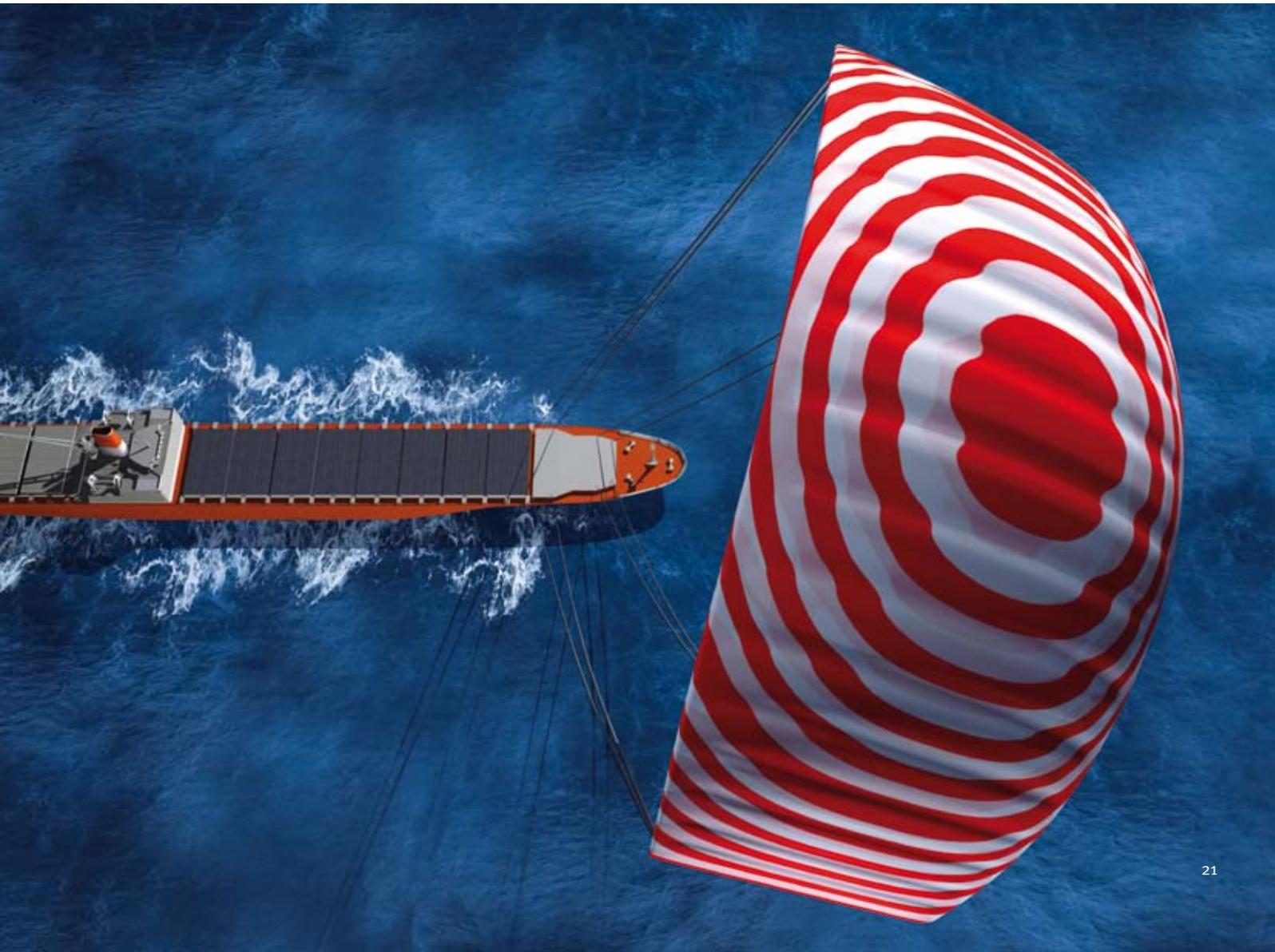
## What has Europe learnt and what about the Future?

The use of plastics is expected to continue and increase, driven by:

- potential for innovation
- energy saving potential – and positive contribution to climate protection
- quality of life enhancement
- enabling of affordable products

Our most important task in the waste management area is to divert combustible waste from landfill. Plastics are particularly important to recover as they offer many options including recovering the calorific content of the material. For recovery, mechanical recycling will remain the preferred method for homogeneous plastics waste streams, whereas for a number of mixed streams different energy recovery options are preferable.

Both methods save resources and CO<sub>2</sub> emissions. The last 10 years have seen a remarkable change in the approach to waste management across Europe. As a result, there has been a significant increase in the recycling of all materials as well as more recovery of energy from combustible waste. The situation with respect to plastics materials is no exception, and as this report demonstrates, both recycling and energy recovery of plastics waste continue to increase.



# References

1. The website of the European Union provides access to details of all policies and legislation. For matters relating to the environment see:  
[http://europa.eu/pol/env/index\\_en.htm](http://europa.eu/pol/env/index_en.htm)  
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4. Best practices for the mechanical recycling of post-user plastics, TNO Institute of Industrial Technology, The Netherlands, published 2000, TNO-report 00 PO 891 HDG
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8. Energy recovery from greenhouse PE film, *PlasticsEurope* (APME) Summary report published 2000
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12. Gasification-the key to a cleaner future, David J. White, Financial Times Energy Publishing, ISBN 1 84083 217 7, published 2000
13. The contribution of plastics products to resource efficiency, GUA Consultancy GmbH, Vienna. Full report published January 2005
14. The characteristics of plastics - rich waste streams from end of life electrical and electronic equipment, published January 2006.

Copies of many of these reports and other technological studies related to plastics and the recovery of plastics waste can be found on the website of *PlasticsEurope* (<http://www.plasticseurope.org>).



## Who are we?

The European plastics industry makes a significant contribution to the welfare in Europe by enabling innovation, creating quality of life to citizens and facilitating resource efficiency and climate protection. More than 1.6 million people are working in about 50.000 companies (mainly small and medium sized companies in the converting sector) to create a turnover in excess of 280 billion € per year.

PlasticsEurope is one of the leading European trade associations with centers in Brussels, Frankfurt, London, Madrid, Milan and Paris. We are networking with European and national plastics associations and have more than 100 member companies, producing over 90% of all polymers across the EU27 member states plus Norway, Switzerland, Croatia and Turkey.

**EuPC** - the European Plastics Converters - is the professional representative body of plastics converters within Europe whose activity embraces all sectors of the plastics converting industry including recycling. The overall objective is to defend and promote the interests of the European plastics converting industry

- Voicing the industry's opinion towards European and international institutions and non-governmental organisations;
- Maintaining relationships with corresponding organisations in Europe and worldwide;
- Carrying out business surveys, studies and research projects in all aspects of the plastics processing industry.

**EuPR** - the European Plastics Recyclers - is the professional representative body of plastics recyclers in Europe.

EuPR promotes plastics mechanical recycling and conditions that enable profitable and sustainable business, while offering a service platform to its members. EuPR members bring together 85% of the European recycling capacity processing more than 2.5 million tonnes of collected plastics per year.

**EPRO** - the European Association of Plastics Recycling and Recovery Organisations - is the association of the national organisations charged with organising and promoting recycling and recovery of plastics throughout Europe.

EPRO provides a unique forum for the leading specialists in plastics waste management from across Europe to exchange learning, develop integrated plastics packaging waste strategies and support technological development.

The material contained in this publication is for information only. The above partners have compiled the pages in this publication very carefully, and the information placed in this publication is offered in utmost good faith and is believed to be correct.





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