The Compelling Facts About Plastics 2007

An analysis of plastics production, demand and recovery for 2007 in Europe

Published in October 2008

Plastics
The Material for the 21st Century

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Methodology and changes

This brochure on 2007 production, demand and recovery is the eighteenth 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 of and demand for the plastics raw materials.

The data for the end-of-life phase was 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 EU27+NO/CH.

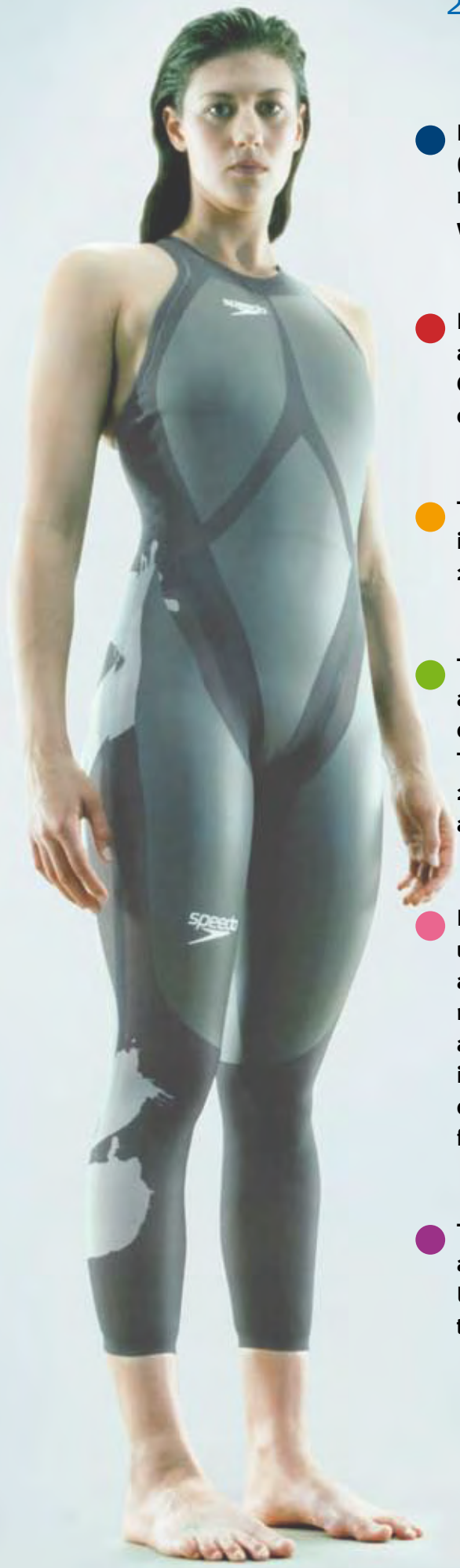
For recovery data, official statistics have been used whenever available from European or national authorities and waste management companies or organisations. Where required research or know how from consultants has been used to complete the picture.
The figures cannot always be directly compared to 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. The countries covered by this data changes to follow EU enlargement, hence Romania and Bulgaria are included from 2007 onwards. When making percentage comparisons with 2006 this is done by including these two countries although they were not included in the 2006 report.
Also, as many figures are the result of assessments applying the same definitions across EU27+NO/CH they can deviate from corresponding numbers quoted by other sources, as they may use different definitions or have made alternative assessments.

PlasticsEurope
Association of Plastics Manufacturers

EuPC
European Plastic Converters

epro
European Association of Plastics Recycling and Recovery Organisations

EuPR
European Plastics Recyclers



2007 – At a glance

- Plastics continue to be a global success story with Europe (EU27+Norway (NO) and Switzerland (CH)) remaining a major manufacturing region, producing about 25% of the total estimated worldwide plastics production of 260 million tonnes.

- For the whole of the plastics industry – producers, converters and machinery manufacturers – the overall turnover in EU27+NO/CH 2007 was in excess of 300 billion euro, with the industry employing more than 1.6 million people.

- The demand by converters for plastics in Europe (EU27+NO/CH) increased from 51 million tonnes in 2006 to 52.5 million tonnes in 2007, an increase of 3%.

- The recovery rate of post-consumer end-of-life plastics now stands at 50% in EU27+NO/CH (up 1% point on the previous year) and disposal stands at 50% (down by 1% point compared to 2006). The recycling rate for post-consumer plastics has increased to 20.4% - up from 19.5% in 2006. Energy recovery remains unchanged at 29.2%.

- Nine of the EU27+NO/CH states recover more than 80% of their used plastics – one more than last year (Norway). 7 of these states are among the top 8 best performers for recycling and together they represent the top 9 states for energy recovery. Their 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 EU27+NO/CH of the growth in used plastics and the volume of plastics waste going to disposal continued. Used plastics going to disposal remained stable at 12.4 million tonnes/year against a growth in plastics use of 3%.

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 applications as diverse as renewable energy production and protection in extreme conditions.

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_2 emissions. The weight reduction enabled by 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 priority 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_2 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_2 used to produce a single portion of meat is about 100 times bigger than that 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 motorcyclist is based on plastics, an astronaut's suit must sustain temperatures from-150 degrees Celsius to+120 degrees and the fire-fighters rely upon plastics clothing which protects against high temperatures, ventilates and are 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 will be used to combat coronary disease. Artificial blood based on plastics is being developed to complement natural blood.

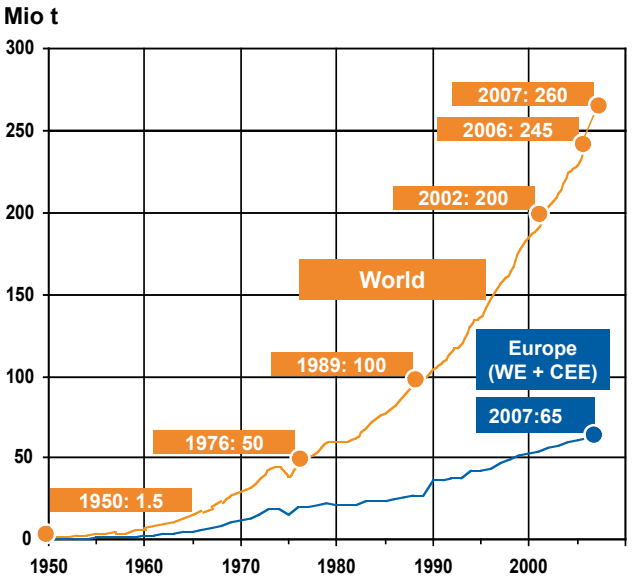
Production of and market demand for plastics in a global context

A track record of continuous innovation has driven a global average increase in production and consumption of about 9% every year since 1950. From around 1.5 million tonnes in 1950, the total global production of plastics grew to 260 million tonnes in 2007 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 towards 140kg per capita by 2015. 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 percentage increase as their economies develop. Their current average per capita consumption, between 50 and 55kg, is a little more than half of that of the old Member States (Figure 2).

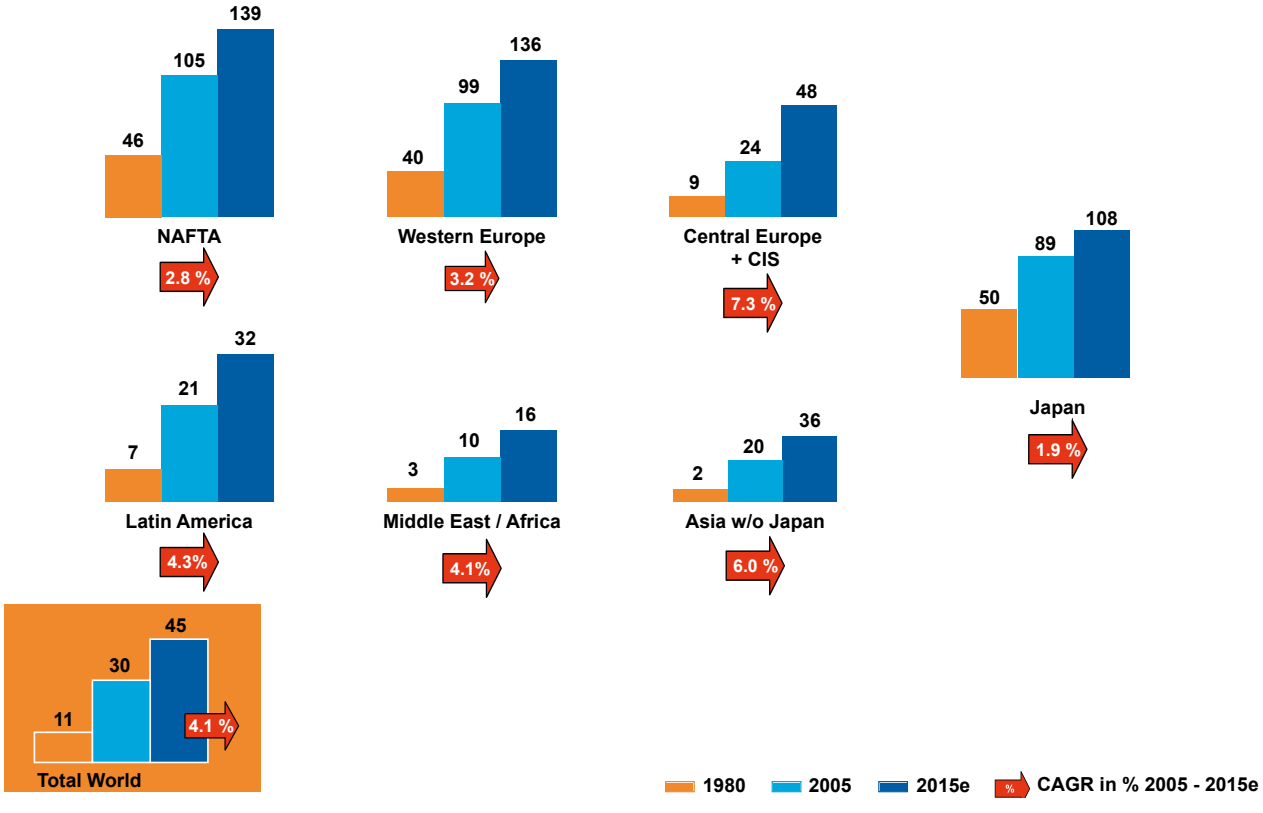
Figure 1. World Plastics Production 1950-2007



Includes Thermoplastics, Polyurethanes, Thermosets, Elastomers, Adhesives, Coatings and Sealants and PP-Fibers. Not included PET-, PA- and Polyacryl-Fibers

Source: Plastic*Europe* Market Research Group (PEMRG)

Figure 2. Plastic demand by converters per capita per region



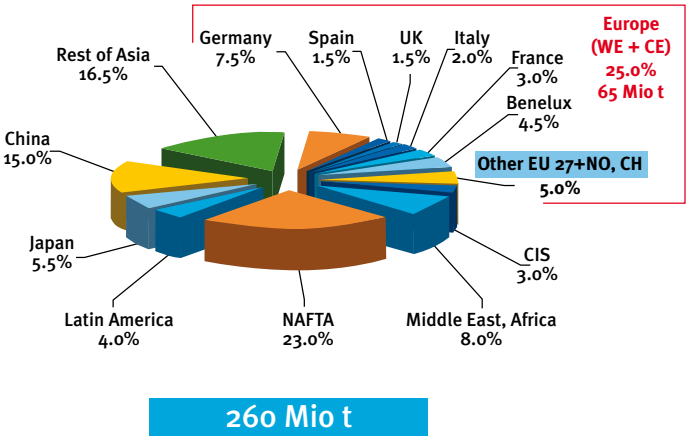
Source: Plastic*Europe* Market Research Group (PEMRG)

Production and demand in EU27+NO/CH

EU27+NO/CH represent 25% of the global plastic production with about 65 million tonnes/year, slightly above NAFTA at 23%. Within Europe, the plastic production facilities are well spread. Germany is the major producer, accounting for 7.5% of global production, followed by the Benelux (4.5%), France (3%), Italy (2%) and the UK and Spain (1.5%) (Figure 3).

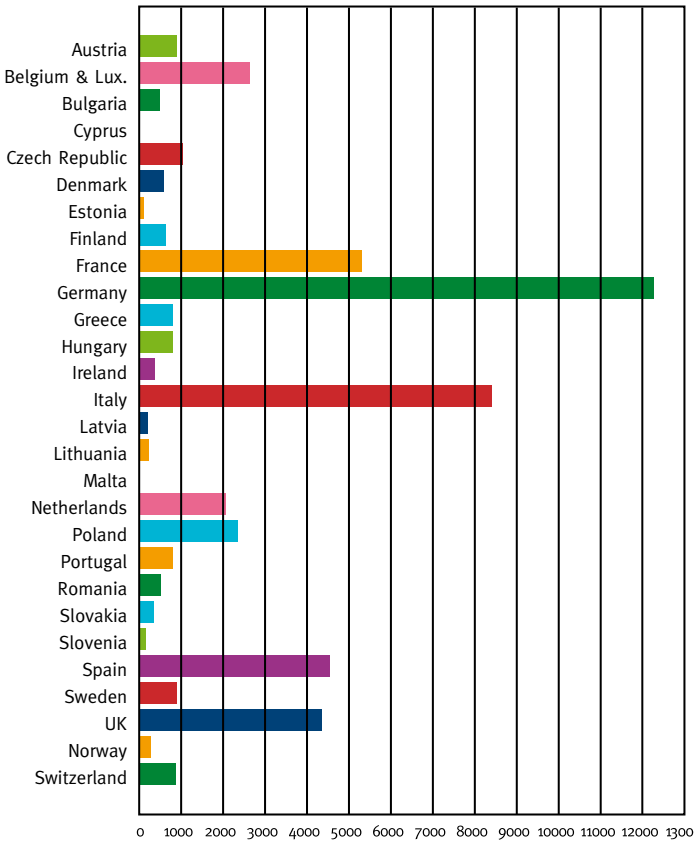
Plastics demand by converters in EU27 + Norway and Switzerland was 52.5 million tonnes in 2007. The demand expressed as tonnage of virgin resin processed by European converters by country is shown in Figure 4. The major countries are Germany and Italy, which together account for around 40% of the European conversion to plastic products. Of the new Member States, Poland has the highest plastic conversion, currently at about 2.35m tonnes of the European total. The Czech Republic and Hungary are each at about half this level. It is expected that the converting industries in most of the new Member States will grow strongly in the coming years.

Figure 3. World Plastics Production 2007



Source: Plastic*Europe* Market Research Group (PEMRG)

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



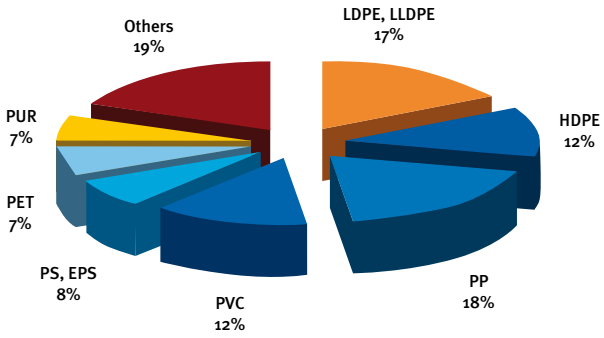
Source: Plastic*Europe* Market Research Group (PEMRG)

Converter Demand per polymer and 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 2007, all of the above experienced growth in demand in the range of 0.5 to 7.5% - with an average of 3% (Figure 5).

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

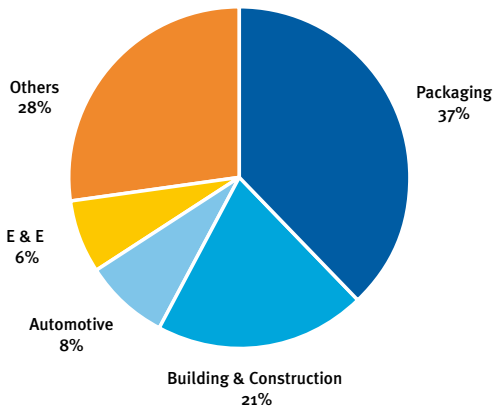
Figure 5. Converter Demand per polymer and application



52.5 Mio t
EU27+NO, CH incl. Other Plastics (6-7 Mio.t)

Source: Plastic*Europe* Market Research Group (PEMRG)

Figure 6. Demand by converter by End Use Segment



52.5 Mio t
EU27+NO, CH incl. Other Plastics (6-7 Mio.t)

Source: Plastic*Europe* Market Research Group (PEMRG)

A revised Waste Framework Directive (WFD) paving the way for a resource efficient Europe

The EU institutions finally reached an agreement in 2008 on the revised Waste Framework Directive (WFD).
The WFD provides a framework to drive waste management practices in the EU. The revision was badly needed to bring legal clarity in a number of important areas. In summary the revised WFD provides a strong drive for resource efficiency and diversion of waste from landfill.
Underpinning this is the recognition of the 5 step waste hierarchy as a priority order to be applied flexibly using life cycle thinking to allow each waste stream to be handled in the best environmental way, considering economic viability and technical feasibility.
The hierarchy for improving resource efficiency is (in descending priority order):

- reduce
- reuse
- recycle
- recover
- disposal

The logic underpinning the hierarchy is that the most resource-efficient approach is not to generate the waste in the first place or to create as little as possible.
The next best option is reuse i.e. using an article over-and-over again, like a beverage crate or a multi-use shopping bag. If reuse is not feasible then products should be recycled, provided that this is more eco-efficient from a lifecycle perspective than recovery. The last resort is disposal which should be minimised.

The new WFD defines recycling broadly, which will stimulate further development of innovative recycling solutions, expanding from traditional mechanical recycling to encompass recycling of plastics' chemical building blocks for use as a raw material. This offers an innovation upside for the European recycling industry to explore new ways of using resources more efficiently than recovery or landfill.
Extremely demanding recycling targets have also been set for household and demolition waste, which will require tough measures in many Member States but will also act as a driver to minimise waste to landfill.

A landmark change is that efficient energy-from-waste will now be classified as recovery rather than disposal, and as it is one step above landfill it will create strong drivers in society. A climate correction factor will be defined to ensure that countries with warmer climates will still have a good opportunity to meet the energy efficiency criteria.
Broadly-speaking the revised WFD will provide a framework which will enable improved recycling of plastics – both mechanical and feedstock - via innovative, eco-efficient technologies. High-calorific waste plastics will be important to help energy-from-waste plants meet the efficiency criteria set for classification as recovery.
Innovative new plastics-enabled solutions will save resources through applications such as packaging, both by reducing waste and by light-weighting the packaging itself. Plastics are resource-efficient materials and will play a key role in driving a resource-efficient Europe.

Plastics contribute in many ways to sustainable use of resources

Reduce
Plastics save energy and CO_2 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 22.4million additional tonnes of crude oil would be required every year.
The corresponding greenhouse gas emissions are equivalent to 30% of the EU25 Kyoto target for 2000-2012.

Plastics contribute to waste minimisation by offering more and more resource-effective solutions, including lower energy consumption during production, a reduction in the plastics material needed to do a particular job and less waste of the packaged 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. Plastics soft drink bottles 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 such as bottles and industrial packaging film, new important developments are ongoing, like the Recovinyl initiative under the Vinyl2010 programme of the PVC industry (covering pipes, window frames, roofing membranes, and flooring).

Another stream which is explored in an number of Member States is the “mixed packaging plastics”

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 in an eco-efficient way:
For these streams plastics offer an additional recovery option – energy recovery. As long as we use fossil fuels for energy production, plastics will offer an additional value to society as plastics enable many vital applications during the lifecycle of these hydrocarbon molecules on their journey from oil well to energy source.

Landfill or disposal must be minimised as it wastes a valuable resource and contributes to greenhouse gas formation.

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

Biobased & Biodegradable Plastics: “Bioplastics”

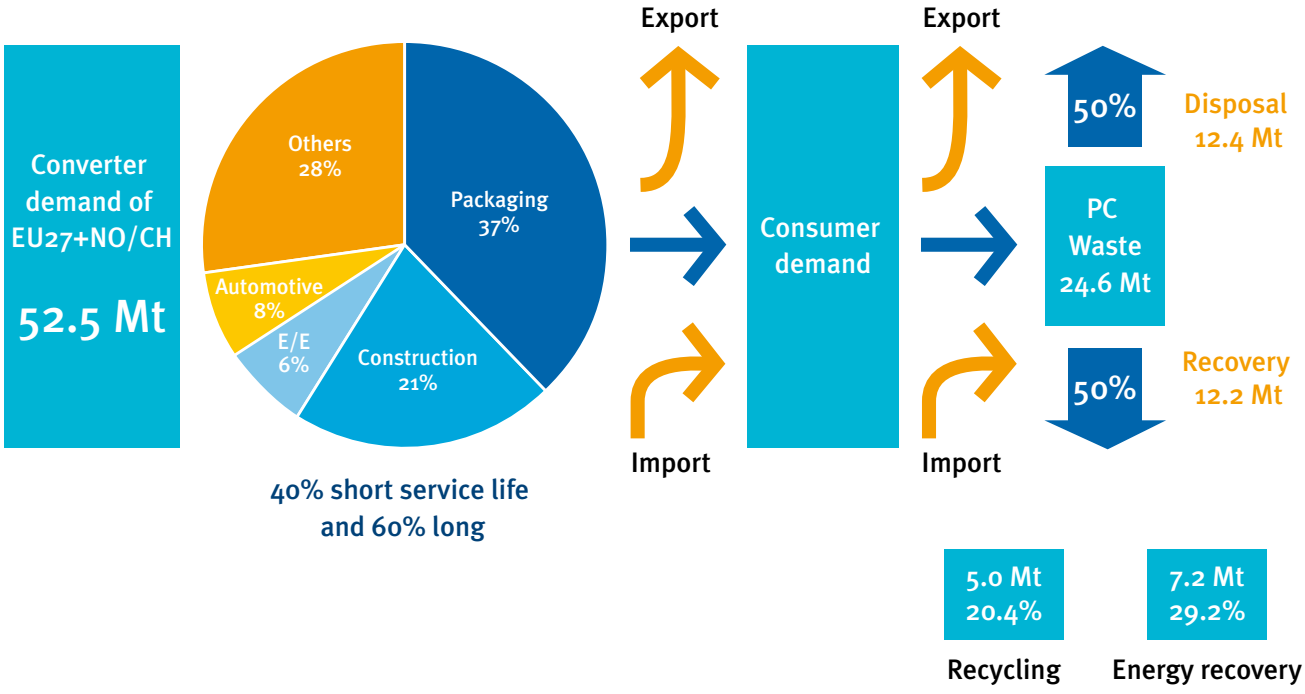
Bioplastics are welcomed as new members of the plastics family, adding new features to the diverse spectrum of plastics materials.
Unfortunately the two aspects of bioplastics – the functional property of degradation and the origin of the feedstock for production – are often mixed-up.
Degradable plastics provide a functional property which is required for certain applications such as compost bags, mulch film for agricultural applications, and packaging for catering and for surgery (to mention just a few).
However the use of degradable plastics must be carefully evaluated in order to ensure that, for example, they do not contaminate recycling loops such as 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 such as sugar and corn. Plastics production uses only 4% of all oil and gas. Long before our reserves of fossil feedstock have run out, the tightening supply-demand balance will lead to higher prices which will move major fossil fuel users, like transport and heating, to alternative sources. Increasingly in the future, complementary feedstock to fossil – like biomass or other carbon sources - will be used to secure undisrupted supplies of plastics to society.
Bio-based plastics today have a share of less than 1 % of the total plastics market but have expected high growth rates.
An application for plastics which has been particularly in focus in the bioplastics debate is the carrier bag.
In the public debate the plastic bag has been the victim of irresponsible litter behaviour in society, which has unfairly 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.
This debate is an example of the misunderstanding around the term “biodegradability”. Biodegradability - as with any other form of enhanced degradation of plastics - does not resolve the litter issue, as this process can take 18 months or more depending on the conditions of the (industrial) composting facility.
All-in-all the debate on biobased and / or biodegradable plastics has become more factual in 2007. Stakeholders are increasingly aware of the multitude of considerations that have to be made to correctly position a product.

Plastics supply chain from cradle to cradle

Figure 7 illustrates the flow of plastics from conversion to the end-of-life phase. The data is valid for EU27+Norway and Switzerland.
The converters used 52.5 million tonnes of plastics in 2007, up 3% on 2006. Of all plastics used by consumers, 24.6 million tonnes ended up as post-consumer waste, up from 23.7 million tonnes in 2006.
50% of the post-consumer used plastic was recovered and 50% went to disposal. Of the quantity recovered, 5 million tonnes were recycled – as material and feedstock – and 7.2 million tonnes were recovered as energy.

The overall material recycling rate of post-consumer plastics in 2007 was 20.4%, with mechanical recycling at 20.1% (up 1.2% points from 2006) and feedstock recycling at 0.3% (down 0.3% points from 2006).
The energy recovery rate remained stable at 29.2% reflecting how the sensitivity and planning complexity of this resource management technology has led to slow progress in society.
In 2007, 12.4 million tonnes of plastics were wasted in landfill.

Figure 7. Plastic from cradle to cradle (EU25+NO/CH 2007)



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 has remained stable. Figure 8 shows the history for EU15+NO/CH up to 2004 and for EU27+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 quantity saw another good increase of 11% in 2007 which is explained by higher plastic prices and improved collection and sorting technology.
Growth in energy recovery quantity slowed to 3% as very little capacity was added in 2007.
More investment in energy recovery facilities is needed to divert streams which cannot be eco-efficiently recycled from landfill.

Figure 8. Continued decoupling of plastic waste and landfill

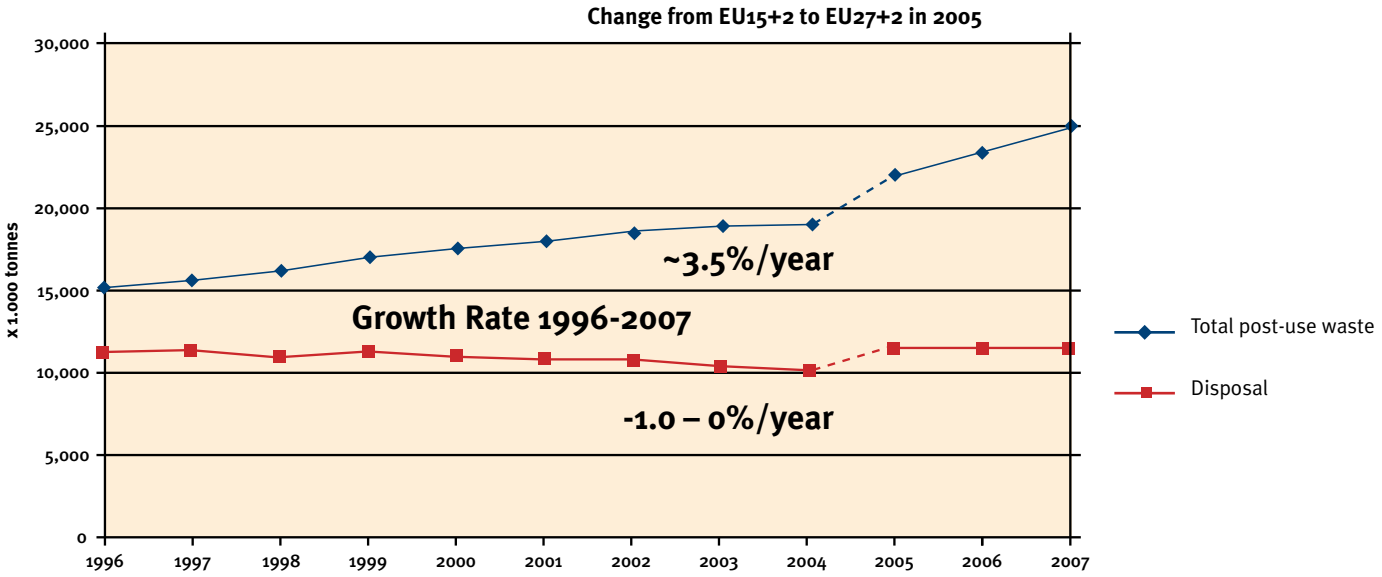
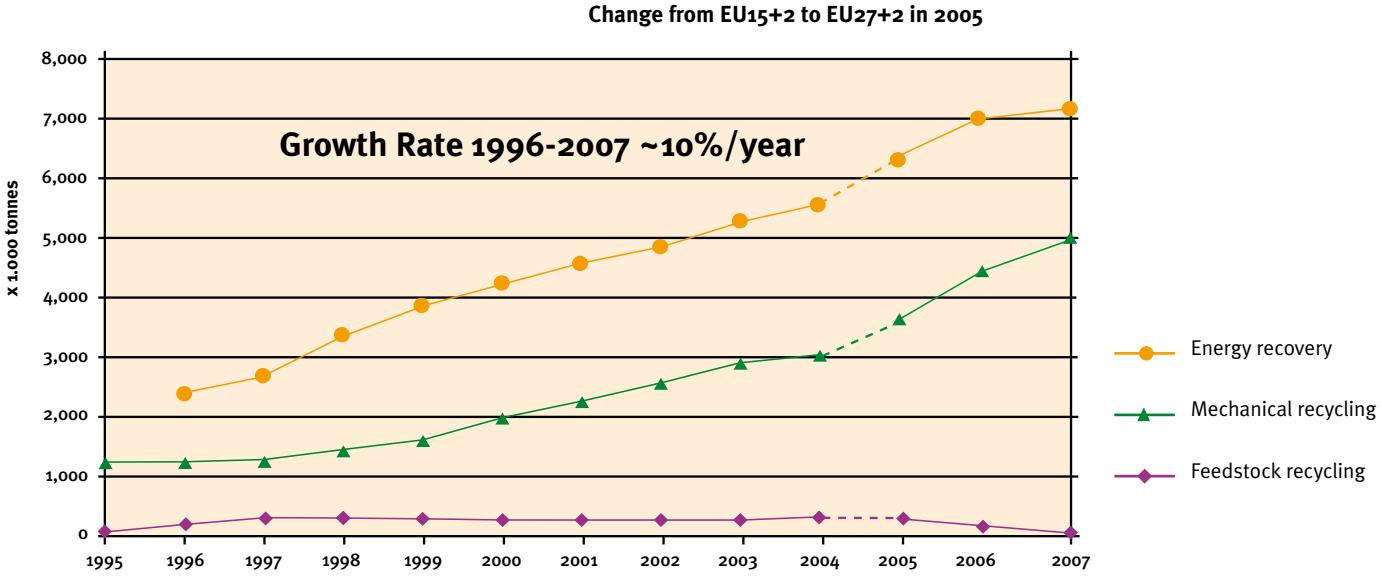


Figure 9. Strong continued growth of recycling and energy recovery



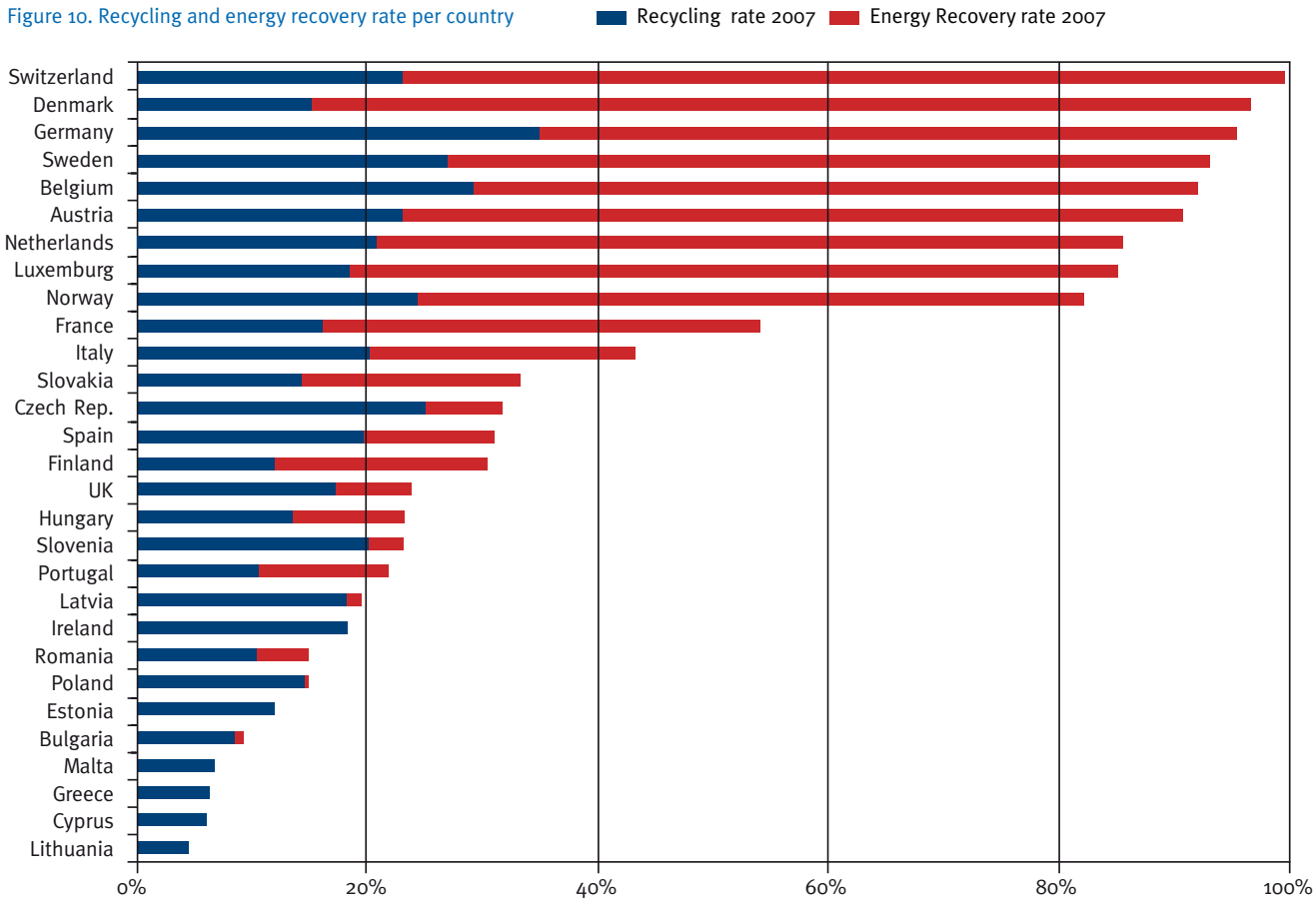
Slow progress towards diversion from landfill

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 very little landfill – these countries are very close to completing their diversion-from-landfill strategy.
A recent study by the Swiss consultancy Prognos(1) showed that 27% of the EU Kyoto target for greenhouse gas (GHG) emissions could be saved if all waste currently going to landfill was to be diverted ***flexibly*** to recycling and energy recovery.
The best results were achieved without specific targets but with full flexibility to explore recycling and energy recovery where it best served the specific waste stream.
In addition to saving GHG emissions, diversion from landfill contributes to increased resource efficiency and energy security while reducing littering.

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 will be able to recycle all post-consumer waste.
The other observation that can be drawn is that whilst recycling performance is fairly similar across most of the EU27+NO/CH countries there are huge differences in the utilisation of energy recovery. Countries which have high dependence on landfill must not only exploit their full recycling potential but rapidly expand their energy-from-waste network.

The progress of the diversion from landfill is slow on average with recycling (mechanical+ feedstock) across EU27+NO/CH increasing from 19.5% in 2006 to 20.4% in 2007 while energy recovery remained stable at 29.2%.
Strong efforts will be required in many Member States to capture the full potential offered by a diversion from landfill strategy, namely GHG emission savings, enhanced resource efficiency and energy security and the avoiding of landfill penalties.

Figure 10. Recycling and energy recovery rate per country



(1) http://www.prognos.com/Singleview.306+M5c828d79ff6.0.html



Trends in 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, 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 EU27+NO/CH continued to increase to an estimated total of 0.65 million tonnes in 2007 (up 30% over 2006). This represents 13% 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 11% over 2006 to 20.1% in 2007. This represents an increase of 0.5 million tonnes, giving an EU27+NO/CH total of 4.9 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 be still 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 PVC products via the programme Vinyl 2010.
As there is still the potential to collect more from these streams across Member States, it is important to continue efforts to drive these streams towards their full potential.
Crates and pallets are two streams where recycling is well above 90%. This successful “closed loop” is threatened by changes in the EU legislation linked to the heavy metal content of these products. Without the derogation extension to continue to recycle and keep the heavy metals safely in the plastic a huge quantity of recyclable plastics could be obsolete. Industry is working towards a controlled scheme to monitor the renewal of the derogation.

In addition countries like the UK are seeking increased recycling from 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. 43% of all used PET bottles were collected for recycling in 2007. This amounts to 1.2 million tonnes/year. The EU27+NO/CH countries demonstrate huge variations, from below 10% for some countries to nearly 70% for countries such as 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 the potential exists to increase recycling by about 1 million tonnes/y across EU27+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 and 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. EFSA – the European Food Safety Agency - has published guidelines for applicants for the safety evaluation of recycled plastics to be used in contact with food. The new European regulation on plastics (EC 282/2008) requires that recycled plastics used in contact with food should only be obtained from processes which have been assessed for safety by EFSA.

Recycling of PVC reaches 150,000 tonnes a year

In 2007 the volume of post-consumer PVC waste being recycled across Europe, mainly through the Recovinyl system as part of the industry Vinyl 2010 voluntary commitment, reached 149,500 tonnes. This represents an 80% increase on 2006 levels, when 83,000 tonnes were recycled and continues the strong growth in PVC recycling seen in the previous two years which saw the volume of Vinyl 2010 sponsored recycling doubling each year. The Vinyl 2010 target for 2010 is for the recycling of 200,000 tonnes of post-consumer PVC waste (in addition to regulated waste streams and to the volumes recycled in 2000). There are now collection and recycling systems for PVC products in many European countries.

Since many PVC applications like window frames and pipes are long-life products that can last for many decades the quantity of end-of-life material is currently limited. Larger quantities of waste material are therefore 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 hackled to fine grain size in a cutting mill.

Additional separation – and processing – steps for quality improvement follow in line.

Packaging Recycling Beyond the Bottle

The plastic bottle is successfully recycled in most EU Member States. To further improve packaging recycling rates we need to

- continue to capture the full potential of the bottle
- explore other content of the packaging stream

Countries like Austria, Italy, Germany, Norway and Spain already collect – in addition to the bottle – rigid packaging such as trays, tubs and pots plus some film.
Improvements in sorting and washing technologies, emerging markets for recyclate and potential business opportunities drive Member States to explore this stream - often referred to as “Mixed Plastics”.
An EPRO working group is focussing on Mixed Plastics by studying existing systems and carrying out industrial tests to assess feasibility, cost effectiveness and environmental benefits of the different end-of-life options. In the UK WRAP - the Waste Resource Action Programme – has run an initial study and is now taking this to full scale validation.
The learning from exploring the recycling of Mixed Plastics is that:

- Input needs to be sorted to high level of purity per plastic type
- Recyclate needs to replace virgin polymer in the next application
- Well defined end markets for each recyclate stream need to be developed
- Only part of the input stream can be turned into recyclate with the balance better used for energy recovery. Percentages depend on quality and consistency of input stream

Additional learning will become available over the next few years as Member States explore this recycling opportunity.

Focus on Italy
Corepla - the National Consortium for the Collection, Recovery and Recycling of Plastic Packaging Waste - has been set up to guarantee recycling and recovery of packaging waste.
In 2002 household collection in Italy was enlarged from bottles-only to all plastic packaging waste.
Since then Corepla has created value for bottles and film with the result that in the year 2007 of more than 200.000 tonnes of bottles and around 50.000 tonnes of film were sold through web-based auctions with a revenue of more than € 40 million.

In 2007 mixed plastics packaging represented more than 35% of the whole household collection with 40% being recycled and the rest used for energy recovery.

Corepla is focused on creating even more value for mixed plastics fractions through automatic sorting (for increased efficiency) and analysis of end-use markets in order to find high-value applications.

Trends in energy recovery

In 2007, 7.2 million tonnes or 29.2% of the post-consumer plastics waste was recovered as energy in EU 27+Norway and Switzerland, unchanged in percentage terms from 2006.

Municipal incinerators remain the most common technology for energy recovery. Nine of the EU27+NO/CH countries use 58-81% of their post-consumer waste in energy recovery plants. France uses 38% while other countries have 20% or less 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 fuel with a defined specification agreed between user and producer. The use of such solid recovered fuels is expected to grow after the introduction of European CEN standards for the production and trade of this type of fuel. This kind of "concentrated" high calorific fuel has a huge potential in partly replacing other fuels for co-combustion in cement kilns, paper mills and combined heat and power plants (including district heating). Significant SRF capacity is being built in Germany and progressed in other countries. Ineos - a plastics producer - has recently obtained planning permission for an SRF-fuelled power plant in the UK and a Finnish power company is building a new SRF-fed power station.
Recent studies have documented that there are significant positive synergy effects from co-firing solid recovered fuel (SRF) with biomass: SRF addition allows earlier ignition (partly because biomass always has a certain water content, while SRF does not), which in turn assures faster and more efficient incineration, better combustion stability and higher boiler output.
As SRF is often locally available, and at a low cost, co-firing SRF and biomass is also a financially attractive option.

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 60.000 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.

Plastic Products, Applications and Goods–enablers of innovation in society

Transport

In addition to the energy savings enabled by plastics in cars, aircrafts and trucks, plastics facilitate innovation in a variety of ways.

Aesthetic design is made possible by the inherent capability of plastics to be designed, coloured and produced in any shape and form.

Cheaper solutions – leading to more affordable cars - are enabled by plastics components allowing the integration into one piece of what had previously been several parts made from traditional materials and requiring an additional joining-together step. Exterior panels able to take small impacts will save money and trouble to the car owner as little or no repair will be needed.

Sports and leisure

The recent Olympic games in Beijing gave numerous examples how plastics enhance performance – in a legal way – in vastly different sports and make it more enjoyable to the competitor whether it is a top athlete or a casual exerciser. Perhaps the best example is the new swimming suits which enabled competitors to break numerous records. Thanks to a polyurethane suit covered in an entirely seamless engineered fabric, where the different panels are ultra-sonically welded together, athletes were provided with a 5% better oxygen intake capability and a 4% increase in speed.

Sports shoes are made lighter and lighter, whilst offering better stability and robustness thanks to better and better foam and supporting structures made from plastics– and what was solely for the top athletes in the Olympics will soon be in the mass market to be enjoyed by the rest of us.

Intelligent textiles

Intelligent textiles will transform the way we work, live, travel and care for our bodies and planet

Cuddly soft baby pyjamas that monitor vital signs and sound an alarm if the child are in danger in its sleep.

The rapid development of so-called intelligent or technical textiles constitutes a revolution both for the textile industry itself and for sectors ranging from transport, construction and work place safety to agriculture, health, consumer electronics and – of course – fashion.

Also known as smart fabrics, these materials generally consist of polymer-based fabrics designed to perform very sophisticated functions and usually incorporate high-tech elements, from biochemicals to photovoltaic cells, into the fabric itself.

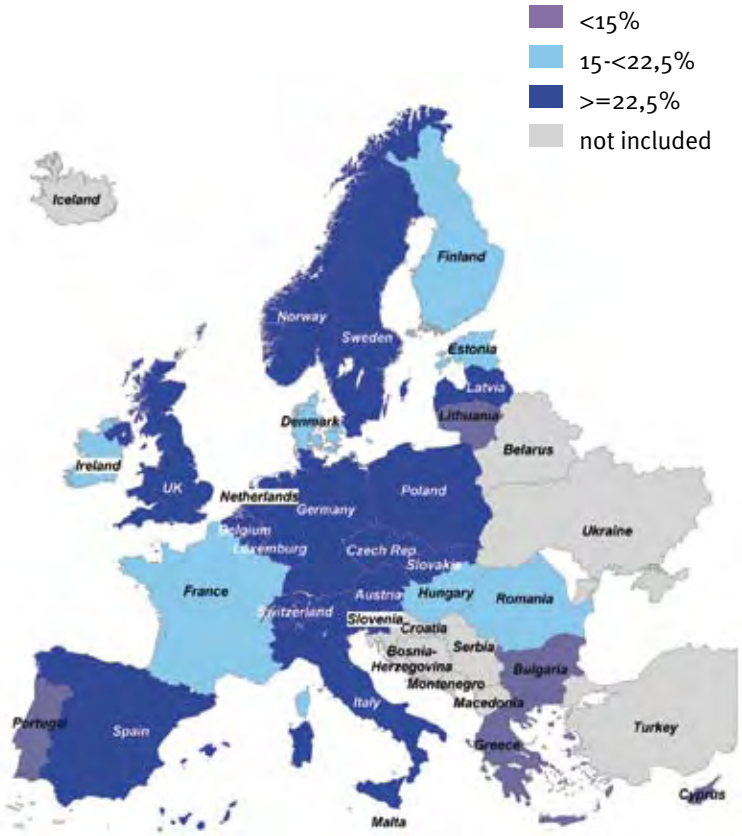
In healthcare we have for some time used intelligent fibres to make the little tubes that prop open blocked arteries in coronary bypass surgery or to reinforce torn ligaments.

Recovery trends by application

Packaging

The packaging application has the longest history of recovery and contributes about 63% 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 EU27+NO/CH.
Crates and boxes are recycled at well over 90%.
Recycling rates for the remaining mixed plastics are still low – below 10% across EU27+NO/CH.
In total the collection for recycling of post-consumer packaging grew in 2007 to an average of 28%, up from 26.2% in 2006.
Fig 11 shows the map over Europe with EU27+NO/CH countries below 15% (current requirement), below 22.5% (requirement from 2008) and those above 22.5%.

Figure 11. Total recycling of plastic packaging waste by country



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 soil pose a technical and financial challenge to eco-efficient recycling or recovery.
EuPC and EuPR are engaged in the LabelAgriWaste project – an EU co- funded project – aiming at developing an integrated approach towards the collection, sampling and labeling of agricultural plastic waste. Progress is expected from this project over the next year.

Automotive

The recycling rate for automotive plastics waste continued to increase to just under 10% in 2007. Volkswagen won an environmental award for their SiCon process - a mechanical process to extract usable secondary raw materials from the residues of vehicles shredded at the end of their useful lives. Plants using 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 of 13% in 2007.

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 € 300 billion per year.

PlasticsEurope is one of the leading European trade associations with centres 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 EU 27 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 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.

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