FINAL REPORT – SUPPORTING THE THEMATIC STRATEGY ON WASTE PREVENTION AND RECYCLING

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EXECUTIVE SUMMARY – SUPPORTING THE REVIEW OF THE THEMATIC STRATEGY ON WASTE PREVENTION AND RECYCLING

The Thematic Strategy on the Prevention and Recycling of Waste (Waste TS) (COM(2005)666) describes a number of **key objectives** as part of an evolving EU policy on waste. These are to:

- Prevent waste;
- Promote re-use, recycling and recovery; and
- Establish the European recycling society.

All the above objectives were intended to contribute to the reduction of the overall negative environmental impacts of resource use, securing a higher level of environmental protection. In essence all require that waste management in Europe is moved up the hierarchy of treatment options, known as the waste hierarchy. This report investigates trends in waste management in Europe, the ability to judge the achievement of Member States (MS) in delivering a recycling society, the state of markets for recycling, the international influence of Europe's waste policies and the impact of the Waste TS itself. Conclusions and future policy recommendations are drawn, intended to aid the Commission in their review of the Strategy.

Understanding Waste Management in Europe

To enable conclusions to be drawn regarding the achievements and potential future needs it is first necessary to understand the picture of waste management in Europe. There is a high degree of variability between the performance of individual MSs in terms of their generation and management of waste, associated with differing economic, demographic, cultural and environmental conditions. The first section of the report presents the headline figures for the EU in terms of waste generation, prevention, recycling, energy recovery, disposal activities and the environmental impacts associated with waste management. More detailed information on waste management performance is set out in sections 2.1, 3.1 and 3.2 of the main report. It should be noted that the best information available has been used in all cases below, however, there remains a shortage of trend data and reliable, comparable statistics to assess performance at the EU level that should be addressed as a priority.

Overall **waste generation** in the EU has continued to increase in recent decades, including inter alia increases in municipal solid waste (MSW), construction and demolition (C&D) waste, hazardous waste and packaging waste. The rate of increase in generation does appear to be showing signs of slowing over time. However, modelling results, based on an assumption of no great future changes to policies or implementation mechanisms (legislative and market-based), predict that per capita rates of waste generation will peak for the EU 27 around 2016, then plateau until 2030 but not decline.

For the EU-27, total waste generation rose from 2.91 billion tonnes in 2004 to 2.95 billion tonnes by 2006, an increase of just over 1%. Between 2006 and 2008 generation fell, driven largely by shifts in the EU 12 to just over 2.6 billion tonnes. This fall may be attributed to drops in economic output associated with the credit crisis and economic downturn in the years 2007 and 2008. For the EU-15, longer term data is available demonstrating that between 1995 to 2006 total waste generation rose from 1.29 billion tonnes to 2.01 billion tonnes, an increase of around 36%. In the EU-12, total waste generation fell between 2004 and 2006, from 0.98 billion tonnes to 0.94 billion tonnes, a decrease of around 4%. This appears to have fallen again between 2006 and 2008 to over 0.7 billion. It is considered that the decoupling of waste generation from economic growth remains to be achieved for the EU as a whole, or at least has yet to be conclusively proved. In terms of waste generation from specific sectors the following trends were identified:

- **MSW** generated per capita in the EU-27 increased by around 5% between 1997 and 2008, from 499 to 524kg per annum, and since 2006 has been relatively stable. In line with other analyses (such as resourece productivity), this compares favourably to the USA (750kg in 2005), but unfavourably to Japan (400kg in 2005).

- **C&D waste** is reported to have increased significantly over the past decade, but comparable time series data are lacking.
- **For industrial waste**, manufacturing waste in the EU-27 fell by 5.4% from 2004 to 2006; mining and quarrying waste by 14%; and waste from other economic sectors increased by 6.2%. This decline is likely be a consequence of the loss or reduction in this economic activities from the EU as well as improved practices.
- **Hazardous waste** in the EU-27 (plus Croatia, Norway and Switzerland) increased by 15% between 1997 and 2006.

Waste prevention, by its nature, is difficult to measure accurately and there is no current mechanism for doing so at the EU level; data on waste generation, however, appear to suggest that waste prevention is not yet occurring in a significant way. Real breakthroughs are yet to be achieved on either quantitative or qualitative prevention; although in terms of the latter significant progress has been made in reducing the hazardousness of specific waste streams, such as end-of-life vehicles through product-based requirements. Into the future chemicals focused measures such as REACH may further aid reduction in qualitative prevention, however, the precise scale of impact will depend on the approach adopted to the implementation of this measure.

Reliable data is not yet available on **preparing for reuse or reuse**, although anecdotal evidence suggests that reuse 'markets' exist in many Member States, e.g. for textiles, furniture, car components and electrical household appliances.

In terms of **recovery**, reliable data is only available on incineration with energy recovery; this treatment method for MSW increased significantly between 1995 and 2006, with primary energy production from MSW incineration almost doubling over that period.

Across the EU levels of **recycling** are noted to be rising albeit at very different rates and from very different baseline levels dependent upon the Member State. There is strong evidence that targets for **recycling** set in EU Directives have driven significant improvements in levels of recycling. In 2006/2007, approximately 51% of waste targeted by EU Directives was recycled. By 2005, recycling accounted for a greater proportion of waste treatment than incineration in the EU-25. EU-15 Member States with the highest baseline rates of recycling (40-50%) have also shown yearly percentage increases in recycling from 2000-2006; however, since 2004 there is some evidence that performance is beginning to plateau in several high achieving countries. The picture is more mixed in the EU-12.

In terms of specific waste streams, recycling performance appears to be somewhat mixed. Recycling and composting of **municipal waste** increased from 19% to 38% from 1998 to 2007. The rate of **C&D waste** recycled reached an EU-27 average of 53% by 2006 (there is a 70% target for 2020), and has generally been either slowly increasing or remaining fairly constant. **Paper and cardboard** recycling in the EU-27 has increased year on year from 55.8% in 2002 to 72.2% in 2009. By 2007, 59% of **packaging** in the EU-27 was being recycled (against a 55% target for 2008). As of 2007 16 Member States had already achieved the 2008 target, however, several remained a long way from compliance including Greece, Cyprus, Latvia and Lithuania. For **ELVs**, the majority of Member States had met or exceeded the 2006 target of 80% reuse/recycling by 2007. For **WEEE**, although the average recycling rate in 2006 was around 79%, only 23% of WEEE placed on the market was reported as collected rate (of the 18 countries for which data were available); this is likely to be inaccurate, but still raises concerns as to the continuing impact of WEEE in the environment. For **batteries**, around 18.4% of batteries placed on the market were recycled in 2008 (there is a 25% collection and 100% recycling target for 2012).

In terms of **disposal**, the quantity of MSW **incinerated** in the EU-27 has increased between 1997 and 2008 from 70kg to 102kg per capita. Only three Member States have seen a decline in incineration from 1995 to 2007 (Belgium, France and Luxembourg). Energy recovery from incineration is increasing, although it is currently difficult to assess whether incineration is meeting the efficiency targets set out in Directive 2008/98/EC. **Landfill** of waste has been decreasing; between 1995 and 2007 landfill of MSW in the EU-15 fell from an average of 62% to 42%; for the EU-12 it fell from an

average of 87% to 79%. Only six Member States (Bulgaria, Malta, Portugal, Romania, Slovakia and Slovenia) saw an increase in MSW landfilled over that period. Based on the modelling assessment landfill diversion and recycling targets appear to be having a significant impact on the level of landfilling across all MSs up to 2020, when decline in landfilling plateaus. Into the future the delivery of this decline assumes that there is significant investment in the recycling, composting, AD and wider energy recovery infrastructure to deal with the shift away from landfilling.

In Europe there is already a **significant, well established industry** aimed at supporting recycling and waste management activities. According to Eurostat figures, in 2006, the EU27 had: 5,170 facilities for incineration with energy recovery; 3,897 facilities for other incineration; 50,682 facilities for recycling; 10,286 facilities for landfilling. In total the waste management and recycling industries were considered to provide between 1.2 and 1.5 million jobs in the EU. Other estimates of low carbon jobs in Europe, for example by WWF, place recycling as one of the core sources of employment. Moreover, given that the EU exports significant quantities of waste this will contribute to job creation globally as well as within European based industry.

Regarding **the environmental impacts of waste in Europe**, changing patterns of waste management have both an indirect and direct impact on GHG emissions and broader environmental condition. Shifting away from landfilling to recycling, reducing waste and reusing materials or, to a lesser extent, the shift to incineration leads to the avoidance of GHG emissions ie indirect reductions in emissions associated with improved waste management. In addition there are additional direct emission reductions associated with limiting landfilling, mitigation measures at landfill sites, increasing recycling and efficiency savings from incinerators emissions from the waste sector in the EU-27 fell from 207.2 million tonnes CO_2 equivalent (or 3.97% of total EU-27 GHG emissions) in 1995 to 141.2 million tonnes CO_2 equivalent (or 2.8% of total EU-27 GHG emissions) in 2007. This decline is despite an increase in overall levels of waste generation over the same period. Data is currently lacking on water, air and land pollution resulting from waste management, but the movement of waste management up the hierarchy is likely to lead to reduced risk of ground and surface water pollution (from landfills), and increased risk of air pollution (from incineration).

The **international impacts** associated with the EU's waste management footprint are growing**.** Europe is exporting an increasing proportion of its waste for reprocessing in third countries, largely to Asian markets. The total trade in notified waste exports from Member States increased four-fold between 1997 and 2005, associated with significant growth in non-hazardous waste shipped from the EU to third countries. From 1995 to 2007 trade in waste metals, paper and plastics between the EU and Asia expanded by five-fold, 10-fold and 11-fold respectively. In 2006, around 3% of generated paper waste (2.1 million tonnes), 10% of metal waste (around 9 million tonnes) and a huge 71% of plastic waste (10 million tonnes) were exported from the EU-25 to non-EU countries. . This trend toward export is anticipated to continue into the future – based on the modelling exercise and opinions of stakeholders. There are currently gaps in terms of the knowledge and data relating to the export of waste, the ultimate treatment of exported waste and the environmental consequences associated with export. The increased import of materials and products into Europe also means increased international impacts, although these are related to production and consumption rather than to waste management.

Delivering a European recycling society is one of the key priorities of the Waste TS. Within this study the approach to assessing a recycling society was to treat this as a potentially holistic mechanism for assessment of MSs overall comparative performance towards desirable waste management goals. In coordination with stakeholders the following issues were identified as of importance when terming a country to be a recycling society:

- overall levels of waste generation are low and trending downwards;
- disposal is no longer the norm;
- increasing resource productivity and waste prevention are priorities, with economic instruments supporting these;
- products are primarily reused or recycled;

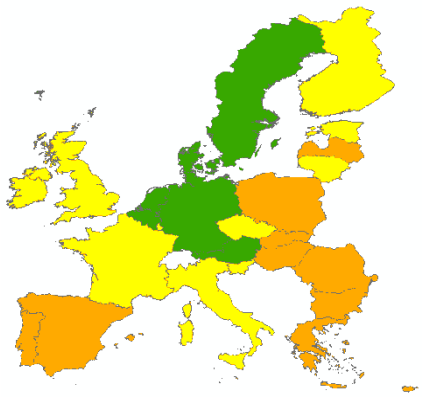
- overall recycling levels are high, with efficient use made of resulting secondary raw materials leading to better resource management
- tools to implement and enforce effective waste legislation and to promote continual improvement in waste management are in place;
- goods are recycled to a high quality and environmental standards;
- the level of secondary raw material use is maximised;
- products are designed to aid recycling and to make use of secondary materials.

When assessing performance towards a recycling society the data sets are currently insufficient to provide details on the broad range of indicators that would ideally be used to demonstrate compliance with the characteristics listed above. Based on the data currently available the following spatial assessment of MS comparative performance towards a recycling society was developed.

High - *Member States delivering the highest level of compliance with the goal of delivering a recycling society* – These countries are considered to be delivering: high levels of MSW recycling with a continuing upward trend, high levels of recovery as a proportion of waste treatment activities; low and/or falling levels of landfilling; and falling levels of GHG emissions from the waste sector

Transitional – *Member States showing rapid improvements in terms of moving towards a recycling society* – These countries are currently seeing: significant increases in their level of MSW recycling but are only achieving medium to low levels overall; medium levels of recovery comparable to a medium or low level of MSW recycling; a falling reliance on landfilling; and falling levels of GHG emissions from the waste sector

Limited – Member States showing limited or slow progress towards a recycling society – These countries are currently seeing: Low levels of MSW recycling and static or low associated rates of increase; high and static or increasing levels of landfilling; and increasing levels of GHG emissions associated with the waste sector.



The Benefits and Limitations of the Current Waste TS

The Waste TS was considered by stakeholders to have provided a useful framework for structuring the future direction of EU waste policy. Particularly in the waste field, with its multiplicity of laws and policies, it was felt important to have a strategic document that sets out the overall priorities and direction of travel. Moreover, the Waste TS offered a basis for discussing the strategic questions related to waste policy, offering a stimulus for debate. The review of the Waste TS and the anticipation of an updated framework building on developments since 2005 (particularly the adoption of the WFD) was, therefore, welcomed in discussions with stakeholders.

Despite general support for the concept of the Waste TS and the continuation of such a strategic approach, limitations to its use and coverage were identified. Stakeholders commented that the Waste TS was too problem-focused rather than presenting shifts in waste management as a positive opportunity to reduce environmental impacts and address questions over the better use of resources. Specifically in relation to the latter point, the focus on waste prevention in the Waste TS was considered limited. While the dossier included prevention within its aims and priorities, it was felt that the EU's role in delivering prevention remains unclear with no collective understanding of performance or direction in terms of structuring efforts to improve the situation. The second key limitation in coverage was the lack of focus on actions to address the EU's international impact in terms of waste management. While this is discussed the Waste TS fails to set out specific actions. Finally, it was considered that while the objectives of the Waste TS are relatively well reflected in waste laws, there needs to be more emphasis on integrating waste and resource considerations into non-waste policies, especially related to products.

Future Needs and Priorities

During the assessment the following key needs were identified as priorities for EU action. These build on the conclusions regarding the state of EU waste management and the role of the Waste TS itself. It is considered that these needs should be incorporated into the priorities for the Waste TS review and form a basis for the recommendations set out in terms of policy action.

- To better promote **prevention**, improve the information base in this area and demonstrate commitment to securing a quality system of national prevention programmes.
- To continue to support further **increases in the rates of recycling** across all MSs recognising the value of EU targets in promoting improved recycling rates and the importance of renewing the ambition of these targets into the longer term. This should be supported by additional actions to better support MS who are struggling to deliver existing targets through the sharing of best practice, better monitoring of MS waste management plans to ensure that efforts envisaged are appropriate and fit for purpose and more extensive enforcement proceedings brought against those who are failing to take action despite efforts to support both development of best practice and better waste management planning.
- Continuing to promote the **diversion of waste from landfill and other disposal activities**, including ensuring continued improvement in energy recovery technologies and avoiding incineration for disposal.
- Urgently **review and improve the information base**, indicator sets and consistency of data collection to enable effective monitoring of waste hierarchy and recycling society goals and achievement of binding targets. This should specifically address questions of consistency in terms of MSW monitoring, the lack of proxies to assess reuse and prevention effort, the lack of information on the quality of materials recovered for recycling, the environmental standards under which materials are reprocessed and the inconsistent use of units.
- To **better define the concept of a recycling society** and the indicators to be used to assess this enabling this concept to provide a holistic and comparable basis for assessing waste management performance across the EU into the future.
- While accepting the treatment of waste is global in nature to continue to **support a stable market for the reprocessing of waste materials in Europe**. This should be based on the ideal of ensuring that EU recycling industries drive forward innovation to deliver efficient recycling and the best processes in terms of environmental outcomes and quality of secondary raw materials. Such an innovative industry, that can demonstrate external environmental and quality benefits, could be supported through the use of funding and tailored policy instruments.
- Improving the **quality of the recyclables supply chain**, secondary raw materials and increasing confidence in the market for recycled goods.
- **Improved oversight of the delivery of environmentally responsible recycling** including developing a system that can take account of international as well as intra EU impacts, helping to improve traceability and monitoring of recycling activities and confidence in the origins of secondary raw materials. The goals of this would be to ensure that waste treated both in the EU and externally are managed in a way that is appropriate in terms of environmental protection, enforcing existing treatment standards and ideally helping to aid their improvement over time.
- Ensuring the **resource, climate and broader environmental benefits** of moving towards recycling, reuse and prevention are fully recognised and economically valued.
- Promoting the environmental **benefits of EU waste laws internationally** specifically in markets servicing the EU with products. This should recognise the success of well targeted product-based standards in reducing resource use and hazardousness of products entering the EU market place and globally.
- To address the **high variation in performance of MSs** in terms of delivering waste management goals and to develop mechanisms to support the lower performing countries to increase the pace of change across the whole of Europe. This could be done in a way similar to mechanisms put in place on air quality where by there was a forum established to share good practice on

economic instruments. This would initially need to be built up on the basis of a coalition of the willing in terms of Member State input.

Taking forward Future Action – Recommendations to the Commission

The review of the Waste TS offers an important opportunity to set out specific priorities and actions for the coming years. Based on this analysis the priorities encompassed in the original Waste TS appear to remain of importance i.e. the desire to move up the waste hierarchy, prevent waste, make better use of waste resources to ensure higher resource efficiency/productivity and deliver a 'European recycling society' focused on the efficient use of waste resources and waste prevention. However, the set of actions and needs identified in order to take these priorities forward have evolved in the past 5 years.

Since the adoption of the Waste TS stakeholders acknowledge that considerable progress has been made in taking forward efforts to improve waste management, most notably within the revision of the WFD. There is now clearly a desire to build on this, especially given rising interest in Europe's resource efficiency. Moreover, as the EU has promoted a shift away from disposal towards recycling new trends have emerged along with challenges to be overcome, these include: rising levels of exports for reprocessing; the need to further develop markets for secondary raw materials; and the need to distinguish between high quality and low quality recycling to drive best practice and continued environmental improvement.

In light of the needs identified and the emerging challenges for waste management, three groups of priority actions have been identified for inclusion in the current revision of the Waste TS – see Box a. These focus on **prevention, supporting increased recycling and promoting the use of secondary raw materials** and are recommended for uptake by the Commission under the current review. The actions are aimed at maintaining pressure to move up the waste hierarchy, improving data and assessment tools, addressing concerns regarding the EU's environmental waste footprint, maximising environmental benefits achieved through improved waste management and promoting the use of secondary raw materials. In summary the intention is to deliver **more environmentally responsible, well-informed and resource focused waste management**.

The actions in Box a have been identified as priorities under the Waste TS review and in the coming 5 years. These are intended as a focused set of supporting actions, as it is not possible to take forward all efforts simultaneously. Moreover, in many areas there is a need to better understand the impact of implementing the WFD before setting out further specific goals. It is, however, acknowledged that the actions in Box a alone will not address all the remaining challenges facing waste management in Europe.

The actions set out, and by extension this review, are seen as **part of an ongoing process of improving waste management in the EU** and addressing questions of resource use. Into the medium term it is envisaged that a **further review** of waste management efforts will be needed. Building on the actions set out in Box a, and the list of needs identified, it is recommended that this longer term vision should additionally consider:

- The role of EU action in terms of supplementing MS efforts on prevention based on national action plan performance, providing a stronger EU approach and thereby ensuring better focus of EU policy on this important activity;
- Mechanisms for further reducing levels of disposal such as landfill bans, promoting higher levels of recycling and the shift away from incineration to increasingly efficient energy recovery plants; and
- Securing further innovation in the recycling sector to promote ever higher levels of secondary resource use.

Box a - Actions Recommended for Uptake by the Commission under the Waste TS Review

Prevention – Prevention should remain central to the review of the Waste TS; however, since the original Waste TS was adopted the WFD set out requirements for the delivery of national waste prevention plans. Given that these plans have yet to be published or implemented the following set of actions on prevention are recommended in the short term i.e. over the next 2-5 years.

a. To put in place a system for overseeing the development and delivery of the **national prevention plans** to ensure high plan quality, that ideas and innovations are exchanged between MSs and that the MSx are demonstrating delivery against their plan objectives.
b. Undertake research aimed at identifying the most **reliable proxies for monitoring prevention and reuse** performance across the MSs, this should include consideration of the best methods for assessing decoupling of waste generation from economic growth.
c. Setting out **extended ecodesign requirements** for products and materials to promote the design and purchase of more resource efficient, less harmful and more environmentally responsible products, and ensuring their reusability/recyclability (linking to the next section on recycling).

Into the longer term, setting out EU action on prevention should be a priority for any subsequent review period eg in 2015. By this point, based on the success and commitment to national prevention plants, the Commission will be aware of the activities that can be effectively undertaken at the national level and gaps that require EU intervention.

Supporting the continued expansion of recycling activities – In the majority of Member States there remain significant levels of disposal activities and a continued need to promote the importance of high quality recycling. The following proposals are intended to both increase understanding of the mechanisms to promote recycling and to continue to promote higher levels of recycling across Member States. It is envisaged that all of the following actions could be set out as priorities for the coming 5 years.

a. Put in place **research efforts** related to the following. This knowledge is necessary to focus future policy and reduction effort in this field.
   - Best practice in recycling approaches and the creation of recycling techniques and standards to identify the most promising methods and promote their use, particularly for use in implementation of the Ecodesign Directive;
   - Successful policy tools that lead to the promotion of recycling to a high level and /or the rapid increase in recycling levels aimed at securing their expanded use;
   - The limitations that inhibit the further expansion of recycling effort in successful MSs to enable breakthrough to higher recycling levels, focus innovation and to set the most ambitious but achievable targets for achievement;
   - R&D efforts and pilot projects to demonstrate mechanisms for improving the efficiency, quality and environmental effectiveness of recycling.
b. Clarify the concept of a **European recycling society** and also the factors that should be used to assess this. This should include details on priority data needs to ensure more coordinated, systematic, consistent and extensive data sets are available in the future.
c. Recognise the **important role of EU regulation and target setting in driving recycling efforts** and continue to **prioritise the setting of ambitious targets** for recycling achievement into the future. To take account of the imbalance in performance across MSs, targets should be set based on the best performing nations' achievements, but with **additional support mechanisms** put in place to aid the increase achievement in the other countries.
d. Prioritise **improved implementation of waste legislation**, including improved oversight and review of Member State waste management plans to ensure their quality and effectiveness (this could build on practices applied in other environmental policy areas such as for renewable energy action plans or river basin management plans), through regular reporting on performance against all targets by MSs and analysis by the Commission, and through the setting up of a waste implementation forum for MS exchange of good practice on direct implementation and supporting mechanisms (such as economic instruments, bans, producer responsibility initiatives, etc).

Stimulating markets for secondary raw materials, securing their quality and environmental credentials – The EU has made considerable progress towards targets for the overall levels of recycling. However, these targets do not automatically lead to quality secondary raw materials, environmentally responsible recycling or the replacement of primary raw materials hence reduced primary resource production or use and a more secure supply of natural resources. The EU has established a pattern for recycling, what is now needed is to promote better recycling - wherever this may be in the world - and the use of secondary raw materials.

It is envisaged that considerable consultative work would be have to be undertaken ahead of proposing a potential framework of actions on secondary raw materials. These proposals would be developed over the coming 2 year period with the aim of their being proposed and approved by the EU institutions ahead of a future review e.g. in 2012.

a. Undertake a dialogue with industry (and other relevant stakeholders) to understand the most effective ways of securing quality recyclables to feed into the supply chain and support the delivery of improved secondary raw materials. Proposals should then be adopted, as part of a wider package to secure secondary markets.
b. A study on the feasibility and effectiveness of tools supporting the domestic (EU) use of secondary raw materials, such as

minimum recycled content, including for which materials this would be needed (as, for examples, metals do not require such measures due to the natural demand for such materials).

c. To develop, with stakeholders, a mandatory approach to ensuring that the nature of treatment of a waste, its reprocessing and resulting secondary raw material can be traced i.e. that the quality and environmental credentials of the reprocessing activities can be tracked and identified, to ensure that environmental performance is comparable to that achieved within the EU. This is intended to provide additional oversight as to the level of environmental protection achieved and the quality of the secondary raw materials, increasing confidence in the recycling market and also addressing concerns about the EU's growing footprint as a consequence of exporting waste for treatment.

d. Develop a mechanism for recognising the best quality, most environmentally responsible recycled materials and products. The development of such a scheme would be integrally linked to the establishment of traceability requirements under point b.

e. To introduce ecodesign requirements to help promote waste prevention, improve waste management and the ability to recycle products. Detailed discussions should be held with stakeholders regarding the viability of including requirements on natural resources and on secondary raw material use.

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GLOSSARY OF KEY TERMS AND ACRONYMS

- **6EAP** – Sixth Environment Action Programme of the European Community 2002-2012 (Decision No 1600/2002/EC). The 6EAP set out the framework for environmental policy-making in the EU for 2002-2012, and outlines actions that need to be taken to achieve them. It also called for the development of seven 'Thematic Strategies', including those on the Prevention and Recycling of Waste, and on Natural Resources.
- **AD** – Anaerobic digestion – a series of processes in which micro-organisms break down biodegradable material in the absence of oxygen; it is used for industrial or domestic purposes to manage bio-waste and to produce methane which can be captured and used as a form of natural gas.
- **BMW** – Biodegradable municipal waste.
- **C&D waste** – Construction and demolition waste, which consists of concrete, bricks, gypsum, wood, glass, metals, plastic, solvents, asbestos and excavated soil arising from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road planning and maintenance. Different definitions are applied throughout the EU Member States.
- **EEA** – European Environment Agency.
- **EFTA** – European Free Trade Association, a free trade organisation composed of Iceland, Liechtenstein, Norway, Switzerland, that operates parallel to the EU.
- **ELV** – End of life vehicles, as defined in Directive 2000/53/EC.
- **Energy recovery** – The recovery of energy from the incineration of waste. Directive 2008/98/EC introduced specific new criteria to determine the efficiency level at which incineration can be deemed an energy recovery rather than disposal activity.
- **EU** – European Union (see also EU-12, EU-15 and EU-27 for further explanation).
- **EU-12** – Refers to the MS joining the EU in 2004 and 2007 i.e. Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.
- **EU-15** – Refers to the countries that were MS of the EU prior to the major enlargement of 2004 i.e. Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK.
- **EU-27** – Refers to all the current MS of the EU to the present date (August 2010).
- **Industrial waste** – Defined by the European Topic Centre on Sustainable Consumption and Production (ETC/SCP) as comprising many different waste streams arising from a wide range of manufacturing and industrial processes, some of the largest being the production of basic metals, food, beverage and tobacco products, wood and wood products and paper and paper products.
- **LCA** – Life cycle assessment (or analysis) – the investigation and evaluation of the environmental impacts of a given product or service caused or necessitated by its existence.
- **LCT** – Life cycle thinking – taking into account all environmental impacts caused by a product, system, or project during its life cycle.
- **MS** – Member State i.e. a country that is a member of the EU.
- **MBT** – Mechanical biological treatment – a form of waste processing combining sorting with a form of biological treatment (e.g. composting or anaerobic digestion); it is a method of processing/pre-treating waste, rather than a process to create an end product.
- **MSW** – Municipal solid waste, which the European Topic Centre on Sustainable Consumption and Production (ETC/SCP) defines as waste generated by households, commercial activities and other sources whose activities are similar to those of households and commercial enterprises. There is no single EU definition; slightly varying definitions are provided in the Landfill Directive (1999/31/EC), the Incineration Directive (2000/76/EC) and the OECD/Eurostat Joint

Questionnaire for reporting. Different definitions are applied throughout the EU Member States, and some use it interchangeably with 'household waste'.

- **Preparing for re-use** – Article 3 of Directive 2008/98/EC defines preparing for re-use as 'checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing'.
- **Recovery** – Article 3 of Directive 2008/98/EC defines recovery as 'any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy'.
- **Recycling** – Article 3 of Directive 2008/98/EC defines recycling as 'any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations'.
- **Re-use** – Article 3 of Directive 2008/98/EC defines re-use as 'any operation by which products or components that are not waste are used again for the same purpose for which they were conceived'.
- **Services sector** – This refers to economic activities falling under NACE Rev. 1.1 codes G-Q, which includes wholesale and retail trade; repairs; hotels and restaurants; transport, storage and communication; the financial sector; real estate, renting and business activities; public administration and defence; education; and health and social work.
- **Waste Hierarchy** – Article 4 of Directive 2008/98/EC makes the waste hierarchy a 'priority order' in waste prevention and management legislation and policy, and defines it as, in order of preference: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal. When applying the waste hierarchy the options that deliver the best overall environmental outcome should be pursued (which therefore allows for some departure from the hierarchy where this is justified by life-cycle thinking).
- **Waste prevention** – Article 4 of Directive 2008/98/EC defines prevention as 'measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products'.
- **Waste TS or TS** – Refers to the Thematic Strategy on the Prevention and Recycling of Waste (COM(2005)666) adopted in December 2005.
- **WEEE** – Waste electrical and electronic equipment, as defined in Directive 2002/96/EC.
- **WFD** – refers to the Waste Framework Directive originally adopted in 1975. This Directive was codified in 2006 and is referenced as 2006/12/EC. In December 2005 a substantive revision of the Directive was proposed (COM(2005)667) alongside the Waste TS, implementing many of the required actions. The revision of the WFD was adopted in 2008 as Directive 2008/98/EC and as of 12 December 2010 must be transposed into MS's national laws. On the same date it will repeal Directive 2006/12/EC along with other related legislation on waste oils and hazardous waste.

1. CHAPTER 1 – INTRODUCTION, OBJECTIVES AND METHODOLOGIES

1.1 THE THEMATIC STRATEGY ON THE PREVENTION AND RECYCLING OF WASTE

The Thematic Strategy on the Prevention and Recycling of Waste (Waste TS) (COM(2005)666) was published in December 2005 alongside a proposal for the revision of the existing Waste Framework Directive (2006/12/EC), which ultimately became Directive 2008/98/EC on Waste and aimed to implement many of the TS's goals. The Waste TS describes a number of **key objectives** as part of an evolving EU policy on waste. These were to:

- Prevent waste;
- Promote re-use, recycling and recovery; and
- Establish the recycling society.

All the above objectives were intended to contribute to the reduction of the overall negative environmental impacts of resource use, securing a higher level of environmental protection. In essence all require that waste management in Europe is moved up the hierarchy of treatment options, known as the waste hierarchy. This requires that waste treatment is prioritised in the following order, based on specifications set out in Directive 2008/98/EC: prevention; preparing for reuse; recycling; other recovery (including energy recovery); and disposal.

In order to achieve these objectives it was proposed to take forward actions intended to modernise the legal framework relating to waste management. These efforts included the introduction of life-cycle analysis into policy-making and clarifying and simplifying EU waste law. Ultimately such efforts were intended to contribute to improving the implementation of waste law and to move the EU 'decisively onto the path of becoming an economically and environmentally efficient recycling society'. Specific actions recommended included:

- A renewed emphasis on full implementation of existing legislation;
- Simplification and modernisation of existing legislation;
- The diffusion and integration of key concepts into EU and MS policies, including the Introduction of life-cycle thinking into waste policy;
- Promotion of more ambitious waste prevention policies;
- Development of better knowledge and information intended to underpin the continued development of waste prevention policy;
- Development of common reference standards for recycling; and
- Further elaboration of the EU's recycling policy, intended to develop new mechanisms by which recycling might be promoted.

In summary the primary aim of the Waste TS is to contribute to reducing the overall negative environmental impact of resource use, by preventing waste generation and promoting re-use, recycling and recovery of waste. The long-term goal is for the EU to become a recycling society that seeks to avoid waste and uses waste as a resource. Promoting movement towards a recycling and recovery society essentially means moving up the waste hierarchy, away from disposal, through recycling and recovery to prevention; the overriding operational objective of the Waste TS is, therefore, arguably to promote movement up the waste hierarchy. As a consequence the anticipated impacts of the measures called for in the Waste TS were:

- Less waste being sent to landfill;
- Increased rates of composting and energy recovery from waste;
- More and better recycling;
- Greater focus on environmental impact to make waste policy more efficient and cost-effective;
- An improved regulatory environment for waste management activities; and

- Strengthening waste prevention policies at the Member State level.

1.2 OBJECTIVES OF THE WORK

The main objective of this work is to 'assist the European Commission in their review of the Thematic Strategy on Waste Prevention and Recycling, by providing supporting information and analysis'. To deliver this there was a need to assess where we stand in terms of waste management in Europe and potential future actions, i.e. to 'consider both retrospective and prospective aspects'. Ultimately the study aims to provide supporting materials to assess progress towards the TS's objectives and help elaborate if aspects of the TS need to be strengthened and, if necessary, what amendments or existing measures might be considered.

Specifically the terms of reference for the work required the following aspects to be considered:

- Past, current and anticipated future trends in terms of waste generation and management in Europe – taking into account likely trends up until 2030;
- The diffusion and integration of key concepts set out in the TS into relevant policies developed within MSs and at the EU level;
- The implementation and impact the TS has had against its key objectives;
- The extent to which Europe can be considered to be delivering a recycling society and the obstacles to the development of these societies specifically the further stimulation of recycling markets;
- The international influence and context for EU waste policies i.e. considering the EU's influence in the waste sector globally.

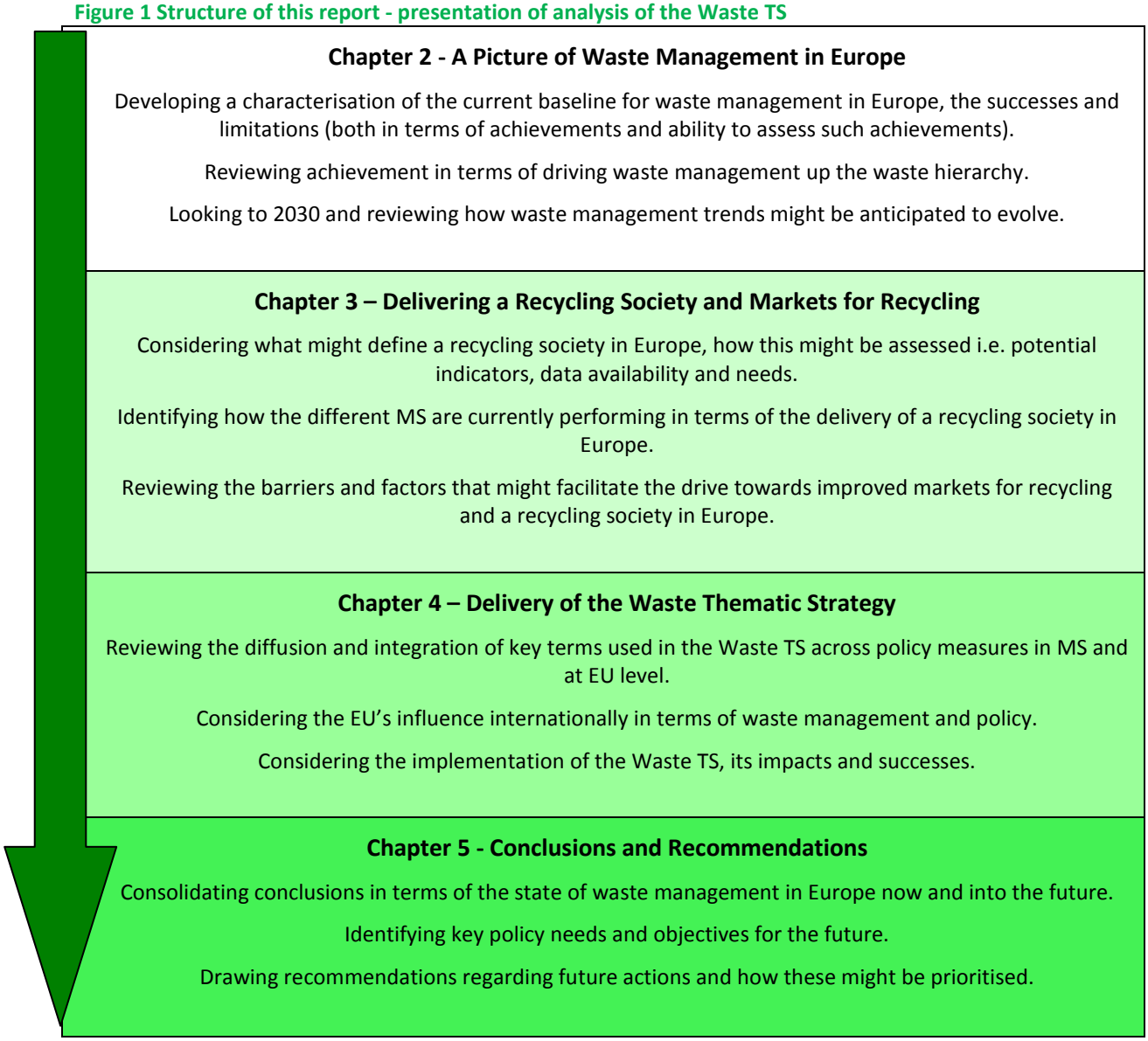
1.3 INTRODUCTION TO THIS REPORT

This report represents a summary of activities and analysis undertaken within ENV.G.4/FRA/2008/0112 – A Preparatory Study for the Review of the Thematic Strategy on the Prevention and Recycling of Waste. The main body of the report represents a concise summary of the extensive data collection and analysis completed in order to inform the Commission and the study itself. Detailed assessments are systematically included as annexes to enable further analysis as appropriate.

As such the information gathered has been presented in a manner that aims to aid the identification of trends in the management of waste and existing data gaps (Chapter 2), an assessment of the development of the EU towards becoming a recycling society (Chapter 3), an assessment of the impact of the Waste TS in particular (Chapter 4), and the development of policy recommendations for the future (brought together in Chapter 5).

As requested by the European Commission this assessment represents a meta study i.e. bringing together information from the existing and extensive literature and data sources. These assessments were then validated and complemented by discussions with specific experts and stakeholders. The study focuses specific aspects of the delivery of the Thematic Strategy, as requested both in the terms of reference and in subsequent scoping discussions with the European Commission. These are set out below and as a guide to the reader allocated by chapter.

Figure 1 Structure of this report - presentation of analysis of the Waste TS



This study was completed by the organisations and experts presented in Table 1.

Table 1 Summary of the key organisations and their representatives involved in drafting this review and their role

Organisation	Name	Role
Institute for European Environmental Policy (IEEP)	Catherine Bowyer	Coordinating the project and analysis
IEEP	Emma Watkins	Coordinating the project and analysis
IEEP	Megan Lewis	Data collation and review
IEEP	Andrew Farmer	Senior review and oversight
IEEP	Bhavika Shah	Case study assessments and broader analytical support
IEEP	Jonathan Baker	Case study assessments and broader analytical support

BIO Intelligence Service (BIO IS)	Véronique Monier	Supervision of BIO input to project
BIO IS	Mathieu Hestin	France, Finland and Poland diffusion case studies
BIO IS	Clementine O'Connor	France, Finland and Poland diffusion case studies
Umweltbundesamt	Hubert Reisinger	Data collation and review, Austrian diffusion case study, development of project methodology
Umweltbundesamt	Thomas Weissenbach	Data collation, Austrian diffusion case study
Umweltbundesamt	Elisabeth Schachermayer	Data collation
Ecologic	Alexander Neubauer	Data collection and review, case study input for diffusion analysis, international policy analysis, and policy review
Arcadis	Mike Van Acoleyen	Modelling and future trends
Arcadis	Laurent Franckx	Analysis of recycling markets
Vito	Ive Vanderreydt	Review and support

1.4 METHODOLOGICAL APPROACH

The Commission contracted the consortium, led by IEEP, to undertake six specific tasks, each intended to inform a particular aspect of the Commission's work. These are specified in Table 2 below, alongside the key methodological tools employed. More detailed methodological information is included within the analytical sections to aid understanding of the outcomes and the conclusions reached.

Given the status of the work as a meta study, the main mechanisms employed were literature review and data collation. This was completed in a structured manner resulting in 10 factsheets examining different elements of waste management in Europe, forming a core information resource for use throughout the project (task 1 – presented in Annex 2) and a detailed review of the literature related to recycling markets (task 3 – presented in section 3.3). These collation activities were supported by modelling efforts, completed under task 1, to assess future trends in waste management up to 2030. The model outputs were based on the assumption that all existing targets and commitments under EU are met, built on the best available data sources and the outcomes were tested in discussions with experts in the field (detailed methodologies and outcomes are presented in Annex 4). Detailed case studies were also completed at MS and EU level looking at the diffusion of key terms into policy, forming the basis of assessments under task 2 (presented in Annex 3).

Tasks 1 to 5, their outcomes and assumptions were supported by extensive expert and stakeholder consultation. A panel of experts activities have kindly supported the work throughout its entirety providing insights into the scoping phase and reviewing outputs. Their opinions were complemented by input from stakeholders during a workshop event on 22 June 2010 – full details of the expert panel and stakeholder event are presented in 1.4.1 and 1.4.2. In addition, many participants at the stakeholder meeting also subsequently submitted further input for use in the review. This has been taken into account in order to support analysis and conclusions throughout the work and within sections discussion expert/stakeholder opinion throughout the report.

Table 2 Review of tasks requested by the European Commission, activities, methods and resulting outputs

Task	Activity	Methodological approaches	Outcomes	Presentation in the report
1	Review of trends and developments relevant to waste management, split into two elements a) review of the existing achievements b) assessment of future trends	a) Review and summary of literature containing data and statistics on 12 key aspects of waste management	a) 12 factsheets reviewing EU performance against key parameters in waste management	a) Summary of the state of waste management in Europe – Chapter 2, section 2.1; Detailed factsheets – Annex 2
		b) Development of a model to deliver projections on waste generation and management in the EU to 2030 based on data collated under the review of achievements; the model analysis was complemented by expert input on waste futures to provide a picture of trends up to 2030. The model draws conclusions regarding the generation and treatment of MSW and non MSW for the EU 27 and three MS groups. These analytical groups were determined based on economic and waste management factors.	b) Outcomes presenting potential waste management trends up to 2030 for waste generation and management, with specific information on MSW and industrial/non household waste	b) Summary of future trends including modelling results and stakeholder input – Chapter 2, section 2.2; detailed modelling methodologies, outcomes and review questionnaire – Annex 4
2	Diffusion and integration of key concepts	Case studies based on review of key policy documents related to waste and resource use resulting in details on the extent of the usage and context of usage of 8 key terms from the Waste TS. Complemented by discussions with key experts at MS level to corroborate conclusions and identify if integration at the policy level was indicative of wider diffusion.	9 MS case studies and 1 EU review considering both the level of term usage and the context for usage for the 8 key terms.	Summary of outcomes and conclusions regarding integration and diffusion of key waste policy terms at EU and MS level – Chapter 4, section 4.1 Detailed case studies – Annex 3
3	The Impacts of the Waste TS	Review of objectives of the Waste TS; summary of actions undertaken at EU level relevant to or implementing the Waste TS; overview of the state of implementation of the EU waste *acquis*; discussion with stakeholders. Complemented by analysis on diffusion and integration of key concepts under 2 above.	Assessment of action taken at EU level to implement the actions of the Waste TS; identification of successes and actions still to be completed/room for improvement	Summary of achievements, limitations and opportunities for future policy development – Chapter 4, section 4.3
4	Delivering a recycling society and markets	a) Reviewing which characteristics or indicators could be used to monitor progress towards a	Conceptual framework for a recycling society, based on a coherent set of characteristics and	Method for defining, characterising and monitoring progress towards a recycling society – Chapter 3,

	a) Assessing mechanisms for evaluating the achievements towards a recycling society b) Assessing comparative MS performance towards a recycling society c) Reviewing the barriers and factors facilitating the achievement of effective recycling markets	recycling society in Europe	indicators derived from available data	section 3.1
		b) Comparing the performance of MS based on the best available data	Indicators, data sets and ultimate measurement proxies to assess MS performance towards a recycling society; comparative spatial maps of MS performance against key waste parameters; assessment of progress made by MS	Comparison of Member State performance against the 11 indicators selected – Chapter 3, section 3.1.4
		c) Literature review considering the barriers and factors that might overcome these barriers building on previous reviews of this issue, coupled with expert opinions as part of the questionnaire exercise and stakeholder input from the 22nd June event.	Assessment of barriers to the creation of a recycling society and the development of markets for recycling, and needs and tools to address them	Summary of Member States policies for recycling – Chapter 3, section 3.2. Assessing barriers and needs to promote a recycling society and the development of recycling markets – Chapter 3, section 3.3
5	The EU's impact internationally in terms of waste management	Literature review, data collection and expert input on the sources of international influence for the EU and the EU's international footprint in terms of waste management. Supported by detailed case studies looking at the impact of specific product based policies on international markets. One of the extended working groups on 22nd June was dedicated to discussing solutions in this field	Assessment of EU influence, positive and negative, on international waste management; categorisation of EU policy influence; review of international conventions; assessment of influence of specific EU legislation (WEEE/RoHS, ELV and packaging); overview of trade aspects.	Summary of EU influence, recommendations for potential future EU action with a view to improving waste management internationally – Chapter 4, section 4.2
6	Engagement with stakeholders	This encompassed expert consultation throughout the project (including an initial questionnaire and subsequent modelling specific questionnaire) and additionally the wider stakeholder event on 22nd June 2010 and subsequent feedback.	Body of opinions gathered from broad range of stakeholders	Summary of stakeholder opinions in all relevant sections List of stakeholders involved in the study – Annex 1

1.4.1 EXPERT GROUP

Within the original proposal for this study an expert group was envisaged. This small group was intended to have a fundamental role in helping to validate and review the outcomes of the work. The Expert Group's make up is presented below in Table 3. The role of the experts within this group was as follows:

- To provide their perceptions on the current state of EU waste management and future trends;
- To provide comment specifically in response to the modelling outcomes and their validity;
- To comment on the draft analysis and conclusions;
- To attend and input at the stakeholder event on 22 June; and
- To comment on the final conclusions reached within the analysis.

All the experts within the group were sent a stakeholder questionnaire to complete (see Box 1 below), in addition they were also sent a questionnaire specifically examining the modelling outputs, which are presented as part of Annex 4 on the modelling approach. Both questionnaires have provided important qualitative information to support the analysis of trends, challenges and next steps for EU waste policy. The expert group were seen as fundament to ensure that the study, while based on existing data sources and literature, drew the most relevant and appropriate conclusions.

Table 3 Details of the Expert Group

Name	Organisation	Comment on Choice of Expert
Christian Heidorn	Eurostat	Provide perspective on waste information available in the EU
Almut Reichel	EEA	Leading expert on waste management and research in this field
Doreen Fedrigo	EEB	Leading expert working in the NGO community on waste and resource issues
Jozsef Szlezak	REC	Expert on EU law making and its application in Eastern European Member States – previously part of the waste topic centre on waste
Frederique Mongodin	RREUSE	Represents small businesses specialising in reuse and recycling
Keith James	WRAP	Leading researchers on resource use and waste management practices and approaches
Ton Goverde	FEAD representative and also Director Corporate Relations at the Van Gansewinkel Group (Netherlands)	Representative from the broader waste management industry groups – representative nominated at a FEAD meeting active member of their working groups
Marlies Veenstra	VROM	Approached as a representative of a national regulator, has previously provided detailed expert input into consultations on waste issues at EU level.
Gev Eduljee	FEAD representative and Director of External Affairs at Sita, UK	Representative from the broader waste management industry, nominated by FEAD

Box 1 Expert Questionnaire

Exploring waste and resource use trends

1. What would you define as the key trends related to waste production in Europe?
2. Do you consider that there have been any significant achievements in delivering better waste management in Europe since the adoption of the Waste Thematic Strategy in 2005?
3. What do you consider to be the key outstanding challenges in terms of addressing the EU's waste footprint?
4. With regards to the objective of delivering a 'recycling society' (a society that seeks to avoid waste, uses waste as a resource, and facilitates recycling and recovery activities) in Europe, can you identify any:
    a. Specific barriers to success?
    b. Factors that may facilitate or promote improvements?
5. Looking towards a 2030 time horizon, how would you conceptualise anticipated trends in waste production, use and disposal? How do you envisage waste management and prevention activities will evolve?

Waste policy and the role of the Thematic Strategy

6. What do you consider to be the key impacts of the Waste Thematic Strategy?
7. Do you consider that the Waste Thematic Strategy itself and/or associated stakeholder engagement processes have had a positive impact on the waste and resource policy agenda?
8. The Waste Thematic Strategy prioritises key concepts such as: the waste hierarchy; life cycle thinking; waste prevention; producer responsibility; and the creation of a recycling society.
    a. Do you consider that awareness of these concepts and issues has increased since the adoption of the Waste Thematic Strategy?
    b. Do you consider the adoption and implementation of these concepts to be sufficient within:
        i. The EU acquis?
        ii. Member States' national waste policies?

International impacts of EU waste policy

9. Does EU waste policy and legislation have a significant impact at the international/global level, or within third countries?
    a. If Yes, please explain what impacts you consider to be most significant.
    b. If No, please explain why you consider this is the case.
10. Please provide any examples where you consider EU policy making on waste has had a positive or negative impact internationally or in third countries.

Looking to the future

11. If you had a blank page, what would you consider to be the priority next steps to deliver more effective waste management and waste prevention in Europe?
12. What, if any, do you consider to be the key gaps in terms of EU policy on waste management and waste prevention?
13. Please set out below any further thoughts on the review of the Waste Thematic Strategy and next steps in addressing waste management in Europe.

1.4.2 STAKEHOLDER MEETING 22 JUNE

On the 22 June 2010 a stakeholder event was held to help inform the review of the Waste TS and specifically the conclusions of this study. Soledad Blanco, Director of Environment Directorate C, provided an introduction to the day by explaining the general policy context and the focus on resource efficiency. Klaus Koegler, Head of the Sustainable Production and Consumption Unit (C2), subsequently presented on the anticipated approach to the review. They were followed by a technical presentation from Catherine Bowyer, of IEEP. This set out the context for the day's discussions in terms of key waste trends in the EU and their anticipated evolution up to 2030. The presentations, along with the background report for the day and full summary of discussions can be downloaded from http://www.eu-smr.eu/tswpr/meetings.php.

The meeting was attended by a mix of experts from: the different industries with an interest in improved waste management ie waste management organisations, producers of secondary raw materials and experts from within the plastics, metals, paper industries, representatives from relevant trade associations; environmental groups and NGOs; experts working academically and researching in this field; and representatives from national governments. The meeting was attended by just under 100 experts from across Europe. Four working groups took up the main part of the day. The groups were formed of a cross section of the invited stakeholders active in the field of waste policy – a full list of attendees is presented in Annex 1.

The four working groups were focused on the:

1. Practicalities of implementing the Waste TS and its objectives;
2. Prevention of waste;
3. International influence and impact of EU waste management policy; and
4. Delivery of an EU recycling market.

The outcome of each working group was presented and discussed in a plenary session. The event was concluded by Michel Sponar, European Commission policy officer in charge of coordinating the TS review.

Discussions during the working groups represent an important input into this study, helping to define and refine conclusions and assumptions in terms of the success of the Waste TS and the potential foci of future action.

Following the meeting stakeholders in attendance were given the opportunity to provide additional input and feedback based on the questions posed in the background paper. Many stakeholders provided useful additional information as part of this process. These inputs have been taken into account systematically in the analysis and conclusions drawn across the report and also, where relevant, in the sections reporting on expert or stakeholder opinion.

Conclusions from the stakeholder meeting are integrated into the relevant sections of this report, with overarching messages integrated into the conclusions and recommendations section – see Chapter 5.

2. CHAPTER 2 – DELIVERING THE WASTE HIERARCHY - A PICTURE OF WASTE MANAGEMENT IN EUROPE

2.1 UNDERSTANDING CURRENT WASTE MANAGEMENT PRACTICES IN EUROPE

Promoting a shift in waste management activity away from disposal and toward waste prevention and recycling activities, i.e. moving management up the waste hierarchy, is a core goal of the Waste TS (see section 1.1 for details). To assess the performance of the EU towards delivering this goal a detailed analysis of available literature and data has been completed and compiled within this section, drawing conclusions as to the nature of recent trends and the current state of play in the EU in relation: waste generation; waste prevention; movement up the hierarchy from disposal (landfill, incineration) to energy recovery (incineration), material recycling and preparation for reuse; and waste export and waste shipments. Within section 2.2 and 2.3 this current performance is compared to anticipated future trends in order to provide a picture of current expectations of waste management in Europe and to support policy decisions.

There is a large volume of information regarding the performance of the EU in terms of waste management. The following sections are intended to present key trends and evidence relevant to achievements at the different stages of the waste hierarchy. This is complemented by detailed presentations of data within a set of 10 fact sheets, which are set out in full in Annex 2. The factsheets collate the data, information sources and perceptions related to the following:

1. Waste Generation
2. Waste Prevention
3. Rates of Preparation for Reuse, Recycling and Recovery
4. Quality of Recovered Waste
5. Energy recovery
6. Landfill Diversion
7. Number and distribution of relevant companies and operators in the EU, and market aspects
8. Societal Aspects
9. European and international trade flows and waste shipment
10. Contribution to environmental impacts

2.1.1 THE GENERATION OF WASTE IN EUROPE

It is important to understand the overall level of waste generation in Europe, both as a total and broken down across the different sectors. This is the first step towards identifying trends towards the delivery of the waste hierarchy and movement away from ensuring just the better management of waste once generated to preventing or limiting its generation. While overall generation of waste continues to increase the goals associated with improving waste management, delivering higher proportions of recycling and reducing environmental impact remain more challenging to deliver; hence making the delivery of the Waste TS's objectives more challenging to meet. This section presents figures for the overall generation of waste in Europe and also generation by sector.

When considering the generation of waste it is not purely the overall quantities generated that are of interest, but also the relationship between this and the economics or demographics of the EU and its Member States. The EU 6th environmental action programme (6EAP) states as one of its core aims 'to

decouple resource use and waste generation from the rate of economic growth'.[1] However, in 2006 an EEA indicator fact sheet found no sign of decoupling of total waste generation from economic growth in Europe.[2] In 2010, some parties believe decoupling to have been achieved to some extent, though progress varies considerably between countries – in some Member States, resource use and waste generation have stabilised, while in others, it can only be said that their economies have grown at a faster pace than their rates of resource use and waste generation.[3] There is at present no reliable mechanism for assessing decoupling and these trends will likely vary depending on whether the whole of waste generation is taken, or particular fractions such as MSW, industry or specific streams such as packaging are reviewed.

Available data on the correlation between economic proxies (such as GDP) and different types of waste is extremely limited. One example was found relating to packaging: between 1998 and 2007, the generation of the four main fractions of packaging waste (paper and cardboard, metals, glass and plastics) increased at half the rate of GDP in the EU-15. This is believed to show relative decoupling of packaging waste generation from economic growth.[4]

To make more effective assessments of the meaning behind waste generation trends and associated patterns of decoupling there is a need for further detailed assessment and review, coupled with the focused development of a more reliable data set. Information should be set out a to what are the most reliable proxies for demonstrating real evidence of decoupling of waste from economic and social trends. For example there are many different measures of waste generation and generation across the different sectors i.e. MSW, C&D, industry waste; there are economic assessments such as the flat rate of GDP or assessments of citizen purchasing power; and assessments based on total waste versus per capita generation.

2.1.1.1 Overarching Trends in Waste Generation

Overall waste generation has tended to increase in recent decades, despite the objective of the 6th Environmental Action Plan to reduce it. In 1995, the baseline year for the targets of the EU Landfill Directive (1999/31/EC), waste generation in the EU-15 was approximately 3.5 tonnes per person, or a total sum of 1.29 billion tonnes[5]; by 2004, total waste generation in the EU-15 was an estimated 1.93 billion tonnes, and by 2006 had reached an estimated 2.01 billion tonnes[6]. This equates to an increase for the EU-15 of around 55% in just over a decade. An additional increase of just under 4% was also experienced between 2004 to 2006 for the EU-15[7]. In the EU-12, total waste generation actually fell from 0.98 billion tonnes in 2004 to 0.94 billion tonnes in 2006, a decrease of almost 4%.[8] For the EU-27, total waste generation was estimated to be 2.91 billion tonnes in 2004. By 2006 the estimate had risen to 2.95 billion tonnes, an increase of just over 1% in two years[9]. There is a high variance in waste generation between Member States; in 2006 this ranged from 445.9 million tonnes (France) to 1.86 million tonnes (Latvia) reflecting the economic, demographic, social and environmental conditions across the different Member States. Figure 2 below compares total waste generation of the EU-27 Member States for 2004, 2006 and 2008. This figure demonstrates the high variability not only in terms of the overall level of generation but also the direction of change i.e. with some Member States such as Bulgaria, Finland and Germany, demonstrating a significant increase across the 4 year period, while others remain relatively static ie Austria, Denmark and Lithuania,

[1] EEA, 2005, The European Environment: State and Outlook 2005, Part B
[2] EEA, 2006, Indicator fact sheet: Total waste generation
[3] European Environment Agency (EEA), 2010, European Environment State and Outlook (SOER), Draft for Consultation 2010
[4] European Environment Agency (EEA), 2010, European Environment State and Outlook (SOER), Draft for Consultation 2010
[5] EEA, 2001, Indicator Fact Sheet Signals 2001 – Chapter Waste
[6] Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation
[7] Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation
[8] Derived from Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation
[9] Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation

and others show a clearer downward trend i.e. France, Hungary, Poland, Romania, Spain, Sweden, and the UK. When this data is aggregated across the EU there is some decrease shown in the total amount of waste generated across the EU-27. It is possible that at least a proportion of the decrease in 2008 is due to decreases in economic output and therefore waste materials. Figure 3 summarises the key trends in overall waste generation for the EU-27, EU-15 and EU-12.

Figure 2 Overall generation of waste (in 1000 tonnes)[10]

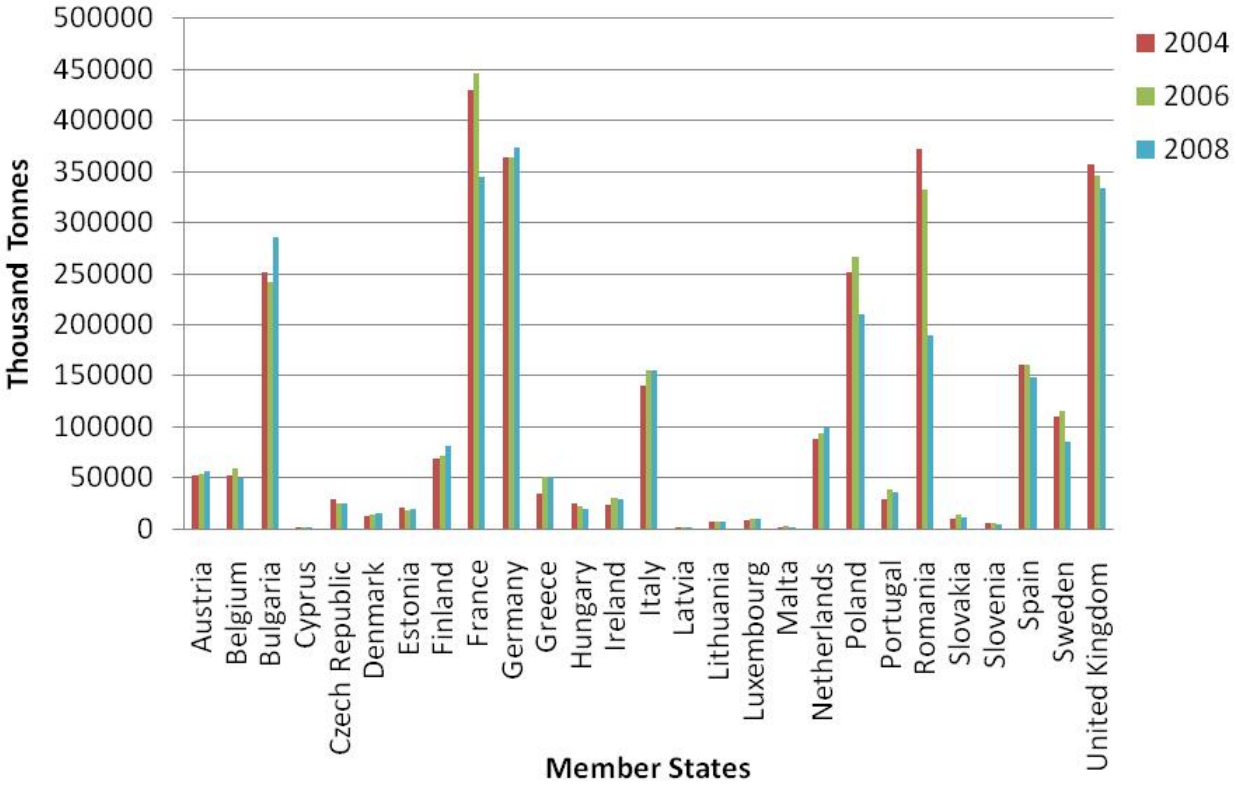


Figure 3 Overall generation of waste (in 1000 tonnes), EU-27, EU-15 and EU-12[11]

[10] Derived from Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation
[11] Derived from Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation

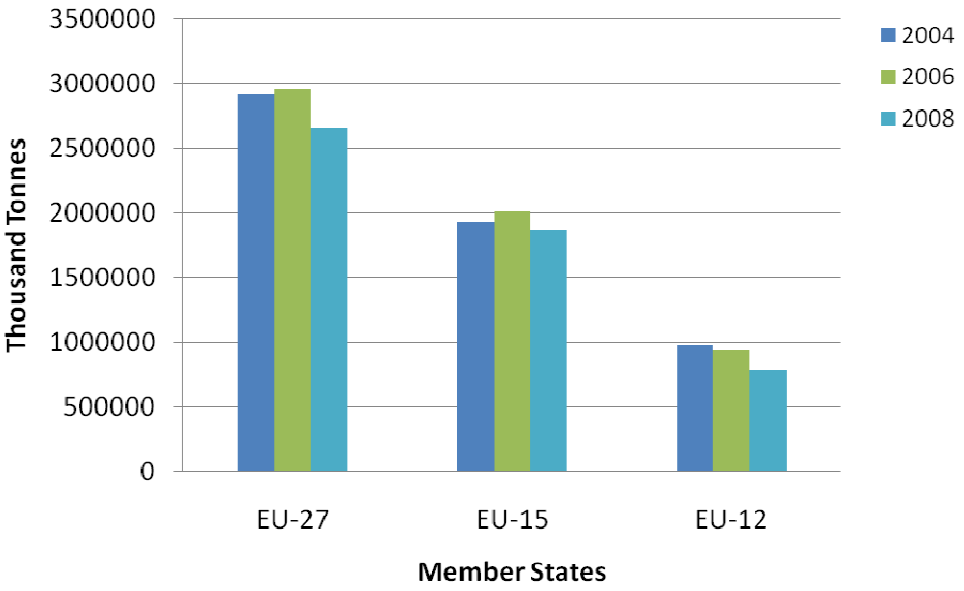
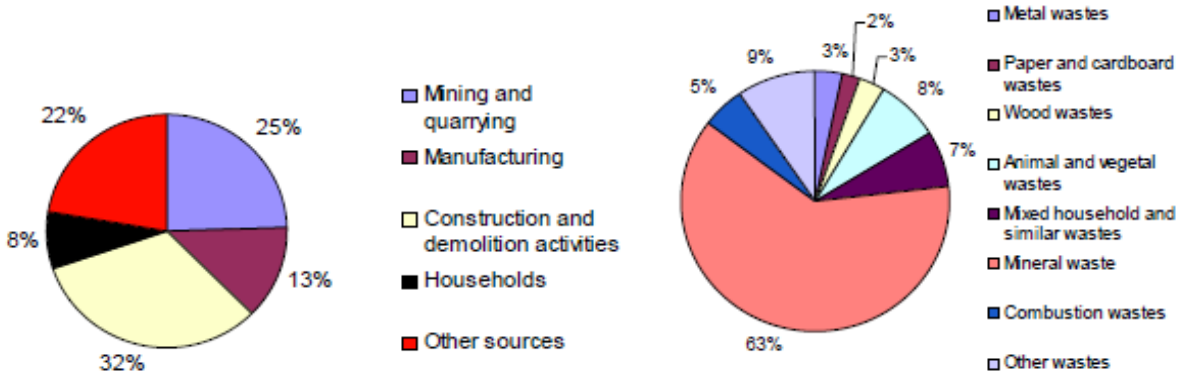


Figure 4 below shows the waste produced by source in the EU, EFTA (excluding Switzerland) and Turkey in 2006 by source, and also by waste stream in the EU-27 and Norway. (NB Some of the percentages of the different waste streams shown would be larger if the mixed waste types could be split up, e.g. mixed household and similar wastes includes some paper and cardboard waste). It demonstrates that in 2006 by far the highest volume contribution to waste was that from construction and demolition (at 32%) followed by mining and quarrying wastes (25%). These two activities likely account for the high levels of mineral waste recorded i.e. accounting for 63% of waste by volume.

Figure 4 Total waste generation in the EU, EFTA (excluding Switzerland) and Turkey in 2006 by source, and Waste streams in the EU-27 and Norway by type of waste[12]



2.1.1.2 *MUNICIPAL SOLID WASTE GENERATION*

Municipal solid waste (MSW) generation per capita in the EU-27 had been increasing until recently (from 499kg in 1997 to 523kg in 2006, with a peak of 527kg in 2002), but since 2006 appears to be stabilising at between 523 and 525kg. However, the total amount of MSW generated by the EU continues to increase associated with a slight increase in EU-27 population.

Figure 5 below shows the overall trends in MSW per capita in the EU-27, EU-15, EU-12 and individual Member States between 1997 and 2008 (the period with the most reliable data set from Eurostat). This

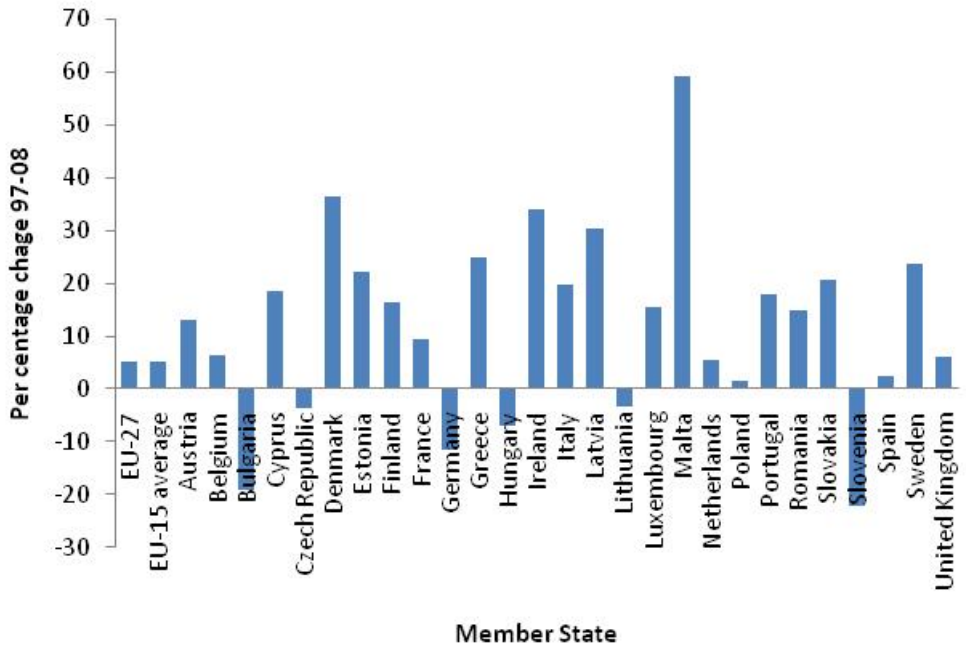
[12] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010

shows an increase of around 5% in the level of MSW generation per capita in the EU-27 (from 239.5 million tonnes to 260.7 million tonnes) and EU-15 (from 200.9 million to 222.7 million tonnes) from 1997 to 2008. On the whole, EU-12 Member States generate less MSW per capita than the EU-15, and less than the EU-27 average[13]. For the EU-12, MSW generation is increasing slightly more quickly than in the EU-15, with an increase of around 7% (from 38.6 million to 38.1 million tonnes) between 1997 and 2008[14].

Figure 5 also demonstrates the variation in trends across the Member States in terms of MSW generation per capita.

According to Eurostat figures, in 2008 municipal waste generation per capita for the EU-27 was 524kg, and for the EU-15 565kg.[15] This compares to figures reported by the OECD of 750kg for the USA and 400kg in Japan in 2005.[16] An assessment published by the EEA in 2007 suggested that the figure for urban China was around 444kg, whilst the generation rate in rural areas was not known.[17]

Figure 5 Percentage change in per capita MSW generation in EU-27, EU-15, EU-12 and Member States, 1997-2008[18]

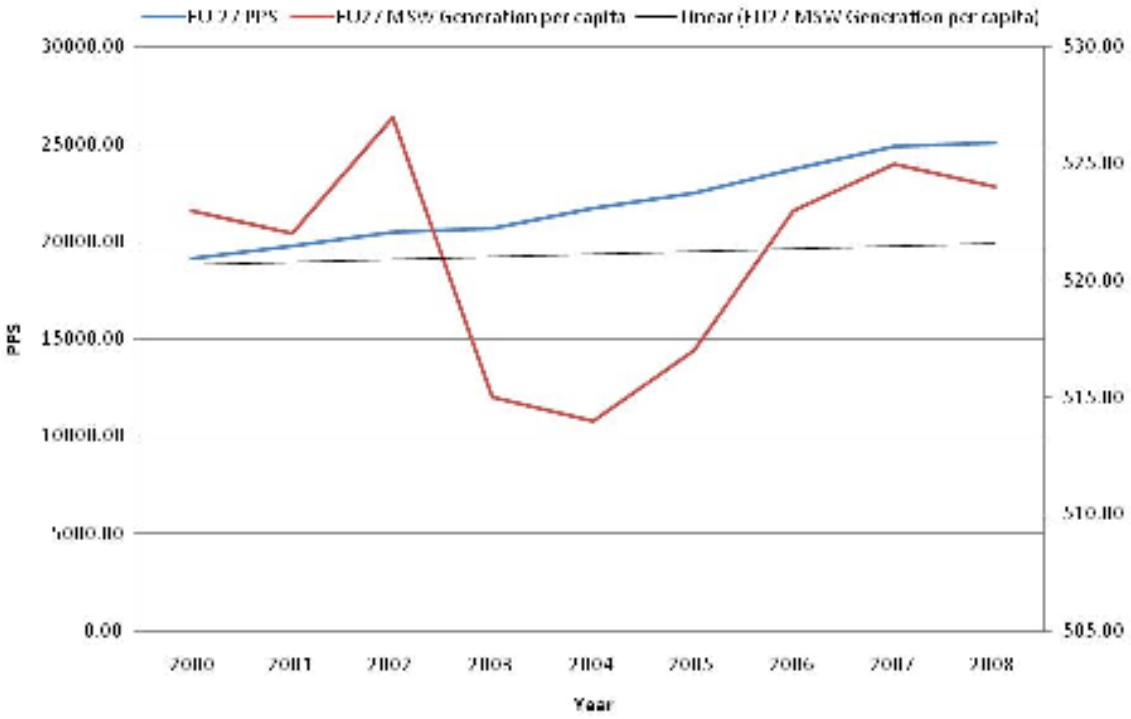


It is clear that for the majority of Member States waste generation is increasing, so absolute decoupling is not occuring. But by comparing this growth in MSW generation rates to Purchasing Power Standards (PPS) it is possible to make an assessment of whether any relative decoupling is occuring. Figure 6 below shows

[13] Eurostat, 2010, Environmental Data Centre on Waste, Municipal Waste
[14] Eurostat, 2010, Environmental Data Centre on Waste, Municipal Waste
[15] Eurostat, 2010, Environmental Data Centre on Waste, Municipal Waste
[16] OECD Environmental Data Compendium, 2008, Waste
[17] OECD, 2007, Municipal waste generation outlook
[18] Eurostat, 2010, Environmental Data Centre on Waste, Municipal Waste

that over time MSW generation per capita has increased slightly, but at a lower rate than PPS, suggesting that some degree of relative decoupling has been occuring across the EU-27.

Figure 6 MSW (kg per capita) Growth Rate for the EU-27 compared to GDP in Purchasing Power Standard (2000-2008)[19]



2.1.1.3 CONSTRUCTION & DEMOLITION WASTE GENERATION

Generation of construction and demolition (C&D) waste is reported to have increased significantly over the past decade, but recent data on C&D waste is not available in the same level of detail as that for MSW due to a lack of European level reporting for the sector to date[20]. Without more consistent data it is difficult to assess whether this increasing trend continues. One source suggests that around 850 million tonnes of C&D waste is generated in the EU per year, representing 31% of total EU waste generation.[21] A partial comparison between two available reports suggests that 180 million tonnes of core C&D waste was generated in the EU-15 in 1998[22]; and that this had increased significantly in the vast majority of countries by 2002-2005[23]. (NB A full comparison is not possible as the data is incomplete.) C&D waste generation per capita in the EU-15 varies considerably; data from between 2004 and 2006 show a range from around 0.3 tonnes in Greece to 15.2 tonnes in Luxembourg. As illustrated by Figure 7 below, all EU 15 countries where

[19] Derived from: Eurostat, 2009, GDP at market prices (http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tec00001&language=en); and Eurostat, 2010, Environmental Data Centre on Waste, Municipal Waste

[20] Eurostat, 2009, Environmental Data Centre on Waste, Construction and demolition waste

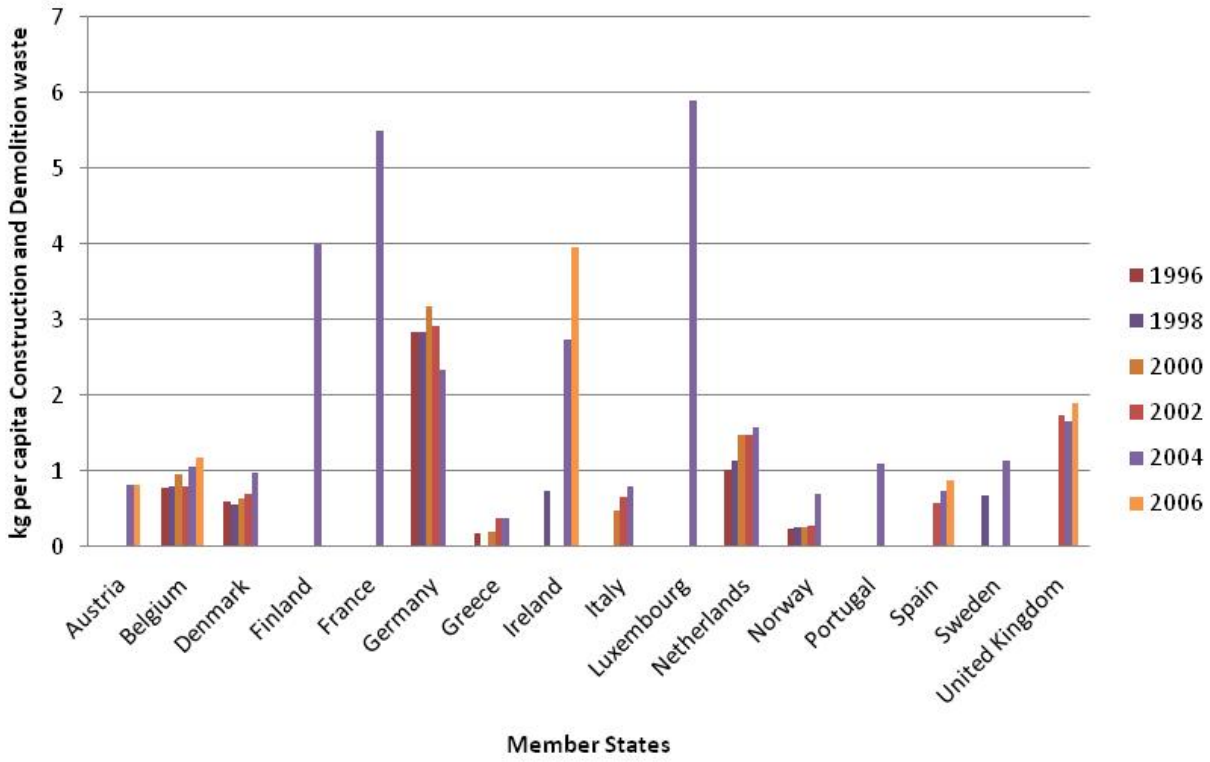
[21] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

[22] Symonds, ARGUS, COWI and PRC Bouwcentrum for European Commission, 1999, Construction and demolition waste management practices, and their economic impacts

[23] OECD Environmental Data Compendium 2008, Waste

data are available for more than one year, except Germany, have seen an increase in generation per capita during the period 1995 to 2006.[24]

Figure 7 Generation of construction and demolition waste per capita in the old EU Member States and Norway[25]

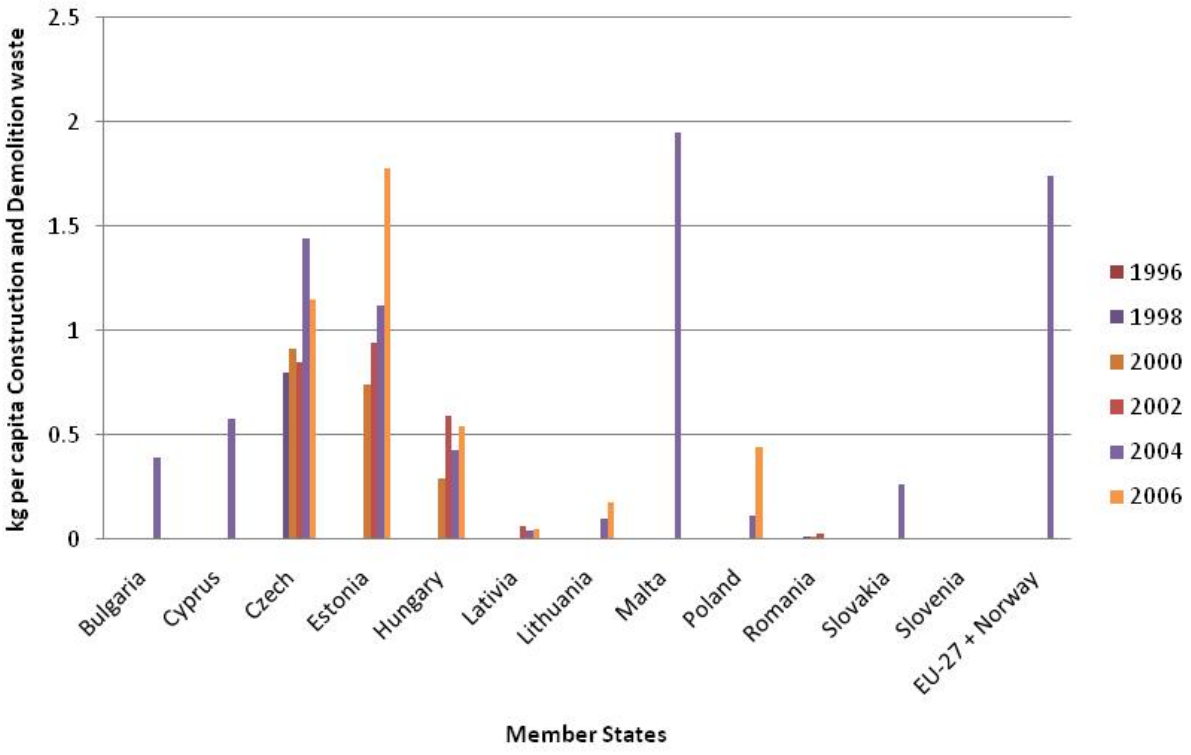


[24] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

[25] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

Figure 8 below shows that among the EU-12 there are also large differences in generation per capita but, that generation is lower than 2 tonnes per capita in all countries.

Figure 8 Generation of construction and demolition waste per capita in the new EU Member States[26]



[26] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

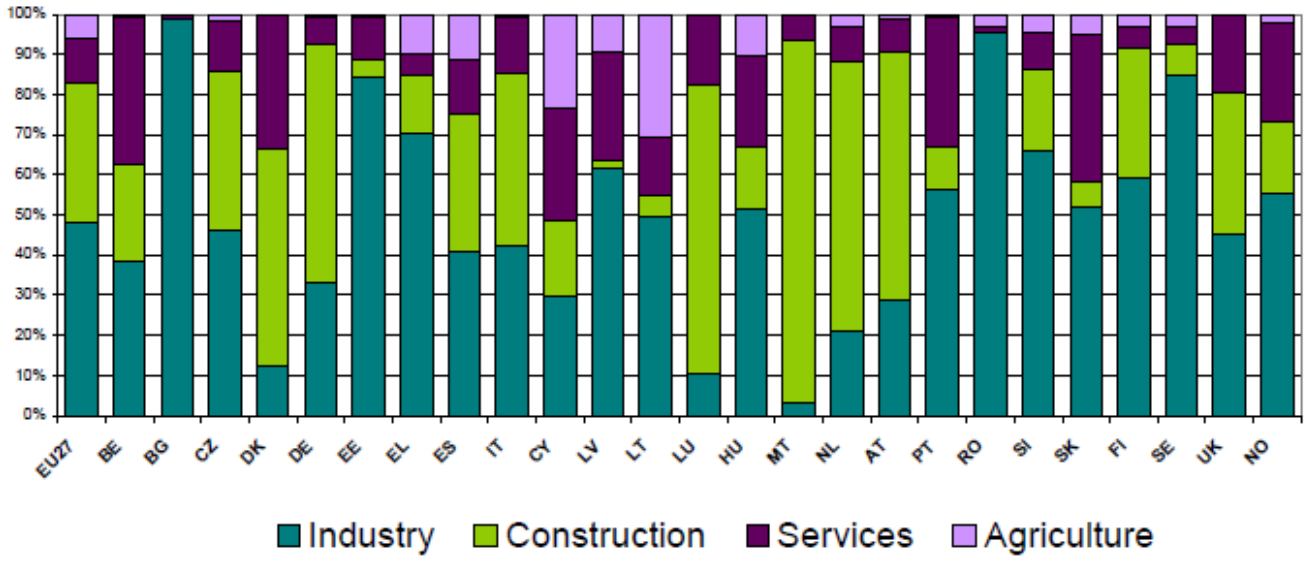
2.1.1.4 INDUSTRIAL WASTE GENERATION

In 2006, industrial activities accounted for around 48% of waste generated in the EU-27 (this is not necessarily directly comparable with the data in Figure 4, which incorporates data from EFTA (excluding Switzerland) and Turkey). Other economic activities that also contributed significantly to levels of generation waste in 2006 included the services sector, accounting for 11.6% of total waste, and agriculture, accounting for 5.8%.[27] As shown in

Figure 9 below, however there is a large amount of variation between Member States; these differences can be partly accounted for by the dominance of different activities within the economy of each country.

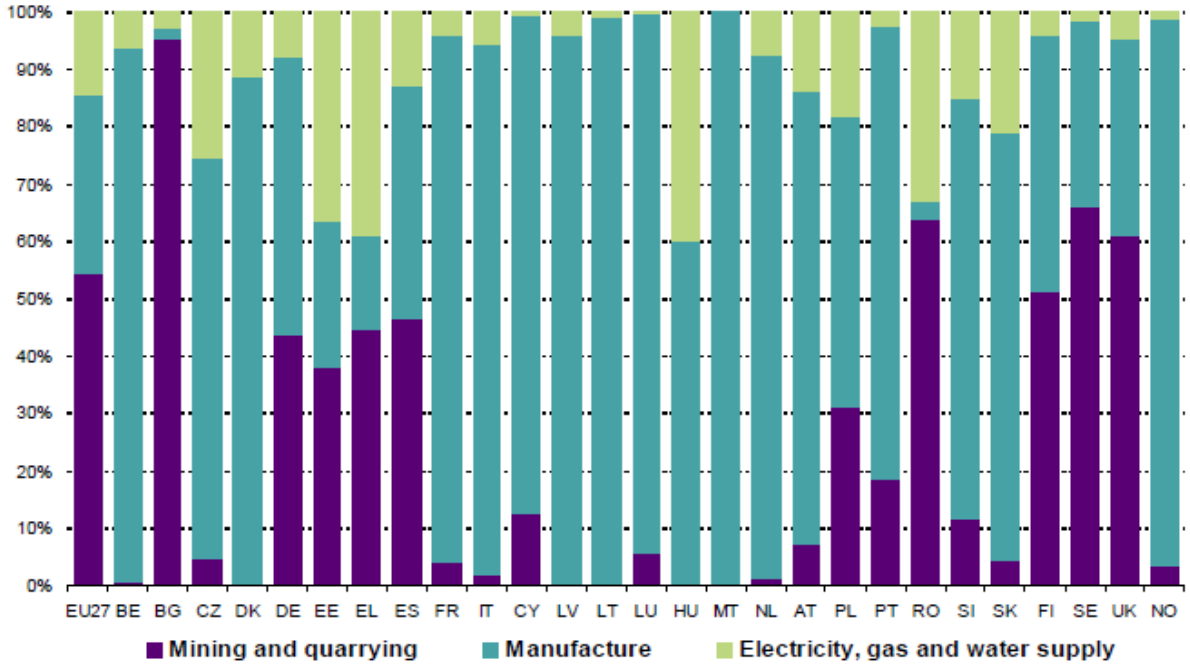
Figure 9 Waste generated by economic activity, 2006 (% of total waste generated)[28]

[27] Eurostat, 2009, Statistics in Focus 30/2009, Generation and treatment of waste
[28] Eurostat, 2009, Statistics in Focus 30/2009, Generation and treatment of waste



In 2006, 54.4% of industrial waste produced in the EU-27 came from mining and quarrying (although small differences in the interpretation of the definition of mining waste may lead to significant differences in the figures applicable across the Member States). In the Member States with a significant mining industry, mining accounted for 40% or more of industrial waste. Similarly, in over half of the Member States the energy sector was responsible for less than 10% of industrial waste, whereas in Hungary, Greece and Estonia this sector accounted for around 40% of industrial waste. Manufacturing accounted for around 31% of waste in the EU-27. The manufacture of basic metal accounted for 32% of all manufacturing waste, and 17% came from food manufacture. Other major contributors to manufacturing waste were wood and wood products (13%), chemicals, rubber and plastic products (11%) and pulp, paper and paper products together with publishing and printing (10%).

Figure 10 Industrial waste generated per sector, 2006[29]



Figures from Eurostat suggest that the generation of manufacturing waste in the EU-27 fell by 5.4% between 2004 and 2006 (from 384.6 million to 363.7 million tonnes). Waste from mining and quarrying fell

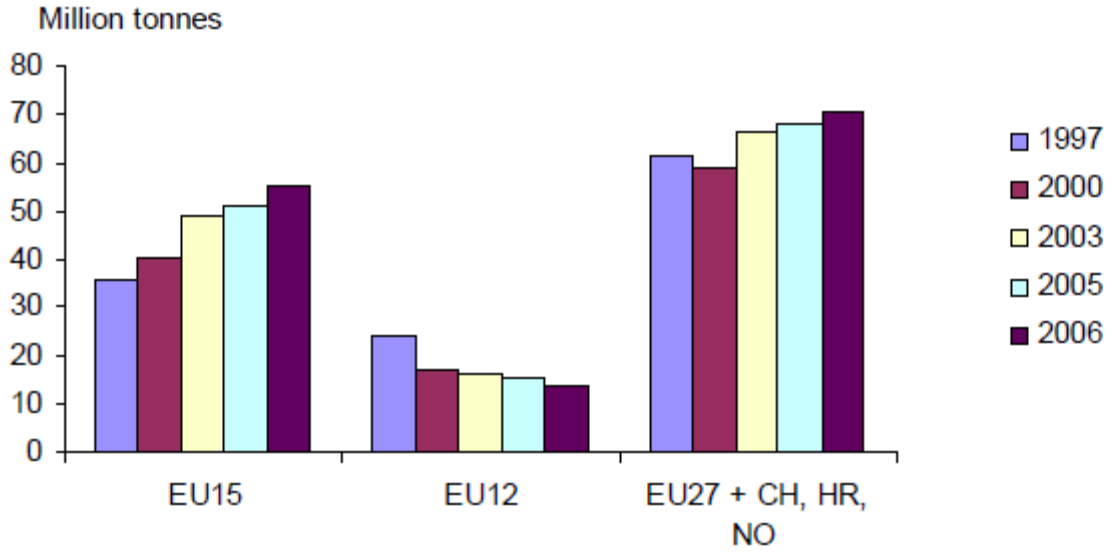
[29] Eurostat, 2009, Statistics in Focus 30/2009, Generation and treatment of waste

by 14% over the same period (from 862.1 million to 740.7 million tonnes). Waste from other economic sectors (services) increased by 6.2% (from 146.8 million to 155.8 million tonnes).[30] These trends may be a consequence of efficiency measures in industry or as a result of changing economics within the EU favouring service industries rather than primary or secondary industrial activities such as manufacturing and mining.

2.1.1.5 HAZARDOUS WASTE GENERATION

The EU-27 Member States, Croatia, Norway and Switzerland together reported the generation of 70.6 million tonnes of hazardous waste in 2006, an increase of 15% since 1997 (see Figure 11 below). Between 1997 and 2006 generation increased by 54% in the EU-15 but decreased by 42% in the EU-12. According to the EEA, taking into account the limited data available, the overall trend shows growing or stabilising amounts of hazardous and non-hazardous waste in the EU.[31]

Figure 11 Hazardous waste generation in the EU-15, EU-12 and EU-27 plus Norway, Switzerland and Croatia, 1997 to 2006[32]

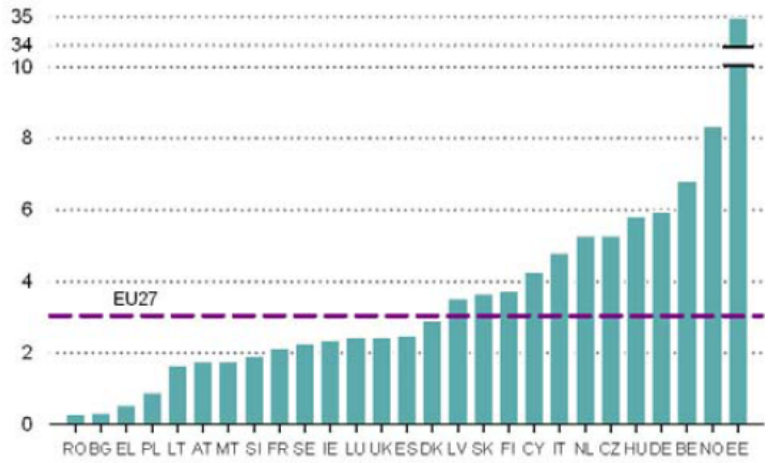


The decrease in hazardous waste generation in the EU-12 can be explained by introduction of cleaner technology and mine closures. In addition, some waste types historically deemed hazardous were re-classified as non-hazardous compared as a consequence of the introduction of the European Waste List upon accession to the EU. The increase in hazardous waste generation in the EU-15 is more difficult to explain, although changes in the EU hazardous waste list in 2001 increased the number of waste codes to cover hazardous wastes that were previously only classed as hazardous in some countries. Other contributing factors may include increased municipal waste incineration (which is estimated to have contributed to an increase in hazardous flue gas cleaning residues of at least 600,000 tonnes between 1997 and 2006) and remediation of contaminated sites.[33]

Across the EU27, hazardous waste accounts for an average of 3% of total waste generated. The proportion varies greatly between Member States, however, as a result of the dominance of different economic sectors; from 0.3% in Greece, Bulgaria and Romania to 35% in Estonia (due to shale oil production) (see Figure 12 below).

[30] Eurostat, 2009, Europe in figures – Eurostat Yearbook 2009
[31] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[32] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[33] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010

Figure 12 Member States' hazardous waste generation as percentage of total waste[34]



2.1.2 WASTE PREVENTION

Waste prevention is the ultimate goal in terms of delivering better resource use and reducing the environmental impacts of our consumption patterns. It involves taking actions before a substance, material or product has become waste, that reduce:

- the quantity of waste, including through the re-use of products or the extension of the life span of products ('quantitative prevention);
- the adverse impacts of the generated waste on the environment and human health; or
- the content of harmful substances in materials and products (qualitative prevention).

Waste prevention can be attempted through improvements to manufacturing processes and eco-design, and through encouraging public and private consumers to demand greener, long lasting products, use services or share rather than purchase products, and operate and maintain products with care. Waste prevention strategies can help to overcome existing barriers to efficient production and consumption such as lack of information, lack of resources, lack of awareness, or to create barriers for inefficiencies like the use of pollutants.

However, waste prevention, by its nature, can be difficult to measure accurately; it is not easy to measure something that has not happened. It is also difficult to say with certainty whether any observed reductions in waste generation are due to waste prevention measures, or to external factors such as economic or demographic changes, or other behavioural changes independent of waste prevention strategies.

A separate study dedicated to waste prevention has been commissioned under contract ENV.G.4/FRA/2008/0112 analysing the need for further support for Member States with regards to waste prevention and their waste prevention programmes. That study has drawn the following conclusions (which were still preliminary at the time of writing this report): on the scope of waste prevention, the actual definition of waste prevention still serves its purpose; quantitative prevention and qualitative prevention are closely linked and there is no natural hierarchy between the two; waste prevention is most effective if undertaken during the design phase; reuse plays an important role in waste prevention, but can lead to perverse effects when combined with export to non-OECD countries; recycling and prevention are connected, but require different policy approaches. The report also assessed potential future trends, concluding that: total MSW generation will increase slowly after a phase of more intense increase until 2016, industrial and total non-household waste will tend to increase; that landfill will drop, incineration will rise and stabilise from 2018 onwards, recycling of MSW fractions will stabilise after a shorter period of continued increase, composting trends will increase considerably, AD will become more important as a source of green energy, and export of waste to non-EU countries will continue to increase. With regards to

[34] EEA, 2006, EEA Indicator fact sheet: Total waste generation

potential future prevention measures, the study suggests that hazardous waste and metal waste offer the highest prevention potential (due to high environmental impacts and large amounts of hidden flows), and that the most promising strategies for reducing such waste would be ecodesign and product standards.

Another study on resource efficiency has also been commissioned.

This section of the report, therefore, focuses mainly on presenting the policy and legislative steps that the EU has taken with regards to waste prevention.

2.1.2.1 QUALITATIVE PREVENTION

Waste prevention also includes addressing certain qualities of the waste, in this case reducing the hazardousness of waste streams which can present a risk to the environment and human health. Recent EU waste legislation including the RoHS, WEEE and Eco-design Directives have focused on this form of waste prevention.

Work undertaken in the separate study on resource efficiency, which ran in parallel to this study, suggests that there have been some improvements related to qualitative prevention. In particular, the RoHS Directive is believed to have prevented up to 89,800 tonnes of lead, 4,300 tonnes of cadmium, 537 tonnes of hexavalent chromium, 22 tonnes of mercury and 12,600 tonnes of octa-BDE (a brominated flame retardant) from entering the WEEE waste stream[35]. However more work is required as the research suggests that the WEEE, ELV, Eco-Design and Packaging Directives are leading to improvements in recycling and re-use but not necessarily prevention.

2.1.2.2 PREVENTION IN THE WASTE TS

The Waste TS addresses waste prevention as a priority issue, to contribute to the overall aim of the EU becoming 'a recycling society that seeks to avoid waste and uses waste as a resource'. Although waste prevention had been the primary aim of both national and EU waste management policies for many years, limited progress had been made and EU and national targets had not been satisfactorily met. The Waste TS concluded that prevention can only be achieved by influencing practical decisions taken throughout a product's life cycle (design, manufacture, provision to the consumer, and use), and that more ambitious waste prevention policies are needed, together with improved knowledge and information to underpin them.

The Waste TS recognised that economic growth, the adoption of best practice by operators, consumer behaviour and social structures also affect levels of waste production.

The Waste TS, however, did not promote the setting of EU waste prevention targets; it suggested that such targets fail to address the complexity of environmental impact (e.g. the weight of waste could be reduced yet the environmental impact could increase). Subsidiarity must also be taken into account; prevention policies need to consider national production and consumption patterns. The Waste TS aimed to create a framework for the development of national policies, and the revised Directive on Waste (2008/98/EC) obliges Member States to develop publicly available waste prevention programmes. Other major policy contributions on this issue include the IPPC Directive and its best available technique reference documents (BREFs), Integrated Product Policy and eco-design initiatives.

The Waste TS stated that the review in 2010 would assess progress on waste prevention policies, and if necessary identify additional measures needed to promote waste prevention and apply life-cycle thinking to waste management and to progress towards a European recycling society.

2.1.2.3 PREVENTION IN EU LEGISLATION

[35] BIO IS et al, Analysis of the key contributions to resource efficiency, Draft Final Report, http://www.eu-smr.eu/reseff/index.php

Historically, EU waste legislation was aimed at providing end-of-pipe solutions (recycling, energy recovery and disposal) and included only limited specific references to waste prevention. However, there is now a growing focus on waste prevention. Table 4 sets out explicit references to prevention in existing EU Directives. It should be noted that in addition to direct references in EU law to delivering waste prevention there are also efforts underway, specifically in terms of limiting the introduction of hazardous substances to the EU market, that will also contribute to waste prevention and specifically the reduction in the hazardous of waste. This includes efforts under the REACH Regulations. These are also included within Table 4

In addition the European Commission has launched various projects to support the delivery of waste prevention, for example the European Week for Waste Reduction will run annually until 2011, this LIFE project aims to raise awareness, encourage behaviour change and share good practice.

The most fundamental legislative shift in terms of action on waste prevention is set out within the WFD, 2008/98/EC. This requires that Member States establish national waste prevention programmes by 2013 and that the EU set waste prevention and decoupling targets for 2020 by 2014. The effectiveness of waste prevention efforts within the EU will therefore depend heavily upon the successful development, review, oversight and delivery of the prevention programmes and associated EU efforts building on the sufficiency of these plans in 2014.

Table 4 References to quantitative and qualitative waste prevention in EU law

Legislation	Relevant References
Waste Framework Directive (2008/98/EC)	• Prevention = reducing the quantity of waste, its adverse environmental and health impacts and the content of harmful substances; • Prevention at the top of the waste hierarchy; • Commission to publish interim report on the evolution of waste generation and the scope of waste prevention (including product eco-design) and an action plan on EU support to change consumption patterns, by the end of 2011; • Waste prevention and decoupling objectives to be set for 2020 by the end of 2014; • Member States to establish (by 12 December 2013), national waste prevention programmes (waste prevention objectives, existing prevention measures, qualitative or quantitative benchmarks for waste prevention measures); • Commission to publish implementation report, including assessment of existing Member State waste prevention programmes, by 12 December 2014
Batteries Directive (2006/66/EC)	• Prohibits the placing on the market of batteries and accumulators containing more than 0.0005% of mercury or more than 0.002% of cadmium by weight (with some derogations); • Prohibits the disposal in landfills or by incineration of waste industrial and automotive batteries and accumulators (but not their treated/recycled residues); • Member States' implementation reports should include developments on measures to promote waste prevention
End-of-Life Vehicles Directive (2000/53/EC)	• Prevention of waste from vehicles is first priority; in addition reuse, recycling and recovery of ELVs and components should be encouraged to reduce the disposal of waste; • Prevention = measures to reduce the quantity and harmfulness of ELVs, their materials and substances; • Requires Member States to: encourage vehicle/material manufacturers to limit/reduce hazardous substances in vehicles; encourage design and production processes to facilitate dismantling, reuse, recovery and recycling; encourage manufacturers to integrate an increasing quantity of recycled material in vehicles and other products. By 1 January 2006, 85% by weight of all ELVs should be reused and recovered and at least 80% reused and recycled (for cars produced before 1 January 1980 lower targets of 75% and 70% applied); and by 1 January 2015, the equivalent figures should be at least 95% and 85%. • Sets strict prohibitions/limits on the use of heavy metals (see Annex II; from 1 July 2003, the use of lead, mercury, cadmium and hexavalent chromium in materials and components of vehicles was banned, apart from in a number of specified uses). A forthcoming study for ACEA will indicate that the hazardous substances measures in the ELV Directive have led to manufacturers both inside and outside the EU dramatically reducing their use of hazardous substances (by over 90%) in vehicles, providing an example

	of how EU targets can drive qualitative prevention even outside the EU.
Mining Waste Directive (2006/21/EC)	Requires Member States to ensure that operators draw up a waste management plan, including the objective of preventing or reducing the production and harmfulness of waste.
Packaging Directive (1994/62/EC)	• Prevention of production of packaging waste is first priority; • Prevention = reduction of the quantity and harmfulness of materials and substances in packaging and packaging waste; • Requires Member States to ensure that preventive measures are implemented, e.g. national programmes, producer responsibility projects; • Requires the Commission to encourage the development of suitable European standards to minimise the environmental impact of packaging; • Requires the Commission (as appropriate) to present proposals for measures to ensure that new packaging is put on the market only if all steps have been taken to minimise its environmental impact; it is for the Member States to enforce this requirement, the Commission provided harmonized standards • Commission implementation reports to cover additional prevention measures, possible development of a packaging environment indicator to assist with prevention, packaging waste prevention plans, and efforts to reduce/phase out use of heavy metals and other hazardous substances by 2010.
WEEE Directive (2002/96/EC)	• Prevention of WEEE is first priority; in addition reuse, recycling and recovery of such wastes to reduce the disposal of waste; • Prevention = measures to reduce the quantity and harmfulness of WEEE and materials and substances contained therein. At the time of writing this report, the WEEE Directive was being recast. Under the recast Directive, prevention will be defined consistently with the meaning of Article 3(12) of Directive 2008/98/EC.
RoHS Directive (2002/95/EC)	• Requires Member States to ensure that from 1 July 2006 new EEE does not contain certain heavy metals, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) (with some derogations); • Allows for the prohibition of other hazardous substances and their substitution, based on scientific evidence. At the time of writing this report, the WEEE Directive was being recast. Under the recast Directive, MS must ensure that new EEE and spare parts do not contain the substances listed in Annex IV (which sets concentration levels for lead (0,1%), mercury (0,1%), cadmium (0,01%), hexavalent chromium (0,1%), polybrominated biphenyls (PBB) (0,1%) and polybrominated diphenyl ethers(PBDE) (0,1%).
REACH Regulation (1907/2006)	• Key aims of the Regulation include: ensuring a high level of protection of human health and the environment; working towards achieving sustainable development; ensuring that by 2020 chemicals are produced and used in ways that lead to the minimisation of significant adverse effects on human health and the environment. • The hazardous properties of substances should be identified and recommendations about risk management measures should be systematically conveyed through supply chains to prevent adverse effects on human health and the environment. • Substitution of substances that cause an unacceptable risk to human health or to the environment should be required where technically and socio-economically feasible. • Restrictions or prohibitions may be placed on substances in order to protect human health and the environment. • Criteria are laid down for the identification of persistent, bioaccumulative and toxic substances, and very persistent and very bioaccumulative substances. • Restrictions are laid down on the manufacture, placing on the market and use of certain dangerous substances.
Regulation on ozone depleting substances (1005/2009)	• Lays down rules on the production, import, export, placing on the market, use, recovery, recycling, reclamation and destruction of substances that deplete the ozone layer, on the reporting of information related to those substances and on the import, export, placing on the market and use of products and equipment containing or relying on those substances. • The substances covered are: chlorofluorocarbons (CFC), other fully halogenated chlorofluorocarbons, halons, carbon tetrachloride, 1,1,1-trichloroethane, methyl bromide, hydrobromofluorocarbons (HBFC) and hydrochlorofluorocarbons (HCFC).
Ecodesign of energy-related products Directive (2009/125/EC)	• The Directive aims to improve the overall environmental performance of energy-using (e.g. appliances) and other energy-related (e.g. windows, insulation) products, thereby protecting the environment; in principle it applies to any product using energy to perform the function for which it was designed, manufactured and put on the market

	(apart from vehicles). • The Directive does not set actual requirements, but rather defines a process, conditions and criteria for setting requirements regarding environmentally-relevant product characteristics to be met for products to be placed on the market (such as energy consumption). • The Directive defines ecodesign parameters relating to different phases in the product life cycle: raw material selection and use; manufacturing; packaging, transport, and distribution; installation and maintenance; use; and end-of-life. For each phase, the following aspects of the product must be assessed: predicted consumption of materials, of energy and of other resources; anticipated emissions to air, water or soil; anticipated pollution; expected generation of waste material; and possibilities for reuse, recycling and recovery of materials or of energy, taking into account the WEEE Directive. • The first set of requirements adopted focused only on energy efficiency, as this was identified as the dominant impact.

2.1.3 RE-USE OF PRODUCTS AND PREPARING FOR THE RE-USE OF WASTE

There is no consistent data setting out the scale of reuse activities (i.e. the re-use of products and materials that have never been deemed to have become waste). In practice reuse it is a widespread activity for many waste streams across the EU 27; reuse 'markets' exist e.g. for textiles, furniture, car components and electrical household appliances. However, as under these markets materials are considered second-hand (third or fourth hand etc) and never become waste it is difficult to monitor the scale of activities or understand the scale of waste avoided/impact upon waste generation activities.

Under the new WFD, 2008/98/EC, a new concept of preparing for reuse is defined. This is where products and materials have become waste but can be reused without reprocessing (which would be considered recycling). This concept was introduced to clarify the waste hierarchy and is defined under the Directive as 'checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing'. This preparation activity is considered to be waste management and is distinct from pure reuse operations where the material was not ever classified as waste, hence contribute to waste prevention. For example, quantities of furniture or electric appliances do come from municipal collection points and kerbside collections, and are therefore formally waste until they are prepared for reuse.[36] Were the same products to be donated or resold by the last owner they would not become waste and hence directly reused.

Given that it is a new concept, data on preparing for reuse is not currently available. This lack of data, coupled with limited information on prevention activities (including reuse activities), represents a significant gap in data coverage when trying to identify performance in the EU waste management sector. Whilst prevention can be measured to some extent through waste generation (i.e. a reduction in waste generation implies some form of prevention) it is not possible with the existing data to fully attribute reductions in waste generation to pure prevention, or reuse, activities.

2.1.4 MOVING WASTE TREATMENT UP THE HIERARCHY

Directive 2008/98/EC defines the waste management hierarchy as follows, in order of priority – waste prevention, preparing for reuse, recycling, other recovery (including energy recovery) and disposal. Movement away from disposal activities, in particular landfilling, and towards recovery and in particular recycling, is key to delivering the objectives of the TS. This section examines waste treatment options in Europe, specifically trends in terms of more and better recycling, delivering energy recovery from waste and trends in disposal.

[36] ACR+, 2006, Compendium on EU waste policy

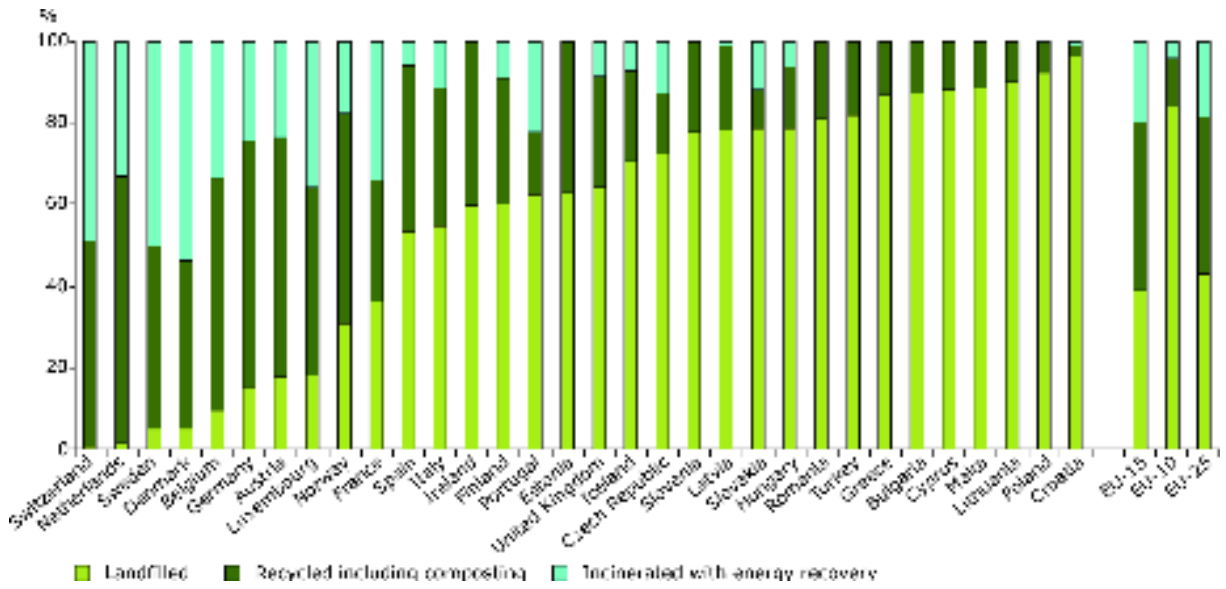
In 1995 (the baseline year for the targets in the Landfill Directive) an average 62% of MSW in the EU-15 was sent to landfill. By 2007, this figure had fallen to 42%.[37] For the EU-27, Eurostat calculated a fall in per capita landfilling of MSW from 293kg to 207kg between 1997 and 2007.[38] However, at the same time they estimate that MSW incineration has increased from 70kg per capita to 102kg per capita.[39] While data on hazardous waste treatment is limited analysis by the EEA concluded that in 2006 33.6% of hazardous waste generated was disposed of and 34% was recovered; there was no information about management of the remaining 32.4%.[40]

The picture in terms of approaches to waste treatment is, however, highly variable across the Member States. Country profiles vary significantly in terms of the preferred waste disposal options, i.e. landfill versus incineration, the balance between recovery and disposal activities and the use of different recovery options i.e. energy recovery versus other (material) recovery. Figure 13 below provides an overall picture of the waste management situation in the EU-25 in 2005. From this figure it is possible to pick out three distinct groups of Member States. Those to the left have high levels of recycling and incineration. There is then a band of Member States with intermediate levels of recycling, substantial levels of landfilling and limited amounts of energy recovery. Finally, to the right of the figure are a group of Member States with low levels of recycling and high levels of landfilling.

When it comes to promoting movement up the waste hierarchy the challenges faced are, therefore, different for each Member State depending on the current balance of disposal techniques and existing level of recycling. For those with low levels of recycling and high levels of landfilling the challenge is to put in place the infrastructure to enable movement away from landfilling based disposal and towards better recycling. For those already achieving high level of recycling the challenge is to improve the mechanisms for recycling, retain progress towards high levels of material recovery and to address the question of waste prevention as oppose to simply management. There is, therefore, a need to systematically assess the priorities for moving up the waste hierarchy within the each Member States and focus on the delivery of these. These priorities should evolve over time as performance improves and the management options available shift.

Figure 13 Rate of recycling versus incineration with energy recovery of municipal waste, 2005 for the EU 25[41]

[37] EEA, 2009, EEA Report No 7/2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union
[38] Eurostat, 2010, Environmental Data Centre on Waste, Landfill and incineration
[39] Eurostat, 2010, Environmental Data Centre on Waste, Landfill and incineration
[40] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[41] EEA, 2007, Europe's Environment, The Fourth Assessment, State of the Environment Report No 1



2.1.4.1 *DELIVERING MORE AND BETTER RECYCLING*

Directive 2008/98/EC defines recycling as a 'recovery operation by which waste materials are reprocessed into products, materials or substances'. Recycling levels in the EU have been increasing, however, data sets reviewing and comparing EU and Member State recycling performance across the whole of waste generation are limited. The most extensive data set available, that enables the comparative analysis of EU and Member State performance in terms of recycling effort, is for Municipal Solid Waste (MSW). As a consequence this section focuses upon the analysis of MSW recycling achievements. It should be noted that no consistent information was identified on the quality of recycling activities nor the development of best practice standards in this area. In addition to increasing the levels of recycling, increasing the quality of outcome is also seen as a priority among the waste community and should be the focus of future efforts in order to secure the best environmental outcomes from recycling activities both within the EU and by third countries.

Data from the EEA suggests that management of waste has improved in the last decade or so with recycling/composting of MSW increasing from 19% to 38% between 1998 and 2007.[42] In terms of MSW recycling there remain significant disparities between Member State achievement in terms of recycling efforts and also importantly differences in the rate of change in terms of performance in recent years. Figure 14 compares Member State performance in terms of MSW recycling in 2000 and 2006. It demonstrates that in 2006 Germany had the highest levels of recycling, also demonstrating significant growth levels in MSW recycling. Belgium and the Netherlands also demonstrate high levels of recycling of MSW, however, the rate of increase has been slower between 2000 and 2006 for Belgium with recycling levels remaining static over the period for the Netherlands. Meanwhile rapid increases in the level of recycling, starting from a low base in 2000, can be seen for Ireland, the UK, the Czech Republic, Slovenia, Latvia and Poland. These 2000 to 2006 trends have been cross checked against more detailed trend analysis and have proved to be a reliable proxy for changes in MS performance. The more detailed trend data, however, also shows a levelling off of recycling efforts for MSW in certain higher achieving Member States. In

[42] European Environment Agency (EEA), 2010, European Environment State and Outlook (SOER), Draft for Consultation 2010

addition to the Netherlands, trend data also shows a levelling off in terms of achievement in Austria, Belgium and Denmark – further details are presented in

Figure 15.

Figure 14 Recycling rates for municipal waste in the EU 27, Norway and Switzerland - EEA, upcoming State and Outlook of the Environment Report 2010, draft version June 2010

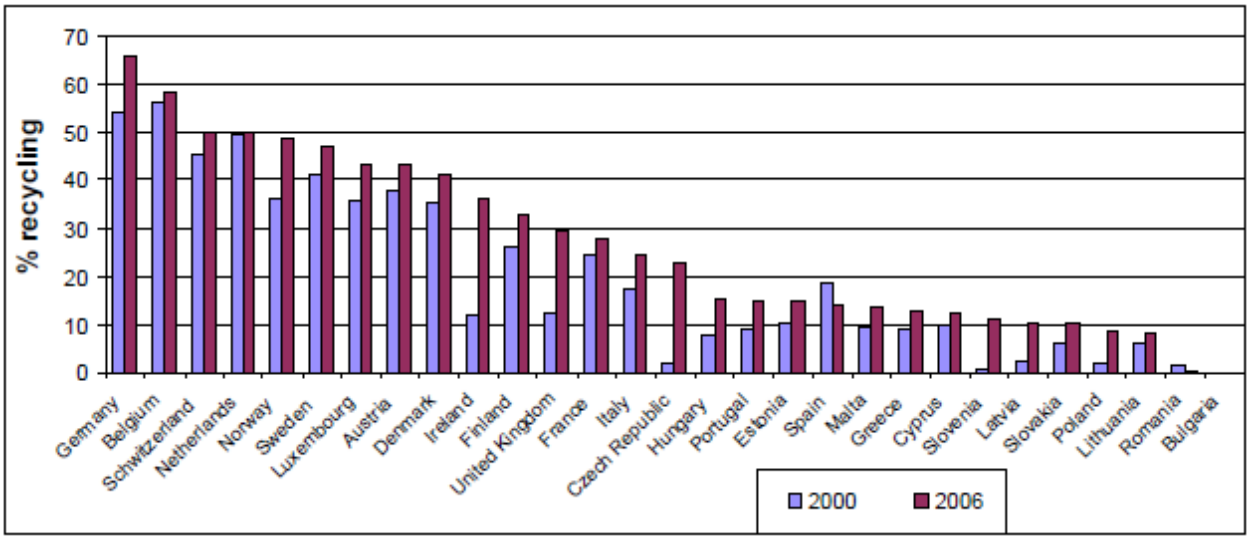
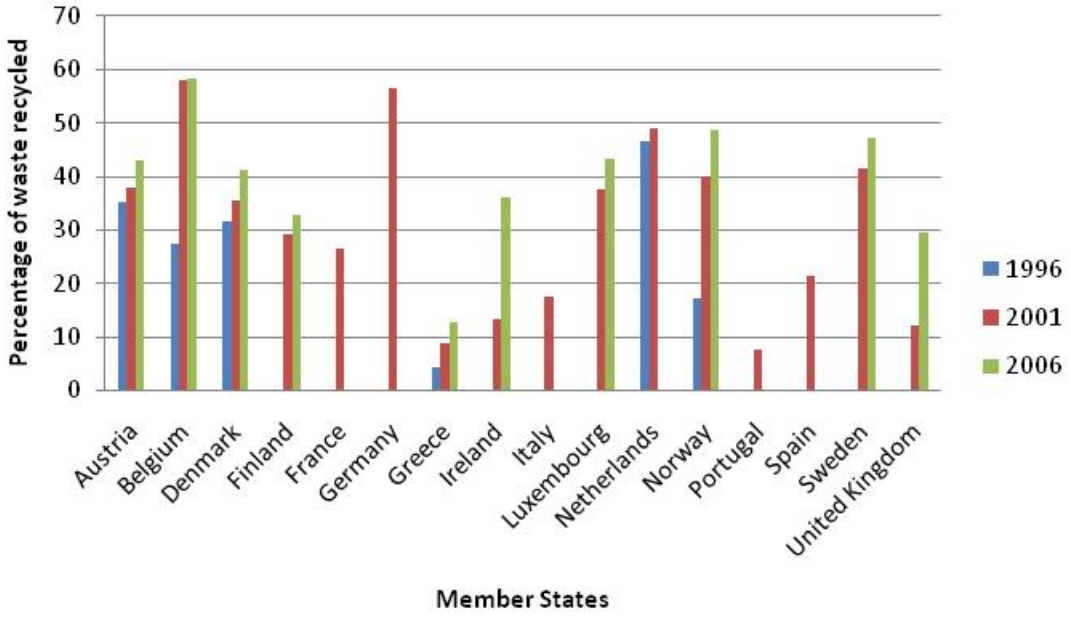


Figure 15 Total municipal waste recycled in percentage of generated amount in the EU 15 Member States and Norway[43]



A European Commission working paper by the ETC/SCP[44] concluded, based on analysis of national performance, that in 2005-2006 the EU 15 recycled between 60kg and 370kg of MSW per capita;

[43] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

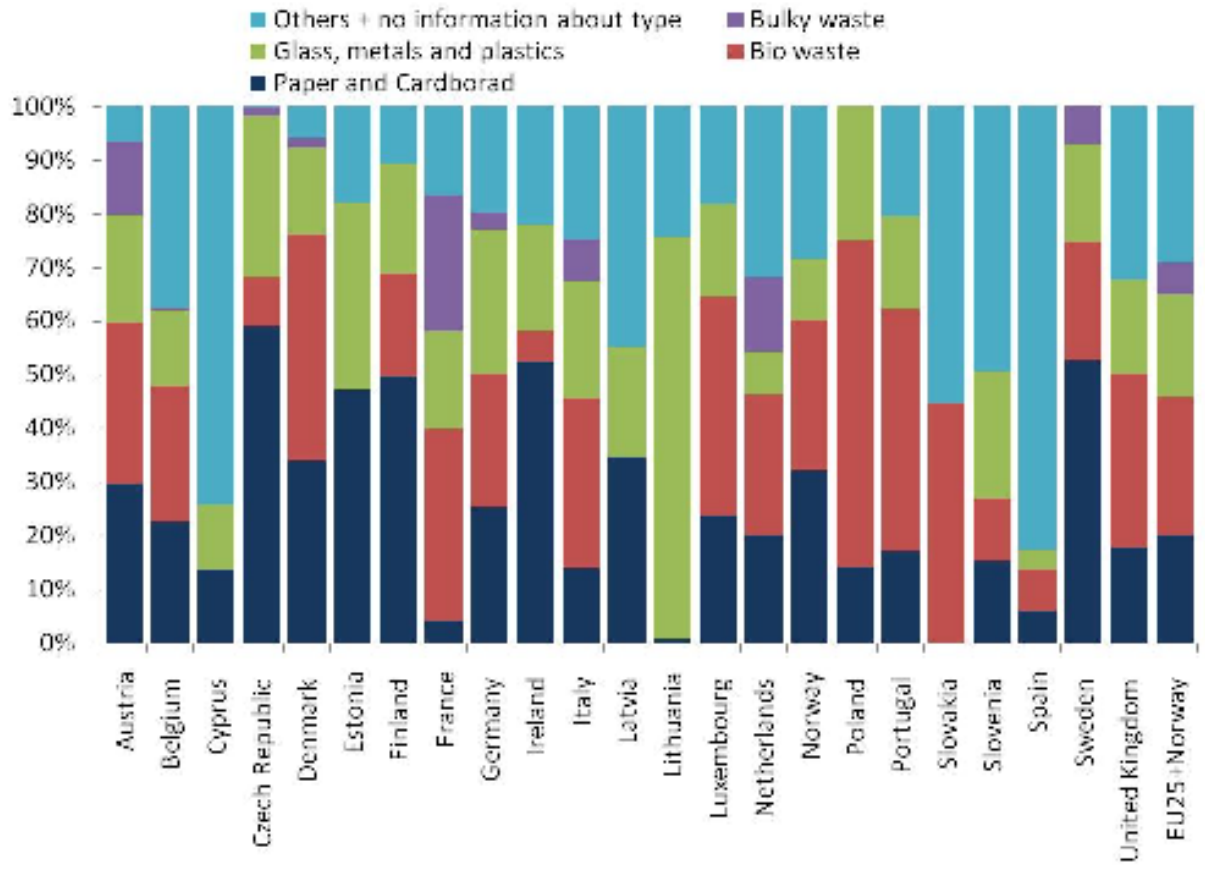
meanwhile the level of MSW recycling in the EU 12 varied from 20kg to 100kg per capita. When interpreting these figures, one must take into account the variations in levels of waste generation in the Member States i.e. a country with high overall levels of generation may show high levels of recycling, but as a proportion of total generation achievement is low. The EU-15 show relatively steep rates of increase in recycling from 1995 to 2006, increasing by a factor of 1.5 to a factor of 6 per capita. Countries with a very high initial level of recycling (e.g. Germany, the Netherlands) showed more gentle increases than others with lower overall levels (e.g. Greece, Ireland, UK). For the EU-12 the trend between 2004 to 2006 is also one of increase with recycling per capita rising by a factor of between 1.5 and 3 (NB a decline in recycling was indicated in some countries prior to 2002; this may be a result of better waste statistics being made available after 2002). The Czech Republic and Latvia demonstrated the most significant and consistent trends in terms of recycling of MSW per capita.

The material composition of recycling of municipal waste is also useful in terms of assessing where improvements in performance might be possible. Figure 16 below indicates that in 2005 glass, paper, plastics and metals accounted for over 35% of MSW recycling in most EU-15 countries and up to 70% in some other countries such as Ireland. Biowaste, in the form of green kitchen waste and garden waste constituted around 25% of the recycling effort in most of the EU-15, although it accounted for larger proportions in some Member States such as Denmark and Portugal. In the EU-12 in 2005/6 glass, paper, plastics and metal constituted over 30% of recycling, and up to 80% such as the Czech Republic and Estonia. In general biowaste recycling was less prevalent in the EU-12 than in the EU-15, with notable exceptions being Poland and Slovakia (where biowaste recycling represented up to 60% and over 40% of the recycling effort respectively. It is worth noting that the inclusion or otherwise of packaging waste in municipal waste statistics can make a significant difference to the statistics.

Figure 16 Composition of recycled municipal waste[45]

[44] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

[45] EEA, , 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'



2.1.4.2 *Delivering EU Recycling Targets*

The EU has a series of targets set out in a various Directives promoting recycling and recovery of waste. Specific product-based Directives promote and set targets for recycling and recovery within certain waste streams ie ELVs, packaging, WEEE and batteries. Directive 2008/98/EC established new targets for the preparation for reuse and recycling of materials from household (and similar) and C&D wastes. Table 5 sets out existing EU targets that might lead to the promotion of recycling and recovery of waste. Progress within each sector, with the exception of household waste which is discussed in the context of municipal waste in section 2.1.2.1, is then systematically discussed in dedicated subsections below.

According to the EEA, in the EU-27 (plus Norway) in 2006/2007, approximately 51% of waste targeted by product specific EU Directives was recycled. For individual waste streams the latest recycling/reuse figures available are: 59% of packaging (2007), 82% of ELVs (2007), 23% of WEEE (2006), 39% of municipal waste (2007) and 53% of C&D waste (2006).[46] These figures include reuse for ELV and WEEE only.

Table 5 Overview of EU waste collection, recovery and recycling targets for different waste streams

	Year	Collection targets	Recovery targets	Recycling targets
a. ELVs	2006	100%	85% including reuse	80% including reuse
	2015	100%	95% including reuse	85% including reuse
b. WEEE	2006	Min. 4kg per	70-80%	50-80% including reuse,

[46] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010

	Year	Collection targets	Recovery targets	Recycling targets
		inhabitant per year	depending on category of WEEE	depending on category of WEEE
	2016	*65% of that set on the market, or 85% or waste arising (proposed)*		
c. Packaging waste	2008		60%	55%
d. Batteries and accumulators	2009			100% of collected batteries
	2011			Minimum recycling efficiencies: 65% by average weight of lead-acid batteries and accumulators; 75% by average weight of nickel-cadmium batteries and accumulators; and 50% by average weight of other waste batteries and accumulators.
	2012	25%		
	2016	45%		
e. Paper, metal, plastic and glass waste from households and similar	2015	Separate collection to be in place		
	2020			50% by weight of these types of waste from households and other similar sources
f. C&D waste (not soils and stones)	2020		70% by weight of non-hazardous waste to be prepared for re-use, recycled or recovered	
g. Biodegradable municipal waste	2006 (or 2010)*	Reduction to 75% of 1995 landfill levels		
	2009 (or 2013)*	Reduction to 50% of 1995 landfill levels		
	2016 (or 2020)*	Reduction to 35% of 1995 landfill levels		

(*) for Member States with derogations (EE, UK, PL, CZ, LT, GR, IE, RO, BU, LV, SK)

Source: Directives 1999/31/EC, 2000/53/EC, 2002/96/EC, 1994/62/EC, 2006/66/EC and 2008/98/EC

a. ELVs

Directive 2000/53 on ELVs set minimum targets of 85% by weight of all ELVs to be reused or recovered (including energy recovery) and at least 80% to be reused or recycled from 2006; and for 95% reused or recovered (including energy recovery) and 85% reused or recycled by 2015.

In 2006, 19 Member States had met the reuse/recycling target of 80% (the Czech Republic and France were close to meeting the target). The reuse/recovery target of 85% was met by 13 Member States (Spain was close to meeting the target).[47]

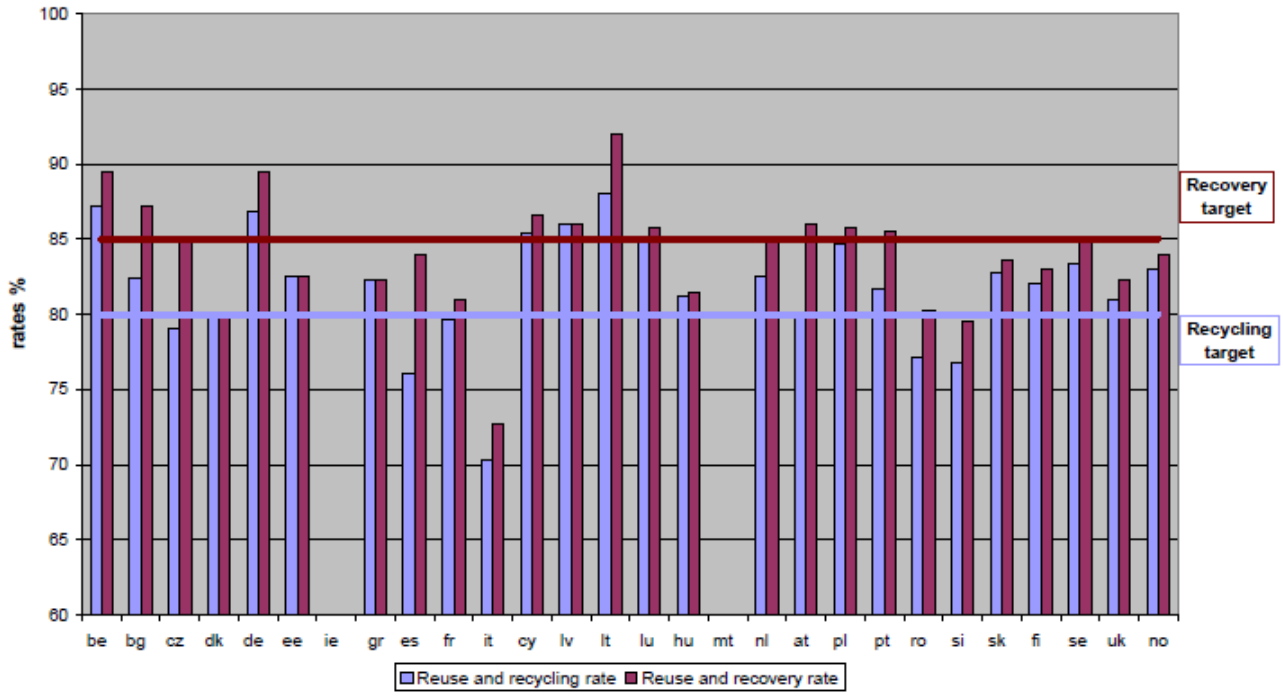
By 2007, five Member States (Bulgaria, Germany, Latvia, Lithuania and Slovakia) had already met the 2015 reuse/recycling target; three Member States (Czech Republic, France and Poland) had failed to meet the 2006 target (although the Czech Republic (79%) and France (79.8%) were very close); all other Member States had met the target.[48]

Also by 2007, only 14 Member States had met the 2006 reuse/recovery target. Significantly, three of the five countries that are responsible for approximately 75% of EU-25 (not including Bulgaria and Romania) vehicle deregistrations – France, Italy and the UK (the others being Germany and Spain) – had failed to meet the target.[49]

In terms of the differences in Member States' performance, it appears that a few of the countries that made an early start in implementing strong targets for cars are on track to meet the reuse and recycling targets, but most fall somewhat short. By weight, it is possible to get a long way towards the reuse and recycling target simply by recycling scrap metal parts (particularly iron and steel) of a vehicle effectively, which is in any case economic to do. This has helped a number of countries to meet the 80% reuse and recycling target in 2006 or soon after. However, further efforts are still needed in order to reach the reuse and recycling targets in full, typically including greater efforts to recycle glass, plastics and other materials. The reuse and recovery targets are also proving challenging in almost all Member States, with few anywhere close as yet to meeting the 2015 target. In recent years, some have been actively looking at the possibility of incineration with heat recovery of parts of the post-shredder waste stream in order to comply.[50]

Figure 17 ELV Reuse and recycling, and reuse and recovery rates, 2006[51]

[47] European Commission, 2009, Report on the Implementation of Directive 2000/53/EC on End-of-Life Vehicles for the period 2005-2008
[48] Eurostat, 2009, Environmental Data Centre on Waste, 2009
[49] Eurostat, 2009, Environmental Data Centre on Waste, 2009
[50] IEEP and Ecologic, 2007, Study for the European Parliament's Committee on Environment, Public Health and Food safety 'End-of Life Vehicles (ELVs) Directive: Assessment of the current state of Implementation by Member States'
[51] Eurostat, 2009, Environmental Data Centre on Waste, 2009



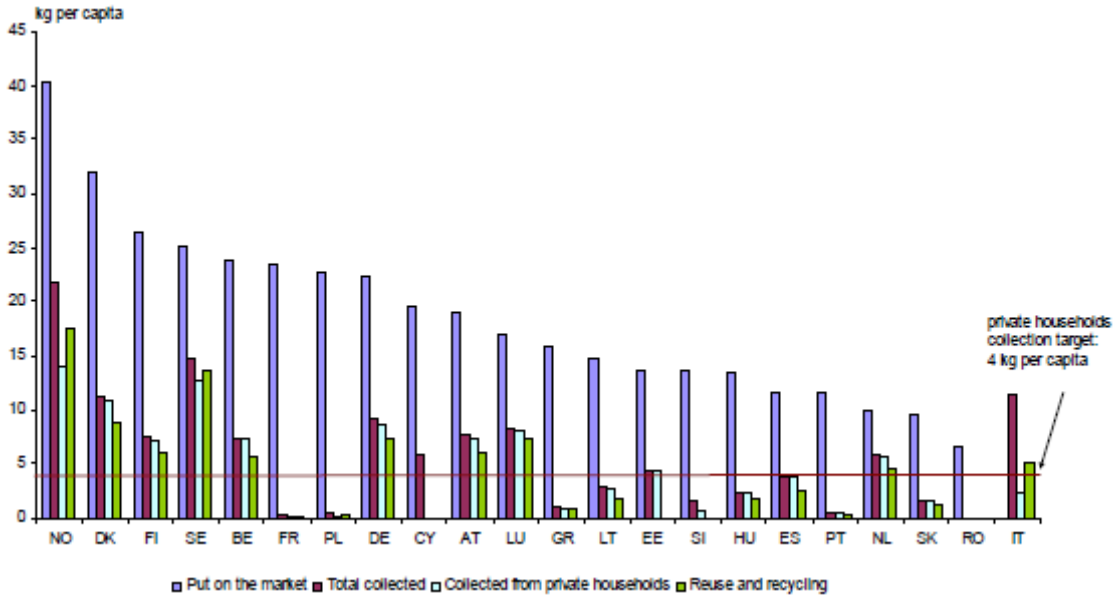
b. WEEE

Directive 2002/96/EC on WEEE set a collection target of 4kg of WEEE per capita and per year from private households. By 31 December 2006, manufacturers and importers were to achieve recovery targets of 70-80% for collected WEEE, and material and substance re-use and recycling targets of 50-75%. A recast of the WEEE Directive, proposed in 2008 and still under discussion at the time of writing, proposes replacing the kg/capita target with a collection target of 65% of the EEE placed on the market in the preceding year (including business-to-business equipment), to be achieved annually from 2016.

Figure 18 below shows that by 2006, only 10 Member States (plus Norway) had reported meeting the 4kg per capita collection target. In percentage terms, in 2006 the average collection rate (of the 18 countries for which data were available) was only 23% by weight of amounts put on the market; it is likely that considerably more than this is collected but not reported, and that a substantial part of this undergoes sub-standard treatment in the EU or is illegally exported. Where WEEE is collected separately, however, it is widely recycled: for 17 countries where recycling rates can be calculated, the average recycling rate was 79%.[52] A study on resource efficiency (being undertaken in parallel to this study) estimates that a maximum of 77% of the material in collected ELV's can be reused, recycled or recovered; based on this, it is estimated that the amount of metals potentially recovered from collected ELV's represents 1.7% of the raw metal input in the EU-27 economy.[53]

[52] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[53] BIO IS et al, 2010, Analysis of the Key Contributions to Resource Efficiency

Figure 18 WEEE put on the market, collected and recycled/recovered/reused in 21 European countries (kg/capita), 2006[54]



c. Packaging

The Packaging Waste Directive sets a recovery target for 2008 of 60%, and a recycling target for the same year of 55% of packaging put on the market.

Packaging waste from households and commercial sources accounts for around 3% of total waste. Generation of this waste stream is increasing, although it appears to be relatively decoupled from GDP growth: in the EU-15, the four main fractions (glass, metals, paper and cardboard, and plastics) grew at half the rate of GDP between 1998 and 2007. Since 1997 countries have increasingly been reporting on wood packaging, resulting in higher overall generation figures for packaging waste. Generation per capita varies widely in the Member States, from 41kg in Bulgaria to 245kg in Ireland.

Figure 19 below summarises the recycling and recover rates for packaging waste in the EU-27 in 2007, compared to the recovery and recycling targets set by the Packaging Waste Directive. It shows that by 2007, 16 MS had already met the 2008 recovery target of 60% (with a further two very close to meeting the target), and 18 MS had already met the 2008 recycling target of 55% (with a further one very close to meeting it). By 2007, 59% of packaging waste in the EU-27 was recycled and 14% energy-recovered.[55]

[54] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[55] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010

Figure 19 Recycling and Recovery Rate for Packaging Waste, 2007[56]

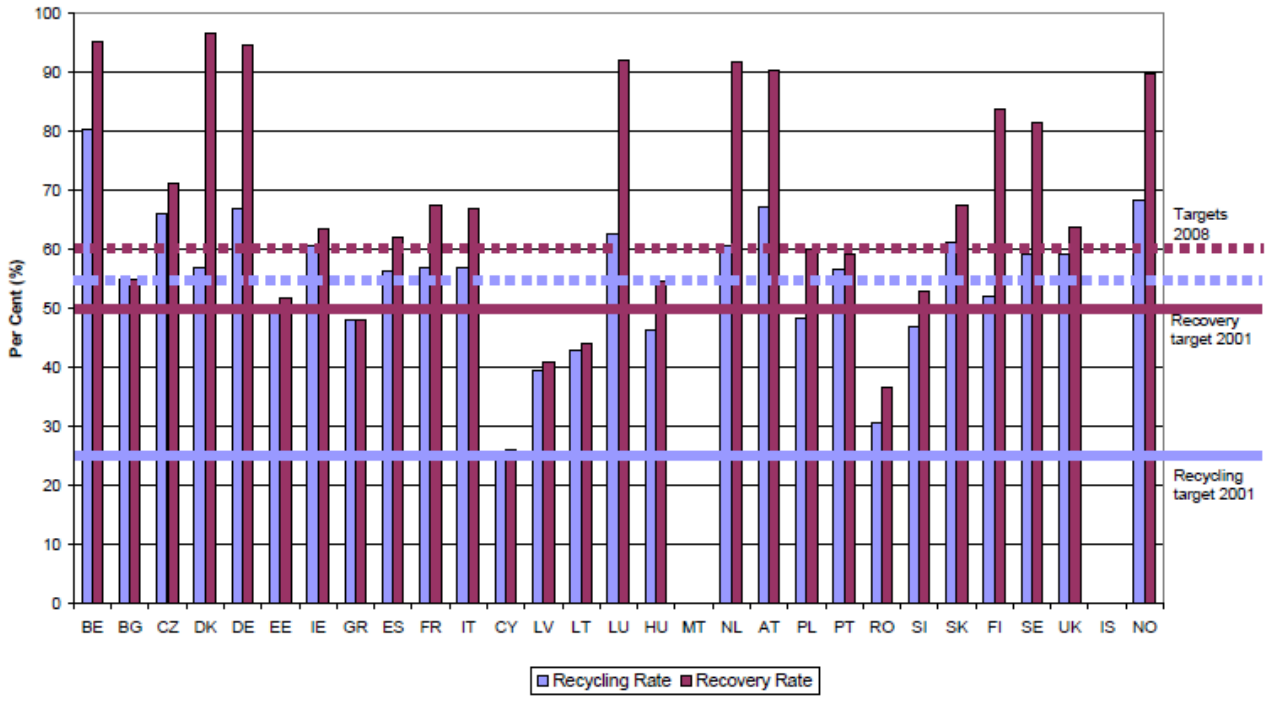
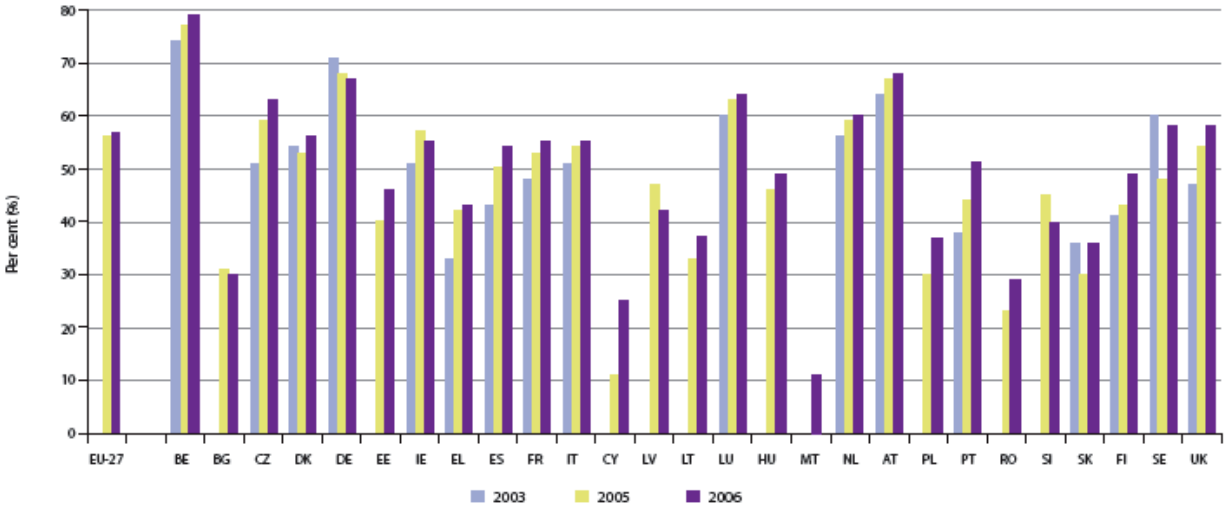


Figure 20 below provides data for 2003, 2005 and 2006 on the performance of the EU-27 with regards to recycling of packaging waste. By 2006 12 Member States had already met the 2008 target to recycle 55% of packaging put on the market (not including energy recovery)[57]. The figures, however, appear to indicate that some Member States that have already achieved a high recycling rate are experiencing problems to further increase or maintain this high level.[58]

Figure 20 Recycling rate for packaging waste, EU-27, 2003-2006[59]



[56] Eurostat, 2009, Recycling and Recovery Rate for Packaging Waste 2007
[57] Eurostat, 2008, Energy, transport and environment indicators
[58] Eurostat, 2008, Energy, transport and environment indicators
[59] Eurostat, 2008, Energy, transport and environment indicators

d. Batteries

Figures collated by the European Battery Recycling Association (EBRA) indicate that in 2008, 27,600 tonnes of used portable batteries in the EU-27 were recycled by EBRA members, equating to an average of 14.5% of batteries put on the market. Factoring in collection and processing by non-EBRA members, the figures increase to around 35,000 tonnes or 18.4%; this is considerably lower that the collection rate of 25% (equating to around 50,000 tonnes) which must be met by 2012 under Directive 2006/66/EC on batteries. Seven Member States (Austria, Belgium, France, Germany, Luxembourg, Sweden and the Netherlands) had, however, reached the 25%, and six others (Denmark, Portugal, Greece, Ireland, Spain and Latvia) were judged to be able to meet the target by 2012. The three remaining EU-15 Member States (Finland, Italy, UK) looked much less likely to meet the target, and for 11 of the EU-12 (all except Latvia) battery collection had only just begun and the quantities collected in 2008 were still very low. It therefore appears unlikely that the EU-27 as a whole will meet the 25% collection target by 2012.[60] Data is not currently available from Eurostat on Member States' performance against the Directive's targets; the first Member State reports will cover the period until 26 September 2012 and will provide information on collection targets (for 2011), recycling levels (per calendar year) and recycling efficiency (per calendar year from 2011 or 2010 where possible).

e. Paper and cardboard

(NB The recycling and use of plastic waste is being reviewed within a separate detailed study[61] for the European Commission. The study addresses trends in plastic waste generation, plastic waste management and its impacts, and the definition of a set of policy options to reduce the environmental impacts of plastic waste. The report predicts that the production capacity for most primary plastics will continue to grow over the next decade (although polystyrene is becoming less favoured and is expected to decline), but that demand for plastic by European converters may decrease if the trend of primary plastic production moving to countries outside the EU continues. Continued innovation and improvements such as weight reduction and growth in bioplastics will be necessary. In 2008, total generation of post-consumer plastic waste was 24.9 Mt in the EU-27, Norway and Switzerland, with plastic packaging making up around two-thirds of plastic waste (but also being the fraction of plastic waste with the highest rate of recycling (approximately 29%); the ELV and WEEE sectors have the lowest amounts of recycling. In 2008 the rate of recycling for overall plastic waste was 21.3%, and the total recovery rate 51.3% (although large differences can be observed between Member States, ranging from 34% recycling in Germany to 8% in Greece). The five policy options identified for future action are: sustainable packaging guidelines; agricultural plastic recovery and recycling guidelines; WEEE and automotive plastic waste targets; bioplastic and recycled plastic phased targets; and research innovation on the reduction of plastic waste.)

Directive 2008/98/EC on waste requires separate collection to be set up for paper by 2015; by 2020, the preparing for re-use and the recycling of waste paper (from households and other origins as far as the waste is similar to waste from households), should be a minimum of overall 50% by weight.

Figures from the European Recovered Paper Council suggest that year on year from 2002-2008, paper and board consumption has been increasing. Levels of recycling of paper and board have also been increasing each year, however, and have risen from 55.8% in 2002 to 66% in 2008.[62] In 2009, a 72.2% recycling rate for

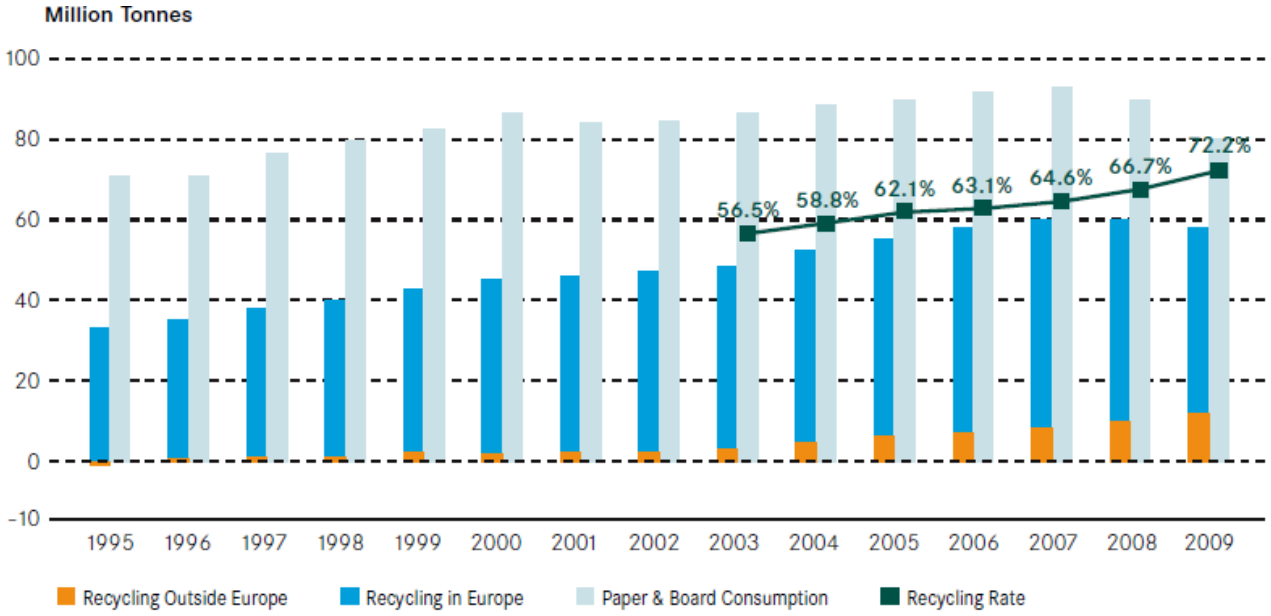
[60] European Battery Recycling Association (EBRA), 2009, Press release 'Stagnation of the quantities of used portable batteries recycled in 2008'

[61] BIO IS et al, 2010, Plastic waste in the environment (Draft final report, specific contract number 07.0307/2009/545281/ETU/G2 implementing Framework contract ENV.G.4/FRA/2008/0112)

[62] European Recovered Paper Council, 2010

was achieved for all paper and board in the EU-27 plus Norway and Switzerland.[63] Performance is therefore already well ahead of the 2020 target.

Figure 21 Paper recycling, EU-27 plus Norway and Switzerland, 1995-2009[64]



f. Construction and Demolition waste

Data on the generation, composition and recycling of C&D waste are more limited; no statistics or data are currently available at a European wide level. Figure 22 below indicates that in percentage terms the rate of generated C&D waste recycled is over 60% in most of the old EU Member States and Norway; in some cases it is over 80% but in others it is only 15%-30%.

Figure 23 shows that commonly recycled materials are concrete, bricks, tiles and asphalt; dredging soil, soil and track ballast contribute significantly in Member States with a high percentage of recycling. From the limited data available in Figure 22 below, it can be concluded that progress towards meeting the 2020 target of 70% recycling of C&D waste is good in 7 MS, reasonable in a further 4 MS, and limited in 7 MS.

Figure 22 Recycling of construction and demolition waste in percentage of generated amount in the EU and Norway[65]

[63] European Recovered Paper Council, 2009, European Declaration on Paper Recycling 2006 – 2010, Monitoring Report 2009

[64] European Recovered Paper Council, 2009, European Declaration on Paper Recycling 2006 – 2010, Monitoring Report 2009

[65] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

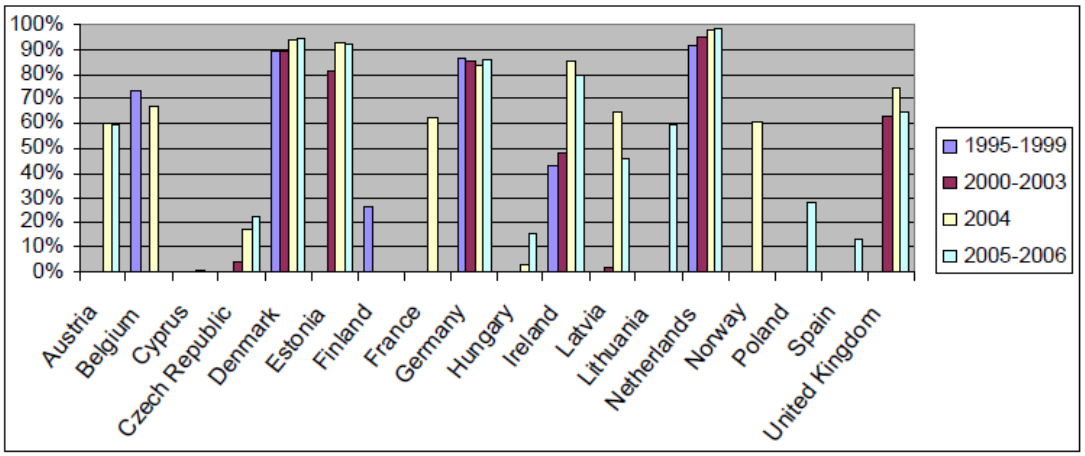
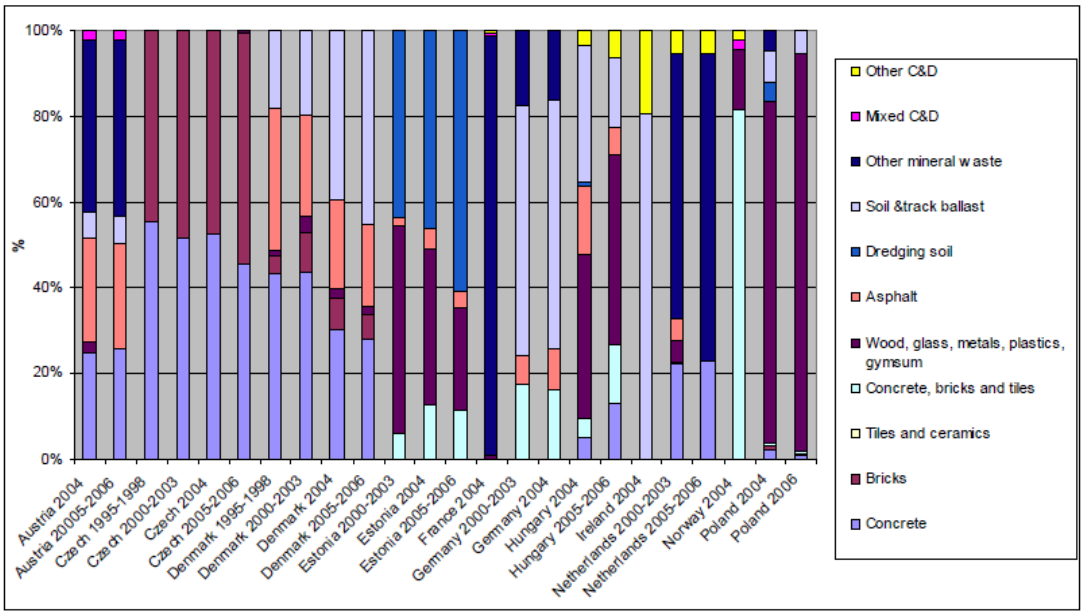


Figure 23 Percentage composition and development of recycled construction and demolition waste in the EU and Norway[66]



It is worth noting that soil recycling does not count towards the 70% EU target for C&D waste.

g. Biodegradable Waste, Composting and Anaerobic Digestion

Biowaste generation and its anticipated future management are discussed in detail in section 2.2 where results from modelling for this waste stream are discussed. About 30 to 40% of the mass of the municipal solid waste produced in the European Union is biowaste, equivalent to 88 million tonnes annually[67]. The

[66] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

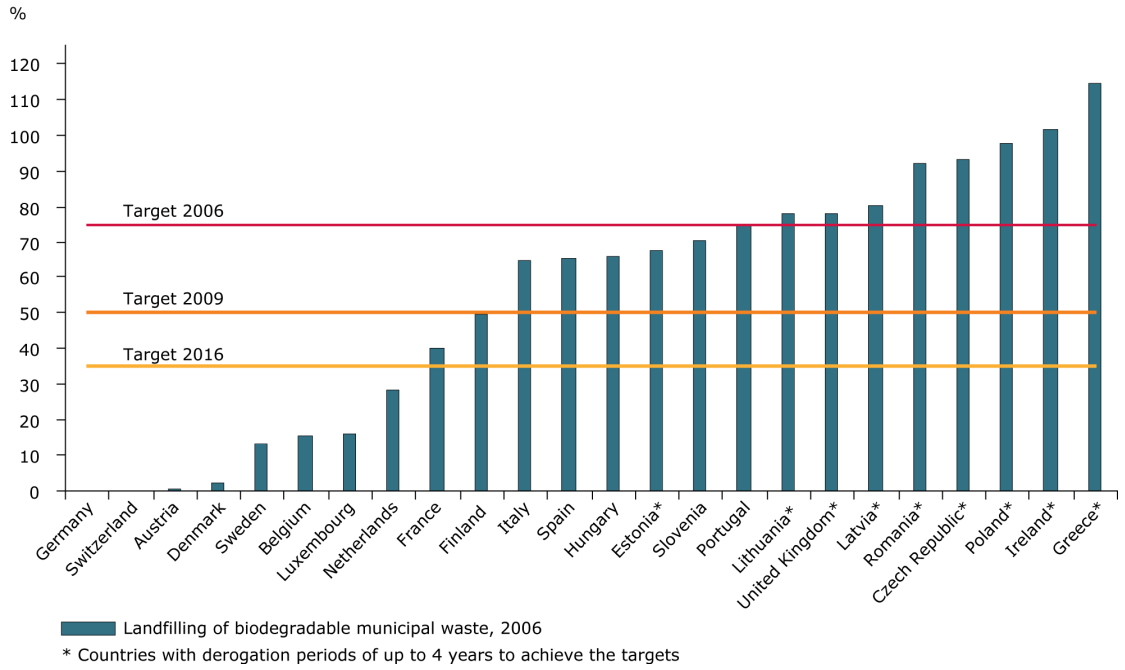
[67] European Commission, 2010, COMMISSION STAFF WORKING DOCUMENT Accompanying the Communication from the Commission On future steps in bio-waste management in the European Union, SEC(2010)577

majority of this is produced by the EU-15 countries ie just under 75 million tonnes, with only limited production associated with the EU-12[68].

Directive 93/1999/EC on Landfills requires Member States to reduce landfill of biodegradable municipal waste to 75%, 50% and 35% respectively of the amounts generated in 1995 by 2006, 2009, and 2016.

Figure 24 below shows that seven Member States had already met the 2016 target by 2006, whereas eight Member States (all with derogation periods) still needed to substantially reduce landfill of biodegradable municipal waste to meet even the 2006 target. Data was missing for four Member States.

Figure 24 Biodegradable municipal waste landfilled in 2006 (% of biodegradable municipal waste generated in 1995), compared to targets of Directive 93/1999/EC[69]



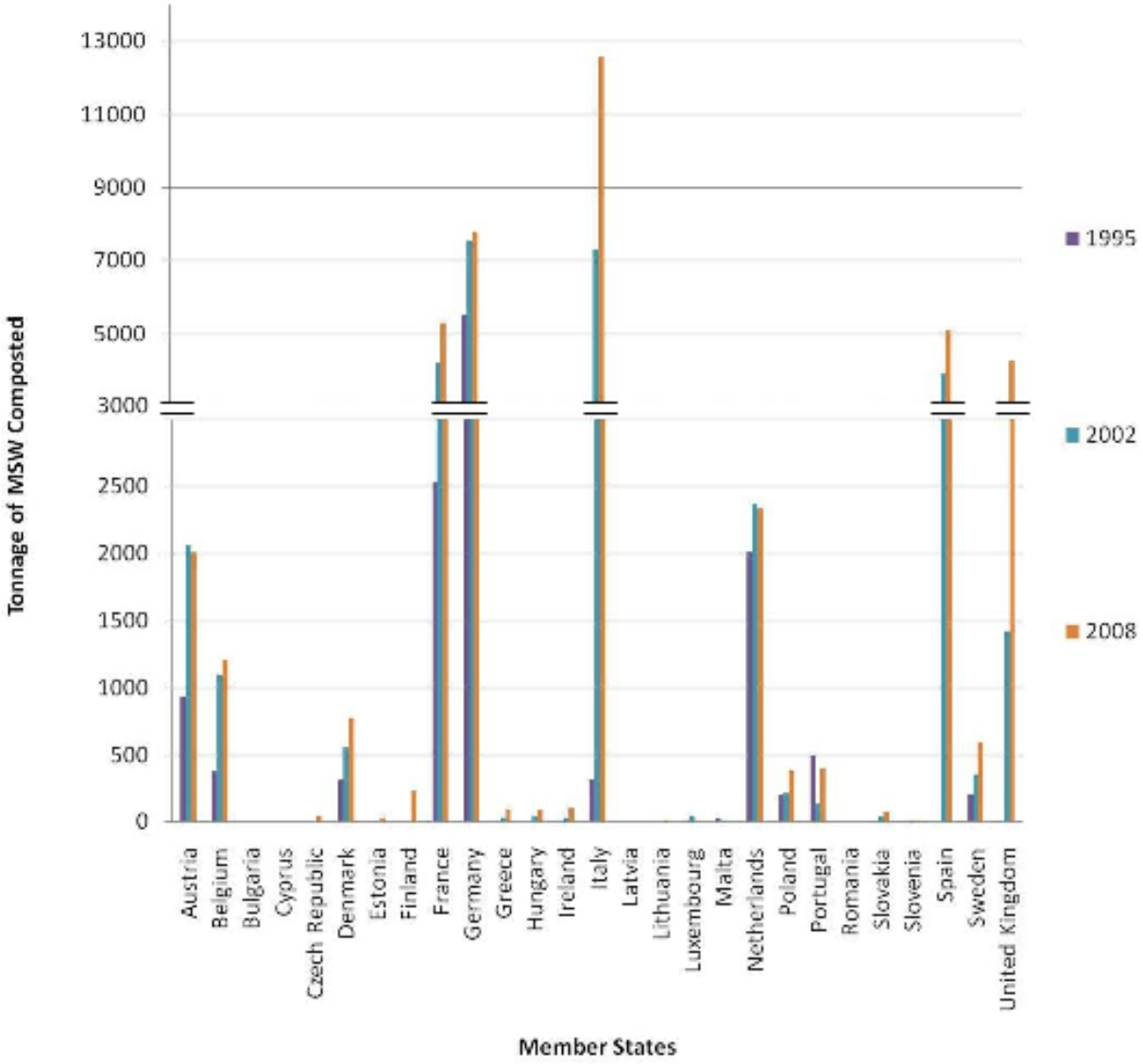
[68] Arcadis and Eunomia, 2010, Assessment of the Options to Improve the Management of Bio-Waste in the European Union

[69] EEA, 2010, The European Environment, State and Outlook 2010 : Thematic Assessment – Material Resources and Waste

Composting generally refers to a process by which a usable product (i.e. compost) is made. Figures from Eurostat suggest that in 2008, 17% of waste treated in the EU-27 was composted.[70] The EU-27 has shown steady year-on-year increases between 1995 and 2008 in the quantity of municipal waste composted, as demonstrated by Figure 25 below.[71]

Anaerobic digestion is a series of processes in which micro-organisms break down biodegradable material in the absence of oxygen; it is used for industrial or domestic purposes to manage bio-waste and to produce methane which can be captured and used to generate energy as a form of natural gas. Reliable data on anaerobic digestion has not been found during the course of this study, but it is an established and expanding treatment technology. As more bio-waste is diverted from landfill and with increasing emphasis on energy recovery from waste anaerobic digestion capacity is expected to increase.

Figure 25 Total municipal waste composted 1996-2007[72]



[70] Eurostat, 2010, 2010, Presentation on 'Municipal waste' prepared for the Meeting of the Working Group "Statistics of the Environment", Sub-Group "Waste" of the Joint Eurostat/EFTA group

[71] Eurostat, 2010, Municipal waste composted in the EU (1000 tonnes)

[72] Derived from Eurostat, 2010, Municipal waste composted in the EU (1000 tonnes)

2.1.4.3 Energy Recovery from Waste, Incineration and Potential Impacts on Recycling

Energy recovery from waste is, at present, primarily achieved through incineration, although anaerobic digestion is anticipated to increase in importance in certain Member States into the future – see section 2.2. The EU legal definition of incineration has varied considerably over the past 10 years, as has its classification and preferential position in waste management strategies. For the purposes of this study, a definition of incineration for the purposes of energy recovery has been taken as incineration of waste featuring capture of thermal/energetic energy. Not all incineration plants operate energy recovery processes but increasingly this technology is being developed throughout Europe. Under Directive 2008/98/EC incinerators must achieve a specified level of efficiency in terms of conversion of waste to energy in order to qualify as an energy recovery activity.

Statistics indicate that incineration of municipal solid waste (MSW) with energy recovery has increased significantly, with primary energy production from municipal waste incineration almost doubling from 1995 to 2006 – see Figure 26 for details of reported Member State incineration with energy recovery activities. The energy content was equivalent to around 10 million tonnes of oil in 2006; according to Eurostat estimates, this is around 0.9% of total final energy consumption[73]. In 2006 Germany and Sweden recovered energy from by far the highest quantities of waste EU wide, subsuming just over 17,000 and 18,000 tonnes respectively.[74]

Figure 26 indicates that from 1997 to 2008 the quantity of MSW incinerated in the EU-27 has increased from 70kg to 102kg per capita. Three Member States are exceptions to this trend, and have experienced a decrease in incineration rates between 1995 and 2007: Belgium, France and Luxembourg (where a large drop of nearly 20% has occurred); see Figure 27. The Member States with the largest number of waste-to-energy facilities are France (130), Germany (67), Italy (51), Sweden (30), Denmark (29), UK (20), Belgium (16), Netherlands (11) and Spain (10).[75] There is also still much public opposition to incineration due to worries over impacts on health and the environment.[76] This impedes the increase in capacity in some countries, for example Italy, where incineration only accounts for 15% of MSW, compared to Germany and Belgium, where capacity is approximately 35%.[77]

Emission standards have tightened considerably; waste incineration in Europe is regulated by the European Waste Incineration Directive 2000/76/EC to limit dioxin and Nox emissions and heavy metals (although this will shortly be subsumed under the new Directive on Industrial Pollution). CO_2 emissions from incineration decreased by 45% between 1990 and 2007 such that CO_2 from incineration in this period contributed only 0.1% of total EU-15 greenhouse gas emissions.[78] Although the Waste Incineration Directive does not include CO_2 limit values, the waste incineration BREF under the IPPC Directive does make reference to CO_2 emissions; in addition, the incineration sector has undergone rapid technological development in recent years, which has, in particular, reduced emissions to air from individual installations.

Figure 26 Municipal solid waste incinerated in the EU-27 (kg per capita)[79]

[73] Calculated from Eurostat, 2010, Final energy consumption
[74] Eurostat, 2008, Energy, transport and environment indicators
[75] Capel, C., 2009, Innovations in waste, Waste Management World, Volume 11, Issue 2
[76] EEA, 2009, EEA Report No 7/2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union
[77] EEA, 2009, EEA Report No 7/2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union
[78] EEA, 2010, Annual European Union Greenhouse Gas Inventory 1990-2010, 02.06.10
[79] Based on Eurostat, 2010, Environmental Data Centre on Waste, Landfill and incineration

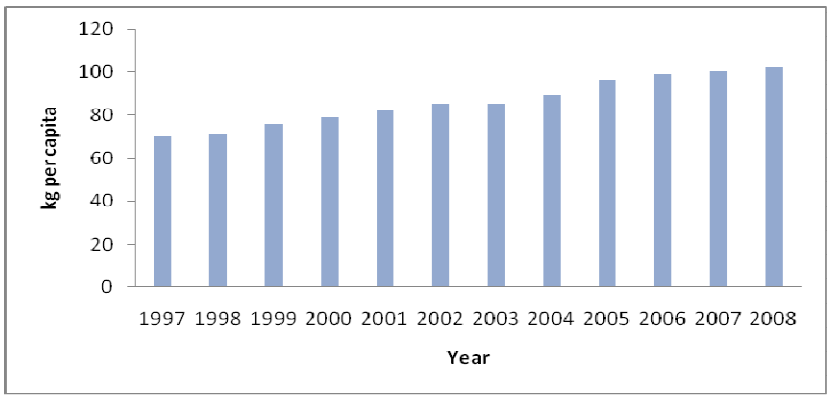
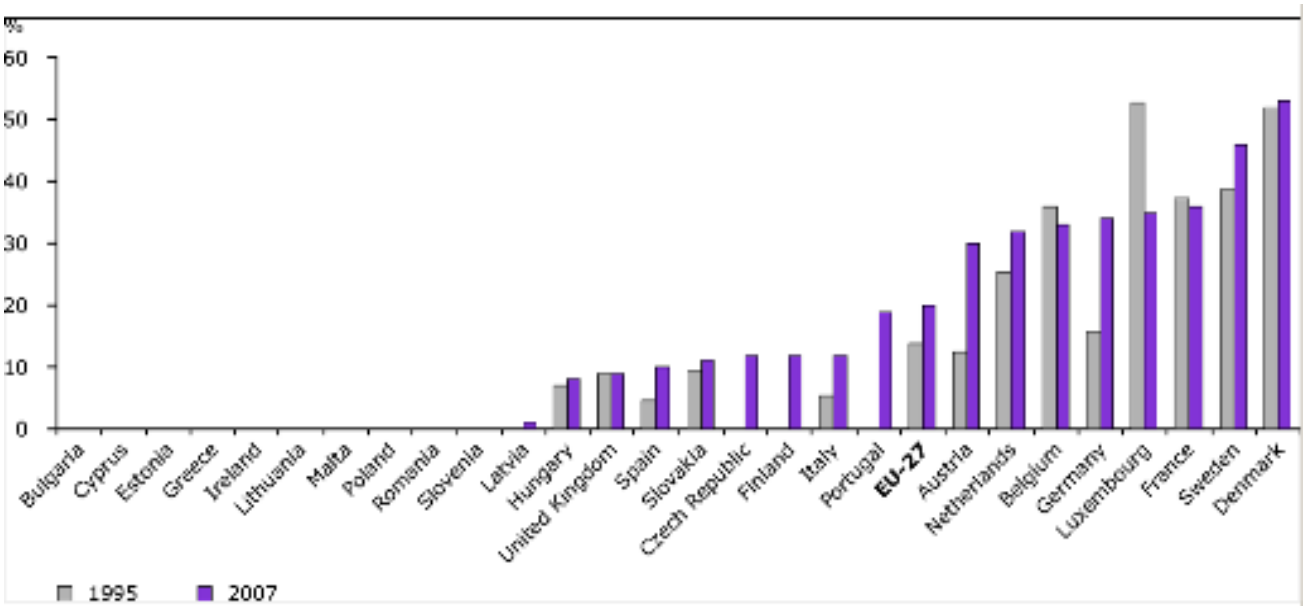


Figure 27 Percentage of municipal waste incinerated in the EU-27, 1995 and 2007[80]



Incineration as Energy Recovery or Disposal

It should be noted that all the statistics presented in relation to incineration and energy recovery originate from before the adoption of the new Directive on waste, when specific new criteria were adopted to determine the efficiency level at which incineration can be deemed an energy recovery rather than disposal activity. It is anticipated that this will help to increase the consistency and reliability of reporting on this issue, with additional information becoming available on the level of energy recovery from waste and the efficiency of plant. During the next data collection process Eurostat will ask countries to specify from which reference year the energy efficiency criterion will be applied.[81]

According to a report covering the period from 2004 to 2007, an estimated 40% of municipal waste incinerators in the EU might be able to achieve the energy efficiency criteria for municipal waste incinerators set by Directive 2008/98/EC.[82]

Incineration and Energy Recovery Versus Recycling

[80] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)

[81] Document on the 'Structural indicator on municipal waste' (Doc. WASTE WG 6.1 (2010)) prepared for the Meeting of the Working Group "Statistics of the Environment", Sub-Group "Waste" of the Joint Eurostat/EFTA group

[82] CEWEP, 2009, Energy Report II (Status 2004-2007)

Incineration with energy recovery is increasingly being considered as a viable alternative energy source but uptake varies across Europe. In Germany, the energy from waste market is competitive with incinerators competing against electricity generating plants owing to subsidies allowed for renewable energy sources. In the UK for example, waste-to-energy technology is being increasingly recognised as a viable component of the energy mix with policy decisions being taken to this effect.[83] Finland currently incinerates less than 10% of MSW due to problems experienced with the integration of energy recovery from incineration into its existing power and heating systems; however, in order to meet the targets of the Landfill Directive, Finland plans to extend its incineration capacity, as does Estonia.[84]

Given the push to deliver renewable energy technologies there are emerging concerns that energy recovery from waste might be promoted to the detriment of recycling and other material recovery activities. There is a risk that incentives to promote energy recovery fail to take into account fully the broader natural resource use and GHG benefits associated with reusing raw materials rather than burning them.

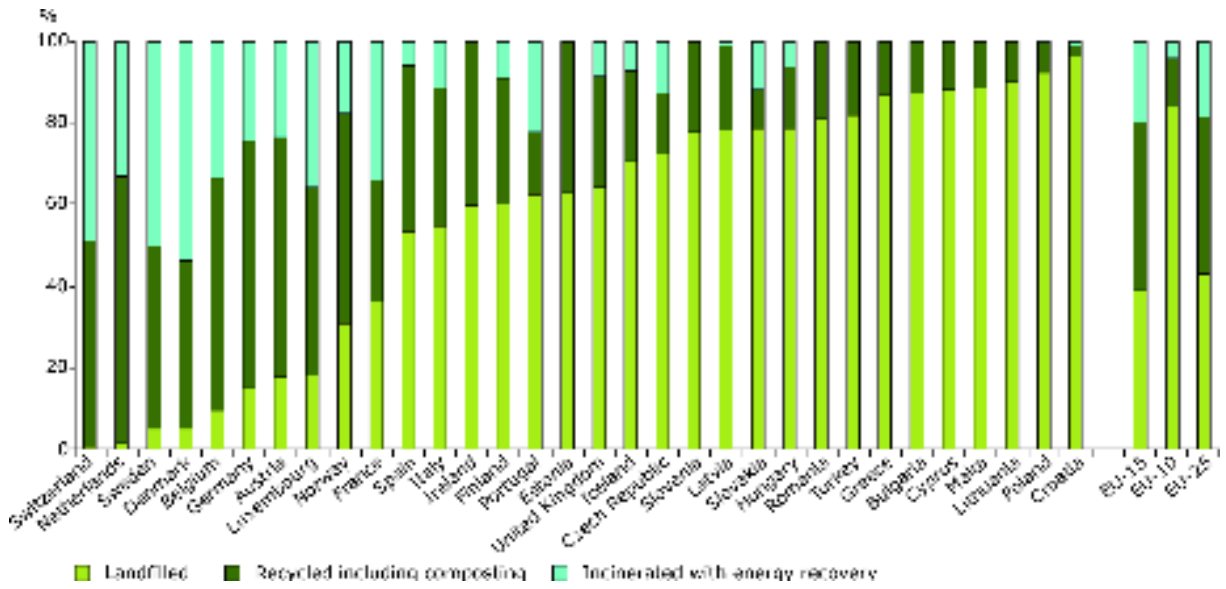
Figure 28 below shows that in 2005, recycling accounted for a greater proportion of waste treatment than incineration in Europe. Despite recycling rates in Europe increasing steadily, concerns still exist regarding the impact of increased incineration of waste on recycling rates.

During this analysis little conclusive evidence regarding conflicts could be identified, however, the potential risks are clear given the failure to recognise the benefits for GHG reduction of recycling, the need for incinerators once operational to subsume a set quantity of waste (not taking into account necessarily anticipated or potential increase in recycling rates) and the need for incinerators to operate on long time horizons to ensure viability. It is difficult, however, to make an assessment as to when incineration of waste would become detrimental to recycling. When considering this issue there are three potential priorities that might help avoid conflicts:

- Certain countries may be at more imminent risk of conflicts ie those where there is already high levels of incineration and recycling and where these two activities dominate waste treatment options for example Denmark, Sweden, Belgium, Germany, Austria – analysis could be conducted in terms of the opportunities for increasing energy from waste potential in these Member States without having a detrimental impact upon recycling potential;
- In countries with lower levels of recycling and incineration measures should be put in place to ensure investments in incinerators take account of anticipated future shifts in the waste profile as a consequence of increased recycling and ensure that subsidies are not only focused on incineration/energy recovery activities but also to promote recycling;
- That mechanisms are put in place to better recognise the potential GHG benefits of promoting recycling as well as energy recovery associated with incineration (discussed below).

Figure 28 Rate of recycling versus incineration with energy recovery of municipal waste, 2005 for the EU 25[85]

[83] The Waste to Energy Research and Technology Council, 2010
[84] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[85] EEA, 2007, Europe's Environment, The Fourth Assessment, State of the Environment Report No 1



Importantly, the renewable energy Directive (while aimed at delivering GHG savings) does not specify that renewable technologies such as energy from waste must deliver a certain level of GHG emission reductions or efficiency level. It is therefore important to identify other mechanisms for taking into account the GHG savings potential associated with recycling, versus incineration. An international review of 55 studies on life-cycle assessments (LCA) suggests that recycling delivers significant carbon savings as compared with incineration and landfill.

below indicates that this is the case in 83% of the LCA scenarios reviewed. No cases were identified where the incineration of glass or the landfill of plastics, aluminium, steel, wood and aggregates provided GHG benefits when compared with recycling; very limited cases were found where landfill of paper and cardboard and glass, and incineration of aluminium and steel provided GHG benefits when compared with recycling. These results suggest strongly that recycling should be the favoured treatment option for these materials.

Each number represents a Life Cycle Assessment study indicating which waste management option has the lowest GHG emissions. For instance there are 22 LCA studies that suggest recycling of paper and cardboard has lower GHG emissions than incineration, 6 that suggest incineration has lower emissions and 9 with no preference.

Table 6 Overall environmental preference of waste management options across LCA scenarios[86]

	Recycling v Incineration			Recycling v Landfill		
Material	Recycling	Incineration	No preference	Recycling	Landfill	No Preference
Paper and cardboard	22	6	9	12	0	1
Glass	8	0	1	14	2	0
Plastics	32	8	2	15	0	0
Aluminium	10	1	0	7	0	0
Steel	8	1	0	11	0	0
Wood						
Aggregates				6	0	0
Totals	80	16	12	65	2	1

When it comes to assessing the GHG benefits of energy from waste it can be difficult to assess the balance or trade-off between energy produced and GHG emissions avoided. GHG emissions might be avoided due to reduced landfilling of biodegradable wastes such as kitchen and garden waste, paper, cardboard. However, although incineration with energy recovery will produce a GHG benefit compared with

[86] http://www.wrap.org.uk/wrap_corporate/publications/benefitsrecycling.html

incineration without energy recovery, this benefit will not necessarily be in terms of avoided use of fossil fuel. Most Member States are currently showing increasing overall energy use, and a major criticism of new renewable energy plants is that they do not replace existing fossil fuel use but merely replace potential future fossil fuel use (i.e. they may reduce potential future emissions from fossil fuel, but do not reduce current emissions from fossil fuel with little focus on reducing energy demand). Ahead of decisions to promote energy from waste there should a strategic review its place within the broader delivery of future energy, its overall GHG benefits and potential implications for other waste treatment alternatives.

A study led by Prognos[87] explored the potential of the waste management sector for CO_2 reduction in the EU-27. It concluded that the main CO_2 emission reduction potential can be achieved by diverting waste from landfilling to recycling and recovery, and by implementing national and EU waste policies. In 2004, waste recycling, reuse of waste streams (as opposed to use of primary raw materials) and disposal of remaining waste accounted for a reduction of CO_2 emissions of almost 92 Mt CO_2 equivalent, and by 2020 this is expected to rise to between 238 and 336 Mt CO_2 equivalent. Within this, decreases in landfill and alternative treatment in waste-to-energy plants for energy recovery are predicted to reduce CO_2 emissions by between 85 and 130 Mt CO_2 equivalent by 2020. Overall, the study suggests that improved management of waste streams and residual MSW could contribute 19 to 31% of the EU's 2020 greenhouse gas emissions targets.

2.1.4.4 REDUCING WASTE TO LANDFILL

The EU Landfill Directive (1999/31/EC) aims to prevent, or reduce as far as possible, negative impacts on the environment from the landfilling of waste, including the pollution of air, land, surface water and groundwater by greenhouse gas emissions ('landfill gas' from the decomposition of biodegradable waste comprises mainly methane and carbon dioxide) and leachate (the liquid which percolates through the landfill). The Directive sets targets for the reduction of biodegradable municipal waste going to landfill:

- to 75% of 1995 levels by 2006 (or up to 2010 for MS with derogations);
- to 50% of 1995 levels by 2009 (or up to 2013 for MS with derogations); and
- to 35% of 1995 levels by 2016 (or up to 2020 for MS with derogations).

Derogations from these targets apply for certain Member States who previously landfilled more than 80% of their waste. If the Directive's targets are to be met, Member States must significantly reduce the amount of waste produced and/or use alternative waste management options.

There have been some significant successes in this regard over recent years.

Figure 28, in previous section, shows that in 2005 many countries sent the majority of their waste to landfill: all 'EU-10' countries (the EU-12 prior to the entry of Romania and Bulgaria into the EU) had landfill rates of at least 60%, as did Ireland, Finland, Portugal and the UK. Conversely, most of the EU-15 had low rates of landfill and high rates of calculated material recovery and incineration with energy recovery.

Sending municipal solid waste (MSW) to landfill has long been the dominant waste management option in the EU-27, but in recent years this has begun to change,[88] and in contrast to rising quantities of MSW generated, since 1997 the quantity of MSW landfilled in the EU has decreased: from 293kg per capita in 1997 to 207kg per capita in 2008.[89]

Figure 29 shows that the majority of EU-27 countries have reduced the amount of municipal waste they send to landfill between 1995 and 2007. Only six countries (Bulgaria, Malta, Portugal, Romania, Slovakia

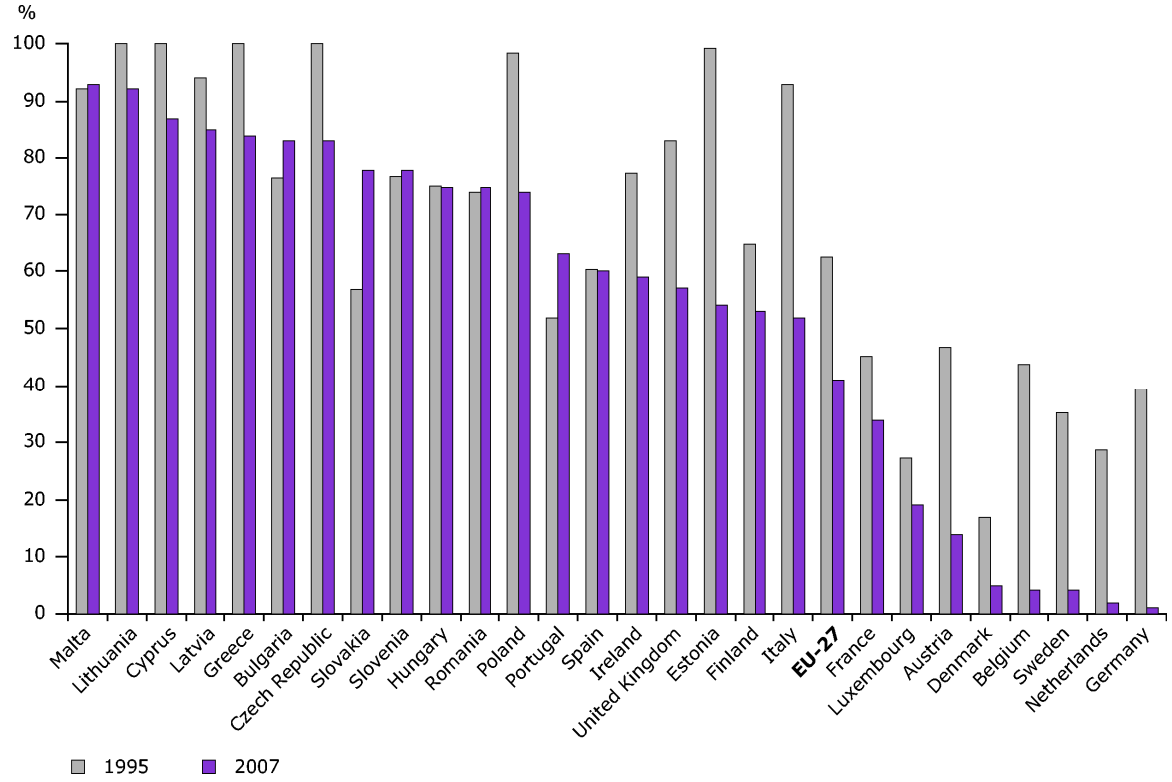
[87] Prognos et al, 2008, Resource savings and CO2 reduction potential in waste management in Europe and the possible contribution to the CO2 reduction target in 2020

[88] EEA, 2008, Briefing No 1/2008, Better management of municipal waste will reduce greenhouse gas emissions

[89] Eurostat, 2010, Environmental Data Centre on Waste, Landfill and incineration (For stats on incineration, choose from drop down menu)

and Slovenia) saw an increase in municipal waste sent to landfill over that time. The variance between Member States is great, with a noticeable difference in the figures for the EU-12 and the EU-15 Member States. In 1995, the baseline year for the targets in the landfill Directive, an average 62% of MSW in the EU-15 was sent to landfill; by 2007, this figure had fallen to 42%.[90] For the EU-12, an average of around 87% was sent to landfill in 1995; by 2007, the figure had fallen to 79%.[91]

Figure 29 Percentage of municipal waste that is landfilled in the EU-27, 1995 and 2007[92]



Due to the difficulties of measuring the biodegradable fraction of MSW (BMW) and the lack of reporting requirements on this, there is a dearth of accurate, consistent information on the amount of BMW sent to landfill in the EU. A Commission report[93] on the implementation of the landfill Directive (based on Member State reporting) contains some data on the amount of BMW sent to landfill, but also notes differences in measurement and reporting between Member States and that some countries did not submit information at all – therefore the data is not perfect. The data as reported are presented in

Figure 30 below. Of the countries that did reply, Estonia and Luxembourg landfilled the least BMW: 18,000 tonnes and 23,000 tonnes respectively in 2006. Italy landfilled the most BMW: 10,680,000 tonnes in 2005 (data for 2006 was not provided).

[90] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[91] Derived from EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[92] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[93] Ecologic & IEEP, 2009, A report on the Implementation of Directive 1999/31/EC on the Landfill of Waste for the European Commission

Figure 30 Total landfilled biodegradable waste (municipal + other), 2004-2006 (Member States qualifying for derogations from the Landfill Directive)[94]

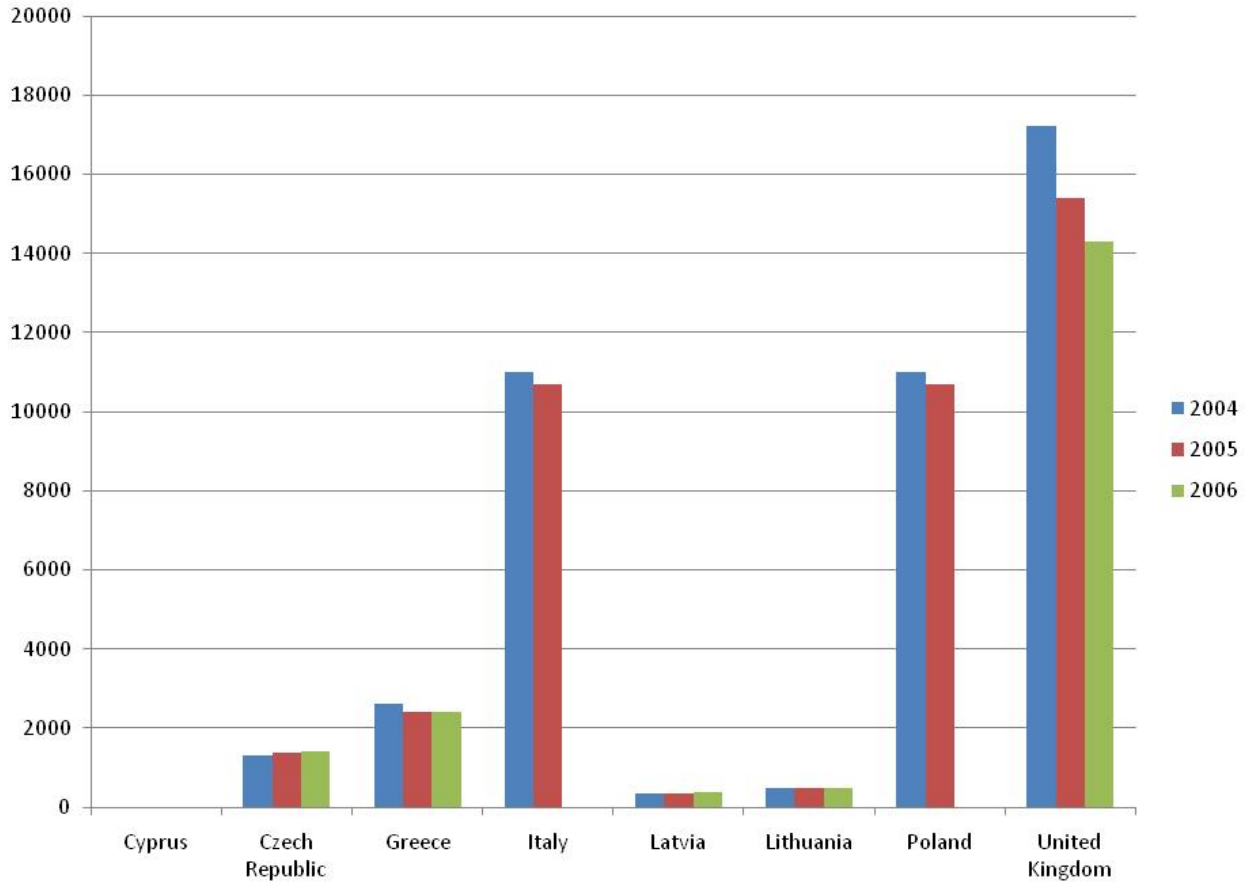


Figure 31 Total landfilled biodegradable waste (municipal + other), 2004-2006 (Member States without derogations from the Landfill Directive)[95]

[94] Derived from Ecologic & IEEP, 2009, A report on the Implementation of Directive 1999/31/EC on the Landfill of Waste for the European Commission

[95] Derived from Ecologic & IEEP, 2009, A report on the Implementation of Directive 1999/31/EC on the Landfill of Waste for the European Commission

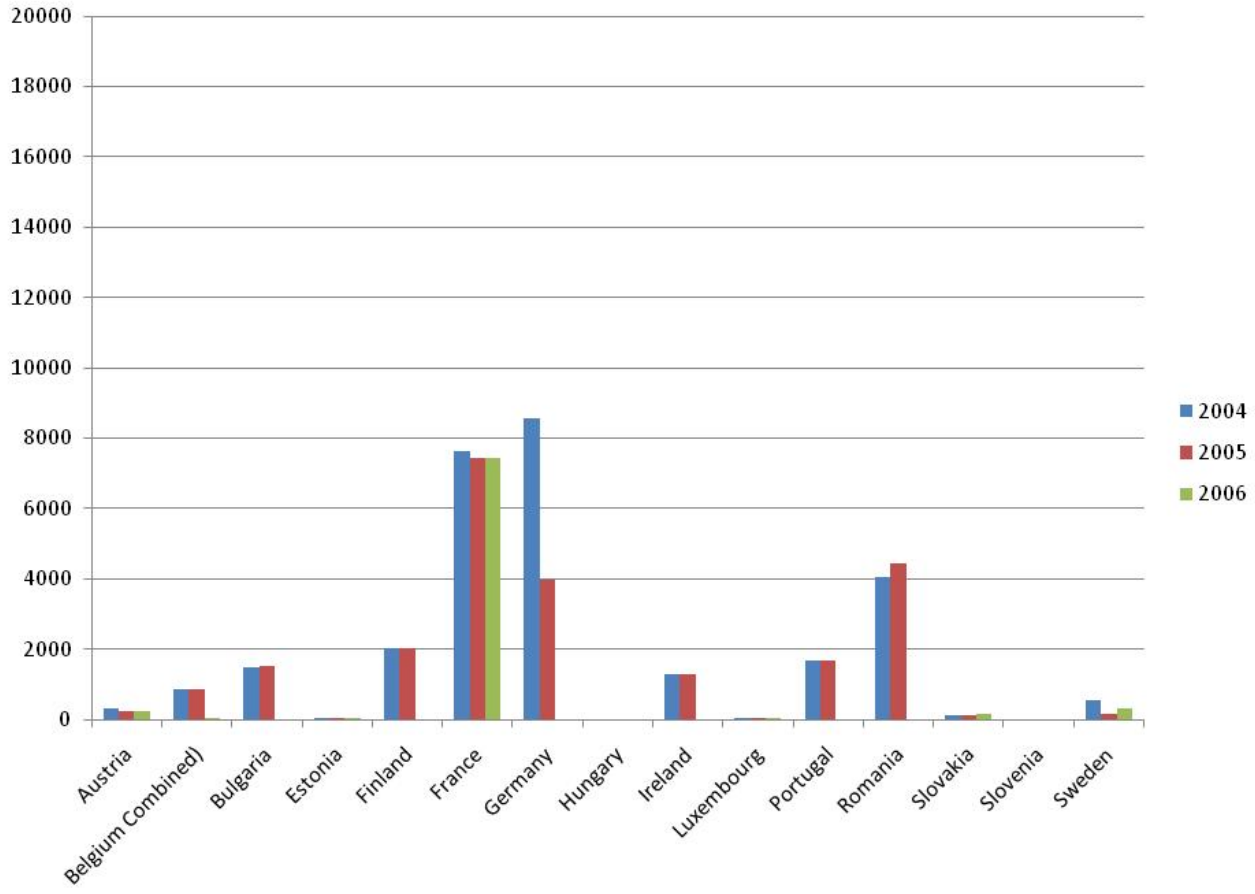
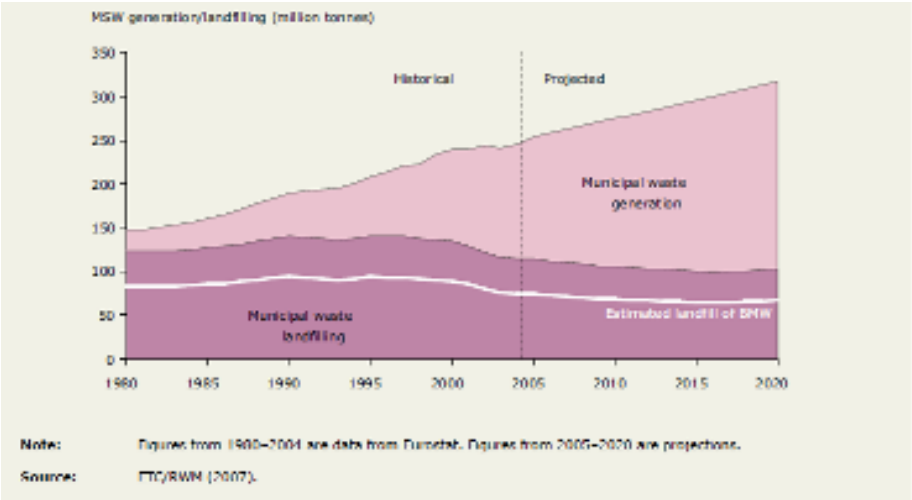


Figure 32 below projects that the quantity of overall MSW generated in the 'EU-25' (the EU-27 prior to the accession of Bulgaria and Romania) will grow 25% in the period 2005-2020, but that landfill will remain relatively stable.

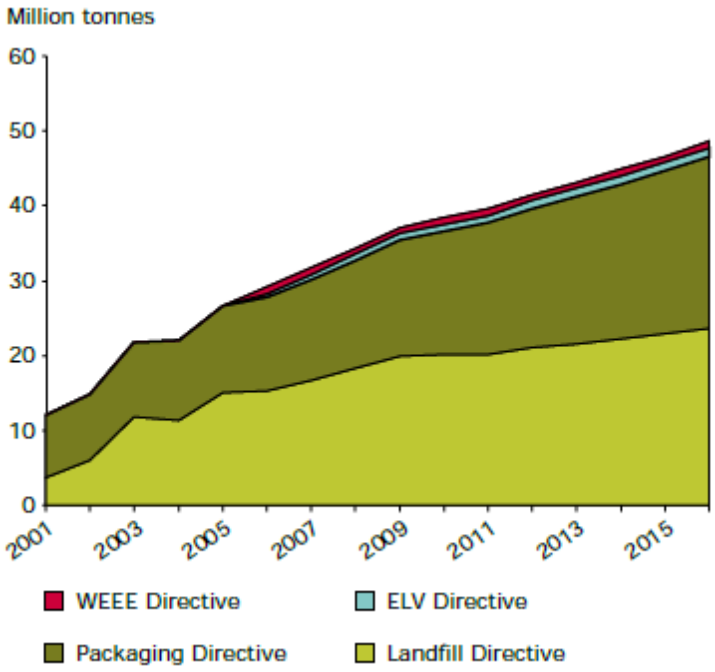
Figure 32 Projected generation and landfilling of municipal waste in the EU-25 (not Bulgaria or Romania)[96]



[96] EEA, 2007, Brochure No 4/2007, The road from landfilling to recycling: common destination, different routes

Several EU Directives are anticipated to have an impact on diverting waste from landfill in the medium-term. Figure 33 below indicates the expected impact of the Landfill, Packaging, ELV and WEEE Directives in terms of reducing waste sent to landfill to 2016. Improved technical standards and reduction of bio-waste sent to landfill as a result of the Landfill Directive, and a reduction in non-biodegradable waste sent to landfill as a result of the Packaging Directive are likely to have the greatest impact.

Figure 33 Projection of waste diverted away from landfill, EU-25[97]



2.1.5 ENVIRONMENTAL IMPACTS OF WASTE MANAGEMENT IN THE EU

The ultimate goal of the Waste TS is to reduce the environmental impacts associated with the generation and treatment of waste. To this end moving waste management up the waste hierarchy is intended to reduce the overall environmental impact of waste. This section examines the evidence available regarding the impact of waste management upon the environment in the EU. This should be read in conjunction with subsequent analysis on the levels of export of waste, where the EU has more limited control over the environmental impacts of waste management. The most reliable and extensive data sets relate to the greenhouse gas (GHG) emissions associated with waste management in Europe, although more limited information is presented within this section regarding the broader pollution implications associated with waste management.

2.1.5.1 WASTE MANAGEMENT DECISIONS AND ASSOCIATED GHG IMPACTS

In 2005, around 2% of total European GHG emissions came from waste management, predominantly methane emissions from landfill. Collection and treatment of waste contributed only around 5% of the total emissions from waste management, due to the generally short distances over which municipal waste is transported. Net GHG emissions from municipal waste management are projected to decline from a peak of around 55 million tonnes CO_2-equivalent per year in the late 1980s to 10 million tonnes CO_2-equivalents by 2020 due to improved waste management (see Figure 34 below). On one hand, the amount of waste entering management facilities is projected to continue to grow, increasing direct GHG emissions from the waste management sector (it is estimated that by 2020 landfill will represent 60%, recycling 20% and incineration 20% of total GHG emissions from the sector). On the other hand, increases in recycling and

[97] EEA, 2005, The European environment: State and Outlook 2005, Part B

incineration are expected to represent savings (or avoided greenhouse gas emissions) to offset direct emissions; by 2020 recycling is expected to contribute 75% of total avoided emissions and incineration almost 25%. (This assessment is based on the assumption that waste management capacity grows to match demand; if it does not, net greenhouse gas emissions may increase.)[98] As set out in Table 6 earlier in this report, LCA assessments of GHG emissions from waste treatment options consistently identified recycling delivering lower emission levels than incineration and landfilling activities.

Figure 34 Trends and projections of greenhouse gas emissions from management of municipal waste in the EU[99]

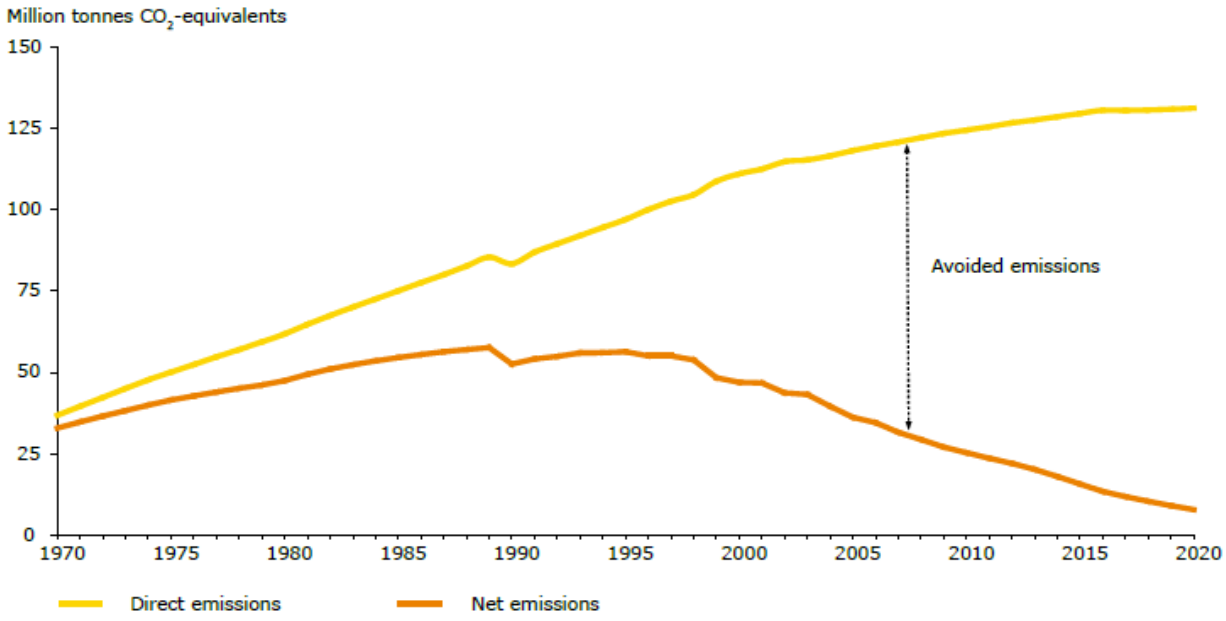


Figure 35 provides an overview of GHG emissions directly contributed by the waste sector in the EU-27, EU-15 and EU-12 from 1995 to 2007. In 1995, GHG emissions from the waste sector in the EU-27 were 207.2 million tonnes CO_2 equivalent, accounting for 3.97% of total EU-27 GHG emissions. By 2007, this figure had dropped to 141.2 million tonnes CO_2 equivalent, accounting for only 2.8% of total EU-27 GHG emissions. In the EU-15, GHG emissions from the waste sector fell by 39% from 1990-2006; they are projected to fall a further 6% below 1990 levels by 2010, based on existing policies and measures (although several Member States, including Cyprus, the Czech Republic, Hungary, Ireland, Latvia, Portugal, Romania, Slovakia, Slovenia and Spain, are expected to produce higher emissions from the waste sector in 2010 compared to 1990 levels).[100]

Figure 35 Total greenhouse gas emissions from the waste sector, EU-27, EU-15 and EU-12, in 1000 tonnes CO_2 equivalent[101]

[98] EEA, 2008, Briefing 2008/01, Better management of municipal waste will reduce greenhouse gas emissions
[99] EEA, 2008, Briefing 2008/01, Better management of municipal waste will reduce greenhouse gas emissions
[100] Eurostat, 2009, Total greenhouse gas emissions & Eurostat, 2009, Total greenhouse gas emissions from the waste sector
[101] Derived from Eurostat, 2009, Total greenhouse gas emissions & Eurostat, 2009, Total greenhouse gas emissions from the waste sector

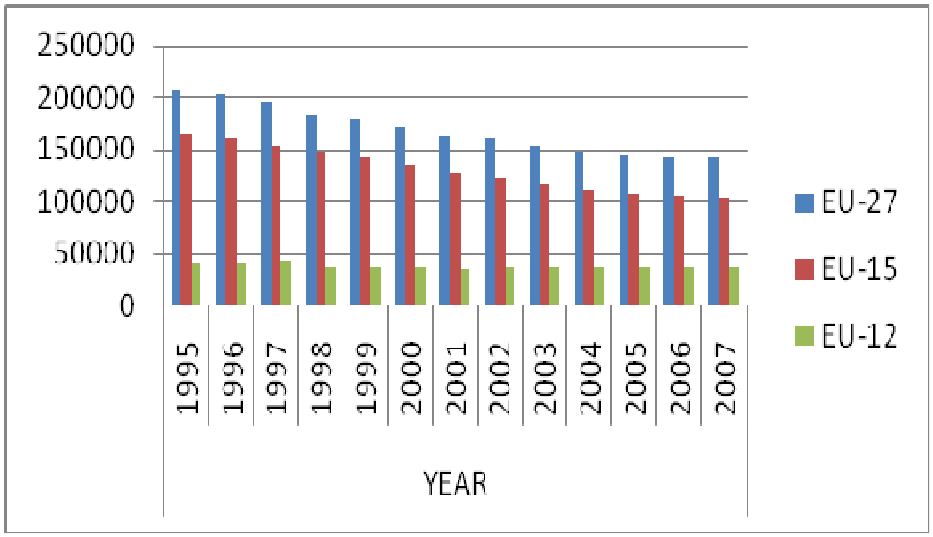
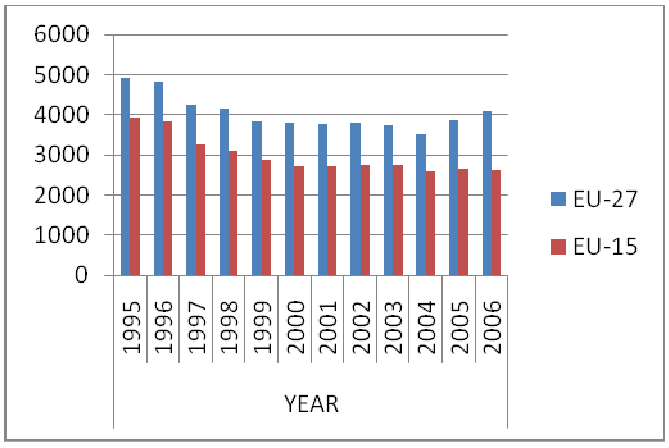


Figure 36 shows that despite a drop in overall GHG emissions from the waste sector, emissions of CO_2 appear to be on the increase again since 2004 after a period of decline. In percentage terms, the waste sector accounted for 0.12% of CO_2 emissions in 1995, showing a general decreasing trend to a low of 0.08% in 2004, then increasing again to around 0.96% in 2006.[102] It is worth noting that the choice of incineration as a disposal method is likely to increase CO_2 emissions; however a recent PROGNOS study[103] concluded that the main CO_2 emission reduction potential can be achieved by diverting waste from landfilling to recycling and recovery, and by implementing national and EU waste policies. In 2004, waste recycling, reuse of waste streams (as opposed to use of primary raw materials) and disposal of remaining waste accounted for a reduction of CO_2 emissions of almost 92 Mt CO_2 equivalent, and by 2020 this is expected to rise to between 238 and 336 Mt CO_2 equivalent. Within this, decreases in landfill and alternative treatment in waste-to-energy plants for energy recovery are predicted to reduce CO_2 emissions by between 85 and 130 Mt CO_2 equivalent by 2020. Overall, the study suggests that improved management of waste streams and residual MSW could contribute 19 to 31% of the EU's 2020 greenhouse gas emissions targets.

Figure 36 Emissions of CO_2 from the waste sector, EU-27 and EU-15, in 1000 tonnes[104]



EU methane emissions have displayed a strong decreasing trend in recent years, both overall and in the waste sector (as shown in Figure 37 below), which saw a decline from 9.1 million tonnes in 1995 to 6.2

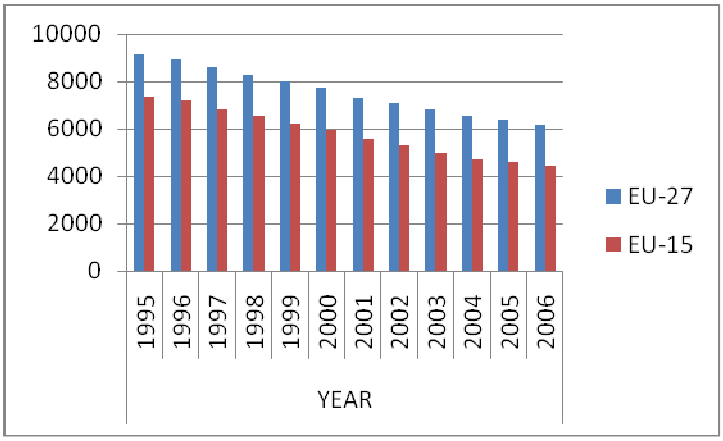
[102] Eurostat, 2009, Total emissions of carbon dioxide & Eurostat, 2009, Emissions of carbon dioxide from the waste sector

[103] PROGNOS, 2008, Resource savings and CO2 reduction potential in waste management in Europe and the possible contribution to the CO2 reduction target in 2020

[104] Derived from Eurostat, 2009, Emissions of carbon dioxide from the waste sector

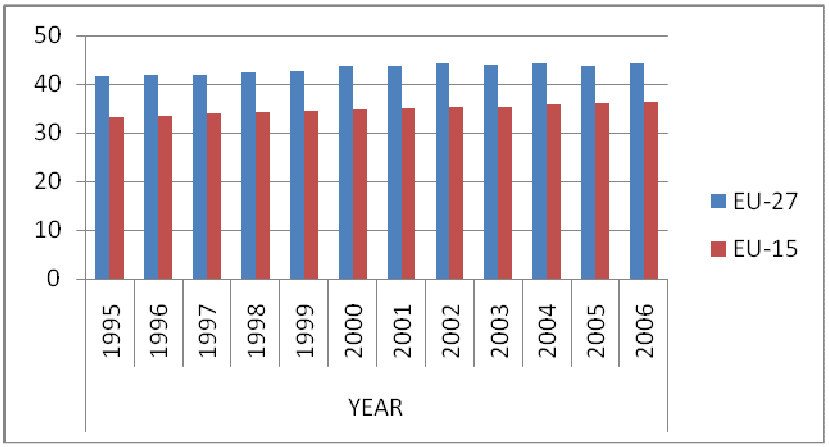
million tonnes in 2006, although the rate of decrease now seems to be slowing.[105] The decrease is likely to be connected to the decrease in land filling and increasing levels of alleviation action such as collection and flaring of landfill gases; indeed, as landfill has decreased as a waste disposal method, methane emissions from landfill have also decreased (by 39% in the period 1990-2007).[106]

Figure 37 Emissions of methane from the waste sector, EU-27 and EU-15, in 1000 tonnes[107]



Although total EU emissions of nitrous oxide (NOx) have decreased since 1995, those generated by the waste sector have increased over the same time period, and from 2000-2006 have been hovering around 43,000-44,000 tonnes (see Figure 38 below).[108]

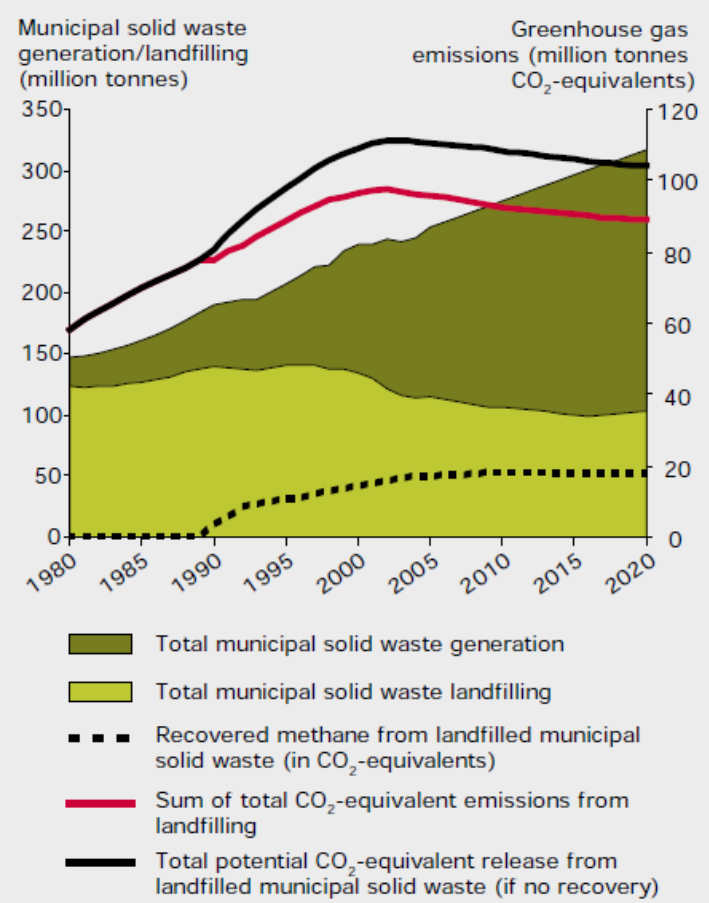
Figure 38 Emissions of nitrous oxide (NOx) from the waste sector, EU-27 and EU-15, in 1000 tonnes[109]



Legislation to improve waste management, including the Landfill and Packaging Directives, is expected to continue to lead to decreased amounts of waste going to landfill, which is predicted to result in continued, if not dramatic, decreases in GHG emissions from landfill, together with improved methane recovery from landfills (see Figure 39 below).

Figure 39 Projected generation of municipal waste and CO_2-equivalent emissions from landfills, EU-25[110]

[105] Eurostat, 2009, total emissions of methane & Eurostat, 2009, emissions of methane from the waste sector
[106] Eurostat, 2009, Pocketbook: Energy, transport and environment indicators
[107] Derived from Eurostat, 2009, total emissions of methane & Eurostat, 2009, emissions of methane from the waste sector
[108] Eurostat, 2009, total emissions of nitrous oxide & Eurostat, 2009, emissions of nitrous oxide from the waste sector
[109] Derived from Eurostat, 2009, total emissions of nitrous oxide & Eurostat, 2009, emissions of nitrous oxide from the waste sector
[110] EEA, 2005, The European environment:State and Outlook 2005, Part B



2.1.5.2 *Broader Environmental Consequences of Waste Management*

Aside from GHG emissions, waste management also has significant potential to cause harm to the natural environment in other ways, both directly through water, air and land pollution and indirectly through resource extraction. Data is distinctly lacking in these areas at present, so only a general analysis is provided here.

Increases in waste generation alongside changes in the types of waste being produced (to those with greater pollution potential, such as batteries (heavy metals), bio-waste (methane, leachate), end of life vehicles (heavy metals, chemicals), hazardous waste and WEEE (chemicals and metals), and plastics (plasticisers, chlorine)) lead to increased environmental risks from waste management. The waste treatment option employed, together with the extent of pollution prevention technology used, determine the potential and actual environmental risks associated with any given management activity. Table 7 indicates the types of pollution generated by different treatment options. EU waste and pollution legislation (including the Landfill, IPPC, Incineration and Groundwater Directives) address issues related to the environmental impacts of waste management, and together with the reinforced waste hierarchy which prioritises waste treatment options with less potential for environmental damage, have significantly reduced the risk associated with each set of impacts. It should be noted, however, that one current gap is a lack of EU legislation distinguishing between the quality of recycling activities ie promoting the use of best practice options and outputs.

Table 7 Indicative direct pollution potential of various waste treatment options

	Municipal Solid Waste Landfill	Inert Waste Landfill	Hazardous Waste Landfill	Mechanical Biological Treatment	Material Resource Facility	Anaerobic digestion	Windrow composting	In Vessel Composting	EfW
Methane	x		-	-		-	-	-	
Carbon dioxide	x			x		x	x	x	x
Nitrous oxide				-		-	-	-	-
Heavy metals to land	x		x	-		-	-	-	x *
Heavy metals to water	x		x	-		-	-	-	- *
Smell (local)	x			-		-	x	-	
Particulate matter									-
Dioxins and furans									-
Bioaerols	-			x			x	-	
High eutrophication potential leachate	x								
Pesticides	-		x						
Persistent Organic Pollutants	-		x	-		-	-	-	

x	Gross pollution potential
-	Some pollution potential

* via Air Pollution Control Residue management

Future reductions in the amount of waste disposed of in non-hazardous landfills, coupled with tighter technical standards for landfills, is likely to result in decreased risk of ground and surface water pollution from landfills. Waste diverted from landfill is likely to move to treatment in the forms of incineration with energy recovery, anaerobic digestion and composting, which in turn may move pollution potential from large sites (landfills) to a greater number of smaller sites. Any increase in the application of treated bio-waste to land could also lead to pollution potential being spread out; regulatory attention (for example through national permitting regimes and the proposed Biowaste Directive) is therefore required to reduce the risks. Increased MBT is unlikely to significantly reduce potential emissions to water; research suggests that the poor quality output tends to be disposed of in landfill as it is not suitable for anything else. Although methane production of the output is lower than untreated bio-waste, the leachate profile remains similar and the risk to ground and surface water therefore remains.

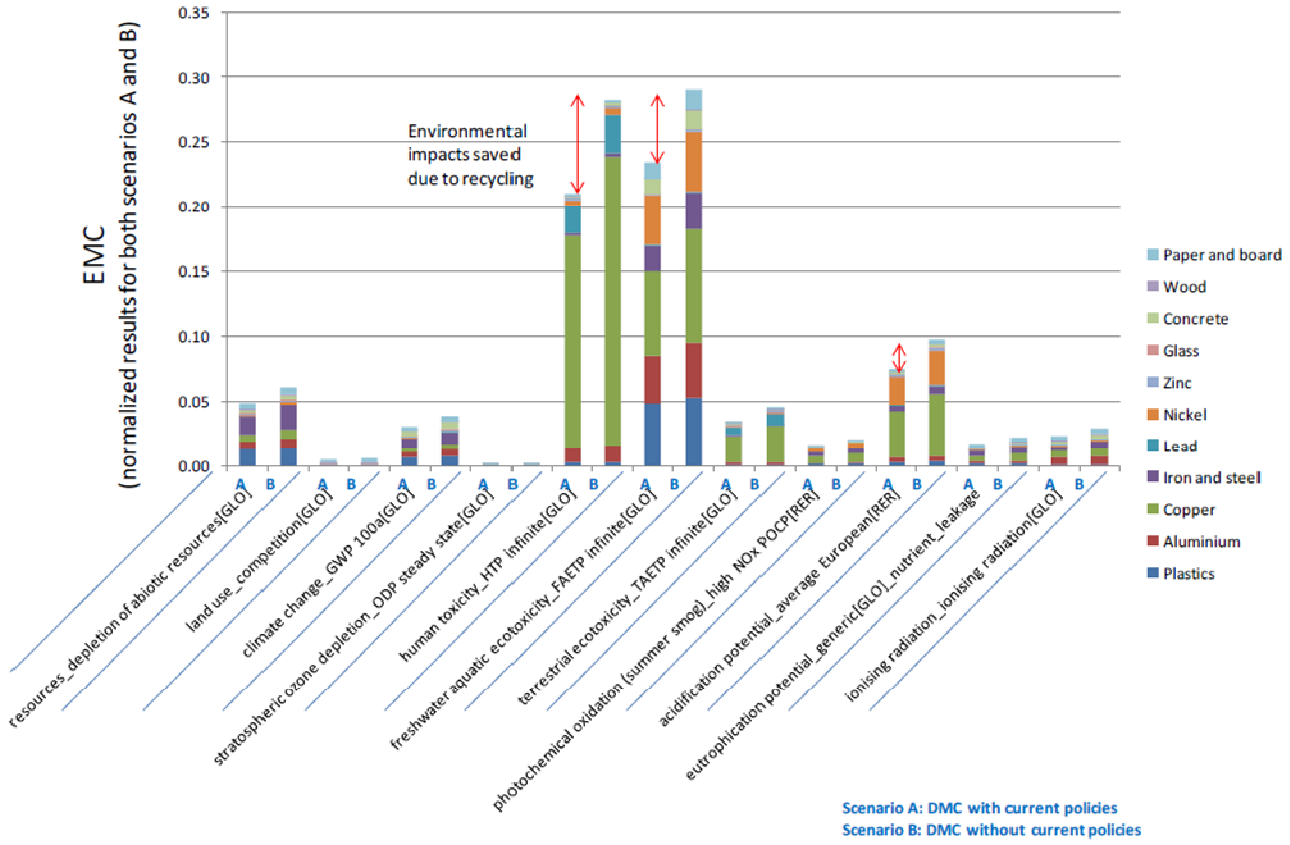
With a shift in disposal/treatment from landfill to incineration with energy recovery, the environmental risk profile will increasingly change from water to air; any proliferation of incinerators should therefore be carefully monitored, to limit the potential air pollution impacts as well as residual hazardous waste from the incineration process. The consequences of mono-filled hazardous waste landfills, a requirement of the Landfill Directive, also remain to be seen; the pollution potential remains very high over long time horizons due to lower bio-degradation and increased concentration of hazardous material. Again, monitoring and enforcement measures will be essential to assess whether this form of waste management is sustainable.

2.1.5.3 RESOURCE EFFICIENCY AND WASTE POLICIES

Resource efficiency is one of the priorities of the EU as shown by the EU Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy[111] and its role in Sustainable Materials Management (SMM)[112]. Resource efficiency is defined as Gross Domestic Product (GDP) divided by Domestic Material Consumption (DMC).

Recent work undertaken by BIO IS has suggested that existing waste policy is having a limited role on improving waste prevention with the exception of the RoHS Directive which has significantly reduced the amounts of hazardous materials going to disposal. This has led to a reduction in environmental impacts, especially for human toxicity, freshwater aquatic toxicity and acidification potential[113], as opposed to a scenario without current policies as shown in Figure 40.

Figure 40 Environmental Weighted material Consumption for materials streams and impact category type



This shows the indirect impact that waste management is able to have on a wide range of environmental impacts and why improvements are beneficial.

Another example of this is land use, The BIO IS report suggests that up to 26,317,000 hectares of bio-productive areas have been freed up as a result of improved resource efficiency. This was primarily driven by improved recycling of wood waste and food waste savings.

[111] Sustainable Development European Sustainable Consumption and Production Policies http://ec.europa.eu/environment/eussd/escp_en.htm

112 Sustainable materials management for a resource efficient Europe, Integrated approaches within reach. Working Paper for the Informal Meeting of the EU Environment Ministers in Ghent: http://smartpro2.eu/documents/SMM%20for%20Europe,%20from%20efficiency%20to%20effectiveness%2031%20March%202010.pdf

[113] Analysis of the key contributions to resource efficiency http://www.eu-smr.eu/reseff/index.php

2.1.6 EMPLOYMENT AND ECONOMIC IMPACTS OF WASTE MANAGEMENT IN THE EU

According to a paper prepared by the EU Presidency for the Council in 2009, recycling makes a significant contribution to the EU economy and to job opportunities. The turnover of waste management and recycling industries in the EU is €95 billion, and they provide between 1.2 and 1.5 million jobs. This includes waste collection, sorting , and the reuse and recycling of materials. In the recycling sector there are over 60,000 companies, of which over 95% are small and medium-sized enterprises (SMEs).[114] According to Eurostat figures, in 2006 the EU-27 had: 5,170 facilities for incineration with energy recovery (R1); 3,897 facilities for other incineration (D10); 50,682 facilities for recycling (R2-11); 10,286 facilities for landfilling (D1, D3-5, D12); and 154 facilities for land treatment and release into water (D2, D6, D7).[115]

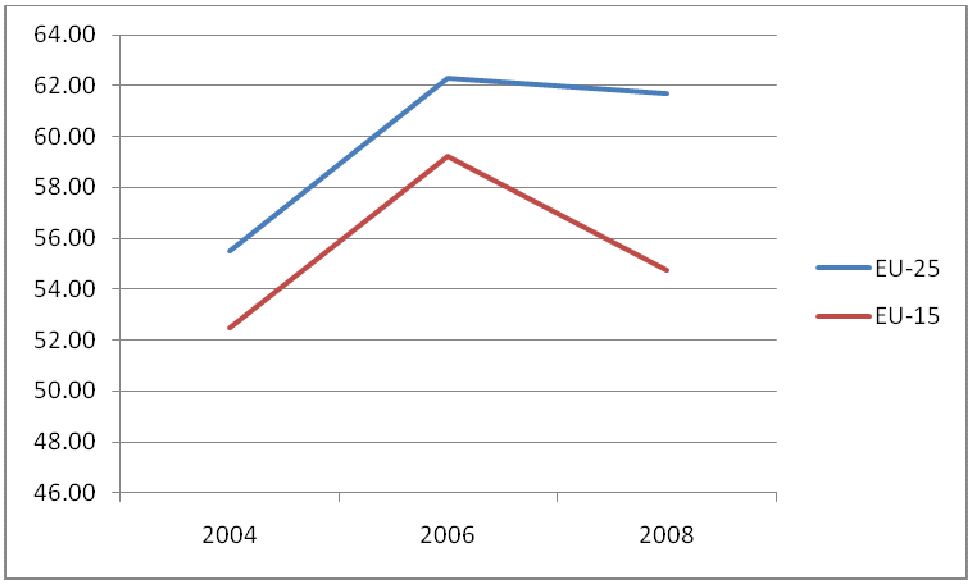
2.1.7 WASTE EXPORTS AND WASTE SHIPMENT

In addition to trends in waste generation/prevention, reuse, recycling, recovery and disposal there is a further key trend that affects the EU's impact related to waste management. As levels of recycling in Member States have increased, so too has the export of waste materials to other countries (other Member States or third countries) for reprocessing. Based on figures published by the EEA, total trade in notified waste exports from Member States increased four-fold between 1997 and 2005. This included a significant growth in the volume of non-hazardous waste shipped from the EU to third countries.[116]

Figure 41 shows the differing trends in overall generation of paper, plastics and metals wastes in the EU-25 and EU-15 from 2004 to 2008. They show that whilst overall generation of paper wastes has fallen since 2006, plastic and metallic wastes have both continued to increase, albeit at a slower rate between 2006 and 2008.

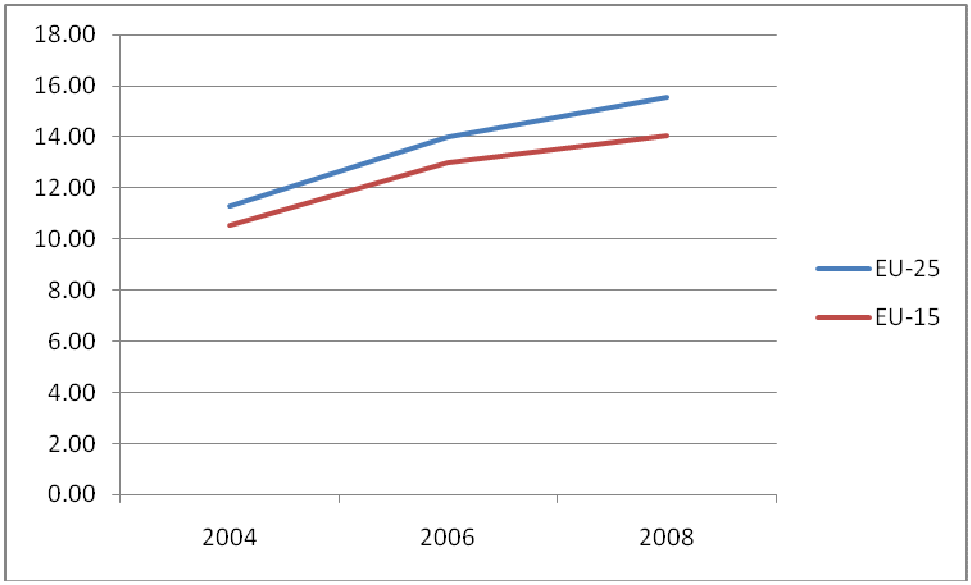
Figure 41 Paper, plastics and metallic waste generation (in millions of tonnes), EU-25 and EU-15 for 2004, 2006 and 2008[117]

Paper and cardboard wastes

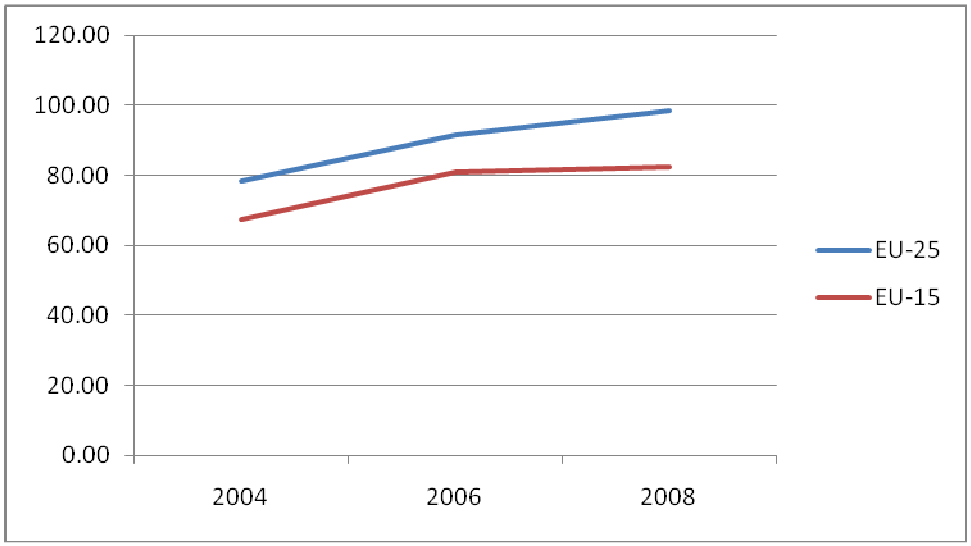


Plastic wastes

[114] Presidency Paper to the Environment Council on the fall in demand for recycled materials, 2009
[115] Eurostat, Waste treatment facilities at country level, 2004, 2006
[116] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)
[117] Derived from Eurostat, 2010, Generation of waste



Metallic wastes



The EU's key market for export has been Asia. This export route accounts for the majority of non-EU trade in waste metal, paper and plastics; a trade which expanded five-fold for metals, 10-fold for paper and 11-fold for plastics between 1995 and 2007. In 2007 more plastic waste was shipped to the Asian market by the EU than was shipped within the EU.[118] In addition half of all waste plastics were exported to China and Hong Kong.[119] Figure 42 demonstrates the trend in terms of the increase in exports of both plastic and paper for treatment. Based on Figure 41 and Figure 42 it is possible to calculate that in 2006, around 3% of paper (2.1 million tonnes), 10% of metals (around 9 million tonnes) and a huge 71% of plastics (10 million tonnes) were exported from the EU-25 to non-EU countries; there is therefore a clear pattern of the majority of paper and metals waste being treated within the EU, whereas the vast majority of plastic waste is shipped to third countries. It should be noted that it is not only the EU that is expanding exports of waste materials; Japan, for example, has shown a general upward trend in exports of iron, steel, copper and plastic waste since 1995.[120]

[118] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)
[119] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[120] Japanese Ministry of Finance, 2010, Trade statistics

The shipment of waste raises many questions. It is known that there is a trend towards export; however, there are concerns regarding the reliability of the data on trade in waste. For example Eurostat's information on trade in WEEE and ELVs has been questioned; according to findings by the European Topic Centre on resource and waste management (ETC/RWM), exports of WEEE (estimated at 250,000 tonnes) are considered low compared to total generated levels of WEEE (estimated at 7 million tonnes).[121] There are also known gaps in the figures on the shipment of green list wastes, with data not available for all of the waste product codes in every year, in particular for plastics. Moreover the rate of reported illegal shipments of waste has increased between 2001 and 2005; for this period on average the EEA report that annual illegal shipments are equivalent to 0.2% of notified waste.[122] In terms of environmental protection there is little understanding or information on the consequences associated with the export of waste.

Given the international nature of trade some Member States have had problems selling their wastes collected for recycling. This has led to questions over the quality of materials collected for recycling in the EU, and the long-term reliability of the market place in terms of absorbing ever-expanding levels of materials as the EU pushes towards more ambitious waste goals.

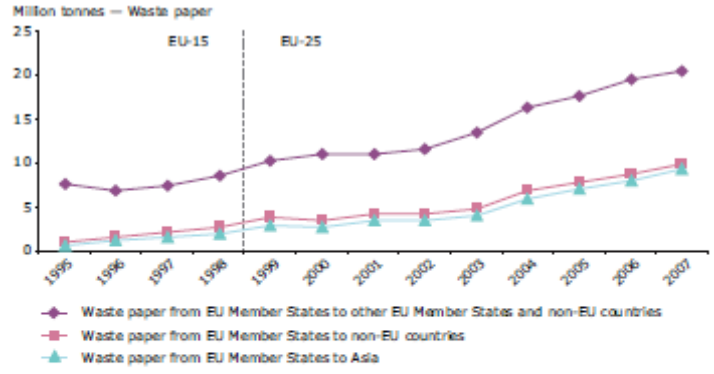
The data and issues related to exports and shipments of waste are discussed in more detail in section 4.2.5 of this report.

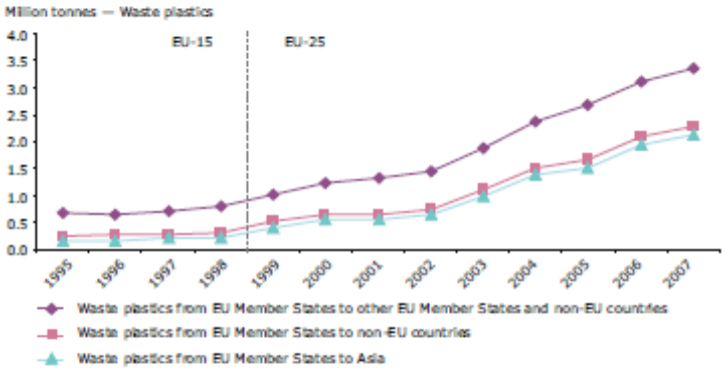
Figure 42 Demonstrating the rise in the export of paper, plastics and metals for recovery outside the EU[123]

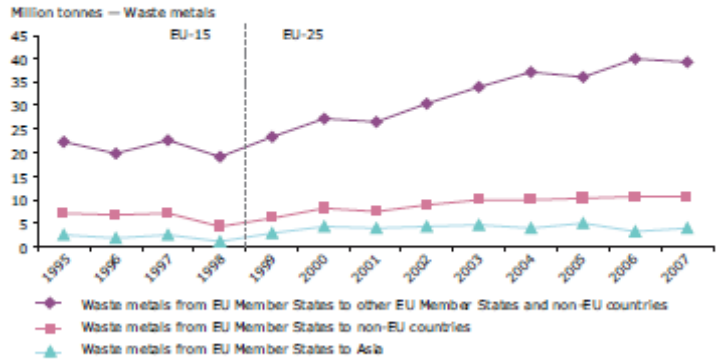
[121] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers

[122] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)

[123] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)







Note: The area between the purple line (top) and the pink line (middle) indicates the amount shipped within the EU. The figures until 1999 cover only the EU-15 countries and from 1999 Bulgaria and Romania are not included.

Source: Eurostat 2007.

2.1.7.1 SHIP DISMANTLING

The taking apart of ships has the potential to release a huge amount of long lasting, toxic, hazardous materials into the environment, in addition ships themselves represent significant sources of secondary materials which need to be appropriately managed. Ships by their nature are international and though the EU has only a small amount of the global recycling capacity, it is directly and in-directly responsible for much of the trade upon which shipping is based. The EU therefore has to consider its international responsibilities as a recycler and owner of shipping.

The Hong Kong International Convention on the Safe and Environmentally Sound Recycling of acts to control global ship recycling following ratification will cover the EU. Recent analysis of future trends and policy actions suggest that strict and timely implementation of the Hong Kong Convention could save significant quantities of GHG through use of carbon intensive materials such as steel, reduce potential environmental pollution and provide employment opportunities[124].

[124]Support to the impact assessment of a nmew legislative proposal on ship dismantling http://ec.europa.eu/environment/waste/ships//pdf/final_report080310.pdf

The issue of ship dismantling is discussed in more detail in section 2.1.7.1 of this report.

2.1.8 Stakeholder perceptions on Waste Prevention Activities and Moving Waste Management Up the Waste Hierarchy

Efforts to move up the waste management hierarchy in general, and waste prevention in particular, were both covered in working group discussions during the stakeholder meeting held on 22 June 2010. The working group on implementation of the Waste TS aimed to investigate stakeholder's perceptions on whether additional action is needed to deliver the overriding objectives of the Waste TS to move waste management up the waste hierarchy and limit the environmental impact of waste, and the working group on prevention focused on whether the Waste TS had been successful in promoting waste prevention, and examining the barriers and potential policy solutions to better promote prevention.

Waste prevention

Stakeholders felt that there had been some successes related to waste prevention, but that these are mostly not specifically related to the Waste TS. The TS was seen by stakeholders as providing an 'umbrella' for future action on prevention, but was deemed to contain little or nothing new in terms of prevention that was not covered by previous waste legislation. Only after Directive 2008/98/EC (in particular Article 29) was issued can Member State activities on prevention be directly linked to the Waste TS. Many waste prevention initiatives are underway in the Member States (e.g. the 'Love food, hate waste' campaign in the UK, landfill tax in the UK, and 270 separate waste prevention initiatives in Germany), but are relatively new and therefore their impact is still to be measured. It may also still be too soon, only 5 years after the Waste TS and 2 years after Directive 2008/98/EC, to truly assess progress on prevention. Overall, though, it seems that major breakthroughs are yet to be achieved on both quantitative and qualitative waste prevention, although some reductions have been observed in harmful waste generation.

There was no consensus amongst stakeholders as to whether it would be feasible – or even desirable – to set quantitative or qualitative waste prevention targets at the EU level. There are already some qualitative targets at the EU level, e.g. for hazardous waste, REACH. Some argued that targets can be good to focus attention on a subject, even if they are largely aspirational, but others felt that the credibility of waste prevention policy would be diminished if targets are truly unrealistic. It would also be difficult to set targets on a European scale; an overall target could perhaps be set, with subsidiary measures to be determined at the national/local level. Rather than targets, some argued that waste prevention policy should focus on incentives and measures – for example, Japanese resource efficiency targets are continually revised and resource efficiency there is improving. It was also felt that industry must be involved where resource efficiency is an issue, and that some degree of sectoral specificity would be necessary to ensure fairness.

Waste prevention should not be seen as an isolated goal, as the aim is to decouple waste generation from economic development (although some stakeholders questioned whether 'coupling' between waste generation and growth in income could be definitively proved). Environmental impacts and life cycle thinking therefore need to be taken into account.

Stakeholders questioned how extended producer responsibility can be applied at the EU level. Such a move would make the EU into an 'island'; the issue would be better tackled at the global level, because although the market of Europe is wide-reaching, it does not have enough influence to change things on a global level.

The issue of the relationship between waste prevention and recycling was raised by stakeholders. Some felt that if recycling rates were increasing, total prevention of waste may not be necessary, and that 'prevention' should rather be seen in terms of preventing waste sent to landfill. Others however felt that dedicated mechanisms for prevention are needed, and that prevention should not be diluted in resource efficiency or recycling policy.

Stakeholders also discussed barriers to promoting and measuring waste prevention. General barriers to waste prevention that were suggested include:

- Targeting policy and/or incentives at the wrong actors – e.g. to extend the lifespan of products, business must be more involved;
- Commercial waste is less sensitive to prices as it is not necessarily linked to profitability; industry on the other hand, is more sensitive to prices as waste represents wasted raw materials which can impact profitability;
- Whilst money can be made from recycling, there may not be enough of an incentive for prevention;
- Production efficiency is increasing but higher consumption results in no overall change in resource use or waste; it is difficult to change consumption behaviour through policy and legislation, but the aim could be to lessen the environmental impacts of consumption;
- Marketing can be effective in tackling lack of awareness amongst consumers, who tend to be resistant to change;
- A shift from waste policy to product policy could be beneficial;
- Business models need to be re-focussed on something other than mass volume, moving towards maximising profit per unit to enable lower production levels;
- The food industry/supermarkets in particular are not catering to modern households, which tend to be smaller (one or two persons), resulting in high levels of waste;
- It is often unclear which actors are responsible for waste prevention, so responsibility can be avoided to some extent;
- There are many local/small-scale measures on prevention (e.g. re-use, home composting) but very few national policies; it will also be challenging to create an EU-wide prevention policy;
- Although household waste prevention is easier to achieve than e.g. mining waste prevention, it has less impact;
- Many items that are classified as waste are actually perfectly useable; it will be challenging to create an EU-wide prevention policy that is suitable for 27 Member States.

Several barriers to measuring waste prevention were also identified:

- There is currently no model to allow predictions on what will happen in five years time, or even how the world would look in the absence of existing policy (although lack of data should not be used as an excuse for lack of action);
- There is a general lack of comparability across cities and countries; common definitions (e.g. for 'municipal waste' are needed to tackle this;
- Environmental impacts are very difficult to measure even when reliable statistics are available, and there is a wide range of environmental impacts that would need to be measures to provide an accurate aggregated picture (carbon emissions, water footprint etc);
- Separate indicators are needed to measure both cause and effect, as measurement of one does not necessarily imply the other;
- As prevention relates to products and production, industry must be involved in measurements and indicators;
- There is no consistency between Member States as to which body/ministry is responsible for sustainable consumption.

Moving up the waste hierarchy

Stakeholders discussed the possible reasons for differing levels of implementation of EU waste legislation and the 'waste hierarchy' principles across Member States. Until Directive 2008/98/EC, the waste hierarchy

was not legally binding, which hampered efforts to measure the progress of Member States. Member States are currently at different stages along the process of shifting from a focus on control and formalisation of waste treatment, to protecting health, to focusing on prevention. A number of possible factors for differing performance were suggested, including geology, historical circumstances, resource availability (air, water and land), consideration of health impacts from waste management, shifts in environmental awareness and the stability of secondary material costs. Local and historical factors also play a role (e.g. in the UK holes from mining need to be filled and were thus used as landfill sites).

Experiences from Flanders and Denmark suggest that success can be achieved by using a range of instruments. Treatment taxes applied at the lower stages of the hierarchy were considered very effective, and stakeholders agreed that economic instruments seem to be most effective when linked to policy instruments.

Whilst movement up the hierarchy is important, it was suggested that the rate of improvement by Member States should be considered rather than merely their absolute level of performance, to ensure that all improvements are encouraged. It was also pointed out that progress at the EU level is often based on the lowest common denominator, whereas it is often technically possible to move much more quickly.

There was some discussion of the concept of 'lock-in', i.e. Member States investing in certain techniques or infrastructure which may actually reduce their ability, or at least their ambition, to move up the waste hierarchy (e.g. if there are enough incinerators to dispose of a certain amount of waste, cheaply and efficiently, there is less motivation to move away from incineration). Some stakeholders, however, felt that the concept ignored the reality of the phased or gradual movement up the hierarchy that is likely to occur in most Member States. Some degree of residual waste is also a reality, and certain infrastructure will always be required to utilise this. There has to be a mix of waste treatment methods combined to treat waste; realistically there will not be a 100% recycling approach replacing former landfilling, there will be a mixture of recycling and energy recovery.

A number of suggestions were made on how to tackle these differences in performance, and how to encourage Member States to move up the waste hierarchy more generally. These are included in the recommendations section below.

2.1.9 Conclusions on the Current State of EU Waste Management

2.1.9.1 Comment Regarding Data Availability

Waste management represents a complex field to both legislate and monitor. At present statistics rely heavily on systematic reporting primarily focused on efforts in specific sectors, with longer term data sets primarily only setting out details of MSW management performance. There is a lack of consistent data, however, in many areas, with a need to standardise coverage, monitoring units and monitoring methodologies to enable fair and balanced comparison of performance EU wide. Particularly in the field of recycling data collection there are concerns regarding the variable measurement points used to determine recycling and whether these are in line with the definition of this process i.e. that requires reprocessing into a new product in order to be complete. The lack of consistent data is also a major issue in terms of monitoring the performance of Member States against the targets of the various waste-related Directives; more coherent and consistent data would assist with this monitoring of implementation and performance in the Member States, which is widely recognised as a major issue in the waste sector. The question of data is explored in more detail in section 3.1 on defining a recycling society.

When reviewing EU performance there remain fundamental gaps in the knowledge relating to prevention, reuse and preparing for reuse, quality of waste streams and recycling activities and the scale of impacts of waste management on jobs, society and the environment – both in the EU and in third countries. There is a need for further work to develop reliable data sources in order to supplement the information base for assessment. Moreover, there is a need for more detailed analysis to develop best practice approaches and

identify information needs to develop a reliable basis for an assessment of decoupling of waste generation and management trends from social and economic drivers.

With this caveat in place, the following section draws headline conclusions from the available data on the current state of waste management in Europe.

2.1.9.2 Conclusions Regarding the State of Waste Management in Europe

Waste generation

Overall waste generation has tended to increase in recent decades. Between 2004 and 2006, an increase in the EU-15 was counteracted by a decrease in the EU-12, resulting in a 1% increase for the EU-27.[125]

MSW generation per capita was increasing until recent years, but now appears to have stabilised somewhat in most of the EU-27, and in the EU-27 as a whole. According to EEA models, without additional measures MSW generation in the EU-27 is expected to continue to grow to 2020, to between 9 and 20% more than in 2007.[126]

Generation of C&D waste, which in 2006 accounted for 32% of total waste generated in the EU, EFTA (excluding Switzerland) and Turkey,[127] has increased significantly over the past decade. All countries for which time series data are available have seen an increase in C&D waste generation per capita from 1995-2006.

In 2006, industry accounted for around 48% of waste generated in the EU-27, with over half coming from mining and quarrying. The generation of waste from manufacturing in the EU-27 fell by 5.4% between 2004 and 2006; waste from mining and quarrying fell by 14% over the same period; and waste from other economic sectors (services) increased by 6.2%.

Across the EU-27, hazardous waste accounts for an average of 3% of total waste generated.[128] Hazardous waste generation in the EU-27 plus Croatia, Norway and Switzerland increased by 15% from 1997-2006 (over this time period, generation increased by 54% in the EU-15 but decreased by 42% in the EU-12).[129]

Decoupling of waste generation from economic growth remains to be conclusively proved[130], although Figure 6 does suggest some degree of relative decoupling has been occuring across the EU-27.

Waste prevention

Waste prevention, by its nature, is difficult to measure accurately. Even when measurements are made, it is difficult to be certain whether reduced waste generation is due to waste prevention measures or other factors. Indications from waste generation statistics, as outlined above, suggest that waste prevention is not yet occurring in a significant way; real breakthroughs are yet to be achieved on quantitative prevention, whilst some qualitative prevention does appear to have been achieved, for example through the RoHS Directive.

A number of barriers exist to promoting waste prevention. These include: targeting policy/incentives at the wrong actors; increasing consumption; business models focussed on mass volume; a confused picture of responsibility for prevention; and a lack of national policies on prevention. There are also barriers to measuring waste prevention, including: lack of existing models for projections; lack of comparability of data; lack of common definitions (e.g. for municipal waste); and difficulty in measuring environmental impacts. These barriers should be addressed in order to bring about achievements in prevention.

[125] Derived from Eurostat, 2010, Environmental Data Centre on Waste, Overall Waste Generation
[126] European Environment Agency (EEA), 2010, European Environment State and Outlook (SOER), Draft for Consultation 2010
[127] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[128] EEA,2006, EEA Indicator fact sheet: Total waste generation
[129] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[130] EEA,2006, EEA Indicator fact sheet: Total waste generation

The Waste TS is broadly felt amongst stakeholders to have provided a useful 'umbrella' for future action, but Directive 2008/98/EC (in particular Article 29) had more impact. Waste prevention also now features strongly in EU waste legislation, in particular Directive 2008/98/EC on Waste, but also the Batteries, ELV, Mining Waste, Packaging, WEEE and RoHS Directives.

The recast of the Ecodesign Directive (now Directive 2009/125/EC) to allow future extension of its scope to cover not only energy-using products (e.g. washing machines, freezers and hair-driers) but also energy-related products (e.g. windows, insulation materials, and certain water using products like shower heads or taps) provides an important new opportunity for environmental and waste-related considerations to be included in the design of a broader range of products. This could offer significant potential for mid- to long-term waste prevention through the ecodesign of products.

There is no consensus amongst stakeholders as to whether it would be feasible – or even desirable – to set waste prevention targets at the EU level. Caution should therefore be exercised should concrete waste prevention targets be considered an option for the future.

Reuse and preparing for reuse

Given that 'preparing for reuse' is a new concept introduced under Directive 2008/98/EC, data is not currently available. Specific data is also lacking on reuse, although anecdotal evidence suggests that reuse 'markets' exist in many Member States, e.g. for textiles, furniture, car components and electrical household appliances. However, it must be noted that parts of these markets never concern waste; rather they are concerned with products being donated or resold by the last owner.

Recycling

There is strong evidence that targets for recycling set in EU Directives have driven significant improvements in levels of recycling. In 2006/2007, approximately 51% of waste targeted by EU Directives was recycled.[131]

Even EU-15 Member States with the highest baseline rates of recycling (40-50%) have shown yearly percentage increases in recycling from 2000-2006.[132] The picture is more mixed in the EU-12, with some showing increases, others relatively constant or fluctuating levels of recycling.[133]

In terms of specific waste streams, recycling performance appears to be somewhat mixed.

Recycling and composting of municipal waste increased from 19% to 38% from 1998 to 2007.[134] The EU-27 has shown steady year-on-year increases between 1995 and 2008 in the quantity of municipal waste composted,[135] and in 2008, 17% of municipal waste was composted.[136]

The rate of generated C&D waste recycled is over 60% in most of the EU-15, reaching an EU-27 average of 53% by 2006,[137] and has generally been either slowly increasing or remaining fairly constant.[138] This is some way short of the 70% target set by Directive 2008/98/EC, but that only needs to be met by 2020, so there does not yet appear to be cause for concern.

[131] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[132] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'
[133] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'
[134] European Environment Agency (EEA), 2010, European Environment State and Outlook (SOER), Draft for Consultation 2010
[135] Eurostat, 2010, Municipal waste composted (1000 tonnes)
[136] Eurostat, 2010, Presentation on 'Municipal waste' prepared for the Meeting of the Working Group "Statistics of the Environment", Sub-Group "Waste" of the Joint Eurostat/EFTA group
[137] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[138] EEA, 2009, Working paper 'EU as a Recycling Society: Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU'

For paper and cardboard, recycling levels in the EU-27 have increased year on year from 55.8% in 2002 to 72.2% in 2009.[139] Performance is therefore already well ahead of the 50% target for 2020. By 2007, 59% of packaging in the EU-27 was being recycled; the picture per Member State was mixed, however, with only 15 countries having met the 55% target for 2008 by 2007. For ELVs, the majority of Member States had met or exceeded the 2006 target of 80% reuse/recycling by 2007, with only three lagging behind.[140]

For WEEE, although the average recycling rate (where it is possible to calculate the rate) was around 79% in 2006, only 23% of WEEE placed on the market was reported as collected;[141] this collection rate is likely to be inaccurate, but still raises some concern in the light of the 65% collection target in the proposed recast of the WEEE Directive. For batteries, around 18.4% of batteries placed on the market were recycled in 2008; considerably lower than the 25% collection rate which must be met by 2012 (only 13 Member States are predicted to be able to meet the 2012 target).[142]

By 2005, recycling accounted for a greater proportion of waste treatment than incineration in the EU-25.[143]

Recovery

In terms of recovery, reliable data has only been found relating to incineration with energy recovery. Incineration with energy recovery of MSW increased significantly between 1995 and 2006, with primary energy production from MSW incineration almost doubling over that period. By 2006, 17 Member States reported recovery/energy recovery rates of over 40%.[144]

Disposal – incineration and landfill

The quantity of MSW incinerated in the EU has increased from 70kg per capita in 1997 to 102kg in 2008.[145] Only three Member States have seen a decline in incineration from 1995 to 2007 (Belgium, France and Luxembourg).[146] Energy recovery is also increasing in importance, although at present it is difficult to assess whether activities are being conducted in line with rules set out in Directive 2008/98/EC.

Whilst the level of MSW generated in the EU has been increasing, the amount sent to landfill has been decreasing. Between 1995 and 2007, only six Member States (Bulgaria, Malta, Portugal, Romania, Slovakia and Slovenia) saw in increase in municipal waste sent to landfill. Over that period, for the EU-15 MSW sent to landfill fell from an average of 62% to 42%; for the EU-12 it fell from an average of 87% to 79%.[147] For biodegradable municipal waste (BMW), nine Member States had already met the 35% target for 2016 by 2006, whereas eight Member States still needed to substantially reduce landfill of BMW to meet even the 75% target for 2006 (although they did all have derogations).[148]

Environmental impacts

The most complete and reliable data relating to the environmental impact of waste is that setting out the waste sectors contribution to GHG emissions. GHG emissions from the waste sector in the EU-27 have

[139] Figures from the European Recovered Paper Council, 2010
[140] Eurostat, 2009, Environmental Data Centre on Waste
[141] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010
[142] European Battery Recycling Association (EBRA), 2009, Press release 'Stagnation of the quantities of used portable batteries recycled in 2008'
[143] EEA, 2007, Europe's Environment, The Fourth Assessment, State of the Environment Report No 1
[144] Eurostat, 2008, Energy, transport and environment indicators, 2008 edition
[145] Eurostat, 2010, Environmental Data Centre on Waste, Landfill and incineration
[146] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[147] EEA, 2009, Diverting waste from landfill – Effectiveness of waste-management policies in the European Union (Report 7)
[148] EEA, 2010, European Environment State and Outlook (SOER) Report, Draft for Consultation April-May 2010

fallen from 207.2 million tonnes CO_2 equivalent (or 3.97% of total EU-27 GHG emissions) in 1995 to 141.2 million tonnes CO_2 equivalent (or 2.8% of total EU-27 GHG emissions) in 2007.[149]

It is estimated that by 2020, landfill will represent 60%, recycling 20% and incineration 20% of total GHG emissions from the waste management sector.[150]

Whilst emissions of CO_2 appear to be on the increase again since 2004 after a period of decline, CO_2 emissions from incineration decreased by 45% between 1990 and 2007, such that they only contributed 0.1% of total GHG emissions from across the EU-15.[151] Methane emissions from the waste sector declined from 9.1 million tonnes in 1995 to 6.2 million tonnes in 2006, although the rate of decrease now seems to be slowing.[152] As landfill has decreased as a waste disposal method, methane emissions from landfill have also decreased (by 39% in the period 1990-2007).[153] Although total EU emissions of nitrous oxide (NOx) have decreased since 1995, those generated by the waste sector have increased over the same time period, and from 2000-2006 have been hovering around 43,000-44,000 tonnes.[154] Continued decreases in the amount of waste going to landfill is likely to result in continued, if not dramatic, decreases in GHG emissions from landfill, together with improved methane recovery from landfills.

Aside from GHG emissions, waste management also has significant potential to cause harm to the natural environment, both directly through water, air and land pollution and indirectly through resource extraction. Data is however currently lacking in these areas, so concrete conclusions on trends and projections are not possible at this stage. However, the movement of waste management up the hierarchy is likely to lead to reduced risk of ground and surface water pollution (from landfills), and increased risk of air pollution (from incineration).

Exports of Waste

As levels of recycling increase so too has the export of waste for processing in third countries, largely to the Asian markets. This trend can be seen most starkly in the rise in exports of paper and plastics and is anticipated to continue to increase. There are gaps in terms of the knowledge and data relating to the export of waste, the ultimate treatment of exported waste and the environmental consequences associated with export.

[149] Eurostat, 2009, Total greenhouse gas emissions & Eurostat, 2009, Total greenhouse gas emissions from the waste sector
[150] EEA, 2008, Briefing 2008/01, Better management of municipal waste will reduce greenhouse gas emissions
[151] Annual European Union Greenhouse Gas Inventory 1990-2010
[152] Eurostat, 2009, total emissions of methane & Eurostat, 2009, emissions of methane from the waste sector
[153] Eurostat, 2009, Pocketbook: Energy, transport and environment indicators
[154] Eurostat, 2009, total emissions of nitrous oxide & Eurostat, 2009, emissions of nitrous oxide from the waste sector

2.2 ANALYSING FUTURE WASTE MANAGEMENT – PROJECTING TRENDS TO 2030

To help inform policy decisions this study aimed not only to define existing trends in waste management, but also to look to the future and identify what might be the anticipated outcomes up to 2030. Importantly this was based on two key assumptions: that existing EU polices and strategies are fully implemented; and that no additional strategies or actions are put in place at EU level.

To provide a full picture of the potential anticipated outcomes to 2030 two exercises were conducted with the intention of providing both quantitative and qualitative insights into waste management futures. The former was provided through a modelling exercise (validated by interviews with key stakeholders[155]) while the latter was based on expert input and discussion of potential trends and impacts. The outcomes of both exercises are presented in the following sections, followed by an integrated analysis of waste future trends and their likely impacts/outcomes. The effort under this work is complemented by additional work completed by team members Arcadis reviewing Biowaste futures for the Commission. This analysis is integrated into the findings of the modelling work completed for this study within section 2.2.4.1.

2.2.1 A QUANTITATIVE ANALYSIS OF WASTE FUTURES - MODELLING TRENDS TO 2030

The modelling exercise was undertaken in two phases, the first ran the model based on specified parameters with the outcomes then presented to Commission officials and other key groups undertaking such work in parallel. Importantly, this review exercise included experts tasked with completing the EEA scenarios for the upcoming State of the Environment Report 2010. Based on the feedback received the model was amended, reviewed and submitted for a second run. It is this final set of outcomes that are presented below. It should be noted that while there are limitations to any modelling exercise – for example based on data availability, time and the assumptions applied – the approach adopted by the team was welcomed by others active in this field and felt to represent a robust basis for assessment. The details of the key data used, assumptions applied and outcomes achieved are a presented in detail in

Box 2.

The modelling exercise was based on the need to provide information on anticipated performance in relation to key aspects of waste management in 2015, 2020 and 2030; intended to provide details of short, medium and longer term trends that might be considered of interest when preparing the review of the Waste TS. It assumes that all relevant waste targets and policies are fully implemented in all Member States, based on the requirements specified by the European Commission – further details of all the assumptions applied are presented in

Box 2.

Given that the modelling exercise represents only one element of this study it was not possible to run the model for all 27 Member States independently. However, given the diversity of development speeds and practices across the EU it was not felt appropriate to only model at the overall EU level. As a consequence it was decided to divide Member States into three groups based on a set of key characteristics that might influence their waste management practices; these are known as the yellow, turquoise and lavender groups – details of the groupings and characteristics upon which the grouping decision was based are set out in Table 8 – with analysis primarily being based on an average of performance across the MS contained in each group. Results are subsequently presented for each of these three groups, along with an overall assessment at the EU level - in essence a fourth group of Member States.

The following results were gained for the yellow, turquoise, lavender and EU-27 groups up to 2030: anticipated generation of MSW and its composition; the evolution of necessary landfill, incineration, recycling and composting capacity needed to deal with MSW; the anticipated generation and composition

[155] This included discussions with those conducting modelling on behalf of the EEA, representatives from industry and other experts from the expert group – see section 1.4.1 on details of the expert group.

of non MSW waste i.e. largely emanating from some form of economic activities whether that be manufacturing, construction or agriculture; the evolutions needed in landfilling, incineration and recycling capacity; and the impact on exporting of waste. The detailed outcomes of the modelling exercise are presented in their entirety within Annex 4.

Box 2 Presenting the key data sets, assumptions and results emerging from the modelling exercise

Main Data Inputs

Waste generation (divided into MSW and non MSW made up of data on of industrial, commercial, construction and demolition, secondary and other waste types different from municipal solid waste) and generation correlated to GDP based on four different decoupling scenarios.

Degrees of waste collection (either mixed or separate) – based on rates of collection and MS data on Flemish, Bulgarian and Greek source composition and sorting assessments for MSs by the JRC

Waste prevention – including the assumption that prevention targets will be adopted in line with the WFD by 2020

Rates of preparation for re-use, recycling and recovery – including the assumption that the WFD targets will be met

The balance between recycling and energy recovery

Landfill and landfill diversion – assuming landfill diversion targets and WFD targets are met

Transboundary shipments of waste, either for recycling or disposal

Key Assumptions

No additional strategies or actions at EU level are put into place. Planned but not yet fully concretised strategies, like waste prevention and decoupling targets to be set for 2020, according to article 9 (c) of the Waste Framework Directive

Any actions currently underway are implemented fully. All legally binding targets are reached at the foreseen timescale. This means that projections do not necessarily represent the business as usual for all Member States as they will likely reach given targets at different speeds. Supplementary policy actions at local or Community level might be necessary to reach these targets

Longer term predictions are confronted with increasing degrees of uncertainty on external parameters, like economic or demographic evolutions, social or cultural shifts, evolutions in technology and evolutions in both domestic and Community environmental policy.

That the ***GDP predictions fully taking account of the impact of the credit crunch were unavailable from the Commission***, although efforts have been made to take some account of the change in GDP, this can not fully account for the impact.

That this assessment is based on the ***best available EU wide data sets*** based primarily on information submitted to Eurostat, however, it is acknowledged that there are limitations to this data set in terms of accurately assessing individual MS performance.

Resulting outputs

Generation of Waste

- anticipated generation of MSW and its composition;
- anticipated generation and composition of non MSW waste;
- presented as trends from now up to 2030.

Treatment of Waste

- the evolution of necessary landfill, incineration, recycling and composting capacity needed to deal with MSW;
- the evolutions needed in landfilling, incineration and recycling capacity;
- impact on the exporting of waste;
- presented as trends from now up to 2030.

Table 8 Characterising the three assessment groups (yellow, turquoise and lavender) (group colours are purely arbitrary)

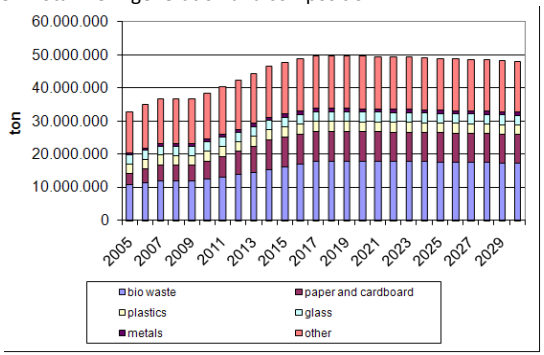
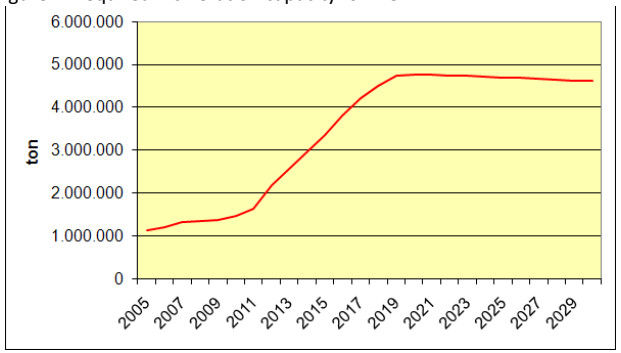
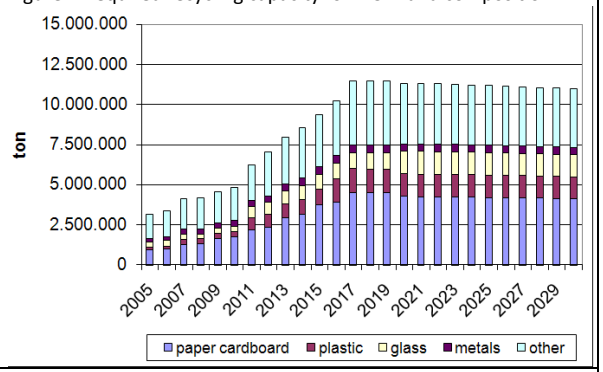
Group	Economic characteristics	Waste management characteristics	Group Members
Yellow	Predominantly very fast evolving economies, currently with a low GDP per capita (up until the recent economic crisis)	Characterised by a negative decoupling of waste, with predominantly a poorly established waste treatment and recycling capacity	Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia
Turquoise	Moderate GDP per capita and fast to very fast growing economies (up until the recent economic crisis)	Characterised by an emerging waste treatment and recycling capacity which is still not fully developed	Cyprus, Czech Republic, Greece, Malta, Portugal, Slovenia
Lavender	High GDP per capita, predominantly moderate growth (up until the recent economic crisis)	Evolving towards decoupling for municipal waste, and usually with a developed waste treatment and some recycling heritage	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, UK

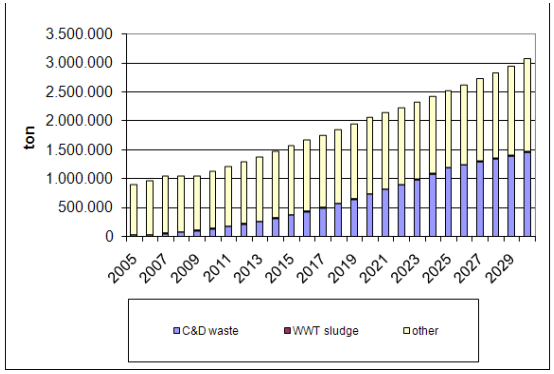
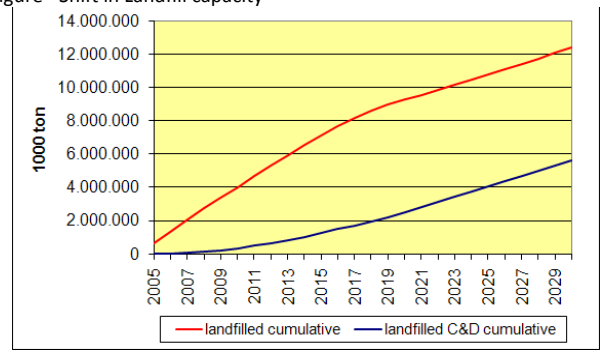
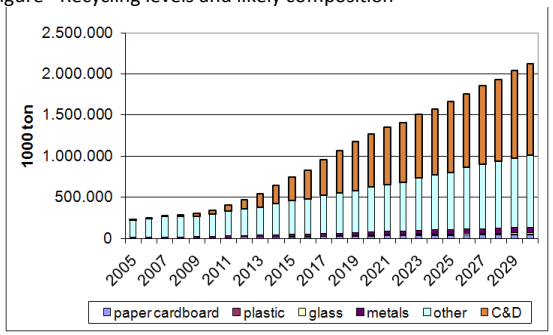
2.2.1.1 MODELLING RESULTS

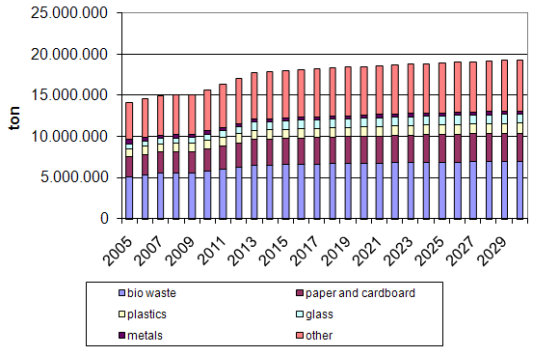
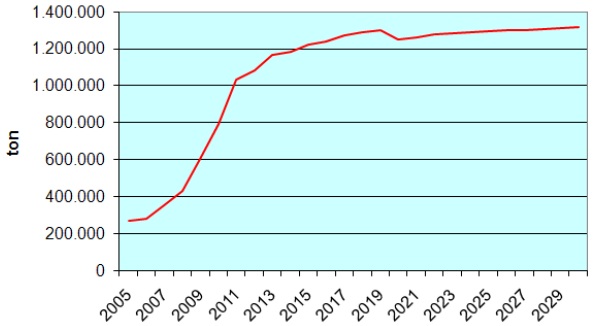
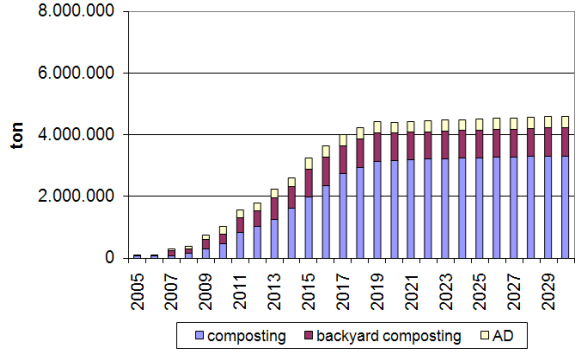
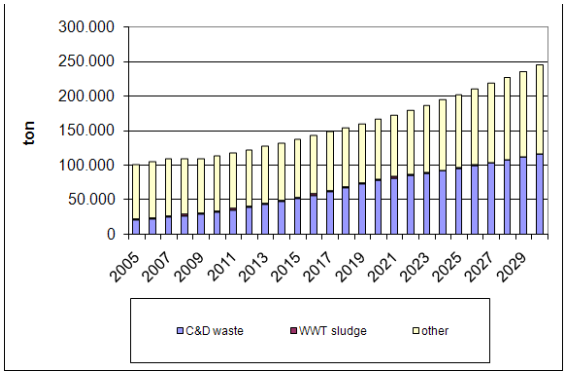
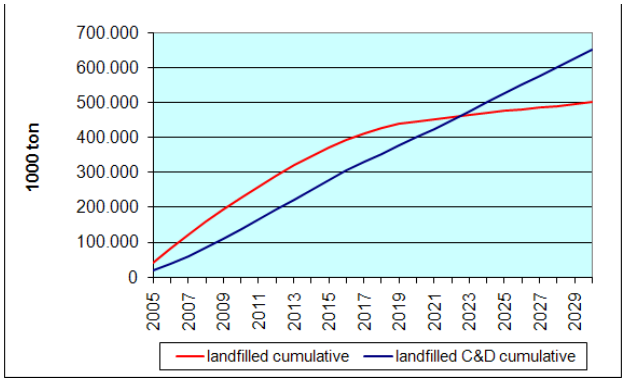
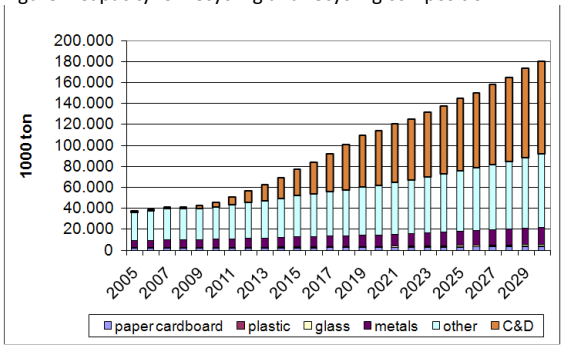
The key results and outcomes based on the modelling exercise are presented in Table 9 these are presented by group and by waste type commenting on the changes in: the generation and composition of waste; the level of disposal and trends in landfilling and incineration; and shifts in the capacity need for recycling and composting of waste. Given the desire under the project to understand waste trends at key development milestones ie 2015, 2020 and 2030 Table 9 presents both the overall trends in terms of changes over time and the performance noted at these three reference points. This is complemented by the results in table? presenting anticipated future trends in waste export, this only covers the non municipal waste sectors given the current exporting rules.

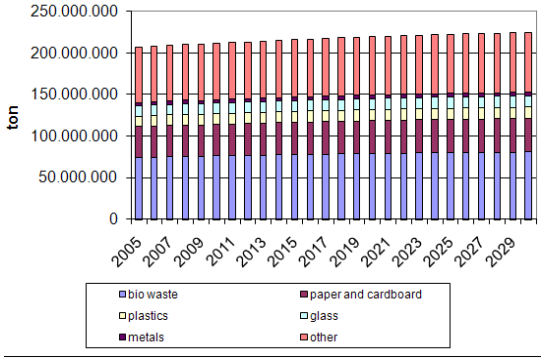
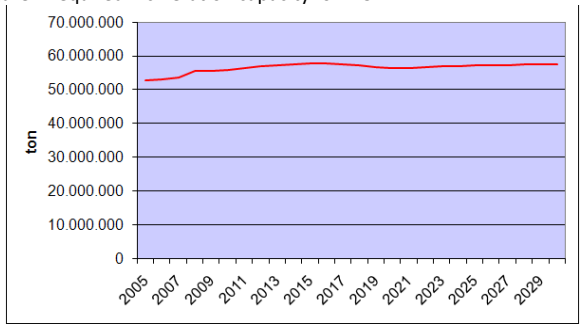
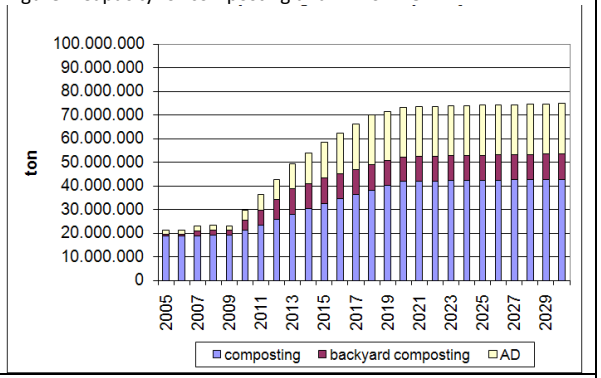
The implications, limitations and consequences of the findings are discussed in the subsequent section.

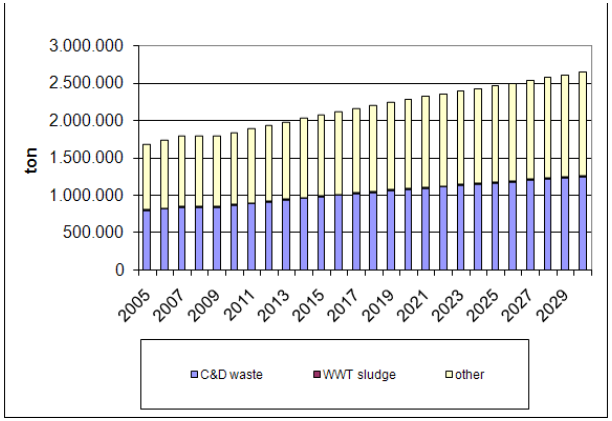
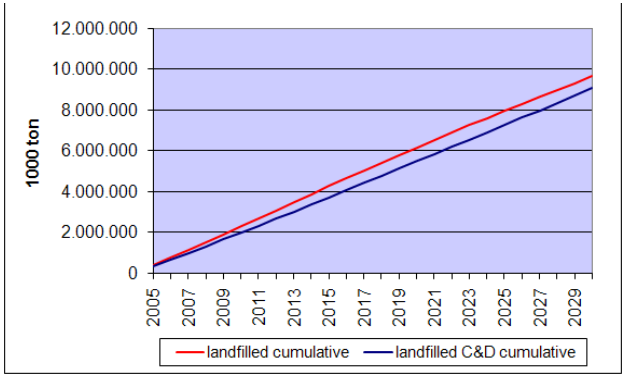
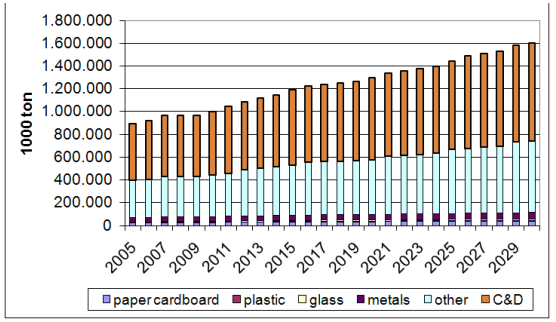
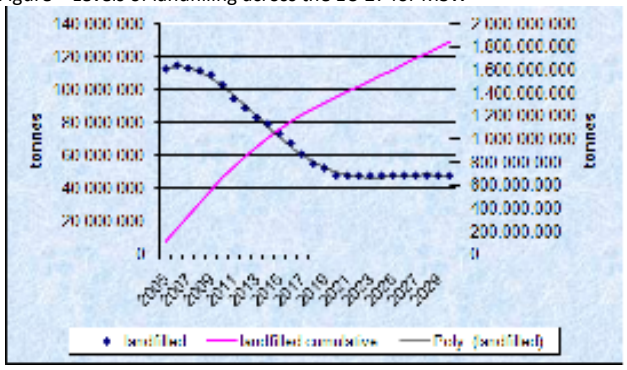
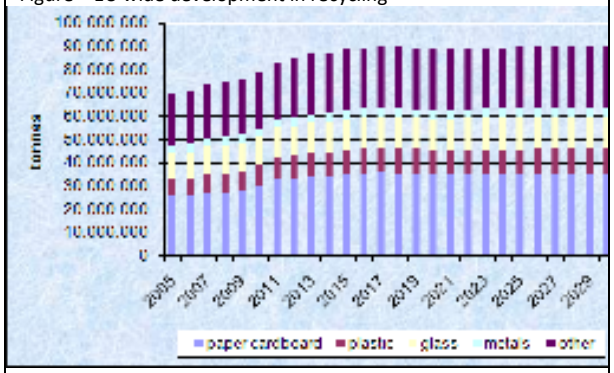
Table 9 – Summarising the key results from the modelling exercise by issue and country grouping

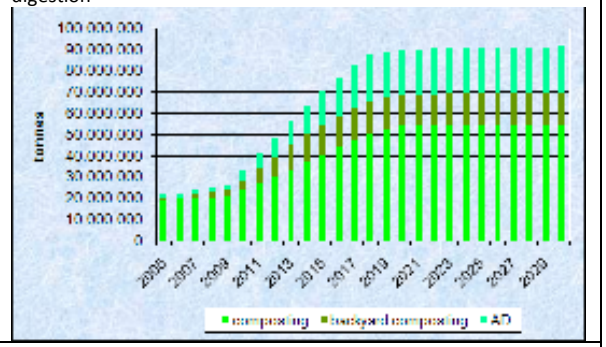
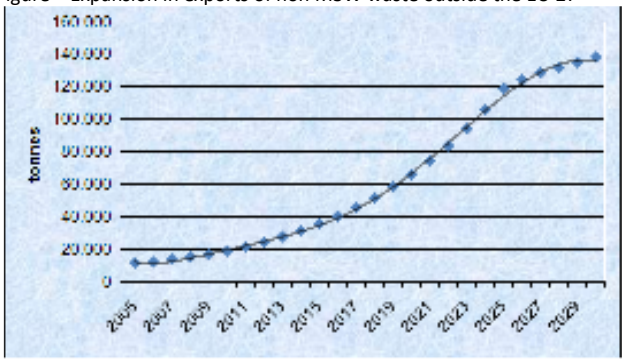
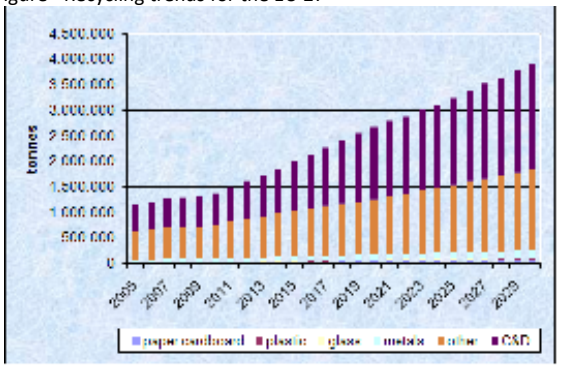
Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
Yellow (Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia)	MSW	MSW generation, both total and in kg/capita rises steeply to 2014, continues to rise to 2016 and then plateaus with a very slight decreasing trend in total generation between 2018 and 2030. According to figures on composition it is rises in the level of biowaste and, to a lesser extent, paper and cardboard that are driving the rise in generation up to 2016. - 2010 to 2015 - Average kg/capita has rapidly increased from approx 450 to 550 with total generation also increasing, but not as significantly, from more than 40.05mt to just below 50mt. - By 2020 - Average kg/capita has plateaued around 550 with total generation peaking in 2018 and very slowly declining - By 2030 - average kg/capita has remained stable with a slow decline continuing in total generation levels but only to around levels experienced in 2015. Figure – Total MSW generation and composition 	Figures for landfill capacity show levels rising from relatively high baseline of approx 25 mt in 2005 to a peak in 2014/2015 of approx 28mt then declining to around 20mt per year by 2020. Levels of landfilling then remain static around the 20mt per year level until 2030. Incineration trends are more dramatic rising slowly from a relatively low base of approx 1mt in 2005, to approximately 1.5mt by 2012. Capacity then rapidly increases hitting over 3mt by 2015 and peaking just under 5mt in 2020. Incineration rates then declines slightly between 2020 and 2030 to approx 4.5mt per year. Figure – Required incineration capacity for MSW 	Recycling capacity increases relatively slowly between 2005 and 2012 from 2.5 to 5mt per year. This rise is primarily driven by an increase in levels of paper/cardboard recycling comparable to the anticipated increase in the contribution of this sector to overall MSW generation. From 2012 to 2017 rates rise rapidly to over 11mt, again primarily driven by increasing levels of paper/cardboard recycling combined with smaller rises in the quantity of plastic and glass recycling. From 2018 to 2030 the level of recycling plateaus. Composting rates rise rapidly from a low base of 1mt in 2005 to over 13mt by 2018/2019. Rates then fall slowly between 2020 and 2030 to just over 12mt. No AD is anticipated. Figure - Required recycling capacity for MSW and composition 
	Non	It can be expected that the generation of industrial and non household	Landfilling will first increase and later on decrease and stabilise at a	The major part of the growth of waste generation will have to be

Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
	MSW	waste will keep increasing. C&D waste will become more important as it will be split off from the other waste fractions. The figure below illustrates a double effect, the total growth in waste generation for both C&D waste and other waste, and the shift towards more C&D waste being separately collected. Export of waste to non EU countries is anticipated to rise consistently until 2030 from near 0 in 2005 to around 40,000 thousand tonnes. Export levels are anticipated to grow faster than waste generation levels. Figure - Total generation of non-MSW waste for yellow group of Member States 	rather high level. Some capacity will be needed for non recycled C&D waste, even when the target of 70% recycling will be reached and recycling will continue growing beyond that target value. Incineration, although rather marginal as a treatment technique may still increase. Figure - Shift in Landfill capacity 	covered by increasing recycling. Figure - Recycling levels and likely composition 
Turquoise (Cyprus, Czech Republic, Greece, Malta, Portugal, Slovenia)	MSW	Average kg/capita generation of MSW rises relatively rapidly from approximately 425kg/capita in 2006 to 525 in 2014. Growth then slows dramatically but continues to rise steadily between 2015 and 2030 reaching just under 550kg/capita by 2030. Total growth in MSW follows similar trends, although these are less pronounced rising from approx 15mt in 2006 to just below 20mt by 2014 and then slowly and consistently increasing to just above 20mt by 2030. These trends largely appear driven by an increase in the level of biowastes.	Levels of landfilling fall from 2005 consistently to 2020, from 12mt to just over 8mt (reaching approx 10mt by 2015). From 2020 onwards this trend levels out and remains just higher than 8mt. Incineration capacity rises rapidly from a very low level of 200,000tonnes in 2005 to around 1.2mt by 2014. The upward trend continues, although more slowly until approx 2020 and around 1.3mt per year. It then remains largely static at this level until 2030.	Recycling capacity shows an increase over the whole period from just below 2.5mt in 2005 to just under 5mt in 2030 ie a doubling. This is marked by a relatively steep increase in capacity up to just under 4mt by 2015, slowing to 2019 and levelling off between 2020 and 2030. This is largely driven by increases in the level of paper/cardboard recycling, as well as rises in plastics and glass. Composting and AD levels rise very rapidly between 2005 and to 2019 from around 0 to over 4mt. AD represents a relatively small proportion of this even at its maximum level of around 0.25mt. From 2020 to 2030 the levels plateau remaining at around 4.25tmt.

Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
		Figure - Total MSW generation and composition 	Figure - Required incineration capacity for MSW 	Figure – Capacity for composting and AD for MSW 
	Non MSW	Non household waste is expected to continue increasing in a rather linear way. Composition will still evolve towards a larger fraction separately collected C&D waste. Export of waste will rise throughout the whole period from around 1,000 thousand tonnes to just below 16,000 thousand tonnes in 2030 Figure – Total generation of non-MSW waste for turquoise group of Member States – demonstrating both increase in waste and increase in separate collection of C&D waste 	Needed landfill capacity will drop due to this separate collection of C&D waste and due to the increase of other treatment methods. Incineration will grow although it will remain rather unimportant. Figure - Required incineration capacity for non MSW 	Recycling has to cover for the growth in waste generation and the decrease on landfilling. Figure – Capacity for recycling and recycling composition 
Lavender (Austria, Belgium, Denmark,	MSW	Waste generation per capita within this group is predicted to remain relatively static over the whole period up to 2030 at approximately 560kg/capita. The overall generation of waste shows a very limited upward trend from 2006 to 2030 rising from just over 200.05Mt to	The level of landfilling capacity necessary to deal with waste per year falls rapidly by approximately 50Mt from 2009 (at approximately 72 Mt) until 2020 (approximately 20Mt). 2015 sees the level of landfilling at approximately 35Mt. As of 2020 this decline plateaus remaining around	The level of recycling capacity requires is anticipated to grow to a level of 75Mt by 2012, but from this point onwards to remain relatively static at around this level. The rise in recycling rates is driven primarily by an increase in levels of recycling of paper and

Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, UK)		approximately 225Mt in a linear way. The average composition of MSW would be anticipated to remain relatively static over this period comprising of approximately 35% biowaste, 20% paper and cardboard, 5% plastics, 5% glass and 3% metals. Figure – Generation of MSW and proportional composition 	20Mt until 2030. This decline is anticipated to be driven primarily by landfill diversion requirements under the Landfill Directive. Incineration capacity necessary per year remains relatively static from 2010 to 2030 around the level of 57Mt. This suggests that changes in landfill usage are not being compensated by incineration. Moreover, it Is considered that incineration has already reached a high level in many countries by 2009 – although application is not consistent across MS. Figure - Required incineration capacity for MSW 	cardboard. Analysis of the potential increase in composting and AD levels is however dramatic. Driven by the need primarily to divert biodegradable waste from landfill the composting capacity is anticipated to rise from approximately 20Mt seen between 2005 and 2009 to approximately 43Mt in 2015, peaking in 2020 at 53Mt and remaining relatively static at this level until 2030. Importantly, unlike for other groups, the lavender group is envisaged to see a significant growth in the use of AD technologies between 2010 and 2030. In 2010 AD sits at around 2/3Mt, by 2015 this has risen to approximately 15Mt continuing to expand to approximately 20Mt by 2020 and remaining static at this level until 2030. This is driven by the desire to divert waste and also the goal of delivering energy from waste. Figure – Capacity for composting and AD for MSW 
	Non MSW	Total was generated increases over the period but from a higher 2005 baseline than in other groups. The rise in C&D separate collection is less marked due to the relative establishment rates in 2005 compared to other less advanced groups. This group will see by far the highest volumes of export of non MSW. The levels of predicted export start in 2005 at around 10,000 thousand tonnes and increase rapidly to around 80,000 thousand tonnes by 2025, The rate of increase then begins to level of f reaching around 85,000 thousand tonnes by 2030.	Landfilling will remain required for C&D was, with a limited rise in incineration rates from around 120,000 thousand tonnes in 2005 to just under 180,000 thousand tonnes in 2030.	Increase in the level of recycling and exports accounts for the main changes in management to address the growth in waste. Also there is a transfer from landfilling to recycling.

Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
		Figure - Total generation of non-MSW waste for lavender group of Member States 	Figure - Rate of landfilling required 	Figure - Rate of recycling required 
EU 27	MSW	The total generation of MSW will increase slowly after a phase of more intense increase until 2016, driven by both demographic and economic changes. The average generation per capita tends to reach a maximum in 2016. From that year on the demographic evolution will be the major driving force. Unlike specific groups, as the yellow group of Member States, the average composition of generated municipal solid waste will remain rather stable at the level of EU-27.	Landfill will drop mainly driven by the evolutions in the lavender group of countries and the assumed compliance with the Landfill Directive targets. Incineration will rise and stabilise from 2018 onwards Figure – Levels of landfilling across the EU 27 for MSW 	Recycling of MSW fractions tends to stabilise after a shorter period of continued increase, driven by the recycling targets for specific waste streams. Composting however affects a larger fraction of generated MSW and trends to increase considerable as a cheap and effective method for landfill diversion of MSW. AD becomes more important as a source of green energy, although anticipated usage varies significantly as demonstrated in the group analysis. Figure – EU wide development in recycling 

Group		Waste generation and composition	Required landfill and incineration capacity	Required recycling and composting capacity
				Figure – EU wide development in composting and anaerobic digestion 
	Non MSW	Industrial and the sum of all other non-household waste streams have the tendency to increase, following a rather stable path. It is important to keep in mind that industrial and non-household waste represents a far larger waste fraction than MSW. Industrial waste is split up in thousands of different waste streams, all with individual properties. For the sake of this exercise two assumed large and homogeneous fractions have been analysed. Inert waste as a proxy for construction and demolition waste, and waste water treatment sludge. Although in quantitative figures the generation of waste water treatment sludge is quite considerable, it does not form a perceivable part of the total quantity of generated waste. Inert waste becomes more and more visible in the reported statistics, which does not mean that it grows at the same speed, but that it is better collected and kept out of the fraction of mixed waste. C&D waste forms an important fraction of the total generated industrial and non household waste. Export of waste to non-EU-27 countries keeps increasing in line with the actual trends. This is a consequence of the increasing availability of recyclable non hazardous 'green listed' waste fractions, and the increasing demand for raw materials in the growing economies.	Although recycling of inert waste and C&D waste becomes increasingly important, landfill of these fractions on e.g. dedicated landfill sites will remain important in EU-27 for the non recycled fraction of 30% or less of the generated C&D waste. Landfill of other industrial waste fractions tends to decrease. Incineration of industrial waste increases until 2016 and then stabilises, although the total waste generation keeps increasing. Figure – Expansion in exports of non MSW waste outside the EU 27 	Due to the large variety of waste streams generated in industry, trade, services, waste treatment the fractions of reported plastics, paper, metals and glass are rather limited compared to all other reported waste streams. Often these fractions are still mixed up with the mixed industrial waste, or are components of otherwise reported waste streams that are split off only at a later stage. The graph below therefore only shows a partial image. Other recycling included e.g. recycling of inert waste or biodegradable waste, but also recycling of paper, glass, metals, plastics in differently named waste streakenams. Recycling is characterised by an over all and continued increase. Figure - Recycling trends for the EU 27 

2.2.1.2 SUMMARISING KEY EMERGING TRENDS

The modelling results demonstrate the differentiation between different Member States in terms of the anticipated evolution in waste management up to 2030. This is in essence determined by the extent to which action has already been taken within the Member State to address waste management and particularly the state of economic development within that Member State, likely emphasised by the GDP based approach and assumptions upon which the modelling exercise was based. Key overarching trends that can be identified from the modelling analysis, these are summarised below.

- That in general the Member States with weaker waste management infrastructure and lower GDP are anticipated to see higher rates of increase in terms of ***waste generation***, with this starting from a far lower base in 2005.
- That for all Member State groupings the trend of ***increase in terms of waste generation*** is anticipated to be greater in the non MSW sector than within MSW ie that non MSW will increase at a faster rate.
- In general increases in the ***generation of MSW*** based wastes peak around 2016 and then plateau, however rises in the level of non MSW continue to trend upwards at similar throughout the period up to 2030. This suggests further action is needed to address the non-MSW sector.
- That for no Member State group is the ***generation of waste*** anticipated to fall based on the model results up to 2030.
- ***Levels of landfilling are anticipated to fall for MSW*** waste from around 2014/2015, this is driven by changes across the Member State groupings but most extensively by evolutions in the lavender group ie those Member States with the highest GDP and most extensive waste management systems. Within these advanced Member States over the same period levels of incineration remain relatively static suggesting that the shift away from landfilling of waste is being addressed through higher levels of recycling, composting etc.
- ***The level of incineration for MSW*** is anticipated to rise significantly when considering the EU 27. While the most developed Member States will not see significant expansion in landfilling capacity to address MSW, the other two groups ie turquoise and yellow will see significant expansion in incineration capacity – it is not possible to identify from the model whether this would be accompanied by energy recover.
- For non MSW waste streams the trend in ***landfill*** is anticipated to increase initially in the lesser developed Member States and incineration will remain marginal as a treatment option for these waste streams. Within the medium and advanced Member States levels of landfilling are anticipated to drop for non MSW waste driven by increases in the level of recycling of C&D waste. Despite the evolutions to increase recycling of inert and C&D wastes landfilling will remain an important waste treatment method for non MSW waste up to 2030.
- ***Recycling of MSW*** waste is anticipated to continue to increase overall across the EU 27 2018 and then plateaus at around 90 million tonnes. The rise is driven primarily by existing EU Directives and their recycling targets. ***Composting of MSW*** waste, and other linked technologies such as Anaerobic Digestion, are anticipated to increase rapidly from a relatively low base of 20 million tonnes in 2007 to around 90 million tonnes in 2020. These trend in the rapid rise of composting and alternative treatments for biowaste is seen across all Member State groupings, although the use of Anaerobic Digestion as a treatment option is much more extensively adopted in the Member States with higher GDPs and more established waste management infrastructure ie lavender group.
- The ***recycling of non MSW*** waste is anticipated to rise across the whole period from 2007 to 2030, from the relatively low base of 1 million tonnes in 2007 to around 4 million in 2030. This is driven

by rising recycling of C&D waste, but also larger proportions of, particularly, metals and paper/cardboard being recycled.

- For the EU 27, and across all Member State groupings, the level of ***non MSW waste exported*** beyond the EU is anticipated to rise rapidly and expand substantially up until 2026/2027 – after this point levels continue to increase but at a slower rate the 2030. The level of non MSW waste exported from the EU 27 is anticipated to rise from 15 million tonnes in 2005/2007 to just under 140 million tonnes in 2030.

2.2.1.3 CAUSES, IMPLICATIONS AND CONSEQUENCES

The outcomes of the modelling exercise have several potentially important implications and outcomes that should be born in mind for policy making and when interpreting their results. Many of these are an artefact of the assumption that all existing EU policy measures will be fully implemented without checking the likelihood of this achievement. Moreover, it should be noted that the official projections in terms of future EU economic growth, taking account of the 2007/2008 credit crisis, were not available for use during the modelling exercise therefore it was not possible to fully take into account changing investment patterns. Key issues to note are as follows.

- The model results assume a major expansion in levels of composting of MSW and recycling of both MSW and non MSW, with this trend particularly pronounced in the middle and less developed groups ie those Member States with more limited current waste management infrastructure and lower GDP. To deliver both the anticipated increase in composting and that for recycling would require a major expansion in the infrastructure both for the collection, treatment and processing of these materials. It is unclear how realistic such an expansion will be given the limited investment resources available in many Member States at present. Therefore, additional support to ensure this change may need to be put in place.
- Incineration expansion is another area where capital is required in significant quantities in order to secure expansion in demand and there might be question marks of the commitment of such funds in the coming years, given the financial crisis.
- There is a clear tailing off of effort in terms of improved waste management performance around 2020. This decline can largely be attributed to the fact current EU targets have largely expired by this data. These declines in effort may not be realised in reality were the EU to continue to commit to policies in these areas or were Member States to take forward effort at an individual level to continue to drive forward action. Neither of these possibilities are taken into account within the model at this stage.
- Trends identified in the model are noted to be driven in particular by the targets within the revised waste framework Directive on recycling and prevention of reuse, and by the landfill diversion targets set out in the Landfill Directive.

2.2.1.4 MODELLING BIOWASTE AND THE RELATIONSHIP TO THE THEMATIC STRATEGY EXERCISE

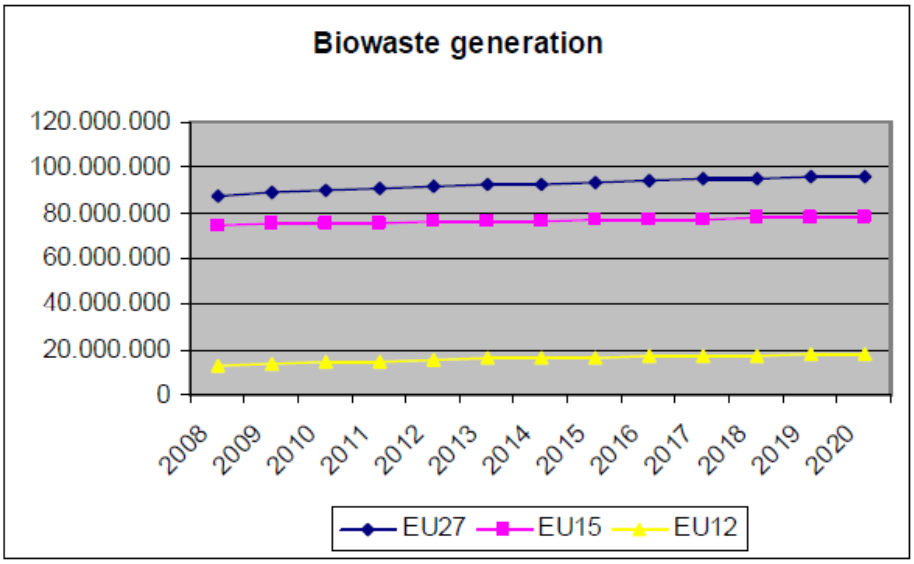
As noted above, in addition to the modelling effort completed for this study a major exercise was also separately undertaken examining the future of biowaste by Arcadis, in coordination with Eunomia. The modelling effort for the Thematic Strategy was based on similar assumptions to the biowaste assessment, albeit a slimed down version given the multiple requirements of this study. The key differences in approach between the biowaste modelling exercise and the exercise summarised above for this analysis are set out below.

- The scope of the biowaste study included all BMW and non-household waste based on EUROSTAT data.
- The larger biowaste study modelled bio-waste generation and treatment for all Member States, as compared to three groups and the EU 27 as for this analysis.

- Bio-waste generation and treatment were modelled based on three difference policy scenarios, where as this assessment only considered the buisiness as usual based on implementation of all existing policies. More detailed modeling for EU waste management taking into different scenarios could be performed in an impact assessment study for any review of the TS.
- The demographic assumptions are based on DG TREN data for bio-waste, and on more recent EUROPOP2008 data for the thematic strategy preparation.
- In the Waste TS assessment zero growth has been introduced in the basic data for the years 2009 and 2010 to take into account the economic and financial crisis. This was not included in the DG TREN data originating from 2007, hence the biowaste analysis.
- The waste treatment options for MSW in the biowaste study were split up over landfill, incineration, MBT, composting, home composting and anaerobic digestion. The options in the Waste TS study are landfill, incineration, recycling, composting, home composting, anaerobic digestion and export out of EU.
- The waste generation and treatment estimations for bio-waste focus on its contribution to mixed MSW and as a separately collected fraction. The estimations in the Waste TS study diversify for MSW on paper, glass, plastic, metal, bio-waste and other, and for non-household waste on C&D waste, wastewater treatment sludge and other.
- The bio-waste study includes detailed estimations based on planned capacity and investments in the treatment of municipal bio-waste in all 27 Member States. The latter study includes a broader assessment of future development in three homogeneous groups of Member States.

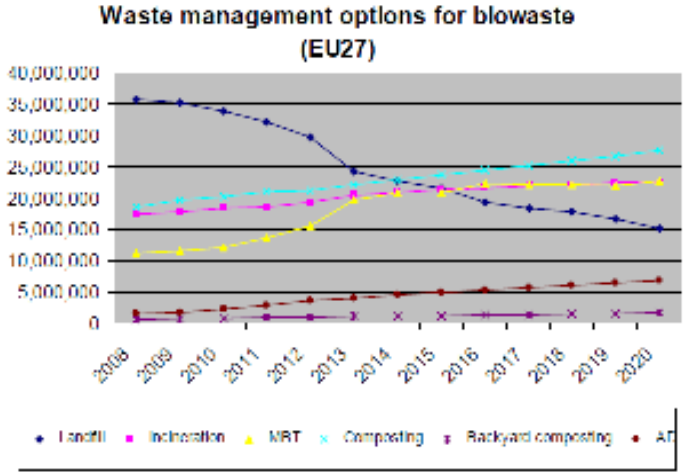
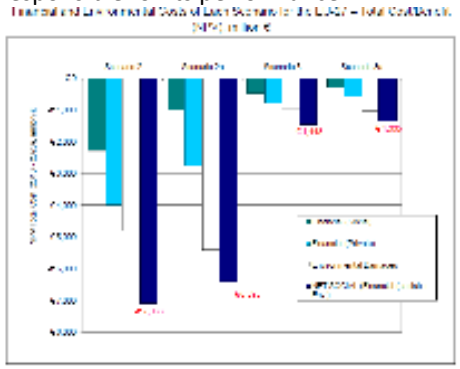
The study on bio-waste concluded that generation would not expand extensively up to 2020, and focused primarily on understanding policy mechanisms and scenarios that might ensure the better treatment of bio-waste. Figure 43 summarises the anticipated changes in bio-waste generation demonstrating the dominance of the EU-15 in terms of generation. Meanwhile the broader conclusions and approach to analysis within the bio-waste modelling exercise are summarised on the following page. Further results and conclusions on bio-waste management can be reviewed at http://ec.europa.eu/environment/waste/compost/developments.htm

Figure 43 - Total bio-waste generation in the baseline, past and predicted trends[156]



[156] Arcadis report on the assessment of the options to improve the management of bio-waste in the European Union http://ec.europa.eu/environment/waste/compost/pdf/ia_biowaste%20-%20final%20report.pdf

Table 10 Summarising the approach to and outcomes from the study reviewing different scenarios for biowaste management in the EU

Waste generation and composition and trends in waste management options	Costs and benefits of various waste management options	Policy Scenarios
Predicted as a baseline that total MSW generation would increase steadily over time, this was mirrored with a growth in bio-waste generation. Similar levels of growth were found in the EU 15 and 12. Based on an analysis of existing MS waste management policies and expert analysis future trends in waste management options for bio-waste were predicted. These indicated that a significant decrease in landfill was likely and that the bio-waste excess would be met by a steady increase in incineration, composting and AD. With home or backyard composting making some contribution.  The biggest expansion was considered to be in Mechanical Biological Treatment between 2012-2015 with the level plateauing at around the same contribution as incineration. Due to the higher reliance on land filling in the EU-15 much of the growth would be from these areas, particularly for AD and MBTs.	Within the policy scenarios the environmental and social costs of various bio-waste management options were considered to vary between countries. However some findings were more generally applicable. • Home composting may not deliver the same environmental benefits as AD, but the financial costs are forecast to be lower. • Collection systems and targets setting had a significant impact on recycling performance of MS. Higher target setting was more likely to require a move towards independent collection systems. • Waste prevention provides the most environmental benefits of all management options. • Free garden waste collections may increase the amount of waste generated but for food waste the findings suggested that a reduction in generation may occur. • The lowest financial cost was IVC and AD with the current electricity source having a significant impact by determining the net benefit of switching. • The biogas to vehicle options was generally found to perform best for the AD options. • The low financial cost of IVC combined with relatively low external environmental cost made it the best performing option for 16 of the 27 MS under the private metric. • The higher financial cost of AD, even with subsidy, made it less attractive generally. • Under social cost metric AD performed better than IVC for 9 of the 27 countries, due to lower capital discount rate and environmental impacts. • There was found to be a net cost to society in closing down existing incineration capacity to build new bio waste facilities, this was based on an assumption that the cost of this investment had been met or *sunk.* • A change in waste management away from incineration to composting could lead to the direct creation of a few thousand jobs at the EU-27 level, and maybe more in waste collection. Though there was a view that net job creation only occurs if those employed in waste management would not be competitive on the regular labour market.	Two wide policy scenarios were considered to determine the most efficient response to the issue of bio-waste management. These were based on a series of common assumptions based on achieving set targets but differing regarding: • High prevention and recycling (7.5% waste prevention, 60% food waste capture and 90% garden by 2020) • Low recycling (no waste prevention, bio-waste collection target (35%0 reached) but 2020) It was forecast that all three scenarios produced a net benefit to society, with scenarios 2 performing better than scenario 3 on financial (private and social), environmental damage. Major reduction in GHG for scenario 2 due to higher waste prevention were partly responsible for its performance. 

2.2.2 EXPERT CONSULTATION – COMPLEMENTING THE QUANTITATIVE TREND ANALYSIS

The modelling exercise was aimed at understanding future trends in waste management in Europe. To complement this exercise, experts were consulted regarding their future vision for EU waste management and the policy needs. The following is a summary of expert visions for the future of waste management and the needs in terms of taking EU action forward.

Generation of Waste and Prevention

- Trends in waste levels will not change without focus on behaviour change
- There will be a focus on product eco-design to improve the durability, repairability and recyclability of products.
- An increase in the amount of repair and reuse facilities
- Zero Waste objectives will become commonplace and successes in achieving high recycling rates will proliferate.
- Whilst the WFD and Waste Thematic Strategy has led to the development of recycling activities across the EU - which are vital in minimising waste disposal - there now needs to be more focus on waste prevention activities (higher up the waste hierarchy) such as reuse. Comparatively reuse activities have a higher job creation potential than other methods of waste management, which would tie in with proposals in the Europe 2020 Strategy for sustainable and inclusive growth.
- Development of waste prevention initiatives in European countries need to be maximised and financially supported to enable their success on a broader scale. The initiatives of some EU countries, regions or cities are being spread to other countries – demonstrated by the LIFE+ Project for a European Week for Waste Reduction event, for example, which took place for the first time officially in 2009. Effective indicators now need to be developed to monitor the results of prevention activities and the identification of best practices across Europe.
- Growing wasteful production and consumption trends of short-lived gadgets may counteract efforts on quantitative and qualitative prevention. This could be addressed through taxes or increase in product/service prices to reflect their environmental impacts.
- A change in waste composition, reducing quantities of food waste from households, increasing quantities of electrical items. However, coupled with an increasing reuse culture and appreciation of the value of goods and services.
- A move away from heavier materials
- A further decrease in waste from manufacturing, and an absolute decrease in waste arising from construction and demolition, driven by the need to conserve resources.
- A reduction in the amount of waste produced per person, and in absolute terms.

Waste Management

- Risk of overlooking waste prevention and recycling through increased focus on energy recovery (seen as more cost effective)
- Focus on cost effective solutions could sustain dumping of waste (both in and outside of EU)
- Developments in waste management in several Member States are likely to be very slow as a result of the economic crisis.
- Recycling technologies will not necessarily be able to keep pace with the high demand of virgin materials due to increasing complexity of material compositions. The overall economic cost of waste management and treatment activities should therefore be evaluated and balanced against the economic gains of mass consumption.
- Current widespread use of incinerators is likely to continue to divert significant amounts of waste from landfill.
- Continued implementation of waste policy on industrial sectors (including Landfill Directive) is likely to lessen environmental impacts overall. “New” environmental impacts may arise if a broader range of waste materials are given EoW status without considering the quality of the product.
- A rise in the use of energy recovery to provide a range of fuels, including vehicle fuel and gas for injection to the grid, as well as heat and electricity.

- Northern European Member States tend to have higher recycling rates than the rest of the EU - these rates appear to have stabilised and further significant increases in recycling will most likely only be achieved at the expense of disproportionate costs. Other Member States are developing alternative waste treatment facilities, with a growing trend in recycling rates.
- Shifts in disposal options – The firm embedment of the waste hierarchy in EU waste legislation will continue to shift Member States' policies towards waste prevention and reduction activities. Eventually this trend will result in a departure from a disposal business model to a more market-driven business model (focused around trading in recyclates and recovered energy).

Natural Resource Management and Use of Secondary Raw Materials

- As virgin materials become scarcer the demand for secondary materials will increase, driving an increase in the market price and quality of secondary materials.
- Local resources will be used more predominantly. There will be less export of secondary materials with the development of more local manufacturing plants.
- The use of composite materials will be reduced unless they can be easily separated at the end of their useful life.
- Growing global demand for materials along with depletion of natural resources may lead to better use of waste as a resource and drive developments in recycling technology. There needs to be a change in business models to drive this change.
- Trade of secondary materials could increase with better waste management such as more specialised recycling processes.
- Trade of secondary materials could increase to level with other commodity markets through better waste management such as more reliable collection systems.
- Higher value of scarce materials may lead to more imports of high value waste existing in small concentrations, which cannot be recovered in the current small-scale, informal treatment facilities.
- Trade in secondary raw materials – Whilst there has been an increase in the trade of secondary raw materials, policy drivers are insufficient to drive further increase in the future trends (perhaps incentivise through reward mechanisms)

Impact Beyond the EU on Waste Management

- There is likely to be an influence from issues outside EU legislation such as markets and prices of natural resources, as well as by recent higher-level political recognition.
- Local resources will be used more predominantly. There will be less export of secondary materials with the development of more local manufacturing plants.
- Trends in the shipment, export and import of waste materials – To date the EU export market has consisted of sending low-quality recyclable material to Asia and the Far-East. This market has now ceased due to the recession, with more focus on quality materials. This may result in a re-balancing of the import-export dynamics, with high grade recyclate produced initially for the domestic market and after that for the export market.
- Increased integrated management of biodegradable wastes, leading to a reduction in exports of paper and card waste. Increased recycling and energy recovery from paper and card which can no longer be recycled as part of an integrated unit. Use of anaerobic digestion to generate energy whilst retaining the nutritional benefit of the digested waste for use on land.

2.2.3 Conclusions – Connecting Past and Future Waste Trends

When combining the conclusions from the modelling analysis and from experts regarding the future trends in waste management it is clear that the EU continues to have a significant environmental footprint associated with waste. Moreover, waste generation is considered to remain a challenge and not anticipated to decrease unless additional policy measures are put in place. The modelling exercise points to shifts towards recycling, composting and incineration and away from landfilling. However, the investment costs associated with the change are likely to be significant. There are concerns among stakeholders that such shifts may not occur unless there is additional investment and that the economic crisis will limit the ability of Member States to invest in future infrastructure. Moreover, there are concerns about the quality and

effectiveness of this shift in waste management given the lack of environmental standards to be applied to recycling etc.

Increasing levels of recycling has the potential to kick start the market place for secondary raw materials, but again stakeholders consider that additional policy measures are needed to ensure the effective development of such a market. The expansion of this resource is considered contingent on the development of better mechanisms for ensuring the effective reprocessing of materials and the access of quality secondary raw materials to the market place. Within this collection systems are considered to be key.

The role of countries external to the EU will expand into the future both in terms of processing EU waste and the management of secondary raw materials. The modelling results suggest a massive expansion in exports of waste form the EU to third countries. Again it was considered that a focus on the quality of waste materials and reprocessing efforts would be necessary into the future to secure the EU's place on the market for recyclables and also to retain the reprocessing of materials within Europe.

The above trends and issues have been taken into account when determining the development of conclusions and recommendations throughout this analysis.

3. CHAPTER 3 – DELIVERING A RECYCLING SOCIETY AND MARKETS FOR RECYCLING

3.1 DEFINING A RECYCLING SOCIETY IN EUROPE AND ITS CHARACTERISTICS

The term recycling society was coined in the Waste Thematic Strategy; the delivery of a recycling society across the EU was seen as a key goal of the strategy and ultimately associated waste policies. There has, however, been some debate as to the characteristics that might define a recycling society and how Europe might demonstrate its progress towards delivering this. This study has examined both the concept of a recycling society, the characteristics that might define such a society and compared this to the data availability. Within this section we attempt to set out a first proxy for the delivery of recycling societies across Europe.

3.1.1 DELIVERING A RECYCLING SOCIETY IN EUROPE – A KEY OBJECTIVE OF THE WASTE THEMATIC STRATEGY

The Waste TS set as a clear goal, the creation of a recycling society in Europe. Key to the delivery of this concept is the need to develop collection schemes that provide quality waste products, and generate markets for the reprocessing of waste and outlets for the secondary raw materials produced. The Thematic Strategy specifically states that 'The long-term goal is for the EU to become a recycling society, that seeks to avoid waste and uses waste as a resource' this should 'move the EU decisively onto the path of becoming an economically and environmentally efficient recycling society. The current level of environmental ambition will be maintained and enhanced while providing the basis for sustained growth'. Two conditions for the creation of a recycling society in Europe were identified: the need for a level playing field for recycling in Europe; and that recycling should be environmentally sound

Relevant actions proposed to enhance a recycling society in the Thematic Strategy were:

- introducing efficiency criteria for selected recovery processes under the Waste Framework Directive and developing guidelines for the application of certain provisions of the Waste Shipment Regulation to combat sham recovery;
- spreading good practice through minimum standards in the Waste Framework Directive for relevant recovery processes and future extension of the scope of the IPPC Directive to selected waste management activities;
- adding a new provision to the Waste Framework Directive to allow the adoption of environmental criteria for specific waste flows in order to specify when they no longer fall under the scope of waste legislation but are to be considered products instead.
- information exchange on disposal tax regimes
- recycling targets - the level of targets should be fixed taking into account the scope of the definition of recycling for the different materials.

It is commented in the strategy that the strategy's review should assess the need for further measures to promote recycling. In particular, it will consider moving towards a more material-based approach and the possibility of using producer responsibility. This would involve assessing whether the market is likely to drive the development of recycling of a given material adequately on its own or if measures are needed to overcome obstacles to recycling.

3.1.2 WHAT IS A RECYCLING SOCIETY?

Within the assessment of diffusion completed for this study (see section 4.1 for full details) recycling society was one of the least diffused of the key concepts set out in the Waste Thematic Strategy. The

researchers considered that the reasons for this are two fold: firstly Member States officials and policy makers are unclear as to what a recycling society would ultimately look like; and secondly that the ideal of a recycling society 'that seeks to avoid waste and uses waste as a resource' encompasses many other concepts, policy objectives and requirements within it.

As part of the analysis for this study the team has examined the question of what is a recycling society in order to develop a series of characteristics that might be anticipated to be demonstrated by such a society and in turn develop some form of assessment approach to identify Member State performance towards this goal. This has been completed with the assistance of stakeholders both as part of input provided by the expert group and during discussions at the stakeholder workshop on 22 June 2010. This analysis led to the following conclusions as the characteristics that should be exhibited by a recycling society (see Box 3).

It is vital to note that the goals and characteristics that define a recycling society are not confined purely to delivering higher levels of recycling, this term is a proxy for referring to the wealth of activities that contribute to the delivery of better waste management and waste prevention in Europe, in essence a short hand term for the desire to move waste consistently up the hierarchy. Many stakeholders felt that the term 'recycling society' risked being interpreted too narrowly as the promotion of recycling and that this goal would be too simplistic. They were, however, supportive of the wider interpretation of a recycling society being that which has pushed waste management up the hierarchy, that is avoiding waste (and as such managing resources efficiently) whenever possible and when generated is making efficient use of the waste resources. It is on this basis that the following discussions as to the delivery of a recycling society in Europe are based.

Box 3 Defining the characteristics of a recycling society

The following represents a list of the key factors identified throughout the study as important to the conception of what is a recycling society. These are based on discussions with stakeholders and policy makers.

- A society where overall levels of waste generation are low and trending downwards.
- A society where disposal for its own sake is no longer the norm and that success is no longer defined in the avoidance of landfilling or disposal.
- A society should be based on the principles of efficient use of resources, of prevention and reuse as well as the efficient use of waste once generated.
- A society that not only better recycles its waste but then makes use of the emerging secondary raw materials in an efficient way leading to better resource management.
- A society where products are designed to be reused and recycled, except in cases where there are good reasons not to.
- A society with tools to implement and enforce effective recycling legislation.
- A society with tools to stimulate the growth of the recycling sector and the use of secondary raw materials.
- A society where goods are recycled to a high standard resulting from an emphasis on source separation and the delivery of high quality recyclables.
- That the emphasis is the delivery of quality recycling rather than recycling as an end point, the goal is environmental protection and the better use of resources.
- The desire to deliver a recycling society should have mainstreamed into the consciousness of citizens, not simply separate industries working alone but a whole chain aimed at delivering an economy wide solution.
- A society where the level of secondary raw material is maximised
- A society where products are designed to aid recycling and to make use of secondary raw materials
- A society where efforts are made to prioritise the appropriate flow of raw materials and their efficient use

- A society where policy mechanisms including economic instruments are set in place to favour recycling materials compared to virgin material

3.1.3 Indicators and Data Availability – Monitoring the Delivery of Recycling Societies in Europe

Based on the list of characteristics of a recycling society identified indicators that could be used to assess a Member State's or the EU's performance towards delivering a recycling society were identified under seven categories: waste generation; prevention and reuse; recycling; energy recovery; waste disposal; environmental impact of waste management; quality of policy measures and its implementation; and the extent to which secondary raw materials are used. For each indicator the data available to enable an EU wide comparison of the performance of all 27 Member States was examined, based on the extensive data review presented in the factsheets supporting this project – see Annex 2.

There are two aims of this work, to inform the Commission regarding a potential set of indicators to be used to assess a recycling society and, given the available data, to identify what information is currently available and as a consequence which indicators it is possible to assess against at present. Table 11 below presents the long list of indicators identified along with an analysis of the data availability related to each – in so doing it should also be noted that this provides an assessment of the availability and quality of all the key sources of waste data in Europe. Within the table the final column provides an assessment of the information that can currently be used to review the progress of Member States towards the delivery of a recycling society – outputs of this assessment are presented in chapter 4. Alongside this the priority gaps in data, that currently significantly limit the ability at provide a true assessment of performance towards a recycling society, are highlighted.

Table 11 Comparative assessment of potential indicators of a recycling society and the data available to monitor against this range of activities.

Green highlighting indicates a data set that can be used as of now to comparatively assess Member State performance towards a recycling society. Blue highlighting indicates priority areas that should be taken forward in terms of delivering new data to enable assessments against key indicators.

Recycling Society Characteristic	Issue	Potential Indicators	Data Availability	Gaps and Issues	Use as an Indicator of Recycling society
A society where overall levels of waste generation are low and trending downwards	***Waste generation***	Declining and consistent trend toward reductions in total waste generation coupled with a declining trend in generation in key sectors ie MSW, industry, hazardous waste	Total generation of waste – only two data points 2004-200	Limited trend data for the EU 27 – only 2 data points 2004 and 2006	Overall generation of waste and whether not this has increased or decreased between 2004 and 2006 could be used as indicators while acknowledging the severe limitations in the data set regarding trends. Could offer a useful basis as data volume increases overtime
			Generation of MSW – extensive data potential trend data for EU 27 from 1997-2008	Some limitations in applicability - some countries data is estimated and there are questions so to whether Member States are comparing the same measures ie municipal waste vs household waste	One of the best data sources with longer term trends possible allowing identification of rate of change – although limitations still exist with a need to better standardise MSW data sourcing
			Generation of Construction and demolition waste	Lack of consistent data, but possible for the future given that reporting requirements are to be amended in line with WFD requirements. OECD holds data for 15 of 27 MS	Not possible at present but potential to use into the future once more effective monitoring is established
			Generation of Industrial waste	Data reporting required under waste stats reg but lack of good quality time series – only 2004 and 2006 data points – Eurostat provides data for commercial and industrial waste combined	Considered not usable at present given the limited time series and different monitoring basis. Data needs to be adjusted before it can be used to provide a reliable indicator as industrial activity varies significantly by Member state and therefore purely comparing overall generation would bias the results. Ideal would be to use trend data.
			Generation of hazardous waste	Reliable trend data not currently available	Detailed information regarding reductions in the use of hazardous materials in

					products etc would be useful in determining the broader awareness of lifecycle impacts across the society.
		Decoupling of waste generation from GDP and /or Comparatively low levels of per capita waste generation coupled with GDP success	Limited time series data for total generation Proxies possible using MSW and GDP data. The latter is available as overall level of GDP or perhaps more meaningfully based on Purchasing Power per Inhabitant – allows differences in population size to be taken into account	Lack of time series information for total generation of waste. Assessments should be based on purchasing power rather than overall GDP adjusting for variable coutry size. Issue that there was rapid growth in the 1990s and 2000s followed by the recent credit crunch – questions over the reliability of any conclusions on decoupling reached as GDP may simply have grown at a faster rate than waste generation is capable of. Decoupling should not be assumed based on this comparison alone	Potentially most usable indicator at present is MSW generation compared to Purchasing Power per capita. Should be developed further info the future to allow account to be taken of rapid GDP shifts eg due to the credit crunch or 1990s boom. Ultimately should take account of overall waste generation as well as the sectors once reliable time series are available
A society at prioritises the efficient use of resources, of prevention and reuse as well as the efficient use of waste once generated.	***Prevention and Reuse***	An established industry based around the reuse and preparing for reuse of goods	Not available at present	Currently no data available on this – ACR+ looked at the question of collating data on reuse	Data on reuse and prevention - not available at present but central to evaluating the performance of MS in moving up the hierarchy
		Evidence of a decline in total generation, once changes in population and economic growth have been accounted for	Not available at present		
A society that not only better recycles its waste but then makes use of the emerging secondary raw materials in an efficient way	***Use of secondary raw materials***	The extent to which secondary raw materials have penetrated the markets for metals, plastics, paper/cardboard.	Not available at present	At present there is no clear monitoring mechanism for assessing the levels of materials in total placed on the EU market or overarching use of secondary raw materials in products used by the EU. Monitoring mechanisms for this, identifying how best to take account of EU consumption and EU production,	Separate indicators would be required to monitor individual waste streams. Some comparative analysis of the levels of secondary and primary raw materials placed on the market would be of use.
		The extent to which the use of secondary raw materials is reducing the overall level of primary	Not available at present		Some proxi for assessing whether the overall level of EU primary resource use is declining as secondary raw materials use rises would be of use. This would enable

leading to better resource management. A society where products are reused and recycled, except in cases where there are good reasons not to		resource use.		would need to be developed. IN the case of the former, this would include impacts of imports of products not produced within the EU	the declining EU footprint in terms of natural resource use to be tracked.
	Recycling	High coverage of recycling collection	Data on the percentage of the population covered by MSW collection	Some data estimated, does not provide any indication of the quality of coverage and whether this simply represents access to collection, household collection, availability if requested but not automatically provided etc	Data is relatively reliably provided for all 27 MS on recycling collection for MSW but provides little detail over the key aspect which is quality.
		Quality recycling collection ie high levels of sorting etc to ensure quality materials result – lack of consistent data – see fact sheet 4, collection is not necessarily synonymous with recycling	Not available at present	Data on collection does not cover the mechanism for collection or the level of sorting of different materials/quality of resultant recyclables	Data on the quality of recycling collection currently not available – but would be central to evaluating performance
		Rising levels of recycling with statistics based on actual reprocessing levels rather than collection - Recycling levels as a percentage of waste generation, ie that high quantities of recycling is not necessarily good if driven by high levels of waste generation	- Recycling data — available for packaging waste (including trend data for EU 15, but more limited for EU 12 either commencing 2004 or 2005); total municipal waste recycled – kg per capita by category but only EU 25; total municipal waste recycled – for all from 2001 – 2006; total municipal waste recycled as a % of generation; construction and demolition waste - Data is also available for the level of composting in given MS	Lack of consistent methodologies to calculate levels of recycling across the Member States, high potential errors in terms of total levels of especially MSW recycling. Some MS know to be using levels of collection rather than processing. Limited time series data for EU 27 assessments Most extensive data sets focus on packaging waste and MSW % recycling Construction and demolition waste – no consistency in reporting at present Composting data is largely estimated and inconsistent, therefore difficult to make reliable use of at present Overall rates of recovery only available for 2006 – can be turned into a proportional assessment of	Data for MSW and packaging waste recycling could be used at present as proxies for overall level of recycling. Ability to assess trend information for packaging waste is however limited for all 27 MS given the lack of information beyond 2004/2005. MSW assessments are possible including time trends, however, there are known to be inconsistencies in measurement therefore both time trends per MS and overall level of achievement will both be used in order to ensure a more balanced comparison. Assessments of recovery as a % of overall reported treatment of waste for 2006 will be provided – although no time series assessment is possible. Data can not be used in its raw form i.e. tonnes recovered
		High overall rate of recycling and across the key sectors/material flows			

			- Overall rates of recovery in units comparable to other treatment technologies	waste treatment	due to the imbalance in levels of waste generation.
		Established environmentally responsible routes for treating the recyclables	Data not currently available in a consistent form	Details regarding the environmental efficiency are limited, no consistent measure of the proportion of recycling that is dealt with by recycling facilities using best environmental techniques	This is key to establishing the environmental responsibility of the societies recycling trend and therefore whether benefits of recycling are being maximised. Effective future assessment should incorporate some form of proxy for this
		An established network of high efficiency recycling installations	Data not currently available on the network of recycling installations or their efficiencies. However, date is available looking at the levels of export of waste for treatment from MS potentially providing an indication of levels of facility availability in a given country	Details on the percentage of waste exported are available	Data on export of waste is useful but it is difficult to determine at present the role of this in determining whether or not a country can be considered a recycling society. It could be considered that high levels of export indicate a country is not a recycling society as it does not have the capacity to deal with its own waste, however, in a global market place it is unclear if such a supposition is valid.
		That levels of key materials including biodegradable waste disposed of to landfill are decreasing	Measurements of the level of biodegradable waste going to landfill	This data is inconsistently monitored across the EU, moreover much is based on estimation as unless waste is separately collected it is impossible to accurately assess this	Not considered to be a key indicator for a recycling society into the long term.
	Energy Recovery	Trend showing energy recovery in tandem with recycling rates and pure incineration and landfilling decreasing	Data on the level of energy recovery per MS for 2006 but no trend series currently available meaning this is difficult to compare to other trends	Questions over statistics relating to energy recovery due to the lag time in terms of implementing the WFD review and requirements specifying recovery activities	Potentially useful assessment for the future as energy from waste becomes more established to ensure that this is not occurring at the expense of other recovery operations and is reducing levels of disposal activity
		Most efficient plants are being used to generate energy from waste	No data held at present regarding the efficiency of different plant and their capacity	Data could usefully be developed for plant capacity and efficiency levels per MS as there are not large numbers of incineration plant	Would be a useful assessment mechanism for assessing the performance of plants used in different MS

A society where disposal for its own sake is no longer the norm and that success is no longer defined in the avoidance of landfilling or disposal	***Waste disposal***	That the capacity of recovery facilities is equal or greater to the capacity for disposal	Data on waste treatment facilities – number per treatment option and capacity in tones per year (incineration, energy recovery and recycling) and m3/year (landfill)	The ability to compare the capacity of different waste treatment facilities is impeded by the different calculation method for landfill capacity vs the other forms.	The lack of consistent units means at present comparison is not possible but could be relatively easily amended or some estimated mechanism for conversion could be used to allow comparison in future. This would potentially be an enlightening comparison especially of EU wide capacity.
		That there is a diversity of waste treatment facilities and operators	Not currently available	Limited data available on market share in different MS of key operators.	Not seen as a priority for the future unless there are specific concerns regarding the dominance of certain elements of the waste sector.
		That there is a trend towards investing in increasing levels of recovery capacity rather than in new disposal capacity	Note that this trend may differ for newer MS/MS with less developed waste management schemes as they my still be investing in eg higher quality landfill capacity to deal with the needs in terms of the landfill or WFD re environmental protection	Key to assessing the future picture of waste management facilities and ambition in terms of EU levels of treatment/disposal. Also key in the context of future EU budget round	This would seem like a useful indicator, however, it would need to consider both public and private funding levels. The assessment should be comparative ie disposal vs recovery operations. However, some mechanism should be found to take account of the differing potential investment needs in these sectors.
		That disposal is trending downwards having reached a low level	Data on MSW landfilled – Eurostat Data on MSW incinerated – Eurostat	Trend information in treatment options – ie recycling, landfilling, composting, incineration – historic data incomplete for many newer MS Data not available for all waste just MSW	Useful assessment based on trends, attempt to be made to combine data to provide information on disposal trends based on the two key disposal mechanisms. Only possible for MSW at present, ideal would be to look at the total levels of disposal. To be compared as a proportion of total waste generated
		That landfill is decreasing while waste generation levels are increasing	Data available on trends in landfill use and generation of waste per MS are available for MSW	Potentially useful comparison taking account of limitations in trend series data.	Comparative information for MSW generation and landfilling possible but given assessment above considered of less relevance
A society where the goal is the goal is environmental protection and the	***Environmental impact of waste management***	Reducing levels of GHG emissions from the waste sector over time	Total GHG from the waste sector 1995 – 2007 – Eurostat	Good trend data	Trend in levels of GHG emissions from the waste sector – i.e. + or – and rate of change
		Declining proportion of all	GHG emissions as a	Good trend data	Trend in waste sector emissions – is the

better use of resources		GHG emissions contributed by the waste sector	percentage of the total emissions – 1995 – 2007 - Eurostat		contribution overall growing of declining – to be assessed in combination with trends in overall waste emission - above
A society with tools to implement and enforce effective recycling legislation	***Quality of Policy Measures and its implementation***	Policy measure exist to drive up levels of recycling, reuse and recovery and reduce levels of disposal	Policy lists available at the EU, but not at the MS level	Data not currently available across MS	Useful area in which to understand more regarding the practices of Member States although arguably the success of a recycling society is delivering change in management practices rather than simply having in place relevant tools. Therefore, for assessing the progress towards a recycling society these measures are of less use, however, they are key to understanding how a MS is delivering these goals they are key. Therefore, should be prioritised non the less.
		That policies are driving effective change	Need for trend data and significant time spans to identify if policy is having an impact	Data not currently available across MS	
		That policies are implemented and monitored in order to ensure success	Data available on the implementation by MS of EU policies	Data not currently available across MS	
		That policies are tailored to deliver change across the different sectors including the use of a variety of policy tools	Need details of the key waste policies being used at MS level to drive forward changes in waste management and their focus	Data not currently available across MS	
		That policy focuses on reducing waste generation and delivering environmentally responsible, efficient treatment of waste	Review of policies and their focus	Data not currently available across MS	

3.1.4 CONCLUSIONS - DEFINING AND MONITORING THE DELIVERY OF A RECYCLING SOCIETY

The concept of a recycling society in Europe was introduced within the Waste Thematic Strategy, however, based on assessments of the use of this term in policies at EU and Member State level, it has yet to widely be adopted in common use to define achievements in the waste sector.

The most important reference in the Thematic Strategy helping to define what might be considered a recycling society is as a society 'that seeks to avoid waste and uses waste as a resource'. As such it is concluded that such a society would have pushed waste management up the hierarchy, would be avoiding waste (and as such managing resources efficiently) whenever possible and, when generation of waste is necessary, making the most environmentally efficient use of the resulting resource. As such demonstrating achievement towards a recycling society could be considered to be fundamental to delivering resource efficiency within a society.

Based on the this broad conception of a recycling society numerous potential indicators were identified, however, only a limited number can currently be made use of due to the significant limitations in the data set relating to waste management. This either relates to a lack of data collection in a given area ie on prevention, reuse and the environmental performance of recycling activities or a lack of time series data for all 27 Member States preventing the most effective comparative assessments. As a consequence only the following data can currently be used to assess the achievement of Member States towards delivering a recycling society:

1. Overall levels of waste generated and the scale of increase or decrease between 2004/2006 – only time series available
2. Long term trend in terms of the generation of Municipal Solid Waste (MSW)
3. MSW generation compared to Purchasing Power per capita to provide a proxy of related to decoupling – although limited time series means conclusions must be caveated
4. Percentage of the population with access to MSW recycling collection – although this does not provide an indication of the quality of collection schemes
5. Overall level and short term trends MSW and packaging recycling – although time series data is limited
6. Assessment of recovery as an overall proportion of reported waste treatment for 2006
7. Trends in disposal including levels of landfilling and incineration of MSW
8. Trends in the overall level of greenhouse gas (GHG) emissions by the waste sector and as a proportion of total GHG emissions per year

Fundamental gaps in the ability to assess performance of achievement towards a recycling society – In addition to limitations associated with limited time series data (which apply to many data sets the assessment identified several key areas where the absence of data seriously inhibits the ability to reach effective conclusions concerning the delivery of a recycling society. These are:

1. Lack of standardisation in the collection of data regarding the collection and management of MSW. Given the importance of this data set as an indicator its improvement and standardisation is considered vital.
2. Data on reuse and prevention (or some form of proxy for this) are central to evaluating the performance of MS in terms of moving up the waste hierarchy and assessing the efficiency of their reuse use.
3. Data on recycling collection rates and overall recycling rates doe not take into account the quality of the recyclables collected nor the environmental standards under which and to which the materials are reprocessed. Both elements are key to securing a robust and environmentally responsible recycling market.
4. A lack of consistent use of units means that at present comparisons are not possible between the capacity of facilities in the EU for recovery and disposal. This is due to landfills being recorded in m3/year while other facilities are recorded as tonnes/year. This could be relatively simply addressed to provide a useful assessment of capacity in Europe.

3.2 COMPARING MEMBER STATE PERFORMANCE – DELIVERING RECYCLING SOCIETIES ACROSS EUROPE

3.2.1 APPROACH

A comparative assessment of Member State performance has been completed based on the data analysis set out in section 3.1 on defining a recycling society. The following section assesses progress towards delivering a recycling society based on the most reliable data sets and indicators available at this point in time. Table 13 below ranks Member States in relation to their performance against all the indicators being used in this assessment.

In total eight data series have been identified and used within this assessment to compare MS performance, these are set out in Table 12 along with the issues they demonstrate. It should be noted for some issues more than one proxy has been used as the basis for assessment. This is because it was felt important to demonstrate not only the rate of change or the level of overall performance within the most recent reliable data set, but both. The importance of this is dual assessment process is demonstrated in Figure 44. This shows both the rate of change in recycling levels of MSW (a) and the overall performance in terms of MSW recycling per MS (b) – based on figures provided by Eurostat. Alone neither proxy provides a fair picture of performance within a given MS. By looking at Figure 44a alone those Member States with the highest rates of change would be selected as most advanced. Meanwhile by looking at 44b in isolation those MS with the highest overall levels would be selected with no understanding of the rate of change or scale of recent improvements made ie the direction of travel. When used together, data from Figures 44a and b, enables an assessment of the level of a MS achievement and also its ambition i.e. the rate at which it is delivering improvements. Both these different proxies are important in determining the progress a given MS is making towards being a recycling society.

Figure 44 a - Demonstrating the rate of change in the recycling of MSW per Member State (2001 – 2005)

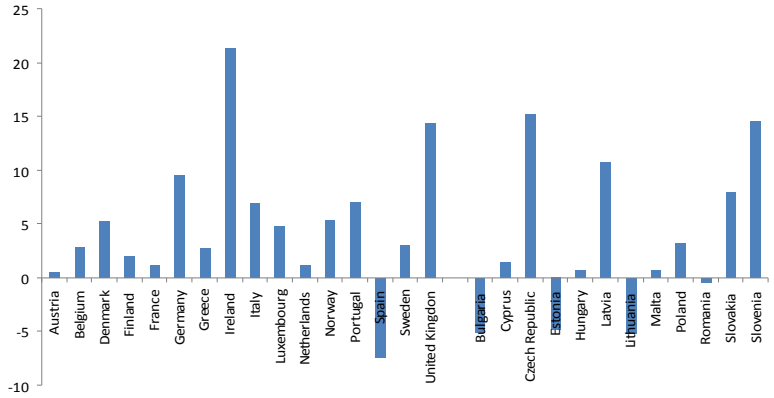
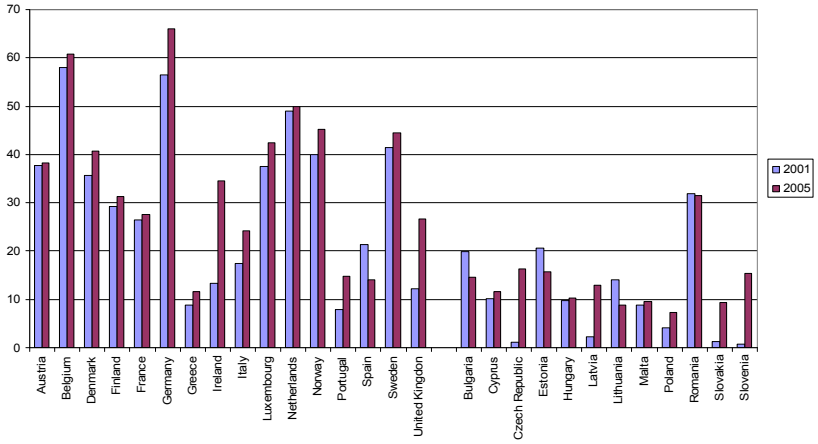


Figure 44 b - the overall proportions of MSW recycling achieved per MS (2001 and 2005)



Given the limitations of the existing data sets it is not currently possible to reliably use the same base years for all the different data sets analysed within this assessment. In order to ensure that the maximum data is available for use the most reliable periods, based on data submitted primarily to Eurostat, have been used. Into the future this assessment would ideally be completed for the same base years for all the data sets. However, importantly this will require more reliable trend information.

Table 12 Indicators, data sets and ultimate measurement proxies used within the assessment of MS performance towards a recycling society

Indicators	Data sets – Provided by Eurostat	Analysis Proxies Used
Waste Generation	Generation of total waste – 2004 and 2006 Generation of MSW – 1997 to 2008	% change in overall waste generation % change in MSW generation per capita MSW generation per capita in 2008
Recovery rates	Treatment of waste - 2006	Material recovery as a proportion of total waste treatment
Recycling rates	Recycling of MSW - 2000 to 2005	% change in MSW recycling Proportion of MSW recycling - 2005
Disposal rates	Landfilling of MSW – 1997-2008	Landfilling per capita (kg) - 2008 % change in landfilling per capita
Environmental impact Resource use?	GHG emissions data - 1997 - 2007	% change in GHG emissions from waste (Co2 equivalent) % of total GHG emissions contributed by the waste sector - 2007

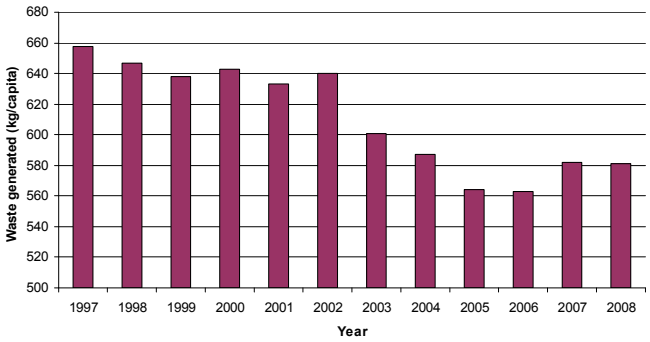
3.2.2 COMPARATIVE MS PERFORMANCE – A SPATIAL COMPARISON

Based on the data set out in Table 12 spatial mapping exercises were be conducted in order to compare and contrast MS performance and allow an assessment of the relative state of delivery in terms of a recycling society. Mapped information is provided in

Figure 46 for some of the key data sets, offering an insight into the relative distribution of performance across the Member States.

The spatial analysis clearly shows that there are differing patterns of waste management occurring across the MSs depending on the indicator applied. Information on the generation of waste shows Eastern Member States such as Poland, the Czech Republic and Latvia showing the lowest levels of waste generation in terms of kg per capita in 2008. When it comes to looking at MSW generation trends over time again Eastern MS show the highest levels of decline between 1997 and 2008, however, in addition Germany has jumped into the top three along with Slovenia and Bulgaria. Historically Eastern European Member States have had lower levels of MSW waste generation per capita and have shown declines in waste generation, this has been considered a consequence of lower levels of economic activity and a decline in industry levels. The addition of Germany appears to be an anomaly. Figure 45 shows a steady decline in the level of MSW generation in Germany until 2006, rising to higher levels in 2007 and 2008. The decline may be a consequence of improved waste management activities, as based on other proxis Germany is considered one of the leaders in this area, or alternatively it could be linked to economic change associated with shifts in the former East.

Figure 45 Graph showing the shift in MSW generation in kg/capita for Germany between 1997 and 2008



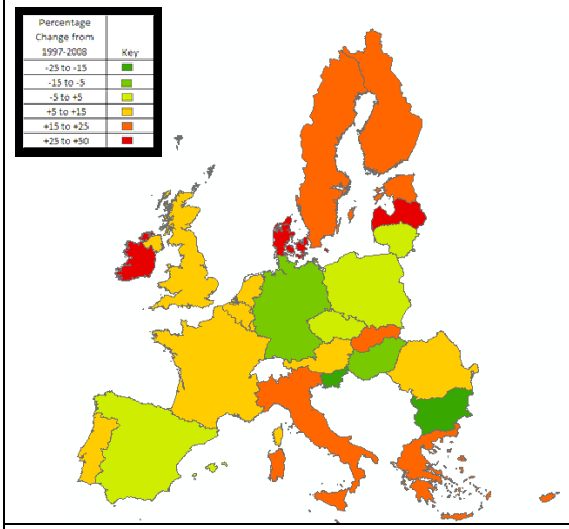
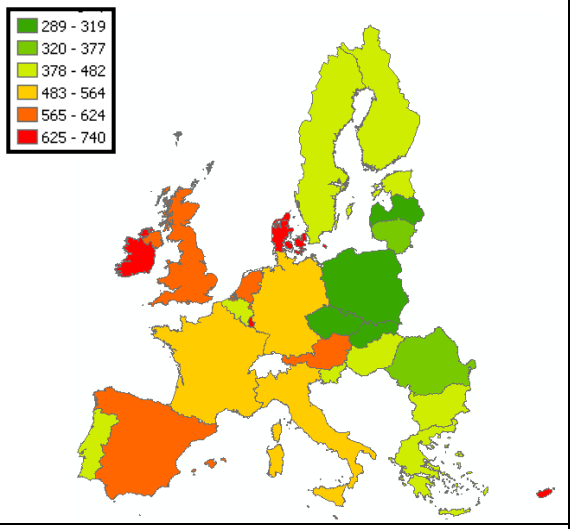
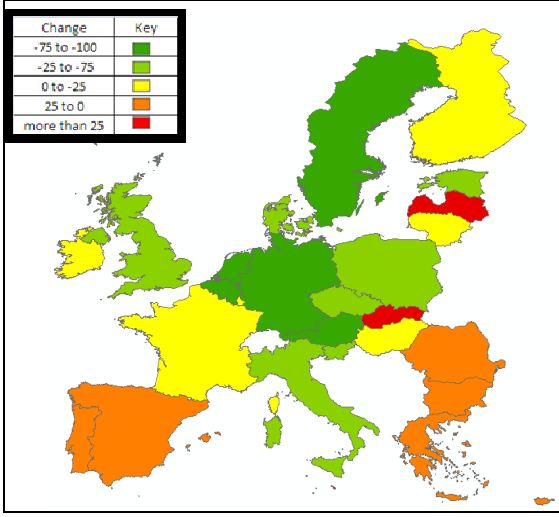
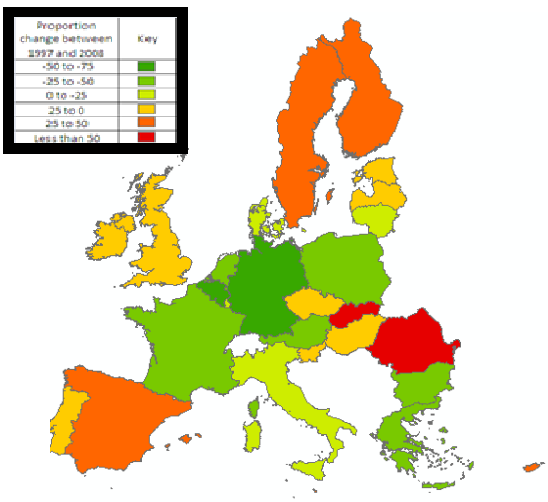
In terms of reducing landfilling of waste per capita Germany and the Netherlands both fall in the top 3 in terms of proportion of landfilling reduction. This is interesting given that both also fall in the top three in terms of having the lowest overall levels of landfilling per capita. Obviously this means that they need to reduce the landfilling by a lesser volume in order to make an impact on their landfill levels, but importantly it indicates that they are continuing to reduce landfill levels despite the low baseline. As discussed earlier the levels of GHG reduction from the waste sector appear to following the same pattern as reductions in landfilling across the Member States given associated declines in methane emissions. It should, however, be stressed that these figures to not fully take account of the emissions avoided in Member States as a consequence of shifting their management practices away from landfill to, for example, recycling. Arguably those Member States who have achieved high increases in recycling over the period, in addition to declines in landfill, should receive some form of bonus when it comes to assessing their GHG emissions levels. Not only is the direct decline important, as can be seen in these figures, but also the additional avoided emissions by shifting waste management practice.

Patterns of recycling rates over time are significantly different, for example, from landfilling reduction rates. Despite demonstrating relatively low overall levels of recycling Ireland and the UK both demonstrate a relatively high rate of change in recycling rates i.e. they are rapidly improving their performance. Interestingly, Germany despite having the highest overall level of MSW recycling, is also demonstrating a significant positive change in terms of its trend in MSW recycling over time (i.e. an increase in 10% between 2001 and 2005) suggesting that efforts have not ceased despite the high levels of achievement. The Netherlands and Belgium also sit in the top three in terms of the overall level of MSW recycling. However, these countries show only low levels of improvement over the 2001 to 2005 period i.e. 1% and 3% respectively. This suggests that there are factors preventing the further rapid expansion of recycling activities in these Member States, causing the level of achievement to plateau at a given level. Further work should be conducted to consider if such Member States are encountering barriers to further recycling increases or if, for example, this is an artefact of changing economic or social conditions. It is important to understand at what levels recycling achievement can be considered to have reached a maximum level and if there are specific limitations determining this. This can be

used to help inform better target setting and also develop policy mechanisms to help break through to higher rates into the future.

While it is important to recognise the higher achievers and build on their example, it should be noted that specifically in relation to recycling of MSW there negative changes are also occurring in some Member States. For example, Spain is showing the high levels of reduction in terms of its recycling rate for MSW with the overall level of achievement dropping by 7.4% between 2001 and 2005 i.e. from 18.4 to 14%. Poland, Lithuania and Slovakia, have achieved the lowest levels of recycling overall (although it should be noted that data from Lithuania appears to be less reliable with considerable jumps in performance over time). Meanwhile Malta, Hungary and Cyprus have low levels of recycling and are showing low levels of increase in performance, with the former two achieving less than a 1% increase in recycling rate between 2001 and 2005. There are, therefore, major disparities between Member State ultimate performance and also between their level of ambition in terms of rate of increase. When developing policies the EU needs to find mechanisms for continuing to support the expansion of recycling in the higher achieving nations and simultaneously increasing and supporting higher levels of improvement among the poorer performers.

Figure 46 Mapping MS performance against key waste parameters – A comparison of achievement

<table>
<tr><td>MSW Generation – 1997 – 2008 - % Change</td><td>Total MSW Generation – 2008 – kg per capita</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Landfilling of MSW per capita – 1997 – 2008 - % Change</td><td>Percentage Change in GHG emissions from the waste sector – 1997 – 2007</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

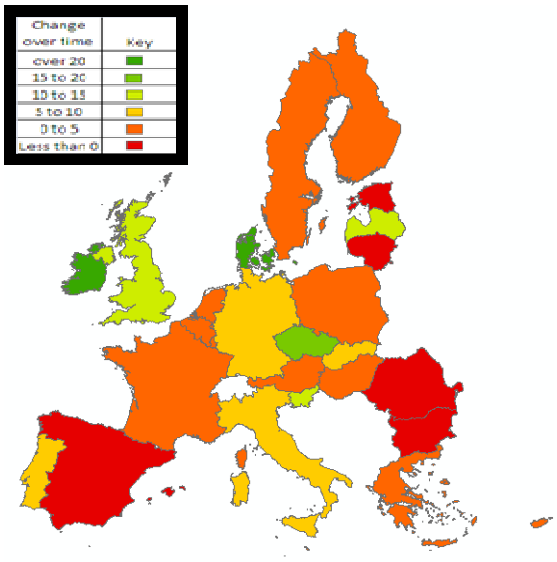
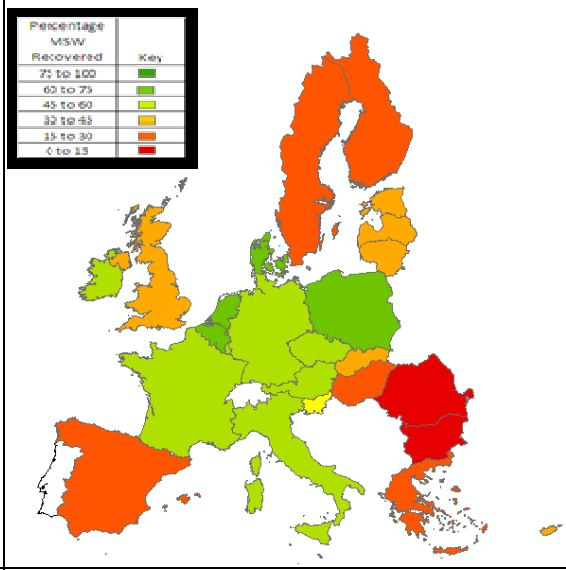
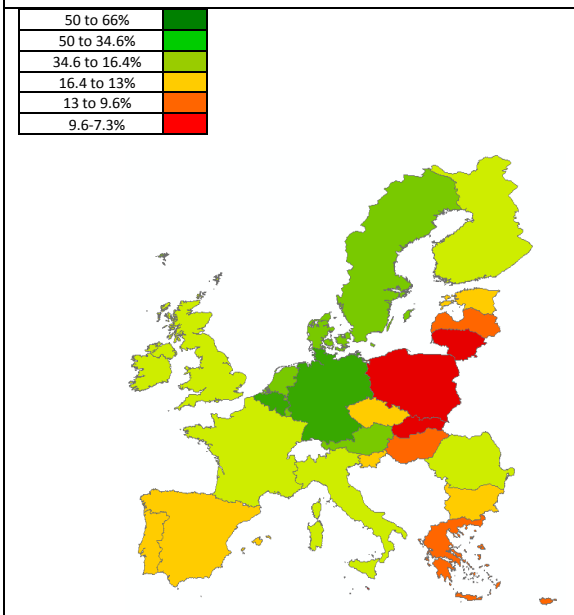
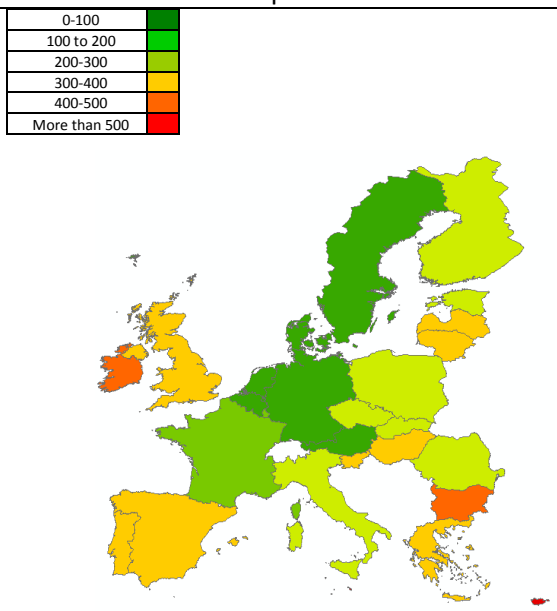
Total MSW Recycling Rate - Percentage Change between 2001 and 2005 – note that the classificatoin of Denmark is considered incorrect due to anomolies in the data set specifically impacting 2001	Proportion of total MSW Recovered – 2006
	
MSW recycling rates – 2005 - Percentages	Level of waste landfilled – 2008 – kg per capita
	

Table 13 Comparative table ranking Member States by their performance against the 11 indicators selected for the assessment of recycling societies in Europe

Rank	Overall Generation of waste (2004-2006)		MSW Generation per capita - % change (1997 – 2008)		MSW Generation per capita - Overall level (2008)		Material recovery as a proportion of total reported waste treatment (2006)		MSW Recycling rates - change in recycling rate 2001 - 2005		MSW Recycling rates as (2005)		MSW collection rates (% of population with access to MSW collection 2006)		Levels of landfilling per capita (kg) (2008)		% change in landfilling rate per capita (1997-2008)		Reduction in GHG from waste sector (tonnes of CO2 equivalent) (1997-2007)		Proportion of total GHG from the waste sector (2007)	
	Country	% change	Country	% change	Country	Rate	Country	%	Country	Change	Country	Rate	Country	%	Country	Rate	Country	% change	Country	% change	Country	% GHG
1	Cyprus	-21	Slovenia	-22	Czech Republic	306	Netherlands	84	Ireland	21.3	Germany	66	Belgium	100	Germany	3	Germany	-99	Germany	-66	Malta	0
2	Czech Republic	-15	Bulgaria	-19	Poland	320	Poland	81	Czech Republic	15.2	Belgium	61	Czech Republic	100	Netherlands	7	Austria	-90	Belgium	-64	Bulgaria	1
3	Romania	-11	Germany	-12	Latvia	331	Denmark	80	Slovenia	14.5	Netherlands	50	Denmark	100	Sweden	15	Netherlands	-90	United Kingdom	-51	France	1
4	Hungary	-10	Hungary	-7	Slovakia	332	Belgium	77	United Kingdom	14.4	Sweden	44	Germany	100	Austria	19	Sweden	-88	Poland	-47	Spain	2
5	Estonia	-9	Czech Republic	-4	Romania	382	Germany	70	Latvia	10.7	Luxembourg	42	Greece	100	Belgium	25	Belgium	-80	Netherlands	-47	Poland	2
6	Bulgaria	-4	Lithuania	-3	Lithuania	407	Ireland	68	Germany	9.5	Denmark	41	Spain	100	Denmark	35	Denmark	-46	Finland	-38	Estonia	2
7	United Kingdom	-3	Poland	2	Greece	453	Czech Republic	67	Slovakia	8	Austria	38	France	100	Luxembourg	131	Estonia	-41	Sweden	-34	Germany	2
8	Germany	0	Spain	2	Hungary	453	Italy	65	Portugal	7	Ireland	35	Italy	100	France	193	United Kingdom	-33	Bulgaria	-33	Italy	2
9	Spain	0	Netherlands	5	Slovenia	459	Luxembourg	64	Italy	6.9	Romania	32	Cyprus	100	Czech Republic	218	Czech Republic	-31	Austria	-32	Belgium	2
10	Austria	2	United Kingdom	6	Bulgaria	467	Austria	63	Denmark	5.2	Finland	31	Luxembourg	100	Poland	228	Slovenia	-31	France	-28	Latvia	3
11	Finland	4	Belgium	6	Portugal	477	France	62	Luxembourg	4.8	France	28	Malta	100	Estonia	248	Italy	-26	Greece	-27	Austria	3
12	France	4	France	9	Belgium	493	Slovenia	48	Poland	3.2	United Kingdom	27	Netherlands	100	Slovakia	250	Poland	-25	Denmark	-13	Sweden	3
13	Slovenia	5	Austria	13	Estonia	515	Slovakia	40	Sweden	3	Italy	24	Austria	100	Finland	265	France	-15	Lithuania	-11	Greece	3

Rank	Overall Generation of waste (2004-2006)		MSW Generation per capita - % change (1997 – 2008)		MSW Generation per capita - Overall level (2008)		Material recovery as a proportion of total reported waste treatment (2006)		MSW Recycling rates - change in recycling rate 2001 - 2005		MSW Recycling rates as (2005)		MSW collection rates (% of population with access to MSW collection 2006)		Levels of landfilling per capita (kg) (2008)		% change in landfilling rate per capita (1997-2008)		Reduction in GHG from waste sector (tonnes of CO2 equivalent) (1997-2007)		Proportion of total GHG from the waste sector (2007)	
	Country	% change	Country	% change	Country	Rate	Country	%	Country	Change	Country	Rate	Country	%	Country	Rate	Country	% change	Country	% change	Country	% GHG
14	Sweden	5	Romania	15	Sweden	515	Latvia	40	Belgium	2.8	Czech Republic	16	Portugal	100	Italy	276	Hungary	-15	Italy	-11	Finland	3
15	Poland	6	Luxembourg	15	Finland	522	United Kingdom	39	Greece	2.7	Estonia	16	Slovenia	100	Romania	287	Lithuania	-13	Luxembourg	-4	Ireland	3
16	Netherlands	6	Finland	17	France	543	Cyprus	38	Finland	2	Slovenia	15	Slovak Rep	100	Portugal	307	Luxembourg	-10	Estonia	8	Slovakia	3
17	Lithuania	9	Portugal	18	Italy	561	Lithuania	37	Cyprus	1.5	Portugal	15	Finland	100	United Kingdom	308	Finland	-6	Portugal	9	Lithuania	3
18	Italy	11	Cyprus	18	United Kingdom	565	Estonia	36	France	1.1	Bulgaria	15	Sweden	100	Latvia	310	Ireland	0	Czech Republic	11	United Kingdom	4
19	Belgium	12	Italy	20	Spain	575	Spain	30	Netherlands	1.1	Spain	14	United Kingdom	100	Spain	327	Bulgaria	2	Hungary	13	Romania	4
20	Luxembourg	15	Slovakia	21	Germany	581	Finland	28	Hungary	0.7	Latvia	13	Bulgaria	94	Hungary	333	Spain	3	Ireland	15	Slovenia	5
21	Malta	15	Estonia	22	Austria	601	Sweden	24	Malta	0.7	Greece	12	Hungary	92	Slovenia	341	Greece	5	Slovenia	19	Cyprus	5
22	Denmark	17	Sweden	24	Netherlands	622	Hungary	21	Austria	0.5	Cyprus	12	Ireland	90	Greece	347	Romania	9	Latvia	20	Hungary	6
23	Ireland	22	Greece	25	Malta	696	Greece	19	Romania	-0.4	Hungary	10	Latvia	85	Lithuania	367	Cyprus	13	Malta	33	Denmark	7
24	Portugal	32	Latvia	30	Luxembourg	701	Malta	6	Estonia	-4.9	Malta	10	Estonia	80	Bulgaria	440	Portugal	14	Cyprus	38	Netherlands	7
25	Slovakia	36	Ireland	34	Ireland	733	Romania	1	Bulgaria	-5.1	Slovakia	9	Lithuania	80	Ireland	440	Latvia	36	Spain	42	Luxembourg	7
26	Greece	47	Denmark	36	Cyprus	770	Bulgaria	1	Lithuania	-5.2	Lithuania	9	Poland	78	Malta	648	Slovakia	41	Romania	77	Portugal	9
27	Latvia	48	Malta	59	Denmark	802	Portugal	NA	Spain	-7.4	Poland	7	Romania	52	Cyprus	672	Malta	84	Slovakia	89	Czech Republic	10

3.2.3 ASSESSING PERFORMANCE TOWARDS A RECYCLING SOCIETY

Reviewing the data set out in Table 13 and the mapped information in three groups of Member States can be identified as distinct in terms of their performance towards a recycling society – presented in Figure 47. These are: countries considered to be achieving a relatively high level of compliance with the needs of a recycling society; transitional countries i.e. that are showing rapid improvements in terms of moving towards a recycling society; and countries showing few of the characteristics synonymous with a recycling society. Table 14 presents the characteristics considered synonymous with each of these groups and the countries deemed to deliver each of the characteristics. Based on this conclusions regarding the comparative performance of Member States in the delivery of recycling societies in Europe can be drawn.

Table 14 Defining Member States' Performance – Towards a Recycling Society

Performance – Towards a Recycling Society	Characteristics	Member States
High – showing a significant level of compliance with the goal of a recycling society	Low levels of MSW generation per capita and/or falling MSW levels per capita	– Low level of MSW generation – CZ, P, LV, SK, RO, LT EL, HU, SV, BU, PT, BE (<500kg/capita) – Falling levels of MSW generation – SI, BU, DE, HU, CZ, LT
	High levels of MSW recycling and a continuing trend towards increase	– High levels of MSW recycling – DE, BE, NL, SW, LU, DK, AT (>35%) – Increasing levels of MSW recycling – IE, CZ, SI, UK, LV, DE (>10%)
	High percentage of waste dealt with via recovery	– NL, PL (although question marks given low levels of MSW recycling), DE, BE, DK, IR, CZ, IT, LU, AT, FR, SV (>60%)
	Low levels of landfilling and/or high levels of landfill reduction	– Low levels of landfilling per capita – DE, NL, SW, AT, BE, DK (<100kg/capita) – High level % reduction in level of landfilling – DE, AT, NL, SW, BE, DK (>45%)
	Rapidly reducing levels of GHG emissions associated with waste	– DE, BE, UK, PL, NL, FI, SW, BU, AT (>30%)
Transitional - showing rapid improvements in terms of moving towards a recycling society	Increasing rates of MSW recycling but only medium/low levels of achievement	– IE,CZ, SI, UK, LV, SK, PT, IT, FI (>5% but not classified as high level of recycling)
	Medium to high levels of recovery and comparable med/low recycling performance	– IE, CZ, IT, LU, FR, SI, SK, LV, UK, CY, LI, EE (>30% recovery)
	Static rates of MSW generation per capita or low rate of increase	– PL, ES, NL, UK, BE, FR, AT (<15%)
	Reducing reliance on landfill as a disposal option	– EE, UK, CZ, SI, IT, PL, FR, HU, LI, LU, FI, IE (50% - 0%)
	Falling levels of GHG emissions from the waste sector	– FR, EL, DE, LI, LU
Limited – showing little or slow progress towards a recycling society	MSW generation per capita with a significantly upward trend	– FI, PO, CY, IT, SI, EE, SW, EL, LV, IE, DE, MT (>15% increase)
	Low rates of MSW recycling and a static or low rate of increase	– Low rates of increase and low level of recycling overall – PL, EL, MT, HU, CY, LV, ES, BU
	Low levels of recovery as a treatment option	– ES, FI, SW, HU, EL, MT, RO, BU
	High levels of landfilling and a static or increasing reliance on this method of treatment	– MT, LV, PT, CY, RO, EL, ES, BU, SK (increasing levels of landfilling)
	Increasing levels of GHG emissions from the waste sector	– SK, RO, ES, CY, MT, LV, SV, IE, HU, CZ, PO, EE

3.2.4 CONCLUSIONS – MEMBER STATE PERFORMANCE – TOWARDS A EU WIDE RECYCLING SOCIETY

The analysis conducted on the achievement of Member States towards a recycling society demonstrates that throughout all the data sets there is a high variability in Member State performance. This demonstrates both the differing speeds and extent of developments in waste management across the 27 different countries. What is clear is that based on this MS specific assessment the EU as a whole can not be considered to have yet reached its goal of delivering a recycling society, however, certain MS are further ahead in terms of ultimately delivering this. It should be noted that there are significant limitations to the data set upon which it is possible to base this assessment. However, by combining the eight most reliable data sets available at present and selecting the most complete trend series it is possible to make the following assessment of MS performance.

The classification is based on the desire to both promote recycling, but more generally to shift waste management up the hierarchy and reduce associated environmental impacts. At present the most important factors in determining the placement of Member States is the combined analysis of their recycling rates for MSW and reliance on landfilling as a treatment option. Into the future, to gain a fuller and fairer picture of Member State performance, new indicators should be developed to help determine the quality of recycling, prevention activities ongoing in the Member State and the broader environmental impacts of waste management activities.

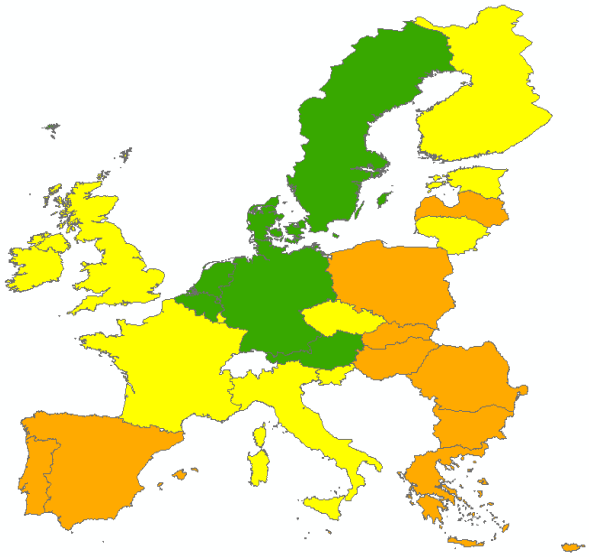
- *High - Member States delivering the highest level of compliance with the goal of delivering a recycling society* – These countries are considered to be delivering: high levels of MSW recycling with a continuing upward trend, high levels of recovery as a proportion of waste treatment activities; low and/or falling levels of landfilling; and falling levels of GHG emissions from the waste sector – Germany, Belgium, Netherlands, Sweden, Austria, Denmark
- *Transitional – Member States showing rapid improvements in terms of moving towards a recycling society* – These countries are currently seeing: significant increases in their level of MSW recycling but are only achieving medium to low levels overall; medium levels of recovery comparable to a medium or low level of MSW recycling; a falling reliance on landfilling; and falling levels of GHG emissions from the waste sector – Ireland, Czech Republic, United Kingdom, France, Slovenia, Luxembourg, Estonia, Finland, Italy, Lithuania
- Limited – Member States showing limited or slow progress towards a recycling society – These countries are currently seeing: Low levels of MSW recycling and static or low associated rates of increase; high and static or increasing levels of landfilling; and increasing levels of GHG emissions associated with the waste sector – Romania, Bulgaria, Poland, Cyprus, Spain, Malta, Slovakia, Greece, Hungary, Portugal, Latvia

It is considered that work into the future could examine the causes of the differences in the performance of Member States in terms of their recycling society status. It would be suggested that a review could be conducted examining the key features of the waste management systems in the high compliance group, to identify what factors are leading to their improved performance. In order to provide a full picture such an assessment could advisably also look at two transitional Member States and two Member States with limited performance.

At present the data limitations mean that the assessment of a recycling society effectively reflects their effectiveness in terms of waste management, rather than the delivery of broader goals related to changing the way Member States make use of materials. Any further assessment should consider whether or not a given Member State performs against other indicators of a recycling society that it has not been possible to consider within this assessment due to data limitations. This should include prevention (including reuse) activities, the type of collection systems in place to ensure quality recycling efforts, the broader environmental footprint of environmental management within the Member State, mechanisms for ensuring the environmental performance of recycling and the comparison of material flows compared to waste production aimed at providing an idea of the scale of waste production versus materials usage ie proportional waste production. Without these further efforts this approach would essentially continue to

provide a picture of integrated waste management performance rather than progress towards delivering the more coherent goal of a recycling society.

Figure 47 – Spatial representation of Member State performance against the goal of delivering a recycling society – based on the data sets set out in Table 13. Member States are classified as High (green), Transitional (yellow) or Limited (orange)



3.3 DELIVERING RECYCLING SOCIETIES AND MARKETS IN EUROPE

The promotion of a recycling society in Europe was a key goal of the waste TS. Key to delivering an advanced recycling society is the closing of the loop between increasing levels of recycling and the increasing use of secondary raw materials. The recycling market is therefore fundamental to the achievement of a recycling society.

The recycling industry falls under the OECD-Eurostat definition of a 'core eco-industry', for which the main purpose is to 'prevent, limit, minimise or correct environmental problems related to waste'. The competitiveness of the recycling industry is driven by technological development, the availability and consequent value of raw materials, policies and regulations, and public awareness.

In Europe there is already a significant, well established industry in place aimed at supporting recycling and waste management activities. According to Eurostat figures, in 2006, the EU27 had: 5,170 facilities for incineration with energy recovery; 3,897 facilities for other incineration; 50,682 facilities for recycling; 10,286 facilities for landfilling[157]. In the EU Presidency Paper from February 2009 it was suggested that the recycling sector had over 60,000 companies, over 95% of which were SMEs. In total the waste management and recycling industries were considered to provide between 1.2 and 1.5 million jobs in the EU[158]. Other estimates of low carbon jobs in Europe, for example by WWF[159], place recycling as one of the core sources of employment. Given the EU's level of export of waste for reprocessing it is also important to acknowledge the generation of jobs and growth globally as a consequence of waste management and recycling. Global market estimates for sustainable resource management, presented in the WWF report, estimated that in 2005 solid waste management and recycling accounted for €30billion world wide and that by 2020 this was anticipated to represent €46 billion. Growth in jobs globally within this sector was estimated to be 9% in the 2004 to 2006 period and 7% between 2007 and 2009. In this global context the EU is considered to be a market leader in terms of exploitation of opportunities in the recycling industry and, according to a study

[157] Eurostat, 2006, Waste treatment facilities at country level in 2004
[158] Presidency Paper to the Environment Council, 2009, The fall in demand for recycled materials
[159] WWF EPO, 2009, Low carbon Jobs for Europe, Current Opportunities and Future Prospects

on the competiveness of the EU eco-industry,[160] holds 50% of market share in the recycling industry globally.

This section explores the potential obstacles and barriers to the delivery of recycling societies and markets and presents data on the trade in primary and secondary raw materials. It then goes on to discuss mechanisms to facilitate the delivery of more effective recycling markets and societies and potential policy solutions that might usefully be put in place to aid this. This section draws on an extensive literature review of materials relating to the development of recycling markets, expert input and responses from stakeholders during discussions at the 22 June event.

3.3.1 Policies for Delivering Recycling Societies and Better Recycling Markets – Application within the Member States

In support of the assessment of Member State performance against the goal of delivering a recycling society and goals to promote improved recycling markets the following information is presented regarding national policies and programmes in place of relevance. Although not specified in the terms of reference for this study, it was agreed that a limited review of Member State policies should be undertaken to provide examples of key tools, in particular those used by Member States classified as 'high' and 'transitional' in section 3.2.4. This is intended to provide an initial basis to illustrate why some Member States are more successfully moving towards a recycling society than others and how policy measures can be used to simulate an improved recycling market. It should be noted that, as discussed in section 3.2.4, additional more detailed work would be necessary in order to effectively correlate causal factors with performance.

One particular tool that is used by a large majority of Member States to encourage the diversion of waste from landfill is various forms of **landfill tax**.

Table 15 below illustrates that in general those countries that are most successfully moving towards a recycling society have a higher landfill tax in place than those making slower progress.

Table 15 Landfill taxes in place in the EU Member States[161][162]

Country	Landfill tax implemented in €/t	Landfill tax planned in €/t	Landfill ban implemented (beyond Landfill Directive)	Landfill ban planned
'High' performing Member States				
Austria	**87** (from Jan 2006) – depending on composition of waste and standard of landfill	Prices adjusted in line with inflation	Total organic carbon (TOC) >5% from 2008. Exceptions for landfilling MBT-treated outputs (separate standards)	
Belgium (Flanders)	**29.71-42.44** (from 2010, non-combustible waste). **55.70-79.56** (from 2010, combustible waste). Ranges exist	Prices adjusted in line with inflation	TOC >6% ban on unsorted wastes, sorted and non-sorted wastes for recovery, combustible residual	

[160] Ecorys, 2009, Study on the Competitiveness of the EU eco-industry (DG Enterprise and Industry
[161] Confederation of European Waste to Energy Plants (CEWEP), 2010, 'Landfill taxes & bans'
[162] See also data on landfill tax levels from http://scp.eionet.europa.eu/facts/factsheets_waste/2009_edition

	due to private/public landfill sites.		fraction from sorting	
Belgium (Wallonia)	**65** (2010, hazardous waste). **60** (2010, non-hazardous waste).	Prices adjusted in line with inflation	Ban enacted since 2004	
Denmark	**63** (from 2010)		From 1997 ban on waste suitable for incineration	
Netherlands	**107.49** (from 2010)		For 35 categories of waste	No
Sweden	**40**		Sorted combustible waste from 2002. All organic waste from 2005.	
Germany	**NONE** (total landfill ban instead)		For all untreated waste from 2005	
'Transitional' Member States				
Czech Republic	**17** (from 2009)			
Finland	**30** (exceptions for private landfills, fly ash, waste used in construction of landfills)			Aim for transitional ban on BMW from 2011
Ireland	**30** (from 2010)	Under review – higher landfill tax expected	Some landfills ban certain waste streams but no national legislation	No
Italy	**1-25** (depending on type of waste, e.g. inert, MSW)		Yes – to be determined	Some combustible waste from 2011
France	**10-50** (from 2010, depending on type of landfill and amount of energy recovered. Exemptions for certain waste types.)	Annual increases between **10-100** (until 2015)	Introduced in 2002 on non-residual wastes (definition of 'residual' under discussion)	No
United Kingdom	**35.19** (from 2007) **3.67** (inert waste)	Rising by **11.72** per annum then top rate of **82.60** from 2013/2014	No	Under consultation
'Limited' performing Member States				
Hungary	**7-15** (from 2010, exceptions for certain types of waste)		Tyres from 2004, rubber scrap from 2006	From 2015 for untreated wastes
Portugal	**3.50**	Updated each year	No	No

Landfill taxes set at a relatively high rate are generally most effective, although understanding public perception and behaviour and acceptability is important when identifying the most appropriate level for the tax. It tends to be the rate of tax in combination with perceived likely rises and future commitment that leads to the driving of changes in behaviour. For example, Estonia has a comparatively low landfill tax rate (€10/t), but as the rate has increased considerably within a few years and is set to continue to increase, waste companies perceive the tax to be very high. The tax has, therefore, had the desired effect contributing to a reduction in landfill in Estonia from 95% of waste in 2000 to around 60% in 2006. For transitional or limited performing Member States, setting a low landfill tax followed by rapid increases can, therefore, prove an effective option for rapidly ramping up pressure to reduce landfilling but in a way that is economically viable for the relevant industries. Supporting regulatory instruments used in Estonia to divert waste from landfill include separate collection schemes for biodegradable packaging waste, deposit-refund schemes for glass and plastic, increased composting capacity, and planned increased incineration capacity.[163] Such support schemes, in addition to landfill taxation, are key. Without them higher taxes may well simply lead to higher costs and potentially linked to this increased illegal dumping of wastes.

Top performers in the EU with regards to amount of waste landfilled are Germany (1%), the Netherlands (2%), Sweden (3%) and Belgium (also 3%). This may indicate a correlation between rates of landfill tax/bans and the proportion of waste sent to landfill.[164]

Germany has implemented a landfill ban for all untreated waste with greater than 3% organic content. Since its implementation in 2005, the amount of municipal waste landfilled has fallen to 1%. Separate collection schemes have also resulted in notably higher recycling rates.[165]

In the Netherlands, the landfill tax has contributed to a 60% decrease in the amount of waste landfilled between 1996 and 2004 (over the same period the amount of waste incinerated increased by 50% and the recycling rate increased by approximately 20%). Complementary measures in the Netherlands include a ban on 35 types of waste from landfill, pay-as-you-throw schemes,[166] and deposit-refund schemes for bottles. The landfill tax has also paved the way for improved separation of waste.[167]

'Pay as you throw' (PAYT) schemes (or 'variable charging') are used in several Member States as a fiscal incentive to encourage consumers to improve waste separation and/or reduce waste. In the Netherlands, many local authorities require households to pay in proportion to both volume/weight and frequency of collection. These 'DIFTAR' (differential tariff) schemes are not regulated through legislation.[168] Austria also widely practices volume-based (and to a lesser extent weight-based) PAYT schemes to encourage waste prevention. New electronic systems for the identification of bags and weighing of waste are currently being tested.[169] The Belgian approach is to operate a pay-per-bag scheme, which has proved to be very effective in reducing the amount of waste collected (it is said to have contributed to about 70% of the decrease in residual waste collected). The scheme also encourages increased source separation (contributing to around 30% of the decrease in residual waste collected). Denmark operates several fee-based systems, including a weight-based charging system; on average, 359kg less waste per household is collected in Danish municipalities with weight-based schemes compared to those without. A significant increase in the amount of paper and cardboard recycling has also been observed in municipalities with such schemes. Some Italian municipalities operate a tagged-bag scheme, where the fee consists of a 'fixed quota' (dependent on the type, width and number of residents in the household) and a 'variable quota' (based on number and weight

[163] EEA, 2009, Diverting waste from landfill – Effectiveness of waste management policies in the European Union (Report 7)
[164] Dutch Waste Management Association, 2009, 'Uneven playing field for landfill in Europe
[165] EEA, 2006, 'Country fact sheet: Germany'
[166] Earth911.com, 2009, 'Trash Planet: The Netherlands'
[167] EEA, 2006, 'Country fact sheet: Netherlands'
[168] Strategy Unit, 2002, Waste Not Want Not, 'Annex I: International Comparisons of Economic Instruments for Waste Management
[169] Eunomia Research & Consulting, 2003, 'Waste Collection: To charge or not to charge? A Final Report to Chartered Institution of Wastes Management Environmental Body'

of bags – tagged by household). In municipalities with the scheme, residual waste collection has fallen by around 18% and the rate of source separation has increased by around 8%.[170] (See section 2.1.2 on waste prevention.)

Producer responsibility and voluntary agreement schemes are another method to promote better waste management. In the Netherlands, voluntary packaging covenants were introduced in 1991 and 1997; the VROM (Dutch Ministry of Housing, Spatial Planning and the Environment) can however make these binding on the whole sector (as has already happened for ELV's, paper and cardboard). These collection schemes arguably do not necessarily encourage greener product design, however. In Austria a take back system for batteries was established in 1993 on the basis of a voluntary agreement with the retail sector; the consumer may either give back the old battery at the point of purchase of a new one, or bring the batteries (and WEEE) to communal waste collection centres.[171] Producer responsibility implies that they become responsible for the impact of their product and often take back obligations for products or materials. The new waste framework Directive requires extended producer responsibility, while other measures such as the WEEE Directive and Packaging Directive require producers to take responsibility for their products.

Product charges and taxes require producers to take responsibility for their products, although in a manner defined by the state. Waste management costs incurred by the producer are often passed on to the consumer.[172] In the Netherlands, product charges are included in the price of certain goods including ELVs, packaging waste, batteries, white (major household electrical appliances) and brown (household electrical entertainment) goods.[173] However, it can be argued that the practice of setting product charges does not necessarily provide an incentive to improve product design as there is no differentiation in the extra charge to the consumer on the basis of a product's recycling performance.[174] The Netherlands also has in place Government grant schemes for innovative collection techniques and for reuse and recycling, which do not penalise economic producers or consumers but rather provide a financial contribution to activities that result in structural improvements in waste management. For example, grant schemes for reuse and recycling financed by businesses and the Government are aimed at supporting the development of markets for secondary plastics.[175]

Interesting examples also exist of explicit **prevention policies**. In the Netherlands an inventory of waste prevention projects within companies was released in 1993/1994 containing specific examples of waste prevention projects. By 2001 the inventory described around 500 projects, and it serves as a reference document for companies who wish to design waste prevention measures. In addition, a Stimulation Programme on Separation and Prevention of Household Waste was introduced by the Dutch Government in 2001.[176] Several different projects are carried out each year to share knowledge between municipalities, provide benchmarking and enhance political involvement in waste prevention and recycling. For example, a number of brochures presenting ideas on how to avoid waste have been published. Since the introduction of this stimulation programme, there has been a relative decoupling between economic growth and waste generation.[177] The 2006 Austrian Waste Prevention Programme contains numerous measures, including the development of a building pass for eco-efficient buildings, criteria for eco-efficient recycling of building materials, standards for selective (recycling friendly) demolition, product related substance flow analysis (for the identification of the origins of pollutants in MSW), and studies on extending the concept of services

[170] Eunomia Research & Consulting (on behalf of Ecotech Research & Consulting), 'Financing and Incentive Schemes for Municipal Waste Management: Case Studies – Final Report to Directorate General Environment, European Commission'
[171] Green Alliance, 2002, 'Creative policy for waste: lessons for the UK'
[172] Green Alliance, 2006, An International Survey of Zero Waste Initiatives
[173] EEA, 2006, 'Country fact sheet: Netherlands'
[174] Green Alliance, 2002, 'Creative policy for waste: lessons for the UK'
[175] Green Alliance, 2002, 'Creative policy for waste: lessons for the UK
[176] Green Alliance, 2002, 'Creative policy for waste: lessons for the UK'
[177] The European Recovered Paper Council (ERPC), 'Actions to promote recovered paper collection, recycling techniques and recyclability of paper and board in the Netherlands'

which can complement/replace products. Measures being discussed for the upcoming 2011 Programme include further development of the building pass to a full material information system, development of the topic 'waste preventing buildings' for vocational training, studies on waste composition and preventing waste containing critical metals, limiting the use of certain hazardous substances, information campaigns and best practice fact sheets for industries and private consumers, support of waste counsellors, the removal of barriers for more efficient production and use of food over the whole life cycle, and further development of reuse-networks and their marketing.[178]

3.3.2 The Market for Recyclables Versus Virgin Materials - Trends in trade and prices of paper and plastic

The economic crisis, commencing in 2008, saw a global slump in the worldwide demand for materials, including recycled materials, and a resulting level of oversupply. This led to a strong decrease in demand for many recyclates in 2008, when demand for primary raw materials also fell considerably.

The vast majority of recyclable materials are close substitutes with primary materials. This implies that, all other things being equal: when the supply of primary materials increases (e.g. due to the discovery of new mines, or the development of new mining technologies), the demand for the recycled material (and thus also the price) will decrease; and when the demand for primary materials decreases (e.g. due to a global economic downturn), demand for the recycled material will also decrease.

Markets for recyclables, however, tend to be more volatile than markets for primary products.[179] As highlighted by Porter,[180] most manufacturers want to ensure a steady flow of virgin materials, which still constitute the bulk of their resources; this is reflected, for instance, in the high level of vertical integration in the industry. They use recycled materials as a marginal supplement when the need arises. In the short term, the supply of primary products is relatively inelastic (e.g. the capacity of a mine cannot be immediately expanded to respond to increased demand), explaining why the demand for recyclables will increase disproportionally when demand for a material increases. The converse happens when the demand for a material decreases; a relatively small decrease in demand can lead to all but the collapse of the demand for the recyclable. Once the relative share of recyclables in the supply of resources has become high enough, price volatility should be reduced. Measures that can reduce the price gap between primary materials and recyclables will lead to a larger and more stable market for recyclables and will thus also reduce price volatility.

The low market price for recyclables is a reason for concern, as this is considered to emanate from structural failings in the system. Fundamentally, there is a failure to take account of the positive externalities associated with recycling and the negatives of virgin material consumption. Moreover, within the recycling sector itself there are weaknesses that lead to increased risk in the market place. During the recent economic downturn it was predictable that a decrease in demand for recyclables would first affect supplies from countries with poorly developed separate collection systems perceived to deliver lower quality recyclable material. If the demand for recyclables falls, it is normal that it should first affect the (low quality) recyclables coming from co-mingled fractions. There is therefore a need to secure high overall levels of quality in the chain in order to maximise recycling market potential.

This section examines the state of the market for recycling for two key material flows, paper and plastics. It examines the level of secondary raw material use and considers the question of the continued use of virgin

[178] Lebensministerium, 2006, The Federal Waste Management Plan

[179] The Commission Staff Working Document accompanying the RMI (SEC(2008) 2741) has itself emphasised that the cyclical nature of the metal industry can be observed throughout the 20th century. It points out that, in the mining industry, it typically takes years between identifying economically viable deposits and the start up of actual mine production (for instance, due to the time needed for raising sufficient investment capital, long planning and permit phases, potential bottlenecks in infrastructure, time lags in delivery of mining equipment, and lack of skilled staff).

[180] Porter, C., 2002, The Economics of Waste, Resources for the Future

materials, whether substitution is occurring with in the system and if not why not. For both paper and plastics the question of reliable quality of product is central the ability to make use of recycled materials. Delivery of quality secondary raw materials, produced using the best quality recyclates will maximise profit and viability.

3.3.2.1 PAPER

Over 72% of the paper and cardboard used in the EU in 2009 was recycled.[181] Despite this, however, the demand and thus also the cost for recovered paper is well below the high demand and high cost for virgin pulp. This is due to several factors, including diminishing quality (in terms of sheet strength) resulting from repeated recycling; the significant amount of treatment required before recovered paper fibres can be used; and the fact that only high graded recovered paper can be easily used to substitute virgin pulp. The recycling loop of paper therefore requires a constant input of virgin pulp in order to work efficiently. While there has been a rapid increase in paper and cardboard recycling over the last decade, the industry has had difficulties in maintaining the quality for efficient reprocessing (particularly as a result of pressures from paper recycling targets that have been introduced for certain local authorities and packaging producers).[182] Maintaining the quality of recovered paper is crucial in order to maintain the best sale value, ensure the highest carbon savings when being reprocessed into new paper/cardboard products, and to ensure that it can be exported simply (high quality recovered paper has low hazardous content and thus can be shipped with minimal handling control).

Prices of virgin pulp and recovered paper generally develop in parallel, although recovered paper prices experience greater price variations than virgin pulp. This is illustrated by

Figure 48 and Figure 49 (obtained from the Confederation of European Paper Industries, CEPI) which demonstrate that the prices of virgin pulp are much higher and much less volatile than the prices of recovered paper (e.g. a slight increase in virgin pulp prices during Jan 2005-July 2008 coincides with a significant increase in recovered paper prices between Jan 2006-July 2008).

Figure 48 Recovered paper average prices (European weighted averages), 2001-2010

[181] European Recovered Paper Council, 2009, European Declaration on Paper Recycling 2006 – 2010, Monitoring Report

[182] Confederation of European Paper Industries (CEPI), 2010

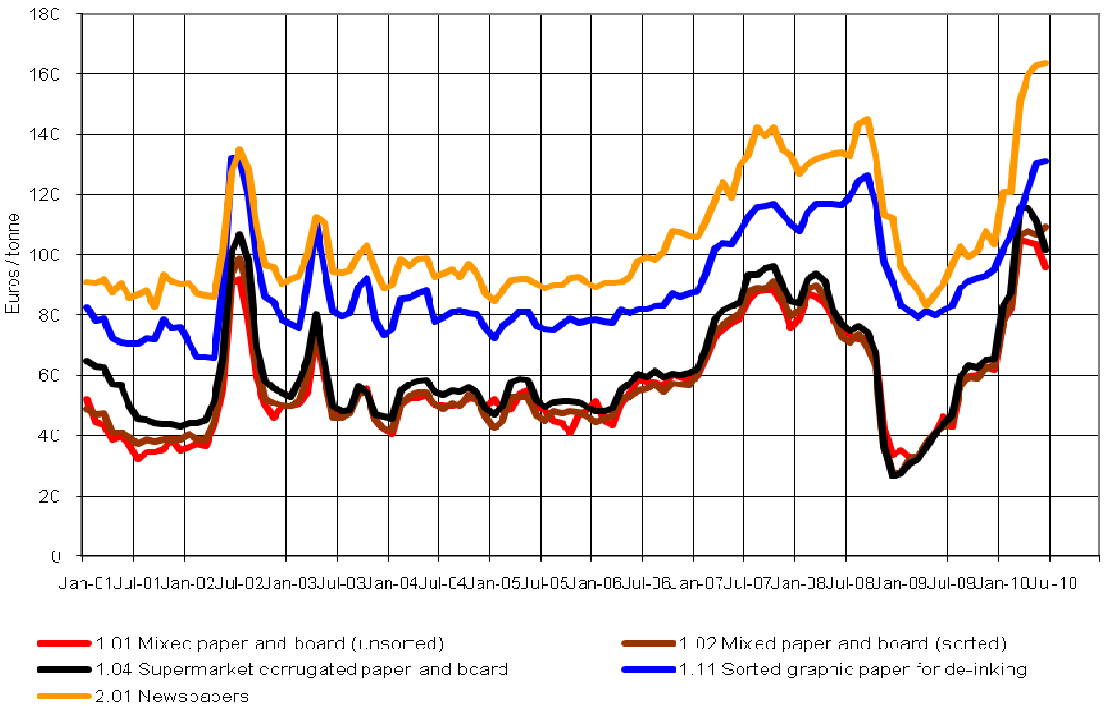


Figure 49 Virgin pulp prices (Western Europe averages), 2001-2010

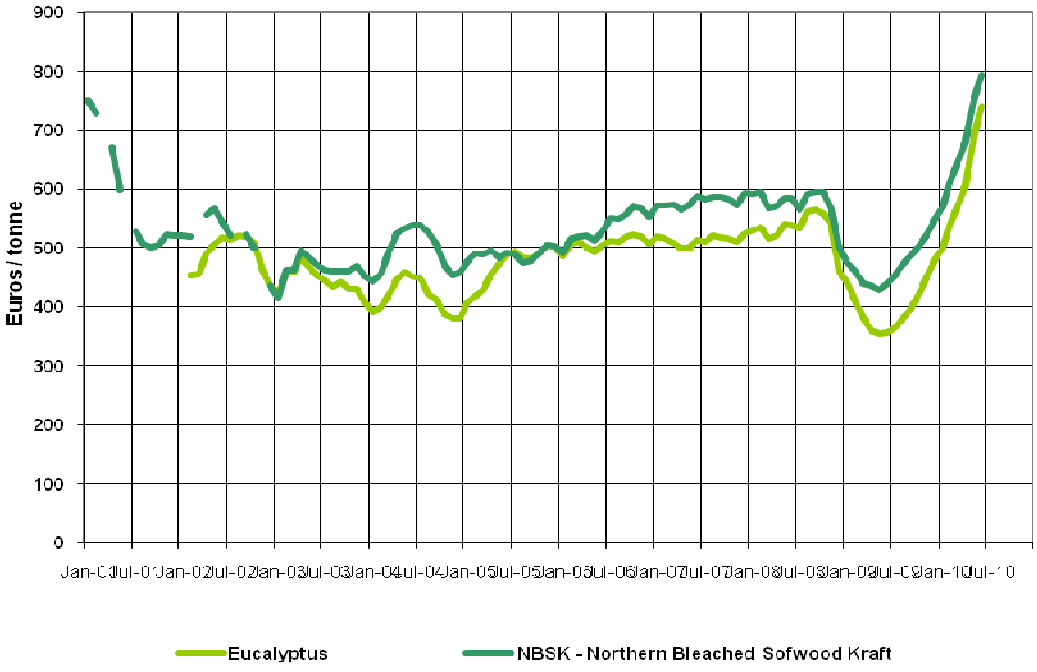
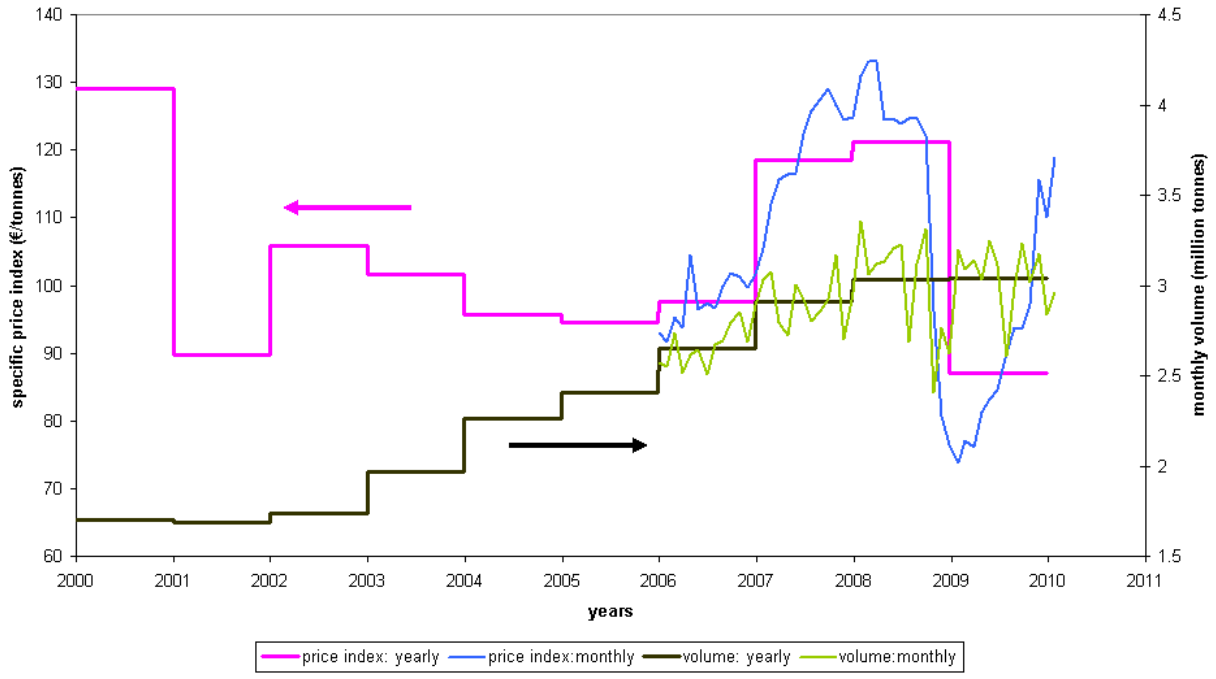


Figure 50 below shows the development of price and trade volumes in paper in the EU-27 (intra- and extra-EU-27 trade) from 2000 to early 2010. Trade volumes are increasing year on year (albeit with monthly fluctuations), whilst prices appear to be much more volatile, including a significant drop in price from 2008 to 2009.

Figure 50 Price developments and trade volume of paper waste in the EU-27[183]

[183] Eurostat, 2010, Price indicator for secondary materials

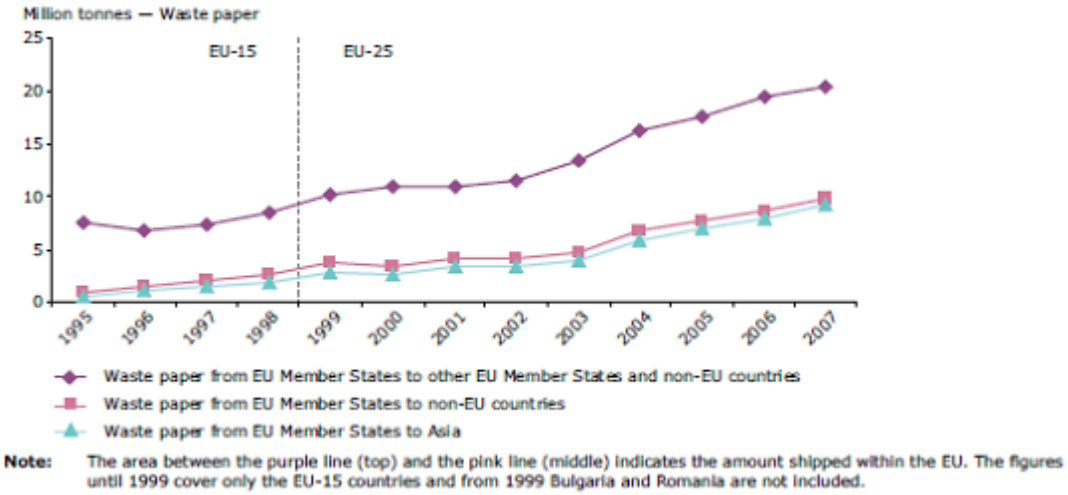


It is very difficult to compare prices for recovered paper in the EU and third countries, as recovered paper classes differ according to country. The European definitions of recovered paper grades are very strict and clear (EN 643 standard) but are sometimes not comparable with the definitions and specifications used in third countries. However, if one considers the 'supermarket corrugated' grade, the price for Chinese traders in Germany is about 20% higher than the price for the German producers.

This is shown in the EU waste paper export data shown in Figure 51 where an expansion in the amount of waste paper generated through greater recycling effort has been met by an increase in waste paper being exported to non EU countries. This suggests that there is a lack of capacity and demand within the EU for these products.

Figure 51 Development in shipments of waste paper out of and within the EU from 1995 to 2007[184]

[184] EEA Report No 1/2009. Waste without borders in the EU? Transboundary shipments of waste http://www.eea.europa.eu/publications/waste-without-borders-in-the-eu-transboundary-shipments-of-waste

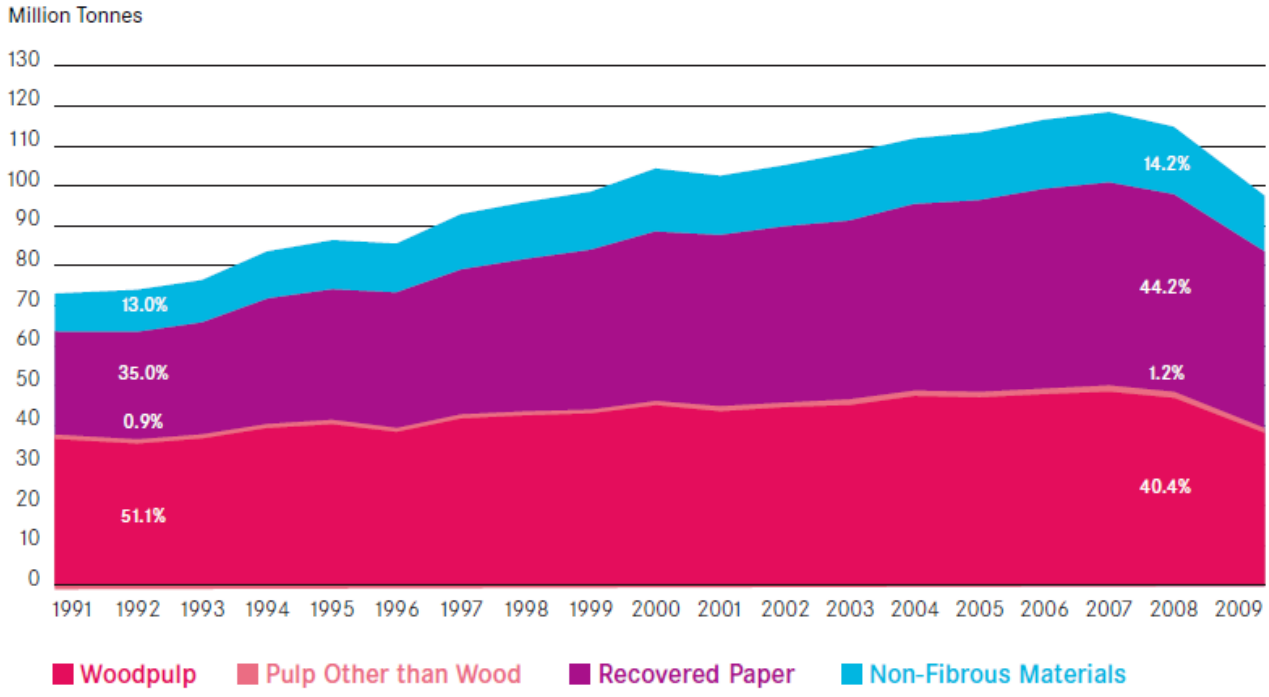


Note: The area between the purple line (top) and the pink line (middle) indicates the amount shipped within the EU. The figures until 1999 cover only the EU-15 countries and from 1999 Bulgaria and Romania are not included.

It is interesting to see how this significant amount of waste paper usage compares to non-recycled paper materials for CEPI Countries who are responsible for the majority of the UK's paper production[185]. Figure 52 shows that recovered paper consists of just less than half of the resource base for paper production. It is also possible to see that this contribution has expanded from 35% in 1991 to 42.2% in 2009. This is due in part to EU policies and comes against expanding consumption.

What it does suggest is that the market for recyclable products has expanded, but as described above there is a limit to the contribution that recycled paper can make due to decreasing quality.

Figure 52 Raw materials consumption in CEPI countries 1991-2009[186]



3.3.2.2 *PLASTICS*

[185] The Confederation of Clean Paper Industries consists of 19 members, 17 EU MS plus Norway and Switzerland, representing 25% of world production.

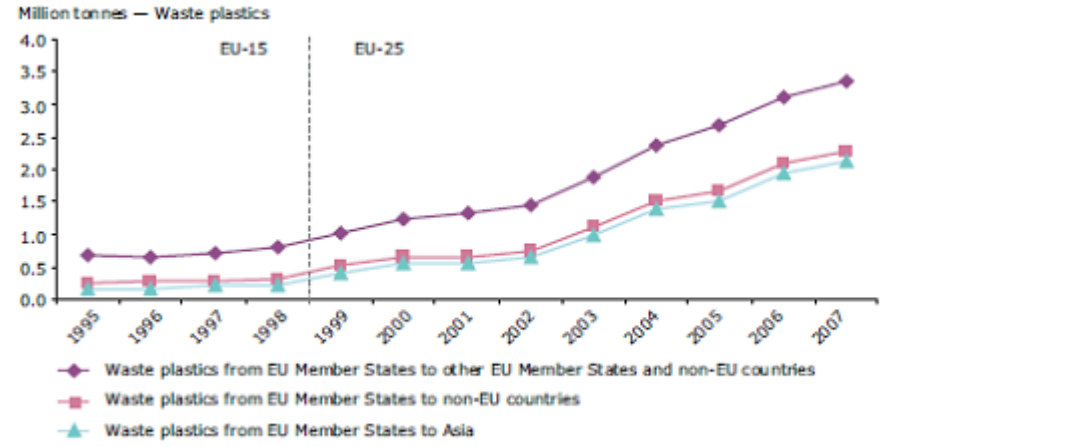
[186] http://www.cepi.org/Objects/1/files/KeyStats09_V01.pdf

Plastics recovery has grown considerably in recent years, with many recycling companies processing a larger amount of plastic bottles than previously. This is due at least in part to increased legislative pressure from tougher waste legislation and targets (including the Packaging Directive). Studies on the manufacture of recycled polythene versus virgin polythene bags have shown that the former consume 90% less water and two thirds less energy, and produce one third of the sulphur dioxide and nitrous oxide and two and a half times less CO_2. In addition, 1.8 tonnes of oil are saved for every tonne of recycled polythene produced.[187] However, as with recovered paper, the quality of recovered plastics is essential in ensuring maximum profitability. During 2007, the rate of plastic recycling increased by 4.3%, a much lower increase than in previous years, believed to be due to the economic downturn. In 2008, the total material recycling rate of post-consumer plastics was 21.3%.

There are several constraints that prevent the recycled plastics market from expanding, including: hygiene concerns that result in recycled plastics rarely being used in food packaging; and the fact that large quantities of recycled plastics would be needed in order to be economically viable compared with virgin plastics, which is difficult to achieve due to the diverse range of sources of plastic waste and the wide range of polymers used.

Figure 53 shows the changes in import, export across the EU from 1995 to 2007. It is clear that the amount of waste plastic has increased as has the amount that is recycled but that much of this is exported. This is indicative of a lack of EU demand and capacity for secondary plastics.

Figure 53 Developments in shipments of waste plastics out of and within the EU from 1995 to 2007



Note: The area between the purple line (top) and the pink line (middle) indicates the amount shipped within the EU. The figures until 1999 cover only the EU-15 countries and from 1999 Bulgaria and Romania are not included.

Due to high domestic demand, China is the predominant importer of recovered plastics from the EU. In 2009, 3.3 million tonnes of plastic scrap were exported from the EU, of which 90% went to China and Hong Kong. During the first three months of 2010, China imported 1.8m tonnes.[188]

Prices of recovered plastics tend to vary by polymer type, colour and quality. Natural HDPE and clear PET are more valuable than coloured/mixed polymers and therefore have higher market values.[189] Figure 54 below shows the average prices for virgin plastics in Europe (in GBP/tonne). There is a close correlation between the price of virgin polymers and recovered plastics, with the high volatility of virgin polymer prices (due in part to rising crude oil prices) being the main cause of fluctuating prices. As the demand and thus prices of virgin plastics increases in the EU, prices for recovered PET have also increased substantially over recent years, due to an increase in overseas demand and increased in recycling capacity in the EU.[190]

[187] Waste Online, 2006, Plastics recycling information sheet
[188] Bureau of International Recycling, 2010, 'Europe should monitor its dependence on China'
[189] WRAP, 2007, Market Situation Report – Autumn 2007, Realising the value of recovered plastics
[190] Letsrecycle.com, 2010, 'PET plastic prices reach unprecedented levels'

Figure 54 Virgin plastics prices in Europe[191]

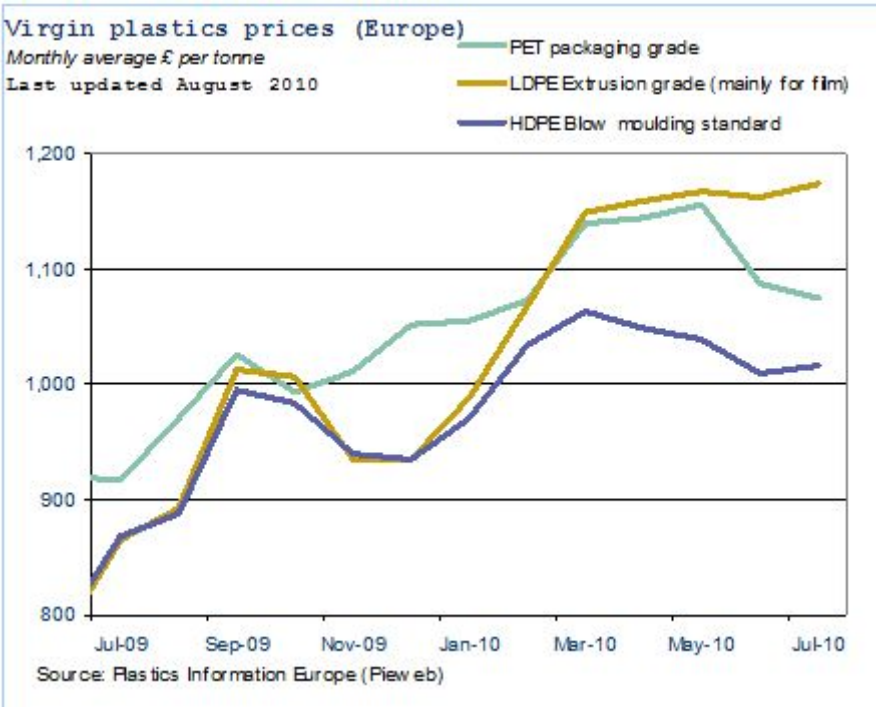
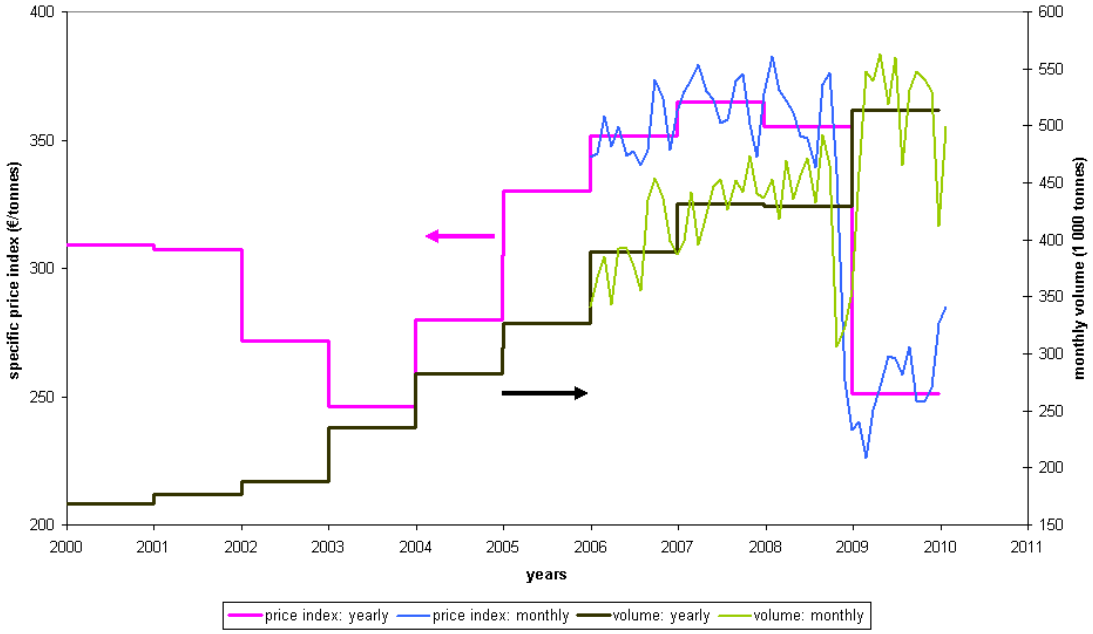


Figure 55 shows the development of price and trade volumes in plastic waste in the EU-27 (intra- and extra-EU-27 trade) from 2000 to early 2010. As with paper, trade volumes are increasing year on year (albeit with monthly fluctuations), whilst prices appear to be much more volatile, including a significant drop in price from 2008 to 2009.

Figure 55 Price developments and trade volume of plastic waste in the EU-27[192]

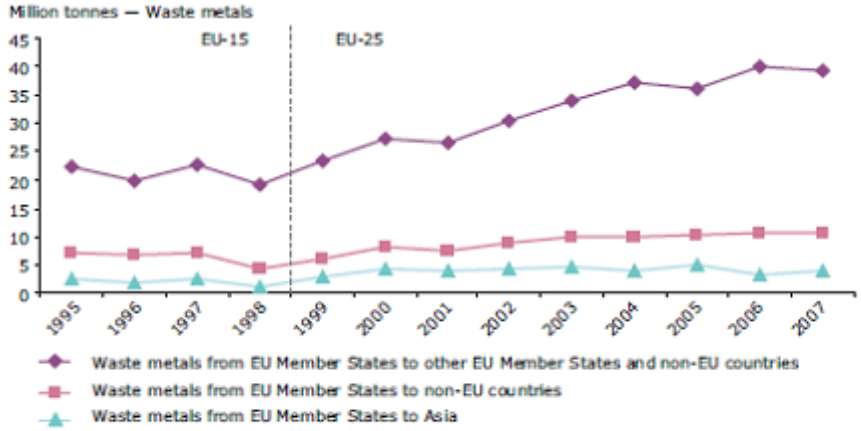


[191] WRAP, 2010, Market knowledge portal
[192] Eurostat, 2010, Prices for secondary materials

3.3.3 METALS

The recovery and recycling of metal has a well established market than other recyclable, primarily due to a relatively high market price and a lower difference in quality between recycled and primary materials than other materials. It also has significant GHG reduction potential due to the high embedded carbon from its energy intensive extraction and production process. It is possible to see in Figure 56 that the majority of metal trade is within the EU and that there has been a significant expansion in the generation of waste metals.

Figure 56 Developments in shipments in waste metals out of and within the EU from 1995 to 2007[193]



Note: The area between the purple line (top) and the pink line (middle) indicates the amount shipped within the EU. The figures until 1999 cover only the EU-15 countries and from 1999 Bulgaria and Romania are not included.

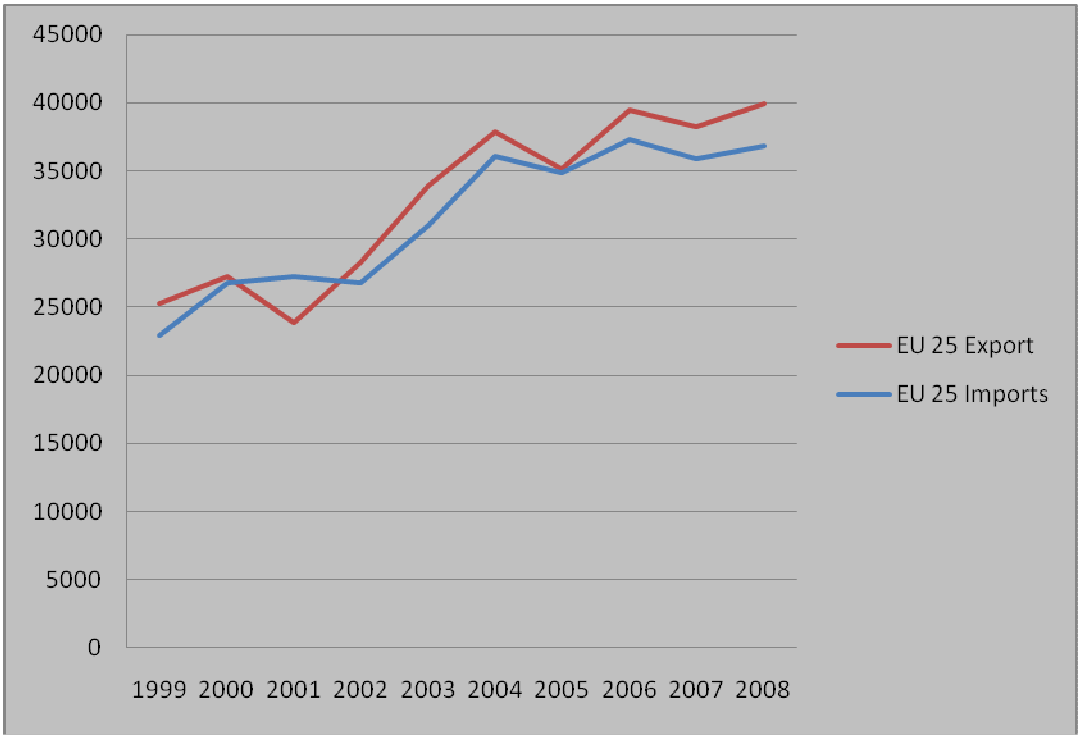
It is predicted that the average recycled content of steel in the EU is 50%[194] this process provides carbon saving of around 1.88t of carbon per tonne of carbon saved and is a significant source of carbon reduction across the bloc. Data for scrap import/ export shows that the EU is largely balanced with similar levels for both with exports being slightly higher, showing that the EU is a gross exporter of steel but less so than for the other materials in this section suggesting that the internal capacity and markets are higher for scrap steel.

Figure 57 Steel import, export for the EU-25 [195]

[193] EEA Report No 1/2009. Waste without borders in the EU? Transboundary shipments of waste http://www.eea.europa.eu/publications/waste-without-borders-in-the-eu-transboundary-shipments-of-waste

[194] http://www.tatasteeleurope.com/file_source/StaticFiles/SustainableSteel%20KeyMessages.pdf

[195] World Steel Association Statistical Yearbook 2009: http://www.worldsteel.org/pictures/programfiles/SSY2009.pdf



3.3.4 WEEE

WEEE differs from the other materials in this section as it is not a 'raw material' in itself. WEEE requires significant deconstruction to extract a wide range of materials, which can be present in very low density and may be difficult and or dangerous to obtain Many of the products within WEEE have high market value such as metals and plastics, others such as glass products less so this makes determining the economics of WEEE disposal difficult[196].

Statistics were not sufficient to give reliable information about amounts of exported WEEE intra or extra EU, this is partly due to the difficulty in determining what is a waste and what is a used product. WEEE arising have been estimated at 7 million tonnes in the EU-25, around 4% of total municipal waste generation. It is considered that these statistics underestimate the total amount of WEEE generated or exported in the EU as it is based on analysis of trade data.

What is clear is that there has been a strong increase in registered export of WEEE from 1997-2005, see Figure 58 to see data for selected MS and Figure 59 for time trend data for the EU bloc. The 250,000 tonnes of exported WEEE constitutes only 3% of total WEEE generation, though this data are likely to underestimate WEEE generation.

Figure 58 Shipments of registered WEEE out of selected EU Member States (EU-15_ based on trade statistics[197]

[196] http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VFR-4W7HNXJ-1&_user=10&_coverDate=08%2F31%2F2009&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_searchStrId=1484284073&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=a25fc10084437e6120818cfba7ac8b1f&searchtype=a

[197] ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers http://eea.eionet.europa.eu/Public/irc/eionet-circle/etc_waste/library?l=/working_papers/shipments290208pdf/_EN_1.0_&a=d

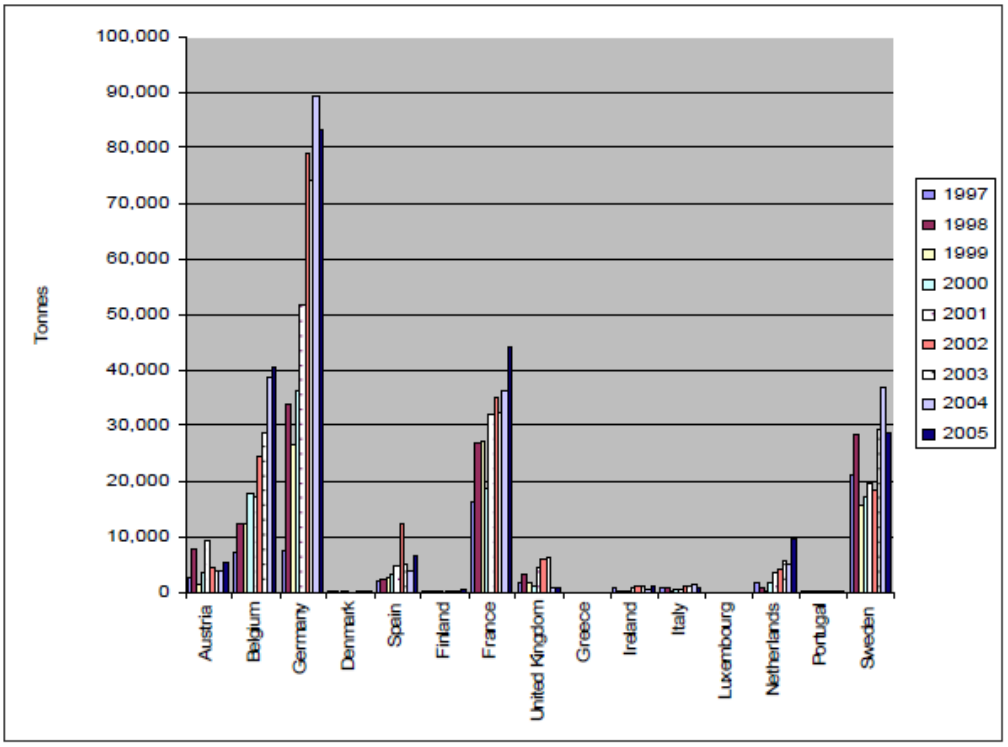
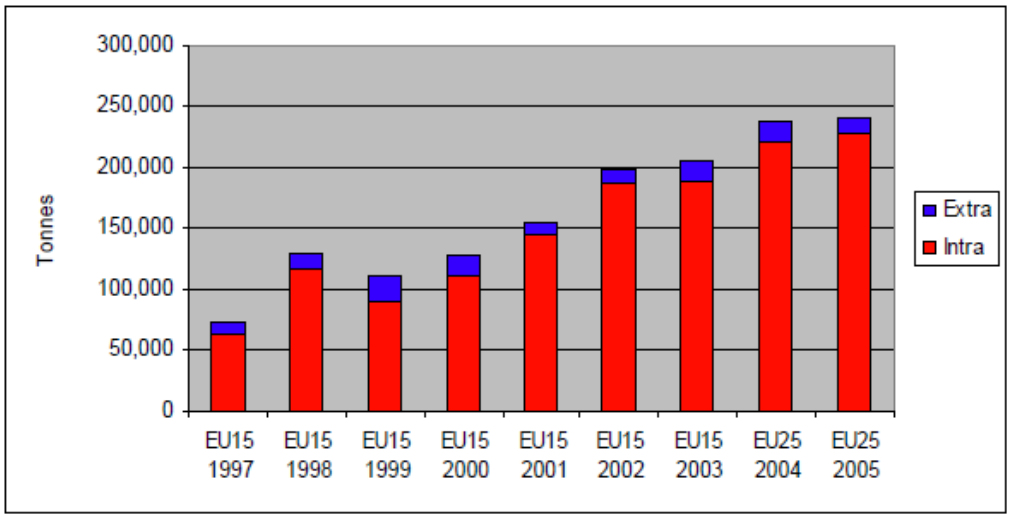
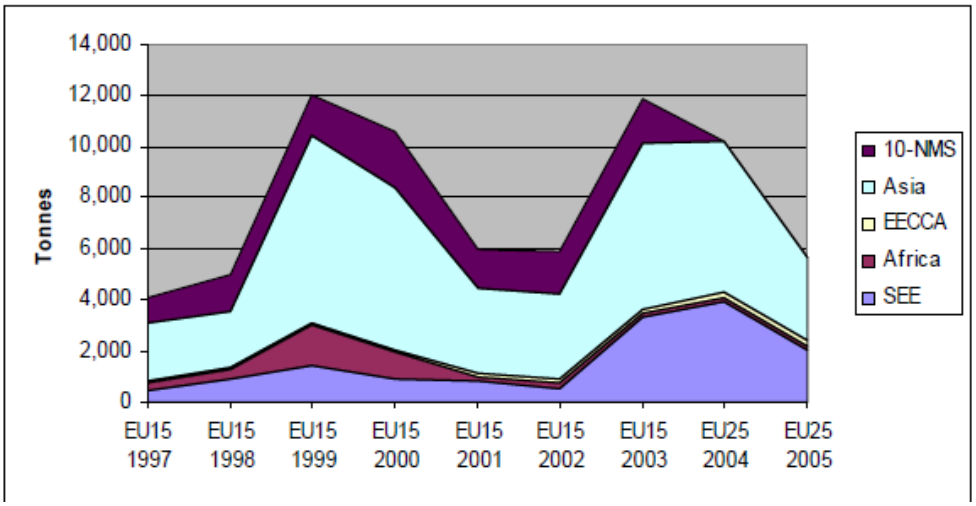


Figure 59 Development of registered export of WEEE from the EU MS 1997-2005 based on trade statistics [179]



Main part of registered export of WEEE is intra EU-25 and is related to batteries; only 10% of that is extra EU export, mainly to Asia, especially China, and South Eastern Europe, see Figure 60.

Figure 60 Destination of shipments of registered WEEE 1997-2005 out of the EU based on trade statistics.



Regarding WEEE, the EEA report 'Waste without borders in the EU'[2] states that even though the export of WEEE to African countries is prohibited, trade statistics show that many discarded TV sets are shipped to Africa, and that the low prices involved indicate that some shipments are likely to be WEEE. The EU exported 3.6 million colour TV sets in 2005 (100,000 tonnes) with an average value per unit of €339 and average weight of 28kg per unit[198].

This suggests that the low value of WEEE as a secondary material is causing them to be shipped outside of the EU where running costs and health safety and environment standards are lower.

3.3.5 Obstacles and Barriers to Recycling Societies and Markets

The potential barriers and needs to address to recycling societies and markets identified by experts, within the literature and stakeholders at the 22nd June meeting are presented in table Table 16 below. These are categorised according to the barrier type to be overcome helping to identify and focus the problems and the potential solutions that could be adopted.

Table 16 Potential barriers and needs in terms of promoting recycling and the improved use of resources identified by experts

Type of barrier	Issues Raised	Needs Identified
Policy	• Failure to implement existing policies effectively • Excessive focus on e.g. national carbon budgets without effective consideration of the effects of the manufacture of primary and secondary materials in third countries • Lack of support from Member States to encourage reuse and waste prevention activities • Lack of systematic reporting on reuse activities • Lack of consideration of the broader sustainability of goods and services, i.e.	• Clear emphasis on targets for waste prevention and reuse • Incentives to promote the use of secondary raw materials • Greater focus on ecodesign for products, including use of secondary raw materials • Development of common methods, measurement and indicator systems for waste prevention • Creation of common EU guidance on the quality of recyclates

[198]EEA Report No 1/2009. Waste without borders in the EU?
Transboundary shipments of waste http://www.eea.europa.eu/publications/waste-without-borders-in-the-eu-transboundary-shipments-of-waste

	gaining benefits from using secondary raw materials • Insufficient activity to tackle waste prevention • Lack of incentives to mitigate against the use of cheap raw materials, i.e. supporting the closing of the recycling/reuse loop • Failure to take into account the positive externatlities associated with recycling and the negatives of virgin material use	
Technology	• Co-mingled waste collection systems producing low quality secondary materials • Lack of confidence or awareness/incentives to promote the use of new technologies	• More reliable collection systems and more specialised recycling processes
Market	• Lack of support for stabilised markets for secondary raw materials • Fear that promoting sales of secondary materials might damage sales of new materials due to competition • Ignorance in terms of the proximity of local markets for resource management acting as a barrier to prevention/reuse activities • Lack of confidence to invest in new technologies • High volatility in the secondary raw materials price • Market distortions and failures linked to lack of consideration of externalities and additional incentives promoting other forms of waste management ie energy from waste • Differences in the interpretation of legal requirements leading to market distortion • Lack of value associated with some recycled product • Lack of emphasis on quality both in terms of recyclables and secondary raw materials • Inadequate collection schemes and perceived cost of high quality collection when the benefits are felt by others	• Boosting support for markets for secondary raw materials • Fair access for private sector to waste management contracts
Social	• Negative perceptions of the concept of waste management associated with a lack of knowledge regarding how to promote such a society • Lack of awareness of environmental problems and associated desire to act responsibly • Perceived marginal cost of refuse collection	• Promote behavioural change to encourage reuse and recycling among industry and consumers • Enabling waste prevention actors to reach out to the public • Finance targeted information campaigns and provide financial support to dedicated waste prevention and reuse projects • Promote the exchange of waste management information between countries

3.3.6 CONCLUSIONS ON DELIVERING RECYCLING MARKETS AND POLICY MECHANISMS

Analysis of the recycling markets suggests that central to the question of promoting the use of secondary raw materials is the question of ensuring quality, reliable streams of recyclables and increasing confidence in the market place in terms of the applicability for use. Moreover, secondary raw materials and recyclable markets proved highly vulnerable to the recent economic downturn, seen most acutely in countries where

recyclable streams are considered of lower value and quality, given lack of source separation and high levels of mixing between materials streams.

Secondary materials continue to command a lower price than primary. This is a consequence of the structural basis of the primary markets ie their relative lack of elasticity in terms of supply. Importantly, however, this is also a consequence of the lack of consideration of the negative externalities of primary production and the positives of secondary material use.

Examination of polices in place within leading MS, and key transitional countries, suggests that there are considerable mechanisms set out to promote higher levels of recycling such landfill taxes. However, many of these promote simply high levels of collection of low quality materials rather than focusing on providing the best goods for future supply chains. We are therefore seeing improved levels of recycling but a more limited improvement in the outcomes in terms of quality materials for secondary use.

Within the literature, analysis of MS policies and discussions in stakeholders the following potential policy solutions were identified to aid the development of recycling markets. It should be noted, however, that it was repeatedly highlighted that there is no one size fits all policy approach to the question of improving recycling markets. It was noted that different tools are levels of intervention are needed in different waste streams as, for example, price and perceived value of secondary materials varies depending on whether discussions are focused on metals, plastics, paper etc and within these groups.

Economic instruments – Landfill taxes were widely considered to be of importance in promoting the wide scale increase in recycling levels, however, alone were deemed unlikely to deliver high quality recyclables for reprocessing. Landfill taxes are most successfully used as part of a well structured and broader mix of instruments to promote improvements in waste management. Economic instruments were suggested as a way of favouring secondary material use over primary, for example, by changing the VAT status of secondary goods to give them a preferential economic standing. Moreover some mechanism might be found to better represent the benefits in terms of GHG reductions associated with use of secondary raw materials, compared to primary. This might reward users of secondary materials or be linked to level of usage of primary materials, designed to rebalance some of the externalities associated with the trade off between material use types.

Responsibility and Product Policy – It was considered that in order to extent increase accountability throughout the product chain, hence desire to use secondary materials etc, producer responsibility for waste and resource use could be extended further along – although it was noted that those deemed responsible must still be able to influence production and waste management practices in the chain to prove effective. Further eco-design requirements linked into more advanced public procurement programmes were also seen as key to simulate secondary material use.

Securing good waste management practices – Sufficient sorting within the EU and selective/separate collection are important to create and maintain viable recycling markets and also reduce dumping of unwanted goods into third countries. Standards could be developed for selective collection. Source separation and separate collection at source were seen by industry as the best option both economically and environmentally.

Regulatory mechanisms – Targets at EU level have proved highly valuable in terms of driving forward recycling efforts, these should not be shied away from into the future. There is a need to continue to promote recycling but in tandem with additional measures to better secure quality in the chain. More flexible regulatory mechanisms were also suggested as potential sources of promoting environmentally responsible recycling such as extending the idea of green certificates to recycled goods to recognise the benefits associated with recycling. Sectoral resource and process efficiency benchmarks could be developed to help maximise the return of unavoidable waste back into the production process

Research – It was considered that centralised research is needed to identify the most environmentally beneficial ways of treating different waste streams and to enable the promotion of best practices.

Awareness raising – There is a need to raise the profile of recycling and the importance of quality recycling and source separation. Moreover, there has been some negative press around recycling related to third country impacts of exports, the importance of recycling and the situations under which it delivers the greatest environmental benefits should be communicated.

Stimulating demand for recycled products/recycled content – This is also important to maintain sustainable markets. Measures could include: consumers awareness-raising on recycled products/content as a quality alternative; mandatory green public procurement targets could require secondary raw materials to be preferred (subject to equal performance); extension of eco-labelling; and the extension of ecodesign requirements. Moreover there was a feeling that as we develop the market for recyclables there is a need to ensure better continuity of supply, to increase industry confidence and ability to rely on these resources. It was suggested that into the future lower landfill and incineration rates might need to be mandated for certain materials to help support the market for recycling. However, care must be taken that the desire to secure supply of recyclables does not inhibit prevention efforts.

4. CHAPTER 4 – DELIVERY OF THE WASTE THEMATIC STRATEGY

4.1 CONSIDERING THE DIFFUSION OF WASTE MANAGEMENT POLICY CONCEPTS ACROSS THE EU

4.1.1 METHODOLOGY

The Waste TS was intended not only to impact on practices in Europe, but also to help guide better policy making in Europe. This study undertook an analysis of the diffusion (take-up) of eight key terms from the Waste TS in relevant EU and Member State documents and legislation. The eight key terms are:

- waste hierarchy;
- life cycle thinking;
- waste prevention;
- producer responsibility;
- proximity principle;
- recycling society;
- using waste as a resource; and
- reducing negative environmental impacts by better waste management.

The analysis looked at 15 EU documents (on waste, natural resource management, procurement/green public procurement, greening product design and industry regulation and pollution control) and 75 documents (legislation, guidance, national/regional waste plans/strategies, progress reports and consultations) across eight Member States. These documents were selected by the researchers carrying out each individual Member State case study, therefore although some guidance on the type of documents was provided, the number and type of documents assessed per Member State varied according to the expert opinion of the relevant researchers.

The first element of the analysis was a numerical count of the occurrence of the terms (and synonyms). The resulting numbers were then categorised as representing either 'extensive' (high number of occurrences and presence in many documents), 'fair' (reasonable number of occurrences and/or presence in fewer documents) or 'limited' (low number of occurrences and/or presence in limited number of documents) level of diffusion. In addition a qualitative element of the analysis aimed to assess the context in which the terms are used, and whether the interpretation of the terms in the Member States is consistent and compatible with the use and definitions of the terms in the Waste TS and Directive 2008/98/EC on waste.

The following sections present a summary of the analysis undertaken. This is by no means intended or claimed to be a comprehensive assessment of the state of compliance or implementation of EU policy and legislation in the Member States; rather it is intended to provide an understanding as to whether broad waste management concepts are penetrating from the Waste TS and Directive 2008/98/EC into Member State policy.

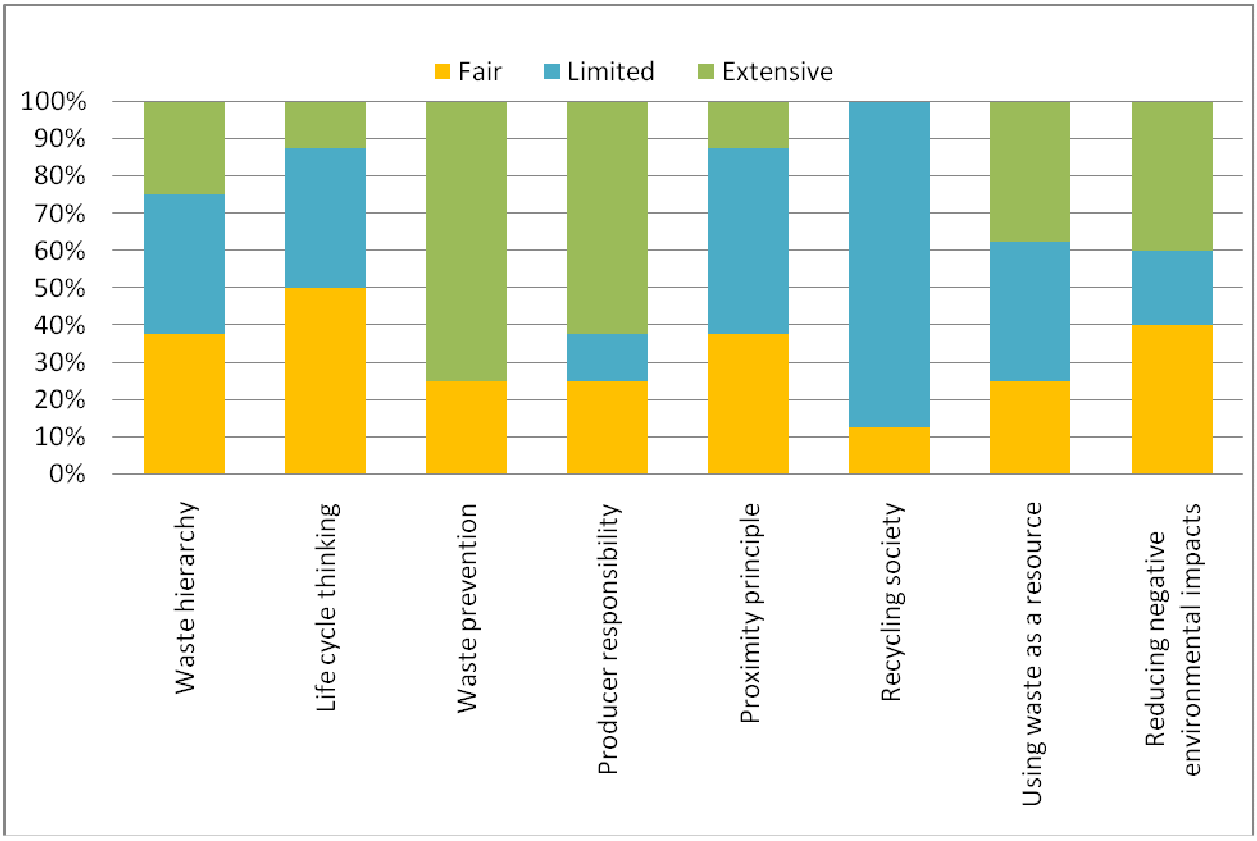
4.1.2 DIFFUSION OF TERMS INTO MEMBER STATE POLICY AND LEGISLATION

This section presents the findings related to the diffusion of terms into the policy and legislation of a selection of eight Member States: Austria, Finland, France, Germany, Italy, Malta, Poland and the UK. The Member States selected were intended to provide a mix of countries with centralised and federal governance structures, large and small countries, EU-15 and EU-12 Member States, and northern and

southern Member States, in an attempt to provide a balanced overall view of the diffusion of terms across the EU Member States.

Figure 61 below attempts to provide an overview of the diffusion of each of the terms across the Member State documents assessed; it shows the percentage of the total number of Member State documents assessed as demonstrating either a limited, fair or extensive level of diffusion of each of the terms.

Figure 61 Diffusion of key terms and concepts in Member State policy documents



4.1.2.1 WASTE HIERARCHY

The term **'waste hierarchy'** enjoys a 'fair' degree of diffusion through national policy documents. However, whilst the actual term is only used to a 'fair' degree (in the cases of Finland and France, for example, the term only occurred in one of the documents), many of the documents reviewed clearly take the concept of the hierarchy into account to a considerable degree. The term arises most often in national and regional waste management plans. Usage of the term across Member State documents appears to be broadly in line with the waste hierarchy as defined in Directive 2008/98/EC. It tends to be used as a general guiding principle for waste management. In some cases the term is not used to refer to the exact five-step hierarchy in Article 4 of the Directive, but it is consistently used to refer to prioritising prevention and recycling over disposal. One German expert interviewed suggested that 'waste hierarchy' is more of a guideline than a legally-binding concept, as instruments to enforce the hierarchy are lacking.

In five Member States (Austria, France, Malta, Poland and the UK), use of the term/concepts with a similar meaning occurs in documents pre-dating the Waste TS. The broader concept has also been in use in Italy and Germany since the 1990s. The Austrian Leitlinien der Abfallwirtschaft from 1988 dedicates a whole chapter to a 'hierarchy of objectives' (= Zielhierarchie), establishing priorities of waste prevention over waste recycling over disposal. In the UK, the term is mentioned more often in the Welsh and Scottish national waste strategies (which pre-date the Waste TS) than in consultation documents to review those two strategies (which were published after the Waste TS and Directive 2008/98/EC); this may simply be a

reflection that the strategies are longer and go into more detail than the consultation documents. It is mentioned most extensively in the consultation document for the transposition of Directive 2008/98/EC in England and Wales. Usage of the term 'waste hierarchy' in Finland and Germany, however, seems to have largely developed after adoption of the Waste TS; the current waste management plan of Baden-Württemberg does not refer to the waste hierarchy, but the 2009 draft for the new waste management plan of Nordrhein-Westfalen does. The Finnish National Waste Plan, approved in 2008, introduces a hierarchy identical to that in Directive 2008/98/EC, and the proposal for a new regional waste management plan for the Piemonte region of Italy is also modelled on Directive 2008/98/EC. It can therefore be concluded that although the concept behind 'waste hierarchy' pre-dates the Waste TS, use of that specific term has expanded since the Waste TS was adopted.

The main synonym identified was 'order of priority/priorities' for waste treatment and disposal; this was predominantly used in Austrian and Italian documents.

4.1.2.2 *LIFE CYCLE THINKING*

The term **'life cycle thinking'** appears to be diffused through national policy documents to a 'fair' degree. However, whilst the actual term is only used to a 'fair' degree, many of the documents reviewed clearly take the concept into account to a considerable degree. It appears to be used a general guiding principle to be followed, for example in the design of new waste legislation (Austria), to improve material efficiency (Finland) and as a means of enhancing waste prevention (Italy). Usage of the term is consistent with the use of the term in the Waste TS level. The regional laws of Germany and Italy that were reviewed do not use the term.

The broad concept behind the term 'life cycle thinking' is present through synonyms used in documents adopted prior to the Waste TS in several countries (Austria, France, Italy, Malta and the UK). The Austrian Leitlinien der Abfallwirtschaft (1988) sets as objectives the minimisation of the use of raw materials/energy and the minimisation of environmental and health impacts by the appropriate design of all economic processes. Usage of the specific term, however, appears to occur in the majority of national documents only after adoption of the Waste TS, perhaps indicating a change in terminology more than a shift in thinking. A Finnish expert interviewed explained that there has been a growing emphasis on life cycle product design since the EU introduced its integrated product policy. Concerns were raised by Italian and French experts that the term was rather vague, although a French expert suggested that the term 'life cycle approach' is becoming better defined in the country as a result of the transposition of Directive 2008/98/EC.

Common synonyms identified included 'life cycle' on its own and 'life cycle analysis'. Also used were 'ecological consideration of the total system', 'lifecycle wide system thinking', 'material flow economy' and 'economy of closed material cycles' (Austria); 'cradle to grave', 'multicriteria approach' (France); 'eco-balance', 'life cycle of products' (Italy); and 'life cycle assessment', 'life cycle approach' in the UK.

4.1.2.3 *WASTE PREVENTION*

The term **'waste prevention'** appears to have been diffused extensively into Member State policy documents. Given that waste prevention is at the top of the EU waste hierarchy and is a major (and relatively new) aim of EU waste policy and legislation, it is significant that this is the most commonly used of all the eight terms assessed across Member State policy documents. This could be presented as a clear indication that the concept of waste prevention is enjoying a high profile in the Member States, as it now does at the EU level, and that Member States are making genuine efforts towards waste prevention. The term is used widely in both legislation (national and regional) and waste management plans, and its use is consistent with the term as used in EU documents. A French expert interviewed suggested that the term 'waste prevention' is becoming better understood as a result of clearer and more consistent definition in EU and national legislation. Experts interviewed in Austria and Finland suggested that qualitative waste

prevention in particular must be dealt with not only in waste-specific legislation, but also in chemicals/product legislation, in order to be effective.

All of the Member States assessed were using the term 'waste prevention' (or similar terms) to some extent prior to adoption of the Waste TS and Directive 2008/98/EC. The precise term does however seem to be enjoying greater prominence since it became a core element of EU waste policy, particularly in Finland and France.

Synonyms identified included: 'waste prevention activities', 'minimisation of pollutant contents' (Austria); 'prevention' on its own (Finland); 'reduction/minimisation of waste arisings' or equivalent (Austria, France, Malta, Poland); 'avoided waste', 'reduction at source' (France). The use of 'reduction' as a synonym for prevention should not necessarily be viewed as a lack of ambition; it often appears to have the same overall aim, of decreasing overall levels of waste (e.g. by eco-design or by consumer choice).

4.1.2.4 PRODUCER RESPONSIBILITY

The term **'producer responsibility'** is used fairly extensively in Member State documents. The term is generally used in relation to specific waste streams such as batteries, WEEE, ELV and packaging, which is in line with the obligations placed on producers in the relevant EU Directives, including obligations to finance separate collection (e.g. for packaging) and to take back end of life products (e.g. batteries, WEEE, ELV). As a result of this, use of the term is very closely aligned to the EU level definition. A Finnish expert interviewed asserted that national producer responsibility systems would not have started in the country without EU impetus. Austrian and Finnish experts expressed concerns that it is often difficult to define the 'producer' who should take responsibility, given complex supply chains and collective responsibility under certain schemes. A German expert interviewed suggested that the principle is currently mainly used for waste streams that are subject to specific legislation (packaging, WEEE, ELV, batteries) and that there remains considerable scope to extend the principle to additional items, for example toys.

In the majority of the studied Member States (Austria, Finland, Germany, Malta, Poland and the UK), usage of the term 'producer responsibility' (and even 'extended producer responsibility' in the case of the Welsh and Scottish national waste strategies in the UK) pre-dates adoption of the Waste TS. This is generally a reflection of the earlier adoption of EU producer responsibility Directives (on WEEE, ELV, packaging and batteries). In some cases (Finland, France) the term appears to have become more commonly used and more deeply entrenched in general waste law (rather than product-specific legislation) since 2008, suggesting influence by Directive 2008/98/EC. In Italy the concept of producer responsibility is not directly used in the current National Environmental Code, although the proposal for a new National Code for the Environment inserts a new article on extended producer responsibility. In Finland, the new waste bill proposes improving the supervision of the producer responsibility system, by obliging certain distributors to check that their suppliers are properly registered on the national register of producers before they are able to distribute their products. These are two examples of tightening of producer responsibility that have occurred following the Waste TS/Directive 2008/98/EC.

Synonyms used include 'burden of producers' (Italy); 'producer obligations' or 'business obligations' (Finland, Poland); 'eco-organisms' (France); 'extended producer responsibility' (France, Italy); 'polluter pays principle' (Austria, France, UK). The latter does not mean exactly the same as 'producer responsibility', but was deemed to be strongly linked to the concept of producer responsibility and therefore included in the analysis.

4.1.2.5 PROXIMITY PRINCIPLE

The term **'proximity principle'** appears to suffer from limited diffusion within Member State policy documents. The specific term does not feature in any of the documents reviewed in Finland or France, and tends to be used sparingly in other countries. However, although the specific term may not feature often in national documents, there is evidence that Member States are making efforts to ensure that waste is treated as close as possible to its source, in particular in the waste management plans reviewed (notable

examples include the waste management plans of Nord-Rhein Westphalia and Baden-Württemberg in Germany, and the regional waste law of Campania, Italy). One German expert suggested that there is no mechanism in the country's federal law to enforce the proximity principle; this is borne out by the term's presence in waste plans rather than in binding legislation.

The Italian National Environmental Code aspires to achieve 'self-sufficiency' when it comes to the disposal of waste, primarily treating waste in installations close to its place of production. This term is also used in UK documents. Its use in Member State documents differs from, but is not contradictory to, its use in EU level documents; whilst Directive 2008/98/EC defines self-sufficiency as waste disposal within the EU or within national borders, some Member States are already using it to refer to the regional/local level.

The concept behind the term 'proximity principle' is present in documents adopted prior to the Waste TS in some countries (France, Italy, UK), but the term was not present in Polish legislation before it was introduced at EU level. Ongoing limited use of the exact term may reflect its novelty, as it was only introduced in Directive 2008/98/EC (Directive 2006/12/EC did however mention the importance of the EU as a whole becoming self-sufficient in waste disposal, the desirability for individual Member States to aim at self-sufficiency, and that movements of waste should be reduced, which are similar goals to the proximity principle). Member States may also shy away from making too explicit a reference to the proximity principle, fearing that it could potentially be construed as contradicting the free movement of goods within the EU. One Finnish expert suggested that although landfills have become more centralised in Finland (there are now 100 where there used to be 1,000), resulting in greater travelling distances for waste, this may make sense in a country with a very dispersed population, resulting in a smaller number installations that can treat more waste more efficiently and more safely.

Synonyms identified included: 'avoidance of long transport distances'/'limiting transportation' (Austria, France); 'waste disposal shall take place at one of the nearest appropriate waste disposal facilities' (Finland); 'principle of disposal proximity', 'principle of disposal near the site of waste production' (Germany); 'self-sufficiency' (Germany, Italy, UK (England and Wales)).

4.1.2.6 RECYCLING SOCIETY

The term **'recycling society'** appears to suffer from limited diffusion within Member State policy documents. The exact term is not used in any of the Italian, Maltese, Polish or German documents reviewed (although the term is used in many NGO briefings and ministerial speeches in Germany). In Finland it is only used in one document, the National Waste Plan, but it features in the title of that document, giving it high prominence. In France, the term was only used in the law transposing Directive 2008/98/EC. It is also used infrequently in Austrian and UK documents, and most of the occurrences of the term in UK documents are as a result of Directive 2008/98/EC being directly quoted. However, it is arguable that although the actual term may not be enjoying widespread use, the Member States are taking steps towards creating policies to encourage a 'recycling society'.

'Recycling society' is a new term with its origins in the Waste TS, and it only occurs in Member State documents published after the Waste TS. Its first usage in the French law is in quotation marks, indicating a certain unfamiliarity with the term. Finnish experts interviewed suggested that the term was included in the National Waste Plan towards the end of the Plan's development, to reflect the strong integration of EU policy goals. The novelty of the term, and the lack of a clear definition at EU level, may go some way to explaining its limited use to date in national policy documents. The term is perhaps inadequate to express its full meaning; experts interviewed in France and Poland suggested that the achievement of a 'recycling society' must include firm commitments by society, understanding of product design, traceable recycling and reuse processes and environmental education, amongst other things. In addition to this, the term implies that recycling is the most characteristic aspect of the population's lifestyle (similar to the terms 'throwaway society' or 'leisure society'. As other concerns (unemployment, economic growth, climate change) tend to be much more important to society, the term 'recycling society' may sound a little like wishful thinking, and Member States may avoid use of the term to avoid sounding too idealistic or unrealistic. One German expert, however, suggested that the term would be a good basis for the

improvement of waste management, in tandem with the goals of increased resource efficiency and climate protection.

Synonyms identified included: 'recycling waste as much as possible', 'to close material cycles' and 'closed loop economy', 'closed circle economy' (= Kreislaufwirtschaft) (Austria, Germany); priority given to recycling in the basic provisions of waste management via the waste management hierarchy (Italy); 'increasing the ecological awareness of society' (Poland); and 'high recycling society' (UK). The latter does not fully correspond to the EU-level interpretation of developing a society more dedicated to and conducive to recycling.

4.1.2.7 USING WASTE AS A RESOURCE

The concept behind the term **'using waste as a resource'** appears to have been diffused extensively into Member State policy documents. This extensive use is encouraging, as it suggests that Member States are recognising the potential value of waste as a resource, and taking steps towards encouraging better use of waste in this manner. In France, the term is used exclusively in the legislative documents reviewed. The English term does not translate neatly into German or Polish, and the term appears to be absent from the Italian and Finnish documents assessed; however, the concept behind the term (sensible use of natural resources, promotion of the reuse of waste etc) are well taken up. For example, in Germany the sharp legal limitation of landfilling of municipal waste necessitates that all of this waste is either incinerated (with energy recovery) or recycled. Use of the exact term and synonyms appears to be broadly in line with usage at the EU level.

Several of the Member States reviewed (Austria, France, Germany, Italy and the UK) appear to have been using the term or similar terms prior to adoption of the Waste TS and Directive 2008/98/EC; synonyms were already being used as early as 1975 in France and 1988 in Austria. Poland, however, appears to have adopted equivalent terms following the Waste TS and Directive 2008/98/EC.

Synonyms identified included: 'reducing raw material consumption' and 'resource conservation' (Austria); 'valuing waste', 'avoided impacts' (France); 'recycling and energy recovery' (Germany); 'waste recovery' (= odzysk) (Poland).

4.1.2.8 REDUCING NEGATIVE ENVIRONMENTAL IMPACTS BY BETTER WASTE MANAGEMENT

Diffusion of the exact term **'reducing negative environmental impacts by better waste management'** through national policy documents appears to be to a 'fair' degree. However, many of the documents reviewed clearly take this concept into account to a considerable degree. The principle behind the term is central to Austrian and Finnish waste management policies. Whilst the exact term was not found in any of the French, German or Italian documents reviewed, the use of synonyms related to the reduction of environmental impacts in the context of waste and waste management does demonstrate that the concept behind the term, if not the exact term itself, is being diffused into national policies in a way that is consistent with EU policy.

Ideas similar to the concept of 'reducing negative environmental impacts by better waste management' have been present in documents in Austria, France and Poland since before the Waste TS, but use of the precise (or similar) term seems to have increased following adoption of the Waste TS.

Synonyms identified included: 'precautionary principle' (Austria); 'environmental impacts' used in the context of waste management (Finland, France); 'neutralisation' (= unieszkodliwienie) (Poland).

4.1.3 DIFFUSION OF TERMS INTO EU POLICY AND LEGISLATION

The 15 EU documents assessed were grouped under together into the following categories: waste acquis/waste-specific policy and legislation (7 documents); natural resource management (3); procurement and green public procurement (1); greening product design (2); and industry regulation and pollution control (2). The full list of documents assessed is available in Annex 3.

Table 17 below gives a quantitative overview of the use of the eight terms (and terms with similar meanings) within the policy documents identified at the EU level, divided into waste-specific and non-waste-specific documents. In the final column, the extent of use of each of the terms across the EU documents is ranked as either: extensive; fair; or limited.

Table 17 Diffusion of key terms and concepts in EU documents

	Waste-specific documents	Non-waste-specific documents	Overall assessment
Waste hierarchy	16	0	16 (Fair)
Life cycle thinking	18	62	80 (Extensive)
Waste prevention	60	3	63 (Extensive)
Producer responsibility	48	0	48 (Extensive)
Proximity principle	7	0	7 (Limited)
Recycling society	6	0	6 (Limited)
Using waste as a resource	4	2	6 (Limited)
Reducing negative environmental impacts by better waste management	17	22	39 (Fair)

Perhaps unsurprisingly, the precise terms (or similar terms) occur most often in the seven documents under the 'waste acquis' category; accounting for around 64% of the occurrences of all terms across all documents. This suggests a good level of diffusion of the use of the key terms across the breadth of EU waste policy and legislation. Use of the terms in the other categories of documents appears mainly very limited; the term 'life cycle thinking' (and related terms), however, is a notable exception.

Diffusion of the term **'waste hierarchy'** is at best 'fair', as it is mentioned in only two of the documents reviewed (the Green Paper on bio-waste and Directive 2008/98/EC on waste). Most of those mentions are in Directive 2008/98/EC; this is logical given the new emphasis placed on the waste hierarchy in the new Directive. The meaning of the term is consistent across the two dossiers; the Green Paper does not explicitly define the term or cross-reference to it, which could suggest that its meaning is viewed as common knowledge. That the term is only mentioned in two waste-related documents is perhaps noteworthy, as it could be expected that other documents in the waste acquis would make reference to what is a central concept of modern waste management. Generally the term was used as a reference point, e.g. to support statements 'according to the waste hierarchy (landfill) is the worst option' or as something to be considered when taking actions '...propose their national targets... taking into account the waste hierarchy'. The term does not appear in any of the documents assessed under the other categories of documents.

The term **'life cycle thinking'** (and other similar terms such as including 'life cycle analysis', 'life cycle assessment', 'life cycle approach', 'whole life cycle', 'cradle to grave' and so on) enjoys 'extensive' diffusion. It is used the most often of the eight terms assessed, and its use is evenly spread across all of the categories of documents. The meaning of the term and its synonyms is consistent across the documents; references are made to the importance of sound science to support life cycle thinking, to the its relationship to the

waste hierarchy, and that much of the life cycle of products occurs beyond the EU's borders. This demonstrates a good understanding of the concept and its complexities. It is rarely explicitly defined in any of the documents, suggesting that it is well-established. The high level of usage of the term suggests that this concept is particularly well integrated across both traditional waste dossiers and dossiers in other areas that have a link with waste policy, in particular those with a focus on taking into account the impacts of products throughout their lifespan. The concept is regularly referred to as the most appropriate scale of analysis for environmental impacts, and is referred to as a requirement in a number of documents. The term is not used in the Interpretative Communication on waste and by-products, COM(2007)59, where its use could have been considered appropriate.

The term **'waste prevention'** (including use of 'prevention' on its own within the context of waste prevention) enjoys 'extensive' diffusion in EU documents. The majority of references refer to prevention as a requirement or obligation, and the predominant focus is on reducing the amount of waste being generated (quantitative prevention) rather than reducing its harmfulness (qualitative prevention). The use is consistent across dossiers. The use of the term is made alongside the waste hierarchy a number of times as well demonstrating a good understanding. All references to prevention occur after the Waste TS was published (the Waste TS is referred to on a number of occasions), suggesting that the Waste TS has to some extent formalised the goal of waste prevention. The vast majority of uses of the term - 95% - occur in the waste acquis category of documents, however. Only one of the waste-specific documents assessed (the Waste Shipment Regulation) does not directly reference waste prevention; this is perhaps logical as the Regulation's function is to deal with waste already produced. Aside from waste-specific documents, the specific term only features once in the Natural Resources Thematic Strategy, and similar terms appear twice in the IPPC Directive. This could be seen as an indication that the concept of waste prevention is not being included in other relevant policies; however, it is also arguable that although that specific term may not be mentioned, many of the objectives, obligations and actions contained in the other categories of documents are in fact contributing to the waste prevention. For example the Ecodesign Directive mentions that the ecodesign of products is a preventive approach designed to optimise the environmental performance of products.

The term **'producer responsibility'** (and similar terms, most notably 'extended producer responsibility', and references to specific responsibilities and obligations placed on producers) enjoys 'extensive' diffusion, although it only occurs in the waste acquis category of documents. Use of the term is consistent across documents. The majority of uses of the term are in Directive 2008/98/EC and in the WEEE recast proposal and the Batteries Directive. This is logical given that these two of the pieces of legislation have a strong connection with producer responsibility.

The term **'proximity principle'** (and terms with a similar meaning) enjoys only 'limited' diffusion, and only occurs in waste-specific dossiers (Directive 2008/98/EC, the Waste Shipments Regulation and the Directive on waste from extractive industries). As the term is fairly specific to waste and waste management, its absence from the other categories of documents is not necessarily cause for concern. It appears to be used in the most relevant items of legislation, and its meaning and use is consistent across those dossiers.

The term **'recycling society'** suffers from 'limited' diffusion. It is used sparingly in only two of the documents assessed (the Green Paper on bio-waste and Directive 2008/98/EC), and is limited to waste-specific documents. Where it is used, it is referred to as a strategic policy goal, providing context for specific actions. Its use in the two documents is consistent. Lack of use of the term cannot be taken as a reflection of lack of ambition of the other categories of documents to contribute to the creation of a recycling society in the EU; many of the other documents make reference to encouraging recycling, and the measures within them are therefore contributing the EU's ambition in this area.

The term **'(using) waste as a resource'** (and similar terms, for example a reference to 'valuable secondary raw materials' in the Communication on the raw materials initiative) also suffers from 'limited' diffusion. It

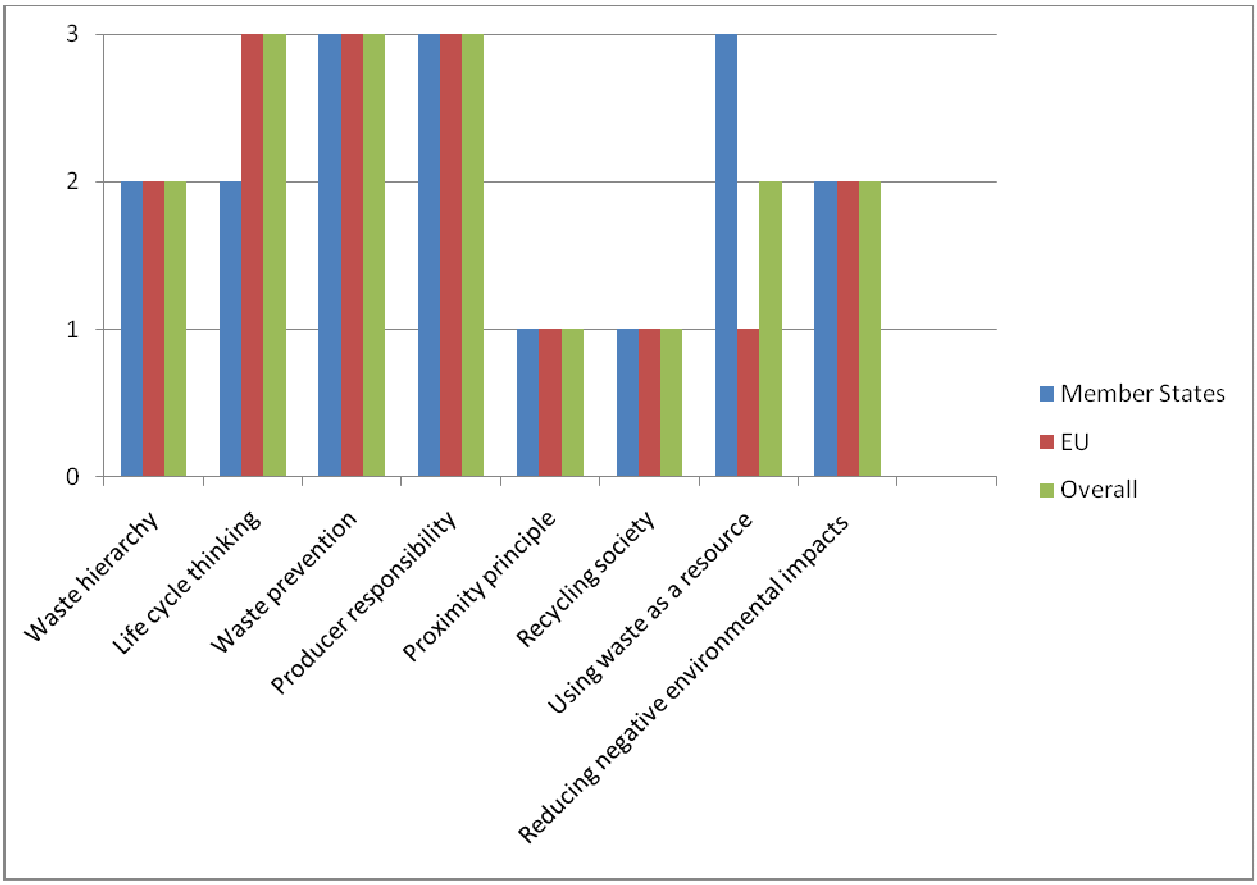
features only in the proposed WEEE recast and Directive 2008/98/EC, and synonymous terms are used in the Communication on the raw materials initiative and 'Buying green! A handbook on environmental public procurement'. All of these documents were published considerably after the Waste TS, in 2008. Its absence from certain documents (the Interpretative Communication on waste and by-products, Directive 2006/21/EC on mining waste, the Communication on SCP/SIP, and the Green Paper on biowaste) is noteworthy; dossiers such as these would seem to offer the potential to more explicitly encourage the use of waste as a resource. In this case, the relative absence of the specific term in the documents assessed could be an indication that the concept is yet to be fully integrated into EU policy.

The level of diffusion of the term **'reducing negative environmental impacts'** (and other terms with similar meanings) is 'fair'. The concept occurs in both waste-specific documents and other categories of documents, although not all of the occurrences relate to reducing negative environmental impacts by better waste management specifically. Generally the term is referred to as a policy objective, or is used in relation to specific actions. Many of the documents, in particular those in the non-waste-specific categories, refer to reducing impacts of resource use in general, in terms of the environmental performance of businesses/companies, or through better durability/reusability, better product design and improved production processes. Whilst this usage is complementary to use of the term in relation to waste management, it does not have quite the same meaning.

4.1.4 CONCLUSIONS AND RECOMMENDATIONS

Figure 62 below attempts to represent the level of diffusion of each of the terms in the Member State documents assessed, in the EU documents assessed, and overall (Member State and EU documents combined). A 1 represents limited diffusion, a 2 fair diffusion, and a 3 extensive diffusion.

Figure 62 Diffusion of key terms (and broader concepts) in Member State and EU policy documents



Headline conclusions of the diffusion analysis

For the conclusions below:

- Extensive diffusion = high number of occurrences and presence in many documents
- Fair diffusion = reasonable number of occurrences and/or presence in fewer documents
- Limited diffusion = low number of occurrences and/or presence in limited number of documents

Extensive diffusion: The terms 'waste prevention' and 'producer responsibility' enjoy extensive diffusion at both EU and Member State level, and 'life cycle thinking' enjoys extensive EU level diffusion and fair Member State level diffusion.

Fair diffusion: The terms 'waste hierarchy' and 'reducing negative environmental impacts by better waste management' enjoy fair diffusion at EU and Member State level, and 'using waste as a resource' enjoys extensive Member State level diffusion but limited diffusion at EU level.

Limited diffusion: The terms 'proximity principle' and 'recycling society' suffer from limited diffusion at both the EU and Member State level.

At the Member State level the term **waste hierarchy** arises most often in national and regional waste management plans; however it is also becoming more common in national and regional legislation with the implementation of Directive 2008/98/EC. Use of the term, usually as a general guiding principle for waste management, and to prioritise prevention and recycling over disposal, is also in line with the waste hierarchy as defined in Directive 2008/98/EC. The term has been in use in several Member States since before the adoption of the Waste TS, although use of the precise term has expanded since 2005. At the EU level, the term only appears in two waste-specific documents. Its meaning is consistent across the dossiers, but it could have been expected that more waste-specific documents would reference the term.

Life-cycle thinking is used in Member State documents as a general guiding principle. Its usage is consistent with use of the term in the Waste TS. The specific term appears to occur predominantly after adoption of the Waste TS; the concept behind the term was however present in many Member State documents prior to the Waste TS, suggesting that this is more a case of a change in terminology than a shift in thinking. The term is particularly well integrated in both waste and non-waste documents at the EU level, and the meaning if the term is consistent across dossiers and with the Waste TS. It is not, however, used in the Interpretative Communication on waste and by-products, where its use could have been appropriate.

Waste prevention is the best diffused term at the Member State level and is used widely in both legislation and non-legislative waste management plans, giving a clear indication that prevention now enjoys a high profile in the Member States, at least in terms of ambition. Its use is consistent with use of the term at the EU level. All Member States were using the term (or synonyms) prior to the adoption of the Waste TS and Directive 2008/98/EC, but its use has increased since their adoption. Focus at both the Member State and EU level tends more towards quantitative prevention rather than qualitative prevention (i.e. reducing the hazardousness of waste). At the EU level, all occurrences of the term arise after the publication of the Waste TS, suggesting that it helped to formalise the goal of waste prevention. The term is used only very rarely in non-waste specific documents, however, although the concept of prevention is arguably integrated into other areas of policy and legislation.

In the Member States, **producer responsibility** is generally used in relation to specific waste streams (e.g. batteries, WEEE, ELV, packaging), and is very closely aligned to the EU level definition. The majority of Member States were using the term prior to the publication of the Waste TS, which is likely a reflection of transposition of the earlier EU Directives addressing producer responsibility. In some cases the term does appear to be more deeply entrenched in general waste legislation since the adoption of Directive 2008/98/EC. At the EU level the term only occurs in waste-specific documents; the meaning of the term across those documents is consistent.

The specific term **proximity principle** is used to a limited degree in the Member States, although their policies, in particular waste management plans, often reflect efforts to ensure that waste is treated as close as possible to its source. Some countries have been applying this concept since before the Waste TS. Use of the similar term **self-sufficiency** differs from but is not contradictory to EU usage of self-sufficiency; in Directive 2008/98/EC it refers to the EU/national level, whereas Member States are already using it at the regional/local level. At the EU level the term is only used in waste-specific dossiers; as it is fairly specific to waste management this is not necessarily cause for concern, and where it is used its meaning is consistent across dossiers.

One of the least well diffused terms is **recycling society**. Although the term itself is infrequently used, however, there is no doubt that the legislation and policies of the Member States are working towards the achievement of a recycling society as per the EU level usage. Where it does occur at the Member State level, it is only used after adoption of the Waste TS; this is a reflection of the novelty of the term in the Waste TS, and perhaps also a reflection of the lack of a clear definition at the EU level. At the EU level, use of the term is limited to waste-specific documents, and its meaning is consistent across dossiers. Again, many other documents contain measures that contribute to the EU's recycling society goal, even where they do not use the specific term.

The term **using waste as a resource** is very well taken up in Member State documents. This suggests that the potential value of waste is recognised, and that steps are being taken to make use of this value. The term or similar terms were in use in several Member States prior to the Waste TS, whilst other countries appear to have adopted equivalent terms following the Waste TS and Directive 2008/98/EC. At the EU level use of the term is limited, and occurs only after the Waste TS. It is absent from certain documents where its use could have been justified, e.g. the Interpretative Communication on waste and by-products, Directive 2006/21/EC on mining waste, the Communication on SCP/SIP, and the Green Paper on biowaste. This could be an indication that the concept is yet to be fully integrated into EU policy.

The term **reducing negative environmental impacts by better waste management** is used to a fair degree in Member State documents, and used in a way that is consistent with EU policy. Ideas similar to the concept behind the term were present in several Member States prior to the Waste TS, but use of the term and synonyms appears to have increased since the Waste TS. At the EU level the term **reducing negative environmental impacts** is used to a fair degree; although many of the uses are not specific to waste management, they are at least complementary to improved waste management.

Whilst the eight specific terms assessed appear to enjoy varying degrees of diffusion into Member State and EU documents, it can be concluded that the concepts behind them do all feature to a reasonable degree at both the Member State and EU level. This is encouraging as it indicates that the Member States and the EU are working to achieve the same goals in terms of waste management. Use of the terms cannot always be assessed as a direct impact of the Waste TS, however, as in many cases (particularly at the Member State level) the terms and the concepts behind them were already being used prior to the adoption of both the Waste TS and Directive 2008/98/EC. Direct influence of the Waste TS is perhaps most pronounced in the case of 'waste hierarchy', 'waste prevention' (both of which also feature in the wording of Directive 2008/98/EC) and 'recycling society'.

As a result, there would only appear to be a limited set of recommendations to be proposed:

- The term and definition waste hierarchy could usefully be specifically referenced in more waste-specific documents at the EU-level;
- The specific term waste prevention (rather than prevention more generally) could usefully be included in more non-waste specific documents at EU level;
- An improved EU level definition of recycling society may help it to become more widely used, in particular by Member States; the term could also be used more widely in non-waste specific documents at the EU level (this would appear sensible as many other areas of policy could make very valuable contributions to the development of an EU recycling society); and
- The term using waste as a resource could also be used more widely in EU-level documents (it is absent from documents where its use could have been justified, including the Interpretative

Communication on waste and by-products, Directive 2006/21/EC on mining waste, the Communication on SCP/SIP, and the Green Paper on biowaste).

4.2 EU INTERNATIONAL INFLUENCE

4.2.1 INTRODUCING INTERNATIONAL ASPECTS OF WASTE POLICY

The Waste TS dedicated a whole section to discussing the international situation in terms of the development of waste management policies both in third countries and at the multilateral level. Despite this, however, it does not include specific actions in relation to the EU's international activities on waste or its international impacts. This section examines the nature of EU influence over waste management internationally.

4.2.2 CATEGORISING EU POLICY INFLUENCE

On the basis of expert input and a review of key dossiers the following three policy areas are considered those where the EU has the greatest potential to influence and improve approaches to waste management globally:

- Shipment of waste – i.e. promoting better practices both in terms of reducing illegal shipments and improving management of materials shipped for recycling or reuse;
- Product standards that might influence the hazardous content of waste; and
- Policies that influence the quantity, quality or use of secondary raw materials.

In these three areas the EU, in particular due to its common market status, has the potential to exert significant influence in terms of improving policy approaches in third countries and reducing the overall footprint associated with the EU's own use of resources.

There are three main ways in which EU policies act upon international waste management practices. Two of these influences were perceived by consulted experts as positive, while the third was negative (although perhaps offering the opportunity for improved approaches into the future). Table 18 below presents the three types of policy influence identified.

Table 18 Mechanisms by which EU policy can influence waste management activities in third countries

Type of Policy Influence	Description	Evidence	Nature of Impact
Fulfilling a leadership role	Adopting ambitious policies to deliver better practice in promoting policy concepts resulting in improved consideration of waste management in some third countries	Stakeholders reported that the EU has had an impact on the broader question of how waste management can be improved. It was considered that the profile of issues such as use of the waste hierarchy and the benefits of improved waste management have been raised as a consequence of EU policy making in this field. Stakeholders commented that the Waste Framework Directive influenced thinking in terms of improving management in the US/Canada/Japan.	Positive
Supporting policy-making in third countries	The adoption of ambitious and effective mechanisms for dealing with problem areas of waste management in Europe leads to the adoption of similar waste laws in third countries	There is extensive evidence of the adoption, in particular, of the product-based recycling legislation by third countries. For example measures similar to or inspired by RoHS/WEEE are reported to have been adopted in Japan, Korea, California, China, Thailand and India. Similar examples of broader adoption of EU policy ideas can be applied to the ELV Directive and the Packaging Directive. Product based Directives apply standards to all imports of a specified good to the EU as well as to EU manufactured products, therefore there is an additional incentive to apply	Positive

		similar rules and requirements in countries for whom the EU represents an important export market.	
Consequences of EU policy-making	Adoption of policies and measures in the EU to reduce disposal of waste leads to increased export of materials for recycling and recovery with the risk that waste is not treated in an environmentally responsible manner	This is a significant concern in terms of the EU's footprint on the global environment, i.e. there is a risk that we are exporting polluting activities. Moreover, there are questions raised, as we push to expand our efforts towards recycling and recovery, as to how we can ensure that this is not at the expense of the environment in third countries. Finally there are concerns that the EU is exporting its material for recycling, resulting in the loss of materials from the EU streams, and that products imported do not sufficiently deliver in terms of recycled content, i.e. completing the recycling loop.	Negative, but potential to alter

From the analysis undertaken, it is anticipated that EU law could influence policy-making in third countries in the following ways:

- EU law is directly copied out into a third country's national law, with the same standards and delivered by the State;
- The EU law inspires similar measures, for example delivered by industry;
- The EU's efforts to address a policy area of concern inspire a third country to tackle an issue as a priority;
- The EU's efforts to prioritise waste management and resource use add to the weight of pressure upon other countries to address their own waste challenges in this field; and/or
- Laws adopted in the EU lead to changes in the consideration of environmental conditions or the use of secondary raw materials in products.

It is anticipated that the rate of adoption of laws similar to or influenced by the EU will depend on the type of relationship between the EU and the third country, for example:

- Whether the third country can be considered an EU neighbour;
- Whether the country is a primary recipient of materials from the EU, for example for processing into secondary raw materials; and/or
- Whether the country is a primary producer of goods for which the EU represents a significant market place.

4.2.3 REVIEW OF INTERNATIONAL CONVENTIONS OF RELEVANCE

International agreements on waste concentrate primarily on waste shipment, especially the shipment of hazardous waste.

The **most important international agreement** is the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The Convention is the most comprehensive global environmental agreement on hazardous and other wastes. It entered into fore in 1992 and currently has 172 signatory Parties. It aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.

An important OECD document in this regard is OECD Decision (C-107/2001) concerning the control of transboundary movements of waste. This Decision forms the basis for a control system for imports and exports of waste destined for recovery within the OECD area, which allows the trading of recyclable materials in an environmentally safe manner.

Other countries have forged **bilateral agreements** concerning waste shipment, with examples including:

- 1986 agreement (amended 1992) between Canada and the United States regarding the transboundary shipment of hazardous waste between the two countries; and

- 1986 agreement between Mexico and the United States regarding the transboundary shipment of hazardous wastes between the two countries.

Other examples of treaties regarding hazardous waste shipment include:

- **Partnership Agreement ACP-EC**: **Cotonou agreement**: successor to the Lomé Convention, Revised in 2010; and
- **Bamako Convention** on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa.

The International Organization for Standardization (ISO) has published a number of standards relating to waste. The most relevant include:

- ISO 15270:2008 Plastics - Guidelines for the recovery and recycling of plastics waste
- ISO 22628:2002 Road vehicles - Recyclability and recoverability - Calculation method
- ISO/IEC Guide 41:2003 Packaging - Recommendations for addressing consumer needs
- ISO 11932:1996 Activity measurements of solid materials considered for recycling, re-use or disposal as non-radioactive waste
- ISO 30000:2009 Ships and marine technology - Ship recycling management systems - Specifications for management systems for safe and environmentally sound ship recycling facilities

4.2.4 REVIEWING THE IMPACT OF EU LAWS ON THIRD COUNTRY POLICIES

In the EU, waste streams such as end-of-life vehicles (ELV), batteries, waste electrical and electronic waste and its hazardous content (WEEE and RoHS) and packaging have been made subject to specific 'recycling directives', which require producers to arrange for the collection and/or recycling/recovery of the products. In general the recycling directives also set minimum recovery and recycling targets. Increasingly, this legislation appears to be taken as a model or as inspiration for legislation in third countries.

A study entitled 'Product stewardship in the United States: the changing policy landscape and the role of business'[199] found that in most cases, the establishment of product stewardship, i.e. the involvement of producers in such issues as waste prevention and recycling, is helped by regulations overseas, typically in the EU.

The following sections outline some examples of legislation in key third countries, specifically legislation related to WEEE/RoHS, ELV and packaging, and highlights where such legislation appears to have taken inspiration from EU legislation. This is based on internet research on countries including Australia, Canada, China, India, Israel, Japan, Korea, New Zealand and the USA.

4.2.4.1 WEEE/RoHS LEGISLATION

China's 2009 Regulation for the Administration of the Discovery and Disposal of WEEE products created a state-managed fund for the disposal (i.e. recycling/recovery/disposal) of WEEE, to be used for the recycling/recovery/safe disposal of WEEE. Manufacturers and importers of WEEE must contribute to the fund. The Regulation also calls upon manufacturers to design their products in such a way as to facilitate re-use/recycling. China also has its own RoHS legislation, which obliged producers to label EEE products that include hazardous substances (i.e. lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl, polybrominated dyphenyl ethers but not Deca-BDE, (by 2007)). A catalogue is also to be produced listing products which may not feature any of the substances (or some other substances) or must abide by limit values. The catalogue was due by the end of 2007, but had still not been produced by early 2010.[200]

[199] Sustainability: Science, Practice & Policy, "Product stewardship in the United States: the changing policy landscape and the role of business", 4(2), 29-35.
[200] Department of Foreign Trade (Dft), Thailand, 2010, China RoHS

China therefore appears to have taken up the principal approach of the EU to involve producers in the financing of their waste materials. Given the timing and the approaches of Chinese legislation, it can be assumed that the EU WEEE/RoHS Directives played a certain role in its design. EU legislation is also likely to have influenced Chinese legislation given that China is a major manufacturer and exporter of electrical and electronic products[201].

Japan's WEEE recycling scheme was laid down by the Home Appliance Recycling Act (2001). Consumers are in principle responsible to pay for the transport and recycling of their WEEE appliances. Disposal (i.e. recycling/recovery) fees are internalised in the prices for personal computers or certain batteries when purchased in Japan (according to a special law), but for major home appliances the Home Appliance Recycling Act requires the consumer to pay a disposal (recycling/recovery) fee, i.e. after the product has become waste; this led to a rise of illegal disposal of major home appliances in Japan.[202] In order to ensure correct collection, goods can be taken to local post offices for collection (e.g. TVs), returned to the point of purchase, or picked up by arrangement with a collection unit.[203] Manufacturers must set up their own treatment facilities or commission recycling services to comply with their recycling obligations. The Home Appliance Recycling Act also sets targets for recycling and reuse of specific goods, based on a percentage of materials depending on appliance type (e.g. 70% for air conditioners and 50% for CRT TVs).[204] Japan has an ordinance, in effect since July2006, requiring special warning labels to be affixed to personal computers, unit-type air conditioners, TVs, microwave ovens, clothes driers, electric fridges and electric washing machines[205] that contain any of the six substances banned by the EU's RoHS Directive (mercury, cadmium, lead, hexavalent chromium, PBB and PBDE).[206]

As there are substantial differences between Japanese and EU legislation, and given the date of the Home Appliance Recycling Act (2001), no major EU influence on Japanese legislation can be assumed, apart from the list of hazardous substances which is the same in Japanese and EU legislation (RoHS).

The government in **India** recently presented a draft for a new separate law on WEEE (which was formerly covered under general hazardous waste law)[207] The legislation is reported to be aiming for all Indian recyclers to be required to register and be authorised, to ensure that all Indian WEEE is recycled safely.[208] The draft also covers the reduction of the use of hazardous substances; this could be a reference to the EU RoHS Directive and the draft's scope is reported to be similar to EU WEEE/RoHS (e.g. it includes EU categories 8 and 9, medical devices and monitoring and control instruments), although further clarity is required.[209] Manufacturers and importers will need to provide written documentation on compliance and include details in a product information booklet.

The details of the draft are not readily available, so it cannot be judged if the draft law reflects much of the EU approach to WEEE and RoHS legislation.

[201] Chong, J., Mason, L., Pillora, S., Giurco, D., 2009, Briefing Paper – Product stewardship schemes in Asia: China and Taiwan, Japan, South Korea. Paper prepared for Department for the Environment, Water, Heritage and the Arts, by the Institute for Sustainable Futures, UTS: Sydney

[202] Read also: Sung-Wong Chung and Rie Murakami-Suzuki, A comparative study of E-Waste Recycling System in Japan, South Korea and Taiwan from the EPR-perspective, p. 129.

[203] Chong, J., Mason, L., Pillora, S., Giurco, D., 2009, Briefing Paper – Product stewardship schemes in Asia: China and Taiwan, Japan, South Korea. Paper prepared for Department for the Environment, Water, Heritage and the Arts, by the Institute for Sustainable Futures, UTS: Sydney

[204] Chong, J., Mason, L., Pillora, S., Giurco, D., 2009, Briefing Paper – Product stewardship schemes in Asia: China and Taiwan, Japan, South Korea. Paper prepared for Department for the Environment, Water, Heritage and the Arts, by the Institute for Sustainable Futures, UTS: Sydney

[205] Design Chain Associates, 2010, Japan RoHS – DCA Overview and Insights

[206] Toffel, M., Stein, A., and Lee, K.L., 2008, Working Paper, Extending Producer Responsibility, p. 10.

[207] B M Krishna Manda, 2007, E-Waste Policy in India

[208] Directive Decoder, 2010, Draft Indian WEEE (RoHS?) proposals

[209] Directive Decoder, 2010, Draft Indian WEEE (RoHS?) proposals

In the **US**, there is currently no federal electronics recycling program or law, although as of October 2009 there were laws in 19 states, with rules pending in a further 14.[210] The majority of states that have enacted legislation have used the producer-responsibility model, similar to the framework established by the EU WEEE Directive. In 2008 Virginia passed legislation creating a producer-responsibility computer recycling program, HB 344 (Plum), which places responsibility on manufacturers to implement a recovery plan for collecting and recycling a portion of computers returned or discarded by citizens.[211] The states of Connecticut, Maine, Minnesota, North Carolina, Oregon, Texas and Washington have also passed take-back regulations requiring producers to pay at least some portion of end-of-life collection and recycling costs of WEEE.[212] California's Electronic Waste Recycling Act imposed a recycling fee on all electronics covered by the Act. A funding system for collection and recycling was established: retailers must collect a fee from the consumer upon purchase; the fee is deposited in an Electronic Waste Recycling Account managed by the Board of Equalization; approved recyclers receive a payment from the Account based on the weight of covered electronic devices recycled, and must pass a portion of this payment to any approved collectors from which the e-waste is received. A special law was enacted for mobile (cell) phones, which every retailer must take back for proper re-use, recycling or disposal.[213] California has also enacted a Regulation for the Restriction on the use of certain Hazardous Substances (RoHS), based on limiting the amounts of certain hazardous heavy metals in specific waste electronic devices (effective since January 2007). The law required the DTSC to adopt regulations prohibiting electronic devices from being sold in California if they are prohibited from being sold in the EU due to the presence of heavy metals above certain maximum concentration values.

The Californian Department of Toxic Substance Control (DTSC) expressly recognises that the California RoHS Law was modelled on the EU RoHS Directive[214].

4.2.4.2 ELV LEGISLATION

Korea is the fourth biggest vehicle producer globally. Korea's ELV legislation combines many aspects of the EU's ELV, WEEE and RoHS Directives in the 2007 Act on the Recycling of Electronic Equipment and Vehicles. The concept of Extended Producer Responsibility (EPR) is a dominant theme. The Act restricts the use of lead, mercury, cadmium and hexavalent chromium from the design stage of electrical/electronic products and vehicles; the limit levels are identical to that of the EU ELV and RoHS Directives. Manufacturers are required to provide recyclers with information on recycling methods of ELVs and components. ELVs should be sent to registered 'wasted automobile recycling businesses' for treatment, which should process/recycle ELVs under the conditions imposed by the Ordinance of the Ministry of the Environment. There are also aspects that show fewer similarities to EU legislation. The Korean Government imposes a charge in the form of 'automobile recycling dues' on producers, based on the cost of processing/recycling, to ensure that vehicles are designed so that they are easier to recycle/re-process. The dues are collected by the Automobile Recycling Promotion Fund and contribute towards R&D for the replacement of hazardous substances and the improvement of efficient recycling of vehicles. The Korean Act also requires producers to adhere to an 'Annual Recycling Rate' proportionate to their market share, but these actual rates have not yet been set out.

[210] Greenemeier, L., 2009, U.S. lags behind world with its patchwork approach to curbing E-Waste, in Scientific American, October 2009

[211] The Virginia Joint Commission on Technology and Science (JCOTS), 2009, International Solutions to E-waste – The Basel Convention, the restriction on hazardous substances (RoHS) Directive, and the Waste Electrical and Electronic Equipment (WEEE) Directive

[212] Vgl.. Toffel, M.W., Sin, A. et al., 2008, Extending Producer Responsibility: An Evaluation Framework for Product Take Back Policies

[213] INFORM, 2006, Strategies for a better environment, Cell Phone and Battery Recycling Laws in Europe and the US

[214] California Department of Toxic Substances Control, 2007, Restriction on the use of certain hazardous substances (RoHS) in electronic devices

Some elements of the Korean ELV legislation therefore clearly echo EU legislation, whereas the Korean legislation goes further by providing a fiscal incentive to ensure greater recyclability.

Japan's Law for Effective Reutilisation of Used Auto Parts (Automobile Recycling Law) was adopted in July 2002 and enforced in January 2005. Similar to the EU ELV Directive, the law adopts the EPR principle and places responsibility on economic operators in terms of ELV waste prevention, collection and treatment. Japanese car manufacturers are required to collect and dispose of three particularly problematic types of vehicle waste: airbags, fluorocarbons (contained in air conditioners) and Automotive Shredded Residue (ASR). Vehicle purchasers and Japan's recycling operator, the Japan Automobile Recycling Promotion Centre (JARC), also have responsibilities. JARC was founded in 2005 to 'help realise the conservation of natural resources, protect the environment, benefit the vehicle users, develop the economy, and improve the living standard of the people'; it monitors producers' recycling performance. The Japanese Government imposes a 'recycling fee' on the vehicle purchaser, to contribute to a fund which is collected and managed by the JARC and used to cover the cost of treating ELVs and components. The Automobile Recycling Law requires producers to recycle 50% of shredded residue by 2010 and 70% by 2015, along with the aim to recycle 95% of ELVs by 2015. It is thought that this last target has been influenced by the EU ELV Directive's reuse/recovery target for the same year. Japan does not have a specific law restricting the use of hazardous substances in vehicles and electronic products, but the Japanese industrial standard for Marking Of Specific Chemical Substances (J-MOSS) (effective from July 2006) (a ministerial ordinance under the Law for the Effective Utilization of Resources) indicates that some electronic products exceeding a specified amount of hazardous substance should be (voluntarily) labelled. Other ministerial ordinances under this Law refer to the 3R's (Reduce, Reuse, Recycle) to encourage voluntary action across product design, product manufacturing, product identification for separate collection and the setting up of collection and recycling systems.

The ELV Directive has had a significant influence on the **Chinese** automotive industry. There are now around 356 qualified ELV dismantlers and around 800 ELV take-back stations in Chinese cities. The improper disposal of products containing hazardous substances (in particular some heavy metals) is common in China, driven by the lack of measures to require separate collection and treatment facilities. The lack of reuse of vehicle parts is also considered to be a result of the absence of proper policies and regulations, aside from the cheap availability of new parts. China's response to the ELV Directive, the Automotive Products Recycling Technology Policy, was adopted in 2006. It adopted the concept of producer responsibility for the recovery and recycling of abandoned vehicles, although no targets are set. In addition, the Chinese Government and the Jiangsu provincial Government are providing a preferential tax system for scrap steel recyclers, whereby some companies receive preferential tax-free treatment for the first two years of operation and a 50% tax reduction for the next three years.

Industry experts in **India** appear to understand that should India become a vehicle manufacturing hub, it will need to comply with EU ELV legislation in order to overcome trade barriers and avoid loss of a significant market. The Network for Preventative Environmental Management (NetPEM) Public Trust has conducted research, gap analysis and capacity and awareness building with respect to the ELV Directive. India's Tata Motors has already been addressing some of the producer responsibility concepts of the ELV Directive; it has set up free take-back schemes (from January 2007) with a UK ELV service provider (cartakeback.com). Vehicle owners are given a 'certificate of destruction' once their vehicle has been handed to an authorised treatment facility (as is done in the EU).

In the **US** there has been no specific transposition of elements of the ELV Directive into legislation. There are no take-back systems in place, but producers are obligated to develop end markets for recycled materials by incorporating recycled materials into vehicles and by increasing the amount that they recycle. Data from the Argonne National Laboratory (Transportation Technology Research and Development Centre) suggests that more than 95% of vehicles are recycled, but this is heavily market-driven rather than being enforced through Government regulation. More than 75% of materials from ELVs (by weight) are recycled, and the Cooperative Research and Development Agreement (CRADA) team (which consists of Argonne, some major car manufacturers and the plastics industry) are collaborating with the US

Government and industry to increase this amount. The CRADA team have developed (and in some cases tested) plants to process shredded residue from vehicles, carried out substantive research into recovery, treatment and reuse methods for components of shredder residue, and developed a process for the separation and recovery of plastics and residual metals from shredded residue. Where legislation for ELVs does exist, it is applied inconsistently across states; some have legislative protection against activities such as the improper disposal of operating fluid, whilst others do not. Legislation also tends to target one type of pollution from vehicles rather than promoting responsible disposal as a whole. In states where legislation is absent, voluntary practices and awareness programmes exist.

4.2.4.3 PACKAGING AND WASTE PACKAGING LEGISLATION

In the **US** the regulation of packaging waste is highly decentralised, with almost all policy actions taking place at the local level. This has led to an imbalanced yet innovative landscape of packaging waste laws[215], including deposit refund schemes, minimum recycled content requirements, labelling, community recycling programmes and disposal bans. The concept of 'producer responsibility' or the Americanism 'product stewardship' underlies many of these schemes and represents the major similarity between the EU and US approaches. Previous attempts at a national response, such as the National Bottle Bill, have been rejected a number of times; the current attempt at legislation in this area, the Bottle Recycling Climate Protection Act of 2009, is currently under review in committee[216]. The US Environmental Protection Agency promotes the idea of extended producer responsibility or product stewardship and provides guidance about incorporating life cycle thinking but limits its role to facilitating communication between states, local governments and NGOs[217].

Other than the use of producer responsibility there is no obvious EU influence within US packaging waste legislation, although due to the federal nature of EU and US governance structures there is potential to share experiences. The fragmented situation in the US is not dissimilar to the situation in the EU prior to the uniting influence of the EU Packaging Directive, so the EU could take the opportunity to share its experience on harmonisation.

In **China**, the majority of current legislation relevant to packaging waste is incorporated into broader pollution or waste laws (Law on the Prevention and Control of Environmental Pollution by Solid Waste[218]; Law of the Promotion of Clean Production[219]). These legislative instruments use similar concepts to the EU Packaging Directive, namely sustainable development, resource efficiency, producer responsibility, public awareness, prevention, recycling economy and life cycle thinking. The Law on the Promotion of Clean Production has as its major tool the production of a compulsory recycling directory, similar to the EU's waste catalogue or the Best Available Technology Reference Notes, which lists the products and packaging that must be recycled as well as the most appropriate recycling technique. The legislation also sets conditions under which certain firms will be subject to audits to assess their use of materials and the pollution emissions from the production and use of their products, in other words an Integrated Pollution Prevention type approach cutting across pollution and waste. The Proposals on Strengthening the Management of the Plastic Package Wastes along Main Roads, in River Basins and at Tourist Attractions 1998[220] deal specifically with the detrimental visual impact of packaging waste. The focus on specific impacts and geographical areas is very different to EU packaging legislation, but it represents strong legislation as it includes measures such as banning disposable non-biodegradable plastic tableware and prohibiting the dumping of packaging waste in or near water-courses or railways. The proposed Excessive

[215] Vogel, D., Toffel, M., Post, D., and Uludere, N.L., 2010, Environmental federalism I the European Union and the United States

[216] GovTrack.us, 2009, Bottle Recycling Climate Protection Act Progress

[217] US Environmental Protection Agency (EPA), 2010,

[218] China Environmental Law, 2010, Law on the Prevention and Control of Environmental Pollution by Solid Waste

[219] Standing Committee of the National People's Congress (NPC), 2002, Cleaner Production Promotion Law

[220] Ministry of Environmental Protection: The People's Republic of China, 1998, Proposals on Strengthening the Management of the Plastic Package Wastes along Main Roads, in River Basins and at Tourist Attractions

Packaging Law[221], which is currently held up in the legislative system, would focus on luxury and gift items popular during festive periods, by setting limits on the amount of recycling allowed for products. The State Council Notice has also restricted the sale of ultra thin plastic bags[222]. The recently proposed Method for Administration and Recycling Packaging Materials[223] represents an EU style 'thematic strategy' outlining the strategic direction of Chinese packaging waste law including making all packaging recyclable or degradable, making reduction and light-weighting mandatory, and regulating and banning excessive packaging. The far-reaching Circular Economy Law[224] sets standards to reduce excess packaging, and highlights the importance of the design stage.

The realisation of the importance of packaging waste, the concepts that support the legislation and the production of longer term strategies suggest some EU influence, even if it is indirect. The lack of targets for prevention or recycling appears to demonstrate some lack of ambition. On the other hand, the EU could learn from some Chinese approaches, specifically the directory on recycling and the inclusion of waste in pollution auditing.

Japan's Container and Packaging Law[225] and ensuing amendments[226] have produced a system very different from that in the EU. Consumers must sort waste based on guidelines produced by their municipality; separated waste is then collected by a Government delegated organisation that passes it on to appointed recycling firms. The delegated organisations are funded by manufacturers and businesses who pay a fee based on the amount of packaging that they generate.

This system has no obvious link to current EU policy, aside from elements of producer responsibility and the polluter pays concept. One criticism of the Japanese approach is that it enables a certain amount of delegation of responsibility by waste producing firms, as other parties are required to manage the waste; waste producing firms are therefore not strongly incentivised to avoid the generation of waste.

The proposed **Israeli** Packaging Waste Law is specifically based on the EU Packaging Directive; it incorporates the same regulations and sets targets of 60% recycling by total weight of the packaging of products sold or imported each year, as well as requiring producers to recycle 70% of glass and cardboard, 65% of metal and 40% of plastic packaging. Producers will also be required to state how products should be recycled[227]. The actual statute was however not available at the time of writing. This legislation is supported by the banning of packaging waste from landfill in 2020 and the wider aspiration of zero waste to landfill[228]. Additional legislation includes the Deposit Law[229] which directly imposes responsibility for collection on producers and importers and is viewed as sitting alongside the new legislation.

This appears to be a clear-cut example of third countries taking on 'ready-made' EU legislation.

Canada's approach is unique among the countries assessed here as it has run a successful scheme based on voluntary agreement with industry since 1989. The National Packaging Protocol achieved its target of a 50% reduction in packaging waste by the year 2000 four years ahead of schedule[230], aided by a National Task Force on Packaging the helped to plan and delivering long-term action plans. The lack of harmonisation

[221] I-graphix.com, 2009, China restarts green packaging laws
[222] BBC, 2008, China announces plastic bag ban
[223] packwebasia.com, 2009, China's Green Packaging Revolution
[224] Standing Committee of the National People's Congress (NPC), 2008, Circular Economy Law
[225] Ministry of the Environment (MOE): Government of Japan, Law for the Promotion of Sorted Collection and Recycling of Containers and Packaging (Container and Packaging Recycling Law)
[226] Ministry of the Environment (MOE): Government of Japan, 2006, Cabinet Decision on a Bill Partially Amending the Law for the Promotion of Sorted Collection and Recycling of Containers and Packaging
[227] Ministry of Environmental Protection: State of Israel, 2010, Israel's Government Approves Proposed Packaging Waste Draft Law
[228] Ministry of Environmental Protection: State of Israel, 2010, Knesset Unanimously Approves Packaging Waste Bill in First Reading
[229] Ministry of Environmental Protection: State of Israel, 2010, Deposit Law on Beverage Containers
[230] Canadian Council of Ministers of the Environment, 1990, National Packaging Protocol

across provinces and territories has however been a point of concern, and how to align regulatory and voluntary systems remains a contentious subject[231]. The current focus is on further promoting the concept of extended producer responsibility, which has led to the production of a Sustainable Packaging Strategy[232] encompassing all the concepts present in EU legislation. Producer responsibility agreements are set with specific sectors to reduce packaging, supported by the use of standards, certification and labelling, indicators and metrics to assess the life cycle sustainability of packaging[233].

There are no obvious signs of EU inspired policy actions in Canada. The less regulatory approach appears to be effective and the creation of specific packaging strategies is interesting, as is setting sectoral targets with industry.

Indian legislation regarding waste packaging is fairly limited and focussed on ensuring compliance with standards and bans. Packaging must be recyclable, thickness standards are set to increase re-usability and different pigmentations are required to allow identification of virgin and recycled plastics so that recycled plastics are not used for foodstuff packaging[234]. Plastics for export are exempted from these requirements[235]; this undoubtedly has potential to impact on dealing with plastic waste in the EU. There is no mention of producer responsibility in either name or intent, which is out of step with all the other legislation assessed in this review.

There are no obvious signs of influence from the EU, suggesting that there is considerable scope for the EU to work with India, in particular on the exemption for exported plastics and to introduce producer responsibility and life cycle assessment into Indian legislation.

The system in **Australia and New Zealand** is akin to the Canadian system, with all bar one of the states and territories having adopted the National Packaging in Covenant in 1999. This self-regulatory agreement between industry and Government is based on the principles of shared responsibility and product stewardship[236]. A 65% national target is set for recycling used packaging by the end of 2010, but focuses on consumer packaging and household paper, excluding newspaper[237,238]. Companies that sign the Covenant are expected to produce action plans, contribute funding and adopt the Environmental Code of Practice for Packaging[239], which includes concepts similar to those in EU policy such as life-cycle, waste hierarchy and producer responsibility.

The level of the target is similar to that in the EU Packaging Directive, but the Covenant differs in its voluntary approach.

In **South Korea**, the Control of Packaging Materials aims to limit the amount of packaging layers and packaging space ratio to decrease excessive packaging[240]. This is supported by bans on certain materials such as expanded Styrofoam[241]. A producer responsibility system exists, based on deposit systems which are supported by levy on the manufacturer[242].

[231] Environment Canada, 2010, Extended Producer Responsibility
[232] Canadian Council of Ministers of the Environment, 2009, Canada-wide action plan for extended producer responsibility
[233] Canadian Council of Ministers of the Environment, 2009, Canada-wide action plan for extended producer responsibility
[234] Gazette of India, 2009, Plastics (Manufacture, Usage and Waste Management) Rules
[235] Deccan Herald, 2009, New rules to curtail usage of plastic
[236] Canadian Council of Ministers of the Environment, 2009, Canada-wide action plan for extended producer responsibility
[237] Packaging Council of Australia, 1999, National Packaging Convenant
238 Department of the Environment, Water, Heritage and the Arts, 2009, National Packaging Convenant Action Plan – July 2008 to June 2010
[239] Packaging Council of Australia, 2005, Environmental Code of Practice for Packaging
[240] Ministry of Environment, Republic of Korea, Control on Packing Waste
[241] Ministry of Environment: Republic of Korea, 2005, 'Green Korea'
[242] Ministry of Environment: Republic of Korea, Extended Producer Responsibility

The Ministry of Environment explicitly refers to EU countries when setting out the system for extended producer responsibility, suggesting that the EU has had some influence within South Korea.

4.2.5 IMPACT OF THE EU ON INTERNATIONAL WASTE-RELATED TRADE

4.2.5.1 SHIPMENTS OF WASTE WITHIN AND OUT OF THE EU

Available data show a general trend of increasing exports of waste materials from the EU to third countries, in particular Asian countries. From 1995 to 2007 there was significant growth in the volume of **non-hazardous/green list** waste (waste paper, plastics and metals) shipped from the EU to third countries and a slower increase in intra EU trade in those materials. Amounts exported to Asia increased by a factor of ten for waste paper, eleven for plastics and five for metals.[243] Exports of waste paper to China increased from almost 0 to 4.5 million tonnes[244]; half of all waste plastics exports were to China and Hong Kong[245], and in 2007 the EU shipped more plastic waste to the Asian market than within the EU[246].

Recyclable waste materials on the market increased between 1997 and 2005; paper and cardboard packaging waste recycled increased from about 24 to 30 million tonnes, and plastic packaging recycled increased from about 10 to 14 million tonnes.[247]

Existing statistics on trade in WEEE and ELVs do not appear to present a complete picture of the actual situation. Registered exports of WEEE seem unrealistically low (250,000 tonnes) compared to total generated WEEE (estimated at 7 million tonnes in the EU), only constituting 4% of total generated WEEE. There was a strong increase in the registered export of WEEE between 1997 and 2005. The main part of registered export of WEEE is intra EU-25 and is related to batteries; only 10% of that is extra EU export, mainly to Asia, especially China, and South Eastern Europe.[248] The EU exported 3.6 million colour TV sets in 2005 (100,000 tonnes) with an average value per unit of €339 and average weight of 28kg per unit.[249] With regards to ELVs some 2.7 million cars in the EU15 + Norway seems to be unaccounted for.[250]

From 1997 to 2005 the quantity of **notified waste** exported from EU Member States increased by almost a factor of four; the vast majority was shipped to other EU countries, a small part to other OECD countries and a limited amount (1-3%) to non-OECD countries. The import of notified waste also increased by more than a factor of four; 89% of imports comprised shipments from other EU countries, and around 11% was imported from other OECD countries. The most significant exporters of notified waste to 2005 were the Netherlands, Ireland, Luxembourg and Belgium followed by Denmark and Lithuania; significant importers were Belgium, Germany and Norway followed by the Netherlands and Sweden. In 2005, nearly 20% was shipped for disposal (mainly incineration) and 80% for recovery (mainly recycling and incineration with energy recovery).[251]

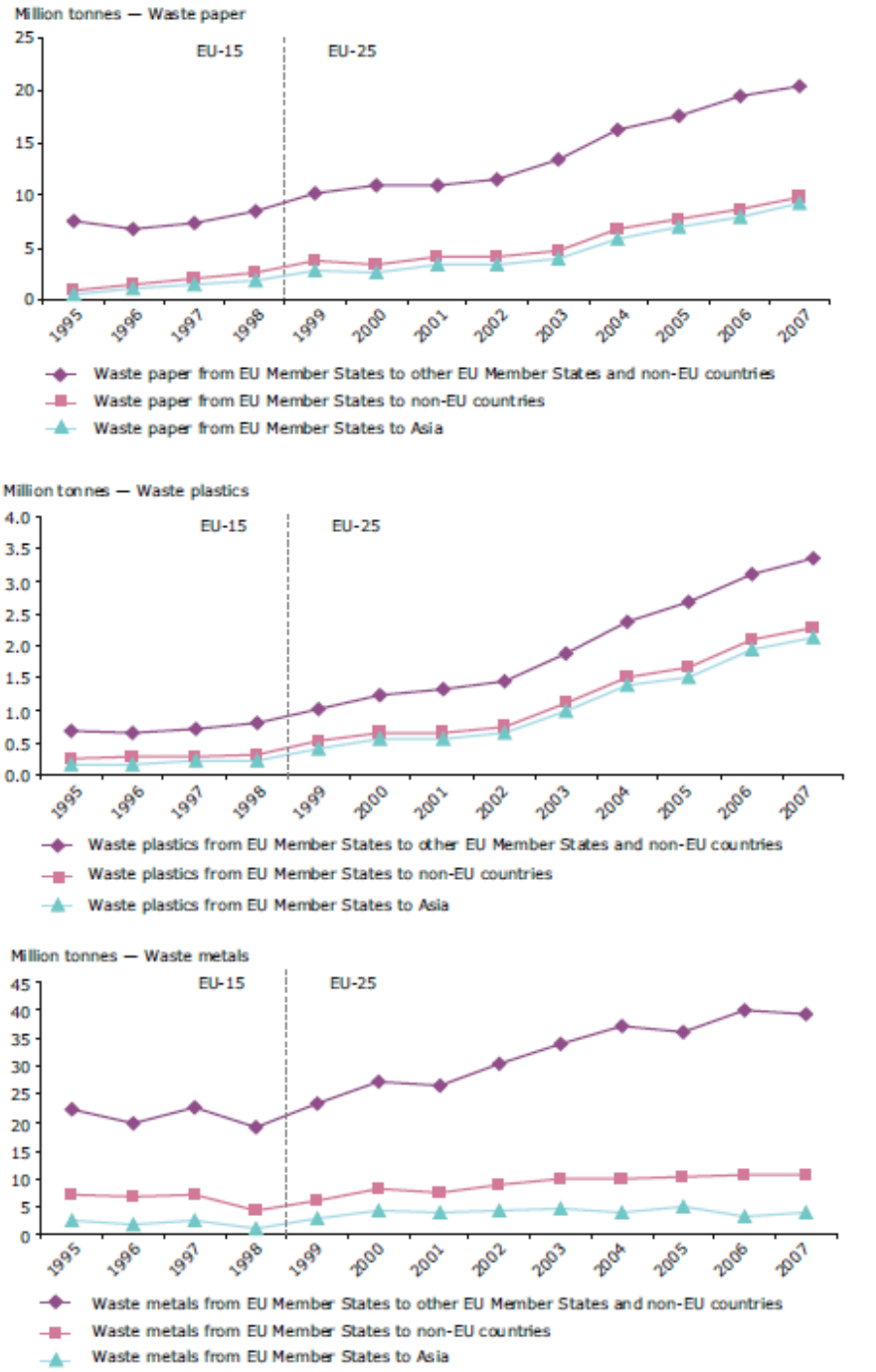
[243] EEA, 2009, 'Waste without borders in the EU? Transboundary shipments of waste' (Mar 2009)
[244] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[245] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[246] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)
[247] EEA, 2009'Waste without borders in the EU? Transboundary shipments of waste'(Mar 2009)
[248] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[249] EEA, 2009,. Waste without borders in the EU? Transboundary shipments of waste(Mar 2009)
[250] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[251] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)

Reported illegal shipments have increased between 2001 and 2005 and are equivalent to 0.2% of notified waste. In 2003, two thirds of illegal shipments were related to hazardous or problematic waste mainly within the EU.[252]

Figure 63 below provides an overall picture of the amount of waste paper, plastics and metals shipped both out of and within the EU from 1995 to 2007. It shows steady upwards trends in shipments of waste paper and plastics, with more significant increases since 2002. For waste metals, overall shipments are also increasing, although the picture indicates that shipments to non-EU countries and to Asia in particular have remained fairly stable since around 2002.

Figure 63 Developments in shipments of waste paper, waste plastics and waste metals out of and within the EU from 1995 to 2007

[252] EEA, 2009,Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)



Note: The area between the purple line (top) and the pink line (middle) indicates the amount shipped withi until 1999 cover only the EU-15 countries and from 1999 Bulgaria and Romania are not included.

Source: Eurostat 2007.

As shown in section 2.1.7, overall generation of paper wastes in the EU-25 and EU-15 has fallen since 2006, whereas plastic and metallic wastes have both continued to increase since 2004, albeit at a slower rate between 2006 and 2008. In 2006, around 3% of paper (2.1 million tonnes), 10% of metals (around 9 million tonnes) and a huge 71% of plastics (10 million tonnes) were exported from the EU-25 to non-EU countries; there is therefore a clear pattern of the majority of paper and metals waste being treated within the EU, whereas the vast majority of plastic waste is shipped to third countries.

4.2.5.2 THIRD COUNTRY INITIATIVES ON WASTE SHIPMENT

Several third countries have their own initiatives and legislation on waste imports.

China prohibits the import of solid wastes that cannot be used as raw materials (based on pre-defined catalogues or lists). Restrictions exist on the import of hazardous wastes and other wastes for recovery (imports of municipal solid waste from abroad are prohibited). The export of hazardous wastes and other wastes for final disposal is also restricted. Export for final disposal is allowed when there are no adequate disposal facilities in China capable of disposing of the waste in an environmentally sound manner; such restrictions do not apply to export for recovery. Exports of hazardous waste for disposal for which there are no adequate disposal facilities in China must comply with the requirements of the Basel Convention and Measures for Administration of Hazardous Waste Export Approval, based on a system of prior written notification similar to that under the EU Waste Shipment Regulation. China has a Quality Standards governing body (the General Administration of Quality Supervision, Inspection and Quarantine, AQSIQ) which imposes quality standards on imported products. China also has pre-inspection processes, with officers located around the world to ensure that quality standards are met before materials/waste are exported to China.

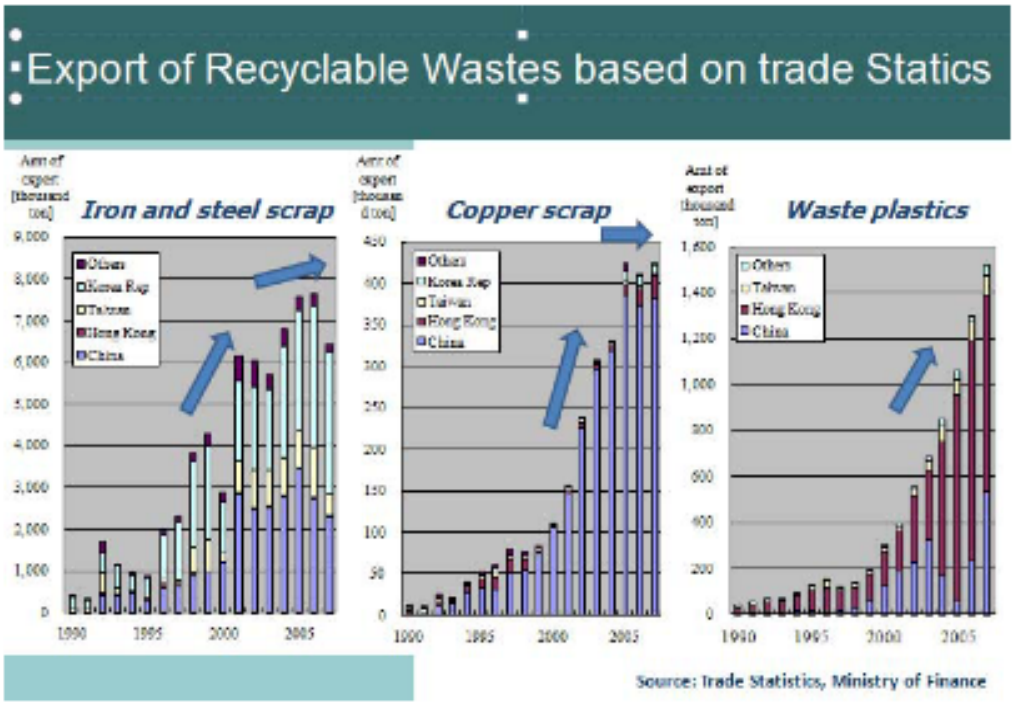
Data related to hazardous waste, as reported to the Basel Convention, indicate that the amount of hazardous waste (Annex I: Y1-Y45 of the Basel Convention) generated in 2006 was 10,840,000 tonnes, and the amount of other waste (Annex II: Y46-Y47) generated was 352,092 tonnes. The amount of hazardous waste exported was 1,074 tonnes.

India also has (less detailed) pre-shipment inspections carried out by Directorate-General of Foreign Trade-approved inspectors, and tests metal scraps for levels of radioactivity, whilst **Taiwan** and **Malaysia** have set standards on imports of computers for reuse.

Figure 64 below, based on statistics from the Japanese Ministry of Finance, shows that the export of certain recyclable wastes (iron and steel scrap, copper scrap and waste plastics) from **Japan** has shown a general upward trend since around 1995, with steep increases in exports of copper scrap and waste plastics between 2000 and 2007.[253]

Figure 64 Export of recyclable wastes from Japan, 1990-2007

[253] Japanese Ministry of Finance, 2010, Trade statistics

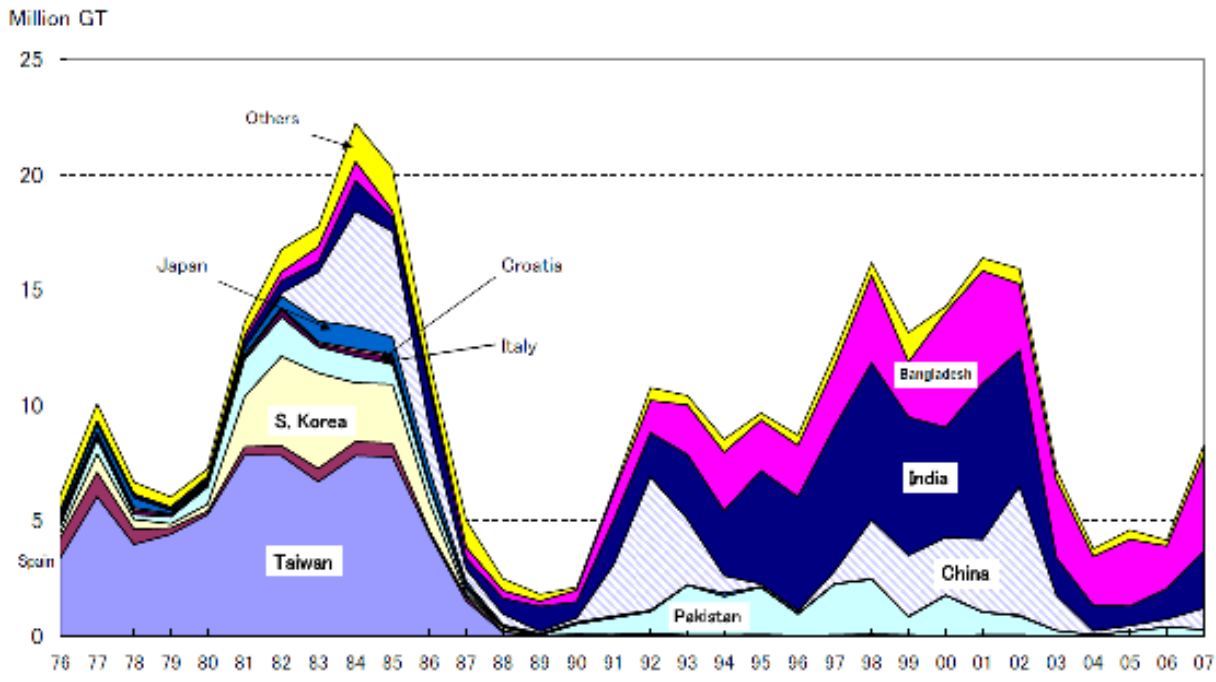


4.2.5.3 SHIP DISMANTLING

Another specific type of waste that can cause environmental problems is **end-of-life ships**. Worldwide, between 200 and 600 large end-of-life ships are broken up and recycled every year to recover valuable steel, other scrap metal and equipment. In the near future, the dismantling of single-hull oil tankers is predicted to peak as around 800 such tankers are taken out of service to be replaced by safer double-hulled vessels. Older ships often contain many hazardous materials, including asbestos, polychlorinated biphenyls (PCBs), tributyltin and large quantities of oils and oil sludge. Anecdotal evidence also suggests that some ships are deliberately (and illegally) filled with waste, in particular hazardous waste, prior to being sent for dismantling, creating additional and unnecessary environmental problems. The number of dismantling sites in the EU has fallen over the past two decades, meaning that there is no longer sufficient capacity to process all ships operating under EU flags or owned by EU companies; this has resulted in the majority of ship dismantling taking place in South Asia (predominantly India, Bangladesh and Pakistan), often under conditions that are environmentally unsound and threaten the health and safety of the workers involved. Figure 65 below shows the evolution of the destination of ships for dismantling; this clearly shows that since the late 1980s the most important destinations have been Pakistan, China, India and Bangladesh.

Figure 65 World disposals by country of ship breakings for the years 1976-2007[254]

[254] COWI, 2009, "Support to the impact assessment of a new legislative proposal on ship dismantling": http://ec.europa.eu/environment/waste/ships//pdf/final_report080310.pdf



(Note) 1. Data Source : Lloyd's Register.
2. Ship Size Coverage : 100 Gross Tonnage and over.

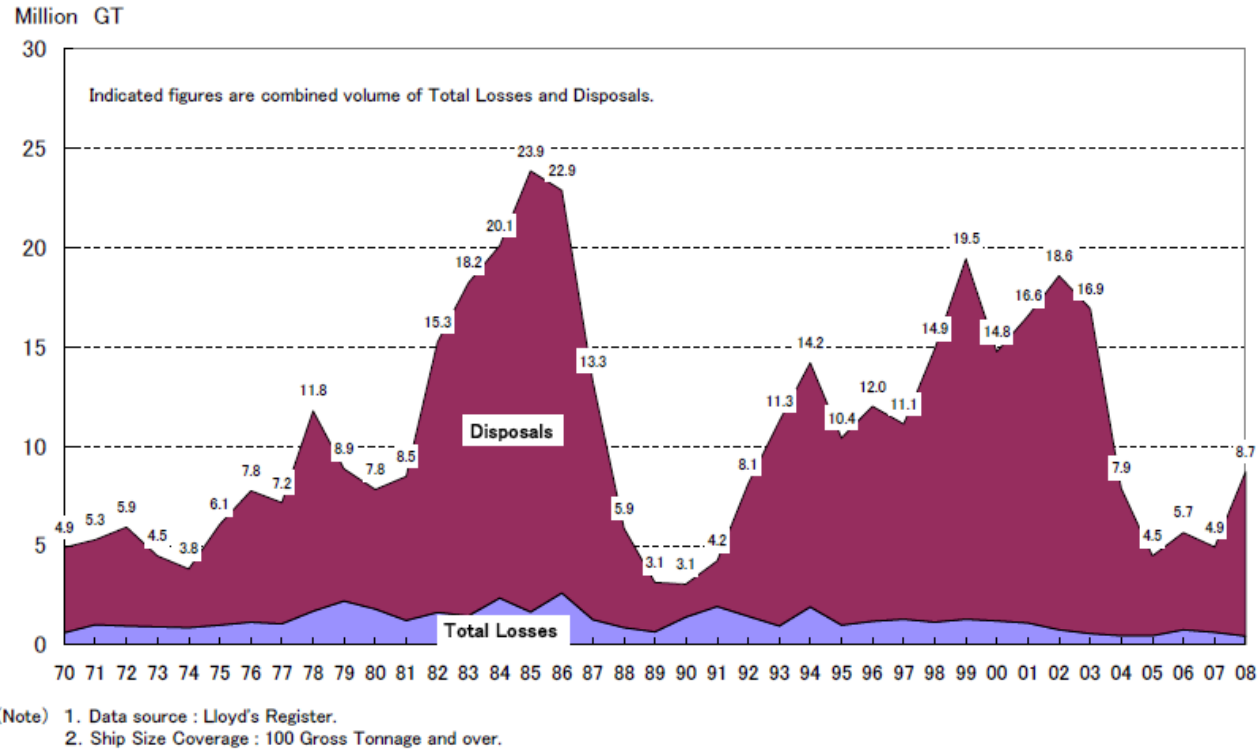
In November 2008 the European Commission presented an EU strategy for better ship dismantling. The EU strategy includes measures to: start preparations for surveys, certification and inventories of hazardous materials on board that will be required under the IMO Hong Kong Convention for the safe and environmentally sound recycling of ships (concluded in May 2009 but not expected to enter into force before 2015); encourage voluntary industry action, e.g. through awards for exemplary green recycling and publication of guidance (such as a list of 'clean' ship dismantling facilities); provide technical assistance to developing countries for safety training programmes and basic infrastructure for environmental and health protection; better enforce current waste shipment rules (e.g. increasing checks at EU ports, improved cooperation and information exchange between EU authorities, and establishing a list of ships ready for scrapping). The strategy also proposed that the Commission look at the feasibility of: developing a certification and audit scheme for ship recycling facilities worldwide and evaluating how EU ships can be encouraged to use such a scheme; making warships and other government vessels not covered by the Convention subject to EU rules for clean dismantling; and establishing a mandatory international funding system for clean ship dismantling.

Available data suggests that between 1994 and 2006, approximately 5,600 ships were dismantled worldwide.[255] A study undertaken by BIO IS for the European Commission suggested that the historical average scrapping rate is approximately 400 vessels per year. Worldwide between 2010 and 2030, an average of around 500 large and very large ships will be dismantled annually, amounting to some 34.7 million gross tonnes of ships (2% of the gross tonnage or 0.5% of the total number of the world fleet). Under the International MARPOL Convention for the Prevention of Pollution from Ships, approximately 784 tankers will be phased out in 2010, 43 between 2011 and 2014, and 109 in 2015. The study estimated that around 13% of ships dismantled globally will be EU flagged ships.[256] According to a study by COWI ship scrappage (in terms of tonnage) peaked in 1985 and 1986 (23.9 and 22.9 million GT respectively), and reached further peaks in 1999 and 2002 (19.5 and 18.6 million GT respectively). Between 2005 and 2007,

[255] Europa, 2007, Ship Dismantling and Pre-cleaning of Ships – Final Report
[256] Europa, 2010, Feasibility of a list of 'Green and Safe' Ship Dismantling Facilities and a List of Ships Likely to go for Dismantling-Final report

scrappage was once again down to a relative low of between 4.5 and 5.7 million GT; this was predicted to rise sharply to around 8.7 million GT in 2008. The same study estimated that EU-flagged vessels will account for around 20% of future scrapped tonnage.[257]

Figure 66 World total losses and disposals, 1970 - 2008[258]



(Note) 1. Data source : Lloyd's Register.
2. Ship Size Coverage : 100 Gross Tonnage and over.

The BIO study raised some concerns over the environmental impacts of ship dismantling, particularly in Bangladesh, India and Pakistan, which were deemed to have a long way to go to reach international standards: ship dismantling there remains largely manual, lacking in hazardous waste management and pollution prevention systems, and lacking in safe and fair conditions for the workforce. It did not present a wholly gloomy analysis, however. It concluded that countries including China and Turkey had made advances in terms of environmentally sound practices and worker safety, including through Environmental Management Systems, Occupational Health and Safety Management Systems, treatment and disposal of waste according to international standards, mechanisation processes and the use of appropriate personal protection equipment. The report concluded that by applying a set of criteria, 24 ship dismantling facilities worldwide (13 within the EU and 11 in third countries, mainly China and Turkey) could be considered 'green and safe' (in particular in terms of hazardous waste management); this would only fulfil 25-36% of dismantling demand. It also recommended that all EU ships be pre-cleaned of hazardous wastes prior to being sent to OECD facilities, and to ensure that EU ships are dismantled in 'green and safe' facilities.[259]

4.2.6 STAKEHOLDER PERCEPTIONS

One of the working groups during the stakeholder meeting held on 22 June 2010 discussed international aspects, examining the question of the EU's international influence considering how best to promote the safe, environmentally responsible recovery in third countries and improved waste management globally.

[257] COWI, 2009, Support to the impact assessment of a new legislative proposal on ship dismantling – Final Report
[258] COWI, 2009, Support to the impact assessment of a new legislative proposal on ship dismantling - Final report
[259] Europa, 2010, Feasibility of a list of 'Green and Safe' Ship Dismantling Facilities and a List of Ships Likely to go for Dismantling-Final report

Stakeholders were in agreement that waste exports from the EU are certainly increasing. Possible reasons identified include: EU recycling targets that lead to higher quantities of recyclables; the existence of major markets for recyclables overseas; economic factors/pricing for certain materials (e.g. plastics); cheaper labour costs for sorting and treatment of waste in third countries; and improved EU definitions and better application of those definitions. Many stakeholders also felt that where clear definitions of when some materials/products become waste (e.g. WEEE, ELV and waste shipment legislation), this has allowed 'grey areas' to develop, resulting in higher levels exports of what is in fact waste (e.g. computers that are in working order, but technologically obsolete).

Stakeholders felt that as third countries (and in particular rapidly developing countries such as China and India) experience economic growth, waste generation will tend to increase. Whilst flows of materials/products are not necessarily bad, in particular where international markets exist, increased waste exports do present some challenges. Exports can have a detrimental environmental effect in countries without adequate technical capacity for recycling, leading to the EU in effect 'exporting pollution'. In particular there is a problem in defining and verifying what is an 'equal environmental standard' of reuse or treatment to that which occurs in the EU, and problems related to incorrectly or dishonestly labelled exports. Stakeholders felt that some countries offer interesting opportunities for cooperation/collaboration/best practice exchange with the EU; one example suggested was Japan, which was deemed to be similar to the EU in terms of economic situation and environmental objectives.

Discussion was also held on whether EU policies are sufficient to influence the 'closing of the resource loop' both in Europe and internationally (i.e. positively contributing to the development of markets for secondary raw materials as well as generating materials for recycling). There was general consensus that current EU policies are not sufficient in this respect. Some stakeholders argued that minimum targets for the use of secondary raw materials are necessary, whilst others felt this would result in distortions or be unrealistic for some waste/material streams (e.g. metals). Incentives (e.g. lower tax) could be put in place to encourage higher levels of recycled content. However, measures should not lead to unsustainable trade of recycled materials just to meet recycled content targets, and sustainable materials management/eco-design principles should be applied across all products placed on the market.

It should also be borne in mind that there may be interesting developments in waste and recycling policy occurring outside the EU from which the EU could learn. Stakeholders suggested that Japan and also some non-OECD countries have very modern and efficient waste treatment techniques, and that some towns/villages (e.g. in Greece and Australia) have gone 'plastic-free', showing that such moves are feasible in some circumstances.

As outlined in section 4.2.6 stakeholders recognised that the EU has an international influence on waste management. In particular they felt that EU legislation has an impact internationally on waste management and products (e.g. reducing the hazardous content of products), and in some instances the direct 'copying' of EU legislation or aspects of it into third country legislation. Stakeholders felt, however, that the EU has limited potential (if any) to influence economic cycles, but that it could attempt to influence third country policy in other ways, such as promoting voluntary producer schemes, attempting to take action to influence the quantity of recycled content, or to ban certain materials going to landfill (whilst taking the complexity of material flows and end-markets into account). Some stakeholders felt that third countries may be more willing to accept standards/practices developed internationally at the UN level, rather than specifically at the EU level.

4.2.7 CONCLUSIONS - THE INTERNATIONAL INFLUENCE OF THE EU ON GLOBAL WASTE MANAGEMENT

EU waste policy and legislation has the potential to influence the policy and legislation of third countries in several ways: direct copying of EU law into a third country's national law; providing inspiration for similar measures, but delivered differently; providing inspiration to tackle a particular issue as a priority; adding to

the weight of pressure upon other countries to address waste challenges; and/or leading to changes in the consideration of environmental conditions or the use of secondary raw materials in products.

Where **WEEE/RoHS** are concerned, EU legislation appears to have played a role to raise awareness and to some extent influence legislation, for example in California, China and probably India. EU influence may also manifest itself in encouraging international producers to abide voluntarily by EU RoHS requirements so as not to lose market share in the EU. In the area of **ELVs**, some aspects of EU legislation are clearly directly taken up in third country legislation, in particular regarding restrictions on the use of heavy metals in cars and components, the concept of producer responsibility, and the use of registered companies for the treatment/processing of ELVs. As with WEEE/RoHS, manufacturers in major car exporting countries (as well as emerging exporters such as China and India) appear to comply with EU requirements so they can continue to export vehicles to the EU. The influence of the EU Directive on **Packaging and Packaging Waste** is not clear to see, although one key exception exists with Israel which has taken on the EU legislation almost verbatim. The lack of replication elsewhere is perhaps not unexpected considering that EU legislation is aiming to maintain a harmonised internal market as well as reduce environmental damage. The EU could possibly seek to exert further influence by promoting to federal countries or regions (e.g. the US and the Asian Packaging Federation) its experience of consolidating legislation across Member States, and promoting improved producer responsibility measures in India.

In terms of areas where the EU could learn from third countries, the EU could consider an approach similar to the Korean use of a fiscal incentive to ensure greater recyclability of ELVs. With regards to packaging, the EU could investigate the compulsory recycling directory and integrated industry audits in China.

The EU exerts significant impact as a result of international waste-related trade. From 1995 to 2007, shipments of waste paper, plastics and metals from the EU to third countries increased significantly, whereas intra-EU shipments grew more slowly. This indicates an increasing trend in exports, borne out by figures showing that waste exports to Asia increased by a factor of ten for waste paper, eleven for plastics and five for metals.[260] Significant increases in shipments of waste paper and plastics occurred between 2002 and 2007; for waste metals, overall shipments are also increasing, although the picture indicates that shipments to non-EU countries and to Asia in particular have remained fairly stable since around 2002.

Data on WEEE and ELVs do not appear to present a complete picture of the international impact of the EU. Exports of WEEE increased strongly from 1997 to 2005, but registered exports of WEEE seem unrealistically low at only 250,000 tonnes or 4% to total generated WEEE. The main part of registered export of WEEE is intra EU-25 and is related to batteries; only 10% of that is extra EU export, mainly to Asia, especially China, and South Eastern Europe.[261] With regards to ELVs some 2.7 million cars in the EU15 + Norway seems to be unaccounted for.[262] From 1997 to 2005 the quantity of notified waste exported from EU Member States increased by almost a factor of four; the vast majority was shipped to other EU countries, a small part to other OECD countries and a limited amount (1-3%) to non-OECD countries. Imports of notified waste also increased by more than a factor of four; 89% of imports comprised shipments from other EU countries, and around 11% was imported from other OECD countries. In 2005, nearly 20% was shipped for disposal (mainly incineration) and 80% for recovery (mainly recycling and incineration with energy recovery).[263]

With regards to end-of-life ships, the number of dismantling sites in the EU has fallen over the past two decades, meaning that dismantling of the majority of ships operating under EU flags or owned by EU

[260] EEA, 2009, 'Waste without borders in the EU? Transboundary shipments of waste' (Mar 2009)
[261] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[262] EEA, 2008, ETC/RWM Technical Report 2008/1. Transboundary shipments of waste in the EU. Developments 1995-2005 and possible drivers
[263] EEA, 2009, Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)

companies takes place in South Asia (predominantly India, Bangladesh and Pakistan). Available data suggests that into the future, between 13% and 20% of ships dismantled globally will be EU flagged ships.[264]

By their very nature, illegal shipments are difficult to track reliably, but are estimated to have increased between 2001 and 2005 and to be equivalent to 0.2% of notified waste. In 2003, two thirds of illegal shipments were related to hazardous or problematic waste mainly within the EU.[265]

In terms of the environmental impacts of EU shipments of waste, data is severely lacking. Although the Waste Shipment Regulation requires exported waste to be treated to the same environmental standards as waste treated within the EU, there is currently no real way to ensure that this is the reality for exported waste. Anecdotal evidence suggests that waste, in particular hazardous wastes including WEEE and end-of-life ships, are often processed in third countries under conditions that are both environmentally unsound and threaten the health and safety of the workers involved.

More broadly, general consumption patterns in the EU (i.e. imports of resources and products from third countries) clearly have an impact on global resource use, the environment, and waste generation and management. In November 2008 the European Commission adopted the EU Raw Materials Initiative, a strategy setting out targeted measures to secure and improve access to raw materials for the EU. The strategy is based on three pillars: ensuring access to raw materials from international markets; setting the right framework conditions within the EU to foster sustainable supply from European sources; and boosting overall resource efficiency and promoting recycling to reduce the EU's consumption of primary raw materials and decrease dependence on imports. The present study concentrates on waste-related aspects of resource use, and as such is not the place for a full discussion of resource use; indeed a separate study[266] on broader resource efficiency has been commissioned through Framework Contract ENV.G.4/FRA/2008/0112. That study aims to define and identify components of resource efficiency, together with methods for calculating environmental impacts of resource use. It makes the link with EU recycling policies and targets, waste prevention and product ecodesign, and reviews and assesses their possible contributions to resource savings and efficiency, reductions in environmental impacts and economic and social impacts. As the report for the study was not complete at the time of writing, the findings of the study will not be summarised here.

During the analysis the following potential policy solutions were identified to take forward action in terms of increasing the EU's international impact both in terms of encouraging improved waste management globally and minimising the negative consequences associated with the export of wastes:

- Defined standards for the value and/or quality of exported materials;
- Clearer legal definitions/guidelines for when a used good becomes waste (some are currently being drawn up for ELVs);
- EU 'usefulness' criteria could address products (e.g. EEE) being exported for reuse that are very close to the end of their useful life and become waste almost immediately;
- Guidelines or formal standards to define and verify what is an 'equal environmental standard' of reuse or treatment to that which occurs in the EU;
- 'Exporting' to third countries EU standards on technical requirements for waste treatment facilities, or sharing experience or providing financial support for improved recycling and waste management technologies (e.g. support for projects on biogas/collection of gas from landfills in countries with higher levels of biodegradable/organic waste);
- More systematic best practice exchange with third countries;

[264] Europa,2010, Feasibility of a list of 'Green and Safe' Ship Dismantling Facilities and a List of Ships Likely to go for Dismantling-Final report

[265] EEA, 2009,Waste without borders in the EU? Transboundary shipments of waste (Mar 2009)

[266] BIO IS et al, 2010, Analysis of the key contributions to resource efficiency, Draft Final Report

- EU support for capacity building to increase standards of treatment of waste materials in third countries;
- Focussing EU efforts on major importing countries;
- Requiring facilities to comply with existing international standards (e.g. UNEP Basel Convention Environmentally Sound Management Guidelines and/or UNEP Stockholm Convention BAT/BEP Guidelines) may be more appropriate than a paternalistic approach of EU 'certification' of overseas waste treatment/recycling facilities;
- Accurate apportioning of emissions reductions (to either the EU or the country of treatment), which could have an impact on the impact assessment process related to EU policy-making;
- Tighter extended producer responsibility principles applied across the whole life cycle of products to lessen the impact of the final product on importing countries;
- Better application and enforcement of rules, in particular the Waste Shipment Regulation, to help tackle environmental issues arising from waste exports. For example with regards to inspections of waste shipments, particular focus could be given to shipments with high economic value (in terms of recyclable content) and those with high potential impact on the environment in the country of destination (i.e. hazardous waste). Also a method of making a clear distinction between new and second-hand goods would be beneficial, and would also assist in facilitating the control of and monitoring volumes of illegal shipments;
- Minimum targets for the use of secondary raw materials, or incentives put in place to encourage recycled content; extreme caution and care would be needed however to avoid distortions or applying targets to inappropriate waste/material streams (e.g. metals);
- Other instruments such as voluntary producer schemes;
- Investigating ways to measure the global impact of the EU's resource consumption and waste generation/management; and
- Improved markets for recycling within the EU to help reduce the increasing levels of exports of waste from the EU to third countries.

4.3 IMPLEMENTATION AND INFLUENCE OF THE WASTE THEMATIC STRATEGY

4.3.1 THE KEY OBJECTIVES OF THE WASTE TS

A considerable amount of EU legislation and policy on waste had been developed prior to the development and adoption of the Waste TS. This legislation consisted of three elements: horizontal legislation on waste; legislation on waste treatment; and legislation related to specific waste streams. Promoting waste prevention had not been a focus of EU action and the TS was seen as the first attempt at creating a comprehensive EU strategy on prevention. The Waste TS was intended to provide an overall strategy/framework for improving waste management in the EU, while allowing Member States to act according to their circumstances.

The main aim of the Waste TS was to **contribute to reducing the overall negative environmental impact of resource use**, by preventing waste generation and promoting re-use, recycling and recovery of waste. The long-term goal was for the EU to **become a recycling society that seeks to avoid waste and uses waste as a resource**. High environmental reference standards would serve to help the internal market facilitate recycling and recovery activities.

The following sections aim to make an assessment regarding the impact to date of the Waste TS with regards to the following key objectives:

- Waste prevention;
- More and better recycling, and more material and energy recovery from waste; and
- Improved disposal (less waste to landfill).

4.3.2 IMPACT OF THE WASTE TS AS A POLICY TOOL

This section presents various elements of the impact of the Waste TS as a policy tool to influence and bring about improvements in waste management in the EU. It therefore presents legislative and non-legislative actions taken at the EU level since the adoption of the Waste TS, progress to date on implementing the EU waste *acquis*, and a short summary of the analysis on the diffusion (take-up) of eight key terms from the Waste TS in relevant EU and Member State documents and legislation (presented in detail in section 4.1).

4.3.2.1 EU ACTIONS UNDERTAKEN RELEVANT TO OR IMPLEMENTING THE WASTE THEMATIC STRATEGY

In order to achieve its objectives, the Waste TS foresaw policy and legislative actions to:

- place renewed emphasis on full implementation of existing legislation;
- simplify and modernise existing legislation;
- introduce life-cycle thinking into waste policy;
- promote more ambitious waste prevention policies;
- develop better knowledge and information to underpin the continued development of waste prevention policy;
- develop common reference standards for recycling; and
- further elaborate the EU's recycling policy.

The specified actions are listed, together with relevant achievements to date, in Table 19 below.

Table 19 Actions and achievements resulting from the Waste Thematic Strategy

Action / activity	Timetable / deadline	Achievements to date	Status
Proposal for a directive amending the Waste Framework Directive and repealing the Waste Oils Directive	Proposed together with Waste TS	Adoption of the Directive on Waste 2008/98/EC (merging the Waste Framework Directive with the Hazardous Waste Directive and repealing the Waste Oils Directive)	Completed 2008
Report on the implementation of Directive 94/62/EC on packaging and packaging waste	2006	Publication of COM(2006)406 and COM(2006)767	Completed 2006
Review of the targets set under Directive 2000/53/EC on end-of-life vehicles	2006	Publication of COM(2007)5	Completed 2007
Proposal for a directive bringing together in one directive the three Directives on waste from the titanium dioxide industry	2006	Proposed recast of the IPPC Directive 2008/1/EC to include the provisions of the titanium dioxide Directives	Completed 2007
Publication of guidelines, based on the jurisprudence of the ECJ, on the issue of when by-products should or should not be considered waste	2006	Publication of COM(2007)59	Completed 2007
Publication of guidelines for Member States on applying life-cycle thinking to management of biodegradable waste that is diverted from landfill	2006	JRC project initiated in 2007: http://viso.jrc.ec.europa.eu/lca-biowaste/index.htm	Ongoing
Improving the knowledge base on impact of resource use, waste generation and waste management and more systematic forecasting and modelling	Starting 2006	- Establishment of the International Panel for Sustainable Resource Management, under the auspices of the Sustainable Consumption & Production Branch of UNEP's Division of Technology, Industry, and Economics - Various follow-up studies to the Natural	Ongoing

Action / activity	Timetable / deadline	Achievements to date	Status
		Resources TS, and studies on the sustainable management of resources (see http://www.eu-smr.eu/) - Creation and continuing work of the Environmental Data Centre on Waste	
Proposal to clarify and extend the scope of the IPPC Directive to additional waste management activities, including biological treatment for recovery of waste and preparation of hazardous waste for incineration and of incineration slags for recovery	2007 (as part of general review of IPPC Directive)	Proposed recast of the IPPC Directive	Completed 2007
Proposal for revision of Council Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture	2007	Latest round of consultation concluded 12 January 2010; proposal expected first quarter of 2010	Ongoing
Publication of basic guidelines to make life-cycle tools easily usable in waste policymaking, with an agreed approach and methodology	2007	Short (4 page) guidelines available at http://lct.jrc.ec.europa.eu/pdf-directory/Making-Sust-Consumption.pdf International Reference Life Cycle Data System (ILCD) Handbook launched March 2010: see http://lct.jrc.ec.europa.eu/assessment/publications Making sustainable consumption and production a reality: A guide for business and policy makers to Life Cycle Thinking and Assessment published 2010: see http://ec.europa.eu/environment/pubs/pdf/sustainable.pdf	Completed
Publication of guidelines on certain provisions of the Waste Shipment Regulation to combat sham recovery	2007	Correspondents' Guidelines have been published on a number of topics: shipments of WEEE; imports of waste generated by armed forces or relief organisations; certificates for non-interim recovery or disposal; classification of WEEE, fly ash from coal-fired power plants, wood waste, slags from processing of copper alloys, glass waste from cathode ray tubes (CRT) and waste cartridges containing toner or ink	Ongoing?
Publication of guidelines on minimum environmental standards for permits of installations that are not covered by the IPPC Directive and on best available techniques for the mixing of hazardous waste	2007	Integrated Pollution Prevention and Control BREF for the Waste Treatments Industries published August 2006, containing some BAT on the mixing of waste Proposed recast of the IPPC Directive 2008/1/EC includes detail on permitting of installations, including combustion plants, waste incineration plants and waste co-incineration plants	Ongoing?
Assessment of the state of play and of the need for additional measures to stimulate the move to a European recycling society	2007	Final report of major study 'Optimising Markets For Recycling' published in November 2008	Ongoing
Review of the targets under Directive 2002/96/EC on waste electrical and electronic equipment	2008	Proposal for recast WEEE Directive published December 2008 (proposes: collection target of 65% of EEE put on the market in the two previous years	Ongoing. Final adoption of recast Directive

Action / activity	Timetable / deadline	Achievements to date	Status
		by 2016; integrating re-use target into recovery and recycling targets; and introducing 5% overall increase in reuse and recycling targets)	anticipated end 2010
Adoption of a first set of quality standards for defining when certain waste flows cease to be waste, starting with compost and recycled aggregates	2008 – subject to entry into force of the revised Waste Framework Directive	JRC project produced two reports: "Study on the selection of waste streams for End of Waste assessment": identifies suitable waste streams for a detailed End of Waste assessment, using quantitative and qualitative selection criteria; and "End-of-waste criteria, methodology and case studies": presents a general methodology or guidelines analysing principles for setting criteria; provides related analytical and impact assessment frameworks required to determine end of waste criteria; includes case studies on aluminium and steel scrap, aggregates and compost Details available at http://susproc.jrc.ec.europa.eu/activities/waste/index.html	Ongoing. Initial phase completed 2009. End-of-waste criteria under preparation for ferrous scrap, aluminium scrap, copper scrap, waste paper; waste glass; textile waste and plastic waste
Clarification of the obligation for Member States to develop publicly available waste prevention programmes	Revision of the Waste Framework Directive	Obligation clarified in Article 29 of Directive 2008/98/EC.	Commission currently finalising guidelines to assist Member States in development of waste prevention programmes
Identifying an efficiency threshold for incinerators to define whether they are to be classified as recovery or disposal	Revision of the Waste Framework Directive	Efficiency threshold included in Annex II (Recovery Operations) of Directive 2008/98/EC	Completed
Develop quality criteria for compost	Following revision of the Waste Framework Directive	Provision made for this in Article 22 of Directive 2008/98/EC	Ongoing. Final report on 'Assessment of the options to improve the management of bio-waste in the EU' published in February 2010

This table demonstrates that a large amount of progress has been made towards implementing the actions outlined in the Waste TS. Perhaps most notable amongst this is the adoption of the new Directive on Waste (2008/98/EC). The new Directive successfully revised the Waste Framework Directive, merged it with the Hazardous Waste Directive and repealed the Waste Oils Directive. Directive 2008/98/EC set the following targets for 2020: 50% by weight of paper, metal, plastic and glass from households and other similar sources to be prepared for re-use and recycled; and 70% by weight of non-hazardous C&D waste to be prepared for re-use, recycled or recovered (including backfilling operations). In addition, the obligation for Member States to develop publicly available waste prevention programmes was clarified in Article 29, an efficiency threshold for incinerators to define whether they are to be classified as recovery or disposal was included in Annex II (Recovery Operations), and Article 22 paved the way for the development of quality criteria for compost.

The proposed recast of the IPPC Directive completed some of the actions proposed, notably to extend its scope to additional waste management activities, and bringing together in one place the three Directives on waste from the titanium dioxide industry.

Other completed actions include the publication of a report on the implementation of the Packaging and Packaging Waste Directive, a review of the targets set under the ELV Directive, the publication of guidelines on when by-products should or should not be considered waste, and publication of basic guidelines on using life-cycle tools in waste policymaking. Several sets of guidelines on provisions of the Waste Shipment Regulation have been published.

A number of actions are still outstanding or ongoing. Work is ongoing by the JRC on guidelines to apply life-cycle thinking to biodegradable waste diverted from landfill, the Commission is considering whether an additional impact assessment should be completed prior to the proposal for a Directive to amend Directive 86/278/EEC on sewage sludge (the proposal is likely before the end of 2010 or in early 2011), new collection targets have been proposed in the framework of the recast of Directive 2002/96/EC on WEEE (with final adoption anticipated by the end of 2010), end-of-waste criteria are under development for a range of wastes, and work on quality standards for compost is also fairly advanced.

Work will remain ongoing on some of the actions specified due to their nature, including improving the knowledge base on resource use impacts, waste generation and waste management, and assessments related to measures to stimulate a European recycling society.

4.3.2.2 IMPLEMENTING THE WASTE ACQUIS

The overall state of implementation of EU waste legislation is outlined in the latest Commission implementation reports, published in November 2009 and referring to the period 2004-2006 (the latest period for which Member State implementation reports are available). The general implementation report, which covers the Waste Framework, Hazardous Waste, Waste Oils, Sewage Sludge, Packaging and Packaging Waste, Landfill and WEEE Directives, concluded that EU waste law is being poorly implemented and enforced in many Member States, in particular with regards to the Waste Framework and Landfill Directives. Problems include: lack of waste treatment infrastructure and lack of separate waste collection; heavy reliance on landfilling (especially in the newer Member States); targets for WEEE, ELVs and packaging not being met; and insufficient diversion of biodegradable waste from landfill. A separate report highlighted problems in implementation of the Waste Shipment Regulation, evidenced by a high number of illegal shipments. Over 20% of all environmental infringement cases are related to waste management.

The picture is not entirely negative, however. Recycling and recovery rates for packaging waste have been continuously increasing for the past 10 years; a ban on landfilling has increased recovery of waste tyres to 95% and developed a strong market for tyre-derived materials; and restrictions on hazardous substances in EEE and vehicles have reduced health risks. The potential benefits of proper implementation and enforcement of all EU waste legislation include: reducing greenhouse gas emissions by up to 30%; significant innovation opportunities for EU businesses; improved access to valuable secondary raw materials; and reduced environmental and financial costs. The Commission has already taken steps to support Member States in better implementation, including awareness-raising and information exchange events, guidance documents for Member States and inspection activities in Member States in close cooperation with the EU network for the implementation and enforcement of environmental law (IMPEL).

Figures gathered during the present study support the findings of the implementation reports. For WEEE, by 2006, only 10 Member States had reported meeting the 4kg per capita collection target, but where WEEE is collected separately the average recycling rate was 79%. Concerning ELVs, by 2006, 19 Member States had met the 80% reuse/recycling target, and 13 had met the 85% reuse/recovery target (meaning that eight and 14 Member States respectively had failed to meet the two targets). For packaging, by 2007, 16 Member States had already met the 2008 recovery target of 60%, and 18 Member States had already met the 2008 recycling target of 55%. By 2007, 59% of packaging waste in the EU-27 was recycled and 14% energy-recovered. With regards to diversion of biowaste from landfill, in 2006 eight Member States (albeit

all with derogation periods) still needed to substantially reduce landfill of biodegradable municipal waste to meet the original 2006 target, and data was missing for four Member States.

4.3.2.3 *Diffusion of key terms into EU and Member State policy and legislation*

The Waste TS was intended not only to impact on practices in Europe, but also to help guide better policy making in Europe. This study has undertaken an analysis of the diffusion (take-up) of eight key terms from the Waste TS in relevant EU and Member State documents and legislation. This is discussed in detail in section 4.1, but a very brief overview of the level of diffusion of terms is presented here as it is relevant to the discussion on the influence and impact of the Waste TS.

Extensive diffusion: The terms 'waste prevention' and 'producer responsibility' enjoy extensive diffusion at both EU and Member State level, and 'life cycle thinking' enjoys extensive EU level diffusion and fair Member State level diffusion.

Fair diffusion: The terms 'waste hierarchy' and 'reducing negative environmental impacts by better waste management' enjoy fair diffusion at EU and Member State level, and 'using waste as a resource' enjoys extensive Member State level diffusion but limited diffusion at EU level.

Limited diffusion: The terms 'proximity principle' and 'recycling society' suffer from limited diffusion at both the EU and Member State level.

4.3.3 Stakeholder perceptions

The implementation and impacts of the Waste TS was the topic of one of the working groups during the stakeholder meeting held on 22 June 2010. The working group aimed to investigate stakeholder's perceptions regarding the impact of the Waste TS, the coverage of existing EU policies and whether additional action is needed to deliver the overriding objectives of the Waste TS to move waste management up the waste hierarchy and limit the environmental impact of waste.

Successes

Stakeholders appreciated the goal of the Waste TS to act as a framework to bring about greater consistency and coherence in EU level actions on waste, and that it had had some success in connecting the different elements of waste legislation, but that the direct impact of this was unclear.

The overriding opinion was that the revised Waste Framework Directive (2008/98/EC) represents the major impact of the Waste TS, helping to formalise the waste hierarchy and raising the importance of waste prevention with the new requirement for Member State waste prevention plans (some stakeholders did however question whether the EU was the right level for proposing national prevention plans, given that there is no intention for EU level prevention plans). Some stakeholders suggested that the new Directive could be seen in hindsight as a 'revolutionary' document (as it went beyond the proposals of the Waste TS) but is now firmly established; others felt that much of the drive for improvement in waste management appears to have come from other legislation, specifically the recycling Directives (e.g. ELV, packaging, WEEE) and their targets, rather than from the Waste TS or Directive 2008/98/EC.

The revised Waste Framework Directive is still to be fully implemented by Member States. Some stakeholders argued that it may be worth allowing Member States the opportunity to implement waste prevention and recycling policies prior to making further major changes in EU policy, to allow a proper assessment of the impact of the Directive before considering the need to push the agenda forward.

The Waste TS was felt to have raised awareness in the Member States of the implications of the waste hierarchy and the Landfill Directive; progress has been made in decreasing the amount of waste to landfill, partly as a result of this (see section on the waste hierarchy).

Stakeholders also suggested that the definition of recycling that stemmed from the Waste TS has had a practical effect, helping to better define how waste is managed and assisting with data generation.

Limitations and next steps

Implementation of the Waste TS could still be improved, however. A number of specific areas were highlighted by stakeholders.

One initial criticism was that the approach of the Waste TS does not represent a change from the negative perception of waste management as a 'problem' to a more positive perception of waste management as an 'opportunity', particularly in economic/business terms with relation to broader environmental and social aims (e.g. sustainability, energy and resource management). The wording/ approach of the Waste TS needs to reflect this better, to assist in a shift in perception, and perhaps even to promote new business models to shift from a focus on growth, and to shift from selling goods to selling services.

Waste prevention policies are still lacking at the EU level, despite waste prevention's place at the top of the waste hierarchy. Stakeholders were not fully confident that ongoing actions will be enough to achieve the objective of decoupling waste from economic growth. Before waste prevention targets are developed (Article 9 of Directive 2008/98/EC requires the European Commission to set waste prevention and decoupling objectives for 2020, and Article 29 requires Member States to define benchmarks such as indicators or targets for their waste prevention programmes), indicators should be devised and data gathered; stakeholders felt that this is possible. The waste sector alone cannot influence overall consumption patterns to the degree necessary to achieve this; the problem of waste prevention must be approached from different angles, including resource efficiency, innovation, design, use and obsolescence. Some stakeholders felt that if the EU took the lead and developed prevention policies, Member States may be more inclined to follow; however it was also suggested that the subsidiarity principle means that EU level targets may not be feasible or even desirable. The importance and sensitivity of this issue makes it a particularly important one to tackle.

There is potential for greater coherence between waste legislation and legislation in other areas (e.g. chemicals, energy, pollution prevention and control). Increased coherence, for example integrating end of waste and resource use elements into Directives in these areas, could significantly help to promote EU recycling markets for high-quality materials (e.g. for waste streams important to the market such as metal and paper) and contribute to the achievement of a 'recycling society'. The current apparent lack of ambition to do this represents a missed opportunity at the EU level.

There is also significant scope to improve the implementation of EU waste legislation by the Member States; some stakeholders suspected that non-compliance may currently be underreported, but this is of course difficult to verify. A more stringent and more coherent approach to reporting would ensure accurate and comparable data, enabling more detailed and accurate comparisons to be made between the performance of Member States. This would help to identify good practices which could help less well performing Member States to improve. Also related to implementation, some stakeholders were concerned that local government/municipalities have tended to be marginalised within policy discussions, which is problematic as they are responsible for much on-the-ground implementation.

Some stakeholders felt that knowledge and information circulation throughout the EU had not improved as a result of the Waste TS, and that more could be done at the EU level to facilitate information and best practice exchange. Existing forums (e.g. the Waste Management Committee and various informal and thematic networks) could be utilised better, and a wider forum of excellence to develop the big picture and promote integration could be convened (the European Chemicals Agency's REACH Forum for the Exchange of Information on Enforcement was cited as a potentially useful model).

Another specific area where confusion remains is that of Life Cycle Assessment (LCA) and Life Cycle Thinking (LCT). Stakeholders felt that these remain very abstract concepts and as a result the approach to their application appears to be on a case by case basis rather than the development of a consistent policy; in fact some stakeholders suggested that there appears to be very little practical application of LCA at any level. A clearer definition of LCA/LCT is needed (including consideration of defined waste treatment options for each product), and this could be provided or at least supported at the EU level.

A final area of concern that remains is the environmental impacts generated outside the EU as a result of material/product imports and EU consumption. These are very significant, yet are often not fully taken into account in existing EU policy. Further attempts could be made to highlight the negative impacts of no policy intervention by highlighting or pricing externalities.

4.3.4 CONCLUSIONS – THE IMPLEMENTATION OF THE WASTE TS

The Waste TS does appear to have had a **positive influence on waste management in the EU** in some respects.

Table 19 demonstrates that a large amount of progress has been made towards implementing the actions outlined in the Waste TS, most notably the adoption of the new Directive on Waste (2008/98/EC) which formalised the waste hierarchy, set recycling targets for 2020, obliged Member States to develop waste prevention programmes, and set an efficiency threshold for incinerators to define whether they are to be classified as recovery or disposal. Progress has also been made through the proposed recast of the IPPC Directive, publication of a report on the implementation of the Packaging and Packaging Waste Directive, a review of the targets set under the ELV Directive, and the publication of guidelines on by-products, using life-cycle tools in waste policymaking, and various provisions of the Waste Shipment Regulation.

The Waste TS also appears to have been successful in encouraging extensive diffusion in EU and Member State policy documents and legislation of the terms 'waste prevention', 'producer responsibility' and 'life cycle thinking'. The terms 'waste hierarchy', 'reducing negative environmental impacts by better waste management' and 'using waste as a resource' enjoy a fair level of diffusion. On the other hand, diffusion of the terms 'proximity principle' and 'recycling society' remains limited.

The Waste TS can be seen as having acted as a framework to bring about greater consistency and coherence in EU level actions on waste, and also bringing about some success in connecting the different elements of waste legislation. It has also helped to raise awareness in the Member States of the implications of the waste hierarchy and, together with the Landfill Directive, helped to push progress on decreasing the amount of waste to landfill. The definition of recycling that stemmed from the Waste TS has also arguably had a practical effect, helping to better define how waste is managed and assisting with data generation.

There are, however, a number of **limitations to the progress encouraged by the Waste TS**.

A number of actions announced in the Waste TS are still outstanding or ongoing, including the development of guidelines to apply life-cycle thinking to biodegradable waste diverted from landfill, a revised Directive on sewage sludge, proposed new collection targets in the recast WEEE Directive, the development of end-of-waste criteria for a range of wastes, and work on quality standards for compost. Work will also remain ongoing on some of the actions specified in the Waste TS due to their nature, including improving the knowledge base on resource use impacts, waste generation and waste management, and assessments related to measures to stimulate a European recycling society.

In addition, the Waste TS does not appear to have been successful in encouraging diffusion in EU and Member State policy documents and legislation of the terms 'proximity principle' and 'recycling society'.

In broader terms, the approach of the Waste TS does not represent a change from the negative perception of waste management as a 'problem' to a more positive perception of waste management as an 'opportunity', particularly in economic/business terms with relation to broader environmental and social aims.

Waste prevention policies are still lacking at the EU level, despite waste prevention's place at the top of the waste hierarchy, and it is not possible to say whether existing ongoing actions will be enough to achieve the objective of decoupling waste from economic growth. The waste sector alone cannot influence overall consumption patterns to the degree necessary to promote waste prevention; it is a goal that must be approached from different angles, including resource efficiency, innovation, design, use and obsolescence.

Care does however need to be taken if action, policy or targets on prevention are to be developed at the EU level, as there are particular concerns related to respecting the subsidiarity principle.

The Waste TS has not brought about definitive coherence between waste legislation and legislation in other areas (e.g. chemicals, energy, pollution prevention and control), which could significantly help to promote movement up the waste hierarchy and the development of EU recycling markets for high-quality materials to contribute to the goal of the EU becoming a true 'recycling society'.

The goal of the Waste TS to introduce life-cycle thinking into waste policy also does not seem to have been fully achieved. Stakeholders have commented that Life Cycle Assessment (LCA) and Life Cycle Thinking (LCT) remain very abstract concepts and as a result the approach to their application appears to be on a case by case basis rather than the development of a consistent policy. A clearer definition of LCA/LCT is needed (including consideration of defined waste treatment options for each product), and this could be provided or at least supported at the EU level.

Although not specifically a failing of the Waste TS, there also remains significant scope to improve the implementation of EU waste legislation by the Member States. Actions on reporting, data comparability and accuracy and identification of good practices could all help less well performing Member States to improve.

A final area of concern that remains is the environmental impacts generated outside the EU as a result of material/product imports and EU consumption. Although the Waste TS recognised that these impacts exist it did not propose specific actions; the impacts therefore remain significant, and yet are often not fully taken into account in existing EU policy.

5. CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This section brings together the key conclusions from this study on the current state of waste management in Europe and actions to deliver the Waste TS. It then sets out the necessary future actions to take forward waste management into the future. These conclusions are compared to potential policy mechanisms that might usefully be used to help deliver better waste management actions. This Chapter then concludes with recommendations. For information Box 4 below sets out the key conclusions identified as outcomes from the stakeholder event, which took place on 22 June 2010, used to inform this review.

Box 4 Key Conclusions from the Stakeholder meeting 22 June 2010

Throughout the day several themes continually emerged during discussions, these included the following:

- That the TS was considered to have been useful for fixing a frame for waste management in the EU. The TS had some impact on the diffusion of key concepts such as the waste hierarchy or the LCA approach. The main action of consequence noted was the adoption of the Directive on Waste;
- That further efforts should be made to ensure that waste policies are based on sound knowledge by improving the reliability of statistics and developing new indicators that better reflect the progress made in applying the waste hierarchy and achieving a "European recycling society";
- That further efforts are needed in order to effectively address the question of waste prevention, requiring new policy solutions to deliver this; that some progress has been achieved in terms of recycling and landfill reduction, but that large differences persist between Member States and these should be addressed;
- That EU policies are leading to higher levels of exports to third countries of materials for recycling and reuse; better mechanisms should be put in place to address the potential environmental and economic (missed opportunities, possible risks to raw material supply) consequences of this trend. It was considered that the transformation of waste management solutions represents an opportunity for the EU as a whole, but we need additional instruments to help bring about sustainable improvements;
- That promoting markets for secondary raw materials is important in helping to deliver more environmentally sustainable waste management. However, delivering such a market is dependent upon product design, collection, processing, and economic factors;
- That a clear and stronger link should be established between waste, product and resources/climate policies. For example, stronger ecodesign policy and the development of extended producer responsibility beyond end-of-life considerations) would encourage consideration of the waste stage in the design phase of products.

The State of Waste Management – Now and Into the Future

- ***Waste generation*** – The current trend for the EU on waste generation, both overall and within the different sectors i.e. MSW and non-MSW, is one of increase. Waste generation per capita is rising at a slower rate than total waste generation. There is some evidence that packaging waste in terms of weight (but not necessarily volume or environmental impact), while continuing to increase, is doing so at a slower rate than other waste streams. For some Member States there is evidence of a reduction in MSW generation; however, performance between Member States remains highly varied. The rate of increase of waste generation appears to be showing signs of slowing over time, and modelling results predict that per capita rates of waste generation will peak for the EU-27 in around 2016, and then plateau. However, the modelling outcomes, based on an assumption of no great future changes to policies or implementation mechanisms (legislative and market-based), do not show an overall decline in waste generation, with levels remaining static between 2016 and 2030.
- ***Delivering recycling and recovery*** – Across the EU, levels of recycling are noted to be rising, albeit at very different rates and from very different baseline levels in each Member State. At the higher end of

achievement there appears to be some slowing in the rate of improvements that are possible, as demonstrated by performance in Germany where a decline in the amount of packaging recycled has been noted, and for Austria, Belgium, and the Netherlands whose overall rates of MSW recycling appear to be plateauing.

- ***Energy recovery from waste*** - Energy recovery from waste appears to be expanding, based on figures provided by Eurostat; however, there is lack of clarity on the level of efficiency of all plants and no firm data available on whether these are in compliance with WFD rules distinguishing between disposal and recovery activities. The EU GHG inventory for the EU-15 states that CO_2 emissions from incineration declined by 45% between 1990 and 2007. Given that incineration rates have risen over this same period, this suggests that, in the EU-15 at least, incineration activities are becoming more efficient and increasingly coupled with energy recovery. However, more investigation is required into this question by the Commission to ensure compliance and continual improvement in this field. It is also important to note that although direct GHG emissions during the treatment phase may be decreasing, the burden outside of the EU is increasing due to the EU's increasing use and consumption of materials and products. It is crucial that the waste hierarchy is respected and that particular efforts are made to promote activities further up the hierarchy.
- ***Trends in disposal*** – There is an overall decline in the level of landfilling. However, reliance on this as a disposal technique varies by MS and for many remains the primary waste management technique. For example, in 2007 seven MS still relied on landfill to dispose of over 80% of MSW and in 12 MS the rate of landfilling of MSW remained over 70%. Based on the modelling assessment the diversion and recycling targets appear to be having a significant impact on the level of landfilling across all MS up to 2020, when decline in the rate of landfilling plateaus and remains level until 2030. Into the future the delivery of this decline assumes that there is significant investment in the recycling, composting, AD and wider energy recovery infrastructure to deal with the shift away from landfilling. Incineration, in contrast to landfilling of MSW, shows an upward trend and, while incineration must meet certain requirements to be considered as energy recovery, there is no wider impetus or support to discourage the use of incineration as a pure disposal route.
- ***Delivering a recycling society in Europe*** – The concept of a 'European recycling society' is felt by stakeholders to be of potential use as a communication tool and to provide a basis for more holistic assessment of waste management. However, for effective use the concept must be more clearly defined encompassing the following key characteristics:
  - overall levels of waste generation are low and trending downwards;
  - disposal is no longer the norm;
  - increasing resource productivity and waste prevention are priorities, with economic instruments supporting these;
  - products are primarily reused or recycled;
  - overall recycling levels are high, with efficient use made of resulting secondary raw materials leading to better resource management
  - tools to implement and enforce effective waste legislation and to promote continual improvement in waste management are in place;
  - goods are recycled to a high quality and environmental standards;
  - the level of secondary raw material use is maximised;
  - products are designed to aid recycling and to make use of secondary materials.

  When assessing performance towards delivering a European recycling society, as for the broader assessments of waste trends, the data sets are currently insufficient to provide details on the broad range of indicators that would ideally be used to demonstrate performance against the ideal of a recycling society. The concept of a European recycling society therefore requires essential mechanisms for collating a basket of indicators that can be used to assess a Member State's consolidated performance to deliver desirable waste generation and treatment outcomes; however, at present this basket of indicators cannot be fully utilised due to data gaps.

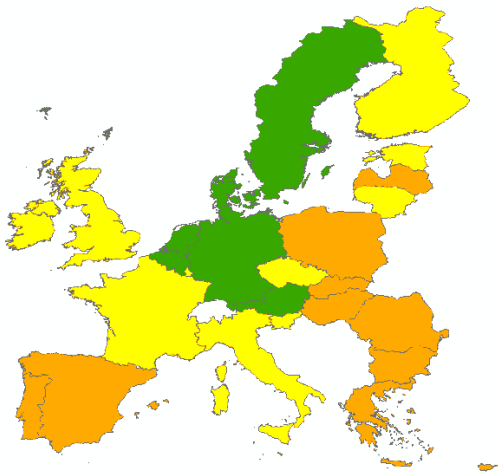
Performance towards the goals of a recycling society

Based on the limited information currently available the following spatial assessment of Member States' comparative performance towards delivering the goals of a recycling society was developed. The map below classifies Member States as follows:

High - *Member States delivering the highest level of compliance with the goal of delivering a recycling society* – These countries are considered to be delivering: high levels of MSW recycling with a continuing upward trend, high levels of recovery as a proportion of waste treatment activities; low and/or falling levels of landfilling; and falling levels of GHG emissions from the waste sector

Transitional – *Member States showing rapid improvements in terms of moving towards a recycling society* – These countries are currently seeing: significant increases in their level of MSW recycling but only medium to low levels of recycling overall; medium levels of recovery comparable to a medium or low level of MSW recycling; a falling reliance on landfilling; and falling levels of GHG emissions from the waste sector

Limited – *Member States showing limited or slow progress towards a recycling society* – These countries are currently seeing: low levels of MSW recycling and static or low associated rates of increase; high and static or increasing levels of landfilling; and increasing levels of GHG emissions associated with the waste sector.



- ***EU footprint*** – Europe is both increasing imports of materials and products and exporting an increasing proportion of its waste for reprocessing in third countries, with this trend set to continue into the future, based on the modelling exercise and opinions of stakeholders on waste exports. However, once materials leave the EU there is little ability to control environmental impact. One of the original principles on which EU waste policy was based was of proximity, requiring waste to be treated as close to its origin as possible. This principle was largely eliminated in the recent revision of the Directive on Waste, which potentially weakens the EU's ability to monitor waste travel. There is a need for a more effective system of tracking the movement of waste and the conditions under which it is ultimately reprocessed in order to promote environmental improvement in this sector and confidence within the industry on the quality of the products that result.

- ***Securing and recognising the environmental benefits from moving up the hierarchy*** – There are mounting concerns that in the push to focus on energy recovery from waste and other aspects of greening disposal and recovery activities the potential benefits of recycling, reuse and prevention are being sidelined. There is a need to better recognise the environmental impacts avoided by making use of the management options higher up the waste hierarchy, to better realise the resource, climate and broader environmental benefits. This needs to be tied to a better system for recognising and distinguishing the most responsibly recycled secondary raw materials, and for prices paid to local authorities to reflect this.

Delivering the Waste TS and its Role

- ***Key Positive Achievements***

The Waste TS has demonstrated the following positive achievements:

- *A useful framework for waste policy* – The Waste TS has provided a useful framework for structuring the future direction of EU waste policy. Having a policy document that makes explicit the goals for EU waste law and policies is important given the large number of Directives applicable to waste management activities.

- *A stimulus for debate* – Importantly the Waste TS has stimulated constructive and extensive debate on the delivery of waste priorities in Europe. The ultimate adoption of the revised WFD (as a consequence of the discussions surrounding the Waste TS) was noted by stakeholders as a progressive step forward in addressing waste management.
- *Diffusion of concepts* – The Waste TS appears to have been successful in encouraging extensive diffusion in EU and MS policy documents and legislation of the terms 'waste prevention', 'producer responsibility' and 'life cycle thinking'. The terms 'waste hierarchy', 'reducing negative environmental impacts by better waste management' and 'using waste as a resource' enjoy a fair level of diffusion.

- ***Key Limitations Identified***

The Waste TS has demonstrated the following limitations:

- *Problem-focused* – The Waste TS still deals with waste primarily as a problem rather than focusing on the opportunities for reducing environmental impacts and improving resource use, upon which the EU might try to capitalise. The positive consequences of improved waste management could be better reflected in the wording of the Waste TS.
- *Waste prevention at EU level unclear* - While waste prevention is a key aim and the Waste TS has raised the status of prevention as a priority of waste policy, it remains unclear what the EU is doing to help deliver waste prevention. Action is split across EU policies and there is no collective understanding of performance. The key tools for delivering prevention are the national waste prevention programmes, but these need to be effectively controlled, overseen and delivered by MS and carefully monitored by the Commission.
- *Lack of integration into non-waste policies* – While the objectives of the Waste TS are relatively well reflected in waste laws, there should be more emphasis on ensuring waste as an issue is properly integrated into policies developed in other fields, in particular relating to product, natural resources (and subsequently, biodiversity) and industrial policies.
- *Missing activities on international impact* – While the Waste TS discusses the international impact of EU waste management it fails to set out any actions to address this. This is an important limitation in delivering waste management that takes account of all of Europe's impacts.
- *Poor diffusion or implementation of concepts* – The Waste TS does not appear to have encouraged the diffusion of the terms 'proximity principle' and 'European recycling society' in EU and Member State policy documents and legislation. Additionally, although terms such as 'waste prevention', 'producer responsibility', 'life cycle thinking', 'waste hierarchy', 'reducing negative environmental impacts by better waste management' and 'using waste as a resource' have been diffused into EU and Member State policies and legislation, it is still not clear to what extent these concepts have had effective results on waste generation or on driving waste management activities further up the waste hierarchy.

The State of EU Action and Future Needs

- ***The importance of targets and legislation*** – Input from stakeholder discussions, outcomes of the modelling exercise and review of current waste management performance, point to the importance of EU legislation and targets to stimulate action to promote recycling, reuse and recovery. Looking to the future it is important that targets be renewed and regulatory efforts not be abandoned. Stakeholders commented that while the market can help deliver the targets and regulatory requirements it is unlikely to develop to the degree necessary to deliver substantial improvements in waste management in the short to medium term i.e. to at least 2020. There is, therefore, a continuing need and role for the EU to require better waste management, and in particular to increase prevention, reuse and recycling activities and reduce disposal.

- ***Delivery of existing waste management targets*** – Given the wide variety of economic and social conditions across the 27 Member States, it is unsurprising that there is a high degree of variation in the approach to waste management and delivery against EU targets. For example in 2007 levels of packaging recycled or reused were estimated at 59% across the EU-27, meaning that the 2008 target for delivering 55% recycling and 60% recovery of packaging can be assumed to be collectively met by the EU as a whole. However, in 2007 15 MS had already met the target for 2008, while others remained some distance from its achievement.

  This pattern of simultaneous over- and under-achievement is likely to be repeated across the EU's other targets for waste management. There is, therefore, a need for targets to keep pace with delivery by the high achieving Member States. This should be supplemented by additional support for poorer achievers to raise overall levels into the future. Stakeholders felt that this dual approach would be more effective given the need for the EU to continue to improve its management of waste and natural resources. In particular it was specifically commented that the packaging targets should be reviewed, as these were required to be revised by the end of 2008.

  Although there are considerable differences between MS economic and social conditions, EU waste policy is one of the oldest of EU environmental policies, dating back to 1974. The evolution of waste policy over this time has taken a predictable path, reinforcing the hierarchy and principles established in the 1970s and which remain central to EU waste policy today. The large differences between MS performance therefore needed closer attention long before more 'complex' legislation, such as on WEEE, was introduced. The complexity of waste legislation is enhanced by the levels of legal responsibility in its implementation, with most direct implementation taking place at local level, meaning hundreds of thousands of delivery bodies needing oversight. Member States and the European Commission can only be supported in better implementation and enforcement through the creation of a waste policy forum where key strategic issues are discussed within the context of greatly improving implementation.

- ***Effective oversight of Member State prevention efforts*** – Member States are only now drawing up waste prevention plans and targets as required under the revised WFD. They will then need to implement these actions. There is therefore a limit to the additional efforts the European Commission can currently make on the question of waste prevention. However, it is vital that effective oversight of Member State action be ensured. The Commission has an important role in ensuring that: prevention plans are clear, adequate and of a high quality; that appropriate systems are outlined and put in place to deliver the promised efforts; and that MS performance against their plans is monitored over time.

  In terms of taking forward action on waste prevention at the EU level, there is a feeling amongst stakeholders that a more effective mechanism needs to be put in place for monitoring prevention activities and to understand the types of action that prove effective in preventing waste generation, as well as to develop best practice approaches. Dedicated research is also needed in order to better understand and monitor the question of decoupling of waste management from economic activities. There is also some confusion as to who should be responsible for delivering waste prevention and, as a consequence, guidance from the Commission regarding good practice approaches to identifying responsibilities and mechanisms for rewarding those who are not using excess raw materials would be welcomed.

- ***Data availability, effectively monitoring and understanding waste management in Europe*** – At present there is a challenge associated with limited time series data for the EU-27; however, this will be addressed over time. In addition, however, there are continuing fundamental gaps in EU data that have long been identified as a priority. Several key areas have been identified where the absence of data seriously inhibits the ability to reach effective conclusions regarding waste management performance and delivery of the objectives of the Waste TS. These include:
  - Lack of standardisation in the definitions used in the collection of data regarding the collection and management of MSW (and to a lesser extent other waste streams). Given the importance of these data as an indicator, improvement and standardisation is considered vital;

- Data on reuse and prevention (or some form of proxy for this) are central to evaluate the performance of MS in terms of moving up the waste hierarchy and assessing the efficiency of their reuse;
- Data on recycling collection rates and overall recycling rates do not take into account the quality of the recyclables collected nor the environmental standards under which, and to which, the materials are reprocessed. Both elements are key to securing a robust and environmentally responsible recycling market; and
- A lack of consistent use of measurement units means that at present it is difficult to make comparisons between the capacity of facilities in the EU for recovery and disposal. For example, landfills are recorded in m^3/year while other facilities are recorded as tonnes/year. This could be relatively simply addressed to provide a useful assessment of capacity in Europe.

- ***International policy influence*** – Product policies developed in the EU have had a significant influence on the development of policies and approaches in third countries specifically where there is a clear market providing goods or products from third countries to the EU, e.g. vehicles and electrical equipment. In these cases there is evidence that EU policies have helped reduce the level of harmful substances in products, specifically vehicles and vehicle components, globally. The importance of EU policy in determining wider environmental conditions is not as marked for products where the supplier/market relationship is less distinct, for example in the case of packaging. While the packaging Directive is of interest in third countries its direct impact in third countries has been less significant given that packaging production and provision is much more dispersed. By setting product standards for the placing of products on the EU market, the EU has the opportunity to influence its own environmental performance, its wider environmental footprint and the environmental performance of third countries' product use. However, the standards and requirements must be clear and specific in terms of materials to be used, levels of hazardous substances and so on, in order to be effective. Given that the EU does not produce a large proportion of the products consumed within its borders, this is a vital tool for helping to control waste management.

- ***Exporting waste for recycling*** – Significant and expanding quantities of waste are now being exported both to other EU countries and to third countries for reprocessing, often illegally. Whilst this is the reality of international markets for secondary raw materials and goods, as exports increase oversight and understanding as to the conditions under which reprocessing and sorting are completed become more difficult. Stakeholders commented that the location of waste reprocessing is not of vital importance, so long as the conditions under which this is completed are monitored and of sufficient quality to deliver environmental protection, efficient conversion and quality products. At present there is not considered to be a sufficient mechanism to track where reprocessing is taking place and the standards under which it is completed to ensure recycling delivers on its promise of environmental responsibility. Defined standards for the quality of exported materials are also currently lacking. Several complementary solutions were proposed to address this:
  - Into the long term it is important for the EU to retain some form of recycling industry to support at least part of the reprocessing effort; measures should be put in place in order to ensure that environmental performance and efficiency of these plants are maximised in order to push forward innovation in this field. This could also be supported by measures promoting domestic use of secondary raw materials, thereby strengthening the market for such materials.
  - A simple form of traceability requirements should be placed upon materials to be reprocessed and ultimately recycled to ensure that it is understood which plants are completing such activities and the standards to which these are delivered. At present all recycled products, whether from the best plant or worst, are treated alike (for example under labelling schemes) with the assumption that they are environmentally responsible. It is time to put in place a mechanism to provide better oversight to ensure environmental responsibility of recycling to promote good practice and provide more security for industry which relies on the environmental and quality credentials of secondary raw materials.
  - Defined standards for the value and/or quality of exported materials, clearer legal definitions/guidelines for when a used good becomes waste, or some form of EU 'usefulness' criteria could be useful, to help address the export of products that are very close to the end of their useful life and therefore are effectively, if not technically, waste.
  - Better application and enforcement of rules, in particular the Waste Shipment Regulation, would help to tackle environmental issues arising from waste exports. For example, particular focus could be given to

shipments with high economic value (in terms of recyclable content) and those with high potential impact on the environment in the country of destination (i.e. hazardous waste). Such processes would also help to tackle illegal exports of waste.

- ***Delivering quality recycling*** – The quality of recyclates and secondary raw materials is key to securing the expansion of recycling and the replacement of primary materials in order to conserve natural resources. Efforts to ensure improvements in the quality of materials are seen as key by industry representatives to securing the better reputation and therefore more widespread use of, and confidence in, secondary raw materials. However, ensuring quality means both a focus on improving processing activities and also the sorting of raw materials, starting with source separation and the production of higher quality material for recycling emanating from Member States. At present there is no mechanism in place to ensure the quality of recyclates entering the market, to monitor the quality of recycled materials or the effectiveness/efficiency of the plants being used for recycling purposes. All of these factors are needed in order to provide for an effective, expanded recycling market and high quality, environmentally responsible, secondary raw materials.

5.2 RECOMMENDATIONS – TAKING FORWARD THE WASTE THEMATIC STRATEGY

This section sets out the priority actions and issues to be considered within a future revision of the Waste TS, in order to spur greater progress towards the goals of moving waste treatment up the hierarchy, delivering a European recycling society and reducing the environmental impact of waste management. This analysis builds on the needs and conclusions identified in section 5.1 above.

Section 5.2.1 provides an initial evaluation of the potential policy options that might be used to address the list of core needs identified. This would need to be supplemented by an Impact Assessment in line with Commission procedures before options were taken forward. Section 5.2.2 sets out the conclusions in terms of taking detailed priorities for action forward within the current Waste TS review. Finally section 5.2.3 summarises the way forward, both in terms of priorities for the current review and the need for continued renewal of the strategic direction for waste policy including longer term priorities.

5.2.1 EVALUATING POTENTIAL POLICY APPROACHES

This section compares the core needs identified in section 5.1 to the policy solutions and recommendations identified within the course of this study and associated discussions with stakeholders. Table 20 compares the needs identified in the conclusions to the potential policy solutions put forward, identifying where there are positive relationships with some policy solutions addressing a number of the challenges identified, identifying where each approach might be of use, and setting out some of the initial pros and cons of adopting these. Table 21 then compares the potential pros and cons associated with different policy solutions, identifies what policy mechanism might be needed to deliver the action and the anticipated timing of any effort. Based on the analysis in Table 20 and Table 21 , final recommendations are set out in section 5.2.2. This section sets out recommendations to the Commission for potential future actions that might be undertaken in response to this review and the needs identified.

Table 20 Comparing the Needs Identified to Potential Policy Solutions – Below a potentially positive relationship is indicated by a + with a significantly positive relationship indicated by a ++

Policy Options identified	Future Needs Identified									
	Reducing the quantity and hazardousness of waste – Promoting Prevention	Supporting increasing rates of recycling across all MS	Ensuring improvement in energy recovery technologies and avoiding incineration for disposal	Continuing diversion from landfill and other disposal activities	Improving the information base/data collection to enable monitoring of waste hierarchy and recycling society goals	Integrating waste goals into other policy areas	Better promoting the environmental benefits of EU waste laws internationally	Improving oversight over the delivery of environmentally responsible recycling	Ensuring the resource, climate and broader environmental benefits of moving towards recycling, reuse and prevention are recognised	Improving the quality of secondary raw materials and confidence in the market
Adopt a revision to the Waste TS setting out the future vision on waste policy	++	+		+	+	+		+	+	+
Continuing to increase and improve EU performance towards recycling targets and set longer term ambitious targets for recovery and recycling into the future	+	++		++	++	+			+	
Offering additional support and advice to MS who are lagging behind in the delivery of waste targets to improve performance	+	++		++					+	
Ensuring a mechanism for oversight and review of MS performance on an ongoing basis to monitor delivery of national prevention plans	++			+	++	+				
Increase standardisation of data collection across the MS	+	+	+		++	+			+	
Conduct research to develop a proxy for collecting data on reuse and prevention	+				++	+			+	
Develop an approach to consistently assess decoupling	+	+		+	+					
More clearly define the	++	++	+	+	++		+	+	+	

concept of a recycling society and the indicators to be used to assess this and data needs										
Develop a simple system for tracing the ultimate destination of materials for reprocessing and identifying criteria for environmentally responsible treatment of recycling wherever it may take place	++	+		+	+		+	++	+	++
Expand ecodesign requirements for products used and produced in Europe	++	++		+		++	++	+		+
Develop standards on recycled materials and acknowledging their environmental credentials i.e. distinguishing the best products	+	++	+	+		++	+	++	++	++
Develop systems to assess, monitor and improve the quality of secondary raw materials entering the market place	+	++		+	+	+		++	+	++
Improve approaches to collection and sorting of waste to ensure higher quality recyclables	+	++		+		++	+	++	+	++

Table 21 Evaluating the potential policy solutions identified, their pros/cons, likely policy mechanism for delivery and potential timing of such actions i.e. short (in the TS review and subsequent 2 year period), medium (in the next 5 years), or long (into the longer term future i.e. beyond 10 years) term

Policy Option	Potential Pros	Potential Cons	Policy Mechanism	Timing
Adopt a revision to the Waste TS setting out the future vision on waste policy	Provide an opportunity for further debate around the future of waste, which is fundamental to delivering broader goals such as resource efficiency/sustainable use of natural resources, sustainable industrial policy, ecodesign, eco-innovation, biodiversity protection, energy efficiency, etc. Provide a direction to continue to drive forward improvement in waste management which is key to delivering environmental and resource goals Establishes waste action as a continuing priority of the EU	Must deliver new ideas and proposals for improved effort into the future in order to satisfy stakeholders Sets expectations that waste management activities will be improved into the future	Commission Communication to be followed by more concrete proposals	Short term
Continuing to increase and improve EU performance towards recycling targets and set longer term ambitious targets for recovery and recycling into the future	Sets out clearly the desire to continue to improve efforts to promote recycling and the determination to secure the benefits associated with recycling Offers a balance to pressures that might be promoting energy recovery Sets a basis upon which the product standards and the recycling market can become more established	Alone targets will not deliver improved approaches to recycling or increased innovation in this section. Therefore this should be adopted alongside other measures to address the environmental consequences of recycling, promote good practice, support for MS struggling to deliver existing targets and research into both improved methods of recycling and assessments of what factors cause a drop off in recycling rates when high levels are achieved.	Legislative proposals accompanied by guidance, research and support Potentially could be proposed in the revision of the TS as part of a package of measures to improve recycling efforts into the future in terms of volume and quality.	To be proposed in the short term, implemented in the medium term and delivered in the long term.
Offering additional support and advice to MS who are lagging behind in the delivery of waste targets to improve performance	Recognises that MS are at different stages in the development cycle in terms of recycling Ensures that some MS are not left behind Offers support and knowledge sharing to improve standards Should lead to environmental improvements	Requires a clear understanding and acceptance of who is failing to meet targets and the nature of support needed in the different MS. This will require quality data sets to identify gains in to the future and target support and understanding of the factors that impede increased recycling levels.	Put forward in TS review Accompany any legislative proposals Best practice information potentially published in guidance Improved monitoring requirements to be adopted as EU Regulation/ amend existing requirements Consideration of funding priorities under EU Budget review	Proposals put forward in the short term Tailored approach to support to be put in place in the medium term
Ensuring a mechanism for oversight and review of MS performance on an ongoing basis to monitor delivery of national prevention plans	Reinforces a key existing policy Demonstrates Commission interest in this field Will provide a basis for identifying core needs in terms of future EU action Will help develop a system for identifying good practice and sharing this	Will require considerable expertise and effort on the part of the Commission May lead to difficulties with some MS Will need to be a clear structure and plan of action in terms of follow up if the NPPs are seen to be poor/under performing ie threat further EU action	Set out as a priority for the TS Commission could provide additional guidance on expectations and good practice	Short term, set out goals. Medium term deliver oversight and adopt additional actions into the longer term
Increase standardisation of data collection across the MS	Will enable greater understanding of policy impacts and the situation in MS enabling comparison and better implementation/targeting of policies	Priorities should be systematically identified to avoid changes that can devalue data sets and to reduce burden of reporting on MS	Set out as a priority in the TS along with a timeline to identify priorities Amendment to existing	Short term – identify priorities and put in place

Policy Option	Potential Pros	Potential Cons	Policy Mechanism	Timing
			Decision/Regulations on monitoring	proposed amendments
Conduct research to develop a proxy for collecting data on reuse and prevention	Key to being able to monitor and evaluate progress in terms of waste avoided and benefits of activities focused on efficiency and ecodesign	Challenging There may be no perfect solution to monitoring this Need for consistency in approach	Set out as a priority in the TS	Short term, monitoring in place in medium term
Develop an approach to consistency assess decoupling	Important in understanding the drivers of waste trends and delivery of success across different economies	May be not perfect solution Additional data resources may need to be in place to secure success	Set out as a priority for research in the TS	Short term investigation
More clearly define the concept of a recycling society and the indicators to be used to assess this and data needs	Provides a clearer basis for communication and assessment of achievement.	Needs to be broadly defined in order to encompass all the different aspects of such a society. Needs to be accompanied with developments in data collection to prove effective as a monitoring mechanism	Clarification in the TS and set out scope for further review of data needs Proposals for improved data collection potentially in amendments to existing reporting requirements/standard guidance for analysis	Short term
Develop a simple system for tracing the ultimate destination of materials for reprocessing and identifying criteria for environmentally responsible treatment of recycling wherever it may take place	Will help to ensure that the environmental benefits of recycling are captured and potential negative environmental consequences are avoided Increase oversight over the recycling chain offering a basis for promoting the best reprocessing activities and improving quality Key to delivering a more robust chain from waste to secondary raw materials Provides a clear basis for reporting on export activities and nature of recycling Appears to be desired by industry as well as environmental stakeholders from discussions to date	Needs to be carefully developed in order to avoid unnecessary burden on industry Will need to apply within and both external to the EU Will need additional support systems for registering activities and certifying them as in line with requirements	Set out ambition and goals in the TS Will need to develop a legislative proposal into the future once issues such as criteria, mechanisms for delivery and infrastructural arrangements have been considered May require staggered implementation ie reporting requirements first followed by legal responsibilities	Medium term, fully operational into the long term
Expand ecodesign requirements for products used and produced in Europe	Help to secure higher quality streams of recyclables for production of secondary raw materials Reduce the quantity and hazardousness of waste meeting prevention and resource efficiency goals When well targeted can reduce environmental footprints beyond the EU borders	Can be a highly time consuming process Design requirements need to be well targeted There are some concerns about the inclusion of requirements for the use of secondary raw materials in products before quality chains have been established Length of time usually taken in developing standards	Set out goal in TS, but develop a programme of research/discussion with stakeholders to identify priority areas for ecodesign improvements	Medium term
Develop an improved system for labelling recycled materials and acknowledging their environmental credentials i.e. distinguishing the best products	Key to delivering better quality recycling and acknowledging/promoting best practice Will help to support quality chains of secondary raw materials	Could lead to confusion among the public and would need to be carefully communicated Would need to be linked to more effective monitoring of the recycling supply chains and understanding of reprocessing activities	Set out as a goal in the TS but would need to be put forward as a legislative proposal linked to traceability requirements	Medium term
Develop systems to assess, monitor and improve the quality of secondary raw materials entering the market place	Key to delivering a more effective recycling market and closing the loop between recycling targets and use of secondary materials	Need to be further examined with stakeholders to identify the most effective solutions as there are concerns for example re including requirements for mandatory use of secondary materials	Set out as a goal in the TS followed by further research with stakeholders	Medium term
Improve approaches to collection and	Important if the quality of recycling and secondary raw materials is to be improved.	Further investigation needed into approaches to collection in MS and the	Set out as a goal in the TS and the scope of further research	Short term, conception of

Policy Option	Potential Pros	Potential Cons	Policy Mechanism	Timing
sorting of waste to ensure higher quality recyclables	It is no longer sufficient just to collect waste for recycling and produce low value substances we need to upscale recycling efforts and products Aim innovation in the sector Help promote more effective recycling in poor performing MS	quality of outputs Identify which materials must be separately collected to ensure quality Needs to be linked to awareness raising as implies greater source separation	Proposal to put forward mechanisms to promote recycling. This could be as part of a package on recycling including traceability/labelling	ideas, Medium term delivery of proposals

5.2.2 TAKING FORWARD FUTURE ACTION – RECOMMENDATIONS TO THE COMMISSION

The review of the Waste TS offers an important opportunity to set out a clear set of more specific priorities and action for the coming years in order to continue to take forward waste management and prevention priorities, and to make stronger links to other related policy areas. Stakeholders clearly saw a value in the Waste TS, both in terms of offering a strategic direction in the waste field and also opening up debate on future priority actions. Based on this analysis the priorities encompassed in the original Waste TS appear to remain of importance i.e. the desire to move up the waste hierarchy, prevent waste, make better use of waste resources to ensure resource efficiency and deliver a 'European recycling society' focused on the efficient use of waste resources and their prevention. However, the set of actions and needs identified in order to take these priorities forward have evolved in the past 5 years.

Since the adoption of the Waste TS stakeholders acknowledge that considerable progress has been made in taking forward efforts to improve waste management, most notably within the revision of the WFD. There is now clearly a desire to build on this progress with waste management and prevention arguably rising further up the agenda given concerns about the need for a resource efficient future that respects resource, climate-related and broader environmental constraints. Moreover, as the EU has promoted a shift away from disposal towards recycling, new trends have emerged and new challenges must be overcome, such as rising levels of exports for reprocessing, the need to further develop markets for secondary raw materials in order to enable the continued increase in recycling effort and the need to now distinguish in the market place between high quality and low quality recycling in order to drive best practices.

Based on our analysis, the following priority needs have been identified:

- To better promote **prevention**, improve the information base in this area and demonstrate commitment to securing a quality system of national prevention programmes.
- To continue to support further **increases in the rates of recycling** across all MSs recognising the value of EU targets in promoting improved recycling rates and the importance of renewing the ambition of these targets into the longer term. This should be supported by additional actions to better support MS who are struggling to deliver existing targets through the sharing of best practice, better monitoring of MS waste management plans to ensure that efforts envisaged are appropriate and fit for purpose and more extensive enforcement proceedings brought against those who are failing to take action despite efforts to support both development of best practice and better waste management planning.
- Continuing to promote the **diversion of waste from landfill and other disposal activities**, including ensuring continued improvement in energy recovery technologies and avoiding incineration for disposal.
- Urgently **review and improve the information base**, indicator sets and consistency of data collection to enable effective monitoring of waste hierarchy and recycling society goals and achievement of binding targets. This should specifically address questions of consistency in terms of MSW monitoring, the lack of proxies to assess reuse and prevention effort, the lack of information on the quality of materials recovered for recycling, the environmental standards under which materials are reprocessed and the inconsistent use of units.

- To **better define the concept of a recycling society** and the indicators to be used to assess this enabling this concept to provide a holistic and comparable basis for assessing waste management performance across the EU into the future.
- While accepting the treatment of waste is global in nature to continue to **support a stable market for the reprocessing of waste materials in Europe**. This should be based on the ideal of ensuring that EU recycling industries drive forward innovation to deliver efficient recycling and the best processes in terms of environmental outcomes and quality of secondary raw materials. Such an innovative industry, that can demonstrate external environmental and quality benefits, could be supported through the use of funding and tailored policy instruments.
- Improving the **quality of the recyclables supply chain**, secondary raw materials and increasing confidence in the market for recycled goods.
- **Improved oversight of the delivery of environmentally responsible recycling** including developing a system that can take account of international as well as intra EU impacts, helping to improve traceability and monitoring of recycling activities and confidence in the origins of secondary raw materials. The goals of this would be to ensure that waste treated both in the EU and externally are managed in a way that is appropriate in terms of environmental protection, enforcing existing treatment standards and ideally helping to aid their improvement over time.
- Ensuring the **resource, climate and broader environmental benefits** of moving towards recycling, reuse and prevention are fully recognised and economically valued.
- Promoting the environmental **benefits of EU waste laws internationally** specifically in markets servicing the EU with products. This should recognise the success of well targeted product-based standards in reducing resource use and hazardousness of products entering the EU market place and globally.
- To address the **high variation in performance of MSs** in terms of delivering waste management goals and to develop mechanisms to support the lower performing countries to increase the pace of change across the whole of Europe. This could be done in a way similar to mechanisms put in place on air quality where by there was a forum established to share good practice on economic instruments. This would initially need to be built up on the basis of a coalition of the willing in terms of Member State input.

Also based on our analysis, three distinct sets of priority actions have been identified to deliver these needs. These three sets of priority actions are outlined below. They represent a suite of actions that it is recommended the Commission take forward over time and set out as key actions to be taken forward under the review of the Waste TS in order to maintain momentum towards waste management and sustainable resource use/resource efficiency goals. Many of the actions are interlinked and support broader efforts to promote more environmentally responsible, well-informed and resource-focused waste management. It should be noted that the following recommendations are made on the basis that it is anticipated that another review of progress towards achieving the objectives of the Waste TS will be needed in the medium term. This review timeline is important in taking forward action on waste, retaining engagement and oversight over this issue and should be set out clearly in the Waste TS review document.

a) **Prevention** – Prevention is obviously a key priority to deliver the needs identified above, reducing resource demands and the overall generation of waste and associated environmental consequences. During this review prevention was seen as important and should remain central to the review of the Waste TS. However, since the Waste TS was adopted the WFD has set out requirements for the delivery of national waste prevention plans, a key new development in this area. Given that these plans have yet to be published or implemented the following set of actions on prevention are recommended in the short term i.e. over the next 2-5 years.
    a. To put in place a system for overseeing the development and delivery of the **national prevention plans** to ensure high plan quality, that ideas and innovations are exchanged between MSs and that the MSx are demonstrating delivery against their plan objectives.

b. Undertake research aimed at identifying the most **reliable proxies for monitoring prevention and reuse** performance across the MSs, this should include consideration of the best methods for assessing decoupling of waste generation from economic growth.
c. Setting out **extended ecodesign requirements** for products and materials to promote the design and purchase of more resource efficient, less harmful and more environmentally responsible products, and ensuring their reusability/recyclability (linking to the next section on recycling).

Into the longer term, setting out EU action on prevention should be a priority for any subsequent review period eg in 2015. By this point, based on the success and commitment to national prevention plants, the Commission will be aware of the activities that can be effectively undertaken at the national level and gaps that require EU intervention.

b) **Supporting the continued expansion of recycling activities** – In the majority of Member States there remain significant levels of disposal activities and a continued need to promote the importance of high quality recycling, especially given increased interest and expansion in the use of energy from waste. The following proposals are intended to both increase understanding of the mechanisms that help promote recycling and their limitations, the effectiveness of EU action on recycling and to continue to promote higher levels of recycling across Member States. It is envisaged that all of the following actions could be set out as priorities for the coming 5 years.
   a. Put in place **research efforts** related to the following. This knowledge is necessary to focus future policy and reduction effort in this field.
      - Best practice in recycling approaches and the creation of recycling techniques and standards to identify the most promising methods and promote their use, particularly for use in implementation of the Ecodesign Directive;
      - Successful policy tools that lead to the promotion of recycling to a high level and /or the rapid increase in recycling levels aimed at securing their expanded use;
      - The limitations that inhibit the further expansion of recycling effort in successful MSs to enable breakthrough to higher recycling levels, focus innovation and to set the most ambitious but achievable targets for achievement;
      - R&D efforts and pilot projects to demonstrate mechanisms for improving the efficiency, quality and environmental effectiveness of recycling.
   b. Clarify the concept of a **European recycling society** and also the factors that should be used to assess this. This should include details on priority data needs to ensure more coordinated, systematic, consistent and extensive data sets are available in the future.
   c. Recognise the **important role of EU regulation and target setting in driving recycling efforts** and continue to **prioritise the setting of ambitious targets** for recycling achievement into the future. To take account of the imbalance in performance across MSs, targets should be set based on the best performing nations' achievements, but with **additional support mechanisms** put in place to aid the increase achievement in the other countries.
   d. Prioritise **improved implementation of waste legislation**, including improved oversight and review of Member State waste management plans to ensure their quality and effectiveness (this could build on practices applied in other environmental policy areas such as for renewable energy action plans or river basin management plans), through regular reporting on performance against all targets by MSs and analysis by the Commission, and through the setting up of a waste implementation forum for MS exchange of good practice on direct implementation and supporting mechanisms (such as economic instruments, bans, producer responsibility initiatives, etc).

c) **Stimulating markets for secondary raw materials, securing their quality and environmental credentials** – It has been identified that the EU has made considerable progress towards targets for the overall levels of recycling. However, these targets do not automatically lead to quality secondary raw materials, environmentally responsible recycling or the replacement of primary raw

materials, hence reduced primary resource production or use and a more secure supply of natural resources.

The EU has established a pattern for recycling. What is now needed is to promote better recycling efforts, wherever they may be in the world, and the use of secondary raw materials. During this analysis key barriers to achieving these goals were identified as: the lack of differentiation and oversight as to which processing plants are being used i.e. there is no reward for using the best facilities nor would an industry representative necessarily be aware of the plant that is ultimately undertaking the reprocessing of their materials; a lack of certainty over the quality of secondary raw materials; and lack of policies promoting the use of secondary raw materials. In order to address these gaps, it is envisaged that considerable consultative work would have to be undertaken ahead of proposing a potential framework of actions on secondary raw materials. Therefore it is envisaged that these proposals would be developed over the coming 2-year period with the aim of their being proposed and approved by the EU institutions ahead of a future review, e.g. in 2012.

a. Undertake a **dialogue with industry** (and other relevant stakeholders) to understand the most effective ways of securing quality recyclables to feed into the supply chain and support the delivery of improved secondary raw materials. Proposals should then be adopted, as part of a wider package to secure secondary markets.
b. A **study on the feasibility and effectiveness** of tools supporting the domestic (EU) use of secondary raw materials, such as minimum recycled content, including for which materials this would be needed (as, for examples, metals do not require such measures due to the natural demand for such materials).
c. To develop, with stakeholders, a **mandatory approach to ensuring that the nature of treatment of a waste, its reprocessing and resulting secondary raw material can be traced** i.e. that the quality and environmental credentials of the reprocessing activities can be tracked and identified, to ensure that environmental performance is comparable to that achieved within the EU. This is intended to provide additional oversight as to the level of environmental protection achieved and the quality of the secondary raw materials, increasing confidence in the recycling market and also addressing concerns about the EU's growing footprint as a consequence of exporting waste for treatment.
d. Develop a mechanism for **recognising the best quality, most environmentally responsible recycled materials and products**. The development of such a scheme would be integrally linked to the establishment of traceability requirements under point b.
e. To introduce **ecodesign requirements** to help promote waste prevention, improve waste management and the ability to recycle products. Detailed discussions should be held with stakeholders regarding the viability of including requirements on natural resources and on secondary raw material use.

5.2.3 SUMMARISING THE WAY FORWARD

In conclusion the priority actions identified for the current review of the Waste TS are to:

- Focus on securing a basis for future prevention efforts;
- Continue to promote recycling as an important mechanism for reducing the impacts of waste management; and
- Undertake a focused effort to develop and improve the quality and environmental credentials of the recycling supply chain to facilitate the more extensive use of secondary raw materials.

These have been identified as priorities for action now and in the coming 5 years, as it is not possible to take forward all efforts at once and there is a need to understand the impact of implementing the WFD before taking forward additional measures. It is, however, acknowledged that alone these do not address all the remaining challenges facing waste management in Europe.

It is important to stress that this review is seen as part of an ongoing process of improving waste management in the EU and addressing the resulting questions of resource use. The actions proposed above are intended to provide a renewed and more informed basis for moving forward waste management in Europe. Into the medium term it is envisaged that a further review of waste management efforts will be needed around 2015, given that the implementation of the WFD will by then be firmly established. Based on the analysis within this report it is considered that this longer term vision should build on the points above and consider specifically:

- The role of EU action in terms of supplementing MS efforts on prevention;
- Mechanisms for further reducing levels of disposal such as landfill bans and promoting the shift away from incineration to increasingly efficient energy recovery plants; and
- Securing further innovation in the recycling sector to promote ever higher levels of secondary resource use.

6. ANNEXES

- Annex 1: List of stakeholders involved in the work
- Annex 2: Factsheets – Presenting key data on 12 key waste management topics
- Annex 3: Case studies reviewing the diffusion of key concepts in 8 Member States and at EU level
- Annex 4: Modelling - detailed methodological approach and report on outcomes, and questionnaire on modelling
- Annex 5: Complete list of references used during the study