Implementing EU Waste Legislation for Green Growth

Final Report

European Commission DG ENV
29 November 2011

bio Intelligence Service

Project description

CLIENT:	European Commission DG ENV
A project under Framework Contract:	ENV.G.4/FRA/2008/0112
REPORT TITLE:	Draft Final Report
PROJECT NAME:	Implementing EU Waste Legislation for Green Growth
PROJECT CODE:	CEENVFWCSMR_1002
DATE:	29 November 2011
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Please cite this publication as:

BIO Intelligence Service (2011), Implementing EU Waste Legislation for Green Growth, Final Report prepared for European Commission DG ENV

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Abstract

This report aims at providing an in-depth analysis of the expected benefits of better implementation and enforcement of EU waste legislation, and the means with which this can be achieved.

A five-step methodology was used in pursuit of this goal. Firstly, the current state of implementation and potential benefits of full implementation were quantified and evaluated. Secondly, barriers to better implementation at the level of the EU and of the MS were identified. Thirdly, concrete tasks for the EU and for the MS to overcome these barriers and to improve waste legislation implementation were defined. Fourthly, three policy options were developed, in which the key implementation tasks are led under three different institutional settings: Option A allocates the tasks to the European Commission, principally extending current activities but adding audit responsibilities concerning national inspections provided inspection standards are adopted at EU level. Option B provides the EEA with all suggested tasks except legal enforcement tasks allocated to the Commission under the Treaty and the proposed inspection audits, which would be tasks for the Commission. Option C proposes the creation of a new specialised waste agency, which would execute all tasks with the same exceptions as in Option B Finally an impact assessment was performed on the three policy options. The assessment involved two parts: first, impacts of each option on timeliness, aptitude and efficiency of legislation implementation were assessed; then, environmental, economic and social impacts are analysed. The impact assessment suggests that given the comparatively low administrative cost needed to implement option B and the high expected performance, option B presents a reasonable proposition to improve the implementation of EU waste legislation.

Executive summary

The purpose of this report is to propose policy options to improve implementation of EU waste legislation across the European Union.

After the introduction (*chapter 1*), the report is structured according to the methodology used to achieve the project objective. This methodology involved five phases (*chapters 2-6*).

First, the current state of EU waste legislation implementation was assessed. Persisting implementation gaps, such as illegal waste shipments and waste management contravening EU legislation, create serious environmental damages, pose risks to human health and generate economic costs. General barriers to better implementation were investigated and found to exist in four categories: technical and market barriers, administrative barriers, knowledge barriers and economic barriers.

A cost-benefit analysis, comparing the current state with a full-implementation scenario, shows that not only the environment, but also society and the economy would strongly benefit from improved legislation implementation across the EU. The study compares two scenarios for the period 2008-2020 - one involving no progress in waste management and the other involving full implementation of eight pieces of EU waste legislation - and concludes that full implementation would mean cost savings of €72 billion per year (see table below). In addition, the study concludes that by raising the level of the EU waste management sector to full compliance, the turnover of waste management and recycling would increase by €42 billion per year and over 400,000 jobs would be created. This data has been derived from an economic scenario analysis as explained in detail in Annex D.

Table 1: Economic and environmental benefits of full implementation

Impacts		Full implementation scenario compared to no policy change scenario	Relative change compared to no policy change scenario
Environmental			
Reduction in total waste generation		**-119 Mt**	**-4%**
Treatment:			
• Reduction in waste landfilling and incineration without energy recovery		**-931 Mt**	**-48%**
• Increase in material recovery		**+686 Mt**	**+72%**
• Increase in energy recovery		**+125 Mt**	**+112%**
Reduction in GHG emissions		**-215 $Mt_{CO_2,e}$**	**n/a**
Economic			
Reduction in total net costs of waste management[1]	**w/out externalities**	**-4.9 billion €**	**-6%**
	with externalities	**-72 billion €**	**-126%**

[1] Taking into account the economic value of reductions in GHG emissions including methane from landfills

Case studies looking at Brandenburg, Cyprus, Ireland, Naples and Rotterdam were developed to demonstrate that economic, financial and social benefits could be gained if Member States correctly implement EU waste legislation. *(Chapter 2)*

Second, specific barriers to better implementation and enforcement for the European Commission and for Member States (MS) were described in detail. A main barrier at EU level is deficiencies in the knowledge base and in the reliability of data on waste streams, volumes and management systems across the EU. This presents problems in the comparability and monitoring of Member States' data, the harmonised implementation of legislation across the EU and the development of targeted measures for improvement.

Moreover, a number of barriers at MS level, such as a lack of commitment and resources for implementation control and enforcement in combination with structural, institutional and constitutional constraints, further impede effective legislation implementation across the EU. *(Chapter 3)*

Third, the report identifies and presents a number of concrete tasks which need to be carried out in order to overcome the identified barriers and to enhance implementation of EU waste legislation. 19 tasks were identified, thereof 14 at EU level, two at MS level and three at both EU and MS level. All tasks were assessed in terms of their potentials to strengthen implementation. Based on the assessment, nine tasks at EU level were selected for the development of policy options for supporting better implementation of EU waste legislation (see table below). *(Chapter 4)*

Table 2: Selected tasks for supporting better implementation of EU waste legislation

Nb.	Task leader	Task
1.0	EU	Development of a more systematic approach of identifying lacks in waste legislation implementation
2.0	EU	Improvement of the knowledge base for mapping Member States' implementation performance, including analysis of
2.1		• Member States' waste management plans
2.2		• Implementation reports from Member States, institutions, NGOs and stakeholders
3.0	EU	More coherent tracking of the status of implementation in the Member States (implementation monitoring)
4.0	EU	Assistance and guidance to Member States on inspections and monitoring of implementation
5.0	EU	Training on inspections and enforcement, e.g. in cooperation with networks such as IMPEL
6.0	EU	Awareness raising on waste legislation implementation
7.0	EU	Review and report on national inspection standards, based on agreed EU standards (audits)
8.0	EU	Technical and scientific assessments and advice concerning waste related data and various information relating to the contents of EU waste legislation
9.0	EU	Technical and scientific assessment of the practicality and enforceability of EU waste legislation

Fourth, three policy options to support better waste legislation implementation were described in detail. In Option A, the European Commission leads or carries out all the tasks selected in the previous section. For this purpose, the Commission would mostly extend current activities and tasks but also take on some new tasks, specifically monitoring and auditing national inspections of waste management operations in Member States, provided .EU inspection standards are agreed. In Option B, the EEA leads or carries out many of these tasks, extending its existing waste data collection activities and taking advantage of its in-house waste expertise. The legal enforcement tasks allocated to the Commission under the Treaty and the proposed auditing task concerning MS inspections would be tasks for the Commission. In Option C, a specialised waste agency would execute all tasks, with the same exceptions as in Option B. (Chapter 5)

Finally, an impact assessment was performed on the three policy options developed in the previous section. The assessment was split into two parts; first, impacts of each option on timeliness, aptitude and efficiency as regards supporting legislation implementation are assessed, then, environmental, economic and social impacts are analysed. Except for the baseline scenario, all options are expected to achieve full implementation in the long-term, and, hence, the same environmental, economic and social benefits. However, the options differ in terms of timeliness (the time needed until full implementation is realised), aptitude (capacity and expertise of staff), efficiency (the administrative costs) of each structural settings for implementation support. A comparative summary of the impact assessment suggests the best overall result as option B. Compared to options A and C, this option could be implemented most efficiently, i.e. at lower administrative cost, while still allowing for effective improvement of waste legislation implementation. The impact assessment results are summarised in the table below. *(Chapter 6)*

Table 3: Summary of impact assessment for policy options

Indicators	Baseline scenario	Option A	Option B	Option C
Timeliness of implementation	-	++	+++	++
Aptitude for implementation activities	0	+	++	+++
Efficiency of implementation	-	--	-	---
Environmental impacts	--	++	++	++
Economic impacts	-	+	+	+
Social impacts	--	+	+	+
Summary	-	+	++	+

'+++': very beneficial effect; '++': substantial beneficial effect; '+': slight beneficial effect; '-': negative effect, '--': substantial negative effect; '---': very negative effect; '0' no effect.

Chapter 1: Introduction

In brief:	The background, objectives and methodology of the study are presented here. The purpose of this report is to propose policy options to improve implementation of EU waste legislation in the MS. Five main tasks were defined to develop five policy options, of which the three most advantageous were selected in order to be assessed in terms of timeliness and efficiency of implementation and in terms of the aptitude of the body to supporting policy implementation as well as in terms of environmental, economic and social impacts.

1.1 Background

Ensuring an environmentally sustainable economic and social development has become a core challenge globally. The United Nations defines green growth as a policy which "emphasises environmentally sustainable economic progress to foster low-carbon, socially inclusive development".[2] The European Commission's new strategy for sustainable growth and jobs, "Europe 2020" incorporates the concepts of green growth and innovation.

Waste management was early recognised as an important issue for a sustainable development in the EU. The first Waste framework directive was established in 1975, followed by a number of additional directives addressing specific waste streams. However, serious gaps persist in the implementation of the EU waste acquis due to a lack of priority in the MS, a lack of reliable data and other impeding factors, which lead to great differences in the state and quality of implementation between Member States. The widespread use of inappropriate waste management technologies, such as landfills and other facilities that do not meet EU requirements, illegal waste shipments and other aspects of insufficient implementation create not only environmental damages, but also economic costs and harm to human health.

A more effective and consistent implementation of the EU waste acquis is therefore a core priority to ensure sustainable development, within and across the borders of the EU. In order to achieve this goal, the MS need institutional support from the EU. Departing from the AG Prognos study "Resource savings and CO_2 reduction potential waste management in Europe and the possible contribution to the CO_2 reduction target in 2020" and the "Study on the feasibility of the establishment of a Waste Implementation Agency" previously commissioned by the European Commission, the present study provides analysis and recommendations on improving implementation and enforcement of EU waste policy, focusing on the economic, financial and social benefits of this activity.

[2] UNESCAP Green Growth Paths www.greengrowth.org

1.2 Objectives of the study

The objective of this study is to present policy options for the European Commission that would enable the Member States to benefit more fully from the exemplary waste policy already in place in the European Union. This study will propose five possibilities for EU waste bodies/structures/mechanisms to improve the implementation of the current legislation as well as to calculate the expected economic and social impacts of the 3 most promising of these 5 actions, leading to the selection of two final recommendations for bodies/structures/mechanisms to be implemented by the European Commission. An economic, social and environmental assessment will be carried out on the two final options, according to the Commission "Impact Assessment Guidelines SEC (2009)(92)", providing building blocks for an Impact Assessment to be prepared by the European Commission.

1.3 Methodology and task structure

The objectives outlined above are realised through the analysis of existing policy, the industries impacted, particular obstacles to better implementation (both at European level and in specific national contexts) and the wide-ranging benefits that fuller implementation offers in economic and social terms. This analysis lays the foundation for the identification of key tasks for policy implementation and enforcement, for the selection of core elements to support such policies via a regulatory framework, and for the detailed assessment of the two most promising policies that conclude this study. The methodology proposed to achieve these objectives is outlined below.

Figure 1: Methodology

Phase 1 considered the current scope of EU waste policy, active challenges encountered in its implementation across the 27 Member States, and the potential economic, social and financial benefits of better enforcement. The approach involved a review of existing studies on waste policy implementation across the EU, a quantification of the EU waste management sector and potential implementation benefits, as well as practical examples of good as well as poor practices in waste policy implementation at national and regional level.

Phase 2 presents the barriers to better implementation and enforcement on the side of the European Commission and associated authorities and the key new tasks necessary to strengthen implementation and enforcement.

Phase 3, based on the findings of Phase 2, develops concrete policy options for the organisation of key tasks.

Phase 4 defines core components of a regulatory framework to support the three policy options.

Phase 5 Environmental, economic and social impact assessment of the policy options for setting up or making adjustments to an existing EU body, mechanism or structure for carrying out the required tasks, established in phases 1-4, to achieve fuller implementation and enforcement of EU waste legislation.

An essential aspect of the study was the consultation of stakeholders (**horizontal phase**). Stakeholders were consulted during two workshops organised in February and July 2011 and through questionnaires. The interim results of the study were regularly uploaded on a dedicated website: http://greengrowth.eu-smr.eu. The outcomes of these consultations have been integrated in this report.

Chapter 2: Benefits of better waste policy implementation

In brief:	Chapter 2 provides an overview of EU waste legislation and current state of its implementation. Persisting implementation gaps, such as illegal waste shipments and the use of inappropriate treatment technologies, create serious environmental damages, pose risks to human health and produce economic costs. General barriers to better implementation are investigated. They exist in four categories: technical and market barriers, administrative barriers, knowledge barriers and economic barriers. A cost-benefit analysis, comparing the current state with a full-implementation scenario, shows that not only the environment, but also society and the economy would strongly benefit from improved legislation implementation across the EU. Case studies looking at Brandenburg, Cyprus, Ireland, Naples and Rotterdam are developed to demonstrate benefits and risks in EU waste legislation implementation.

2.1 Overview of EU waste legislation and levels of implementation

This chapter looks at the current state of implementation of key legislation and the specific factors that contribute to successful implementation.

2.1.1 EU waste policy and provisions addressed

Eight central policies in the EU waste acquis were examined. In this exercise, key provisions were selected, their level of implementation was assessed, and the specific barriers and drivers for their implementation were identified. The table below contains a summary of this analysis. The complete policy analyses are available in Annex A and a synthesis of findings is provided here below.

Table 4: EU waste policies and provisions addressed

EU waste policy	Key provisions addressed in detail
Waste Framework Directive The revised 2008 Waste Framework Directive institutes a new approach to waste management that focuses on limiting impacts on human health and the environment. It introduces a waste hierarchy that prioritises the prevention of waste, and requires MS engagement through National Waste Prevention Programmes. The Directive extends producer responsibility for waste generation, stimulates recycling and recovery through the promotion of separate collection, and sets objectives for specific waste streams.	1. Article 4 (1): The waste hierarchy 2. Article 10 (2): Separate collection of waste 3. Article 8 (1): Extended producer responsibility 4. Article 23 (1): Permitting of waste treatment 5. Article 22: Bio-waste 6. Article 21 (1): Waste oils 7. Articles 17, 18, 19 and 20: Hazardous waste
Landfill Directive The 1999 Landfill Directive aims to prevent or minimise the impacts of the landfilling of waste on water, soil, air and human health. The Directive covers the location and technical requirements for landfills, such as water oversight, leachate management, and methane emissions control. It also sets targets for landfilling reductions.	1. Article 13: Closure of illegal landfills 2. Article 11: Waste acceptance criteria 3. Article 5: Bio-waste diversion targets
Incineration Directive The 2000 Waste Incineration Directive sets operational and monitoring conditions as well as technical requirements and limits discharges to water and emissions to air.	1. Article 4 (1): Permitting of incineration plants 2. Article 7 (1): Air emissions limit values 3. Article 10 (1): Monitoring and surveillance systems
Waste Shipment Regulation The 2006 Waste Shipment Regulation transposes the Basel Convention, which governs international exports and imports of waste and transboundary movements of waste in particular, into European Law. The Regulation defines key terms in waste shipment, sets harmonised rules for the transboundary movements of waste for disposal or recovery, and requires information from Member States on waste shipments. The Waste Shipment Regulation is closely linked with the Waste Framework Directive, which both underline the EU waste hierarchy for waste management options. The Waste Shipment Regulation emphasises environmental protection and self-sufficiency in waste disposal (proximity principle), and focuses on better enforcement and cooperation.	1. Article 50 (2): Inspections and spot checks 2. Article 8: Transportation of hazardous waste 3. Article 25: Repatriation of waste

Batteries and Accumulators Directive The 2008 Batteries and Accumulators Directive requires the separate collection of batteries and accumulators, limits their hazardous content in terms of mercury and cadmium, and sets collection and recycling targets.	1. Article 8: Collection schemes and free take-back 2. Articles 10 and 12: Collection targets
End-of-Life Vehicle Directive The 2000 End-of-Life Vehicles (ELV) Directive aims to prevent vehicle abandonment and promote vehicle and component reuse, recycling and recovery, to minimise the landfilling of vehicle waste and improve the environmental performance of ELV waste management. The Directive furthermore bans certain heavy metals from use in vehicles to improve safe dismantling and treatment, and requires national measures for the collection and free take-back of vehicles.	1. Articles 5 and 6: Collection facilities and free take-back 2. Article 7: Reuse, recovery and recycling targets
Packaging and Packaging Waste Directive The 2004 Packaging Directive aims to harmonise MS packaging legislation, prevent and minimise the environmental impacts of packaging waste, and to ensure the efficient functioning of the internal market. It requires measures to reduce packaging waste and stimulate reuse, and sets targets on recycling and recovery.	1. Article 9: Essential Requirements 2. Article 6 (1): Recycling and recovery targets 3. Article 7 (1): Return, collection and recovery systems
Waste Electrical and Electronic Equipment Directive The 2002 WEEE Directive prioritises the prevention of WEEE and seeks to minimise its landfilling. The WEEE Directive promotes ecodesign measures that make WEEE easier to dismantle, refurbish, recycle and recover, in particular through the reduction of hazardous substances in electronic products. The Directive also introduces producer responsibility for WEEE and in practice implementation of this Directive focuses on recycling and recovery of waste products.	1. Articles 5 and 6: Obligation to adopt measures for high level separate collection 2. Article 7: Reuse, recycling and recovery targets

2.1.2 Summary of levels of policy implementation

The aforementioned waste policies and specific provisions and their respective implementation issues can be regarded in detail in the policy summaries in Annex A. The state of policy implementation, based on the provisions examined, has been synthesised here, according to the following broad conditions:

Green:	Transposition has taken place, good evidence of implementation of provisions addressed
Yellow:	Encouraging signs but insufficient data, mixed results among MS
Red:	Many provisions not yet implemented in multiple MS, infringement proceedings underway

Table 5: Summary of policy implementation levels, based on specific provisions

Directive name	Date of entry into force	Date for transposition	Level of implementation	Key issues
Revised Waste Framework Directive (2008/98/EC)	12 December 2008	12 December 2010		Lack of emphasis on prevention, unused potential for recycling, varying performance on separate collection and bio-waste management, various issues with hazardous waste management
Landfill Directive (99/31/EC)	16 July 1999	16 July 2001		Remaining illegal landfills, slow and sporadic implementation of WAC, varying performance on bio-waste diversion
Incineration Directive (2000/76/EC)	28 December 2000	28 December 2002		Effectively transposed by most MS, many MS exceeding required conditions
Waste Shipment Regulation (EC 1013/2006)	14 June 2006	12 July 2007		Shipments of waste increasing, including hazardous waste
Batteries Directive (2008/12/EC, amending 2006/66/EC)	26 September 2006	28 September 2008		Lack of data before 2012, mixed results from MS so far
End-of-Life Vehicles Directive (2000/53/EC)	21 October 2000	21 April 2002		Infringement cases pending, some data missing
Packaging Directive (94/62/EC)	31 December 1994	27 June 1996		Most targets met, but lack of emphasis on prevention
WEEE Directive (2002/96/EC)	13 February 2003	12 August 2004		Most MS have not met targets, many infringement cases

This analysis demonstrates the range of issues that have not yet been well addressed. The proceeding section will examine the predominant causes of poor policy implementation, and the drivers for progress.

2.1.3 General barriers and drivers of policy implementation

Certain factors in the implementation of EU waste policy emerge recurrently in the analysis, either as good practices that drive better implementation of numerous policies, or as elements that are lacking and therefore blocking implementation. Each of these implementation issues is described below.

TECHNICAL AND MARKET BARRIERS

Infrastructure and capacity building

Adequate capacity for separate collection and environmentally sound recycling and recovery operations is an important factor in Member States' (MS)ability to comply with EU waste policy. A balance between separate collection and treatment capacity is highlighted as an issue for bio-waste management for example. Systems for WEEE collection, disassembly and treatment, furthermore, are highly specialised and require capacity or funding for investment that may not currently be available in all MS. Infrastructure and technical capacity are therefore fundamental issues to address in ensuring waste policy compliance.

Market development

A level playing field for waste in terms of costs and taxes on treatment is critical to effective EU policy implementation. Unless treatment availability costs, levies and incentives are standardised across EU, waste shipments will continue in search of the most cost-effective waste management option. The development of markets for separately collected waste products across the EU will make the separate collection process and infrastructure more efficient and economically viable.

ADMINISTRATIVE BARRIERS

Administrative competency and capacity

A staff that understands the administrative requirements of EU waste policy and its reporting and compliance procedures is critical to proper policy implementation. The maintenance of sufficient staff capacity and appropriate training in the details of procedures are underlined here. Cooperation or partnership between related bodies (for example between customs offices and police forces in the case of waste shipments) supports coherence and consistency of implementation. Costs associated with training on new regulations, administrative complexity in general and the employment of sufficient numbers of employees are highlighted as obstacles here. Ineffective reporting, resulting from a lack of administrative competency and/or capacity, leads to coherence problems that make comparisons between MS difficult.

Enforcement measures

The monitoring of policy implementation, surveillance of specific issues (such as illegal landfills), the imposition of penalties and the prosecution of infractions contribute to better policy implementation and deter violations. Some implementation reports however noted the high burden of some monitoring, surveillance and reporting activities on small operations, plants or municipalities.

KNOWLEDGE BARRIERS

GAPS IN KNOWLEDGE ABOUT THE STATE-OF-IMPLEMENTATION

A main barrier at EU level is deficiencies in the knowledge base and in the reliability of data on waste streams, volumes and management systems across the EU. This presents problems in the comparability and monitoring of Member States' data, the harmonised implementation of legislation across the EU and the development of targeted measures for improvement. New tools are available for this purpose via recently revised EU legislation (e.g. waste management plans and waste prevention programmes in the EU waste framework directive 2008/98/EC). The application on the ground of EU waste requirements is not comprehensively documented. In order to make effective progress with activities to strengthen implementation, such as inspections, guidance, advice, training, awareness-raising etc., it seems necessary that this problem is first solved. For example, inspections need to target implementation deficits and training should focus on problematic areas.

Expertise and specialised skills

Staff with specific expertise are required for many aspects of EU waste policy implementation. Skills required for WEEE disassembly and treatment are one example. Inspections staff are critical to several key policies including the ELV Directive and Waste Shipment Regulation, but a lack of capacity and of training has been highlighted as a problem. Investment in both training and capacity building are drivers here.

Knowledge sharing

Cooperation between relevant bodies and the sharing of knowledge between MS have been key drivers of effective implementation of many policies. Given the multiple stakeholder groups involved in the generation, shipment, management and recovery of waste, specific knowledge sharing initiatives can be particularly helpful. Examples include inspection exchange programmes related to waste shipments, knowledge sharing among competent authorities related to the packaging Essential Requirements or to the separate collection of bio-waste, and other means of highlighting best practices in specific implementation contexts.

Awareness-raising

Awareness and understanding among the general public and the public authorities responsible for policy implementation at local level are important factors to the success of many key policy provisions. Understanding of separate collection practices and the waste products they relate to

(scope of bio-waste/green waste collection; which packaging products can be recovered) contributes greatly to the efficacy of such systems. Communication campaigns to encourage participation in return, collection and recovery schemes of all sorts, and in particular consolidated guidance to households on how to deal with all of their waste products, impact behaviour and target achievement.

ECONOMIC BARRIERS

Targets

Targets in most cases stimulate efforts to implement waste policy objectives, whether they are EU-level targets on packaging or WEEE, MS targets for extended producer responsibility or separate collection programmes, or targets for municipal level landfill reductions. A lack of quantitative targets is frequently cited as a cause of under-implementation of policy. However, in isolated examples, such as the End-of-Life Vehicles Directive, it is forwarded that the varying abilities of MS to comply with EU level targets has not adequately been taken into account, presenting a barrier to implementation that results in a low level of MS transposition of the Directive by the required deadline.

Economic instruments

Increases in landfill gate fees, landfill taxes, penalties on municipalities not meeting targets, and tax incentives for packaging recovery schemes are among numerous examples of economic instruments identified as drivers of policy implementation.

Terminology is sometimes stated as an implementation issue, where lack of clarity can lead to varying MS interpretations (the Essential Requirements of the Packaging Directive for example), however this issue will not be considered by this study.

The direct application of these factors to the Directives analysed is summarised in the table below.

Table 6: Barriers for implementation by waste policies

Implementation factor	Revised Waste Framework Directive	Landfill Directive	Incineration Directive	Waste Shipment Regulation	Batteries Directive	End-of-Life Vehicles Directive	Packaging Directive	WEEE Directive
	(2008/98/EC)	(99/31/EC)	(2000/76/EC)	(EC 1013/2006)	(2008/12/EC)	(2000/53/EC)	(94/62/EC)	(2002/96/EC)
Infrastructure and capacity building	X	X		X	X	X	X	X
Administrative competency and capacity	X	X	X	X			X	X
Expertise and specialised skills		X		X	X	X		X
Knowledge sharing	X	X		X	X		X	X
Awareness raising	X	X		X	X		X	X
Enforcement measures	X	X	X	X		X		X
Targets	X	X			X	X	X	X
Economic instruments	X	X			X	X	X	X
Market development	X	X		X	X	X		X

2.2 Economic (including financial) and social benefits of better waste management implementation

To assess economic and social benefits of better waste management implementation, two scenarios were developed based on review of literature: one assuming no policy changes as compared to the current institutional setting and one assuming an institutional setting allowing for full legislation implementation as by the year 2020. The comparison of economic and social costs in 2020 of both scenarios shows significant benefits for full implementation, such as, among others, reduction in total waste generation by 119 Mt (-4% compared to the scenario with no policy change), a reduction in waste landfilling and incineration without energy recovery by 931 Mt (-48%) and a reduction in total net costs of waste management by 72 billion € (-126%).

Please see Annex D for complete details on the methodology used.

2.2.1 Approach

In order to quantify and illustrate the potential benefits of fully implementing the European Union waste legislation two scenarios for the year 2020 were developed in the present study. The scenarios are based on data derived from a literature review, specifically from investigations by Milieu et al.

(2009), Prognos (2008, 2009a) and BIOIS et al. (2011 (see Annex C). The year 2020 was selected as reference year as at this time all existing provisions should and technically could be implemented. The two scenarios are defined as follows:

- Scenario A: No further development of waste management system as compared to the year 2008
- Scenario B: Full implementation of waste legislation.

The difference between Scenario B and Scenario A shows the incremental benefits from the 2008 state of implementation to full implementation of EU waste legislation.

A detailed description of:

- the literature on which the scenario assumption was based
- the scenario parameters
- the impacts considered
- and the scenario results

can be found in Annex D: Scenarios of year 2020 EU-27 waste management system.

A summary of the scenario parameters is shown in Table 7 and the targets taken into account in Scenario B are illustrated in Table 8.

Table 7: Summary of scenario parameters

Parameter	Scenario A	Scenario B
General description	No further development of waste management system as compared to 2008	Full implementation of waste legislation
Waste generation	According to economic growth and historic development (Not affected by waste prevention)	Reduced waste generation due to waste prevention
Waste treatment capacity	Waste treatment capacity stays at 2008 level, additional waste is landfilled	Waste treatment capacity is extended so that provisions of waste legislation (see Table 8) are met

Table 8: Targets considered in scenario B

Directive	Targets considered
Waste framework directive 2008/98/EC art. 9 and 11	Decoupling of waste generation from economic growth by 2020
	70 % recycling of C&D
	50 % recycling of paper, metal, plastic and glass from households and similar installations
Landfill directive 1999/31/EC, art. 5 and 14	35 % biodegradable waste landfilled as compared to 1995
	Closing of non-compliant landfills
	No landfill of tyres
Packaging directive 1994/62/EC	Recycling rates: 60 % glass, 60 % paper, 50 % metals, 22.5 % plastics, 15 % wood
End-of life vehicles directive 2000/53/EC, art. 6	85 % re-use and recycling of cars
	95 % metal recycling
WEEE Directive 2002/96/EC, art. 5 and 7	Separate collection of 4 kg/capita/year
	75 % re-use and recycling, 70-75 % recovery
Batteries Directive 2008/12/EC, art. 10, 12, annex III	Battery collection rates: 45 %

Table 9 shows the main results of the scenario analysis, that is:

- the reduced amount of waste generated in Scenario B (full implementation of waste legislation) as compared to Scenario A (No further development of waste management system as compared to 2008) due to waste prevention
- the increased material and energy recovery
- the prevented greenhouse gas emissions, due to reduced emissions from landfilled waste and due to prevention of emissions in other sectors by material recycling and energy recovery.

Table 9: Difference between waste, material and energy flows as well as greenhouse gas emissions of scenario B and scenario A in the year 2020

	Unit	Scenario A	Scenario B	Difference (B-A)	Difference (B-A) in % of A
Waste generation					
Total	Mt	2,984	2,864	-119	-4
Treatment					
Landfilling/Incineration without energy recovery, other disposal	Mt	1,927	996	-931	-48
of which MSW	Mt	230	69	-161	-70
Material recovery	Mt	951	1,637	686	72
Energy recovery	Mt	106	231	125	118
Energy recovery	PJ	1,544	3,288	1,744	113
GHG emissions					
GHG emission avoided by material and energy recovery	$Mt_{CO_2,e}$	209	324	115	55
GHG emission from MSW landfilling	$Mt_{CO_2,e}$	142	42	-99	-70
Total difference in GHG emission	$Mt_{CO_2,e}$			215	

Table 10 shows the amount of secondary materials recovered from waste in Scenarios A and B. In Scenario B, a total of 1,637 million tonnes of secondary raw material is recovered in 2020. This is 686 million tonnes more than in Scenario A (than without a full implementation of EU waste legislation).

Table 10: Recovery of secondary raw materials in the year 2020 in Mt

	Unit	Scenario A	Scenario B	Difference (B-A)	Difference (B-A) in % of A
Glass	Mt	9.6	17.7	8.1	83.7
Paper and cardboard	Mt	33.0	59.4	26.4	79.8
Plastics	Mt	3.8	9.2	5.4	141.1
Iron and steel	Mt	76.9	101.7	24.8	32.2
Aluminium	Mt	3.0	4.3	1.3	43.5
Copper	Mt	0.8	1.3	0.4	51.6
Zinc	Mt	0.6	1.3	0.6	99.8
Lead	Mt	0.5	1.0	0.5	85.2
Other metals	Mt	0.5	1.0	0.6	122.2
Waste Wood	Mt	20.4	29.9	9.5	46.6
Textiles	Mt	2.5	4.7	2.1	84.9
Rubber and tyres	Mt	1.5	1.7	0.2	14.2
Bio-waste	Mt	28.2	108.5	80.3	284.4
Oil containing waste	Mt	2.0	2.8	0.8	40.3
Spent solvents	Mt	0.4	0.6	0.2	67.4
Ashes and slag	Mt	74.6	69.8	-4.8	-6.5
Mineral construction material	Mt	692.1	1,222.2	530.1	76.6
Total	**Mt**	**951**	**1,637**	**686**	**72.2**

2.2.2 Cost-Benefit Analysis

METHODOLOGY

The cost-benefit analysis considers micro- and macro-economic costs of waste management. The calculation of both the micro-economic costs (costs for setting up and running the required waste management infrastructure) and macro-economic costs and benefits (amounts and market value of recycled materials and of recovered energy) was based on literature review. Annex C lists the references for the literature review and Annex D provides a detailed description of the methodology used and the calculations made for the cost-benefit analysis.

RESULTS

Based on the waste flows, emissions and amount of recovered materials and energy shown in Table 9 the costs and monetised benefits of Scenarios A and B are calculated on two levels:

- The micro economic level (that is without externalities) as shown Table 11
- The macro-economic level (including external costs and benefits) as shown in Table 12

The costs and values shown refer only to one year (2020).

When looking only at the micro-economic level (see Table 11):

- A full implementation of the waste legislation by 2020 requires an additional financial input of 42.9 billion €/year as compared to a system which remains at the implementation level of 2008. These additional costs result mainly from the improvement of current waste management infrastructure, the upgrading of treatment technologies and the enhancement of collection systems (e.g. establishment of separate collection of different waste streams).

- However, the revenues from a fully implemented system are 47.8 billion €/year higher than without further implementation, thanks to more efficient recovery technologies and, consequently, increased amounts of recovered energy and materials.

Hence, the net micro economic costs of a fully implemented waste management system are 4.9 billion € or 6 % lower than the year 2008 implementation level system.

In addition to the costs considered in the micro-economic analysis, the macro-economic calculations take into account the externalities of waste management (see Table 12). On the cost side, these externalities include:

- the economic cost of GHG emission from MSW landfilling
- the economic cost of Ecotoxicity of Zn emissions
- the economic cost of Ozone depletion
- the economic cost of Endangering species richness by land use

On the revenue side, the macro-economic externalities include:

- the economic value of GHG emission avoided by material and energy recovery
- the economic value avoided acidification
- the economic value avoided eutrophication

When taking into account all these macro-economic externalities (see Table 12):

- A full implementation of the waste legislation requires an additional 10.5 billion €/year in gross costs as compared to a system which remains at the implementation level of 2006.

- However, the values generated by a fully implemented system are 82.3 billion € higher than without further implementation

- Hence, a net macro-economic value of 71.8 billion €/year is generated by a fully implemented waste management system as compared to a waste management system which remains at the year 2008 implementation level.

Table 11: Total micro-economic costs of waste management in the year 2020 (without containment and repatriation costs)

Parameter	Unit	Scenario A	Scenario B	Difference (B-A)	Difference (B-A) in % of A
Base costs of waste management	billion €	88.4	90.6	2.2	2.5
Base costs of recycling	billion €	52.2	90.8	38.6	73.9
Costs of waste prevention	billion €	0.0	2.1	2.1	
Gross costs of waste management	**billion €**	140.6	183.5	42.9	30.5
Revenues from recovered materials	billion €	54.8	94.4	39.6	72.3
Revenues from recovered incineration energy	billion €	6.5	13.8	7.3	112.3
Revenues from recovered landfill gas energy	billion €	0.5	1.4	0.9	180.0
Total revenues	**billion €**	61.8	109.6	47.8	77.3
Total net costs of waste management	**billion €**	78.8	73.9	-4.9	-6.2

Table 12: Total macro-economic costs/benefits of waste management in the year 2020

Parameter	Unit	Scenario A	Scenario B	Difference (B-A)	Difference (B-A) in % of A
Base costs of waste management	billion €	88.4	90.6	2.2	2.5
Base costs of recycling	billion €	52.2	90.8	38.6	73.9
Costs of waste prevention	billion €	0.0	2.1	2.1	
GHG emission from MSW landfilling	billion €	11.1	3.3	-7.8	-70.3
Ecotoxicity of Zn emissions	billion €	23.3	0.1	-23.2	-99.6
Ozone depletion	billion €	1.2	0.1	-1.1	-91.7
Endangering species richness by land use	billion €	0.5	0.2	-0.3	-60.0
Gross costs of waste management	**billion €**	**176.7**	**187.2**	**10.5**	**5.9**
Revenues from recovered materials	billion €	54.8	94.4	39.6	72.3
Revenues from recovered incineration energy	billion €	6.5	13.8	7.3	112.3
Revenues from recovered landfill gas energy	billion €	0.5	1.4	0.9	180.0
GHG emission avoided by material and energy recovery	billion €	16.3	25.3	9.0	55.2
Avoided acidification	billion €	14.1	27.9	13.8	97.9
Avoided eutrophication	billion €	27.7	39.4	11.7	42.2
Total value generated	**billion €**	**119.9**	**202.2**	**82.3**	**68.6**
Total net costs of waste management	**billion €**	**56.8**	**-15.0**	**-71.8**	**-126.4**

Not included in Table 11 and Table 12 are following cost categories:

- Containment and repatriation costs as it is not clear what would be a realistic assumption on how much of non-compliant waste would be contained and how much of the exported waste (from electric and electronic equipment, batteries and end-of-life vehicle) would be repatriated in Scenario A
- Health damage costs as no realistic assumption on how many persons would be affected by non-compliant waste management in Scenario A could be made
- Environmental damage costs from ecotoxic pollutants other than zinc, as no realistic assumption could be made on how much heavy metals and organic pollutants would be released in Scenario A
- Health and environmental damage costs in countries outside the EU related to material and fuel imports or waste exports

Nevertheless, four very important conclusions can be made with respect to health damage and containment/repatriation costs:

- In areas where waste management does not exist at all the health damage costs are 20 times higher than the gross micro economic costs of a fully established, compliant waste management system would be
- When taking into account the prevention of health damage costs in both Scenarios A and B the benefits exceed the costs; in scenario B, however, more than in Scenario A
- If, in Scenario A all the non-compliantly landfilled waste were contained and all the exported WEEE, batteries and ELV repatriated even the micro-economic waste management cost of the European waste management system in Scenario A would exceed those of Scenario B by more than 50 %
- When health damage costs, all environmental damage costs, containment costs and repatriation costs are taken into account the superiority of Scenario B, that is of full implementation of waste legislation, over Scenario A further increases

Table 13 shows the turnover and jobs in the waste management sector and recycled materials sector created in Scenarios A and B. By raising the level of the European waste management sector to full compliance the turnover of waste management and recycling increase by 42 billion €/a and the number of jobs increase by 400,000.

Table 13: Turnover of waste management and recycling, as well as jobs in Scenarios A and B for the year 2020

Parameter	Unit	Scenario A	Scenario B	Difference (B-A)	Difference (B-A) in % of A
Turnover in "waste management" sector	M€	90,200	92,400	2,200	2.4%
Turnover in "recycled materials" sector	M€	54,800	94,400	39,600	72.3%
Total turnover	**M€**	**145,000**	**186,800**	**41,800**	28.8%
Jobs in "waste management" sector		1,434,900	1,469,900	35,000	2.4%
Jobs in "recycled materials" sector		512,300	882,200	369,900	72.2%
Total jobs		**1,947,200**	**2,352,100**	**404,900**	20.8%

SUMMARY OF BENEFITS

The benefits of a full implementation of EU waste legislation in EU-27 by the year 2020 are as follows.

By applying waste prevention measures the generation of waste can substantially be reduced. It is estimated that some 4 % of waste can realistically be prevented.

By introducing and improving separate collection systems, by improving waste treatment, by actively discouraging landfilling and by developing recycling markets the amount of waste recycled

and secondary material produced can be increased. This leads to a reduction of primary material consumption and related environmental impacts. Biodegradable waste may be composted and, if unpolluted, used as a fertiliser. It is estimated that material recycling can be increased by 72 % (worth an additional 39 billion € per year in recovered materials) in order to fully comply with European waste legislation.

By improved separate collection systems and waste treatment also the share of waste that may be used as secondary fuel can be increased without polluting the environment. Waste can be incinerated in specialised incineration plants with sophisticated pollution control and off-heat utilisation. Biogas from biological treatment plants and landfill-gas may be collected and used as fuel for power and heat generation. All options for recovering energy from waste, taken together, increase the level of energy from waste by 113 %, and reduce the consumption of primary energy (worth 8 billion € per year) and the related environmental impacts.

Waste prevention, increased recycling and improved treatment together reduce the amount of waste to be landfilled by 48 %. Compliant landfill-systems tend to use landfills with a smaller specific area consumption per tonne of waste landfilled. It is therefore estimated that the total area consumption for the waste landfilled in the year 2020 in EU-27 in a fully compliant system is 64 % smaller than in a system without increasing compliance above the year 2008 level. This in turn results in a lower pressure on biodiversity.

Keeping biodegradable and other reactive waste from landfills and equipping landfills with base, side and cover lining and leachate control additionally reduces the emissions of pollutants such as heavy metals or soluble/volatile organic compounds from landfills into air, water and on soil and reduces the emissions of dust and stench.

In a fully compliant system no waste and especially no hazardous waste such as waste from electric and electronic equipment (WEEE) or batteries of end-of-life-vehicles (ELV), would be illegally exported. If waste is exported, it is treated at the same environmental standards as if it would be treated within the EU.

In total:

- The impact of waste on human health for all EU-citizens is reduced to almost zero, leading to increased life expectancies
- The impact on animals and plants, on biodiversity and nature-protected-areas is much reduced
- Greenhouse-gas emissions are reduced within the waste management sector and by replacing primary energy and materials in other sectors by an estimated total of 215 Mt CO_2
- Zinc emission (as representative of emissions of ecotoxic substances) is reduced by 28,900 tonnes annually
- Acidification potential is reduced by 22.6 Mt $SO_{2,e}$/a
- Eutrophication potential is reduced by 9.3 Mt $PO_{4,e}$/a
- Ozone depletion potential is reduced by 7,000 tonnes CFC-11_e per year

The related costs are reduced accordingly.

As the environmental and health impacts of non-compliant landfilling persist for many years after the landfilling activities have stopped, containment and clean up of non-compliant landfills will be necessary in future. When meeting all requirements of EU-waste legislation in a compliant waste management system, such containment and clean up costs and activities will not be necessary. Therefore full compliance will save containment and clean up costs on the long run.

The situation with illegal waste exports is similar. When the receiving country finds that the environmental or health damage connected to the exported waste is unbearable it can make the EU economy liable and force the waste to be taken back inducing high repatriation costs. Such costs will not occur when the European waste management system is operated in full compliance with EU waste legislation.

Full compliance may also be seen as a proof that European industries operate with low environmental impact and thus enhance the image of the industries with the wider public and consumers.

Recycling of materials and the use of energy from waste are valuable alternatives to primary raw materials and energy for the European economy, increasing the security of supply, reserving resources for future generations and dampening price volatilities (more on that in chapter 2.3).

Compliance with EU-waste legislation in all EU-27-regions ensures a level playing field for waste management across the EU, hence preventing unnecessary transports, assuring investment certainty and forming the basis for an efficient and effective waste management system (more on this aspect of compliance can be found in chapter 2.3

According to the scenario, calculations of full compliance with EU-waste legislation show increases in the annual turnover of the combined waste management and recycling sectors by 42 billion € or 29 %, creating an economic sector in Europe with a turnover of 187 billion €/year and 2.4 million jobs. Compliance creates some 400.000 jobs. While some part of the jobs created may represent job losses in other sectors, mainly the mining sector and in foreign countries, recycling is much more labour intensive than primary raw material and fuel mining and thus creates many more jobs than costs.

The need to expand the waste management system with expanding waste generation and to bring non-compliant systems into compliance creates opportunities for innovation and market penetration of efficient technologies especially in the focus-eco-industries. The gained knowledge and developed technologies/techniques may later on support lower environmental impacts also in other parts of the world to which the European economy is connected by high material and product flows.

Overall, full compliance with EU waste legislation will in many ways contribute to an increased quality of life for EU-citizens. It ensures an effective balance between environmental protection, economic opportunities for the waste management sector and the EU industry as a whole, and social development.

Enabling compliance in all EU-countries is an effective means of internalising external costs in a fair way and therefore an important contribution to the sustainable development of the EU economy from the environmental, economic and social point of view.

2.3 Value of complete compliance for the EU waste management sector and for other EU Industries

In this chapter, the value of full implementation of EU waste legislation for the development of the EU waste management system and for other industrial sectors is discussed.

2.3.1 Value of complete compliance for the EU waste management sector

Within the EU, waste shipments to countries, which do not yet fully comply with all requirements of EU waste legislation have increased over the last years. In non-compliant regions, waste dumping is cheaper than the sophisticated treatment necessary for fulfilling EU legislation in an effective way. This leads to increased transport of waste, which from an economic point of view is unnecessary and causes environmental/economic harm in five ways:

- Additional energy consumption and emission of pollutants are caused
- The environmental impact of waste disposal in the receiving region is much larger than the environmental impact of waste treatment would be in the country of origin
- Valuable materials and energy contained in the waste is lost
- The drain of waste reduces the throughput for compliant waste treatment installations as well as their economic turnover and ultimately can lead to bankruptcies
- Non-compliance in one region ultimately leads to non-compliance in all connected regions and to a deflation of environmental standards.

Only the full implementation of all EU-waste legislation on equal terms in all parts of the European Union (and the requirement that all waste exported to countries outside the EU is treated with high environmental standards) enables a level economic playing field for the development of the European waste management system. It is a precondition for sufficient security in high-level waste management investments. It is a precondition that the waste management and recycling sector can expand and provide its services to the European economy.

The 29% increase of the turnover of the waste management and recycling sector, calculated in the scenario analysis, (see chapter 2.2) are only possible when:

- A truly level playing field is created
- The demand for low environmental and health impact waste management is created

The same is true for the 400,000 jobs that are the estimated potential gain of full implementation of EU waste legislation.

2.3.2 Value of complete compliance for EU industries

The value of implementation of EU waste legislation for the EU industry as a whole shall be discussed from following perspectives:

- Industries as waste owners
- Industries as users of environmental services
- Industries as affected by climate change
- Industries as consumers of materials
- Industries as consumers of energy

Industries as waste owners

The principle responsibility for waste and the damage it can generate lies with the waste producer. Therefore, those economic sectors with high waste generation and especially high hazardous waste generation (see Table 14 below) would be most affected by improper waste management and are most interested in efficient waste management.If a waste-producing plant cannot find an enterprise that is willing to take over the waste it would have to store and somehow contain the produced waste on its own premises, while preventing dangerous reactions and harmful emissions. It has proved to be much more efficient and economically appealing for most industrial plants to hand over materials that cannot be used any further to professional specialised waste collection and treatment enterprises.

The waste treatment enterprise, however, can provide its services only at reasonable prices if it has enough security for its investments. If a non-level playing field persisted between the different European regions due to varying degrees of implementation of EU waste legislation, waste management enterprises would have to introduce risk premiums to cover for the increased investment uncertainty, making waste management for European industries more expensive. Only a level playing field, achieved by full implementation of EU waste legislation, in all EU regions can allow for competition among waste management companies on equal terms and thus keep the prices for waste management at a competitively low level. This in turn helps European production industries to keep their production prices low and competitive.

Waste prevention measures foreseen in the EU Waste Framework Directive (Dir 2008/98/EC) may also directly support European production industries in developing more economic, material and energy efficient processes and products, providing a further edge competition in the world market.

When the industries can prove that their waste is treated in an efficient and environmentally friendly way this can enhance the image of the industries with the wider public and the consumers. This is especially important for eco-industries.

Table 14: Year 2008 EU-27 waste generation by economic sector (based on: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)

NACE-Code	Economic sector	Year 2008 EU-27 waste generation in kt		Share in %	
		Total waste	Hazardous waste	Total waste	Hazardous waste
A	Agriculture, forestry and fishing	45	0.9	1.7	1.0
B	Mining and quarrying	727	13.9	27.8	14.2
C10-C12	Manufacture of food products; beverages and tobacco products	54	0.6	2.1	0.6
C13-C15	Manufacture of textiles, wearing apparel, leather and related products	4	0.1	0.2	0.1
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	29	0.3	1.1	0.3
C17_C18	Manufacture of paper and paper products; printing and reproduction of recorded media	32	0.3	1.2	0.3
C19	Manufacture of coke and refined petroleum products	6	3.5	0.2	3.5
C20-C22	Manufacture of chemical, pharmaceutical, rubber and plastic products	53	7.3	2.0	7.5
C23	Manufacture of other non-metallic mineral products	25	0.6	0.9	0.6
C24_C25	Manufacture of basic metals and fabricated metal products, except machinery and equipment	112	10.1	4.3	10.3
C26-C30	Manufacture of computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment	22	2.6	0.8	2.7
C31-C33	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	7	0.3	0.3	0.3
D	Electricity, gas, steam and air conditioning supply	91	6.6	3.5	6.8
E	Water supply; sewerage, waste management and remediation activities	167	14.4	6.4	14.7
E36_E37 _E39	Water collection, treatment and supply; sewerage; remediation activities and other waste management services	36	3.1	1.4	3.1
E38	Waste collection, treatment and disposal activities; materials recovery	132	11.3	5.0	11.6
F	Construction	859	20.2	32.9	20.6
G-U_X_ G4677	Services (except wholesale of waste and scrap)	138	12.6	5.3	12.9
G4677	Wholesale of waste and scrap	24	1.0	0.9	1.0
EP_HH	Households	221	2.1	8.4	2.1
	Total	2,615	97.7	100.0	100.0

INDUSTRIES AS USERS OF ENVIRONMENTAL SERVICES

Several industries need unpolluted environmental media, such as clean soil, clean water or clean air, and fully developed environmental services (e.g. sufficient biodiversity, recreational areas, unpolluted materials etc.) as input or basis for their products and services. This is especially true for agriculture and the food industry. The recent contamination of eggs with dioxins is only one example in which polluted input material has brought down a whole market (at least for some time).

In addition, the production of highly sophisticated technologies is much cheaper when it can start with an unpolluted input. Therefore, also the lowering of environmental pollution which is achieved by full implementation of the EU waste legislation provides necessary preconditions for a competitive industry and a flourishing market.

INDUSTRIES AFFECTED BY CLIMATE CHANGE

The expected climate change which is caused by the increased level of greenhouse gases in the atmosphere will lead to increased erosion, changes in water patterns and quality and environmental disasters which, by destroying infrastructures and industrial plants directly or indirectly will affect also European industries. The reduced greenhouse gas emissions which can be achieved by the full implementation of EU-waste legislation will help to avoid these effects.

INDUSTRIES AS CONSUMERS OF MATERIALS

The importance of raw material input for the European production industry may be illustrated by the German case. In the German production industry, the cost of materials is by far the largest cost item, being 100 % higher than the personnel costs and 20 times higher than the energy costs. In the period 1995 to 2006, the share of the material costs on the overall production costs continuously rose from 37.4 to 42.9 %. In the same period the share of the personnel cost decreased from 24.7 to 18.2 percent (see Figure 1)[3].

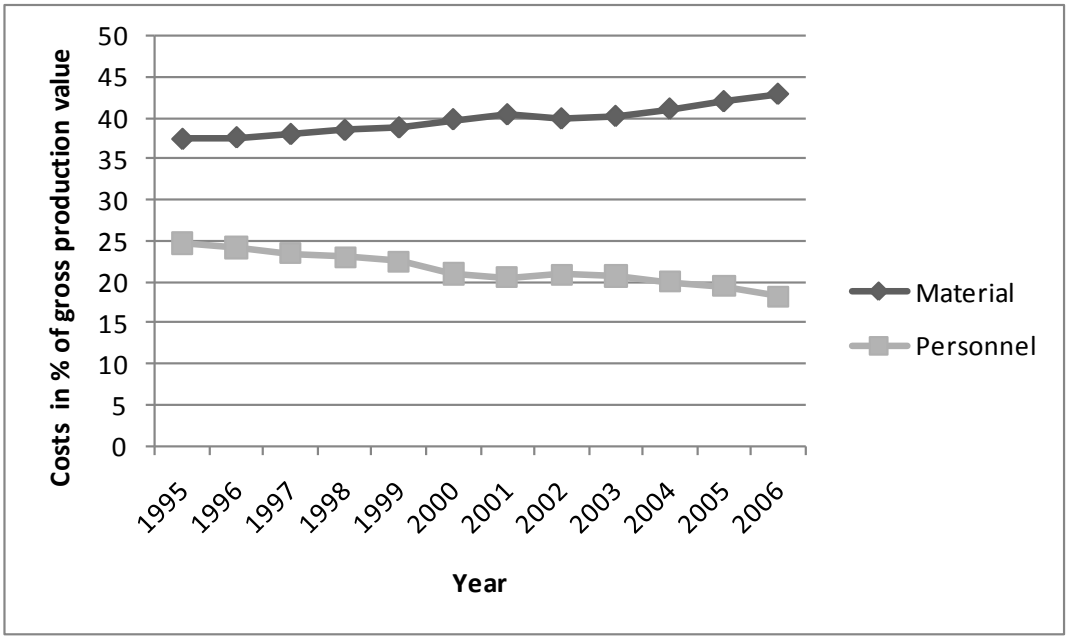

Figure 1: Costs in Germany's production industry in % of gross production value (Schmidt 2009)

[3] Schmidt (2009)

Due to a strongly increased demand in the period 2000 to 2008, world primary metal production increased by 95 % and world primary industrial mineral production by 27 %. In 2009, production volumes for primary metal and primary raw materials , remained equivalent to 2008 levels (see Figure 2) despite the economic downturns caused by the financial crises. In the future, further increases in primary material demand and production are expected.

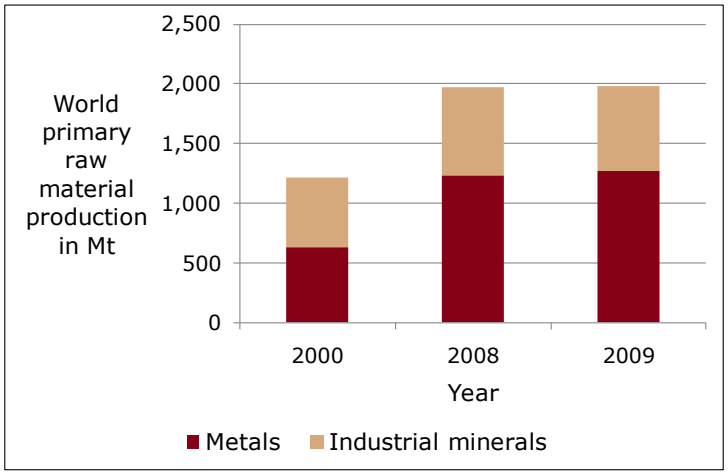

Figure 2: World primary raw material production (USGS 2001, 2010)[4]

At the same time, primary metal mining shows a strong tendency towards monopolisation. In the year 2008, out of 41 metals, more than 50 % of world production was concentrated in only 1 country for 16 metals, and more than 80 % of world production was concentrated in only 3 countries for a further 8 metals. China is the number one producer of 19 metals (USGS 2009[5], Weber & Zsak 2008[6]). The market position of China is further strengthened as it is also the main user for many metals.

The strong growth in world material demand has led to a substantial increase in price volatility for raw materials. The economic downturn in 2009 brought only a short relief (see Figure 3).

[4] Sources: USGS - U.S.Geological Survey fo the U.S. Department of the Interior (2001): Mineral commodity summaries 2001. Washington D.C. USGS - U.S.Geological Survey fo the U.S. Department of the Interior (2010): Mineral commodity summaries 2010. Washington D.C.

[5] USGS - U.S.Geological Survey fo the U.S. Department of the Interior (2009): Mineral commodity summaries 2009. Washington D.C.

[6] Weber, L. & Zsak, G. (2008): World Mining Data - Minerals Production. BMWA - Bundesministerium für Wirtschaft und Arbeit, Volume 23, Wien

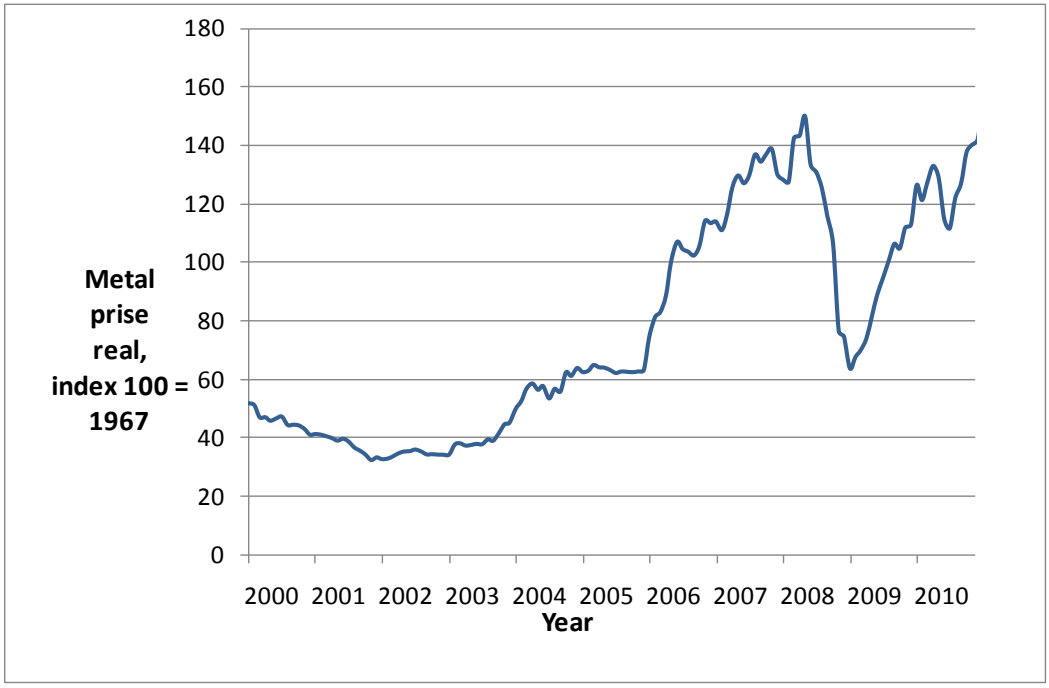

Figure 3: Mixed copper, steel, lead, tin, zinc price index (CRB 2011)[7]

The scenario analysis (see chapter 2.2) has shown that full implementation of the EU waste legislation leads to a substantial increase in the amount of recycled secondary materials available on the market (see Table 9).This secondary material served as a valuable alternative for the European production industries, helping to prevent monopolistic tendencies, increasing the security of supply, helping to keep the price volatility at bay and helping to lower the prices of input materials. It also helps to save primary raw material reserves for future use.

INDUSTRIES AS CONSUMERS OF ENERGY

The dependence of European production industries on energy can be characterised in a similar way to its dependence on raw materials. Crude oil, natural gas and coal still are the most important sources of energy, with very limited natural reserves within the EU and largely monopolistic supply structures. The situation may be even more severe than with primary raw materials if forecasts by the International Energy Agency (IEA 2010[8]) come true, that is that world crude oil production capacity has already passed its peak and that all economically deliverable crude oil reserves will be spent in some decades. The fact is that crude oil priced in the last decade followed almost the same pattern as shown for metal prices in Figure 3.

Therefore, the increased energy from waste, made available by the full implementation of European waste legislation is a valuable alternative for the European production industries, helping to prevent monopolistic tendencies, increasing the security of supply, helping to keep the price volatility at bay, helping to lower the prices of required energy as well as helping to save primary energy reserves for future use.

[7] CRB - Commodity Research Bureau (2011): CRB-Spot-Inidces - Monthly Charts and Data. http://www.crbtrader.com/crbindex/

[8] IEA – International Energy Agency (2010): World Energy Outlook 2010. Paris. http://www.worldenergyoutlook.org/

SUMMARY OF BENEFITS OF FULL IMPLEMENTATION OF EU WASTE LEGISLATION TO THE INDUSTRY

The following table summarises the main benefits of full implementation of EU waste legislation to the industry.

Table 15: Benefits of full implementation of EU waste legislation to the industry

Industry relation to waste management	Benefits of full implementation of EU waste legislation
Industries as waste owners	• Availability of proper and compliant waste treatment services • Lower prices for waste treatment (due to even level playing field and investment security) • Lower waste storage costs (due to available opportunities for outsourcing of waste management)
Industries as users of environmental services	• Unpolluted environmental media (e.g. clean soil, clean water or clean air) as input or basis for products and services • Fully developed environmental services (e.g. sufficient biodiversity, recreational areas, unpolluted materials) as input or basis for products and services
Industries as affected by climate change	• Reduced strategic and operational risks (e.g. risk of destruction of industrial infrastructure true environmental catastrophes)
Industries as consumers of materials	• Increased amounts of recycled secondary materials available on the market • Increased security of supply • Lower price volatility for input materials • Lower prices of input materials • Saving of primary raw material reserves for future use
Industries as consumers of energy	• Increased availability of energy from waste • Increased security of supply • Lower volatility of energy price • Lower energy prices • Saving of primary energy reserves for future use

2.4 Case studies demonstrating benefits of better waste implementation

This subchapter highlights five case studies demonstrating the economic and social benefits of strengthening implementation and enforcement of EU waste legislation. Case studies were defined with the Commission as the following:

- Port of Rotterdam (NL): Waste Shipment Regulation Enforcement
- Cyprus (CY): Landfill Directive Implementation
- Naples (IT): Waste Management Crisis
- Brandenburg (DE): Landfill Closure and Containment
- Ireland (IR): Increasing Compliance with Waste Legislation

The case studies specifically focus on assessing the impacts of strengthening the implementation and enforcement of EU waste legislation on the turnover of waste and related industries, financial impacts, resource use, employment, and public health. A detailed description of each case study can be found in the Annex. These descriptions include the following sections: context, economic (including financial) impacts, social impacts, and barriers and drivers to implementation. The case studies were prepared using Commission publications, relevant literature, news articles, Eurostat data, and interviews with related parties and waste management experts.

Summaries of the five case studies, highlighting the benefits achieved through increased implementation and enforcement of EU waste legislation, are presented in the boxes below.

Port of Rotterdam: Waste Shipment Regulation Enforcement

- **Context**

Rotterdam is one of the main European ports and logistical hubs, boasting an annual cargo throughput of 400 million tonnes in 2009. The primary drivers for Rotterdam focusing on enforcement of the Waste Shipment Regulation are costly repatriation requests, increasing public and political awareness of waste shipment issues, and Rotterdam's position as a point of exit from the EU.

- **Economic and Social Benefits**

Stricter enforcement of the Waste Shipment Directive has primarily provided economic benefits in the form of increased turnover of the waste management and recycling industries. Financial benefits of increased enforcement include the avoidance of: illegal waste shipment fees (€500 to €1000 per tonne), environmental clean-up costs (€152m in the Probo Koala incident of 2007), and waste repatriation costs (€1.2 million for a shipment destined for Nigeria). In terms of benefits related to resource use, increased enforcement could route potentially illegal waste shipments destined for emerging economies into the legal treatment system, increasing materials available for waste-to-energy treatment as well as ensuring maximum recovery rates for materials such as metals; improper dismantling and recovery processes for illegal waste such as WEEE lead to recovery rates of approximately 20% in developing countries while use of state-of-the-art recycling in the EU leads to approximately 95% recovery. As a result of stricter enforcement on waste shipments in the Port of Rotterdam, Nancy Isarin of the IMPEL-TFS Secretariat cited increased waste quality due to higher quantities of waste routed through legal channels for recovery and treatment, hence leading to optimised processes and better sorting techniques and consequently better access to high quality raw materials.

Nancy Isarin also estimated that the stricter WSR enforcement has led to the creation of 22 jobs (12 public sector, 10 private sector) including positions for Customs officers, waste inspectors, environmental coordination and waste treatment and recycling plants. The health impacts of insufficient enforcement of the WSR are linked to the reception and improper treatment of waste, particularly WEEE, in developing countries, which has long-ranging impacts including pollution to air, water, soil and habitats as well as health risks for workers and citizens.

- **Barriers and Drivers**

Barriers to better implementation and enforcement of the WSR in the Port of Rotterdam include difficulty centralising information and validating shipment reporting as well as political prioritisation. Drivers of better implementation and enforcement include coordinated control and inspection activities, 24-hour availability of environmental inspectors and emergency numbers for customs officers, and the sharing of guidance materials and databases across authorities.

Cyprus: Landfill Directive Implementation

- **Context**

Since the 1980s, Cyprus has experienced the opening of an increasing number of illegal landfilling and dump sites. In 2004, the Ministry of the Interior commissioned a study on the identification and risk assessment of illegal landfills, which located 113 unofficial and uncontrolled dump sites and ranked their danger to the environment and health, in order to focus closure efforts on the most problematic zones. This launched a programme of landfill closure and installation of state-of-the art treatment plants, combined with the installation of green points for separate collection.

- **Economic and Social Benefits**

The installation of new treatment plants has produced economic benefits of increased turnover for the waste management and recycling industry; potentially higher gate fees for treatment and disposal are a secondary impact of the installation of the new plants. Financial impacts avoided via the closure of illegal landfills and the opening of new treatment plants include penalty fees and prison sentences associated with illegal landfilling and incorrect waste management; maintaining tourist revenue is an additional benefit, as official complaints were made by tourists about the waste dumping situation in Cyprus. The closure and rehabilitation of illegal landfills in Cyprus has led to increased usage of the legal collection, treatment and disposal system, and thus helped Cyprus achieve benefits of more effective resource use; from 2003 to 2007 recycling increased from a negligible percentage to 20%.

Dr. Costas Papastavros, of the Environmental Service of the Cyprus Ministry of Agriculture, Natural Resources and Environment, estimated that due to the Cypriot government's focus on illegal landfilling and waste management over the past 10 years, 300 jobs have been created annually in the waste management and recycling sector; the opening of the new treatment sites has also lead to an increase in competencies for waste-specific processing. Negative impacts on public health avoided via the closure of illegal landfills were assessed by the Cypriot study in 2004 as including: groundwater pollution, soil pollution, underground transport of landfill gas, odour, landfill gas fires and explosions, landfill fires incurred to reduce the volume of waste, and animal grazing as often dumping sites are not fenced in.

- **Barriers and Drivers**

Barriers to better implementation and enforcement of the Landfill Directive in Cyprus include limited human resources and specialised knowledge, and a lack of public awareness on waste issues. Drivers of better implementation and enforcement include tourist industry revenue concerns, an increasing governmental focus on waste issues and increasing public and political awareness on waste and illegal landfilling.

Naples: Waste Crisis

- **Context**

Italy declared a state of emergency for waste in the Campania region, including Naples, in 1994, and was ordered by the European Commission to clean up all illegal waste dumps and to develop a waste disposal programme involving waste separation and recycling, which led to the establishment of a Commissario Straordinario (Special Commissioner) to address the situation. In December 2007, the Naples waste crisis began when municipal workers in charge of waste collection went on strike, leading to a build up of waste in the street; ongoing efforts to manage waste volumes and effectively implement Landfill Directive requirements have remained unsuccessful as facilities for waste collection and treatment remain insufficient.

- **Economic and Social Benefits**

Economic benefits lost due to ongoing failure of proper implementation of EU waste legislation, include tourist revenue losses (estimated at €64 million in 2007), mozzarella di bufala revenue losses (estimated at up to 50%) and in the long term potential revenue losses for other food production and farming activities in the Naples region due to the entry of toxic waste into groundwater and soil as a result of improper waste disposal. Financial impacts of the Naples waste crisis are primarily linked to ongoing waste management and clean up costs; these include €400,000 per day, since 2007, for sending waste for incineration to Germany, €2 million for staff in charge of waste management, €36,000 daily spending since 2007 on leachate waste disposal due to inadequate draining systems at landfill and treatment sites, and required annual spending of €1.2 million to protect the natural biodiversity of Vesuvius National Park due to the existence of waste dumping sites within its borders. As reported by the Italian budgetary office, spending through the Special Commissioner structure has increased exponentially over time, from on average €5 million annually up until 2006, to up to €50 million across the 2 year period from 2007 to 2009. Additional financial benefits lost in the Naples waste crisis are related to civil unrest and the continued police and military presence necessitated by such unrest.

The ongoing waste situation in Naples negatively impacts employment in the tourist industry and the agricultural sector, notably producers of mozzarella di bufala; employment impacts in the waste management sector are difficult to assess. Health impacts of the build-up of waste in the streets, the burning of waste by residents, the overfilling of full capacity landfills, and the improper treatment of waste, especially toxic waste are multiple: increased rates of neoplasia, hepatic tumours, lung tumours, stomach tumours, birth defects and mortality rates.

- **Barriers and Drivers**

Barriers to effective implementation and enforcement of EU waste legislation in the Naples region include lacking and misused infrastructure, surplus staff, management issues, corruption and organised crime. Drivers to improved implementation and enforcement include taking political responsibility, increasing citizen involvement, restricting funding, and counteracting illegal activity.

Brandenburg: Landfill Closure and Containment

- **Context**

After the reunification of East and West Germany, it was necessary for the region of Brandenburg to restructure their waste management system especially to align with EU Landfill Directive requirements. The majority of landfill sites were closed, contained and revegetated and 15 plants for treatment and recycling of residual waste were installed, hence reducing the amount of waste landfilled to 29% of the 730 000 tonnes produced per year.

- **Economic and Social Benefits**

It is difficult to assess the impacts of the landfill closure and containment on turnover in the waste management sector, but it is possible to cite that as of 2009, waste management costs in the Brandenburg region, at 68 €/cap/annum, were 89% below the German average. Financial inputs for the containment of non-central landfills programmes were €37 million; for the closure programme of the central landfills, €113 million was spent, €47 million of which was funded by the European Regional Development Fund (ERDF). For the creation of the 15 treatment plants approximately €300 million was invested and contributed to the achievement of an annual turnover of €100 M through the plants. Benefits in terms of resource usage include the recycling of 31% of waste collected as valuable materials and the recovery of an additional 288 kt of construction and demolition waste; 222 kt of waste collected was used for energy generation in Brandenburg in 2009.

Landfill closure and containment activities have had a positive impact on employment, leading to the creation of 1600 temporary jobs related to the landfill containment project and 200 permanent jobs through the restructuring of the waste management system as a whole. An increase in the life expectancy of newborns in Brandenburg from 1991/1993 to 2007/2009, exceeding the Germany average increase over the same period, by 1.8 years, serves as a potential indicator of positive health benefits of landfill closure and containment efforts.

- **Barriers and Drivers**

Barriers to landfill closure and containment include financial aid required at a regional, national and EU level, the difficulty of initially convincing landfill operators and related organisations to cooperate, and continuing illegal landfilling activities as of 2009 despite efforts to establish an efficient and affordable waste management system. The primary drivers of better implementation and enforcement of the Landfill Directive in the Brandenburg region were the necessity to reach Western European environmental and economic standards as quickly as possible, and the possibility for job creation and economic growth through the restructuring and upgrade of the waste management system.

Ireland: Increasing Compliance with Waste Legislation

- **Context**

In 1998, the Republic of Ireland undertook an aggressive programme entitled 'Changing our Ways' to enforce waste management legislation and modernise waste management infrastructure. The programme involved awareness campaigns, the use of fiscal instruments, the introduction of stricter enforcement legislation, particularly for illegal waste dumping, and the creation of waste guidance documents. National prevention plans were established, targeting various audiences, such as households, businesses, etc.

- **Economic and Social Benefits**

Benefits of increased enforcement and implementation of waste legislation in relation to turnover in the waste management sector include the creation of employment, reduced transportation of waste, greater national self-sufficiency, and reinforced public confidence in the environmental benefits of recycling. Financial impacts of increased enforcement include the reduction of clean up costs for illegal waste dumping; investments made over the 2000-2006 period are estimated at over €825.5 million with the Market Development Programme investment accounting for €14 million. In terms of resource use, increased enforcement lead to higher recycling and recovery rates for a number of materials, especially paper, cardboard and glass.

Job creation benefits have been experienced with the focus on diverting waste from landfill and towards recycling and composting facilities; job creation is estimated at around 300 for municipal waste management. Public health benefits are linked with improvement waste treatment methods and a reduction in illegal waste dumping.

- **Barriers and Drivers**

Barriers to improving waste legislation enforcement include a lack of development of waste management infrastructure in parallel with continuous environmental improvements in national requirements in the legal and enforcement framework as well as competition in waste management sector. Drivers to increased enforcement include awareness raising and fostering behaviour change in both business and consumers, the use of fiscal instruments, and further investments in waste infrastructure.

Chapter 3: Barriers in better waste policy implementation

In brief:	In this chapter, specific barriers to better implementation and enforcement for the European Commission and for Member States are described in detail. A main barrier at EU level is deficiencies in the knowledge base and in the reliability of data on waste streams, volumes and management systems across the EU. This presents problems in the comparability and monitoring of Member States' data, the harmonised implementation of legislation across the EU and the development of targeted measures for improvement. Moreover, a number of barriers at Member State level, such as a lack of commitment and resources for implementation control and enforcement in combination with structural, institutional and constitutional constraints, further impede effective legislation implementation across the EU.

3.1 Overview of barriers in better waste policy implementation

Bad implementation of waste legislation is still significant in many Member States. This study focuses on both structural and administrative barriers to good implementation in the Member States. The table below summarises the barriers identified.

Table 16: Barriers to full implementation for EU Commission and for Member States

Implementation body	Barrier
EU Commission	• Sources informing the Commission on bad implementation: erratic knowledge base
Member States	• Lack of interest and/or resources • Fear of high costs, lack of awareness of potential economic/financial/social benefits • Inadequacy of waste management structures • Complexity of the institutions: multi-level governments • Diffusion of responsibility for waste management • Environmental authorities do not have the power to tackle criminal offences • Constitutional constraints • Local particular situations • Special issue: criminal activities counteracting implementation

3.2 Detailed description of barriers in better waste policy implementation

3.2.1 Barriers for European Commission and associated bodies

The following sub-chapters analyse the basic barriers for the European Commission to effectively ensure enforcement of European waste law on the ground, i.e. in the Member States.

Sources informing the Commission on bad implementation: erratic knowledge base

The European Commission does not have the general power to enforce European waste law directly in the Member States. This is basically the prerogative of national, in fact often regional and local, authorities. According to article 17 of the Treaty on the European Union, the Commission shall promote the general interest of the Union and take appropriate initiatives to that end. Thereby it shall ensure the application of the Treaties, and of measures adopted by the institutions pursuant to them. It shall oversee the application of Union law under the control of the Court of Justice of the European Union.

According to Art. 337 of the Treaty on the Functioning of the EU the Commission may, within the limits and under conditions laid down by the Council acting by a simple majority in accordance with

the provisions of the Treaties, collect any information and carry out any checks required for the performance of the tasks entrusted to it.

Art. 337 does not empower the Commission generally to carry out on the spot controls and inspections if this is not foreseen by specific secondary law. Therefore, the EU Commission is on the sole basis of the Treaty in general not authorised to carry out any pre-announced or not pre-announced checks on the ground. The European Court of Justice has clarified that, where it is a question of checking that the national provisions intended to ensure effective implementation of e.g. the Waste Framework Directive are applied correctly in practice, the Commission does not have investigative powers of its own on the ground and thus is largely reliant on the information provided by complainants, by public or private bodies, by the press or by the Member State concerned[9].

The fields where the Commission has such direct rights of execution by virtue of secondary law, are competition, transport, anti-fraud action and agriculture. In the waste field this is not the case.

As regards the rights and obligations of MS with regard to the European level, the Member States shall take any appropriate measure, general or particular, to ensure fulfilment of the obligations arising out of the Treaties or resulting from the acts of the institutions of the Union. In turn, they shall facilitate the achievement of the Union's tasks and refrain from any measure which could jeopardise the attainment of the Union's objectives (see Art. 4III of the EU Treaty). This includes the obligation to give all the information needed to the Commission to enable the Commission to fulfil their obligations as a guardian of the treaty. In addition, where the Commission has adduced sufficient evidence to establish certain circumstances in a Member State leading to suppose bad implementation of waste legislation, it is for that Member State to challenge in substance and in detail the data produced and the inferences drawn.[10]

Given that it cannot act as waste inspector and enforcement agency on the ground (e.g. intervening in permitting procedures for waste-related activities and enforcing permitting conditions via inspections and penalties, mapping illegal landfills in a country), the Commission currently depends on information provided by Member States, citizens, NGOs and the concrete co-operation of national authorities in order to ascertain whether European waste law is enforced to a satisfactory extent in the respective MS.

In order to set priorities, the Commission needs to understand where the major problems in enforcement and European waste law implementation lie in the EU. Upon this knowledge, the Commission can then take the appropriate legal action to require the MS to improve their enforcement and implementation performance.

Currently, the European Commission's knowledge of the implementation status in every MS is mainly based on the following pillars:

- Implementation reports from Member State (3 year reporting periods for the different waste-related directives and regulations) and from the IMPEL network[11];

[9] See ECJ, C-297/08, para. 101.

[10] Ibid., para. 102.

[11] IMPEL is a non-profit association of the environmental authorities of the European Union Member States. It is the European Union Network for the Implementation and Enforcement of Environmental Law. IMPEL's purpose is to contribute

- Waste management plans established by Member States according to Article 28 of the Waste Framework Directive (2008/98/EC).
- Complaints by citizens sent to the Commission;
- Inquiries of the European Parliament
- Other implementation reports submitted by institutions, NGOs and stakeholders.

As for the question whether new directives or amendments of directives have been correctly transposed into national law, notification reports of transposing measures have to be sent by the MS to the Commission. These reports describe how Member States have transposed new or amended directives into national law. The notification reports are analysed by the legal unit of DG Environment possibly with the help of external consultants. The issue of correct transposition of EU waste law into national law is not focus of this report.

Regarding the question of factual implementation of waste law on the ground, the implementation reports from the MS are a source, in addition to complaints, petitions or inquiries directed at the EU Commission from citizens or the EU parliament. As for the relevant information contained in complaints, petitions and inquiries, these are followed up by the policy officer in the EU Commission charged to deal with the piece of legislation that seems to be improperly complied with in a MS. The respective policy officer often cooperates with and is assisted by the legal unit of DG Environment, especially if enough evidence could be gathered in order to send e.g. a formal notice of non-compliance to the Member State.

Up to now, most complaints are issued by citizens (regarding e.g. illegal landfills, illegal waste incineration, littering on the beaches, etc.) while very few complaints come from NGOs in the field of bad waste management. While complaints from citizens or NGOs are a valuable source, they do not necessarily point out the most important cases of non-compliance and much less do they bring to the Commission's notice all cases of non compliance. The implementation reports from the Member States even thought they are required to answer to-the-point questions, are at times incomplete and do not treat the decisive questions to a satisfying extent. As a result, the cases of bad implementation that are identified are rather random and erratic. This impedes the systematic identification of the gravest cases of infractions.

Another barrier is the possible involvement of organised criminal groups in waste management operations in a Member State. Effective implementation and enforcement of waste legislation is in these cases at times made even more difficult if such criminal activities can count on the tacit consent of local authorities in place. Such issues would need to be dealt with by additional criminal police forces.

Finally, the Commission has limited resources to follow up all cases of non-compliances. In order to rationalise infraction procedures the Commission has taken to combine cases in the form of 'horizontal cases', which allows the Commission to collect different similar cases of infraction in one MS and to handle them as one infraction case (e.g. hundreds of illegal landfills).

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to a more effective application of EU environmental law by capacity building, awareness raising, sharing good practices, providing guidance and tools, enforcement cooperation and giving feed back to lawmakers and regulators on the practicability and enforceability of environmental legislation.

In sum, the main barriers to better implementation concerning the European Commission are:

- Reluctance of Member States to give full information on the realities of waste treatment; lack of co-operation with the Commission;
- Lacking financial and data-gathering capacities in Member States; complex data reporting requirements for often difficult to measure waste streams;
- Capacities of DG Environment to follow up every complaint is limited (good prioritisation needed)
- The knowledge base on which the Commission identifies cases of bad implementation is erratic and incomplete;
- The activities of criminal groups in waste management in some regions lessen the effectiveness of infraction procedures.

3.2.2 Barriers for Member States

While the European Commission cannot intervene in the Member States by undertaking controls and inspections and therefore is hampered in guaranteeing good implementation of European waste legislation, the Member States have the discretion, the duty and in theory should have the means to implement waste law and ensure its enforcement be it on national or regional/local level.

Barriers in successful implementation of EU waste legislation on the MS side include diverse factors ranging from inadequacy of waste management structures, diffuse responsibility for waste management and environmental enforcement to organised crime. These barriers are presented in the section below.

LACK OF INTEREST AND/OR RESOURCES

Implementation of waste legislation is mostly left to the regional or local governments in the Member States with the national level often having a stake in devising general lines and requirements in waste policy.

There are local governments and authorities, which tend not to dedicate a lot of resources to deal with environmental problems in general and to prevent or improve negative environmental impacts from waste management in particular. This can be explained by a lack of interest in these issues, read: "nobody cares about waste as long as it is taken away and out of sight". For example, in Italy "grave inertia" of the administrative authorities has been identified in a (draft) report by the Italian parliament as one cause for the completely inadequate implementation of waste law in some parts of Italy, such as Sicily.[12] In Greece, a strategy for diverting biological municipal waste (BMW) was worked out in 2003, including concrete measures of diverting biological waste from landfills thereby meeting the targets of the landfill directive. The competent ministry, however, did not perceive the

[12] Commissione parlamentare di inchiesta sulle attività illecite connesse al ciclo dei rifiuti, Proposta di relazione sulle attività illecite connesse al ciclo dei rifiuti, 2010, p. 392.

implementation of the strategy as a high priority.[13] As a result, concrete measures to extract biological waste from waste put in landfills confined itself to treating a small amount of municipal waste in Mechanical-Biological Treatment Plants covering only about 30% of the required diversion of biological waste, and paper recycling covering about 40%[14]. As a consequence Greece seemed set to fail the deadlines of 2010 and also 2013 as regards diversion of biodegradable waste from landfills.

Closely linked to this is the lack of financial or personnel resources of the environmental authorities. A major point that has been mentioned by Member States is the diminishing human resources dedicated to public administration entrusted with overseeing waste legislation implementation. Lack of manpower will affect the quality of controls and inspections needed before issuing an authorisation for waste-related activities. It will also limit the frequency and quality of inspections and controls needed to survey compliance of an activity with the conditions of the permit. The lack of resources also hampers the design of elaborate waste management strategies (e.g. by establishing separate collection schemes as appropriate for the respective locality). As a consequence, waste management is often designed in the most primitive way (e.g. landfilling). As has been reported in a parliamentary inquiry into the reasons for the very poor quality of waste management in Sicily, preventive measures are only rarely taken by the authorities as they do not have the manpower to consistently map and control the territory. Consequently, when repressive action can be taken, a part of the environmental damage is already done.[15]

FEAR OF HIGH COSTS

Good implementation of waste legislation (especially the proper implementation of the waste hierarchy) can also be hampered by the fear of regional/local politicians that sophisticated waste strategies and concepts involving a high percentage of recycling could lead to higher costs and thus higher waste fees for their constituents. Such fears can stifle any progress in proper waste management. As a remedy, regional/local politicians need to be convinced that a clever waste management concept with a high recycling target can lead to a decrease in cost, i.e. there are socio-economic benefits.

Yet, the real or perceived high costs involving the transition from a very low level of waste management have put off countries from implementing waste legislation, especially with regard to moving up the waste hierarchy.[16]

A specific problem in this respect is also the public resistance against waste incineration. Waste incineration could complement the recycling and recovery of other waste streams. If a country comes from a situation where the lion's part of waste was put in landfills, waste incineration (respecting all legal conditions for waste incineration) could be one of a series of steps to improve waste management. As waste incineration is seen critically in many Member States for reasons of

[13] Lasairidi, K., Implementing the Landfill Directive in Greece: problems, perspectives and lessons to be learned, in The Geographical Journal, December 2009, p. 269.

[14] This phenomenon does not only concern waste authorities, of course, but large parts of the public administration.

[15] Commissione parlamentare di inchiesta sulle attività illecite connesse al ciclo dei rifiuti, Proposta di relazione sulle attività illecite connesse al ciclo dei rifiuti, 2010, p. 392.

[16] See for Greece, Lasairidi, K., Implementing the Landfill Directive in Greece: problems, perspectives and lessons to be learned, in The Geographical Journal, December 2009 p. 270.

cost and/or supposed risks to health and the environment, this can serve as an excuse to stick with landfilling.

INADEQUACY OF WASTE MANAGEMENT STRUCTURES

A specific problem can also be the inadequacy of waste authorities as such due to their structure, competences or size. In Italy, specific organisations have been built, the ATOs (*Ambienti Territoriali Ottimali*, sort of waste unions) that have at times not got the resources to guarantee proper waste management and have not proven apt to run or organise operative waste management (the formerly politically responsible municipalities have transferred to the ATOs the responsibility without providing them with the adequate amount of money). For Sicily there were far too many ATOs (27) not being able to deal with waste management resource-wise so that the ATOs were reduced to nine in 2010. [17] A similar problem was observed in Greece where there were more than 40 WMA (waste management authorities) in 2006. Few of them were believed to be in a position to provide integrated waste management services while most of them are facing problems of poor technical, financial and institutional capacity.[18]

ENVIRONMENTAL AUTHORITIES DO NOT HAVE THE POWER TO TACKLE CRIMINAL OFFENCES

The prosecution of violations of environmental law is a problem in many Member States. Either prosecution of violations rarely takes place/takes place too late or fines are relatively low.

As a recent report on implementation underlined[19], many environmental inspectorates do not have the discretion to impose administrative fines nor have powers of criminal police[20]; therefore good collaboration with the police is required to facilitate criminal prosecution. Collaboration with judicial inquiries on the poor waste management standard in Sicily has for example been denied by l'ARPA Sicilia (Agenzia Regionale Protezione Ambiente Sicilia) arguing that unlike criminal police they were not allowed to do analyses or take waste samples.[21]

The judicial police themselves are often lacking the manpower or the interest to deal with environmental issues, briefly it is often not a priority.

[17] Commissione parlamentare, ibidem, p. 373.

[18] Mavopoulos, A./Skoulacinou, S., Karkazi, A., Mentzis, A. , undated, Drivers and Barriers for the application of waste-to-energy technologies in Greece, Blog contribution: http://www.scribd.com/doc/3212936/DRIVERS-AND-BARRIERS-FOR-THE-APPLICATION-OF-WASTETOENERGY-TECHNOLOGIES-IN-GREECE.

[19] See Mileu, Ambiendura and FFact, 2009, Study on the feasibility of the establishment of a Waste Implementation Agency.

[20] Ibid., p. 42.

[21] Repubblica, 8 October 2010, sezione Palermo, p. 4, "Percolato d'oro e business inceneritori "Le mani della mafia sui rifiuti siciliani

LOCAL PARTICULAR SITUATIONS

Local and historical factors play an eminent role in conditioning the level and quality of waste legislation implementation.

As a way of example, landfilling was favoured by the UK just because the territory featured many holes from mining that needed to be filled and were thus used as cheap landfill sites.[22]

The situation of the EU-12 is of specific interest. These MS having acceded to the EU in 2004 or 2007 had at times to completely rehaul their waste management systems and to create infrastructure from the scratch to adapt themselves to the environmental acquis of the European Union. These efforts are especially directed at completing conclusive waste management plans and, achieving the required minimum recovery and recycling targets of the different directives and complying with the standards and objectives of the landfill directive. Especially, the observance of the waste management hierarchy involves not only a change in collection and treatment infrastructure but also an adaptation of mentalities of business and citizens whose help is needed to realise the separate collection of waste streams needed for proper recycling. The necessary process of habit change slows the process of environmental waste implementation in new Member States.[23] In addition, the prospect of higher costs associated with new waste management systems in line with European law are a barrier to fully implementing it.[24]

With regard to recycling and recovery activities, a few EU-12 MS like Romania, Bulgaria and Malta still feature a percentage of waste disposal of all waste resulting to over 90%.[25] Other EU-12 countries like the Czech Republic, Poland, Slovenia or Latvia have, however, made considerable progress in increasing recovery and recycling rates.[26]

SPECIAL ISSUE: CRIMINAL ACTIVITIES COUNTERACTING IMPLEMENTATION

Handling waste is a lucrative business. While in some Member States corruption is rampant especially when it comes to awarding contracts to certain waste management firms (e.g. for the construction and/or running of waste treatment plants) without foregoing compliance with environmental law ('normal' corruption), in other Member States organised crime effectively competes with the legally empowered authorities or firms. This can regard the collection and 'treatment' of waste or conditions the mode of waste management in a certain territory.

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[22] Preparing for the review of the Thematic Strategy on the Prevention and Recycling of Waste, Report from stakeholder event - 22 June 2010, Brussels http://www.eu-smr.eu/tswpr/docs/meetings/stakeholder_meeting_note.pdf, p. 11.

[23] See for this a study of the currents situation of waste management in Katowice (Poland) and the proposal of environmental improvements involving stakeholder interviews on the barriers to an improvement, Bräuer, I., Neubauer, A, 2007, An actor-based impact assessment to analyse potential conflicts - 3 case studies, http://holiwast.brgm.fr/Documents/Deliverables/Holiwast_D52_Final.pdf, p. 27.

[24] See for this also Lasaridi, p. 271.

[25] See COMMISSION STAFF WORKING DOCUMENT Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Thematic Strategy on the Prevention and Recycling of Waste, undated, see http://ec.europa.eu/environment/waste/pdf/Commission%20Working%20Doc.pdf, p. 30.

[26] Ibidem, p. 31.

A report from EUROPOL (30 August 2011) reports on a significant increases in criminal activities, in particular organised crime, relating to illegal waste disposal and waste shipments[27]. The report states, for example, that illegal waste disposal in the EU is organised by sophisticated networks of criminals with a clear division of roles (e.g. collection, transportation, recovery or legal expertise). Many of the brokers coordinating this activity are embedded in the legal waste management system and also use their positions in legitimate waste brokerages or waste recovery/recycling plants in their attempt to exert corruptive influence on key governmental authorities. According to Europol, illicit waste trafficking is often facilitated through cooperation with legitimate businesses, including those in the financial services, import/export and metal recycling sectors, and with specialists engaged in document forgery to acquire permits. Permits are also obtained by means of corruptive influence on issuing bodies. Europol has found evidence of corruption in both public and private sectors. The conclusion is drawn that while mafia-type structures have sufficient resources to participate in large scale illegal waste management, there is evidence that lower level groups are engaged in illegal shipments of hazardous waste.

The draft report of a recent parliamentary enquiry into the waste sector in Sicily concluded that the mafia is involved at three levels in the business of waste management (see report[28], p. 384): (1) the 'classical way' by imposing an illegal 'fee'('pizzo') on waste management firms making them lose money and not being able to fulfil their tasks; (2) by controlling/conditioning certain waste management activities also via tacit or overt collaboration with the public administration, e.g. landfills, waste transports, provision of waste-related devices; (3) direct control of the waste management cycle, e.g. by running waste incineration plants or landfills (with the consequence of the non-separate collection of waste and the disposal of as much waste as possible in landfills).

Criminal activity in waste management is rampant in some European regions. Criminal activity could be combated by a concerted effort of environmental authorities and the criminal police. This is made difficult by lacking manpower or environmental offences being a non-priority for the police. Sometimes there is also a covert alliance between criminal organisations and local authorities and firms.

MS stakeholders also note that corruption is an important barrier as a relevant form of organised crime. Large differences between EU MS in the corruption perception index[29] have been determined by the European Topic Centre (ETC/SCP).

[27] See http://migrantsatsea.files.wordpress.com/2011/05/octa_2011-11.pdf and

https://www.europol.europa.eu/content/press/europol-warns-increase-illegal-waste-dumping-1053

[28] Commissione parlamentare di inchiesta sulle attività illecite connesse al ciclo dei rifiuti (2010) Proposta di relazione sulle attività illecite connesse al ciclo dei rifiuti

[29] Established by Transparency International

Chapter 4: Tasks needed to strengthen implementation and enforcement of EU waste policy

In brief:	This chapter presents concrete tasks to overcome the identified barriers and to enhance implementation of EU waste legislation. 19 tasks were identified, thereof 14 at EU level, two at MS level and three at both EU and MS level. All tasks were assessed in terms of feasibility, i.e. ease of implementation. Based on the assessment, nine tasks at EU level were selected for the development of policy options for supporting better implementation of EU waste legislation.

4.1 Overview of tasks needed to strengthen implementation and enforcement of EU waste policy

The key tasks needed to strengthen implementation and enforcement at EU and MS level were discussed at the first stakeholder workshop organised during the course of this study and subsequently through a written stakeholder consultation. The key tasks identified through this process are summarised in the table below. These include operative issues such as increasing the knowledge base through scientific assessment, training, awareness, and audits, as well as special issues such as combating organised crime.

Since currently the European Commission carries out most of the existing tasks, the Commission (Directorate-General for the Environment) is referred to in this chapter to simplify matters as the potential body to carry out the tasks. It should be noted, however, that when dealing with the different policy options, several of the tasks could also be carried out by e.g. the European Environment Agency (EEA), or even a new EU mechanism in order to support the Commission. It has also to be underlined that legal enforcement tasks allocated to the Commission under the Treaty and the proposed inspection audits would be tasks for the Commission and not for other institutions, such as the EEA and any new EU mechanisms. Chapter 5 of this report, on policy options, contains the more detailed assessment of the possible institutional settings to carry out the tasks outlined below.

Table 17: Overview of tasks to strengthen implementation and enforcement of EU waste policy

Nb.	Task leader	Task
1.0	EU	Development of a more systematic approach of identifying lacks in waste legislation implementation
2.0	EU	Improvement of the knowledge base for mapping Member States' implementation performance, including analysis of
2.1		• *Member States' waste management plans)*
2.2		• *Implementation reports from institutions, NGOs and stakeholders*
3.0	EU	More coherent tracking of the status of implementation in the Member States (implementation monitoring)
4.0	EU	Assistance and guidance to Member States on inspections and monitoring of implementation
5.0	EU	Training on inspections and enforcement, e.g. in cooperation with networks such as IMPEL
6.0	EU	Awareness raising on waste legislation implementation
7.0	EU	Review and report on national inspection standards, based on agreed EU standards (audits)
8.0	EU	Technical and scientific assessments and advice concerning waste related data and various information relating to the contents of EU waste legislation
9.0	EU	Technical and scientific assessment of the practicality and enforceability of EU waste legislation
10.0	EU	Direct on-the-spot controls by the Commission or a separate Waste Agency
11.0	EU	Creation of waste unit in Europol
12.0	EU	Combating corruption
13.0	EU	Provision of financial incentives and develop effective system of waste charges in accordance with the polluter pays principle (Article 18 of the EU waste framework directive).
14.0	MS	Sufficient personnel and adequate waste management bodies to control and inspect
15.0	MS	Improving inspections and monitoring of good implementation of EU waste legislation
15.1		• *Best practice on inspections*
15.2		• *Strengthening the awareness of police and co-operation with the police*
15.3		• *Compliance assistance/awareness raising*
15.4		• *Promoting good practice cases*
15.5		• *Adequacy of penalties*
16.0	EU & MS	An information and best practice sharing platform for knowledge sharing between MS
17.0	EU & MS	Development of strategic partnerships
18.0	EU & MS	Development of guidelines

The different tasks and approaches outlined in the table are described in detail in the following section.

4.2 Detailed description of tasks

A detailed description of the tasks identified as necessary for better implementation of EU waste legislation are presented here. The table below summarises the barriers to implementation, the task proposed to improve the situation, and the support tools for carrying out this task.

Table 18: Barriers, tasks and tools to strengthen implementation of EU waste policy

EU level			
Barriers/Problems	**Task**		**Tools**
Limited resources and lack of consistent procedure to identify gaps in waste legislation implementation	1.0	Development of a more systematic approach of identifying lacks in waste legislation implementation	• Guidelines on prioritisation of non-compliance cases
Lack of reliable information on state of waste legislation implementation	2.0	Improvement of the Commission's knowledge base	• Specialised mechanism for complaints; cooperation with stakeholders (NGOs, citizens, environmental agencies etc.)
Lack of systematic monitoring of state of waste legislation implementation in Member States	3.0	More coherent tracking of the status of implementation in the Member States (implementation monitoring)	• Quality standards on reporting • Special implementation reports from Member States • EU state of play reports on implementation
Lack of systematic procedure for analysing the state of implementation of waste legislation across the EU	4.0	Assistance and guidance to Member States on inspections and monitoring of implementation	• Recommendation of the European Parliament and of the Council of 4 April 2001 providing for minimum criteria for environmental inspections • Guidance documents • Studies carried out by IMPEL
Great variance in quality of training across Member States and lack of EU-wide training standards	5.0	Training on inspections and enforcement, e.g. in cooperation with networks such as IMPEL	• IMPEL network as a training forum
Lack of awareness of issues related to waste legislation implementation among the general public and the public authorities responsible for policy implementation	6.0	Awareness raising on waste legislation implementation	• Training and awareness activities
No power for the Commission for direct interventions in the MS, such as on the ground inspections of national waste management systems	7.0	Review and report on national inspection standards, based on agreed EU standards (audits)	• Audits aimed to verify effectiveness of national control systems • Adopt corresponding secondary legislation if necessary
Lack of reliable waste data and lack of understanding of EU waste legislation in authorities responsible for waste legislation implementation	8.0	Technical and scientific assessments and advice concerning waste related data and various information relating to the contents of EU waste legislation	• Improved collection and analysis of waste flow data • Impact assessments • Comprehensive analysis of waste policy and waste streams

Lack of reliable information on whether current or new legislation is clear enough or if additional legislatory work would be needed to improve the MS' ability to well implement EU waste legislation	9.0	Technical and scientific assessment of the practicality and enforceability of EU waste legislation	• Practicality assessments for new legislation
No power for the Commission for direct interventions in the MS, such as on the ground inspections of national waste management systems	10.0	Direct on-the-spot controls by the Commission or a separate Waste Agency	• Establishment of central waste agency with the power to control and assess the inspection approaches, methods and results of national authorities
Activities of organised crime in waste management, specifically illegal waste shipments	11.0	Creation of waste unit in Europol	• Establishment of specialised waste unit within EUROPOL, which would be responsible for: • exchange of information between Europol and Europol Liaison Officers • provision of operational analysis and support to Member States; • provision of expertise and technical support • generation of strategic reports
Political and administrative corruption	12.0	Combating corruption	• Development of specialised waste unit within EUROPOL
MS lack of financial resources for waste legislation implementation	13.0	Provision of financial incentives and application of the polluters pays principle	• Alternative financing instruments • Public-private partnerships • Interpretation and application of the polluter pays principle
MS level			
Barriers/Problems	**Task**		**Tools**
Quantitative and qualitative lack of staff and structural deficiencies in waste authorities hindering the implementation and enforcement of EU waste legislation	14.0	Sufficient personnel and adequate waste management bodies to control and inspect	• Minimum standard for staffing and equipping waste authorities • National networks of representatives of waste authorities • Memorandums of understanding between customs and enforcers
Absence of systematic national control and enforcement procedures to ensure implementation of EU waste legislation and lack of awareness of implementation issues and of expertise in waste management and legislation implementation	15.0	Improving inspections and monitoring of good implementation of EU waste legislation	• Best practice guidelines on model inspection planning • Training of waste authorities staff • Awareness raising campaigns • national working groups for waste implementation • Collection of data on use of penalties
EU and MS level			
Barriers/Problems	**Task**		**Tools**
Transnational challenges in waste legislation implementation (e.g. illegal waste shipments)	16.0	A platform for sharing information, knowledge and best practices between MS	• Trans-European working group for waste legislation implementation
Stakeholder partnerships offer untapped potential benefits in dealing with specific enforcement problems	17.0	Development of strategic partnerships	• Trans-European working groups • Public-private partnerships
Lack of waste management expertise and experience in the national and international authorities and bodies responsible for supporting, controlling and enforcing EU waste legislation implementation	18.0	Development of guidance	• Guideline documents

Please see chapter 4.3 for an assessment of the feasibility of these tasks.

4.2.1 EU

4.2.1.1 OPERATIVE ISSUES

4.2.1.1.1 *Development of a more systematic approach of identifying lacks in waste legislation implementation*

Problem to address

The European Commission currently has limited resources to consistently identify and follow up on cases of poor compliance or outright non-compliance with EU waste legislation[30]. A possibility to ensure the adequate handling of EU waste legislation infringement by MS could be realised by a prioritisation of breaches.

The need for a prioritisation has also been highlighted in the Communication "A Europe of results – applying community law" from 2007.[31] The issue has been also addressed with a focus to environmental law implementation in the Commission Communication on implementing European Community Environmental Law of 2008.[32]

Description of the task

In order to concentrate better on the major and most hazardous cases of bad compliance or non-compliance with waste legislation in Europe, a recommendable approach would be to prioritise cases of bad compliance/non-compliance and distinguish those for follow-up and prosecution from those that are only of minor importance or impact. As an example, the case of 'mild littering' such as on holiday beaches is not as gravely important as major landfill sites or many smaller 'municipal' landfills which do not comply with the most basic technical requirements thereby posing a threat to soil and ground water, constituting a major source for methane, and posing fire risks. However, prioritisation does not mean that other minor cases would not be addressed at all. It just means that certain cases would be dealt with more immediately and intensively.[33]

In the above mentioned 2007 Communication, the Commission highlighted that prioritisation "should be attached to those infringements which present the greatest risks, widespread impact for citizens and businesses and the most persistent infringements confirmed by the European Court of Justice." These categories cover:

- Non-communication of national measures transposing directives or other notifications obligations (suggested benchmark: 12 months that elapse from

[30] The EU Commission has discretion over whether they follow up a citizen complaint. Citizens cannot reclaim the Commission to act (no subjective rights to infringement procedures), see Lachmayer, K., Bauer, L., 2008, Praxiswörterbuch Europarecht, p. 954 with references to jurisdiction e.g. ECJ, C- 141/02.

[31] COM(2007) 502 final, pages 8ff.

[32] COM (2008)2876.

[33] COM (2007) 502, page 9.

the sending of the letter of formal notice to the resolution of the case or seizure of the Court of Justice);

- Breaches of Community law, including non-conformity cases, raising issues of principle or having particularly far-reaching negative impact for citizens, such those concerning the application of Treaty principles and main elements of framework regulations and directives;

- Respect for Court judgements declaring the existence of infringements (Article 288 TEC, now 258 and 260 TFEU) (suggested benchmark: an average between 12 and 24 months is the equivalent period in proceedings to ensure respect for an earlier judgment of the Court).

In its Communication on implementing European Community Environmental Law of 2008, the European Commission has already elaborated these criteria further.[34] These categories – that generally apply to all environmental fields - could build the basis for the criteria on the prioritisation of infringements in the waste sector. The criteria listed in the communication are the following:

- Non-conformity with key legislation viewed as presenting a significant risk for correct implementation of environmental rules and hence their overall effectiveness.

- Systemic breaches of environmental quality or other environmental protection requirements presenting serious adverse consequences or risks for human health and well-being or for aspects of nature that have high ecological value.

- Breaches of core, strategic obligations on which fulfilment of other obligations depends.

- Breaches concerning big infrastructure projects or interventions involving EU funding or significant adverse impacts.

These list of criteria could be further developed; also with a specific view to the waste sector. A major criterion could also be if an infraction is likely to set a visible bad example in Europe and if there is a risk of faulty implementation taken up by other Member States (i.e. if a case of bad implementation or non-implementation becomes notorious and is not prosecuted, how important is the risk that this sets a bad example and non-implementation is imitated by other countries because they know they will not be prosecuted).

The development of the guidelines would build on the current structure of the Commission's observation activities and would not require any legal action to provide for these guidelines. From a financial and manpower point of view, there would not be any barriers to developing the guidelines.

[34] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on implementing European Community Environmental Law {SEC(2008) 2851} {SEC(2008) 2852} {SEC(2008) 2876} /* COM/2008/0773 final */, pages 7ff.

Support tools

Priorities have to be defined in a transparent and manageable manner. This could be realised through the adoption of a set of **guidelines** that specify and explain the criteria to help personnel prioritise cases of non-compliance in the waste sector. These guidelines would guide the different scientific officers in charge of the different waste-related directives and help to ensure that the limited resources are used in the best way for the environment and human health as a whole. General guidelines for Commission staff would also counteract the problem that personnel in the Commission's services change position frequently and that consequently the approaches to waste implementation control might change.

4.2.1.1.2 *Improvement of the knowledge base*

Monitoring and analysing information from Member States' waste management plans and implementation reports from Member States, NGOs and stakeholders)

Problem to address

As explained in the preceding chapters, the European Commission does not have its own services in the Member States to assess the implementation situation in every Member State.

Thus, the Commission's record of bad or non-implementation cases could be much improved if the Commission had reliable cooperation partners in Member States who could be trusted to inform the Commission of the most important cases of non-implementation.

Description of the task

NGOs and citizens are often the first to be aware of infringements, thus this task focuses on harnessing their intelligence to improve waste legislation enforcement, both at MS and at EU level. Complaints from civil society are a form of alert to compliance and enforcement authorities, although not each complaint constitutes an actual infringement. An infringement is confirmed where a Member State does not take effective action on the subject matter. Therefore, it should be encouraged that complaints to the Commission should only be lodged after national authorities have been alerted and Member States have been systematically unresponsive.

NGO networks can provide intelligence on specific waste issues that might otherwise be difficult to access. For example, the Basel Action Network could provide information about the movements of end-of-life ships. Other NGOs, e.g. those for nature and wildlife protection, could be called upon to report massive littering in woods and the existence of illegal landfills. Thus, NGO networks could and should be encouraged to report such cases consistently to the European Commission. A fluid communication between the Commission and NGOs could be established in this regard and the contribution of NGOs to an improvement of implementation of waste legislation increased.

The Commission, also partly dependent on the information about infringements by citizen groups or single citizens, should ensure effective treatment of complaints regarding poor implementation, through initial information exchange or cooperative problem-solving. So far, general enquiries are handled through Europe Direct, Citizen's Signpost, and European Business Centres.[35]

[35] COM (2007) page 7.

Support tools

A **specialised mechanism for complaints** on waste could be established. In order to improve the involvement of NGOs and citizens, they should be encouraged to use the mechanisms available at EU-level and national level to notify infringements by adequate means. This will be facilitated both by certain European Commission and MS efforts. For instance, the Commission has to ensure that EU environmental law and relevant information are available in all official languages. Moreover, an effective investigation of complaints and petitions will foster the citizen's participation in the Community law implementation. MS could foster **good cooperation with the public** by means such as confidential telephone lines, complaint handling procedures, enforcement oversight bodies and ombudsmen.[36]

Intensifying communication with stakeholders and improving the knowledge base would not alter the current structural setting of the Commission's observation activities. Thus, those activities would be in the framework of the Commission's current approach to identify implementation gaps. From a financial and manpower point of view, an **increased communication with NGOs and civil society** will be relevant but not excessive.

Improving and intensifying the analysis and follow-up of national waste management plans and implementation reports

Problem to address

The MS have to inform the Commission of their waste management plans under Articles 28-33 of the Waste Framework Directive and submit implementation reports for the most important waste-related directives based on structural questionnaires valid for all MS every three to four years. The waste management plans must contain an analysis of the current waste management situation in the MS and are therefore valuable tools to monitor and control the level of compliance with EU waste legislation.

When analysing the plans and reports, it becomes apparent that either specific questions are at times not answered with the necessary precision or MS report aspects in which they excel whereas they are very short on aspects where they do not seem to have many positive things to report.

Description of the task

Given the noted weakness of reporting, the Commission should not only sum up the reports and draw conclusions on the basis of the information provided but also analyse closely the information given with a view to where implementation gaps are likely based on the information provided. On this basis, MS that have not reported on all questions or have submitted implementation reports of insufficient quality should be admonished and lacking information should be consistently reclaimed.

This would also imply a tougher approach by the EU Commission to follow up on missing information and to not accept waste implementation reports of rather poor quality. Likely implementation gaps should be pointed out to the MS, who should have a chance to provide further information to exonerate themselves. If MS are unable to provide further information, the Commission may have identified a case of bad compliance or non-compliance.

[36] COM (2008) pages 6ff.

Support tools

A tougher approach by the Commission to impose and enforce **quality standards on reporting** and to follow up MS in the case of faulty or incomplete information would not exceed the Commission's current competences in ensuring good implementation of waste legislation. Additional efforts from Commission staff to analyse and to follow up on information would be needed. A tougher approach in **assessing waste implementation reports** all over the waste policy field could justify an additional part-time policy officer in the Waste Unit. The approach also seems practical and effective.

4.2.1.1.3 *More coherent tracking of the status of implementation in the Member States (implementation monitoring)*

Problem to address

In addition to the Commission's permanent screening of the waste legislation implementation situation in the Member States, the state of implementation of waste legislation within individual Member States and across the EU should be analysed in a more profound and systematic routine manner.

Description of task

Special reports at European level in addition to the annual report on the implementation of EU law (which has a section of waste law as well) would enable more coherent intelligence on MS implementation activities.[37] This could be done in the framework of the EEA's State of the Environmental report or as a special report that is published with a higher frequency.

Member States should also be encouraged to collect and actively disseminate themselves key information on implementation and enforcement. The Commission can assist by helping to identify the key categories of information and providing support for effective information systems.

Support tools

The **implementation reports** of the Member States plus further information provided by Member States could be used as a basis to create the special reports. The data transmitted by MS should be put to good use and compiled so as to clearly depict the state of waste legislation implementation in each MS.

Such a **state of play report** combining statistics and explanations of the waste management development in MS would meet the Commission's priority to have a high emphasis on full waste legislation implementation. The completion of such a report would require additional resources in the Commission or the EEA as regards gathering and processing of data. The extent of additional staff needed depends on the frequency of the reports and the information to be gathered. The corresponding work could also be done by consultants in close co-operation with the Commission.

The Commission could produce **guidance** on the establishment of effective active information systems on waste implementation within Member States.

[37] Available here: http://ec.europa.eu/eu_law/infringements/infringements_annual_report_27_en.htm

4.2.1.1.4 *Assistance and guidance to Member States on inspections and monitoring of implementation*

Problem to address

MS are the competent authorities to ensure good waste legislation implementation. In contrast to the Commission, they are entitled to control and inspect waste managers and waste treatment installations directly. Thus, they are the primary enforcers of waste legislation and also the main 'contact' authorities that the waste managers in the respective territory have to respond to.

Description of task and support tools

In order to improve the effectiveness of MS as competent authorities for waste legislation implementation, the EU Commission could produce guidance documents or use other means to help authorities of the MS to rationally plan their inspection and control activities and set priorities. In order to plan inspections well, the specific authorities also need to engage in a consistent monitoring of waste legislation implementation in 'their' territory.

Such guidelines from the EU Commission should also make clear what material, training and equipment is needed to carry out environmental waste-related inspections that comply with EU waste law. This also includes the infrastructure of permitting authorities that each MS must have as a minimum.

The **guidance documents** could be worked out in close co-operation with MS/the IMPEL network (the European Union Network for the Implementation and Enforcement of Environmental Law) and could follow a risk-based approach (similar to the guidelines proposed above for the Commission's own screening of MS' performance). The guidelines can build upon already very extensive **work done by the IMPEL** network, such as in the "Doing the right things" project that produced a guidance book to assist environmental authorities in planning inspections. In the "EasyTools" project, a risk assessment tool for inspection planning has been developed. Moreover, the IMPEL Review Initiative project has been designed to develop and test "a voluntary scheme for reporting and offering advice on inspectorates and inspection procedures" in EU Member States. It offers peer reviews of environmental authorities / inspectors meaning that they take part in inspections in other Member States to explain how they have implemented the legislations in their responsibilities.[38] The IMPEL network also carries out a number of waste related projects, such as the "Doing the Right Things for Waste Shipment Inspections (DTRT-TFS)" which looks at how DTRT could help authorities improve their inspections related to the Waste Shipment Regulation.[39] Also the conclusions of the 2005 IMPEL project "Waste Permitting and Enforcement"[40] and the 2003 IMPEL project "Waste-related Conditions in Environmental Permits"[41] can be used for this purpose and if needed updated. The **Recommendation of the European Parliament and of the Council of 4 April**

[38] http://impel.eu/key-highlights/joint-european-commission-%E2%80%93-impel-seminar-on-environmental-inspections .

[39] The project is still ongoing. See http://impel.eu/projects/doing-the-right-things-for-waste-shipment-inspections-dtrt-tfs.

[40] This report describes the results of a project carried out by twelve EU Member States, aiming at improving cooperation and information exchange on the permitting and enforcement of environmental conditions at landfills and waste incineration plants within the framework of the Integrated pollution prevention and control Council Directive 96/61/EC (IPPC) and the Waste incineration Directive (2000/76/EC), the Landfill of waste directive (99/31/EC).

[41] The report compiles a number of good examples of permit conditions which address amongst others, measures to minimise waste, substitution of raw materials, handling and disposal of waste as well as audits and assessments.

2001 providing for minimum criteria for environmental inspections in the Member States could also be a good basis for developing a guide specific for waste-related inspections.

Such guidelines addressed at the national level and to be used by national/regional/local authorities could be modelled on the work/method done/used for the guidelines for waste shipment controls. Such guidelines would not exceed the Commission's current competences and would not require high costs; they could be worked out by consultants for the Commission in close consultation with Member States/IMPEL network and other stakeholders.

4.2.1.1.5 *Training on inspections and enforcement, e.g in cooperation with networks such as IMPEL*

Problem to address

A recently published study assessed the current activities in training on waste legislation implementation. The study revealed that no EU waste legislation specify requirements for training of Member State officials. Training is offered in the EU and MS. The IMPEL network provides workshops and inspector exchange programmes at EU level. An inquiry of Member States has shown that the extent of trainings varies considerably across Member States. But these trainings are not provided on the large-scale and based on general, EU-wide standards.[42] The EU Commission is advised to become more active in this field.

Description of task

The Commission could streamline training activities to promote application of best practice permitting and inspection procedures in Member States.

Support tools

Staff with specific expertise are required for many aspects of EU waste policy implementation. Skills required for WEEE disassembly and treatment are one example. Inspections staff are critical to several key policies including the ELV Directive and Waste Shipment Regulation, but a lack of capacity and of training has been highlighted as a problem. Regarding training, the IMPEL network could be still more employed as a **training forum** for national authorities. The IMPEL network has traditionally focused on Waste Shipment when it dealt with waste issues but could in the future take up training specifically on such waste aspects as landfilling, compliance with the waste management hierarchy, etc. With a view to issues beyond command and control, the IMPEL network is currently carrying out a project entitled "Exploring the use and effectiveness of complementary approaches to inspection for ensuring compliance". The project description reads: "As part of the better regulation agenda, there is an increasing interest in using complementary measures to traditional regulation methods to deliver improved environmental outcomes, but little evidence of their effectiveness."[43] The issues discussed in this study will be useful to develop approaches complementing inspections to foster good implementation in the Member States. Additional manpower would be used to carry out the training, but the trainings can be done at project level. Training should also be provided to judges that are in charge of environmental law, as it has been already pointed out by the

[42] Milieu (et al.): Study on the feasibility of the establishment of a Waste Implementation Report, page 49.

[43] http://impel.eu/projects/exploring-the-use-and-effectiveness-of-complementary-approaches-to-inspection-for-ensuring-compliance

Commission in its 2008 Communication on implementing European Community Environmental Law.[44]

4.2.1.1.6 *Awareness raising on waste legislation implementation*

Problem to address

Awareness and understanding among the general public and the public authorities responsible for policy implementation at local level are important factors to the success of many key policy provisions. Understanding of separate collection practices and the waste products they relate to (scope of bio-waste/green waste collection; which packaging products can be recovered) contributes greatly to the efficacy of such systems.

Description of task

The Commission carried out a series of awareness-raising events concerning certain key EU waste requirements, covering all Member States, during 2006-2010[45]. More communication campaigns should be carried out to encourage participation in return, collection and recovery schemes of all sorts, and in particular consolidated guidance to households on how to deal with all of their waste products, impact behaviour and target achievement. Adequate means are media campaigns (internet, poster, leaflets). A very good example is the Berliner Stadtreinigung (BSR Berlin City Cleaning Company, Germany) that is known for its ambitious media campaign to inform consumers about waste disposal. They won several prises on their campaign.

Support tools

Awareness raising in public authorities on the importance of a proper implementation can be carried out *inter alia* by **training** and conferences and therefore related to the task described in the previous section.

4.2.1.1.7 *Review and report on national inspection standards based on agreed EU standards (audits)*

Problem to address

MS are responsible for enforcing and implementing EU waste legislation. The Commission has generally no power to intervene directly and, for instance, to carry out inspections to control whether legislation has been implemented properly.

Description of task

The Commission could be empowered to consistently monitor and assess the national inspection standards as regards waste management activities by means of 'audits'. As a rather moderate but still effective approach compared to hypothetical direct interventions, the Commission services would be authorised to review and audit the inspection performance of MS, including inspection planning and frequency, inspection reports and technical approaches applied in inspections. On the basis of the review, the Commission/staff engaged by the Commission could make proposals to the

[44] COM(2008) 773 final, page 5.

[45] http://ec.europa.eu/environment/waste/shipments/reports.htm, http://ec.europa.eu/environment/waste/landfill_index.htm

national authorities on how to improve their approaches and could impose an action plan to improve the inspection performance, including the Commission's power to control compliance and results of the action plan.

Support tools

Review and audits of national inspections standards would support the European Commission here. A similar approach is pursued by the 'general audits' of the DG SANCO's Food and Veterinary Office (FVO). The division FVO is in charge of ensuring effective implementation and enforcement on food and veterinary related EU legislation within the EU and in third countries in relation to their exports to the EU. This is done by carrying out audits and inspections aimed at verifying the effectiveness of national control systems for enforcing the relevant Community standards in the fields of food safety, animal health and welfare and plant health. For each year, a work programme of inspections and audits is developed to identify priorities areas as well as Member States that will be subject to audit and inspections. Not all facilities are visited; it is rather assessed how national inspectors operate generally. All findings are presented in an inspection report, together with conclusions and recommendations with a possibility for Member States to comment. Based on the recommendations of the FVO, the competent authorities are requested to present an action plan to the FVO for improvement. The action plan is assessed and its implementation monitored. As a last resort, legal action under EU law may be taken by the Commission to ensure that Member States meet their obligations under Community law.[46]

The work done by IMPEL in the context of the so called cluster 1 on "permitting, inspections & enforcement" could serve as role model. Based on guidelines developed earlier by the clusterhead, the Commission adopted Recommendation 2001/331/EC of the European Parliament and of the Council of 3 April 2001 proving for minimum criteria for environmental inspections (RMCEI).[47] They are being revised currently by the Commission. This recommendation could be further developed with a view to waste installations. Also the IMPEL review initiative (see above) is a good pattern.

However, the Commission services could generally not proceed without a legal basis, according to the principle of conferral laid down in Article 4 TFEU. The task of assessing national inspection standards and enforce improvements would firstly, require that EU standards for inspections are adopted. Secondly, this would require the EU law maker to **adopt corresponding secondary legislation** on which basis the Commission could act in this regard.

An extension of Commission power would, certainly, require the Commission to contract new internal or external personnel to carry out the review of inspection standards in the Member States.

[46] See Food and Veterinary Office, Annual Report 2008, Available at http://ec.europa.eu/food/fvo/annualreports/index_en.htm.

[47] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on the review of Recommendation 2001/331/EC providing for minimum criteria for environmental inspections in the Member States [SEC(2007) 1493] /* COM/2007/0707 final */.

4.2.1.1.8 *Technical and scientific assessments and advice concerning waste related data and various information relating to the contents of EU waste legislation*

Problem to address

A part of implementation work has to be carried out by the European Commission. This concerns cases in which the European Commission is responsible for adopting mostly technical details in the context of a comitology procedure according to secondary EU legislation.

Description of task

For this technical assessments need to be done, e.g. studies on the current state and future perspective for the management of waste (e.g. C&D Waste, food waste, plastic waste), technical, environmental, economic studies to support Impact Assessments.

Support tools

Such technical and scientific assessments and advice concerning waste could involve both quantitative and qualitative analysis and may take the following forms:

- Analysis of waste flows

  Such an analysis would involve assessing the quantity of a given waste stream, its material flows, its potential environmental, economic and social impacts, its current treatment methods and its future potential. This type of study could cover a waste stream currently covered by legislation, under consideration for coverage by legislation or a transversal stream, such as plastics. Examples of studies of this type include:

  - EC, Bio-waste generation and prevention indicators, 2011 (for DG ENV)
  - EC, Plastic waste in the environment, 2009-2010 (for DG ENV)
  - EC, Management of construction and demolition waste, 2009-2010 (for DG ENV)

  In the case of examining a waste flow covered by current EU legislation, the analysis should assess its application in individual Member States as well as at the EU level, identifying strong points and areas for improvement, as well as potentially focusing on one aspect of the legislation, such as battery labelling in the case of the Batteries Directive. An example of studies of this type is: EC (2008) Effective controls of waste shipment, for DG ENV.

- Impact assessment

  Impact assessments can focus on analysing potential policy developments to understand their possible impacts, or key waste streams to understand their environmental impacts and involve comparative analysis of policy scenarios or material treatment options. Impact assessments are intended to provide EU decision makers with a broad vision of the potential environmental, economic and social impacts of modifying current legislation or

introducing new legislation on waste, and inform the policy making process. Examples of studies of this type completed by BIO and partners include:

- EC, Comparative LCA of NiCd batteries used in cordless power tools (CPT) vs. their alternatives NiMH and Li-ion batteries, 2010-2011 (for DG ENV)
- EC, Study on elements for an impact assessment on proposed capacity labelling of portable primary batteries, 2010 (for DG ENV)
- EC, Extended impact assessment of different technical amendments for a possible review of the IPPC (Integrated Pollution Prevention and Control) Directive (96/61/EC), 2007 (for DG ENV)

▶Comprehensive analysis of waste policy and waste streams

Such an analysis involves undertaking an assessment of the entire body of EU legislation in relation to broader waste and resource related concepts such as resource efficiency, eco-design, etc. This type of analysis could also be linked with larger strategy documents in the EU waste acquis such as the Thematic Strategy on the prevention and recycling of waste or the Thematic Strategy on the sustainable use of natural resources. Examples of studies of this type include:

- EC, Analysis of the key contributions to resource efficiency, 2009-2010 (for DG ENV)
- EC, Preparatory study for the review of the Thematic Strategy on the Sustainable Use of Natural Resources, 2009-2010 (for DG ENV)
- EC, Analysis of the contributions of recycling, waste prevention and product design policies to resource efficiency, 2009-2010 (for DG ENV)

The above types of technical and scientific assessments can involve a variety of methodologies, (e.g. case studies, benchmarking, fact sheets, check lists, comparative tables, etc.) and a number of data collection methods (e.g. literature review/desk research, direct measurement, direct observation, stakeholder consultation, questionnaires, expert interviews, etc.). Such studies form an integral part of the Commission's policy design process, allowing politicians to make decisions in light of the best available evidence.

4.2.1.1.9 *Technical and scientific assessment of the practicality and enforceability of EU waste legislation*

Problem to address

In order to improve waste management performance across Europe, reliable information is needed on whether current or new legislation is clear enough or if additional legislatory work would be needed in order to improve the MS' ability to well implement EU waste legislation.

Description of task

Waste legislation should be assessed in a scientific-technical way to find out if the legislation in force is sufficiently clear to be implemented well by MS. These assessments are intended to show whether legislation needs to be improved or complemented by additional legislation in order to enable MS to implement the legislation correctly.

Support tools

The **assessments** can be done on behalf of the EU Commission or for example by IMPEL. Two exemplary projects have been done by IMPEL on the practicality of new legislation:

- Practicality of the WEEE Proposal 2008[48]:
- Practicability and Enforceability of the IPPC Recast Proposal: The report highlights a wide range of P&E issues.[49]

4.2.1.1.10 *Direct on-the-spot controls by the Commission or a separate Waste Agency*

Problem to address

MS are primarily responsible for implementing EU measures in national law (see Article 291 paragraph 1 and 192 paragraph 4 TFEU), which comprises the adoption of legal measures as well as the administrative enforcement. The Commission has generally no power to intervene in the implementation process of MS, notwithstanding the fact that EU inspections can be carried out in the areas of competition, regional policy, fisheries and veterinary according to the conferral of the corresponding power and are also carried out based the loyalty commitment of Member States in Article 4 (3) TEU.[50] Moreover, the EU Commission is able to control the application of EU legislation on the spot in accordance with the obligation of Member States to cooperate in implementing any EU legislation, especially in the context of single infringement procedures under 258 and 260 TFEU.[51] Apart from this, Commission officials have participated in inspections in the MS when invited by the MS representatives.[52]

The lack of direct inspections powers of the Commission in the field of waste has been identified as an obstacle on effective implementation by stakeholders and by science.[53]

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[48] The project description reads "Based on the work of the IMPEL Better Regulation Cluster to develop and use a checklist on the practicability and enforceability (P&E) of legislation, a working group carried out an assessment of the Recast of the WEEE Directive. Initially, views from IMPEL members were collected via a questionnaire and on 27 April 2009 a workshop was held to discuss the findings."

[49] http://impel.eu/projects/practicability-and-enforceability-of-the-ippc-recast-proposal

[50] Kahl, Wolfgang in Callies/Rufert, EUV/AEUV, Kommentar, 4. Auflage, Artikel 4, Rn 61; Milieu (et al.): Study on the feasibility of the establishment of a Waste Implementation Report, page 61.

[51] ECJ cases C-33/90 Commission v. Italy [1991] ECR I-5987, para 18: C-375/92, Commission v. Spain [1994] ECR I-923, para 24ff; C-82/03, Commission v. Italy [2004] ECR I-6635, para 15.

[52] See for example the case of waste emergency in Naples, ECJ case C-297/08, Commission v. Italy [2010], para 21.

[53] Milieu (et al.): Study on the feasibility of the establishment of a Waste Implementation Report, page 61.

Description of task

To improve the efficacy of the Commission's enforcement of good waste legislation implementation, the Commission's powers could be modified with regard to the implementation of EU waste legislation. In its most radical form, this would mean that the Commission or a separate EU Agency would have the power to carry out on-the-spot controls in the Member States (e.g. in waste treatment plants, in landfills, etc.) and could insofar act as substitute for the national authorities. Such an expansion of the power of the Commission or the European level in carrying out on-the-spot controls has been suggested and discussed by the recent study "Study on the feasibility of the establishment of a Waste Implementation Agency" (2009).[54]

While such a modification of power could turn out to be very effective in certain cases and would foster the Commission's position vis-à-vis the Member States, there is also a number of sound objections against this approach. First of all, the general principles of EU law set limitations regarding direct interventions by the Commission services. The principle of subsidiarity as laid down in Article 5 TEU says that in areas which do not fall within the exclusive competence of the EU, it shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States. Since there are other, more moderate means available, an extension of the Commission's power to direct interventions in Member States would probably not be in accordance with the subsidiarity principle. The same applies to the proportionality principle which says that the content and form of EU action shall not exceed what is necessary to achieve the objectives of the Treaties.

Moreover, this task would not be in line with general multilevel and multinational government systems, in which responsibilities need to be allocated in different authorities to allow an effective implementation. Not all tasks can realistically and pragmatically be executed by one single and centralised authority (here European Commission) as by taking on administrative tasks better be done by the regional/local level it would overexert itself. Tasks need to be shared and to be executed by the authority that has the most immediate relation to the issue and the subject of the inspection (here national/regional or local authority).

Support tools

The central authority, while not suited to direct intervention, could carry out a **monitoring function, controlling and assessing the inspection approaches, methods and results of national authorities** as discussed in the preceding task. Thus, the European Commission would retain an overseeing and controlling role over the MS and their authorities while the MS would keep carrying out the operative inspections exclusively. In addition, the European Commission could gain the role of assessing and enforcing the improvement of inspection standards.

[54] http://ec.europa.eu/environment/waste/pdf/report_waste_dec09.pdf

4.2.1.2 SPECIAL ISSUES

4.2.1.2.1 *Creation of waste unit in Europol*

Problem to address

Given that organised crime has a stake in non-compliance with EU waste law, police powers should be involved in combating such cases of non-compliance. One of the major fields of activities for organised crime is illegal waste shipment.

Description of task

One measure to combat organised crime, especially when it is operating transnationally, could be the creation of a waste unit in EUROPOL.

Support tools

Europol (the European Police Office) has been set up to handle Europe-wide criminal intelligence. Europol's aim is to help the EU Member States co-operate more closely and effectively in preventing and combating organised international crime. Currently it deals in particular with drug trafficking, immigration networks, vehicle trafficking, trafficking in human beings including child pornography, forgery of money and other means of payment, terrorism, and trafficking in radioactive and nuclear substances.

EUROPOL supports MS inter alia by

- facilitating the **exchange of information** between Europol and Europol Liaison Officers (ELOs);
- providing **operational analysis** and supporting Member States' operations;
- providing **expertise and technical support** for investigations and operations carried out within the EU, under the supervision and the legal responsibility of the Member States;
- generating **strategic reports** (e.g. threat assessments) and crime analysis on the basis of information and intelligence supplied by Member States or gathered from other sources.

Especially when it comes to providing expertise and technical support for investigations in the waste field, a specialised unit familiar with the special circumstances of waste management is needed.

The creation of such a unit would require a re-organisation of EUROPOL and demand additional personnel. Thus, such an additional department would also be accompanied with additional costs. Yet, the large influence of organised crime in the waste sector is very important in some European regions thus EUROPOL involvement would be called for.

4.2.1.2.2 *Combating corruption*

Problem to address

Poor implementation of waste legislation is often due to political and administrative corruption.

Description of task and support tools

Authorities and bodies created to combat corruption also should set a focus on corruption issues related to waste management. This may also make use of a special waste crime unit at EUROPOL.

4.2.1.2.3 *Provision of financial incentives*

Problem to address

Adequate implementation of the polluter pays principle[55] – as laid down in Article 14 of the Waste Framework Directive – has the potential to contribute to an effective application of EU waste legislation. It can set financial incentives to comply with the relevant legislation and – on the other hand – can help to provide the necessary financial resources for waste management. The polluter pays principle is one of the classic EU environmental principles, as it was originally adopted in the first action programme of the European Communities on the environment in 1973.[56] Since then, the principle has been included in EU primary law (see Art 191 paragraph 2 TFEU) and transposed by the adoption of secondary legislation (e.g. Environmental Liability Directive[57]).The principle has been part of the waste framework legislation since 1975[58] and was further strengthened in the 2008 Waste Framework Directive.

Moreover, EU structural funds are relevant for establishing the necessary waste infrastructure in many parts of the EU and their application should be examined in this context.

Description of task

One of the identified challenges in waste management and enforcement is the allocation of sufficient resources, including the resources needed to meet inspection and enforcement costs. The polluter pays principle in Waste Framework Directive in its Article 14 provides that the costs of waste management are to be borne by waste producers or waste holders. It is proposed that the way in which this clause is interpreted and operated be explored in more detail as it should provide a means of securing the necessary resources for effective waste management carried out by Member States.

The Commission's approach to align cohesion policy in the future more strongly with the objectives of the Europe 2020 strategy is being welcomed by stakeholders; waste projects will take into account the five-stage waste hierarchy, in other words, they will essentially give preference to

[55] It basically says that "*natural or legal persons governed by public or private law who are responsible for pollution must pay the costs of such measures as are necessary to eliminate that pollution or to reduce it so as to comply with the standards or equivalent measures which enable quality objectives to be met or, where there are no such objectives, so as to comply with the standards or equivalent measures laid down by the public authorities." See* 75/436/Euratom, ECSC, EEC: Council Recommendation of 3 March 1975 regarding cost allocation and action by public authorities on environmental matters, OJ L 194 , 25/07/1975 P. 0001 – 0004.

[56] Declaration of the Council of the European Communities and of the representatives of the Governments of the Member States meeting in the Council of 22 November 1973 on the programme of action of the European Communities on the environment, OJ C 112, 20.12.1973, p. 1–2.

[57] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, OJ L 143, 30.4.2004, p. 56–75.

[58] See Art. 15 of Council Directive 75/442/EEC of 15 July 1975 on waste, OJ L 194, 25.7.1975, p. 39–41.

recycling and recovery of materials from waste over landfill and incineration of waste. However, this can only be done if projects are made accessible for private capital and knowhow.

Support tools

Policy-makers at European level can improve the framework conditions for **alternative financing instruments**, in particular for **public-private partnerships**. In this way, cohesion policy can make a contribution to disseminating high quality environmental standards rapidly across the entire EU.

Such an action would not impact EU personnel levels; a preparatory study could be completed by outside consultants and the recommendations should be able to be executed by current staff. This initiative would continue along the same lines of recent efforts to simplify and make more transparent the process of fund distribution.[59] Similar research could be carried out on options to internalise costs in accordance with the polluter pays principle (such as innovative waste charging systems) as well as on the potential of this principle as laid down in Art. 14 Waste Framework Directive.

4.2.2 Member States

The following tasks on Member States are only illustrative as they will not be considered in the context of the policy options in the further assessment. The policy options to be developed further only focus on the structural changes that can be realised by the EU level. Nevertheless, also enhanced MS efforts are needed to ensure the proper implementation of EU waste legislation.

4.2.2.1 SUFFICIENT PERSONNEL AND ADEQUATE WASTE MANAGEMENT BODIES TO CONTROL AND INSPECT

Problem to address

In some MS, a quantitative and qualitative lack of staff in the waste authorities, preventing authorities from organising waste management in a way completely compliant with EU waste legislation, has been noted by many stakeholders. Closely associated with this problem is the issue of structurally weak authorities, meaning that authorities are, due to their size or the territory that they have to cover, are not able to ensure implementation and enforcement of EU waste legislation.

As regards lack of personnel, quantitative insufficiency means that there is simply not enough staff to deal with all the waste-related issues in a given territory. Qualitative insufficiency means that the staff available is not trained well enough to ensure full compliance with EU waste legislation. In reality, quantitative and qualitative insufficiencies are combined and add up to both lack of staff in general and lack of properly qualified staff in particular.

As regards the adequacy of waste management bodies and authorities, the Member States are responsible for implementing EU waste legislation and have to set up authorities capable of ensuring implementation. Moreover, as a way of example, Art. 34 of the Waste Framework Directive lays down that establishments or undertakings which carry out waste treatment operations (…) shall be subject to appropriate periodic inspections by the competent authorities. Yet, on the basis of

[59] Financial Times (2 December 2010) 'Europe's hidden billions: cohesion for a reason' http://www.ft.com/cms/s/0/e594c934-fe52-11df-abac-00144feab49a.html#ixzz1KAoHy4xo

stakeholder comments, it appears that in some Member States waste authorities (waste management bodies as inspection authorities) are designed in a way that does not allow them to carry out their tasks correctly. Some authorities cover too small a territory to allow them to make use of, for example, economies of scale, leading them to resort to very primitive waste management and enforcement patterns. Some MS do not provide sufficient financing for the waste sector as a whole, which results both in poor material equipment for waste authorities and an insufficient number of staff.

Description of task

As a remedy to this, Member States may:

- design appropriately sized authorities for dealing with waste management
- equip these authorities with qualified personnel which by its number are sufficient to ensure compliance with waste legislation in a given territory

Support tools

One important strategy for promoting the adequate equipment of authorities is to make the political and administrative decision makers (mostly on the regional level) aware of what resources are as a **minimum standard** needed on the level of enforcement and implementation of waste legislation. For this, abstract criteria should be developed to help regional/local decision makers to plan and equip the waste authorities (waste management planning authorities, enforcement authorities, permitting authorities) in a way that allows the authorities to complete their tasks effectively. Here the capacities and competencies needed for the implementation of the different waste-related directives/laws could be outlined (including the required qualifications that inspectors must have), which could help decision makers to base their personnel planning on a solid base – this is especially relevant for new Member States, which had or still have to design new waste permitting and enforcement infrastructure in line with the EU legislation from scratch. Irish and Flemish **internal network** models could serve as a Best Practice. They have been designed to bring together waste practitioners doing different jobs (inspectors, prosecutors etc.) via a network approach. Also **memorandum of understandings** have emerged as best practice in certain areas of waste management, in particular liaison between customs and waste enforcers.

Such blueprints or **draft organisational charts** could be worked out by the Member States themselves reflecting the specific waste-related administrative realities of the respective Member States. Alternatively or additionally, a more basic blueprint could be worked out by the European Commission in co-operation with Member States whereby better performing Member States should be involved to a larger extent. Good basic work covering these issues has already been completed by the IMPEL network.

New financial resources for waste management could be provided by an extended application of the polluter pays principle (see above task 'provision of financial incentives').

4.2.2.2 *IMPROVING INSPECTIONS AND MONITORING OF GOOD IMPLEMENTATION OF EU WASTE LEGISLATION*

4.2.2.2.1 *Best practice on inspections*

Problem to address

In order to improve the effectiveness of their authorities for waste legislation implementation, Member States have to rationally plan their inspection and control activities and set priorities. They have to provide an infrastructure of authorities that are able to cope with the challenge of effective inspections and mapping the status quo of the implementation of EU waste legislation.

Description of task

In order to plan inspections well, the specific authorities need to engage in a consistent monitoring of implementation. In addition to this, they need to be aware of what material, training and equipment is needed to carry out environmental waste-related inspections that comply with EU waste law. This also includes the infrastructure that each MS must have as a minimum in equipping its waste authorities (see preceding section).

Support tools

Member States could work out **guidelines** that would lay down a model permitting authority, a model inspection planning and model site visits adapted to the different waste-related issues that require inspections. Work from the IMPEL network exists on many of these issues, they should in most cases, however, be adapted to the national situation, to the specific issues of waste legislation, and need at times to be updated.

The completion of such guidelines will not generate considerable additional costs. In fact, a more rational planning of inspections and controls could contribute to a better use of available staff, thereby reducing costs in the long run. New guidelines are not likely to meet with much political resistance.

4.2.2.2.2 *Strengthening the awareness of police and co-operation with the police*

Problem to address

Member States should see to it that police forces (both criminal and municipal police) develop a sensitivity for environment-related crime. Police need to understand the social importance of combating environment-related crime. Wherever this applies, police need also to be aware that systematic infractions of waste law is in specific circumstances related to organised crime which needs to be fought with determination and by the competent and appropriately equipped authorities.

Modelled on the area of waste shipment, where a good co-operation between waste authorities, police and customs has been established in many Member States, good routine co-operation should also be achieved in other areas of waste legislation implementation, e.g. with controls of landfills, waste treatment plants, etc. A continuous exchange should be made possible. As responsibility for waste controls and inspections is often at the local level, reliable contacts need to be formed between local authorities and the relevant police forces. National level or inter-regional working

groups can provide background information, training and good practice guidance on what the co-operation should look like and what criteria, including training, such a partnership should include.

Description of task

As a consequence, the concrete task would be to:

- Raise awareness within police forces of the importance of tackling waste-related crime (e.g. via training, seminars, etc.)
- Improve the day-to-day co-operation between police forces and waste authorities including 'rehearsals' of joint inspections in order to facilitate inspections and imposition of immediate enforcement measures
- Involve criminal police in the fight against organised-crime related infractions of waste law

Support tools

Such an improvement would not change the competences of neither the national waste authorities nor the different police forces. Better **training** and **awareness raising** would entail additional costs; however, these should not be too significant. It would be more difficult to recruit additional personnel in the police forces given that political resistance is to be expected from both within the police forces (which departments gets more personnel?) and from fiscal politicians. The effort to involve police more in inspection and control activities is practical and could increase the efficacy of inspections a great deal.

4.2.2.2.3 *Compliance assistance/awareness raising*

Problem to address

It is important that personnel in national authorities, responsible for controlling and permitting waste management operators, has a solid knowledge and understanding of all actual EU waste legislation.

Description of task

Member States should bring together and possibly train permitting authorities on interpreting the current and new legislation so as to lay a common groundwork on which the permitting authorities can operate. Key requirements of waste legislation should be discussed and experience with implementation presented.

Support tools

Implementation problems should be presented and discussed in such **working groups** and common solutions found.[60]

[60] See for such an awareness raising event e.g. the Information Exchange and Awareness Raising Events on landfill of Waste carried out by BiPRO: http://www.bipro.de/waste-events/doc/events07/si_presentation_1bipro_ns.pdf .

4.2.2.2.4 *Promoting good practice cases*

Problem to address

In order to address any irrational political fear of exploding costs at the municipal level caused by moving up the Waste Management Hierarchy (e.g. by raising the share of waste to be recycled), best practice cases need to be presented to the municipalities. These best practice cases should prove that moving up the waste management hierarchy does not necessarily cause (much) higher costs and can be a basis for municipalities to develop their waste management strategies

Description of task

Such good practice cases could be prepared by national or regional level MS authorities or by the European Commission in co-operation with Member States or the IMPEL network.

Support tools

Such **best practice cases** do not concern the actual waste legislation enforcement but rather the design of waste management strategies, which are certainly a highly relevant aspect of implementing EU waste legislation.

No high costs would be involved for the public or private sector. A specific problem is that obtaining reliable costs for the different waste treatment options is difficult.

4.2.2.2.5 *Adequacy of penalties*

Problem to address

Each legislator, by laying down penalties for environmental misdemeanours/crimes, should strive to put off people from engaging in this behaviour. Thus the concrete extent of penalties must be effective with a view to discouraging people from this type of behaviour.

Description of task

In line with this, national legislators should review their penalty system and assess whether the penalties in the environmental and specifically the waste field are adequate and effective. This is the prerogative of Member States.

Support tools

Member states should **collect data** on the use of penalties to make them transparent and allow the monitoring of compliance.

No persistent high costs for the public sector would be anticipated in connection with this task; No large political resistance is to be expected.

4.2.2.3 EXCURSUS: SHARING OF COMPETENCES

When laying down or redefining the share of competences between the public sector and private waste managers in waste collection and waste treatment, Member States should see to it that this share does not too much complicate or even impede an effective enforcement of waste management standards.

Rather negative experiences with regard to controlling the movements of waste flows have been reported from those MS or regions that have chosen to fully liberalise the waste market with the

effect that each household can choose its own waste collector and manager. As a consequence, it has become very difficult for waste authorities to follow up and control the destination of waste streams collected from households by a multitude of different, also very small waste companies, all often competing for the lowest price.

While the issue of the share of responsibility between the private sector and the public sector is a sensitive issue in Europe with MS taking up vastly different approaches, the issue of controllability should be discussed when competences are defined. This could take the form of ensuring that private actors regularly provide substantiated information to public authorities on quantities of waste collected and treated, allowing public authorities to have a transparent picture of waste management operations even when such operations are managed by the private sector. As MS take vastly different approaches, it is anticipated that at the European level authorities can only share positive or negative experiences.

4.2.3 Both EU and MS

4.2.3.1 AN INFORMATION AND BEST PRACTICE SHARING PLATFORM FOR KNOWLEDGE SHARING BETWEEN MEMBER STATES

Problem to address

Implementation of EU waste legislation poses many trans-national challenges (e.g. illegal waste shipments). The exchange of experiences and good practices in waste management and in implementing EU waste legislation is a prerequisite to enhance implementation across the EU.

Description of task

A knowledge-sharing network, enabling MS to share experiences and data on practical implementation issues, was considered helpful by stakeholders.

This may be particularly important for the Waste Shipment Regulation, which is dependent on cross border cooperation, but could encompass the entirety of waste legislation. Such a platform could be built on current projects managed by IMPEL, including the TFS network which runs joint inspection activities, training and encourages knowledge sharing exchanges as well as Cluster 1 of IMPEL's activities focused on permitting, inspection and enforcement.[61]

Support tools

The creation of an information and best practices sharing platform is an initiative which could be spearheaded either by MS or by the Commission, or by a partnership of both. It seems most likely that such an initiative would require funding by the European Commission, but could be managed independently by a **working group** of MS, similar to the EU Cradle to Cradle (C2C) network, which brings together EU regions to share best practices and hosts **targeted projects** on subjects linked to sustainable consumption and production.[62] MS would need to be actively involved to orient exchanges towards key challenges in implementation and enforcement and to benefit from the

[61] IMPEL, Cluster 1 – Permitting, inspection and enforcement: http://impel.eu/cluster-1

[62] Cradle to cradle network: http://www.c2cn.eu/content/project

practical experiences of others. As many notifications on waste infractions come from citizens, an information sharing platform could not only focus on sharing best practices, but could also underline the possibilities for citizens to highlight enforcement failures, clarifying and publicising this process. A number of **key targets** for such a working group/network could be set, with one of these targets focused towards citizens and others focused on implementation and enforcement of specific waste-related Directives, or thematic issues such as bio-waste, prevention, recycling, separate collection, etc.

This initiative should not require additional staff on the part of the European Commission, as it would presumably fall under a currently existing EU grant programme; however, the animation of such a network/working group could be managed by an external consultant or by participating MS themselves. Financial costs could be estimated at around 2.5 million Euros for a two-year period, similar to the C2C network; however, costs involved would depend on the specific actions and tools selected for sharing best practices and information. Political resistance is expected to be minimal.

4.2.3.2 DEVELOPMENT OF STRATEGIC PARTNERSHIPS

Problem to address

Stakeholder partnerships can be effective in dealing with specific enforcement problems.

Description of tasks

Strategic partnerships between stakeholders involved in waste management and waste legislation implementation should be developed.

Support tools

Regulatory bodies can work with the police, as well as customs and border agencies in dealing with large scale waste crime. A lack of dialogue between environmental authorities and the police can hamper effective enforcement; cooperation through defined **working groups** with an associated budget and clear waste enforcement priorities can ameliorate this. Transnational links between authorities are particularly important for such waste acquis as the Waste Shipment Regulation, the WEEE Directive and the ELV Directive, due to potential waste export related issues.

The development of strategic partnerships could also involve building links between local and regional waste authorities and private waste management companies or EU-wide associations; **public-private partnerships** could be particularly relevant for waste product streams covered by EU legislation involving extended producer responsibility clauses, such as WEEE, batteries, and ELV. Partnerships between community organisations and local authorities with regulatory bodies can be effective in dealing with local amenity issues or small scale illegal landfills or waste activities.

Similar to the development of a platform for sharing information and best practices, as discussed above, an initiative for the creation of strategic partnerships would most likely involve funding by the European Commission and management by MS or by an external consultancy. The development of strategic partnerships for implementation and enforcement of EU waste acquis could strongly tie in with current projects underway through knowledge exchange networks such as IMPEL. Strategic partnerships should be focused on a well-defined issue related to waste legislation implementation and enforcement (e.g. shipment of e-waste).

Such an initiative should not require an augmentation in staff on the part of the European Commission; however, the development of strategic partnerships would most likely involve the financial support of the European Commission. In the case of local waste management authorities, building a strategic partnership should not involve a large financial investment. It seems quite possible that such an initiative could be the extension of IMPEL's existing activities.

4.2.3.3 DEVELOPMENT OF GUIDELINES

Problem to address

Waste legislation implementation problems often arise from a lack of waste management expertise and experience in the national and international authorities and bodies responsible for supporting, controlling and enforcing EU waste legislation implementation.

Description of task

As mentioned above, many types of guidelines can be developed either by MS or by the EU Commission or by both in co-operation. This regards, for example, criteria for a rational inspection routine or criteria for robust waste authorities.

Support tools

Guideline documents constitute the most important support tool for this task.

4.3 Feasibility assessment of tasks

This section provides an assessment of the tasks outlined above.

The tasks are assessed using a simple matrix system with the following assessment criteria:

- does the task require legal changes and the set up of new institutions/organisations at the European level;
- would the task involve extra costs for personnel, equipment etc. and if so, to what extent they. (broad assessment);
- does the task seem feasible from a practical point of view.

Table 19: Legend for task assessment table

Colour	Meaning
	Yes
	No
	Highly recommend
	Recommend
	Do not recommend

The following conclusions can be derived from the assessment:

- At EU level, tasks 1.0 to 9.0 prove to be most feasible. These tasks can be comparatively easily implemented and are likely to produce an effective impact/ Therefore, these tasks will be further considered in the definition of the policy options.
- Tasks 14.0 to 15.0 (MS level) and 16.0 to 17.0 (both EU and MS level) are all evaluated as feasible. As the policy options will focus on institutional settings at EU level to support MS in better EU waste legislation implementation, these tasks will not be considered specifically in the policy options. However, it is suggested that tasks 14.0 to 17.0 are implemented by MS (or jointly by EU and MS) in parallel to the policy options.

The outcome of the assessment is presented in the tables below.

Broad assessment of implications of the tasks

Table 20: Assessment of tasks at EU level

Nb.	Task	Possible with current framework	Requires new organisation	Intensity of work to implement instrument	Financial Costs	Feasibility	Recommendation
1.0	*Development of a more systematic approach of identifying lacks in waste*	Yes	No	Low	Low	Yes	++
2.1	*Improvement of the knowledge base for mapping Member States' implementation performance, including analysis of waste management plans, and)*	Yes	No	Low	Low	Yes	++
2.2	*Analysis of implementation reports from Member States, NGOs and stakeholders*	Yes	No	Quite personnel consuming for the Commission and MS	Low to medium	Feasible, but it is time consuming	++
3.0	*More coherent identification of the status of implementation in the Member States (implementation monitoring)*	Yes	No	Might be quite high for European institutions (COM, EEA) and Member States if this involves more frequent and additional reporting	Medium	Yes	++
4.0	*Assistance and guidelines to MS on inspections and monitoring of implementation (Guidelines for Member States on inspection routines)*	Yes	No	Low	Low	Yes	++
5.0	*Training on inspections and enforcement, e.g in cooperation with networks such as IMPEL*	Yes	No	Medium	Medium	Yes	++
6.0	*Awareness raising on waste legislation implementation*	Yes	No	Medium	Medium	Yes	++

Nb.	Task	Possible with current framework	Requires new organisation	Intensity of work to implement instrument	Financial Costs	Feasibility	Recommendation
7.0	*Review and report on national inspection standards, based on agreed EU standards (audits)*	No	No	Medium	Medium	Yes	++
8.0	*Technical and scientific assessments and advice concerning waste related data and various information relating to contents of EU waste legislation*	Yes	No	Low to medium	Low to medium	Yes	++
9.0	*Technical and scientific assessment of the practicality and enforceability of EU waste legislation*	Yes	No	Additional projects need to commissioned	Low	Yes	++
10.0	*Direct on-the-spot controls by the Commission or a separate Waste Agency*	No	No	Intense	High	No	-
11.0	*Creation of a waste unit in Europol*	No	Yes	Intense	Medium	Yes	+
12.0	*Combating corruption*	Changes in the priorities needed	Yes	Intense	Medium	Political resistance likely	++
13.0	*Financial incentives*	No	No (but changes needed)	Medium	Low	Certain amount of political resistance is likely	++

Table 21: Assessment of tasks at MS level

Nb.	Task	Possible with current framework	Requires new organisation	Intensity of work to implement instrument	Financial Costs	Feasibility	Recommendation
14.0	*Sufficient personnel and adequate waste management bodies*	Yes	No	Low intensity of work	Low	Yes	++
15.1	*Best practice on inspections*	Yes	No	Low to medium intensity	Low	Yes	++
15.2	*Strengthening the awareness of police and co-operation with the police*	Yes	No	Low intensity	Low	Yes	++
15.3	*Compliance assistance/awareness raising*	Yes	No	Low-intensity	Low	Yes	++
15.4	*Promoting Best Practice cases*	Yes	Yes	Low intensity	Low	Yes	++
15.5	*Adequacy of penalties*	Yes	Yes	Low intensity	Low	Yes	++
16.0	*Information and best practice sharing platform for knowledge sharing between MS*	Yes	No	Low intensity	Medium for the Commission; limited for MS	Yes	++
17.0	*Development of strategic partnerships*	Yes	No	Low intensity	Medium for the Commission; low to medium for MS	Yes	++

Chapter 5: Policy Options

In brief:	In this chapter three policy options to support better waste legislation implementation are described in detail. These policy options are built on a comprehensive assessment and development of current challenges and barriers (see Chapter 2: and Chapter 3:) as well as on an in-depth analysis of three different potential institutional settings to better support implementation of EU waste legislation. Based on the input from discussions with stakeholders and the Commission, the project team selected three key policy options or arrangements for the implementation of tasks at European level. In Option A, the European Commission leads or carries out the tasks selected in the previous chapter. For this purpose, the Commission would mostly extend current activities but also take on some new tasks, specifically the monitoring and auditing of national control and inspection systems for waste management schemes in Member States. In Option B, the EEA leads or carries out many of the tasks, extending its existing waste data collection activities and taking advantage of its in-house waste expertise. Legal enforcement tasks allocated to the Commission under the Treaty and the proposed inspection audits would, however, be tasks for the Commission. In Option C, a specialised waste agency would execute all tasks, with the same exceptions as in Option B, excepting the audit task, which would remain with the Commission. In this section, the policy options are further described briefly. It will be explained how the tasks (new or existing) will be carried out in each policy option. The main characteristics are pointed out by a table at the beginning of the description of the individual policy tasks. Finally, cornerstones of a regulatory framework for each policy option are developed.

5.1 Policy Option A: 'New and extended tasks for the Commission'

5.1.1 Short characterisation

Table 22: Short characterisation of policy option A: 'New and extended tasks for the Commission'

Main responsibility	
• Commission in cooperation with other existing bodies, such as the EEA, Eurostat, JRC and other relevant national and EU entities	
Main tasks	
1.0	Development of a more systematic approach of identifying lacks in waste legislation implementation
2.0	Improving the knowledge base for mapping MS' implementation performance
3.0	More coherent tracking of the status of implementation in the MS – implementation monitoring'
4.0	Assistance and guidance to Member States on inspections and monitoring of implementation
5.0	New task: Training on inspections and enforcement, e.g in cooperation with networks such as IMPEL
6.0	Awareness raising on waste legislation implementation
7.0	New task: Review and report on national inspection standards, based on agreed EU standards (audits)
8.0	Technical and scientific assessment and advice on waste related data and various information relating to the contents of EU waste legislation
9.0	Technical and scientific assessment of the practicality and enforceability of EU waste legislation
Most relevant changes	
• Enhanced cooperation between relevant EU bodies	
• Strengthening and improvement of work done so far	
• New task: Review and report on national inspection standards (audits)	

Most of the tasks suggested in this option expand activities already carried out by the Commission. However, training on inspections and reviewing and reporting on national inspection standards constitute new tasks, which require additional expertise and probably also additional personnel.

5.1.2 General description

This policy option aims to improve certain aspects on part of the Commission, especially regarding its implementation monitoring work. The tasks (existing and new) identified by the study to monitor the implementation of EU waste law are carried out by the Commission in cooperation with other

existing bodies, such as the EEA, Eurostat, JRC and other relevant national and EU entities. Moreover, under this policy option, the Commission is provided with additional resources and an extended margin for action.

This section summarises the tasks to be completed by the Commission under this policy option and how this should be approached in practice.

Development of a more systematic approach of identifying lacks in waste legislation implementation

A key task for the EU Commission under this policy option is the development of a more systematic and priority-based approach for observing the implementation situation of waste legislation in the Member States, especially the identification of non-compliance or bad compliance with EU waste legislation in Member States. That would help to deal with the important cases more immediately and intensively. The need for a prioritisation has also been highlighted in the Communication "A Europe of results – applying community law" from 2007.[63] The issue has been also addressed with a focus to environmental law implementation in the Commission Communication on implementing European Community Environmental Law of 2008.[64] Both communications laid down a first set of criteria on prioritisation, which could be further adapted to waste law. Guidelines one adequate prioritisation criteria could be developed and provided to Member States as well as to the responsible Commission staff.

Improving the knowledge base for mapping Member States' implementation performance

In order to carry out a prioritisation, the Commission needs to improve its knowledge base on the state of implementation, especially beyond the general reporting commitments of the Member States. This includes the encouragement of civil society (NGO, citizen groups) to report bad implementation of EU waste legislation, which can be facilitated by a number of means (fluid and straightforward communication between Commission and Member States, effective and prompt treatment of complaints in the context of easy complaint handling procedures, confidential telephone lines etc). First of all, the Commission's knowledge base could be extended and strengthened by a more ambitious analysis and follow-up of national waste management plans and implementation reports. Sufficient requirements for Member States reporting commitments have already been adopted to a great extent. Waste management plans – as required by Art.28 of the Waste Framework Directive – have to meet strict standards. These are more stringent than those required by the previous legislation. For example, Member States must carry out an analysis of the current waste management situation and present this in their plans. In this way, extended information on Member States management of waste will be available. It is suggested that the Commission – with the support of the EEA – takes advantage of this information in order to improve its knowledge base.

More coherent tracking of the status of implementation in the Member States – implementation monitoring

This should also be combined with a more centralised reporting by the Commission on the status of the implementation of EU waste legislation). A comprehensive state of play report combining statistics and explanations of the waste management development in Member States would meet

[63] COM(2007) 502 final, pages 8ff.

[64] COM (2008) 2876.

the Commission's priority to have a high emphasis on full waste legislation implementation. Beside the information from the Member State's implementation, the compilation of sufficient data would also require the cooperation with the EEA and Eurostat.

Assistance and guidance to Member States on inspections and monitoring of implementation

Based on this information, the EU Commission should offer concrete guidance on the proper implementation of EU waste legislation to Member States; especially on the inspection of the relevant waste-producing and waste-treating sites. This would be best realised by the production of adequate standards and guidance documents. The Commission could build on the work done so far by the IMPEL network (the European Union Network for the Implementation and Enforcement of Environmental Law).

Training on inspections and enforcement, e.g. in cooperation with networks such as IMPEL

Further guidance could be provided by training of Member States officials that are in charge of the implementation of EU waste legislation. Training should be completed by exchange of best practices on implementation of waste legislation, including inspections and enforcement of EU waste legislation (in cooperation with national authorities, judges, prosecutors, ombudsmen, IMPEL, and other relevant national, EU and international entities). The Commission should employ or work closely with the IMPEL network to organise trainings and should build on the abundant work that is available from IMPEL (such as from projects "Doing the right things" that produced a guidance book to assist environmental authorities in inspections or the IMPEL Review Initiative which is a voluntary scheme for reporting and offering advice on national inspections). In some cases it will be sufficient to disseminate project results from IMPEL better among Member States to raise awareness of those results. In other cases, the basic work would need to be specified and adapted to waste-specific issues. This could help Member States to improve their inspections practice and the implementation monitoring. Guidance and trainings could cover the following issues:

- Model of well-performing waste authorities (number of staff, training, equipment);
- Model of best practice waste inspection planning including setting ex-ante priorities for an optimal use of inspection staff;
- Compliance assistance with EU waste law: here the main and basic requirements of current and new EU waste law can be presented and any problems related to implementation could be debated also with a view to the specific Member State situation;
- Promoting good practices of waste management that comply with all prerequisites of EU waste law, including especially the waste management hierarchy – this promotion should point out that good waste management is also economically and socially affordable.

Awareness raising on waste legislation implementation

Training should also be accompanied by awareness raising campaigns on waste legislation implementation, both to the general public and public authorities. This could be carried out by comprehensive information campaigns that could also be addressed to stakeholders.

Technical and scientific assessment and advice on waste related data and various information relating to the contents of EU waste legislation and **Technical and scientific assessment of the practicality and enforceability of EU waste legislation**')

Implementation of EU waste legislation depends to a great extent on the technical knowledge on the issues. This applies especially to cases in which the Commission is in charge of adopting technical details in the context of comitology procedures.

The success of this policy option would therefore also benefit from an enhanced technical and scientific assessment of both the practicability and enforceability of EU waste legislation as well as the adequate collection and reporting of waste data. In that regard, the Commission will benefit from a closer and more target cooperation with the EEA. Information on certain questions could be provided by external experts. This policy option A should generally be combined with **clearer arrangements and enhanced co-operation**, especially between the EU bodies involved in overseeing/reviewing waste legislation implementation or documenting waste legislation implementation (Eurostat, EEA, Joint Research Centre, Commission), which could be laid down in a cooperation agreement. As regards the responsibilities of each of the four institutions, their fields of activities intermerge at times. Eurostat is responsible for statistical waste data processing including drawing conclusions from these data. The Commission *inter alia* assesses the waste legislation implementation reports from the Member States and draws relevant conclusions which can lead to the initiation of infringement procedures. EEA is *inter alia* responsible to draw up the European State of the Environment Report including the picture in the waste field. Also the EEA provides technical and scientific input in the waste field and carries out technical assessments. The Joint Research Centre is responsible to provide technical and scientific studies, e.g. studies on end-of-life criteria on different waste streams. Given that the four European institutions are all active in the waste field including waste legislation implementation, conflicts of interests and overlapping competences are likely. Thus, a cooperation agreement between those four institutions could better define the roles and the limits of competences of these institutions to avoid double structures and conflicts of interest. An improved cooperation should also include the judicial level. Cooperation with responsible judges should be strengthened, especially through the European Forum of Judges for the Environment and the Association of European Administrative Judges. Also a cooperation with prosecutors could be beneficial. Another focus should be laid on clearer arrangements for cooperation between national authorities, taking into account existing national frameworks which bring together waste practitioners doing different jobs (e.g. Irish and Flemish network models for inspectors, prosecutors etc.). Such cooperation mechanisms could be based on memoranda of understanding (e.g. between customs and environmental authorities in the area of waste shipments).

Review and report on national inspection standards, based on agreed EU standards (audits)

Most importantly, the Commission will be equipped with more power to oversee the implementation of waste legislation in Member States. This is meant to guarantee the success of this policy option. The new task will not include direct intervention of the Commission via on-the-spot controls in the Member States, but focus on increased guidance, monitoring and review of the Member States' inspection activities. National inspections of the relevant sites and operators (waste-producing, waste-treating etc.) are necessary means to enforce EU waste legislation. The Commission would thereby gain a role as an 'auditor' of national authorities and their approaches, similar to DG SANCO's Food and Veterinary's Office (FVO)'s "General Audits". The Commission would gain the power to review, assess and potentially enforce the improvement of national

inspection standards. This would require the development of common inspection standards, which could build on the findings in the Recommendation on minimum criteria for environmental inspections in the Member States as well as the corresponding Communication.[65] The Commission could issue audit programmes in accordance with the model of the FVO. After the review of national inspections, the Commission could present the findings in special reports. In case of shortcomings, Member States could be obliged to adopt action plans, which are assessed and monitored by the Commission. In case of non-compliance with these procedures, the Commission could initiate infringement procedures as last resort.

Establishment of a transnational network

In addition, a committee/network of the relevant national authorities and Member States representatives focusing on the implementation of waste legislation could be set up in order to discuss concrete problems of bad implementation of waste legislation. In its 2008 Communication on implementing European Community Environmental Law, the Commission stated that it will, following the adoption of major new environment directives, establish permanent networks involving Commission officials and Member States contact points. [66]

An informal Directors' group consisting of representatives from the Commission and the Member States has been established by DG Environment in order to advance the current implementation in the Member States. It has held five meetings so far during 2007-2011. Its tasks include ensuring continuity and focused information exchange on implementation among officials at the appropriate executive level; identifying priorities and bottlenecks in implementation and promoting actions at MS level; receiving up-to-date information on concrete cases (for example: contributions made by members of the IMPEL network); comparing performance of the various MS in the waste sector and exchanging best practices; discussing implementation problems and possible solutions to prevent any potential future infringement cases; and promoting the use of financial instruments for improving compliance in the waste sector.

A more formalised approach based on specific EU legislation was set up in the water sector where the meeting of national water directors and a so-called Strategic Co-ordination Group contribute to the implementation of the EU Water legislation (the EU Waster Framework Directive). On a first level, the Water Directors meet regularly and take strategic decisions. These are informal meetings held semi-annually in the Member State currently holding the rotating EU presidency. These meetings are organised and co-ordinated by the Commission. One primary objective of these meetings in the water field has been proper implementation by the Member States of the Water Framework Directive (WFD), whose objective is to have all community waters in good status by 2015. Since May of 2009, the Water Directors have been meeting jointly with the Marine Directors, who are responsible for coastal and marine waters of Member States charged with implementation of the Marine Strategy Framework Directive[67]. At a more technical level, the Strategic Co-ordination Group supports the water directors by discussing technical issues related to EU Water legislation; they comment *inter alia* drafts of guidance documents for different pieces of legislation. They

[65] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on the review of Recommendation 2001/331/EC providing for minimum criteria for environmental inspections in the Member States [SEC(2007) 1493]; COM (2007) 707 final.

[66] COM (2008) 2876.

[67] http://www.eutrio.be/informal-meeting-eu-water-and-marine-directors

prepare the basis for the decisions of the Water Directors. For each topic, a lead country is chosen which is responsible for and finances the meetings. Few issues are financed by the Commission.

Another example of a good-working dialogue platform in the field of nature conservation between national authorities, institutions and interested parties is the European Habitat Forum, which contributes to the implementation of the Natura 2000 network on the basis of the Habitats Directive (FFH Directive).

In addition, the existing IMPEL network could be encouraged to focus more on waste policy and waste legislation implementation. The IMPEL cluster[68] on permitting, inspections and enforcement seems adequate for this. A specialised Committee consisting of high representatives of the waste authorities in the Member States that discusses the major waste management problems and potentially financed by the Commission plus the extension of the current foci of work of the IMPEL network would be an effective, however low-key policy option to foster better waste legislation implementation.

5.1.3 Cornerstones of a regulatory framework

Policy Option A aims at strengthening the Commission´s powers and responsibilities on the basis of its competence related to waste enforcement. In principle, enforcement of EU law including waste law is a Member State responsibility. However, as guardian of the Treaties, the Commission is entitled to check whether the transposition measures of Member States conform to EU law and are effectively applied on the ground.

Identifying gaps in waste legislation implementation, mapping Member State´s performance and monitoring the status of implementation in the Member States are all intrinsic parts of this control function, which may also include the more political issue of awareness raising on waste legislation implementation. The same applies to the preparatory steps of technical-scientific assessment of the practicability and enforceability of EU waste legislation as well as technical-scientific assessment and advice on waste related data and various information relating to the contents of EU waste legislation. Since these technical and scientific tasks are at the core of the EEA´s mandate (see chapter 5.2.3), they imply an enhanced cooperation between the Commission and EEA.

Assistance and guidance to Member States on inspections and monitoring of implementation as well as training on inspections in cooperation with the IMPEL network, on the other hand, are measures of cooperation with Member States concerning their task to ensure enforcement of EU waste law. As long as they do not impose duties on the Member States against their will, such enforcement cooperation measures are compatible with the Commission´s mandate.

Some of these tasks require cooperation between the relevant EU institutions and bodies, whose enhancement, e.g. by clearer arrangements for cooperation, is a task in itself. There is no uniform legal instrument for cooperation between EU institutions and bodies. Besides contracts or other forms of binding cooperation agreements, memoranda of understanding as a softer kind of legal commitment could be used.

[68] The Objectives of the Cluster are to develop new project ideas within the framework of the IMPEL Multi Annual Work Programme, to act as a reference group, steering group or quality review forum for projects and to act as act a think-tank for IMPEL primarily within the Cluster's scope.

Thus, most of the tasks included in Policy Option A could be fulfilled within the current legal framework.

In contrast, the new auditing task of reviewing and reporting on national inspections standards would require new regulation. It is a prerequisite for this task to be carried out that common inspection standards are agreed and adopted at EU level. Only after this has been achieved could a possibility exist to review and report on how Member States inspections relate to the EU standards.

The legally non-binding Recommendation 2001/331/EC on Minimum Criteria for Environmental Inspections[69] may serve as a basis for common standards.[70] Furthermore, for waste shipment, regulated by Regulation 1013/2006/EC[71], activities are under way to develop harmonised criteria and requirements for waste shipment inspections[72] which, when drafted or finalised, could be used as a reference. According to the principle of subsidiarity (Article 5 TEU), the EU is entitled to set binding criteria for inspections in Member States by EU legislation if the objectives of the proposed action cannot be sufficiently achieved by the Member States but can be better achieved at Union level. Thus, the EU would have to prove that the current enforcement of EU waste legislation by Member States via inspections was not sufficient and could be better achieved by harmonised inspection criteria.[73]

Auditing of inspections is currently conducted by the Food and Veterinary Office (FVO) of DG Sanco according to Regulation 882/2004/EC on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules.[74] Thereby, FVO experts carry out general and specific audits in Member States according to an annual control programme. The FVO reports on the findings of each control and makes recommendations if appropriate. The competent authority of the country visited is given the opportunity to comment on the reports at draft stage. If shortcomings are identified, the competent authority is requested to present an action plan to the FVO addressing the shortcomings. Together with other Commission services, the FVO evaluates this plan and monitors its implementation through a number of follow-up activities.[75]

That regulatory framework could serve as a model for corresponding audits in the field of waste legislation implementation. When based on binding EU criteria for waste inspections, the auditing would focus on national inspections being carried out conforming to these criteria. Thus, legislation on auditing would be compatible with the control function of the Commission towards waste legislation implementation conferred upon it by the Treaties.

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[69] Recommendation of 4 April 2001, OJ L 118 0f 27.4.2001, p. 41.

[70] Milieu/AmbienDura/FFact, Study on the feasibility of the establishment of a Waste Implementation Agency, Revised Final Report, 7 December 2009, p. 82.

[71] Regulation of 14 June 2006 on shipments of waste, OJ L 190 of 12.7.2006, p. 1.

[72] Between 25 January and 12 April 2011 a public consultation was carried out on this subject, http://ec.europa.eu/environment/waste/Shipments/news.htm.

[73] See on waste shipments BIO, Environmental, Social and Economic Impact Assessment of Possible Requirements and Criteria for Waste Shipment Inspections, Controls and On-the-Spot Checks, Final Report, 4 June 2010, p. 5-6.

[74] Regulation of 29 April 2004, OJ L 165 of 30.4.2004, p. 1.

[75] See Articles 45 of Regulation 882/2004/EC and the overview in Milieu/AmbienDura/FFact, Study on the feasibility of the establishment of a Waste Implementation Agency, Amended Final Report, 7 December 2009, p. 81 and Final Report: Annexes, 7 December 2009, Annex V, p. 48.

While binding criteria for inspections could be laid down either in a directive or in a regulation, depending on the margin of discretion left to Member States, audits of inspections should be regulated by an EU regulation. Thus, both components may be included in a single regulation. In addition, reference to this legislation by amendment of the Waste Framework Directive 2008/98/EC[76] would contribute to highlighting its importance.

Finally, the establishment of a transnational network for waste legislation implementation could be foreseen in the new regulation on waste inspections or by amendment of the Waste Framework Directive. Such a network could also be established in an informal way, e.g. by extension of the IMPEL network. This may however reduce its impact, e.g. in relation to the number of Member States participating in the network.[77]

[76] Directive 2008/98/EC of 19 November on waste and repealing certain Directives, OJ L 312 of 22.11.2008, p. 3.

[77] See Milieu et al., p. 75.

5.2 Policy Option B: 'New and extended tasks for the EEA'

5.2.1 Short characterisation

Table 23: Short characterisation of policy option B: 'New and extended tasks for the EEA'

Main responsibility	
• EEA providing technical support and assessments regarding all tasks • The Commission will carry out legal enforcement tasks in accordance with the Treaty, monitoring of MS implementation and the proposed auditing of national inspections	
Main tasks	
EEA	
1.0	• Development of a more systematic approach of identifying lacks in waste legislation implementation
2.0	• Improving the knowledge base fin order to support the Commission's mapping of MS' implementation performance
3.0	• Support to the Commission's implementation monitoring: more coherent identification of the status of implementation in the MS
4.0	• Technical support to Member States on inspections and monitoring of implementation
5.0	• Technical support to training on inspections and enforcement, e.g in cooperation with networks such as IMPEL
6.0	• Technical support to awareness raising on waste legislation implementation
8.0	• Technical and scientific assessment and advice on waste related data and various information relating to the contents of EU waste legislation
9.0	• Technical and scientific assessment of the practicality and enforceability of EU waste legislation
Commission	
7.0	• Legal enforcement under the Treaty, monitoring of MS implementation and reviewing and reporting on national inspection standards, based on agreed EU standards (audits)
Most relevant change	
• Strengthening of the work done so far • Increasing the technical expertise in the monitoring process on the implementation of EU waste legislation • Close cooperation between Commission and EEA • Legal enforcement and audit of national implementation measures by Commission	

5.2.2 General description

Under policy option B, the European Environmental Agency (EEA) – the environmental agency of the EU - would play a central role. The EEA is generally in charge of providing:

«(a) objective, reliable and comparable information at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment, and to that end;

(b) the necessary technical and scientific support.»[78]

Under this policy option, the work of the EEA on the waste sector is strengthened and improved. It will be equipped with a number of new tasks.

The EEA would thereby not become a 'political' authority in this scenario as its tasks would be limited to providing technical support and assessments for the Commission's implementation monitoring and enforcement tasks. This would allow an effective identification of the implementation gaps as regards EU waste legislation. The EEA should be a neutral agency with no powers of legal enforcement or audits. This would help to develop a more systematic approach of identifying lacks in waste legislation implementation. It could help to improve the Commission's knowledge base on infringements, especially by a comprehensive analysis and follow-up of Member States' waste management plans and implementation reports. It could offer assistance and guidelines to Member States on inspections and monitoring of implementation, accompanied by training and awareness raising campaigns. Moreover, it could carry out more technical assessments, related to waste data as well as on the practicability and enforceability of EU waste legislation as such. For this, it could built on the work of or even cooperate with the IMPEL network. On this basis, the EEA could inform the Commission on the infringement cases, leaving the decision on the concrete action to the discretion of the Commission. Thus, the political decision on who to prosecute would still be up to the EU Commission as the Guardian of the Treaty.

The advantage of this option would be that the EEA with its relevant technical expertise could focus on the technical issues of EU waste legislation implementation. The key tasks the EA would cover are listed at the beginning of this subchapter and are described in detail in policy option A.

All executive and legal responsibilities (infringement procedures and other enforcement action) shall stay with the Commission. The EEA would remain a scientific body dealing with waste data gathering through Eionet and technical and scientific assessments in the waste sector, while taking up or enhancing documentary implementation work.

In addition, the Commission could be equipped with the task relating to audits of national inspections in Member States, provided EU standards have been agreed and adopted (see above).[79]

All policy options include the establishment of a transnational network. Thus, a committee/network of the relevant national authorities and Member States representatives focusing on the

[78] Article 1 of Regulation (EC) No 401/2009 of the European Parliament and of the Council of 23 April 2009 on the European Environment Agency and the European Environment Information and Observation Network, Official Journal L 126 , 21/05/2009 P. 0013 – 0022.

[79] Please refer to policy option A for the description of the task.

implementation of waste legislation could be set up in order to discuss concrete problems of bad implementation of waste legislation and to exchange best practice.[80]

5.2.3 Cornerstones of a regulatory framework

Under Policy Option B, most of the powers and responsibilities mentioned under Policy Option A would be allocated to the EEA. According to its mandate in Article 1 of Regulation 401/2009/EC[81], the EEA has to provide the Community and the Member States with technical and scientific support in gathering information, assessing measures to protect the environment and informing the public about the state of environment. Thus, in assessing measures to protect the environment, the EEA is involved in the control of the implementation of EU environmental law by the Member States, although, in an indirect way.[82] However, it does not have enforcement powers, but is restricted to preparatory measures of a technical and scientific nature, e.g. in reporting on the state of the environment in the field of waste management.[83] In particular, the EEA is coordinating the European environment information and observation network (Eionet) in order to obtain inter alia comparable environmental data from the Member States at European level[84]. However, apart from this coordination role for Eionet, the EEA is not collecting data on waste, but using the data collected from Eurostat according to Annex I.B (1) of Regulation 401/2009/EC. The EEA is an independent body supporting the Community´s institutions as well as the Member States, as reflected in its governance structure.[85]

The EEA does not only work closely with the Commission and other EU institutions, but also co-operates with other EU bodies concerned with implementation issues. In particular, Regulation 401/2009/EC assigns special tasks for cooperation with the Joint Research Centre and with Eurostat.[86] The Regulation does not foresee a special kind of agreement for these co-operations, except for the co-operation within Eionet, where contracts are highlighted by Article 5. The Eionet group consists of the National Focal Points, the National Reference Centres, the European Topic Centres and representatives of the Commission.[87] Within the 'Group of Four', the EEA, DG Environment, the Institute for Environment and Sustainability of the Joint Research Centre and Eurostat agreed in 2005 on a division of tasks in environmental reporting and disseminating

[80] Please refer to policy option A for the description of this option.

[81] Regulation of 23 April 2009 on the European Environment Agency and the European Environment Information and Observation Network, OJ L 126 of 21.5.2009, p. 13.

[82] For the latter: Statement of Jock Martin, Head of Programme Integrated Environmental Assessment at EEA, of 26.8.2011.

[83] See e. g. The European Environment State and Outlook 2010 – Synthesis with chapter 4 on natural resources and waste, available at http://www.eea.europa.eu/soer/synthesis/synthesis.

[84] See the description of Eionet in http://www.eionet.europa.eu/about.

[85] In accordance with Article 8 and 9 of Regulation 401/2009/EC, the Management Board of the EEA consists of one representative of each Member State, two representatives of the Commission and two scientific personalities designated by the European Parliament. The Management Board appoints the Executive Director as its legal representative on a proposal from the Commission, http://www.eea.europa.eu/about-us/governance.

[86] See Article 15 in connection with Annex I.

[87] http://www.eionet.europa.eu/partners.

information.[88] In particular, the four EU bodies set up Environmental Data Centres and thereby conferred upon Eurostat the leading role for the Data Centre on Waste.[89]

Most of the tasks allocated to the EEA according to Policy Option B could be reconciled with the EEA´s restricted competence under Regulation 401/2009/EC, at least to some extent. This holds especially true for the primary tasks aimed at bridging the knowledge gap through, inter alia, the assessment of new data from the Member States´ waste management plans. To the extent not covered by Regulation 401/2009/EC, EEA´s mandate may be extended if compatible with EEA´s general function as technical-scientific body. Otherwise, Policy Option B could be combined with one of the other Policy Option, e.g. the remaining (parts of the) tasks may be conferred upon the Commission.

In particular, improving the knowledge base for mapping Member States´ implementation performance as a precondition for any further progress on implementation and enforcement of EU waste policy is a core function of the EEA. Being responsible for the assessment on the state of the environment according to Article 2 (e) of Regulation 401/2009/EC, the EEA is the best suited body for the monitoring and analysis of Member States´waste management plans, which will be the main source of information on Member States´ waste management available for the EU.[90] The same applies to the development of a more systematic approach to identifying gaps in waste legislation implementation and a more coherent identification of the status of implementation in the Member States, which may be fulfilled through the EEA´s State of the Environment reports. Equally, technical and scientific assessment and advice on waste related data and various information related to the contents of EU waste legislation are provided for inter alia by the EEA´s expert reports. Furthermore, assistance and guidance to Member States on monitoring of implementation is part of the tasks assigned to EEA.[91]

Assistance and guidance on inspections and training on inspections, e.g. in cooperation with the IMPEL network, are not expressly mentioned in Regulation 401/2009/EC, nor is awareness raising on waste legislation implementation. The latter may be considered to some extent as part of the reporting duty of EEA according to Article 2 (e) of Regulation 401/2009/EC. As for the former, it might be justified as advice to individual Member States on the development, establishment and expansion of their monitoring systems if requested by Member States and compatible with the further requirements in Article 2 (d) of Regulation 401/2009/EC. Furthermore, technical and scientific support for Member States´ inspections and inspectors is compatible with EEA´s mandate when confined to cooperation with the IMPEL network or other bodies in the exchange of information. To assign these tasks in a clear and comprehensive way, however, Regulation 401/2009/EC would have to be modified accordingly.

As already mentioned, auditing of Member State´s inspections on the basis of agreed EU inspection standards would clearly require legal changes, e.g. through a new regulation. New legislation could assign to the EEA tasks related to audits of inspections to the extent compatible with the EEA´s current mandate in Regulation 401/20097EC, or amend this regulation. In order not to change EEA´s

[88] http://www.eea.europa.eu/about-us/key-partners; http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/introduction.

[89] http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/introduction.

[90] See the information requirements in Article 28 (3) of Directive 2008/98/EC.

[91] Article 2 (c) of Regulation 401/2009/EC.

nature as a technical and scientific Community agency, these new tasks should be confined to providing the Commission with technical and scientific support for the audits, which should be executed by auditors from the Commission. Thus, for example, the EEA could give support for reporting requirements on national inspections according to the new binding EU criteria, advise Member States upon their request on the best way to adapt their inspection systems to the new inspection criteria and assess, and contribute to gathering, data on national inspections according to the new EU criteria through Eionet.

The EEA may also cooperate with the transnational network described in chapter 5.1.2 according to Article 3 (3) of Regulation 401/2009/EC.

5.3 Policy Option C: 'EU Waste Agency'

5.3.1 Short characterisation

Table 24: Short characterisation of policy option C: 'EU waste agency'

Main responsibility	
• New EU Waste Agency • Commission	
Main tasks	
1.0	Development of a more systematic approach of identifying lacks in waste legislation implementation
2.0	Improving the knowledge base for mapping MS' implementation performance
3.0	More coherent identification of the status of implementation in the MS – implementation monitoring'
4.0	Assistance and guidance to Member States on inspections and monitoring of implementation
5.0	Training on inspections and enforcement, e.g in cooperation with networks such as IMPEL
6.0	Awareness raising on waste legislation implementation
7.0	Review and report on national inspection standards, based on agreed EU standards (audits)
8.0	Technical and scientific assessment and advice on waste related data and various information relating to the contents of EU waste legislation
Most relevant change	
• Special EU agency with a clear focus on waste • Bundling of expertise • Appreciation of EU waste policy	

5.3.2 General description

As a variation of the policy option B, a specific waste agency could be created that - while having its own legal personality - would co-operate closely with the Commission. This new body would – comparable to the EEA -- carry out the tasks described in detail on policy option A. The feasibility of the establishment of such a body or agency has been assessed comprehensively by a study published by Milieu et al. in 2009 (Study on the feasibility of the establishment of a Waste Implementation Agency). The key advantages would be that the new agency would have a clear focus on waste with a bundling of expertise. The waste sector would be gain more value and attention; which would also increase the awareness and pressure of Member States to properly implement and enforce EU waste legislation.

The main tasks of the agency are listed above and are described in further detail under policy option A.

The waste agency would not be a political agency but rather an administrative and scientific-technical agency with possible additional assignments as training body and information point. However, the waste agency would not carry out audit activities. As in options A and B, the power to audit national inspection systems would remain with the Commission (see also task **"Review and report on national inspection standards, based on agreed EU standards (audits)"**). The study of Milieu et al. suggests that the audit power should always be left to the Commission in order to ensure the independency from Member States in any case.[92]

While the waste agency would consistently map the Member States' implementation performance, the final decision of which case to bring before court would still be up to the European Commission to which the agency would report. As such, the waste agency would carry out very important investigative and monitoring work to gather evidence for bad implementation, but it would be finally the Commission as the Guardian of the Treaty that would initiate infringement procedures.

Again, as policy option A, policy option C shall include the '**Establishment of a transnational network'**. Thus a committee/network of the relevant national authorities and Member States representatives focusing on the implementation of waste legislation could be set up in order to discuss concrete problems of bad implementation of waste legislation and to exchange best practice.[93]

5.3.3 Cornerstones of a regulatory framework

Policy Option C requires the establishment of a new EU agency called 'EU waste agency'. The creation of EU agencies has no formal legal basis in the EU Treaties, but can be based on the relevant Treaty provision governing the area in which they will operate.[94] They are thus established by secondary legislation. According to the ECJ's judgment in the *Meroni* case, the delegation of powers by EU institutions to European agencies is limited to the powers possessed by the delegation institution under the Treaties and to executive powers, excluding discretionary powers.[95] Meanwhile, this restrictive position may be outdated.[96] Nowadays, European agencies are considered a viable means to enable the Commission to concentrate on their political functions and thus to provide for better regulation.[97]

It seems obvious that the tasks assigned to the EEA under Policy Option B could also be allocated to a new Community agency established by European legislation. As mentioned above, the option to establish a European Waste Agency has been assessed comprehensively and recommended by a

[92] Milieu et al. page 115.

[93] Please refer to policy option A for the description of this option.

[94] See ECJ, Case 217/04, *United Kingdom v. European Parliament and others*, judgment of 2 May 2006.

[95] Case 9/56, *Meroni & Co., Industrie Metallurgische SpA v. High Authority* [1958] ECR 133. Accordingly Regulation 58/2003/EC of 19 December 2003, OJ L 11 of 16 January 2003, p. 1.

[96] Klaus Meßerschmidt, Europäisches Umweltrecht, München 2011, p. 468.

[97] See COM(2002) 275 final, p. 5; COM(2002) 718 final, p. 2.

study published by Milieu et al. in 2009 (Study on the feasibility of the establishment of a Waste Implementation Agency).[98]

According to the study, such an agency could fulfil or assist the Commission in executing a variety of tasks including training, enforcement, guidance, support for updating and clarifying legislation, improving information exchange and data gathering.[99] However, the waste agency would not be provided with the power to carry out audits of national inspections. This audit task would be assigned to the Commission. New regulation would be required to empower the Commission to carry out this new review and audit function (for a detailed discussion of the legislative changes needed see chapter 5.1.3).

In providing for technical and scientific assessment and advice on waste related data and various information related to the contents of EU waste legislation, the new agency would have to work closely with EEA and other relevant bodies such as Eurostat[100].

A transnational network could play an important role in supporting the new agency on several tasks, e.g. information exchange on training and enforcement.[101]

The mandate of the European Waste Agency would have to be adapted to these tasks.[102] As the mission of such an agency, the Milieu study proposes the following statement:

"The European Waste Implementation Agency is dedicated to promoting uniform, effective implementation and enforcement of EU waste legislation across the European Union in order to protect human health and the environment. The Agency´s activities support the EU Member States and European Commission in their respective roles."[103]

The organisation of the new agency should be modelled on the governance of existing Community agencies such as the EEA.[104]

[98] Milieu/AmbienDura/FFact, Study on the feasibility of the establishment of a Waste Implementation Agency, Amended Final Report, 7 December 2009.

[99] Milieu et al., p. 10 ff., 71 ff.

[100] See Milieu et al., p. 109.

[101] Milieu et al., p. 115.

[102] See Milieu et al., p. 116-117 in relation to the tasks described in that study.

[103] Milieu et al., p. 116.

[104] Milieu et al., p. 117-118.

Chapter 6: Impact assessment for selected policy options

In brief:	In chapter 6, an impact assessment is performed on the three policy options developed in the previous chapter. The assessment is split into two parts; first, impacts of each option on timeliness of implementation as well as efficiency and aptitude of each body for supporting policy implementation are assessed, then, environmental, economic and social impacts are analysed. A comparative summary of the impact assessment shows the best overall result for option B. Compared to options A and C, this option could be implemented most efficiently, i.e. at lower administrative costs, while still allowing for effective improvement of waste legislation implementation.

6.1 Problem definition

As outlined in chapter 2.1 of this report, serious gaps persist in the implementation of the EU waste acquis. Even though performance in implementing the EU waste acquis heavily varies between MS, some main implementation problems can be observed across the EU:

- Many MS fail to meet recycling targets
- Illegal landfills and illegal waste shipments persist in many MS
- In general, MS do not meet reporting requirements and the quality of EU waste data remains poor
- Many infringement cases are pending
- The waste hierarchy is poorly considered in national waste management systems and many MS still landfill most of their municipal solid waste.

The present study identified environmental, economic and social benefits of a more consistent implementation of the EU waste acquis. A full implementation would reduce total waste generated by 4% and increase the amount of materials recovered from waste by 72% as compared to the current state. Moreover, macroeconomic net costs of waste management would be significantly reduced while the negative effects of waste on human health could be alleviated.

6.2 Objectives of the impact assessment

Different policy options exist that would enable the MS to more effectively and completely implement EU waste legislation. Three policy options have been selected as the most promising ones (see Chapter 5:). The aim of this impact assessment is to analyse and compare the environmental,

economic and social impacts of these three policy options and thus to provide the basis to identify the option, which would support the most effective and consistent implementation of the EU waste acquis.

6.3 Policy options

As discussed in Chapter 5:, this study defined five policy options to strengthen implementation of EU waste legislation. Three out of these five policy options were considered most promising in achieving this purpose, i.e.:

- Policy Option 0: Baseline Scenario

The baseline scenario reflects the current state. This option provides no policy change and no change in the institutional setting to support implementation of EU waste legislation.

- Policy Option A: 'New and extended tasks for the Commission'

This option focuses at improving the Commissions work, particularly the implementation monitoring. Under this option, the Commission would carry out the tasks identified by the study in cooperation with other existing bodies, such as the EEA, Eurostat, JRC and other relevant national and EU entities. This policy option requires that the Commission is provided with additional resources and an extended margin for action.

- Policy Option B: 'New and extended tasks for the EEA'

This option attributes a central role to the EEA, which would carry out new and extended tasks, in cooperation with e.g. the Commission. Auditing tasks remain with the Commission.

- Policy Option C: 'EU Waste Agency'

Policy option C suggests the creation of a specific waste agency that would be responsible for the tasks listed in option A and closely cooperate with the EC. However, the tasks related to auditing national inspections would remain with the Commission.

All three options are complemented by the set up of a network of relevant national authorities and Member States representatives, which would discuss issues related to the implementation of the EU waste acquis, such as concrete implementation challenges or best implementation practices. All three options are described in detail in Chapter 5:.

6.4 Analysis of the impacts (environmental, social and economic) of the different options defined

The impact assessment is split in two sections:

1. In the first section, the timeliness of implementation and the efficiency and aptitude of each body for supporting policy implementation are assessed. It is important to note, that not the implementation of the legislation as such but the execution of tasks to support the

implementation of the EU waste acquis in the MS is assessed for this purpose. This is due to the assumption made that all options achieve full implementation in the long-term. However, they are likely to differ in terms of timeliness, efficiency and aptitude for the defined implementation tasks.

2. In the second section, the environmental, economic and social impacts of the three options are analysed. Once again, it is assumed that each option achieves full EU waste legislation implementation in the long term. Therefore, for this assessment, the baseline scenario (no further development of national waste management systems) is compared to the full implementation scenario.

All impacts are assessed on EU level, i.e. in terms of effects on EU administration or in terms of EU wide social, economic or environmental effects.

Where quantitative assessment is not feasible due to a lack of data or relevant information, a qualitative assessment is made based on the following standard scale:

'+++': very beneficial effect; '++': substantial beneficial effect; '+': slight beneficial effect; '-': negative effect; '--': substantial negative effect; '---': very negative effect; '0' no effect

6.4.1 Impacts on timeliness of implementation and the efficiency and aptitude of each body for supporting policy implementation

In order to analyse timeliness, efficiency and aptitude of the body to support policy implementation, each option is assessed against the criteria outlined in the table below.

Table 25: Indicators and assessment scale for impact assessment

Objectives	Indicators	Description	Assessment scale
Timeliness of implementation	*Completeness of implementation in the **long run***	Measures the level of implementation of the EU waste acquis in the long run.	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. full implementation) to '---' (very negative effect, i.e. seriously enhanced implementation problems)
	*Completeness of implementation in the **medium run***	Measures the level of implementation of the EU waste acquis in the medium run.	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. full implementation) to '---' (very negative effect, i.e. seriously enhanced implementation problems)
Aptitude for implementation activities	*Qualification of personnel carrying out implementation-assistance tasks*	Measures the specialisation/expertise in waste management and policy of staff in bodies responsible for execution of tasks.	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. significantly better qualification compared to current state) to '---' (very negative effect, i.e. significantly lower qualification level)
	Capacity of personnel to carry out implementation-assistance tasks	Measures the availability of staff for execution of implementation-assistance tasks.	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. significantly higher availability compared to current state) to '---' (very negative effect, i.e. significantly lower availability level)
Efficiency of implementation	*Costs to carry out implementation-assistance tasks*	Measures the annual administrative costs for execution of implementation assistance tasks for the involved bodies.	Quantitative assessment in Euros
	Adaptability to current legislative structures	Assesses whether the implementation of the option requires changes in EU law.	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. no legal change necessary) to '---' (very negative effect, i.e. complex legal changes necessary)
	Number of staff members needed to execute implementation-assistance tasks	Measures the number of staff members needed per task	Quantitative assessment in number of staff members per task per body per year
	Duration of implementation	Measures time needed to achieve full implementation	Qualitative assessment on a scale from '+++' (very beneficial effect, i.e. very fast implementation) to '---' (very negative effect, i.e. very slow implementation)

6.4.1.1 TIMELINESS OF IMPLEMENTATION

Timeliness of implementation is assessed in terms of how quickly each option can achieve full implementation of the EU waste acquis. Thus impacts in the medium and in the long term are analysed separately.

- Completeness of implementation in the long term
  - Option 0 (baseline): The continuation of the current state is likely to lead to an overall regress in the implementing EU waste legislation; current implementation gaps will persist and extend, inappropriate treatment technologies will stay in use and motivate more illegal waste shipments across the EU.
  - Option A, Option B and Option C: All three options are assumed to achieve full implementation in the long run.
- Completeness of implementation in the medium term
  - Option 0 (baseline): Without any institutional changes, waste legislation implementation is likely to regress in the medium term. Treatment technologies will not improve while waste volumes increase. This situation leads to an extension of current implementation gaps and many Member States are likely to fail in meeting recycling and reuse targets set by European waste legislation.
  - Option A: This option requires only minor legislative adaptations and is likely to achieve positive effects on waste legislation implementation in the medium run. However, due to a relatively low expertise and capacity for implementation support in this option (see next section), only moderate effects on implementation can be expected in the medium run.
  - Option B: The EEA already has a waste management unit in place and could, therefore, benefit from synergies with existent specialised expertise for setting up and performing the necessary activities to carry out the additional implementation support tasks. Consequently, this option could effectively enhance implementation in the medium run.
  - Option C: The set up of a new waste agency requires legislative changes. Moreover, it takes time for the new personnel to set up the processes and methods for carrying out the implementation support tasks. Therefore, even though the new agency would dispose of a high expertise and capacity, in sum, no significant effects on implementation are expected in the medium term.

The table below summarises the impact assessment for the timeliness of implementation.

Table 26: Impact assessment table for timeliness of implementation

Completeness of implementation in the long term		
Option	Impact	Explanation
Option 0 (baseline)	-	Persistent of current implementation gaps; continued use of inappropriate treatment technologies; increase in illegal waste shipments; overall regress in implementation performance.
Option A	+++	All options are expected to achieve full implementation in the long term.
Option B		
Option C		
Completeness of implementation in the medium term		
Option	Impact	Explanation
Option 0 (baseline)	-	Persistence of current implementation gaps; continued use of inappropriate treatment technologies; increase in illegal waste shipments >> overall regress in implementation performance.
Option A	+	Only minor legal changes required; priority based approach supports consistent focus in implementation across MS; improved knowledge base >> advancements in legislation implementation possible in the medium term
Option B	++	EEA benefits from synergies in terms of expertise and established methods and processes >> enhancements in implementation in the medium term likely.
Option C	0	Set up of new agency requires legal changes; establishment and gaining experience in activities in new agency requires time >> no effects on legislation implementation in the medium term.

6.4.1.2 *APTITUDE FOR IMPLEMENTATION ACTIVITIES*

Aptitude for implementation activities is assessed in terms of the "*expertise of personnel carrying out implementation-assistance tasks"* and the *"capacity of personnel to carry out implementation-assistance tasks".* Even though all three options are assumed to result in full implementation in the long term, aptitude indicates how well suited each institutional setting is for providing support to waste legislation implementation, given existing characteristics.

- Expertise of personnel carrying out implementation-assistance tasks

  - Option 0 (baseline): In this option, the staff of the Commission Services would continue carrying out its current implementation support tasks. No additional personnel resources or staff trainings are foreseen in this scenario. Therefore, option 0 has neither a positive nor a negative effect on the expertise of the personnel carrying out the implementation assistance tasks.

  - Option A: This option suggests that most tasks would be carried out by the Commission, and some tasks, specifically training and awareness raising, are carried out by the Commission in cooperation with the EEA and IMPEL. As the staffs of both the EEA and IMPEL have a high experience in waste management and training activities, overall, the expertise of the personnel carrying out implementation support tasks would be increased in this option.

- Option B: Most tasks would be carried out by the EEA, where a team of waste and statistical experts is already in place. Therefore, in this setting, expertise of personnel carrying out implementation support tasks would be considerably increased.

- Option C: The set up of a specialised waste agency would clearly have the most significant positive impact on the expertise of the personnel carrying out the implementation support tasks. The waste agency would employ a complete team of specialists in waste management and in legislation implementation, thereby combining all skills required to fulfil the implementation support tasks.

▶Capacity of personnel to carry out implementation-assistance tasks

- Option o (baseline): As this option provides neither structural changes nor additional financial or personnel resources for the Commission, capacity for implementation support remains unchanged.

- Option A: This option foresees some additional resources and an extended margin for action for the Commission, specifically to perform the new task of monitoring national inspection systems. As a consequence, the capacity for support of waste legislation implementation slightly increase compared to the current state.

- Option B: Under this option, the EEA receives additional resources for carrying out the new tasks it would assume. Moreover, the EEA can rely on existent expertise in environmental and waste management and benefit from synergies with some of its actual activities such as waste data collection and analysis[105], conduction of waste policy effectiveness studies, country fact-sheets on waste policies[106] or integrated waste-related assessments[107]. Given these additional resources in combination with internal synergies, this option has a considerable positive effect on capacity for waste implementation support.

- Option C: As the new waste agency's mandate would be to support and enhance implementation of EU waste legislation, its staff could fully concentrate on the proposed tasks. Hence, of all options this setting has the highest capacity for implementation support.

The table below presents the impact assessment for the aptitude indicators.

[105] The EEA currently maintains two indicators on waste that are regularly updated: 'Municipal waste generation' (see http://www.eea.europa.eu/data-and-maps/indicators/municipal-waste-generation/municipal-waste-generation-assessment-published-3) and 'Generation and management of packaging waste' (see http://www.eea.europa.eu/data-and-maps/indicators/generation-and-recycling-of-packaging-waste/generation-and-recycling-of-packaging-2). Six more waste indicators are currently under development.

[106] http://scp.eionet.europa.eu/facts/factsheets_waste

[107] http://www.eea.europa.eu/soer/europe/material-resources-and-waste

Table 27: Impact assessment table for aptitude for implementation activities

Expertise of personnel carrying out implementation-assistance tasks		
Option	Impact	Explanation
Option 0 (baseline)	0	Tasks currently carried out by Commission Service personnel; waste management is not a core competence of Commission Services; no additional resources foreseen to improve waste management expertise of Commission Service personnel >> no improvements in expertise of staff.
Option A	+	Training and awareness raising activities carried out in cooperation with EEA and IMPEL; additional resources foreseen, that could be used to contract external experts for technical and scientific assessments >> slight improvement in specialisation of staff.
Option B	++	Most tasks carried out by EEA, where a team of waste and waste statistical experts is already in place >> high specialisation of staff
Option C	+++	Agency would be specifically staffed with experts in waste management, statistics and waste legislation implementation >> very high specialised expertise of staff
Capacity of personnel to carry out implementation-assistance tasks		
Option	Impact	Explanation
Option 0 (baseline)	0	No change in the current institutional setting >> no change in capacity
Option A	+	Some additional resources and extended margin for action for EC, specifically to perform additional monitoring tasks; set up of new methods and processes to carry out new tasks required >> capacity increases
Option B	++	Additional resources for EEA to carry out additional tasks; existent expertise in environmental and waste management; benefits from internal synergies based on existent activities related to waste management such as data collection and analysis and country fact-sheets on waste policies or integrated waste-related assessments >> high capacity
Option C	+++	Agency's main responsibility would consist in enhancement of waste legislation implementation; agency staff could fully focus on respective tasks >> very high capacity

6.4.1.3 *EFFICIENCY OF IMPLEMENTATION*

Efficiency of implementation is assessed in terms of the "a*daptability of each option to the current legislative structure"* and the *"administrative cost to carry out implementation-assistance tasks (including including number of staff members needed to execute implementation tasks)"*

- Adaptability of the institutional setting suggested by each option to the current legislative structure
  - Option 0 (baseline): As this option provides no structural or policy changes it is perfectly compatible with the current legal framework.
  - Option A: The provision of the Commission with the power to audit national inspection standards in Member States requires the adoption of corresponding secondary legislation empowering the Commission to act in this regard.

- Option B: As for option A, changes in secondary EU law are required to empower the Commission to audit national inspection standards in Member States. The assignment of the EEA with some of the new tasks would also require legal changes to adapt the EEA's mandate so as to cover the extended and new tasks.

- Option C: Implementing option C would imply several legislative changes; first, the EU legislative bodies need to provide a legal basis for the Commission to audit national inspection standards in Member States. Second, the set up of a new waste agency constitutes an extension of the European institutional structure and, therefore, requires respective legislative adaptations. In sum, the implementation of option C would require most changes to the current legal framework compared to the other options.

▶Administrative cost to carry out implementation-assistance tasks (including number of staff members needed to execute implementation tasks)

- Option o (baseline): The number of staff and administrative costs do not change in this policy option as it involves no additional tasks or structural changes.

- Option A: This option assumes additional personnel for the Commission Services to have enough capacity for the extended and new tasks, specifically for the monitoring of the Member States' control systems. Consequently, this option implies clearly higher administrative costs compared to the current state.

- Option B: If the EEA would perform all suggested tasks except for the monitoring of the national inspection systems, it would probably need to employ additional personnel. However, as it can rely on synergies with some of its existent activities (e.g. creation of country fact-sheets on waste policies or integrated waste-related assessments), the number of additional staffs required is expected to be lower than in option A. The audit of national inspection systems would remain with the Commission, which would require some additional personnel in the Commission Services (or additional financial resources for outsourcing this task to third party audit-service providers). In sum, this option implies slightly higher administrative costs compared to the current state. But, thanks to potential synergies, option B involves still lower administrative costs than options A and C.

- Option C: As options A and B, option C requires additional personnel resources at the Commission for performing the audits of national inspection systems. In addition to this, the new agency would need to employ a complete team of waste management and legislation experts. In sum, implementing option C would require more additional personnel resources and, as a consequence, highest administrative costs in comparison to all the other options.

The table below presents the impact assessment for the two efficiency indicators.

Table 28: Impact assessment table for efficiency of implementation

Adaptability to current legislative structures		
Option	Impact	Explanation
Option 0 (baseline)	**+++**	Compatible with current legislative structures >> no legal changes required
Option A	**-**	Provision of the Commission with the power to audit national inspection standards in Member States >> legislative changes required
Option B	**-**	Provision of the Commission with the power to audit national inspection standards in Member States requires legislative changes and assignment of some of tasks to the EEA requires adaptation of EEA's mandate >> legislative changes required
Option C	**---**	Creation of a new EU agency >> complex legislative changes required
Administrative cost to carry out implementation-assistance tasks (including number of staff members needed to execute implementation tasks)		
Option	Impact	Explanation
Option 0 (baseline)	**0**	No change in institutional setting >> no changes in administrative cost
Option A	**--**	Additional personnel for Commission foreseen to carry out additional tasks, specifically for auditing MS' control systems >> Rise in number of staff at Commission and increase in administrative cost
Option B	**-**	Additional staff required at Commission to carry out audits of MS control systems; additional personnel resources for EEA foreseen to carry out additional tasks; EEA can benefit from synergies with existing tasks (e.g. improving the knowledge base) for carrying out new tasks, which reduces number of additional staff required at EEA >> Rise in number of staff at Commission and EEA, but benefit from existing expertise at EEA; in sum, increase in administrative cost
Option C	**---**	Additional staff required at Commission to carry out audits of MS control systems; complete new staffing of new agency >> significant increase in number of staff at new agency; some increase in Commission staff; therefore, considerable increase in administrative cost

6.4.2 Environmental, economic and social Impacts

Since each option is supposed to support full implementation of the EU waste acquis, all three options are expected to have the same environmental, social and economic impacts. Hence, the following two scenarios, which were developed in chapter 2.2, are compared:

- **Scenario A** (baseline):
  - No further development of waste management system as compared to 2008
  - Waste generation according to economic growth and historic development (Not affected by waste prevention)
  - Waste treatment capacity stays at 2008 level, additional waste is landfilled
- **Scenario B** (full implementation):
  - Full implementation of waste legislation
  - Reduced waste generation due to waste prevention
  - Waste treatment capacity is extended so that provisions of waste legislation are met

For details on the methodology and data sets applied to calculate the two scenarios see chapter 2.2 and Annexes C and D. All three policy options are expected to result in the full implementation scenario (scenario B) in the long term. However, as discussed in the previous sections, the effects on implementation performance in the medium term might differ between the options. Since these differences between the options' effects on timeliness of implementation were already considered in chapter 6.4.1, only long-term effects are assessed.

A description of the calculation methodology and input data for both scenarios are presented in chapter 2.2 and in Annex D. The key results for the two scenarios are summarised in the table below.

MAIN ENVIRONMENTAL IMPACTS

As shown in the table below, a full implementation would reach a reduction in total waste generation by 4% (i.e. -119 Mt) as compared to the baseline scenario. Amounts of waste landfilled or incinerated without energy recovery could be reduced by 48% (i.e. -931 Mt). The amount of materials recovered from waste would increase by 72% (+686 Mt) whereas the quantity of waste processed for energy recovery would more than double to 231 Mt (+185%).

MAIN ECONOMIC IMPACTS

Taking into account all macro-economic costs of waste management, including health damage costs, full implementation would significantly increase the value gained from waste management (+69%) in terms of revenues from recovered materials, recovered incineration energy, recovered landfill gas energy, GHG emission avoided by material and energy recovery, avoided acidification, avoided eutrophication. Given only a slight rise in gross waste management costs (+5.9%) as compared to the baseline scenario, full implementation would result in a reduction of macroeconomic net costs by 126%. Moreover, 0.4 million more jobs (+21%) would be created in the waste management and recycling sector. Full implementation would also reduce clean-up and repatriation costs for illegal landfills and illegal shipments and foster innovation and growth in eco-industries in Europe. Finally, a consistent implementation of EU waste acquis in all member states

would create an even level playing field for waste management across the EU, i.e. equal competitive and legal conditions for all waste management operators across Europe.

MAIN SOCIAL IMPACTS

By decreasing the amounts of waste produced and by using less harmful treatment technologies, such as incineration with energy recovery, the negative impacts of waste on human health would be reduced for all EU-citizens in the full implementation scenario, leading to increased life expectancies and higher quality of life for all European citizens

Table 29: Summary of environmental, social and economic impacts

Impacts	Scenario A	Scenario B	Absolute change (B-A)	Relative change in % (B-A)/A
Environmental				
Total waste generation	2,984 Mt	2,864 Mt	-119 Mt	-4 %
Treatment:				
• Landfilling, Incineration without energy recovery, other disposal	1,927 Mt	996 Mt	-931 Mt	-48 %
• Material recovery	951 Mt	1,637 Mt	686 Mt	72 %
• Energy recovery	106 Mt	231 Mt	125 Mt	118 %
GHG emissions[1]	n/a	Reduction by 215 $Mt_{CO_{2,e}}$ compared to scenario A	-215 $Mt_{CO_{2,e}}$	n/a
Economic				
Total net costs of waste management	56.8 billion €	-15.0 billion €	-71.8 billion €	-126%
Total value generated[2]	119.9 billion €	202.2 billion €	+82.3 billion €	+69%
Gross costs of waste management[3]	176.7 billion €	187.2 billion €	+10.5 billion €	+5.9%
Total turnover of waste management and recycling[4]	145.0 billion €	186.8 billion €	+41.8 billion €	+29%
Total jobs created[5]	2.0 million	2.4 million	+0.4 million	+21%
Innovation & competition	Clean-up and repatriation costs for illegal landfill containment and illegal shipments; Uneven level playing field	Reduction in clean-up and repatriation costs for illegal landfills and illegal shipments; Increased innovation and growth in eco-industries; Even level playing field for waste management across EU	n/a	n/a
Social				
Health and quality of life	Negative impacts of waste on human health, decreasing quality of life	Reduced impact of waste on human health compared to baseline scenario; increased life expectancies and quality of life for European citizens	n/a	n/a

[1] Difference between total emissions avoided by material and energy recovery and total emission from MSW landfilling; [2] includes revenues from recovered materials, recovered incineration energy, recovered landfill gas energy, GHG emission avoided by material and energy recovery, Avoided acidification, Avoided eutrophication; [3] includes costs of waste management, recycling, waste prevention, GHG emission from MSW landfilling, Ecotoxicity of Zn emissions, Ozone depletion, Endangering species richness by landuse; [4] includes turnover in waste management sector plus turnover in recycled materials sector; [5] includes jobs created in waste management sector and in recycled materials sector

6.5 Comparison of the options

The table below summarises the impact assessment for the baseline scenario and the three options. The following conclusions and recommendations can be drawn from the direct comparison in Table 30 Table 30: Summary of impact assessment:

- **Option o** (i.e. no policy change or adaptations of the institutional setting)**:** Options A, B and C are all assumed to achieve full implementation in the long term and thus their positive environmental, economic and social impacts would be equal. In contrast, the continuation of the current situation (option o) is likely to lead to a regress in overall performance in waste legislation implementation in the long term. Even though, option o implies the lowest administrative costs, as no additional resources are needed to continue working in the current setting, overall economic costs are highest in this scenario. This is owed to the long-term macroeconomic costs resulting from persistent implementation gaps, which clearly outweigh the short-term gains in administrative expenditures. Moreover, option o may allow for serious negative impacts on the environment and human health across the EU in the medium and long term.

→ **DUE TO THE LOW IMPLEMENTATION PERFORMANCE IN THE MEDIUM AND LONG TERM AND THE ENVIRONMENTAL, SOCIAL AND ECONOMIC RISKS INVOLVED, IT IS ADVISABLE TO CONSIDER REVISING THE CURRENT INSTITUTIONAL SETTING IN ORDER TO SUPPORT A BETTER IMPLEMENTATION OF EU WASTE LEGISLATION.**

- **Option A:** This option could be implemented at moderate administrative costs. However, these costs would still be higher than in option B, where the EEA could benefit from internal synergies to execute the extended and new tasks. The aptitude of option A for implementation activities based on the existing set up is likely to be lower than with options B and C. In contrast to the personnel of the EEA or the potential new waste agency, the Commission Services staff (DG Environment) does not generally recruit waste management experts. The DG Environment staff often has a generalist environmental management background. Moreover, regular rotation of personnel between units at DG Environment can hinder the development of in-depth expertise on specific issues (such as waste legislation implementation) and the establishment of a systematic approach to waste legislation implementation. Due to these factors, the capacity to carry out implementation support tasks may be lower in the Commission Services than in the EEA or in a specialised waste agency.

→ **OPTION A IS CONSIDERED MORE COSTLY AND LESS EFFECTIVE THAN OPTION B IN THE MEDIUM RUN.**

- **Option B:** The results from the impact assessment suggest that option B provides, in sum, the most advantageous setting to support better waste implementation. This can be explained by the fact that option B involves relatively low costs and relatively high quality of implementation support at the same time. Consequently, positive impacts on legislation implementation are likely to become manifest within a comparatively short period. The EEA has already a unit of waste experts in place and can benefit from synergies with existent activities, such as the creation of country fact-sheets on waste policies[108], waste data collection and analysis or integrated waste-related assessments[109]. It can rely on this specialised expertise and would require less additional staff compared to options A and C to perform some of the new tasks to support waste legislation implementation.

→ **GIVEN THE RELATIVELY LOW ADMINISTRATIVE COST AND EFFORTS NEEDED TO IMPLEMENT OPTION B AND GIVEN ITS HIGH APTITUDE FOR IMPLEMENTATION SUPPORT, OPTION B PROVIDES A REASONABLE PROPOSITION TO IMPROVE THE IMPLEMENTATION OF EU WASTE LEGISLATION.**

- **Option C:** A specialised waste agency would benefit from the highest aptitude for implementation activities, since such an agency would purposefully be staffed with experts in waste management and waste legislation implementation. The agency would have the highest capacity, since, in contrast to the Commission and EEA, its sole responsibility would be to support waste legislation implementation. However, the set up of a new agency requires significant changes in the legal framework that may present feasibility problems. The agency would need to hire a complete team, rather than building on the work of existing employees, presenting greater personnel than options A and B. Also, it would take time for the agency staff to establish systematic processes and methods to carry out the new tasks and to gain experience in performing these activities. In sum, these necessary efforts may slow down the provision of implementation support early on before presenting benefits, and consequently, limited effects on overall legislation implementation performance are expected in the medium term.

→ **IN COMPARISON TO OPTIONS A AND B, OPTION C CONSTITUTES A MORE COSTLY AND LEGISLATIVELY COMPLEX INSTITUTIONAL SETTING FOR ENHANCING WASTE LEGISLATION IMPLEMENTATION.**

[108] http://scp.eionet.europa.eu/facts/factsheets_waste

[109] http://www.eea.europa.eu/soer/europe/material-resources-and-waste

Table 30: Summary of impact assessment

Indicators	Baseline scenario	Option A	Option B	Option C
Timeliness of implementation	-	++	+++	++
• *Completeness of implementation in the long run*	-	+++	+++	+++
• *Completeness of implementation in the medium run*	-	+	++	o
Aptitude for implementation activities	o	+	++	+++
• *Expertise of personnel carrying out implementation-assistance tasks*	o	+	++	+++
• *Capacity of personnel to carry out implementation-assistance tasks*	o	+	++	+++
Efficiency of implementation	-	--	-	---
• *Adaptability to current legislative structures*	-	-	-	---
• *Administrative cost of implementation (including number of staff members needed to execute implementation tasks)*	o	--	-	---
Environmental impacts	--	++		
• *Waste generation*	--	+		
• *Waste treatment (material & energy recovery, diversion from landfills)*	-	+++		
• *GHG emissions*	--	+		
Economic impacts	-	++		
• *Macroeconomic net costs of waste management*	o	+++		
• *Job creation*	-	+		
• *Innovation & competition*	--	++		
Social impacts	--	+		
• *Health and quality of life*	--	+		
Summary	-	+	++	+

'+++': very beneficial effect; '++': substantial beneficial effect; '+': slight beneficial effect; '-': negative effect, '--': substantial negative effect; '---': very negative effect; 'o' no effect; '>': increase; '<': decrease.

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Annex A: Policy implementation overviews

Annex D contains a factsheet for each of the following EU waste legislation directives:

- Waste Framework Directive
- Landfill Directive
- Incineration Directive
- Waste Shipment Regulation
- Batteries Directive 2006/66/EC
- End-of Life Vehicles Directive 2000/53/EC
- Packaging Directive
- WEEE Directive 2002/96/EC

The factsheets present the state of implementation, barriers to implementation and drivers of implementation for the main provisions of each directive.

Waste Framework Directive

Waste Framework Directive
Provision 1: Waste Hierarchy
Article 4 (1): The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal
State of implementation
While all MS confirm having transposed the Directive into their national law, major differences exist in the implementation of the waste hierarchy and the use of waste as a resource. The degree of recycling/recovery varies both for waste in general and in respect to different waste streams. Increases in recycling and recovery rates appear to be partly due to the implementation of the requirements of the recycling directives and partly due to national waste management policies. Reports have shown that a number of MS still overwhelmingly resort to waste disposal via landfilling, especially for domestic waste; this situation is particularly true for new MS. Some MS, such as Denmark, the Netherlands and Slovenia still employ waste incineration without energy recovery, accounting for 58%, 42% and 11% of waste disposal respectively. There is still significant unused potential for recycling, leaving more than half of the existing resources embedded in waste completely unexploited.

Barriers to implementation
Prevention policy is progressing at differing rates, though this is likely to develop rapidly across the EU as MS design National Waste Prevention Programmes by the 12 December 2013 deadline. A number of MS, including Ireland and Finland, have already prepared National Waste Prevention Programmes. The European Commission's report on the Implementation of the Community Waste Legislation cites a lack of enforcement methods and measures as a barrier to full implementation of the WFD, in part due to the fact that the Waste Framework Directive and the Waste Hierarchy in particular set up a waste management philosophy that does not foresee any mechanism to effectively prevent non-compliance; instead waste stream-specific directives (such as the Packaging Directive, etc.) set enforceable legally binding targets. [6]
Drivers of implementation
The introduction in the revised Waste Framework Directive of recycling targets as follows: • 50% for household waste by 2020 • 70% for non-hazardous construction and demolition waste by 2020 creates enforceable targets, stimulating MS with very high levels of waste disposal in landfills to find ways to improve their recycling rate, especially for domestic waste.
Provision 2: Separate Collection
Article 10 (2): Where necessary to comply with paragraph 1 and to facilitate or improve recovery, waste shall be collected separately if technically, environmentally and economically practicable and shall not be mixed with other waste or other material with different properties
State of implementation
There remain significant deficiencies in waste management infrastructure for separate collection and treatment. Problems remain notably in MS which joined the EU in 2004, where over 90% of waste continued to be landfilled as of 2006. As of 2010, EUROSTAT reported that recycling accounted for 23% of waste treatment across the EU-27, while composting accounted for 17% of all treatment. Separate collection of municipal and industrial packing waste is put in place in all MS, but to varying degrees; for example, with municipal packaging waste, the systems established vary widely in their extension and the materials focused on. Collection of WEEE across the EU-27 was at 22% in 2006.
Barriers to implementation
Barriers to implementation of separate collection include: • Lack of financial and regulatory incentives • Lack of collection infrastructure and processing facilities • Underdeveloped markets • Insufficient public and business awareness and commitment
Drivers of implementation
While the introduction of separate collection and treatment systems can be costly depending on the waste infrastructure in place in a given MS, the possibility for reducing costs via the introduction of separate collection in the long-term can serve as a driver for implementation.

Provision 3: Extended Producer Responsibility
Article 8 (1): In order to strengthen the re-use and the prevention, recycling and other recovery of waste, Member States may take legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has extended producer responsibility. Such measures may include an acceptance of returned products and of the waste that remains after those products have been used, as well as the subsequent management of the waste and financial responsibility for such activities. These measures may include the obligation to provide publicly available information as to the extent to which the product is re-usable and recyclable.
State of implementation
Extended Producer Responsibility has not been formally measured in MS hence making it difficult to assess the state of implementation of the provision.
Barriers to implementation
Barriers to implementation include the lack of a successful collection system already in place as well as motivating consumers to actively participate and separate end-of-life products. Unlike the Packaging Waste Directive which specifies targets for recovery and the WEEE Directive which dictates targets for separate collection and handling, the Waste Framework Directive does not set specific EPR-related targets.
Drivers of implementation
An effective EPR scheme will internalise the true cost of waste management within the retail price of the product and the company producing the product, hence making the producers financially responsible and encouraging them to reduce these costs to remain competitive, in turn promoting eco-design of products. EPR programmes with government enforcement against freeriders produce higher collection and recycling rates than purely voluntary programs. Additionally programmes with government-set goals or mandates for collection and recycling are able to produce higher results than those without goals, unless other significant incentives exist for consumers to participate.
Provision 4: Permitting
Article 23 (1): Member States shall require any establishment or undertaking intending to carry out waste treatment to obtain a permit from the competent authority.
State of implementation
Overall MS appear to have put in place permitting systems; yet, it remains difficult to assess the alignment of such systems with WFD permit specification requirements such as types of waste, precautionary measures and monitoring. However, IPPC permit reporting can serve as a proxy for strictly WFD-related permitting, as often the requirements and permit systems are linked in MS. Over half of MS report above 90% compliance, with 10 reporting 100% compliance on IPPC permitting requirements. A few MS lag behind; the Commission has already taken 6 MS to court for infringements of the IPPC Directive and in October 2010 referred Sweden to the European Court of Justice for the continued operation of 26 installations with permits that have not been updated.
Barriers to implementation
Administrative complexity, potentially long processing time required for permitting and a lack of guidance documents on permitting procedures are potential barriers to implementation of a permitting system in line with the Waste Framework Directive's requirements. Lack of administrative capacities for permit enforcement is an additional barrier to effective implementation for some MS.

Drivers of implementation
Drivers for the effective implementation of permitting regulations laid out in the Waste Framework Directive include the creation of national waste management plans, as required by Article 28 of the WFD, efforts by national governments to minimise administrative complexity when putting in place a permitting system, as well as the preparation of clear guidance documents on permitting for all parties involved in the process.
Provision 5: Bio-waste
Article 22: Member States shall take measures, as appropriate, and in accordance with Articles 4 and 13, to encourage: (a) the separate collection of bio-waste with a view to the composting and digestion of bio-waste; (b) the treatment of bio-waste in a way that fulfils a high level of environmental protection; (c) the use of environmentally safe materials produced from bio-waste.
State of implementation
There are large differences between Member States in MSW and bio-waste management. According to the European Environmental Agency, three main approaches exist: • Countries relying heavily on incineration to divert waste from landfills, accompanied by a high level of material recovery and often advanced strategies promoting biological treatment of waste • Countries with high material recovery rates but relatively low incineration • Countries relying on landfills, where landfill diversion remains a major challenge due to lack of capacity The first approach is associated with Denmark, Sweden, the Flanders region of Belgium, the Netherlands, Luxembourg and France while the second approach is linked with Germany, Austria, Spain, and Italy. Those countries using the third approach are largely new MS. In the EU, bio-waste typically constitutes between 30% and 40% (but ranges from 18% up to 60%) of MSW, the majority of which is treated by options ranking low in the waste hierarchy. On average 41% of MSW is landfilled, while in some MS this percentage exceeds 90%. However, due to the implementation of national policies and the requirements introduced in the Landfill Directive requiring the diversion of bio-waste from landfills, the average amount of landfilled MSW has dropped from 288 to 213 kg/capita/year since 2000. Bio-waste recycling, including both composting and anaerobic digestion, is supported by separate collection in certain MS including Austria, the Netherlands, Germany, Sweden and parts of Belgium, Spain and Italy, while other MS, including the Czech Republic, Denmark and France focus on composting green waste, collecting kitchen waste with MSW. The Green Paper on the management of bio-waste in the European Union, prepared by the European Commission estimates the overall potential for separately collected bio-waste at up to 150 kg/inhabitant/year, or 80 Mt for the EU-27, including kitchen and garden waste from households, park and garden waste from public estates and waste from the food industry. Approximately 30% of this potential, or 24 Mt, are currently collected separately and treated biologically.
Barriers to implementation
Despite the fact that in all regions where separate collection has been introduced it is regarded as a successful waste management option, many MS remain hesitant about the potential costliness and complexity of putting in place a separate collection system for bio-waste.

Drivers of implementation
The binding Landfill Directive targets for biodegradable municipal waste combined with the target for recycling of 50% of household waste by 2020, introduced in Article 11 (1a) of the Waste Framework Directive, which can include bio-waste, incite MS to focus on bio-waste separate collection and recycling mechanisms. The introduction of a separate collection system for bio-waste as well as an assessment on the most appropriate treatment option in a given MS are some of the first steps for increasing bio-waste recycling and fulfilling this WFD provision.
Provision 6: Waste Oils
Article 21 (1): Without prejudice to the obligations related to the management of hazardous waste laid down in Articles 18 and 19, Member States shall take the necessary measures to ensure that: (a) waste oils are collected separately, where this is technically feasible; (b) waste oils are treated in accordance with Articles 4 and 13; (c) where this is technically feasible and economically viable, waste oils of different characteristics are not mixed and waste oils are not mixed with other kinds of waste or substances, if such mixing impedes their treatment.
State of implementation
The previous Waste Oils Directive, 75/429/EEC of 16 June 1975 which was replaced by the revised Waste Framework Directive, was fully transposed by all MS into national legislation, with appropriate permitting and control mechanisms introduced to prevent the negative environmental and health impacts from the management of waste oils. However, the Directive did not bring about expected results as regards the promotion of regeneration of waste oils; despite a legal obligation to promote regeneration, combustion has been the most popular option. Infringement cases were launched and a study concluded that regeneration was environmentally and economically no more beneficial than combustion, hence infringement cases were dropped and the article on Waste Oils in the revised WFD does not give an absolute priority to regeneration [7].
Barriers to implementation
Barriers to implementation are minimal as the older Waste Oils Directive has been fully transposed and ongoing EC reporting indicates implementation across the EU-27.
Drivers of implementation
Drivers of implementation include reporting requirements on waste oil collection and treatment.
Provision 7: Hazardous Waste
Articles 17, 18, 19 and 20 address control of hazardous waste, ban on the mixing of hazardous waste, labelling of hazardous waste and hazardous waste produced by households.
State of implementation
Given that hazardous waste has been treated by a number of pieces of EU legislation since 1975, making it one of the older issues in European waste legislation, the majority of countries have completed the transposition of hazardous waste requirements into national law. Currently Germany and Luxembourg attain the highest levels, of over 50%, for recycling of hazardous waste. Flanders attains 42% while most other MS have much lower recycling rates. However, ongoing reporting by MS on implementation indicates some cases where reporting is insufficiently precise to validate proper implementation of hazardous-waste-related requirements. Additionally, there remain doubts as regards the enforcement of the mixing ban and the related

exemptions from this ban as well as permit requirements [7]. The regularity of inspections was not ensured by several MS and concerns exist on the enforcement of reporting requirements for producers. Situations have arisen in some MS (Italy in particular) where the management of hazardous waste is undertaken by illegal operations, leading to significant deficiencies in human and environmental safety.
Barriers to implementation
While most MS have included requirements on hazardous waste reporting in national legislation, ineffective enforcement of such reporting requirements on hazardous waste and producers of hazardous waste make it difficult to validate the full extent of implementation. A lack of infrastructure appropriate for the correct separation and treatment of hazardous waste in some MS is the largest barrier to effective implementation.
Drivers of implementation
The inclusion of the waste hierarchy in the revised Waste Framework Directive serves as a catalyst for MS to focus on prevention and recovery or recycling of hazardous waste.

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Landfill Directive

Landfill Directive
Provision 1: Closure of illegal landfills
Article 13 requires the closure of landfills when specific conditions are met or at the request of the competent authority.
State of implementation
In 2005, 10 of the EU15 MS reported having zero illegal landfills, due to existing and well-enforced national permitting systems. Belgium, France, Greece and Italy however reported significant numbers of illegal landfills at that time)[1]. In the EU10, only two MS have inventories of illegal landfills (Cyprus and Malta)[2]. Many MS are however aware of the number of closed landfills in their region, and that an unspecified number of them are used as illegal dumping sites.
Barriers to implementation
Lack of information on number and impact of illegal dumpsites and landfills. A divergence in the definition of illegal landfills also makes MS comparison difficult. Lack of efficient/comprehensive national collection systems. Rising waste disposal fees exacerbate difficulties closing illegal sites. Lack of consistent understanding of the Landfill Directive in local administrations hindering coherent implementation. Closure of landfills can create illegal dumpsites without proper enforcement [2].
Drivers of implementation
Historic national legislation requiring the permitting of landfills and its enforcement appears to be a key driver for MS reporting zero illegal landfills on their territory. Prosecution of infractions and high financial penalties, along with physical barriers to sites and surveillance are cited as effective drivers. Incentives for recycling and development of infrastructure for managing specific types of waste. Curbside collection of bulky waste [1]. Inventories of illegal sites support coordinated national response. Information exchange and awareness raising activity has increased understanding of policy and supported its coherent application. Inclusion of illegal landfill sites in MS implementation reporting may further increase awareness/understanding of the problem [2].
Provision 2: Waste Acceptance Criteria
The Waste Acceptance Criteria (WAC) set out in Article 11 of the Landfill Directive and accompanying Council Decision of 2002 govern the entry of hazardous, non-hazardous and inert waste to landfills. It includes lists of wastes accepted without testing, leaching limit values, procedures for specific types of waste such as asbestos, and criteria for waste destined for underground storage, among other specific provisions.
State of implementation
Mechanisms for acceptance of waste established in most EU15 MS. Slight variations in implementation of acceptance procedures such as basic characterisation, testing and on-site verification noted in Wallonia, Greece, Ireland and Spain. Some variation in transposition of acceptance criteria was noted, where more or less stringent criteria were adopted [2]. The 2005 study however had described the implementation of WAC as "slow and sporadic", with some delays in transposition [1].
Barriers to implementation
Discrepancies in the definitions and characterisation of wastes across MS have been a barrier to implementation, as well as the transition to a new system from familiar and well-understood previous systems [1]. Increased administrative burdens and costs associated with new requirements noted in many MS. Preliminary standards for acceptance of waste missing in some MS, impacting effective implementation of subsequent acceptance procedures. Criteria for physical stability and waste

bearing capacity, as well as for stability and non-reactivity of hazardous waste at class B landfills, were under-addressed in transpositions by many MS [3].

Drivers of implementation
Awareness-raising and best practice sharing can support understanding and then application of the WAC. Obligatory sampling procedures at continuous intervals can help generate reliable data on the waste composition (as attempted in Germany and Austria).

Provision 3: Bio-waste diversion targets
Article 5 requires MS to reduce bio municipal waste going to landfill to 75% of 1995 levels by 2006, to 50% by 2009, and to 35% by 2016. Derogations for MS landfilling 80%+ of municipal waste in 1995.
State of implementation
In 2006, attainment of targets among MS varied significantly, with 7 MS meeting the 2016 targets already, 8 MS meeting the 2009 targets, and 8 MS with derogation periods still far from meeting the 2006 targets. Greece, Ireland and Poland had the highest rates of landfilling of biodegradable waste in 2006 [6]. Italy's performance in the separate collection and treatment of bio-waste varies widely by region, with the southern regions far from meeting the 2006 targets, six regions meeting the 2006 target and Lombardy having already reached the 2016 target [5].
Barriers to implementation
Infrastructure for separate collection is insufficient and being outpaced by creation of treatment facilities for bio-waste in some MS. Variable quality of compost, lack of European recognised compost standard (planned in 2008 EU Green Paper), related lack of well-functioning market for compost.
Drivers of implementation
Closing of sub-standard landfills has been an important driver in adoption of other methods of bio-waste treatment. Building of new incinerators and expanding existing capacity. Effective quality standard for compost developed in Finland, Flanders, Germany and Ireland. Increase in gate fees of landfills (Finland, Flanders) and landfill taxes (Estonia, Finland, Flanders, Italy) have been effective where the difference was significant. Some MS are applying severe penalties on municipalities who fail to meet the targets [1]. Pay-as-you-throw systems can be effective where they effect behavioural change among consumers and producers. Clearly defined waste management targets and cooperation between regions are also helpful in meeting objectives [5].

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Incineration Directive

Incineration Directive
Provision 1: Permitting
Article 4 (1): Without prejudice to Article 11 of Directive 75/442/EEC or to Article 3 of Directive 91/689/EEC, no incineration or co-incineration plant shall operate without a permit to carry out these activities.
State of implementation
The majority of MS have effectively transposed permitting requirements into national legislation. In Latvia and the UK, incineration and co-incineration permitting requirements were transposed via the IPPC Directive. Some MS put in place a date for a required update of permits to align with the requirements in the Incineration Directive; others issued general permits requiring inspection only in the case of significant equipment or operational changes. Stricter conditions than those required by the WID have been imposed by 9 MS: Austria, France, Ireland, Italy, the Netherlands, Slovenia, Spain, Sweden and the UK.
Barriers to implementation
While the majority of MS report having put in place permitting requirements, reporting on inspections or verification of permits issued is not available, indicating a potential area for improvement to ensure full and effective implementation.
Drivers of implementation
Inspections and checks on permitting at a national level drive effective implementation of Article 4 of the WID.
Provision 2: Air Emissions Limits Values
Article 7 (1): Incineration plants shall be designed, equipped, built and operated in such a way that the emission limit values set out in Annex V are not exceeded in the exhaust gas.
State of implementation
Overall, through the implementation of Best Available Technology (BAT), MS have achieved Air Emissions Limits Values. The Czech Republic, Hungary, Finland, the Netherlands, Austria, Belgium, Poland, Portugal, Sweden, the UK, France, Slovakia, and Germany all report plants having realised BAT Air Emission Levels. France, Germany, Hungary, and the Czech Republic report the largest number of plants having reached BAT Air Emissions Limits Values. Stricter air emission limit values have been imposed on a number of plants and as a general rule for the incineration and the co-incineration of waste in at least 4 Member States. Austria, the Netherlands, the UK and Luxembourg have put in place Air Emissions Limits for other pollutants than those required by the Directive.
Barriers to implementation
Stakeholders in a study prepared by Ökopol GmbH, raised the point that measurement requirements for air emissions may impose an unnecessary burden on plant operators in certain cases and that further exemptions from these requirements are justifiable, thereby allowing discontinuous, instead of continuous, emissions measurement..
Drivers of implementation
The measureable environmental benefits of reduced air emissions from incineration and co-incineration plants serves as a driver for implementation as well as the complementary, and often stricter, air emissions limits laid out in the IPPC Directive.

Provision 3: Monitoring and Surveillance Systems
Article 10 (1): Measurement equipment shall be installed and techniques used in order to monitor the parameters, conditions and mass concentrations relevant to the incineration or co-incineration process.
State of implementation
Monitoring and surveillance systems appear to be in place in the majority of incineration and co-incineration plants across MS [1]. Romania reported technical problems regarding emissions' monitoring, especially for metals and dioxins, while monitoring and measurements were cited by Spain as a challenge in implementation of the WID. Monitoring and surveillance systems were cited by multiple MS as a challenge for smaller plants. Exceptions for monitoring requirements on HCl, HF and SO_2 were most commonly reported by MS.
Barriers to implementation
The installation of monitoring and surveillance systems is difficult and costly for smaller plants or for certain types of plants, for example, the Slovak Republic cited the high costs involved for effective monitoring at hospital waste incineration plants. Many MS have cited monitoring requirements as overly detailed, with some requirements appearing superfluous.
Drivers of implementation
Similar monitoring requirements in the IPPC Directive and the Incineration Directive, linked to permitting standards, drive implementation of monitoring and surveillance systems.

Sources:

[1] Ökopol, Assessment of the application and possible development of community legislation for the control of waste incineration and co-incineration, November 2007.

http://www.otersu.es/pages/docs/2.Estudios-Publicaciones%20general/46.Estudio_incineracion_Okopol_2007.pdf

Waste Shipment Regulation

Waste Shipment Regulation
Provision 1: Inspections and Spot Checks
Article 50 (2) requires the undertaking of inspections of establishments and spot checks on shipments of waste and on the related recovery or disposal.
State of implementation
Between 2002 and 2009, according to IMPEL, physical inspections increased to roughly 75% of administrative inspections performed, the number of countries performing waste shipment inspections increased from 17 to 22 and the average ratio of transfrontier shipments of waste out of the total number of inspections completed increased from 16% to 19%. IMPEL's Seaport project uncovered approximately 20% of inspected waste shipments as illegal during its initial phase from 2002 to 2004. In the second phase of the Seaport project, from 2004 to 2006, participating countries carried out 175 inspections, comprised of a combination of custom document checks, inspection of storage locations, traffic inspections and inspections of container vessels; 51% of waste shipments checked were found to be illegal, with 43% of shipments detected with infractions, such as missing or incomplete information. The IMPEL-TFS Enforcement Action II Project, spanning 2008 to 2011, completed a set of inspections from November 2008 to April 2009 during which 53 offenses were detected out of 94 control cases.
Barriers to implementation
Lack of infrastructure for the completion of inspections as well as lack of a clearly defined partnership between the competent authority and other organizations such as the customs office, police forces, etc., constitute a problem in many countries. Additional barriers to implementation include the complexity of practical implementation of the WSR, difficulty centralising information, difficulty validating shipment reporting, lack of training and diffusion of competencies on waste inspection, as well as low political prioritisation in some MS.
Drivers of implementation
Participation in IMPEL-TFS and inspection exchange programs as well as the training of customs officers and related authorities can improve the consistency and stringency of inspections and spot checks. Awareness raising and provision of guidance and best practices on implementation of the Waste Shipment Regulation.
Provision 2: Transportation of Hazardous Waste
Article 8 in the Preamble to the WSR states that shipments of hazardous waste are to be reduced to a minimum, consistent with environmentally sound and efficient management of such waste.
State of implementation
Total hazardous waste generation in the EU25 increased slightly from 51 million tonnes in 1997 to 55 million tonnes in 2003; the EU15 generated 42 million tonnes in 2003, an increase of 28% since 1997 while the NMS-10 countries generated 13 million tonnes in 2003, a 29% reduction since 1997. The amount shipped within the EU accounts for approximately 10% to 15% of the total generated amount of hazardous waste, indicating the EU is increasingly acting as a single market for treatment of hazardous and problematic waste. Overall intra-EU waste shipment is increasing due to a rise in transboundary movement of wastes destined for recovery between EU countries, indicating further progress to be made in relation to reducing transport of hazardous waste.
Barriers to implementation
Often shipping takes place because treatment or recovery activities are cheaper in certain EU MS than in others; unless treatment availability and costs are standardised across the EU, hazardous waste shipments will continue. Additionally, variations in the perception of the notification requirements and the choices on how to report to the European Commission makes it difficult to track detailed information on hazardous waste shipments.

Drivers of implementation
Efforts to even out the playing field in terms of pricing and taxes for hazardous waste disposal or recovery are key to reducing shipments of hazardous waste.
Provision 3: Repatriation of waste
Article 25 of the Waste Shipment Regulation makes compulsory the repatriation of illegal waste shipments, either by the person whose action caused the illegal shipment, or failing that case, by the competent authorities of dispatch or destination.
State of implementation
A study prepared by the European Topic Centre on Resource and Waste Management indicates a varying number of instances of repatriation of waste over time in the case of illegal shipments, with no clear trend other than the majority of cases reported by the Netherlands and Belgium, both countries with large seaports. Action in response to the discovery of an infraction or illegal shipment varies by country, with for example, the United Kingdom giving levels of warnings, while Germany fines shipments in violation.
Barriers to implementation
Requirements for repatriation as defined by the Waste Shipment Regulation may not be followed due to confusion on the application of the Regulation or a lack of guidance materials available to customs officers or police officers. Additionally, many countries do not have specific procedures defined for notification and treatment of illegal or infringing waste shipments.
Drivers of implementation
Participation in the IMPEL-TFS project, the creation of partnerships between the competent authority and customs officers or other stakeholders involved in monitoring or handling waste shipments, and the creation at a regional or national level of a procedure for responding to WSR infringements can all contribute to effective repatriation of illegal waste shipments. For countries with procedures already in place, ongoing training and 24-hour availability of the competent authority can be important to ensure effective handling of violations.

Sources:

[1] Consortium ESWI, Services to support the IMPEL network in connection with joint enforcement actions on waste shipment inspections and to coordinate such actions, 15 July 2009.

http://ec.europa.eu/environment/waste/pdf/impel_report_09.pdf

[2] Fischer, Christian et. al., Transboundary shipments of waste in the EU: Developments 1995-2005 and possible drivers, EEA: Copenhagen, 2008.

http://eea.eionet.europa.eu/Public/irc/eionet-circle/etc_waste/library?l=/working_papers/shipments290208pdf/_EN_1.0_&a=d

[3] Isarin, Nancy, IMPEL-TFS Seaport Project: European Enforcement Initiative to Detect Illegal Waste Shipments, 2004.

http://www.inece.org/conference/7/vol1/41_Isarin.pdf

[4] Kiayias, George, The EU Waste Shipment Regulation – Enforcement and Implementation European Commission (PWP Presentation), Brussels, 2008.

http://www.bipro.de/waste-events/doc/events08/hu_pres_1_eu_gk.pdf

[5] UNEP/Basel Convention, Global Trends in Generation and Transboundary Movements of Hazardous Wastes and Other Wastes, Châtelaine, Switzerland, 2002.

http://www.basel.int/natreporting/trends2.pdf

Batteries Directive

Batteries Directive 2006/66/EC
Provision 1: Obligation to introduce free-of-charge separate collection for batteries
Article 8: Member States shall ensure that appropriate collection schemes are in place for waste portable batteries and accumulators and for taking back waste portable batteries or accumulators at no charge.
State of implementation
Reporting on the implementation of the Batteries Directive is not due for completion until September 2012. However, statements by EU Member States in various sources such as country-level waste assessments in the European State of Environment Report (EEA 2010) convey the impression that the implementation of the Batteries Directive is on a similar path as the WEEE Directive. In fact, in some countries, the take-back systems of both seem to be merged to some extent. Most countries for which information is available indicate that a collection scheme is already in place or in the process of implementation. Detailed information statements from MS are provided below. **Austria:** The directive was transposed into national law and the corresponding collection and treatment system, based on experience with voluntary agreements from the early 1990s, established in 2008. **Cyprus:** For batteries, an integrated management plan is already set up. **Estonia:** The set of different policy instruments are in place and implemented – recovery and recycling targets for WEEE, end-of-life vehicles (ELVs), batteries and accumulators. **Finland:** Producer responsibility is included in waste legislation and covers inter alia WEEE, batteries and ELV. **Germany:** A joint return system for batteries, the Stiftung Gemeinsames Rücknahmesystem Batterien (GRS Batterien) has been established. **Greece:** A draft of the act to transpose the directive into national law is under preparation. **Hungary:** Separate waste collection systems were established for wastes for which producers have responsibility (batteries, WEEE…). **Latvia:** Plans to carry out activities to improve the separate collection system for municipal waste up to 2020. This will also help to achieve the targets for collection and recovery of batteries and WEEE. Hazardous wastes are mostly recovered or exported. At present, waste streams such as lead batteries are exported for treatment. **Romania:** Waste laws, harmonised with the European Union legislation, have had a positive impact in the last few years, but considerable efforts are still needed to ensure compliance with EU standards. **Slovenia:** The Batteries Directive was transposed into national law. In 2008, regulations introduced extended producer responsibility for waste batteries and accumulators. Environmental taxes were also introduced for environmental pollution caused by for example ELV, WEEE and batteries.

UK: In response to the Batteries Directive, laws were introduced in February 2010 to enforce battery recycling. Vendors of batteries weighing more than 32kg are required to take back used batteries from the public, free of charge.

Barriers to implementation

Batteries are sold in many shops including grocery stores. Batteries are sold with and in cars, tools and toys. Consequently the batteries market is characterised by a huge number of agents who put batteries on the market and an even bigger number of consumers who use the batteries.

A system which provides free-of-charge take back at the point of sale and at waste collection centres, and which successfully transfers the financial cost for collection and treatment from the producers to the waste collectors and treaters requires a rather complex structure, especially when competing low-cost subsystems exist. Monopolies may arise which need to be kept under close control in order to avoid inefficiencies.

Even if a system of take back points is fully established, and even if the consumer may give back the equipment at the point of sale free of charge, he/she must invest some effort to bring the equipment to a collection location. Especially since batteries are often quite small, the waste bin frequently seems to be the most convenient solution.

Drivers of implementation

A high price of the materials contained in batteries is a strong driving force for the separate collection and recycling of the batteries and may finance part of the system. If primary raw material prices return to lower levels a material tax should be considered.

A transfer of knowledge from EU-MS with longer traditions separate collection for batteries to Member States which are new to this field may be of help.

It is necessary to establish many easily accessible give back/take back points and to motivate people (again and again) to use them. Intensive information and motivation programmes are a necessity.

Provision 2: Minimum separate collection rate for batteries and minimum efficiencies for their recycling

Article 10; Article 12, Annex III, Part B:

Member States shall achieve the following minimum collection rates for all batteries and accumulators combined:

(a) 25 % by 26 September 2012;

(b) 45 % by 26 September 2016.

Recycling processes shall, no later than 26 September 2010, meet the recycling efficiencies

(a) 65 % for lead-acid B&A;

(b) 75 % for nickel-cadmium B&A;

(c) 50 % for other B&A.

State of implementation

A methodology for calculating recycling rates has been proposed by BIPRO et al. (2009).

Battery recycling in Germany, Greece, and Malta has increased over time; according to reporting data available, Germany, Greece, and Luxembourg have achieved collection rates above the minimum collection rates required by 26 September 2016.

Eurostat has not yet published collection and recycling rates for batteries. However, the following details on battery collection/recycling rates, as reported in the 2010 EEA report, can provide some idea of developments/problems in selected countries:

Bulgaria: The amount of recovered batteries and accumulators decreased in 2008, to 8,283 tonnes. The decrease was due to a decrease in treatment of end-of-life vehicles.

Cyprus: Is optimistic about meeting all the required targets of separate collection for 2016.

Germany: The proportion recycled has risen from 19% in 1999 to 92% by 2007, with the return and recycling rate for car batteries at almost 100%. The new Battery Act (Batteriegesetz) which came into effect in December 2009 lays down mandatory collection targets for ordinary batteries – 35% by 2012 and 45% by 2016.

Greece: Collection rates increased from 75% in 2007 to 77% in 2008.

Luxembourg: Up to 50% of old batteries and old accumulators are collected.

Malta: In 2006, 51 tonnes of batteries were shipped abroad for recycling.

Poland: In 2008, 42,211,319 batteries were recovered and 2,696,780 were recycled. More than 2 million nickel-cadmium batteries were recovered and recycled.

Barriers to implementation

Effective separate collection of batteries requires the establishment of many easily accessible give back points at the premises of many different agents and the establishment of the chain from these (well maintained) give back points to collection centres, sorting centres, treatment plants and recycling-material-markets. Many shops only bring very small amounts of batteries onto the market (frequently as part of electronic products). To include them in the battery collection system substantially increases the organisational efforts required, to achieve only small gains.

As some battery types still contain considerable concentrations of mercury, an independent treatment step for the separation of mercury is required. Changes in the market shares of different battery types and new upcoming battery technologies may require new treatment steps. The system requires a considerable capacity of specialised workers and organisational skills to optimise the treatment capacities, materials flows and financial flows of the many different companies and associations involved. Not all skills and capacities required may be available and fundable in the different member states.

For some battery materials only few treatment facilities are available in Europe, heading leading to additional transport costs. For some components of the lithium-ion-battery an efficient recycling infrastructure seems not yet to have been established.

The biggest waste battery flow is the starter batteries in end-of-life vehicles. The loss of end-of-life vehicles by their legal or illegal export draws on the amount of batteries available for recycling and on the economics of the total recycling system.

On a statistical level, there are several barriers to realistically assessing the separate collection and recycling rates: while the number of batteries separately collected is usually well documented, it is difficult to provide the collection rate as a percentage of the total portable consumer battery waste, as the quantities of batteries purchased are not typically tracked. When summing up all the consumer batteries collected separately and the consumer batteries found in different waste types, the total

number could be 30% lower than the number of consumer batteries sold in a given year. It can be assumed that some of the batteries sold in a given year are kept as a future stock by users. However, if all the untracked batteries had remained with the final consumers over the past 10 years, this would represent a phenomenally large volume of batteries.

Drivers of implementation
A high price of the materials contained in batteries is a strong driving force for the separate collection and recycling of the batteries and may finance part of the system. If primary raw material prices return to lower levels, a material tax should be considered. An effective prevention of illegal exports of end-of-life-vehicles and waste from electric and electronic equipment (containing batteries) substantially increases the amount of batteries available for recycling and thus the economic appeal of battery recycling. A transfer of knowledge from EU-MS with longer traditions in the separate collection batteries to Member States which are new to this field may be of help. It is necessary to establish many easily accessible give back/take back points and to motivate people (again and again) to use them. Intensive information and motivation programmes are a necessity.

Abbreviations

B&A	batteries and accumulators, waste from batteries and accumulators

Sources:

[1] BIO Intelligence Service (2003) *Impact Assessment on Selected Policy Options for the Revision of the Battery Directive* European Commission, Brussels.
http://ec.europa.eu/environment/waste/batteries/pdf/eia_batteries_final.pdf

[2] BIPRO, Umweltbundesamt & Enviroplan (2009): Study on the calculation of recycling efficiencies and implementation of export article (Art. 15) of the Batteries Directive 2006/66/EC. Consortium ESWI. München, Wien. http://ec.europa.eu/environment/waste/batteries/pdf/batteries090528_fin.pdf.

[3] BIPRO, Umweltbundesamt & Enviroplan (2010): Exemption for the use of cadmium in portable batteries and accumulators intended for the use in cordless power tools in the context of the batteries directive 2006/66/EC - Replacement of Cadmium Batteries in Cordless Power Tools. http://ec.europa.eu/environment/waste/batteries/pdf/cadmium_report.pdf.

[4] Department of Trade and Industry, UK (2000) *Analysis of the Environmental Impact and Financial Costs of a Possible New European Directive on Batteries,* Oxford.
http://www.berr.gov.uk/files/file30640.pdf

[5] EEA – European Environment Agency (2010): State of Environment Report 2010 – Part C Country Assessments, Waste. Copenhagen.
http://www.eea.europa.eu/soer/countries/

[6] Extended Impact Assessment of the batteries Directive, 2003.
http://ec.europa.eu/environment/waste/batteries/pdf/exten_impact_assessment.pdf.

End-Of-Life Vehicle Directive

End-of Life Vehicles Directive 2000/53/EC
Provision 1: Adequate collection facilities and free take-back
Article 5 and 6: Member States shall ensure the adequate availability of collection facilities within their territory and that all end-of life vehicles are transferred to authorised treatment facilities without any cost for the last holder of the car. ELVs are to be treated and de-polluted in an environmentally friendly way.
State of implementation
22 of the 27 EU MS reported on the state of implementation of the ELV-directive in 2009 (EC 2009). All reporting MS stated that they had taken the necessary measures to ensure that economic operators, in most cases the producers and/or importers of vehicles, set up systems for the collection of end-of-life vehicles and (as far as technically feasible) of used parts removed during repairs and considered as waste, as well as to ensure the adequate availability of collection facilities within their territory. The number of authorised treatment facilities varies from 2 in Cyprus to more than 1,600 in the United Kingdom. In all countries measures were taken to ensure that all end-of-life vehicles are transferred to authorised treatment facilities. All respondents indicated having adopted measures to ensure that end-of-life vehicles can be delivered to authorised treatment facilities without any cost for the last holder or owner. In most Member States the delivery of an end-of-life vehicle is not free of charge if it does not contain the essential components or if it contains waste that had been added to it – an option in line with the Directive. In spite of this relatively positive reporting 9 infringement cases were pending in 2009, indicating that directive 2000/53/EC not yet had been fully of correctly implemented in 9 EU MS (EC 2009). There is evidence suggesting that ELVs are treated illegally in some cases. However, the situation seems to be improving as the number of authorised treatment facilities since 2005 have increased significantly in some MS (e.g. in the UK, Belgium, Greece) (EP 2010).
Barriers to implementation
The ELV-directive lists specific targets and minimum requirements for certain economic actors, but fails to take into account varying abilities to comply. This has been reflected by the failure of many Member States to accomplish transposition of the Directive into law by April 21, 2002. For example, Ireland did not transpose the Directive until 2006.
Drivers of implementation
As take back systems of ELVs are mainly financed by the revenues from the recovered ELV-materials, all measures which keep ELVs from leaving the country illegally and for increasing the rate of recovery also provide incentive for a more complete/better implementation of the take back system. An additional incentive could be provided by the introduction of a deposit-refund system.
Provision 2: Reuse, recovery and recycling rates for ELV
Article 7: By 2006: • Rate for reuse + recovery = 85% • Rate for reuse + recycling = 80%.

By 2015:

- Rate for reuse + recovery = 95%
- Rate for reuse + recycling = 85%.

State of implementation

Most Member States transposed the targets set in the Directive literally. The Netherlands adjusted their initially very ambitious date by which the targets of 95% reuse/recovery and 85% reuse/recycling have to be met from 2007 back to 2015 as required by the Directive. In Bulgaria, a recovery target of 87% and a recycling target of 81% shall be attained by 31 December 2008; a gradual increase to 95% for recovery and 85% for recycling is set for 2015. The Czech Republic, Greece, Hungary, Italy, Latvia, Poland, Portugal, Romania, Slovakia and the United Kingdom made use of the possibility to set lower targets for vehicles produced before 1 January 1980.

Concerning the rates of reuse/recycling and reuse/recovery, the 2006 figures are available for all Member States except Ireland and Malta. In 2006, nineteen Member States (Belgium, Bulgaria, Denmark, Germany, Estonia, Greece, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, the Netherlands, Austria, Poland, Portugal, Slovakia, Finland, Sweden, and the United Kingdom) 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 thirteen Member States (Belgium, Bulgaria, the Czech Republic, Germany, Cyprus, Latvia, Lithuania, Luxembourg, the Netherlands, Austria, Poland, Portugal and Sweden). Spain was close to meeting the target.

In Germany, for example, in 2006 a reuse and recycling rate of 86.8% had been achieved. This, however, affected only 16% of the cars which were removed from the vehicle register that year. There is no information on how many of the exported 'second-hand' cars and of the missing cars were actually re-used or recycled while meeting environmental protection standards.

In Slovakia the number of ELVs treated increased from 723 in 2004 to 67,800 in 2009.

Barriers to implementation

The core problem with the recycling of ELV can be visualised with the example of German statistics:

In 2006, two-thirds of the cars removed from the vehicle register were exported as used vehicles, 56% went to EU countries, 8% to non-EU countries and only 16% were recycled as end-of-life vehicles according to the Federal Statistical Office. The whereabouts of the remaining 20% cannot be statistically verified. There may have been additional, statistically unrecorded, exports as well as thefts or use on private land.

In Austria in 2008 some 26% of the cars removed from registration were treated within the national territory. This phenomenon is not limited to the old EU MS. In Slovenia, for example, out of a total of about 980,000 registered cars only 7,000 were treated as ELV in 2008 (though the reuse and recycling rate lies above 80%).

ELV treatment companies who had invested in increased capacity based on the assumption that the majority of the ELVs would have to be treated within the country (as was the case until some years before 2006) now suffer from the low numbers of ELVs available for treatment. However, those ELVs which are dismantled within the country are not always treated in an optimum way. Certain types of fluids or components such as brake fluids, windscreen washer fluid, oil filters or shock absorbers are not always removed or de-polluted. Usually little effort is put into the removal of components containing heavy metals, such as mercury containing display backlights or switches (EP 2010).

Drivers of implementation

MS should support the establishment of sufficient capacity and skills for environmentally sound

recycling and recovery operations. This may be helped by knowledge transfer from more experienced MS to less experienced MS. They also should increase their efforts in controlling the legal compliance of car dismantlers and the quality of recovery operations. In order to prevent illegal export of ELVs, inspections of transports within the EU and out of the EU should be intensified. When deregistering a car, the next step of its life cycle (its further fate) should be documented.

On the legal level EU-wide binding rules for the distinction between ELVs and used cars may curb illegal exports. It also should be considered if the export of used cars should only be allowed if a waste treatment after use is guaranteed with environmental standards comparable to the EU standards.

On the statistical level improvements may be gained by the implementation of binding rules for the classification of treatment operations for 'recycling', 'recovery' and 'disposal', data collection and balancing methodology.

Abbreviations:

ELV end-of life vehicles

Sources:

[1] EC – European Commission (2009): Report from the Commission to the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions on the Implementation of Directive 2000/53/EC on end-of-life vehicles for the period 2002-2005. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0635:FIN:EN:PDF

[2] EEA – European Environment Agency (2010): State of Environment Report 2010 – Part C Country Assessments, Waste. Copenhagen. www.eea.europa.eu/soer/countries/

[3] EP - European Parliament (2010): End of life vehicles: Legal aspects, national practices and recommendations for future successful approach. Brussels.
www.europarl.europa.eu/activities/committees/studies/download.do?language=en&file=33075

[4] GHK, BIO (2006): A study to examine the benefits of the End of Life Vehicles Directive and the costs and benefits of a revision of the 2015 targets for recycling, re-use and recovery under the ELV Directive, Final Report to DG Environment, A report submitted by GHK In association with Bio Intelligence Service, May 2006.
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www.law.umn.edu/uploads/BX/fw/BXfwZTMoVoxN2BtOQ7E2Vg/Konz-Final-Online-PDF-03.30.09.pdf

[6] Umweltbundesamt (2010): Statusbericht 2009 zum Bundes-Abfallwirtschaftsplan. Klagenfurt, Wien. www.bundesabfallwirtschaftsplan.at

[7] Mehlhart, G., Merz, C., Akkermans, L. & Jordal-Jørgensen, J. (2011). European second-hand car market analysis. Final Report. European Commission - DG Climate Action . Accessed on the 19 September 2011 at : http://www.oeko.de/oekodoc/1114/2011-005-en.pdf
European second-hand car market analysis. Data. Electronic Annex (2011). Accessed on the 19 September 2011 at : http://www.oeko.de/publications/reports_studies/dok/659.php?id=&dokid=1116&anzeige=det&ITitel1=&IAutor1=&ISchlagw1=&sortieren=&dokid=1116

Packaging Directive

Packaging Directive
Provision 1: Essential Requirements
Article 9, the Essential Requirements, states that: 1. Member States shall ensure that three years from the date of the entry into force of this Directive, packaging may be placed on the market only if it complies with all essential requirements defined by this Directive including Annex II. These essential requirements are designed to minimise the environmental impact of packaging, focusing on prevention and minimisation at the source as well as ensuring that waste is recoverable, or recyclable, or reusable.
State of implementation
According to a study by Arcadis on compliance with the Essential Requirements, a large gap between the MS and industry exists in regards to the implementation of and compliance with the Essential Requirements. The industry is very much in favour of the Essential Requirements, as they leave open the option of technical solutions for minimising the amount of packaging, and regret that that so few MS enforce implementation. Authorities, on the other hand, demonstrate minimal interest in enforcing the Essential Requirements, leaving it up to industry to comply. Most MS do not have rules or guidelines for companies to validate compliance with the Essential Requirements, other than compliance with basic standards set out by the European Committee for Standardisation. Four MS, the UK, France, the Czech Republic and Bulgaria, have implementation measures and an enforcement procedure for all three Essential Requirements; however, none of these MS have set up systems to assess the effectiveness of such enforcement mechanisms. Other than occasional communication, company support and awareness raising, enforcement measures focus primarily on the heavy metal content of packaging. However, even as regards this requirement, inspections efforts could be improved and augmented. MS have expressed a desire to exchange knowledge on how to organise on-the-ground inspections for heavy metal content as well as awareness raising programmes enabling knowledge exchange between competent authorities. The general and vague way in which the requirements are formulated and the way in which the standards are defined by the European Committee for Standardisation (CEN standards) make enforcement of the Essential Requirements difficult. However, this approach is perceived as necessary to cover the diverse market of packaging solutions.
Barriers to implementation
The largest barrier to implementation is the lack of precision in the terms of the Essential Requirements, which can be difficult for MS to translate into practical enforcement action. Authorities cite other priorities, lack of staffing and a lack of understanding on how to assess compliance as barriers to more full implementation and enforcement. Additionally, the timing of consideration of the Essential Requirements remains an ambiguous point; debate continues on whether they be considered during the design stage of the packaging or even earlier before strategic discussions regarding the product and its packaging. Interpretation problems with the definition of consumer acceptance and the concept of recyclability also hamper effective implementation of the Essential Requirements.
Drivers of implementation
The key driver of implementation for the Essential Requirements is engagement and efforts on the part of industry to incorporate the principles into their production processes. Additionally, knowledge sharing among competent authorities appears to help implementation.

Provision 2: Recycling and Recovery Targets
Article 6 (1): In order to comply with the objectives of this Directive, Member States shall take the necessary measures to attain the following targets covering the whole of their territory; (a) no later than five years from the date by which this Directive must be implemented in national law, between 50% as a minimum and 65% as a maximum by weight of the packaging waste will be recovered; (b) within this general target, and with the same time limit, between 25% as a minimum and 45 % as a maximum by weight of the totality of packaging materials contained in packaging waste will be recycled with a minimum of 15% by weight for each packaging material;
State of implementation
By 2002, all EU15 countries met their 2001 targets for overall recovery and recycling. The Czech Republic and Hungary met their overall recovery targets by the required 2005 date. Cyprus missed its overall recovery and recycling targets, only reaching 11.1% for both by the required date of 2005, however its recycling target was met by 2006. Malta missed its 2005 overall recycling target, only achieving 10.8% by 2006, while Lithuania missed its overall recovery target only reaching 38.4% by the required 2006 date. By 2006, 13 of the EU-27 MS had already met their overall recovery target for 2008; of the remaining MS, 4 had surpassed the 2001 target level and 10 had not yet reached the 2001 target level. In terms of recycling targets, by 2006, 9 MS had already met their targets for 2008 and of the remaining MS, 17 had surpassed the 2001 level; only 1 had not yet reached the 2001 target level. Out of the 66 million tonnes of packaging waste generated, around 36 million tonnes or 54% were recycled in 2002, which compared with 1997, represents an increase of 9 million tonnes and an 8% increase in the recycling rate. Packaging recovery and incineration at waste incineration plants with energy recovery increased from 31 million tonnes or 52% in 1997 to 41 million tonnes or 62% in 2002. In 2002, all of the 75 different targets applicable to the EU-15 were achieved. While the overall goal of the Directive is prevention of packaging waste generation, MS typically focus on recovery and recycling rates as they are more easily measurable and enforceable. Measures taken to ensure implementation and achievement of the targets include, producer responsibility, mandatory collection or a ban on landfilling of certain waste streams, as well as instruments that aim at improving markets for secondary (recycled) materials. Producer responsibility is the most widely used instrument, reflecting a larger European trend: nearly all countries have placed responsibility on various parties in the packaging chain. However, the requirements and design of such systems vary greatly among MS.
Barriers to implementation
The required interplay and cooperation between public authorities and the private sector has been cited by some MS as causing a barrier to effective implementation and achievement of recovery and recycling targets. Other MS cite the incompatibility between the overall goal of the Directive of preventing packaging waste generation and its focus on recycling. A lack of relevant indicators to track progress on prevention makes it difficult to quantifying packaging waste prevention.
Drivers of implementation
The pre-existence of national legislation and programmes on packaging waste prior to the entry into effect of the Packaging Directive served as a driver to reinforce efforts in certain MS. A focus on extended producer responsibility coupled with use of economic instruments to encourage achievement of recycling and recovery targets has been a particularly effective approach.

Provision 3: Return, Collection and Recovery Systems
Article 7 (1): Member States shall take the necessary measures to ensure that systems are set up to provide for: (a) the return and/or collection of used packaging and/or packaging waste from the consumer, other final user, or from the waste stream in order to channel it to the most appropriate waste management alternatives; (b) the reuse or recovery including recycling of the packaging and/or packaging waste collected, in order to meet the objectives laid down in this Directive.
State of implementation
All MS have taken measures to ensure the creation of return, collection and recovery systems for packaging waste. Most MS have set up producer responsibility systems requiring producers to take back packaging waste, organise their own take back systems or participate in return systems for the return, collection, reuse, recovery or recycling of packaging waste. The specific elements and organisation of such schemes varies among MS. In all countries, industry has been involved in the implementation and design of such systems. Approved collective systems to which producers can sign up have been created in many MS; several MS have also created municipal or public schemes for the return of packaging and packaging waste. Some deposit schemes have been put in place, particularly for drinks packaging, to encourage the return of used packaging. Latvia offers tax relief to businesses that put in place voluntary packaging management programmes. The main impact of return, collection and recovery obligations on MS has been the stabilisation of the internal market for collection and recycling, creating business opportunities and a number of new jobs [2]. The impact of return, collection and recovery obligations on the direct and first round indirect employment rate in the packaging recovery and recycling industry has been estimated by the Commission at 42,000 full time job equivalents [2]. Differences in financing were levelled out to some extent as all MS have put in place financing mechanisms to support packaging recycling systems [2].
Barriers to implementation
The potential complexity of setting up a return, collection and recovery system for packaging waste in MS lacking an existing system is a barrier to implementation. Motivation of the public also contributes to the effective implementation of such systems; lack of awareness or misunderstanding of such a system by the public can lower its efficiency.
Drivers of implementation
Use of tax incentives or the creation of municipal or public schemes can encourage implementation. The creation of approved collective systems to which producers can sign up reduces the complexity of an individual producer putting in place such a system, thus encouraging participation. Communication campaigns to encourage participation in return, collection and recovery schemes can also be a factor.

Sources:

[1] Arcadis, Survey on compliance with Essential Requirements in the MS, 2009.

http://ec.europa.eu/environment/waste/packaging/pdf/report_essential_requirements.pdf

[2] EC, Report from the Commission to the Council and the European Parliament on the Implementation of Directive 94/62/EC on Packaging and Packaging Waste and its Impact on the Environment, as well as on the functioning of the Internal Market, 2006.

www.europen.be/download_protected_file.php?file=109

[3] EC, Study on the implementation of the Packaging Directive and options to strengthen prevention and re-use LDW, 2005.

http://ec.europa.eu/environment/waste/studies/packaging/050224_final_report.pdf

[4] Ecologic & IEEP, A Report on the Implementation of the Packaging and Packaging Waste Directive 94/62/EC, May 2009.

http://ec.europa.eu/environment/waste/reporting/pdf/Packaging%20Directive%20Report.pdf

[5] EEA Report, Effectiveness of packaging waste management systems in selected countries: an EEA pilot study, Copenhagen, 2005.

www.eea.europa.eu/publications/eea_report_2005_3

[6] RDC & Pira, Evaluation of Costs and Benefits for the Achievement of Reuse and the Recycling Targets for the Different Packaging Materials in the Frame of the Packaging and Packaging Waste Directive 94/62/EC, March 2003.

http://ec.europa.eu/environment/waste/studies/packaging/costsbenefits.pdf

WEEE Directive

WEEE Directive 2002/96/EC
Provision 1: Obligation to adopt measures for high level separate collection
Article 5 and 6: Member States shall adopt appropriate measures in order to achieve a high level of separate collection of WEEE. For WEEE from private households, systems shall be established allowing final holders and distributors to return WEEE at least free of charge leading to a collection of 4 kg/capita/year by the end of 2006. Systems shall be established to provide for the treatment of WEEE using best available treatment, recovery and recycling techniques
State of implementation
In the EU, MS systems for the separate collection and treatment of WEEE have been established. However, especially in newer MS there seems to be potential for improving the system. The collection target of 4 kg/capita/year had not been met by five Member States as of 2006 (two other did not report) (EC 2009). The average collection rate in the EU-25 was estimated at around 5.9 kg/capita/year in 2005. In Germany and Austria the collection rate for WEEE from households is approximately 8 kg/capita/year. In Luxembourg as much as 16 kg/capita/year of WEEE was collected separately in 2008 (as compared to 6 kg/capita in 2005).
Barriers to implementation
A system which provides free-of-charge take back at the point of sale and at waste collection centres, which transfers financial means for covering the collection and treatment costs from the producers to the waste collectors and treaters requires a rather complex structure, especially when competing low-cost subsystems exist on the market. Monopolies may arise which need to be kept under close control in order to avoid inefficiencies. Even if a system of take back points is fully established, and even if the consumer can return the equipment at the point of sale free of charge, he/she needs to take invest some effort to bring the equipment to the collection point. Especially for smaller goods the waste bin frequently seems to be the most convenient solution. Emerging electric and electronic equipment contains an ever increasing diversity of chemical elements in low concentrations. For example, a mobile phone may contain as much as 43 different chemical elements. Low concentrations and high diversity make a recovery of the different materials less economically viable and hence generate less income for financing the separate collection system. For some materials only few treatment facilities are available in Europe, leading to additional transport costs.
Drivers of implementation
In countries which not yet have long experience with take back systems and their financing, a knowledge exchange with experts from countries which already have well established systems may be of help. In all countries it is necessary to perform intensive motivation and information campaigns to: • Show private consumers the consequences of mixing WEEE with residual waste

- Show what possibilities they have to bring back WEEE in a convenient way
- Motivate them to bring the WEEE back

This may be part of a wider campaign on motivating citizens about separate collection and food waste prevention, performed primarily in schools but also targeted towards households and cleaning personnel.

Driving implementation may also be based on local waste advisers. Though politicians usually are reluctant to impose a deposit, this measure should be considered if no other measure leads to the targeted results.

Provision 2: Reuse, recycling and recovery targets

Article 7: Following recovery (re-use+recycling) rates shall be achieved by 2006:

80 % (75 %) for large household appliances and automatic dispensers

75 % (65 %) for IT and consumer equipment (TV, radio....)

70 % (50 %) for most other electric/electronic equipment

(80 %) for gas discharge lamps

State of implementation

EERA (European Electronics Recyclers Association) estimates that the amounts of WEEE reported by the EU Member States as being separately collected corresponds to 20 to 33% of the electric and electronic equipment put on the market. The European Commission (EC 2008) finds that

- 33 % of the WEEE generated is separately collected and reported
- 13 % of the WEEE generated is landfilled or incinerated

and concludes that

- the remaining 54 % of the WEEE generated are
  - either separately collected and treated in a not compliant way
  - separately collected and exported without being reported
  - or deposited in illegal landfills

But even when neglecting the unaccounted loss of WEEE, only five Member States met all recycling targets and merely four the recovery targets. In 2009, infringement cases for non-conformity with the WEEE Directive were pending against fourteen Member States and another for failure to report against one MS (EC 2009).

Barriers to implementation

Recycling of WEEE requires a very complex system of collection of many different gadgets and types of gadgets, their disassembly, the compilation of similar components, and their transport and treatment in specialised plants (parts of which are metallurgical). The system requires a considerable capacity of specialised workers and organisational skills to optimise the treatment capacities, material flows and financial flows of the many different companies and associations involved. Not all skills and capacities required may be available and fundable in the different member states.

While 20 years ago a mobile phone contained some 12 chemical elements it now contains more than 40 in ever decreasing concentrations (Hagelücken 2010).

While existing WEEE recycling is already labour intensive (material recycling from waste creates 5 to 7 times more jobs than disposal by incineration and 10 times more jobs than disposal on landfills (EC

2008)) the increasing diversity of electric and electronic equipment and of the chemical elements included in WEEE makes recycling even more labour intensive. Decreasing concentrations for some chemical elements lead to thermodynamic borders, meaning that more resources have to be invested than can be gained. Diversification of chemical elements and components and decreasing concentrations lead also to a concentration of treatment towards the most economic elements and the most abundant components, while less usual components cannot be recycled in an efficient way.

There also may be differences in determining the base figures for calculating the recovery and recycling rates, which may require further standardisation.

Drivers of implementation
In principle, high raw material prices are the main drivers for recycling. If the market prices return to a lower level, a raw material tax should be considered. Higher volumes of WEEE separately collected and recycled make recycling more economically appealing. Therefore any effort to increase the share of WEEE separately collected and treated in a registered way also supports recycling. Important measures would be the effective prevention of illegal WEEE exports, the elimination of non-compliant landfilling and the motivation of final consumers to bring back WEEE to separate collection points. The difference in the recycling rates between MS may be a hint that less successful MS may require organisational support in financing and operating their WEEE collection and recycling system. It also possible that more successful MS may provide some advice and support capacity building. A more standardised collection of base data for calculating the recovery/recycling rates may make the rates of the different Member States more comparable.

Sources:

[1] EC - European Commission (2008): Commission staff working paper accompanying the proposal for a directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) (recast) - Impact Assessment {COM(2008) 810 final} {SEC(2008) 2934}. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2008:2933:FIN:EN:PDF

[2] EC - European Commission (2009): Report from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on implementation of the community waste legislation Directive 2006/12/EC on waste, Directive 91/689/EEC on hazardous waste, Directive 75/439/EEC on waste oils, Directive 86/278/EEC on sewage sludge, Directive 94/62/EC on packaging and packaging waste, Directive 1999/31/EC on the landfill of waste and Directive 2002/96/EC on waste electrical and electronic equipment for the period 2004-2006 {SEC(2009)1586}. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0633:FIN:EN:PDF

[3] EEA – European Environment Agency (2010): State of Environment Report 2010 – Part C Country Assessments, Waste. Copenhagen. www.eea.europa.eu/soer/countries/

[4] Hagelücken, Ch. (2010): Wir brauchen eine globale Recyclingwirtschaft - mit völlig neuen Ansätzen. Proc. Wie sicher ist die Rohstoffversorgung für die Energietechnologien der Zukunft? Vienna, 11.10.2010. www.nachhaltigwirtschaften.at/nw_pdf/events/20101011_rohstoffversorgung_christian_hagelueken.pdf.

[5] Ökopol, IIIEE Lund University & RPA (2007): "The producer responsibility principle of Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)". http://ec.europa.eu/environment/waste/weee/pdf/final_rep_okopol.pdf

[6] Umweltbundesamt (2010): Statusbericht 2009 zum Bundes-Abfallwirtschaftsplan. Klagenfurt, Wien. www.bundesabfallwirtschaftsplan.at.

[7] UNU, AEA, REC, Gaiker & TU Delft (2007): "2008 Review of Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)". http://ec.europa.eu/environment/waste/weee/pdf/final_rep_unu.pdf

Annex B: Case studies

Port of Rotterdam: Waste Shipment Regulation Enforcement

Context

Since 1995, the Netherlands has put in place stringent environmental standards for waste recovery and disposal, using monitoring and registration practices, introducing minimum standards for permits procedures and the notion of producer responsibility, as well as applying market forces to waste management[110]. Additionally, a landfill tax and local waste taxes have been introduced. Separate collection is a hallmark of Dutch waste policy. While total waste generation in the Netherlands grew from 47 Mt in 1985 to over 63 Mt in 2000, since 2000 waste volumes have decreased and are currently at approximately 60 Mt[111].

Since the introduction of the Waste Shipment Regulation (ECC regulation 259/93 of 1 February 1993 then 1013/2006), the Netherlands has addressed issues related to waste shipment notably through the Port of Rotterdam, as part of their waste management plan. Rotterdam is one of the main ports and largest logistical and industrial hubs in Europe, boasting an annual throughput of 400 million tonnes of cargo in 2009[112]. Costly repatriation requests from Asia, leading to an increase in public and political awareness of waste shipment issues, and the position of Rotterdam as a primary transit hub and point of exit from the EU have been primary drivers of the focus on waste shipment issues at the Port of Rotterdam. With the disappearance of the internal borders in the EU, Customs Officers' activities have been focused on the EU's external borders, notably the Port of Rotterdam.

As reported by the European Environment Agency, transboundary shipment of waste increased significantly between the period 1995-2005. In 2003, approximately 8.6 tonnes of hazardous and problematic waste were shipped across European borders, with over 90% of this volume destined for other EU countries, 80% for recovery and 20% for disposal.[113] In addition to transboundary waste exchanges in the EU, there is a trend towards waste exportation towards Asia and Africa. The European Environment Agency cites paper and metal as comprising the main flows of non-hazardous waste streams out of the EU in 2005, totalling around 8 and 10 million tonnes respectively, with the vast majority destined for the Far East. Concerns over shipping to developing countries are primarily the illegal export of hazardous waste and the shipment of electrical and electronic waste falsely declared as second-hand goods.

[110] "The Dutch Waste Profile 1999-2005" Waste Management Autority Senternovem, 2006.

[111] EEA (2010) *The European Environment – State and Outlook 2010*
www.eea.europa.eu/soer/countries/nl/soertopic_view?topic=waste

[112] Port of Rotterdam website
www.portofrotterdam.com/en/Port/port-in-general/Pages/default.aspx

[113] EEA (2008) *Transboundary shipments of waste in the EU: Developments 1995-2005 and possible drivers*

The Netherlands and the Port of Rotterdam have taken a leading role within the EU on waste shipment regulation enforcement, notably participating and acting as a leader in IMPEL, the European Union Network for the Implementation and Enforcement of Environmental Law, and their Transfrontier Shipment network (TFS-network). The TFS network organises a number of activities including exchange of inspectors and joint inspection activities. The Inspectorate for Housing, Spatial Planning and the Environment is the competent authority for the enforcement of the WSR in the Netherlands, but relies on a network of partners for effective enforcement: the National Police Services (KLPD), the Tax and Customs Administration, the Transport and Water Management Inspectorate (IVW) and the regional police forces. For the purposes of enforcing the WSR, a guide on how to act when an infringement is detected has been prepared by the Inspectorate, known as the VIP EVOA[114].

Marina de Gier, Programme Manager for International Waste Affairs at the Inspectorate for Housing, Spatial Planning and the Environment, highlighted the importance of the partnership between the Inspectorate and the Customs Officers in enforcing waste shipment regulations in the Port of Rotterdam[115]. Customs Officers are trained on illegal and hazardous waste concerns and a convention has been put in place allowing Customs Officers to take immediate action on irregular shipments. The Inspectorate deals with more difficult cases and has a telephone service for information available for Customs Officers at all times. An extensive exchange of information between the Customs Office and the Inspectorate allows the Inspectorate to identify risk profiles each year based on waste streams or countries of import or export most likely to be problematic, guiding the Customs Officers in their inspections.

The Netherlands and particularly the Port of Rotterdam have prioritised WEEE shipments as a concern since 2004. Initial research on illegal WEEE shipments was completed in 2000 and 2001 and additional projects focused on investigating the regional streams of WEEE, incentives for its illegal shipment and parties involved. Carl Huijbregts of the Inspectorate for Housing, Spatial Planning and the Environment underlined the importance of the use of a supply chain approach in this exercise; inspections and investigations were completed for retailers, municipalities and traders, not just at port locations[116]. This initial exercise led not only to the exposure of a major electronics retailer as being at the root of much illegal WEEE shipping, but also to the creation of a guidance document on WEEE shipments for use by Customs Officers and Inspectors. Additionally, the Inspectorate initiated a number of projects with African and other developing countries to better understand the illegal e-waste trade and create partnerships to reduce such trade.

Economic impacts

IMPACTS ON TURNOVER OF WASTE AND RELATED INDUSTRIES

Stricter enforcement of the Waste Shipment Directive would most likely impact the turnover of the waste management and recycling industries. Increased stringency on the shipment of certain waste

114 "Inspectorate for Housing, Spatial Planning and the Environment procedure on Regulation 1013/2006 VIP EVOA", 1 January 2009.

115 Interview with Marina de Gier, December 2010.

116 Interview with Carl Huigbregts, December 2010.

streams can encourage usage of legal collection and treatment channels, hence increasing turnover in the waste and recycling industries.

Carl Huijbregts, of the Inspectorate for Housing, Spatial Planning and the Environment, cited an increase in the volumes of WEEE collected through official channels following on stricter inspection of WEEE shipments since 2005, particularly for hazardous items such as refrigerators and televisions. This shift led to a renegotiation between producers and the municipality of Rotterdam on pricing and procedures for disposal leading to the creation of a more efficient system.

FINANCIAL IMPACTS

Fines for illegal waste shipments in the Netherlands through the Port of Rotterdam range from €500 to €1000 per tonne, based on the content of the containers in question and their level of hazardousness.

While environmental crises related to illegal waste shipment and dumping, such as the Probo Koala incident in 2007, in which toxic waste was dumped in and around the city of Abidjan in Côte d'Ivoire, causing around a dozen deaths and inciting nearly 100,000 citizens to seek medical attention, are rare, environmental clean-up costs as well as longer term health care costs related to toxic waste exposure and incorrect treatment can be quite high. In the Probo Koala case, clean-up costs paid by Trafigura, the Dutch shipping company responsible for the dumping, to the government of Côte d'Ivoire were approximately €152m. A settlement of €33m to 31,000 citizens of Côte d'Ivoire for health concerns was also paid by Trafigura.

Due to the varying scale of dumping activities and the informal nature of illegal waste treatment in developing countries, it is difficult to estimate the financial costs of the environmental and health damage caused by illegal waste shipment activities. However, a study commissioned by the Inspectorate of the Ministry of Housing, Spatial Planning and the Environment of the Netherlands and the Dutch Association for the Disposal of Metal and Electrical Products on WEEE management in Ghana provides some indications of sources of financial costs linked to environmental and health damage. In Ghana, the primarily populations impacted by illegal WEEE treatment are waste collectors, recyclers and refurbishers. While collectors and refurbishers experience relatively minimal health risks related to strain and lead exposure, respectively, recyclers are exposed to a number of health risks due to open incineration practices for metal recovery and inappropriate dismantling techniques[117]. While health risks are highest for the population of recycling workers, improper and crude recycling techniques can lead to severe pollution including fumes or dust which can impact entire communities leading to illness and premature mortality.

Legal fees and costs for repatriation of illegal waste shipments to their country of origin contribute additional financial costs which could be reduced through stricter enforcement of the Waste Shipment Regulation. While repatriation costs are paid by the company originally responsible for the shipment, in the case of their default the countries involved in the shipment must take responsibility for the costs of repatriation. Nancy Isarin, formerly of the IMPEL-TFS Secretariat, cited repatriation costs as made up of shipment fees, container rental and required treatment activities following on the return of the waste to its country of origin[118]. An instance of repatriation

117 Öko-Institut e.V., Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana, August 2010.

118 Interview with Nancy Isarin, December 2010; now of AmbienDura.

of hazardous waste destined for Nigeria via the United States, under the Basel convention, led to repatriation to Rotterdam costing €1.2 million.

The Waste Shipment Regulation, EC 1013/2006, implements the Basel Convention; however, some key differences exist in the two documents. While the Basel Convention deals exclusively with hazardous waste shipment, the WSR addresses transboundary shipment of waste in general. However, the principles presented in the WSR are aligned with the Basel Convention, such as environmentally sound management (ESM) and dealing with waste as close to where it was produced as possible. The waste classifications and reporting procedures outlined in EC 1013/2006 are aligned with the Basel Convention. Additionally EC 1013/2006 incorporates OECD Decision C (2001) 107 Final on transboundary movements of wastes destined for recovery operations.

IMPACTS ON RESOURCE USE

The use of waste as a resource via proper recycling and treatment could reduce the necessity of using virgin materials as well as generate energy. Marina de Gier of the Inspectorate for Housing, Spatial Planning and the Environment pointed out the possibility of a more robust market for the sales and purchase of waste as a resource, achievable through a standardised EU-wide enforcement of the Waste Shipment Regulation. According to the European Environmental Agency, reported annual illegal shipments range from 6 000 to 47 000 tonnes, with an average of 22 000 tonnes, which represents 0.2% of notified waste; however, it is expected that reported instances represent a fraction of the actual number and that the actual number is considerable.[119]

Additionally, improper dismantling and recovery processes for materials, such as precious metals, in developing countries lead to recovery rates of approximately 20% while state-of-the-art industrial recycling methods available in the EU lead to much higher recovery possibilities, approximately 95%, hence achieving much more effective usage of resources[120].

As a result of stricter enforcement on waste shipments in the Port of Rotterdam, Nancy Isarin of the IMPEL-TFS Secretariat cited increased waste quality due to higher quantities of waste routed through legal channels for recovery and treatment, hence leading to optimised processes and better sorting techniques and consequently better access to high quality raw materials.

Social benefits

IMPACTS ON EMPLOYMENT

The impacts on employment and job creation of more effective enforcement of the Waste Shipment Regulation would primarily be linked to the waste management and recycling sectors. Increased strictness on waste shipments would lead to an augmentation of collection and treatment of waste by legal routes thereby increasing business for recycling and treatment providers, in turn creating jobs in this sector.

119 EEA, Waste without borders in the EU?, 2009.

120 Deutsche Umwelthilfe, Hamburg – Gate to the world for illegal waste exports? Part 2 2007.

The port of Rotterdam's focus on WEEE shipments has, according to Nancy Isarin, led to the creation of companies specialised in dismantling WEEE. Private sector positions linked to environmental coordination and inspection have grown as a result of increased inspection and enforcement of the WSR in the Port of Rotterdam. Also, additional positions have been created for Customs Officers, Inspectors and government officials involved in waste shipment permitting and inspection. Nancy Isarin, formerly of the IMPEL-TFS Secretariat, estimated that stricter enforcement of the WSD in the Port of Rotterdam led to the creation of 22 jobs; 12 in the public sector, including positions such as inspectors at the EPA and Customs, other law enforcement bodies, permit writers and administrative support, as well as 10 in the private sector for positions such as environmental managers at companies and increased staff at waste treatment facilities in order to improve waste quality.

IMPACTS ON PUBLIC HEALTH

The shipment of waste can result in an increased level of environmentally sound recycling, as recycling capacity is not necessarily located close to the place where recyclable waste is generated, such as in the case of shipments from new MS to the EU-15 of old transformers containing PCBs, as facilities for treatment in the countries of origin are inadequate. However, recycling standards and capacity must be guaranteed in the country of destination, otherwise potential environmental hazards are simply being exported to other parts of the world[121]. This issue was brought to light notably by the Probo Koala dumping incident in Côte d'Ivoire in 2006, in which the dumping of hazardous sludge led to the deaths of sixteen people and the poisoning of hundreds of others.

The impacts of illegal waste shipments for countries receiving them include pollution of air, water, soil and habitats as well as health risks for workers and citizens, with the extent of the impacts closely linked with the usage of proper or improper waste treatment techniques. The already toxic nature of hazardous substances often can become an augmented risk due to a lack of personal protection equipment or pollution control measures used in waste treatment in those countries receiving illegal waste shipments. Improper treatment and disposal of waste materials in developing countries leads to emissions of heavy metals and persistent organic pollutants, contributing to global warming and ozone depletion, as well as posing long-term health risks for citizens. A study completed by EMPA on WEEE burning in Delhi, India, found no risks of immediate intoxication for populations around burning sites, but indicated the possibility for a higher-than-average risk of cancer due to increased levels of chlorinated dioxins and furans; inhalation by children and food preparation near the burning sites were cited as the most problematic forms of contamination which could lead to long-term health risks[122].

[121] Milieu, AmbienDura, and FFact (2009) Study on the feasibility of the establishment of a Waste Implementation Agency

[122] EMPA, 'Risk Assessment of E-waste burning in Delhi, India,' 2004. www.empa.ch/plugin/template/empa/*/59242

Summary of barriers and drivers

BARRIERS TO BETTER IMPLEMENTATION AND ENFORCEMENT

Barriers to better implementation and enforcement of the EC Regulation 1013/2006, the Waste Shipment Regulation, in the Port of Rotterdam involve a number of factors, discussed below.

- **Difficulty centralising information**

While the Netherlands has implemented a system of coordination for Customs Officers, Police Officers and the Ministry of Environment, a lack of partnership and cooperation among organisations within other MS as well as lack of coordination between MS on waste shipment issues poses a challenge to effective centralisation of information[123].

- **Difficulty validating shipment reporting**

An ongoing issue in tackling waste shipment issues in the Port of Rotterdam is false information reported by shippers. Information reported by shippers is difficult to validate and, if false, leads to an inaccurate picture of the actual state of waste shipment.

- **Political prioritisation**

Another barrier to enforcement is political prioritisation of waste shipment as an issue; the importance assigned to environmental issues and specifically issues linked to illegal waste shipments varies between the MS; this has shifted over time in the Netherlands.

DRIVERS OF BETTER IMPLEMENTATION AND ENFORCEMENT

Drivers of better implementation and enforcement of the Waste Shipment Regulation in the Port of Rotterdam include a number of factors, outlined below.

- **Coordinated control and inspection activities**

Focusing on coordinating control and inspection activities between political and judicial bodies involved in waste shipment issues is a driver to more effective implementation.

- **24-hour availability of environmental inspectors and emergency numbers for customs officers**

On-call access for Customs Officers and front-line inspectors of waste specialists and competent authorities can improve correct application of inspection procedures for waste shipments and more stringent examination of questionable shipments.

- **The sharing of guidance materials and databases across authorities**

[123] "Study on the feasibility of the establishment of a Waste Implementation Agency" Milieu, AmbienDura, and FFact, 7 December 2009.

A more extensive sharing of guidance materials as well as databases on shipments, shippers and waste across authorities in a given MS and across EU MS can improve profiling for questionable shippers and shipments and drive more stringent enforcement.

Cyprus: Landfill Directive implementation

Context

Council Directive 99/31/3C of 26 April 1999 on the landfill of waste entered into force on 16 July 1999, with a deadline of implementation in Member States of 16 July 2001. The objective of the Landfill Directive is to prevent or reduce as far as possible the negative environmental impacts of landfilling of waste. The Directive includes regulations on landfill classification, permitting procedures and disposal options for different types of waste as well as requirements on reporting and closure of illegal landfill sites. In a follow-up study on the implementation of the Landfill Directive prepared for the European Commission in June 2007, an illegal landfill is defined as: "a landfill which is operated without permit"[124].

Since the 1980s, Cyprus has experienced the opening of an increasing number of illegal landfilling and dump sites. Municipality laws were introduced in 1985 and 2002 and Local Communities Laws in 1999 to 2002 to address waste management and landfilling. In 2002, the Law on the management of solid and hazardous waste was put in place, declaring the disposal of waste in unauthorised sites as illegal and defining enforcement as the responsibility of the Ministry of the Interior[125]. With the introduction of this legislation, Inspectors from the Solid Waste Management Sector of the Ministry of the Interior were given the authority to prosecute or to issue court fines for illegal landfilling and improper waste treatment. From 2007, applicable fines ranged up to a maximum of CP 200 (approximately € 340); if the non-conformity for which the fine was issued is not rectified within 48 hours, then the fine is doubled and once again doubled if the problem is not resolved within another 48 hours. Following this period, in a situation of continuing non-conformity, a charge for appearance in court is made.

Until 2005, seven disposal sites were officially in operation; however, none of these seven sites fulfilled the requirements of the Landfill Directive[126].

While the legislation on solid and hazardous waste put in place in 2002 mandated permits for Cypriot landfills, as of 2004, there remained no procedure for the systematic identification and closure of illegal landfills to enforce the permitting requirement. Hence, in 2004, the Ministry of the Interior commissioned a study on the identification and assessment of illegal landfills. The study did not include areas of ad hoc illegal waste disposal, only used on an occasional basis, but instead focused on sites selected by local authorities for use as waste disposal sites, but which did not receive the required permits. The study identified and recorded 113 unofficial and uncontrolled waste dump sites; a geographic information systems (GIS) database with complete information for

[124] COWI and EC, "Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25" June 2007.

[125] Ibid.

[126] Cyprus joined the European Union on 1 May 2004.

each site was developed[127]. A risk assessment of the sites was carried out using a method of multiple criteria decision analysis to select the ten most risky sites requiring immediate restoration. The assessment focused on detecting sites serving settlements of at least 2,000 inhabitants and included a literature search, interviews with local authorities, and on-site examinations of the disposal areas.

The risk assessment used multiple criteria decision analysis (MCDA), considering the pollution mechanism created between source, path and receiver, and hence analysing types of waste, waste volume, distance of industrial zones from landfill, the path of pollution including precipitation, distance from an aquifer and ground permeability as well as distance from sites related to water use/protected areas.

The 2003 Strategic Plan for the Management of Solid and Hazardous Wastes governs waste management in Cyprus, foreseeing four new landfill sites operational by 2009, to replace the approximately 100 existing waste disposal sites. Implementation plans are in place for specific districts in Cyprus: Paphos, Larnaca/Ammohostos, Lefkosia and Limassol. Following on an illegal landfill closure, measures taken include monitoring landfill leachate, ground water and surface water as well as monitoring of biogas for possible utilisation.

Delays in the initial timeline laid out for the closure, rehabilitation and after-care of identified illegal sites, as well as the opening of all new sites planned, mean that Cyprus has not, by the expected 2010 date, completed all stated objectives in the 2003 Strategic Plan. Work remains ongoing; as to date, approximately 60 illegal landfills still require closure and rehabilitation procedures, while an upgraded sanitary station has been installed in the Pathos district, sanitary stations for the Nicosia and Limassol districts remain in the planning stage. The current operating installations are not capable of handling the high consumption and waste generation patterns observed in Cyprus, of over 700 kgs of waste generated/capita/year[128].

Charalambos Theopemptou, the Cyprus Commissioner for the Environment, cited getting citizens to recycle as a linked issue; awareness campaigns on specific waste streams and the installation of separate collection containers at civic amenity sites, called 'Green Points', have helped increase awareness and participation in recycling activities[129].

Economic impacts

IMPACTS ON TURNOVER OF WASTE AND RELATED INDUSTRIES

Both Charalambos Theopemptou and Dr. Costas Papastavros cited that illegal landfill closure and the development of state-of-the-art 'sanitary landfills', comprised of a sorting line and treatment plants for specific waste streams, has led to increased turnover for the waste management and recycling industry. Currently, the 'Green Points' and sanitary landfills cover 85% of waste produced in Cyprus, leading to the collect and treatment of 400,000 tonnes of recyclable material. Panagiotis

[127] Enviroplan S.A. & Cyprus Ministry of Interior, "Risk Assessment and Evaluation of Uncontrolled Landfill Sites in Cyprus" 2007.

[128] Dr. Costas Papastavros, Cyprus Environmental Service, "The Cyprus Strategic Plan on Solid and Hazardous Waste Management" April 2007.

[129] Interview with Charalambos Theopemptou, December 2010.

Frangkakis, a consultant at Enviroplan, cited potentially higher gate fees for treatment and disposal of waste in the new integrated sustainable waste management facilities[130].

FINANCIAL IMPACTS

High penalty fees as well as potential prison sentences apply for violations on illegal landfilling and incorrect waste management. Strict enforcement of usage of legal treatment and recycling routes can transfer fines spent on infringement towards the waste management sector in support of proper handling.

The tourist industry is a large financial driver in Cyprus; at various points tourists have made official complaints about illegal dumping and inadequate waste management services. The closure of illegal landfilling sites and the creation of state-of-the-art waste treatment centres reduce negative environmental impacts on the island and the associated media attention that this can generate, securing Cyprus as a safe and inviting tourist destination and potentially boosting revenues.

While no specific cases of exposure to toxic waste or unsafe drinking water have been reported in Cyprus linked with illegal landfilling, by closing or rehabilitating illegal landfill sites, Cyprus has averted long-term potential health costs of continued illegal landfilling.

IMPACTS ON RESOURCE USE

The closure and rehabilitation of illegal landfill sites in Cyprus has led to increased usage of the legal collection, treatment and disposal system, and thus more effective resource use. The separate collection points as well as the state-of-the-art sanitary plants installed in Cyprus allow for increased recycling and waste recovery, with landfilling as a last resort. While in 2003 waste disposal in Cyprus was nearly entirely landfill, by 2007, approximately 20% of waste was recycled.

Social benefits

IMPACTS ON EMPLOYMENT

Closure of illegal landfilling sites and the creation of state-of-the-art 'sanitary landfills', has led to job creation at both intermediate sorting stations and larger recycling plants. Dr. Costas Papastavros, of the Environmental Service of the Cyprus Ministry of Agriculture, Natural Resources and Environment, estimated that over the past 10 years, due to the Cypriot government's focus on illegal landfilling and waste management, 300 jobs have been created annually in the waste management and recycling sector[131].

The training and development of new competencies could also be cited as a social benefit of illegal landfill closure and the opening of new sanitary landfill sites, especially for waste stream-specific processing activities. Additional job creation could be expected in other public-sector functions related to environmental issues and waste management such as the Ministry of the Environment,

[130] Communication with Panagiotis Frangkakis, December 2010.

[131] Interview with Dr. Costas Papastavros, December 2010.

local community councils, etc. Costas Kotziapashies, of the Ministry of the Interior, cited the potential job creation resulting from the construction projects to put into place the 'sanitary landfills' as well as their operating staff[132].

IMPACTS ON PUBLIC HEALTH

Closure or rehabilitation of illegal landfill sites has averted potential long-term public health issues such as toxic waste exposure or unsafe drinking water. The Cypriot study on illegal landfills completed in 2004 showed that serious environmental impacts have resulted over the years of operation of the landfills. The major environmental and health concerns identified include:

- Groundwater pollution
- Soil pollution
- Underground transport of landfill gas
- Odour
- Landfill gas fires and explosions
- Landfill fires usually incurred to reduce the volume of waste
- Animal grazing; as illegal landfills or dumping sites are not fenced in, it is thus rather common for herds to enter waste disposal areas[133]

An impact assessment identified groundwater pollution, soil pollution and surface water pollution as the three most high-risk environmental issues resulting from illegal landfill operation in Cyprus.

Summary of barriers and drivers

BARRIERS TO BETTER IMPLEMENTATION AND ENFORCEMENT

Barriers to better implementation and enforcement of the Landfill Directive in Cyprus involve a number of factors, discussed below.

- **Limited human resources and specialised knowledge**

Speaking in 2007, Dr. Costas Papstavros of the Cyprus Environmental Service cited limited human resources at the government level as a barrier to the effective Cypriot adoption of EU waste legislation. The "Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25", prepared in 2007 by COWI and the European Commission, cited a lack of human resources ensuring enforcement as a barrier to effective implementation of the Landfill Directive in

[132] Communication with Costas Kotziapashies, December 2010.

[133] COWI and EC, "Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25" June 2007.

Cyprus as well as a risk of insufficient knowledge about waste management requirements, especially in rural areas[134].

- **Public awareness of waste issues**

While the introduction of the 2003 Strategic Plan for the Management of Solid and Hazardous Wastes and the completion of a risk assessment on illegal landfills in 2004 contributed to improvements in waste management and the enforcement of the Landfill Directive, awareness remains an ongoing issue. Charalambos Theopemptou, the Cypriot Commissioner for the Environment, cited the ongoing difficulty of getting citizens to recycle and the importance of expanding campaigns on the importance of recycling and correct disposal for various waste streams[135].

- **Drivers of better implementation and enforcement**

A number of drivers, outlined below, contribute to the better implementation and enforcement of the Landfill Directive in Cyprus.

- **Tourist industry revenue concerns**

As the tourist industry accounts for a large portion of Cyprus's economic activity, official tourist complaints about waste management and concerns about lowered tourist revenues increased political awareness of the issue and served as a catalyst for improved implementation and enforcement of EU waste legislation, notably the Landfill Directive.

- **Governmental focus**

A governmental focus on waste related issues due both to the creation of national waste legislation and the preparation of a strategic plan for its implementation in 2003 and 2004 as well as the required implementation of EU waste legislation following on Cyprus joining the in EU in 2004 has served as an ongoing driver for waste management inspection and enforcement activities.

- **Increasing public and political awareness**

The organisation of Information Exchange and Awareness Raising Events on the landfilling of waste in Cyprus, with the cooperation of the EU, in both 2007 and 2009, has served as a method for benchmarking progress, sharing good practices and encouraging continued planning and enforcement. Additionally, Costas Kotziapashies of the Ministry of Interior cited increasing Cypriot public awareness as a driver of better enforcement.

[134] COWI and EC, "Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25" June 2007.

[135] Interview with Charalambos Theopemptou, December 2010.

Naples: Waste Management Crisis

Context

Italy is progressively increasing the diversion of municipal waste from landfill, with a 50% diversion rate in 2006. However, waste management performance is highly variable by region, with a separate collection rate for bio-waste for example at 40% in the north, against a rate of 10% and 20% in the south and centre respectively. Waste management, and particularly application of the Landfill Directive, has historically been an issue in southern Italy, where local government has difficulty maintaining authority and landfill capacity has been a problem since the mid 1990s.

Italy declared a state of emergency for waste in the Campania region, including Naples, in 1994, leading to the establishment of a Commissario Straordinario (Special Commissioner) to address the situation. In 1994, the Campania region was ordered by the European Commission to clean up all illegal waste dumps and to develop a waste disposal program involving waste separation and recycling[136]. As the regional plan previously put in place for waste management in Naples did not appear to be working, the Special Commission offered a contract for tender for the period 1998-2000. The integrated disposal plan for MSW which won the tender included the use of seven waste plants and the construction of two incinerators by the end of 2000. The contract gave the consortium who won the bid the power to select locations for the incinerators without consultation of the local government or citizens, or the completion of an impact assessment, leading to the selection of two locations next to each other, Acerra and Santa Maria La Fossa. The incinerator specified in the 1998-2000 contract was not completed by the end of 2000.

Since 1994, waste management has improved in other districts in the Campania region. Salerno, the district next to Naples, for example, launched a widespread awareness-raising campaign, imposed severe fines for illegal dumping, put in place an effective separate collection system and improved recycling rates[137]. Mariella Maffini, of the Special Commission, cited improved separate collection rates across the region with 340 out of 551 towns reaching a 70% rate of separate collection, and another 71 towns achieving between 25% and 35% of separate collection[138]. However, waste management and the fulfilment of the Landfill Directive has remained an ongoing issue for the Naples district.

The Naples waste crisis began in December 2007, when municipal workers in charge of waste collection went on strike, leading to a build up of waste in the streets. Many factors contributed to this crisis. In 2007, Naples produced 1,700 thousand tonnes of waste, out of which 1,300 thousand were landfilled. Following the strike and resulting civil unrest, at the request of residents, at the end of 2007, the government closed one of two major landfills near Naples. In order to ease the waste

[136] Alexander Smoltczyk, Spiegel Online, 'In Naples, Waste is Pure Gold,' 14 January 2008.

www.spiegel.de/international/europe/0,1518,528501,00.html

[137] S. Romano, Regional Environmental Centre for Central and Eastern Europe (REC), 'Municipal Solid Waste Management Policies and Problems in Naples, 2009.

[138] Interview with Mariella Maffini, December 2010.

situation in Naples in the short-term, as of 2008, everyday a freight train carried 700 tonnes of municipal waste from Naples to Hamburg for incineration with energy recovery[139]. In 2008, after winning the national elections, the Italian President Silvio Berlusconi arranged for the removal of the waste from the streets of Naples, as promised during his campaign. In May 2008, Mr. Berlusconi held his first cabinet meeting in Naples, returning again in March 2009 for the inauguration of the new incinerator in Acerra. However, the Acerra incinerator is reported to have never run at full capacity.[140]

While recycling levels in the region are low, separate collection trials across the Campania region have shown that it is not a social issue or the result of the opposition of communities to recycling. Separate collection rates of between 50% and 70% have been achieved in the neighbouring communes of Salerno and Caserta. Organisational and infrastructural problems stem from the illegal import and dumping of often toxic waste, which constitutes a profitable business for the Camorra, a major criminal organisation operating in the region. Illegal import and dumping of toxic waste violates not only the Waste Shipment Regulation, but also the Landfill Directive's stipulations on permitting and correct disposal procedures for landfilling of waste, posing risks for surface water, ground water, soil, air and human health. It was reported that Neapolitan landfills had been filled with industrial and special waste from other parts of Italy, and that this has resulted in the lack of capacity for local municipal waste[141]. In addition, it was further reported that a landfill 30km from Naples, Parco Saurino #3, with a capacity of 400,000m^3, was empty, although it had the capacity for 4-5 months of the total municipal waste generation of the Naples area[142].

As of October 2010, the announcement by the government to build another, larger, landfill inside Vesuvius National Park to hold 3 million metric tonnes of waste, led to protests and rioting, leading once again to the build up of waste in the streets of Naples itself. While various measures have been taken since the initial declaration of a state of emergency in the Campania region in 1994 and the waste crisis in Naples in 2007, the situation has yet to be resolved. The Naples region remains in violation of the Waste Shipment Regulation and the Landfill Directive, leading to financial, economic, social and health-related losses.

Economic impacts

IMPACTS ON TURNOVER OF WASTE AND RELATED INDUSTRIES

Mariella Maffini cited the tourist industry as being the sphere of activity most impacted by the waste crisis in the Naples region and the ongoing failure of proper implementation of EU waste legislation.

[139] European Environmental Agency, 'Developments in shipments of paper waste as an example of non-hazardous wastes out and within the EU from 1995 to 2007', 9 January 2009.

http://www.eea.europa.eu/data-and-maps/figures/developments-in-shipments-of-paper-waste-as-an-example-of-non-hazardous-wastes-out-and-within-the-eu-from-1995-to-2007

[140] Emiliano Fittipaldi and Claudio Pappaianni, L'Espresso, 'Rifiuti che bluff,' 25 March 2010.

http://espresso.repubblica.it/dettaglio/rifiuti-che-bluff/2123808

[141] Interview with Roberto Cavallo in December 2010, President of ERICA, who conducted separate collection trials in Campania in 2009.

[142] Interview with Walter Ganapini in December 2010, Environmental Director to the Region of Campania until June 2010.

Roberto Cavallo, at ERICA, quantified the impacts of improper waste management on the Naples tourist industry in 2007 as a loss of €64 million, due an estimated loss of 650,000 tourists that year.

The entry of toxic chemicals into the groundwater and soil due to improper waste disposal creates concerns for the agriculture sector around the Naples area, as the Campania region is a major agricultural area. In 2008, the discovery of higher-than-permitted levels of dioxins in buffalo milk herds in the Campania region, responsible for the production of regional speciality mozzarella di bufala, led to the quarantine of 66 dairies, causing mozzarella sales to drop by as much as 50%[143]. Antonio Pace, the president of the Association of Authentic Neapolitan Pizza-Makers expressed concern about potentially reduced national consumption of pizzas, in most of which mozzarella is a key ingredient. An estimated 33,000 tonnes, of a €300 million value, of Denominazione d'Origine Protetta mozzarella is produced annually in Italy, employing around 20,000 people; ongoing high levels of dioxin could lead to additional drops in sales and a loss of revenue for the sector, due to loss of public confidence in the product[144]. The entry of toxic waste into groundwater and soil due to improper waste disposal could create long-term impacts for farming in the region with impacts for all agricultural products produced.

FINANCIAL IMPACTS

The ongoing costs of waste management and clean up appear to be the largest financial impacts of the waste crisis in Naples. Mariella Maffini noted that the municipality has reported paying €2 million for staff in charge of waste management. Since 2007, Naples has been sending waste for incineration to Germany, at a cost of €215 per tonne, or €400,000 in total per day, half of which represents transport costs. Cost estimations for waste treatment within Italy are approximately €290 per tonne, representing €120 for mechanical treatment, €20 for transport, and €150 for temporary landfilling.[145]

Mariella Maffini noted that higher service fees paid, largely due to transport costs, for the compostable portion of waste collection, handled by the Puglia region as part of an agreement between the two regions, were another part of the Special Commission's spending.

Furthermore, due to inadequate drainage systems for leachate at waste disposal sites in the Campania region, each day 20 trucks transport the sewage liquid to treatment sites. The cost of each round-trip leachate transport is €1,800, representing a minimal daily level of spending of €36,000, adding up to over €20 million since 2007.[146] Furthermore, the existence of waste dumping sites within Vesuvius National Park is reported to require annual spending of €1.2 million by the Ministry of the Environment to protect the natural biodiversity of the area.

A study completed by Alessandro Marangoni of Althesys estimated that the Naples waste crisis required the payment of €1.1 billion above the average amount of waste management spending for Italian regions. The same study by Mr. Marangoni estimates the total costs of the Naples waste crisis at €18 billion, in addition to benefits lost from non-participation in Green Dot packaging systems

[143] Michael McCarthy & John Phillips, The Independent, 'Italy's toxic waste crisis, the Mafia – and the scandal of Europe's mozzarella,' 22 March 2008. www.independent.co.uk/news/world/europe/italys-toxic-waste-crisis-the-mafia-ndash-and-the-scandal-of-europes-mozzarella-799289.html

[144] Denominazione d'Origine Protetta or DOP indicates certain protection and quality guarantees.

[145] Roberto Cavallo, ERICA, 'Economie de la crise déchets à Naples,' 16 December 2010.

[146] Emiliano Fittipaldi and Claudio Pappaianni, L'Espresso, 'Rifiuti che bluff,' 25 March 2010. http://espresso.repubblica.it/dettaglio/rifiuti-che-bluff/2123808

estimated at €6.7 billion, resulting in an overall cost estimation of the Naples waste crisis at €24.7 billion. A report prepared by the Italian budgetary office cited the exponential increase in spending through the Special Commission structure, from on average €5 million annually up until 2006, to up to €50 million across the 2 year period from 2007 to 2009.[147]

In addition to waste management and clean-up costs, the financial losses due to civil unrest and the continued police and military presence necessitated by such unrest represent a financial loss for Naples and the Campania region. Ms. Maffini cited the burning of over 100 waste collection trucks, at a price of €300,000 each and the ongoing presence of the army in the region as contributing to costs. In extreme instances of trash build-up in the city of Naples, the army has been ordered in to collect and dispose of trash, while salaries continued to be paid to waste management workers. The burning of waste by residents as well as protesting and rioting have led to damages and required the ongoing involvement of police and military forces. Due to waste-related spending, the Campania region has built up a €300 million debt to the Italian government since 2008[148].

If Italy does not address the ongoing crisis situation in Naples and the Campania region and their non-compliance with EU waste legislation, and the European Commission refers the case to the European Court of Justice for a second time, Italy will face fines of up to millions of Euros, calculated as a percentage of GDP, with day-by-day penalties added to an initial lump sum[149]. Already, in 2007, the European Commission withheld funds from Naples from the European Regional Development Fund (ERDF), a decision reversed in May 2010.[150]

Social benefits

IMPACTS ON EMPLOYMENT

The ongoing waste situation in Naples and the surrounding Campania region negatively impacts revenues and employment in the tourist industry as well as the agricultural sector, notably producers of mozzarella di bufala.

While spending, particularly through the Special Commission, on waste management has increased exponentially, presumably leading to job creation in the waste management sector, it is difficult to assess the true impact of such spending. In their article in L'Espresso in March 2010, Emiliano Fittipaldi and Claudio Pappaianni refer to an ongoing circle where citizens do not pay for services, the municipality accumulates debt and the provincial associations inherit the debt and do not pay employees wages. But on the other hand, the waste management structure in Naples and the surrounding Campania region has been cited as being overstaffed.

[147] Roberto Cavallo, ERICA, 'Economie de la crise déchets à Naples,' 16 December 2010.

[148] Emiliano Fittipaldi and Claudio Pappaianni, L'Espresso, 'Rifiuti che bluff,' 25 March 2010.

[149] EU Business, 'Italy risks big fines over Naples trash crisis: EU,' 26 November 2010.

www.eubusiness.com/news-eu/italy-waste-health.79f/

[150] European Commission, 'Judgment of the General Court of 6 May 2010 — Comune di Napoli v Commission,' 6 May 2010.

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:161:0039:0039:EN:PDF

IMPACTS ON PUBLIC HEALTH

Public health impacts in Naples and Campania, due to the build-up of waste in the streets, the burning of waste by residents, the overfilling of full capacity landfills, and the improper treatment of waste, especially toxic waste, are multiple.

An analysis of tumour deaths in towns near waste dumps in the Campania between 1994 and 2001 found the risk of stomach, kidney, liver, bladder and lung cancers were 50 to 100% higher than the regional average, with a similar increase in birth defects[151].

The five categories of risks for the population living near waste dumping sites in the Campania region were assessed by the 11th annual national Italian public health conference, as the following:

- Increased percentage of neoplasia (+1,5% for men, +1% for women)
- Increased percentage of hepatic tumors (+4,3% for men, +6,6% for women)
- Increased percentage of lung tumors for men (+1,9%)
- Increased percentage of stomach tumors for men (+5,2%)
- Increased percentage of birth detects (+13,8%) including for the urogenital system, leading to increased mortality rates (+1,7% for men, +2,4% for women)[152]

Risks are even higher for employees of landfill sites; the Maruzzella landfill, the first in San Tammaro, serves as an example. In 1996 there were 20 workers, since, 5 have died of cancer and another 3 are fighting cancer, leaving 12 workers.[153]

The municipality of Naples awarded €500 per person to 14 citizens and business owners in Naples seeking damages for the health impact of the overrun of waste in their buildings, due to an ongoing lack of waste collection services. While is it possible to ascertain that morality rates, particularly from cancer, around Naples and in the Campania region are higher than national averages, linked to illegal toxic waste dumping, Mrs. Maria Triassia, the Director of the Department of Hygiene and Preventative Medicine at the private general hospital of Naples stated that it will take 10 years before it is truly possible to evaluate the health damage resulting from the ongoing waste situation in Naples. Additionally, Naples residents have reported a rise in the number of rats, pigeons and seagulls; experts warned this could result in the rise of infectious gastrointestinal diseases.

Potential contamination of agricultural products in the Campania region also poses a potential health risk. In 2008, the discovery of higher-than-permitted levels of dioxins in buffalo milk herds in the Campania region caused alarm and impacted product sales; however, ongoing contamination of agricultural fields and herds due to toxic waste dumping and improper waste treatment could impact mortality rates in the long-term, not only in towns near waste dumping sites but also across the entire Campania region.

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[151] Tom Kington, The Observer, 'Naples burns as residents protest at garbage crisis,' 27 May 2007.

www.guardian.co.uk/environment/2007/may/27/italy.waste

[152] Roberto Cavallo, ERICA, 'Santé et la crise déchets à Naples,' 27 December 2010.

[153] Emiliano Fittipaldi and Claudio Pappaianni, L'Espresso, 'Rifiuti che bluff,' 25 March 2010.

An additional concern is that the landfill sites chosen by the government for collecting waste from Naples and the majority of the cities in the Campania Region do not have adequate leachate draining systems, necessitating their collection and transport to treatment sites and posing an ongoing threat of overflow into nearby agricultural and grazing fields.

Summary of barriers and drivers

BARRIERS TO BETTER IMPLEMENTATION AND ENFORCEMENT

Declarations on the rapid or two week clean up of Naples have been made by the national authorities, but the systemic nature of the waste build-up has not been addressed. EU Environment Commissioner Janez Potocnik noted it would take at least "several years" to set up the infrastructure required to handle the 7,200 tonnes of waste accumulating daily in Campania, avert future waste crises, and bring the Naples region into line with EU waste legislation requirements.

Barriers to better implementation and enforcement of the Landfill Directive and Waste Shipment Regulation in Naples and the surrounding Campania region involve a number of factors, discussed below.

- **Lacking and misused infrastructure**

Despite contracts for the construction of waste treatment plants commissioned prior to 2007, only one incinerator is currently operational (Acerra), another remains under construction and 12 composting plants are in the process of being built as well. The incinerator at Acerra operates at a third of its capacity.

- **Surplus staff**

A number of employees were hired around 2007 to help address the waste crisis, however they have remained on staff even though the need for such a large emergency staff has diminished. Salaries of surplus staff represent a cost of €2,000 per month per employee to the Special Commission.

- **Management issues**

The Special Commission, created in 1994, because of its 'extraordinary' and in principle temporary nature, does not benefit from the usual checks and balances in government structures dealing with waste management. Its spending has increased exponentially from €5m per year in 2006 to €50m in the last two years[154].

- **Corruption and organised crime**

The involvement of the organised crime organisation, the Camorra, in the management of waste in Campania, the consequent lack of proper controls in the handling of industrial, special and toxic waste and the lack of adequate, functioning waste capacity is at the heart of the Naples waste crisis. This is a complex problem in which billions of Euros of waste investment and management spending is involved. It is a problem that needs to be handled by EUROPOL and the proper police authorities,

[154] Roberto Cavallo, ERICA, 'Economie de la crise déchets à Naples,' 16 December 2010.

and without which, it is difficult to see how further investment or fines will improve the situation in the long-term.

DRIVERS OF BETTER IMPLEMENTATION AND ENFORCEMENT

Drivers of better implementation and enforcement of EU waste legislation in Naples and the surrounding Campania region are outlined below.

- **Taking political responsibility**

Safe and reliable waste management in Naples will be supported by a regional waste management plan that is not undermined by corruption or illegal forces, and one that is guaranteed by the local, regional and national authorities in the long-term.

- **Increasing citizen involvement**

Involving citizens in political decisions and keeping them aware of waste-related issues and progress could reduce civil unrest and encourage participation in separate collection systems to reduce pressure on landfills and increase revenues from recycling.

- **Restructuring funding**

It must be ensured that funding for the management of the waste crisis does in fact resolve the crisis, rather than becoming a continual and increasing source of revenue. Funding for the construction of new infrastructure should be accompanied by conditions that guarantee that projects will be completed on time and to a high standard. Infrastructure created needs to be operated safely and correctly and fulfil EU permitting and treatment requirements.

- **Counteracting illegal activity**

Organised crime and the persistent failures to put a lasting end to it is a root cause of the waste crisis. This complex problem needs to be addressed with the appropriate tools; in this case, EUROPOL and national police authorities. Other drivers of better waste legislation implementation in Campania risk being impotent, if the foundational crime problem is not addressed effectively.

Brandenburg: Landfill Closure and Containment

Context

After reunification of East and West Germany it was necessary for the German region of Brandenburg, from the economic and from the ecologic point of view, to restructure not only the economy as a whole but also to restructure the waste management system. In order to meet the requirements of the EU waste legislation provisions and specifically the provisions of the Landfill Directive (99/31/EC), the majority of the sites for landfilling municipal waste in Brandenburg had to be closed down, contained and revegetated. The remaining 7 landfill sites for municipal waste fully meet the EU standards. This programme was complemented by the establishment of a waste treatment system.

Brandenburg is a 'Land' (region) in Eastern Germany with 2.5 million inhabitants (MUGV 2010b). Since June 1st 1990, waste regulations of the Federal Republic of Germany have been valid also for the area of the former German Democratic Republic. In the period 1990 to 1992 a programme was implemented to survey the landfill sites in the former GDR. This survey was also used as a job creating initiative.

For the area of Brandenburg about two thousand sites where waste had been deposited up until 1989 were identified. While ordinary municipal waste had been landfilled at a smaller number of central sites, the inhabitants of the communities used the two thousand less central sites for disposing of mainly excavated soil, construction and demolition waste and garden waste. The majority of the less central sites had been closed by 1990 but needed to be contained and revegetated.

In the period 1990 to 1997, some 600 former landfills were contained and revegetated by the municipalities, receiving €138 million of financial aid. As part of the programme "for the removal or conform adaptation to the landscape of old communal deposits" ("zur Beseitigung oder landschaftsgerechten Einpassung kommunaler Altablagerungen"), a further 775 sites were contained and revegetated in the period 1998-2002.

Before launching the close down, containment and revegetation of landfill sites, the risk emanating from the landfill sites was assessed in more than 1,200 cases.

Containment activities included the following:

- Collection of bulky and similar waste which was deposited after 1989
- Surface-covering
- Adaptation to the surrounding area
- Securing the landfill against unauthorised access (Muentner 2010a)

Of the 100 central landfill sites operating in 1990, 56 were still in operation in 1992. Of these, 35 were upgraded to EU standards to extend their lifetime, such that by the year 2000 all 35 landfill sites

were still in operation. 21 sites had been closed down by May 31st 2005 and a further 9 by July 16th 2009. Thus the landfilling of residual municipal waste in Brandenburg has been concentrated in the 5 remaining sites.

After having finished the containment of the less central sites, the optimisation of the landfill system focused on the close-down of central cites. This was mainly funded by the European Regional Development Fund (ERDF) 2000-2006.

- 16 landfills were completely covered and sealed,
- 8 landfills partly or temporarily covered and sealed
- 2 landfills with a combined volume of 280,000 m³ completely removed
- 18 landfills equipped with active degassing
- 5 landfills equipped with passive degassing
- 1 landfill of 2.1 million m³ surrounded by a sealing wall
- 1 landfill stabilised by accelerated biological degradation.

430,000 tonnes of waste were recovered and consequently an additional 50,000 m² of ground made available for other use.

In parallel to the closure of most landfill sites, 15 plants for the treatment and recycling of residual waste were installed (Kreutzberg 2006), so that of 730,000 tonnes/year, only 29% or 212,000 tonnes need to be landfilled (MUGV 2010b). The total amount of waste landfilled in Brandenburg was reduced from 4 million tonnes in 1992 to 0.52 million tonnes in 2009 (MUGV 2010a,b). Nearly half of the 4 million tonnes of waste landfilled in 1992 had been reactive waste. From the 523 kt of waste landfilled in 2009, all waste was non-reactive, that is either construction and demolition waste or secondary waste from mechanical-biological treatment (MUGV 2010b).

As a result, the greenhouse gas emissions from Brandenburg landfills are expected to decrease from 6 million tonnes of CO_2 equivalents in 1996 to 1.4 Mt CO_2 equivalents in 2010 (that is by 77%) (MLUV 2007).

The main reason for the containment project, however, was to limit the leaching of hazardous substances from the existing landfills; as an example of the environmental effects of landfill containment, the complete removal of 186,000 m³ (300,000 tonnes) of mixed waste from a landfill site (that costed €8.3 M) can be taken. This transfer of waste from a site without bottom sealing to a compliant landfill resulted in the lowering of volatile organic compounds (VOC) concentration in the down stream ground water of the original site from 400 – 1.200 µg/l to 20-200 µg/l. While the latter values are still high, as the downstream earths and rocks are still somewhat contaminated, the removal of the waste has removed the source of contamination and brought down the groundwater contamination by some 90% (Muentner 2010b).

Economic impacts

IMPACTS ON TURNOVER OF WASTE AND RELATED INDUSTRIES

Table 31 shows the costs and thus the turnover of the Brandenburg waste management system.

Table 31: Costs of waste management in Brandenburg 2009 (MUGV 2010b).

	Costs in million €	Share in %
Collection and transport	73	43
Collection of hazardous substances	3	2
Treatment of residual waste	54	32
Recovery	24	14
Landfilling	8	5
Other management services	8	5
Total	169	100

With waste management costs of 68 €/cap/annum, Brandenburg lies 89% below the German average of 610 €/cap/annum. Also the waste management costs per tonne of waste generated, at 115 €/t in Brandenburg, lie below the German average of 137 €/t (calculated from MUGV 2010b, BMU 2007 and Eurostat 2010 data).

FINANCIAL IMPACTS

The financial aid for the containment of non-central landfills programmes was €37 million. More than 1,600 persons were employed during this process.

For the closure programme of the central landfills, €113 million was spent, from which €47 million was funded by ERDF (Muentner 2010b).

Through the commissioning of the 15 treatment plants:

- about €300 million was invested
- 200 jobs were created
- an annual turnover of €100 M € is achieved (Kreutzberg 2006).

IMPACTS ON RESOURCE USE

Of 1,469 kt of waste generated in 2008, some 456 kt (31 %) were collected as valuable materials for recycling (see Table 32). An additional 288 kt of construction and demolition waste was recovered. About 222 kt of waste was used for energy generation in Brandenburg in 2009 (MUGV 2010b).

Table 32: Collection of valuable substances in Brandenburg in kt (kilo-tonnes) 2009 (MUGV 2010b).

	Total
Paper/cardboard	183
Metals	3
Glass	63
Plastic packaging	86
Biowaste	98
Electronic equipment	15
Other valuable substances	9
Sum	**456**

Social impacts

IMPACTS ON EMPLOYMENT

The landfill containment project provided some 1600 temporary jobs (Muentner 2010b). The restructuring of the waste management system as a whole create 200 permanent jobs (Kreutzberg 2006).

IMPACTS ON PUBLIC HEALTH

Life expectancy of newborns in Brandenburg increased from 73 years in 1991/93 to 79 years in 2007/2009 (Amt der Statistik Berlin Brandenburg 2010, DESTATIS 2010). While the average German life expectancy also grew in this period, the increase in Brandenburg exceeded the German average increase by 1.8 years. While the increase in life expectancy cannot be allocated to a single measure, let alone to the changes in the waste management system, it is a strong hint that negative health impacts on the Brandenburg economy receded and the environmental health increased.

Summary of barriers and drivers

BARRIERS TO BETTER IMPLEMENTATION AND ENFORCEMENT

The restructuring and upgrade of the waste management system could only partly be financed from the waste levies in place. Additional funds from the regional and the national government and the EU were necessary.

The 1998-2002 programme for the closure and containment of landfills had a relatively long start-up phase during which only a few landfill operators cooperated with the programme. Only after good experiences could be demonstrated did the programme gain speed (LASA 2001).

In spite of the efforts to establish an efficient and affordable waste management system, 6,500 tonnes of waste (or 0.4 % of the total waste generated) were still deposited illegally in the year 2009 in Brandenburg (MUGV 2010b).

DRIVERS OF BETTER IMPLEMENTATION AND ENFORCEMENT

A main driver for the containment and restructuring programme was the necessity to reach Western European environmental and economic standards in the shortest possible time.

The restructuring and upgrade of the waste management system could be used for job creation purposes and was seen as part of restructuring the whole economic system (LASA 2001).

List of Abbreviations

a	annum, year
cap	capita, inhabitant
ERDF	European Regional Development Fund
GDR	German Democratic Republic
kt	kilo-tonnes = thousand tonnes
Mt	Mega-tonnes = million tonnes
MUGV	Ministerium fuer Umwelt, Gesundheit und Verbraucherschutz (Brandenburg)
t	tonne

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Ireland: Benefits of Strengthening Implementation & Enforcement of Waste Legislation

Context

This case demonstrates the before and after pros and cons of the Republic of Ireland (ROI) dramatic improvements in waste management over the last 10-12 years. This is due to an aggressive programme commenced in 1998 through the *Changing our Ways* policy to implement and enforce waste management legislation and modernise waste management infrastructure. This has been successful in enabling the achievement of key targets for waste diversion from landfill, recycling rates, waste prevention / minimisation and a diverse, growing waste management market. This demonstrates the transition from an unsophisticated and one dimensional approach to waste management which is heavily dependent on landfill and suffered from poor enforcement, to one which reflects the waste hierarchy and the polluter pays principle. It demonstrates the benefits strengthening implementation and enforcement of EU and associated Irish waste legislation can bring. However, gaps in infrastructure still exist and improvement opportunities at the top end of the waste hierarchy still to be achieved. Aspects of the improvements to date have involved an 'all island' approach to encompass economies of scale between ROI and Northern Ireland. For similar size countries at an early stage of waste management enforcement, the case has key elements that are transferrable.

The Irish waste management improvements have come from a mixture of policy and legislation implementation, development of an active enforcement infrastructure, fiscal measures, national programmes and pilot initiatives, infrastructure development to include Public Private Partnerships and media campaigns to engage the public and business. A summary of the key developments and current status of waste management for municipal and commercial streams is outlined below. From an EU perspective much of the law in relation to waste management in Ireland derives from EU waste management legislation to include the EU Waste Framework Directive, EU Landfill Directive, Waste licensing and permitting legislation, EU Producer Responsibility legislation e.g. for Packaging, Waste Electrical and Electronic Equipment (WEEE) and End of Life Vehicles (ELV) Directives respectively.

POLICY, LAW AND ENFORCEMENT MEASURES

Key waste implementation, planning and enforcement strengthening measures have been introduced since 1998 by the Irish Department of the Environment and Local Government (DOEHLG) in conjunction with local government and the Irish Environmental Protection Agency (EPA). These include *Changing our Ways* (1998), *Delivering Change* (2002), *Waste Management – Taking Stock and Moving Forward* (2004), *National Strategy on Biodegradable Waste* (2006). In terms of key functions, waste management planning is managed through central (DOEHLG) and local government (Local Authorities). Enforcement is through the EPA and Local Authorities. Control of waste is split between the private sector and public sector, with the latter's share continually decreasing. Other stakeholders include waste management industry associations e.g. Irish Business and Employers

Confederation (IBEC), Irish Waste Management Industry Association (IWMA) and industry support organisations Forfas and Enterprise Ireland.

Fiscal instruments have been and continue to be key instruments in the Irish waste management strategy to include the *Landfill Levy*, the *Environment Fund* which uses landfill levy revenues for waste management infrastructure development, *Plastic Bag Levy* (targets consumers by putting a 20 cent levy on carrier bags from shops) and Producer Responsibility (Packaging, WEEE, ELV, Batteries). Further high profile awareness raising campaigns have been used to inform and engage both business especially SMEs through *Small Change* and consumers through campaigns e.g *Race Against Waste* (www.raceagainstwaste.ie) which has now completed. The National Waste Prevention Programme is the current best practice programme focusing on behaviour change.

Waste dumping without authorisation was a significant problem early on because of increasing landfill charges, in particular in Dublin and cross-border where there was trafficking of waste and large-scale illegal dumping. To strengthen enforcement of existing waste legislation to prevent illegal disposal of waste the *Protection of the Environment Bill 2003* was passed strengthening the powers of the key enforcement agencies *(DoELG, EPA, Local Authorities).* Most importantly, the establishment of the Environmental Protection Agency's IPPC and Waste Licensing regimes drove immediate changes in the environmental performance in the waste sector. Further, the establishment of the Office of Environmental Enforcement (OEE) within the EPA in 2003 and its Environmental Enforcement Network (of local authority enforcement officers) was pivotal to eliminating unauthorised dumping. Since 2000, over 150 cases have been prosecuted at District Court level[155]. Further the establishment and operation of an inter agency national Environmental Enforcement Network (to include the EPA, DOEHLG, Local Authorities and police)[156], has effectively targeted improvements on waste to include transfrontier shipment, illegal waste activities , packaging and farm plastics.

A National Waste Management Agency was proposed at that time and addressed in the Taking Stock and Moving Forward policy document (DOEHLG, 2004), but never came to fruition, however, centralised co-ordination was seen as adding value. For waste management specifically, the system for Waste Licences/Permits for collection and processing of wastes in line with EU legal requirements was developed.

To tackle hazardous waste the first *National Hazardous Waste Management Plan* was published in 2003 at the EPA. To drive waste prevention and recycling, the *National Waste Prevention Programme* (NWPP) www.nwpp.ie was established by the Minister for the Environment to be led by EPA in 2004. Initiatives have targeted business (*Green Business, Green Hospitality*), households (*Green Home Programme*), hospitals (*Green Healthcare* Project), retail (*Green Retail Programme*), packaging (*Packaging Waste Prevention Programme*), and local authorities (*Local Authority Prevention Network, Stop Food Waste*) to prevent waste generation. In 2008, the EPA published the revised *National Hazardous Waste Management Plan* (2008-2012). This focuses on the prevention of hazardous waste and seeks to promote the safe collection and domestic treatment of such waste. The 2009 EPA

[155] http://www.epa.ie/whatwedo/enforce/prosecute/

[156] http://www.epa.ie/whatwedo/enforce/network/

guidance on municipal solid waste pre-treatment should act as a significant driver in relation to pre-treatment of waste prior to landfill and diversion to recovery/recycling. Waste research has been part of the EPA's programmes. Examples include a quality standard for compost derived from source-separated biodegradable wastes, and research on the potential of mechanical biological treatment (MBT) technologies. To increase recycling markets the national *Market Development Programme for Waste Resources* (www.rx3.ie) was established in 2006.

BENEFITS OVERVIEW

The key benefits achieved from the waste management approach over the last decade are the reduced environmental impacts of improved waste management job creation and economic growth. The environmental improvements include diversion from landfill, fewer landfills in operation and at much higher operational controls as well as a mixture of waste management options including increased recycling and composting..

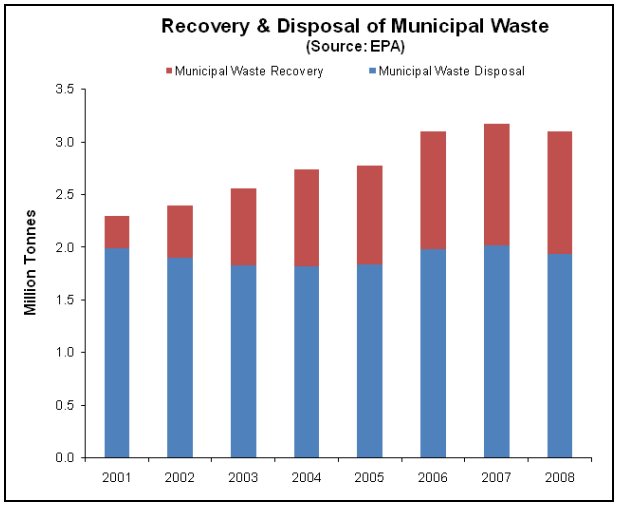
WASTE MANAGEMENT IMPROVEMENTS

Over much of the last decade Ireland's waste growth has tracked the growth in population and economic performance. However, in 2008157 there was a decline in the generation of municipal waste reflecting the fall in GDP. Household waste generation fell despite a rise in population, indicating a leveling off in personal consumption. This suggests a decoupling of the link between increasing municipal waste generation and population growth. Nevertheless, per capita waste generation is still considered to be at a high level. A feature noted is that Municipal Sold Waste (MSW) figures are not comparable across the EU as every country uses different ways of gathering data/different definitions. This as noted as an area where improved harmony across Member States would be beneficial. Irish data is considered very good in that all waste is weighed at the 29 landfills left in operation.

Municipal Waste

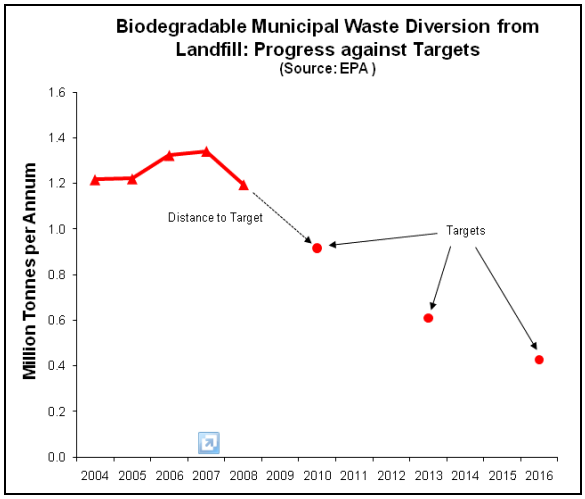
As illustrated, the amount of municipal waste produced has increased steadily over the last decade to approximately 3 million tonnes in 2008. However as the figure also shows, municipal waste recovery has increased dramatically over the last decade with 37.5 % of this waste recovered as distinct from landfilled in 2008 (EPA, 2010).

[157] The 2009 EPA Waste Statistics report with 2009 data is due to be published by end Feb 2011. These updated figures can be incorporated in the final report.



Biodegradeable Municipal Waste (BMW)

As illustrated, the quantity of biodegradable municipal waste disposed at landfill has started to decrease to 1,196,044 tonnes in 2008. Increased home composting and kerbside collection of organic waste are contributing to this trend. A further reduction of 280,000 t on the 2008 tonnages is needed to reach the July 2010 EU Landfill Directive target (EPA, 2008 & 2010).



Packaging and WEEE

Ireland has been compliant with all statutory packaging recovery targets set since 2001. A recovery rate of 65% is reported for packaging waste, exceeding the EU target of 60% due in 2011. In 2008 a total of 51,964 t of WEEE was collected for recovery. This included 9 kg per capita of household WEEE, exceeding the EU target of 4 kg per capita (EPA, 2010).

Construction & Demolition

The quantity of Irish construction and demolition (C&D) waste collected in 2008 was 13.5 million tonnes. The mining and aluminum production sectors are the largest generators of non-hazardous industrial waste (EPA, 2010).

Hazardous Waste

The quantity of hazardous waste managed has been increasing in recent years and was 319,098 tonnes in 2008 (EPA, 2010). The treatment of hazardous waste on-site at industrial facilities is declining in favour of the use of commercial hazardous waste treatment facilities in Ireland or abroad.

Economic impacts

IMPACTS ON TURNOVER OF WASTE AND RELATED INDUSTRIES

A lack of a waste management infrastructure to support environmentally sound and cost effective municipal and commercial waste generational nationally was an identified economic limitation prior to improvements moving forward, but no quantified economic data for this has been identified in the evidence base.

The Market Development Programme have identified in particular that a greater indigenous recycling capacity in Ireland will lead to:

- creation of employment;
- reduced transportation (with its associated cost and environmental impacts);
- greater self-sufficiency and ability to respond to global economic shocks or market failures;
- reinforce public confidence in the environmental benefits of recycling and drive forward participation (MDP, 07-11).

For enterprise sectors, while the improved waste management infrastructure over the last decade is associated with enabling economic growth in business, the increasing costs of waste management over this time is noted as a barrier to competition (Forfas, 2010).

FINANCIAL IMPACTS

In the waste management improvements in Ireland over the last decade a polluter pays principal has been used where costs are paid by both business and consumers. Costs to the householder have increased to cover disposal, composting and recycling. As part of a review of waste policy in light of international practice conducted in 2009, the costs of providing a household collection with reuse and recycling (i.e. excluding the costs of disposal) were estimated as €200 per annum. This was seen as very high in comparison to other EU Member States (Eunomia, 2009). Efficiencies of the order of €50/household/annum (overall potential benefit for all Irish householders of €50 million/annum) were also identified as being possible with a range of restructuring measures not designed to adversely impact the reuse and recycling rates.

Other financial impacts associated with the original lack of an enforced waste management policy and infrastructure include environmental clean up costs of illegal disposal. No total figure for this was available. However from 2003-2006, the OEE Enforcement Network, noted as a key success factor in reducing illegal waste disposal, cost over €7.4 million to operate (EPA, 2008). Capital investments for waste management by central government in the 2000- 2006 period are estimated at over €825.5 million with the Market Development Programme investment costing €14 million (07-2011).

IMPACTS ON RESOURCE USE

In line with Irelands waste legal and infrastructure framework improvements over the last decade, the recovery of materials for recycling has steadily increased. As illustrated in Table 33 household recycling has increased from 75,000 tonnes/annum in 2001 to 425,000 tonnes/annum in 2007 (Curtis et al, 2010). In terms of materials this increased recycling has encompassed paper, cardboard and glass in the main. Considerable scope exists for other resource streams under utilised at present, in particular organic waste and plastics. This is a key focus of the Market Development Programme for Waste Resources who identified organics, paper and plastics as offering the greatest potential for recycling activity in Ireland (MDP 07-11). However, market stimulation was seen as key to develop markets if national recycling was to be successful.

Table 33: Household waste generation and management 2001-2007 (thousand tonnes)

	2001	2002	2003	2004	2005	2006	2007
Generated	1469	1679	1705	1728	1746	1979	1761
Landfilled	1255	1294	1231	1215	1199	1379	1200
Recycled	75	133	186	286	345	394	425
'Uncollected'	139	252	288	227	203	205	136

Source: Le Bolloch *et al.* 2009, Meaney *et al.* 2003.

From a resource perspective, currently, export is still a key feature of Irish waste management in spite of the significant improvements over the last decade. These are mainly due to the remaining limitations of national infrastructure, in particular for recyclables that would enable better resource use. Based on 2008 data, 78.5 % of non-hazardous waste was exported to other EU Member States for recovery. The reasons for this are largely due to scale, limited recycling infrastructure and markets. In terms of scale the Irish market is small and as such it is difficult to develop a recycling industry of sufficient scale that can economically compete with large facilities abroad. Further even during the 'boom' economic times, enterprise did not invest sufficiently in infrastructure development and this is even more unlikely in the recession.

Looking at the impact of the strong reliance on overseas recycling on raw materials, national recycling facilities for streams e.g. plastic and paper could have economic advantage. However for paper, the closure of the only Ireland based paper mill in 2005 requires new recycled paper markets from low to high value to be grown. For plastics, the current use of recycled plastic in Ireland is estimated to be in the range of 70,000 to 80,000 tonnes. Most is imported from France, Holland and the UK. In 2005, the Irish plastic manufacturing industry imported 220,000 tonnes of polymers. However, barriers to growing the Irish market for recycled plastics include an unstable market subject to price fluctuations and limited investment in infrastructure to date (MDP 07-11).

Social impacts

IMPACTS ON EMPLOYMENT

Growth in the Irish waste management sector and associated job creation has been connected with the improvements in waste management to divert waste from landfill in particular to recycling and composting as well as improved hazardous waste management over the past decade. However not all of these additional jobs will have arisen in Ireland in light of the export reliance for recycling and some hazardous wastes. Those that have been identified for Ireland include:

- Increases in the Recovery and Recycling sector that has developed which is estimated to be worth €560m (based on 2008 data albeit this was noted as being based on limited data at that time) (Forfas, 2008). The sector is comprised mainly of SMEs with a small number of large enterprise and some foreign direct investment. It was seen as a growth sector in 2008, pre recession.

- Estimated jobs created only from the collection and sorting industries, and from the composting and digestion of organic wastes, net of those lost in the residual waste/landfill management are only 300 for the municipal waste changes alone (Eunomia, 2009).

- If the additional waste management infrastructure planned for organic and additional recycling waste streams come to fruition, these employment figures would be expected to increase.

IMPACTS ON HEALTH

Qualitative improvements to public health have occurred in line with the waste legal and infrastructure developments. These include:

- Public health benefits of significantly reducing waste dumping, from improved household collection and segregation of waste as well as from designated legally compliant civic amenity centres for waste collection and recycling.

- Landfill engineering , operational controls and management in line with waste landfill licensing and guidance has brought health benefits for landfill employees. Key successes are that all municipal waste is now landfilled in lined cells with gas and leachate collection. Odour complaints from waste transfer stations have reduced almost three-fold (from just under 200 to 68) during 2006-2008 (EPA, 2009).

Summary of barriers and drivers

BARRIERS TO BETTER IMPLEMENTATION AND ENFORCEMENT

The key barriers to better implementation and enforcement include:

- Lack of development of a waste management infrastructure in parallel with continuous environmental improvements in national requirements in the legal and enforcement framework;
- Competition in waste management sector.

These are outlined below.

First barrier: Waste infrastructure still missing

The waste infrastructure in Ireland in 1998 was mainly based on using landfill which is not an environmentally desirable option. At current national waste generation rates it is estimated that there may be just enough residual municipal waste landfill disposal capacity to last to 2020. This capacity is not distributed evenly and some regions are at a critical capacity shortage stage. Even with some infrastructure developments now in place, Ireland is still dependent on export arrangements for certain waste streams such as hazardous waste and a large proportion of recyclables with 78.5 % of non-hazardous waste recovered abroad in 2008. Part of the barrier is because Ireland is a small country and hence national recycling facilities are likely to find it hard to compete economically with larger facilities abroad.

However, infrastructure developments have incorporated some waste recovery and recycling as well as composting. Figure 4 illustrates municipal waste recovery options in Ireland vs a selection of other countries as of 2008.

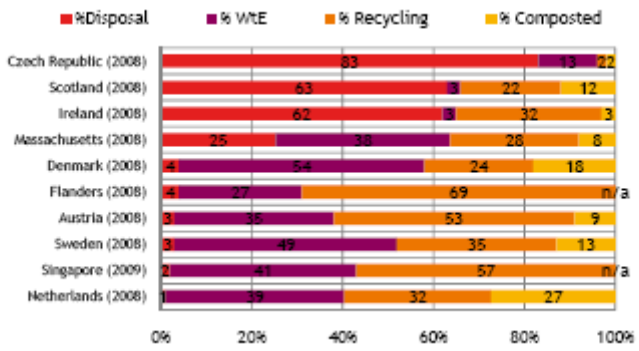


Figure 4: Municipal Waste Treatment Options 2008 (Source: RPS, 2009)

Overall recycling/recovery rates continue to climb steadily, particularly in the municipal, packaging and Waste from Electrical and Electronic Equipment (WEEE) waste streams. Regarding incineration, Ireland has no merchant municipal waste incineration capacity, nor does it have any merchant hazardous waste incineration or hazardous waste landfill facility. As of 2008, landfilling still represented 62 % of municipal waste in 2008 (a drop from 64 % % in 2007), but this is still considerably above the EU average of 42% in 2007 (EEA, 2009).

Looking to the future, total volume of municipal waste is likely to increase substantially within the coming decade requiring further future investment in waste management infrastructure. These include enabling re-use, biowaste treatment, materials recovery and incineration (EPA, 2011). It is anticipated that merchant municipal incineration capacity (under construction and expected to be operational by end 2011), as well as waste recovery/treatment will become available in this period. These developments in conjunction with the reduction in biodegradable municipal waste going to

landfill, are designed to enable greater diversion of resources to beneficial use, including waste to energy (EPA, 2010).

Second Barrier: Lack of Competition

For business, a lack of cost competition in the Irish waste management options has been seen as a barrier for some time. However, it was noted that in the recession this has not been seen as competition between landfill operations has made recycling less economically attractive.

From an enterprise perspective, increased legislation (e.g. requiring waste separation and recycling), to include the progressive increases in landfill levy and the new proposed waste facility levy are seen as adversely impacting on the direct cost of businesses and putting jobs at risk (Forfas, 2010). Key improvements identified to resolve this include:

- Having clear, unambiguous policies rolled out in the targeted timelines
- Providing a legal level playing field for public and private sector waste management service providers
- Ensuring policy promotes competition for, rather than competition in, the market such that competition for the market delivers increased efficiencies and lower collection prices for businesses and households.

Conclusions

The key conclusion from these barriers is that in addition to an effective waste implementation and enforcement structure, a competitive waste infrastructure is needed. In particular, this needs to develop in parallel and at the same timeline as waste legal compliance obligations to enable continuous environmental improvements at the higher end of the waste hierarchy.

DRIVERS OF BETTER IMPLEMENTATION AND ENFORCEMENT

Key drivers for better implementation and enforcement have included:-

- Awareness raising and fostering behaviour change in both business and consumers;
- Use of fiscal instruments;
- Waste Infrastructure investment.

These are outlined below.

First Driver: Awareness Raising in Business and Consumers

Ireland was the first EU MS to introduce the Plastic Bag levy such that plastic bags in retailers incur a charge. A high profile national media campaign *Race Against Waste* and specific messaging on the plastic bag levy in the media and in store were conducted in tandem and helped to improve awareness on the litter, environmental , health and cost saving reasons behind better waste management. The campaigns initially focused on shock tactics highlighting the health concerns of

excessive waste generation and running out of landfill space. This moved on to education on how to recycling and compost plus local infrastructure information to facilitate use.

For business and in particular SMEs the Race against Waste *Small Change* (now complete) and current NWPP Econcertive and Green Business/Hospitality programmes of behaviour change to illustrate the business case and cost saving opportunities from more effective waste management practices. Further this was integrated with capacity building supports e.g. guidance, financial schemes (e.g. Enterprise Ireland EMS and waste management supports), waste clubs, pilot schemes and published case examples.

Second Driver: Fiscal Instruments

For business, a policy of high and progressively increasing landfill charges for many years, enforcement of legislation and improving availability of waste management recycling and composting infrastructure in combination have been an effective driver to motivate business to engage on improved waste management that has resulted in diversion from landfill and increased recycling. In particular, the landfill levy has been a primary financial driver within this integrated programme. Ireland has one of the highest net landfill fees in the EU and Figure 5 shows how Ireland compares with a range of other countries.

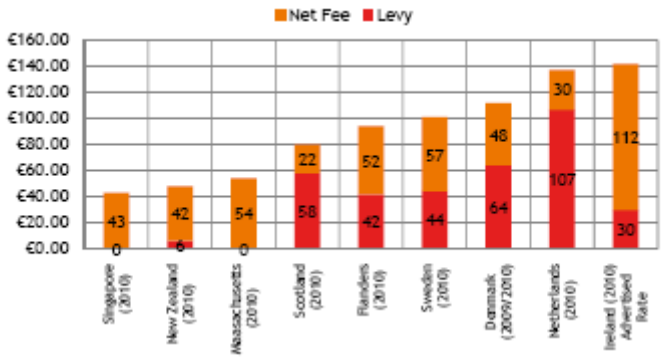


Figure 5: Advertised Landfill Gate Fees including levy, 2010 (Source, RPS, 2009)

Further, a policy to introduce a waste facility levy for all waste treatment options was proposed in the January 2011 draft Environment Bill 2011 **(**DOEHLG, 2011), specifying the following landfill and waste facility charges for commercial waste:-

- **Landfill Levy:** Maximum: €120 per tonne. Maximum increase of €50 per annum.
- **Waste Facility Levy:** Maximum: €120 per tonne. Maximum increase of €50 per annum.

However, the future of this policy is now uncertain pending formation of a new Irish government at the forthcoming election.

For consumers, the introduction of the infrastructure for separate household collection of dry mixed recyclable and compostable food wastes (green and brown bin system) and charging by weight for collection has been effective in driving householders to reduce the waste they generate and hence would have to pay to have collected.

Third driver: Waste management infrastructure

While the remaining limitations in Irish waste management structure described in 5.1.1 above are seen as barriers, the significant investment in infrastructure coupled with legislation, enforcement, fiscal tools and awareness raising has been a key driver. Significant increases in public and private investment in waste infrastructure have been, and will continue to be, important in stimulating growth in certain sectors of the market (Forfas, 2008).

Conclusions

The last decade has seen huge change in relation to how waste is managed in Ireland. The regulatory regime imposed on the waste industry in this period has yielded significant and measurable improvements in environmental protection. Ireland has moved quickly from a position of almost total reliance on landfill for managing waste to a high level of recovery of certain recyclable materials, albeit infrastructure limitations are still a barrier resulting in Ireland being reliant on waste export markets to an unsustainable extent. A range of regulatory and market based instruments have been utilised to achieve more sustainable waste management practices. These include levies (e.g. landfill, plastic bags), source separated collection of biowaste, and pre-treatment and restriction of particular waste streams to landfill. Proposals for a new waste facility levy are now in consultation. Plans for continued infrastructure developments needed have been delayed but are still anticipated going forward to enable the improvements achieved over the last decade to be maintained and continue. EU legislation continues to be a significant driver of waste policy (e.g. Waste Framework Directive, Landfill Directive and Producer Responsibility initiatives, etc).

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Annex C: References for 2.2 and 2.3

List of abbreviations

As,e	Arsenic equivalent – unit for risk from carcinogenic emissions into air
C&D	construction and demolition waste
CFC-11, e	CFC-11 (trichlorofluoromethane) equivalent – unit for ozone depletion potential
CO_2,e	Carbon dioxide equivalent – unit for greenhouse gas potential
dm	dry matter
ELV	end-of-life vehicles
EU-27	European Union of 27 Member States
GDP	Gross domestic product
$Gt_{CO2,e}$	Giga tonnes (= billion tonnes) of CO_2 equivalent
HH	households
kt	kilo-tonnes, thousand tonnes
M€	Mega Euro, million Euro
MSW	municipal solid waste
Mt	Mega tonnes, million tonnes
$Mt_{CO2,e}$	Mega tonnes (= million tonnes) of CO_2 equivalent
MW	municipal waste
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne (Statistical classification of economic activities in the European Community)
PJ	Peta-Joule (10^{15} Joule)
PM	particulate matter
PM_{10},e	Particulate matter smaller 10 µm equivalent – unit for health risk from particulate matter
PO_4,e	Phosphate equivalent – unit for eutrophication potential
SO_2,e	Sulfur dioxide equivalent – unit for acidification potential
WEEE	waste from electric and electronic equipment
WFD	Waste frame directive (dir 2008/98/EC)

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Annex D: Scenarios of year 2020 EU-27 waste management system

Summary of reports on which the scenarios were based

The following reports provide information on the development of the European waste management system and its actual or potential impacts. They form the basis for the subsequent definition of the scenarios on the EU-27 waste management system with/without full implementation of EU waste legislation.

Milieu et al. (2009)

An estimated 2.9 billion tonnes of waste were generated in 2006 in the EU, over 6 tonnes per citizen, and about 89 million tonnes of this waste is classified as hazardous.

The EU15 has at least 63,000 waste management facilities, and the EU12 at least an additional 7,400, according to data reported by Member States to Eurostat. These numbers are installations requiring a permit under the Waste Framework Directive. The number of waste facilities and sites are likely to be significantly higher due to the existence of a suspected large number of facilities and sites lacking permits, which should be subject to enforcement measures.

Another issue is the dramatic increase in waste shipments in recent years, both within the EU and to third countries. For example, between 1995 and 2005, EU15 exports of waste paper increased more than five-fold and those of waste plastic, seven-fold. The rising number of shipments brings new risks that illegal waste shipments are made. In recent years, media reports have highlighted illegal exports of hazardous waste from the EU to developing countries that lack adequate waste management facilities, as well as electrical and electronic waste illegally shipped as second-hand goods.

The European Parliament, the Council and the Commission have set in place a comprehensive system of over 60 legal acts (regulations, directives and decisions) aimed at ensuring that all waste in the EU is managed so as to prevent harm to human health and the environment.

In 2006 and 2007, waste cases accounted for 19% of all new environmental infringement (non-compliance) cases – the second highest category behind nature protection (26%).

Gaps in implementation and enforcement have given rise to significant problems in many parts of the EU, notably:

- illegal waste dumping at a significant scale,
- large numbers of landfills and other facilities and sites that do not meet EU requirements
- and a high level of illegal waste shipments.

Milieu et al. (2009) conclude that Protection of human health and the environment is not achieved.

Recommendations:

- Installation of an EU Agency for waste implementation
- European network of Member States to support agency

With total costs of 16 M€/a. (The proposed agency would require just under 50 professional staff members and 11 management and support staff. Additional staff would also be needed by the proposed body for carrying out direct inspections and controls of facilities and sites, possibly hosted by the Commission/DG Environment: 20 new staff, including 15 operational staff for the body. Additional staff would be added at the secretariat of the European network (2), Member State governments (5), and EEA/Eurostat (1.75 combined). In addition to these annual costs, the agency would require an additional 1.6 million Euros in estimated start-up costs in its first two years.)

Potential benefits:

- Protection of human health and the environment is achieved
- No illegal waste dumping
- Landfills and other facilities and sites meet EU requirements
- No illegal waste shipments
- Better trained staff for controlling and monitoring of waste streams and treatment facilities; better coordination among national bodies with responsibilities for inspections and controls; better information for the planning/regulation of future waste management
- Economic benefits:
    - Governments and taxpayers in some Member States would face a lower burden for the future clean-up costs of illegal waste activities and sub-standard landfills.
    - Related health and environmental costs would be reduced.
- lower greenhouse gas emissions.
- level playing for European companies, lowering their costs;
- create opportunities for innovation in waste management
- increase access to valuable secondary raw materials.

UNEP Green Economy Report (UNEP 2010)

In the waste chapter of the UNEP green economy report (UNEP 2010) negative impacts of non functioning waste management systems and possible benefits from fully functioning waste management systems are analysed from the global view. Core findings are:

- The increasing volume and complexity of waste are posing serious risks to ecosystems and human health.

- Of all the waste streams, waste from electrical and electronic equipment containing new and complex hazardous substances presents the fastest growing challenge in both developed and developing countries.
- Uncontrolled dumpsites are linked to many harmful health effects and losses of property values or livelihoods (e.g. related to agriculture or tourism) around the landfill areas.
- Consumer demand for materials and energy is growing while scarcity of these resources is increasingly felt.
- Proper waste management and recycling can solve these problems. E.g. in terms of resource and energy saving, per tonne of paper recycling 17 trees and 50 % of water can be saved. Recycling one tonne of aluminium saves 1.3 tonnes of bauxite residues, 15 cubic meter cooling water 0.86 cubic meter process water, 37 barrels of crude oil, 2 tonnes CO_2 and 11 kg SO_2.

Stern Report (Stern 2006)

1.3 $Gt_{CO_2,e}$ greenhouse-gas emissions (that is 3 % of the total world greenhouse-gas emissions of 42 $Gt_{CO_2,e}$) have been caused by waste worldwide in the year 2000. Agriculture accounted for 14 % and buildings for 8 % of the global greenhouse gas emissions.

If no action is taken climate change will lead to major disruptions to economic activity, later in this century and in the next, on a scale similar to those associated with World War I and II and the economic depression of the first half of the 20th century. With 5 to 6 °C warming – which is a real possibility for the next century – models estimate an average 5 to 10 % loss in global GDP. When direct impacts on the environment and human health are taken into account, the cost of climate change increases by a further 6 % of GDP. **The social costs of carbon are estimated to lie with 85 $ per tonne (corresponds to 78 €$_{2010}$/t).**

The benefits of strong, early action considerably outweigh its costs. The earlier effective action is taken, the less costly it will be. The cost for stabilising the atmospheric greenhouse-gas concentration at 550 ppm by the year 2050 are estimated to lie at 1 % of global GDP (with a range between – 1 % (net gains) and +3.5 %). The net benefits are estimated to lie with 2.5 trillion dollars (2.3 trillion €$_{2010}$).

In total, the cost-benefit ratio of early greenhouse-gas abatement seems to be at about 1:10.

IFEU (2005)

IFEU (2005) compares the German municipal waste management system of the years 1990 (limited implementation of waste legislation), 2001 (advanced implementation of waste legislation) and 2005 (full implementation of waste legislation) and investigates following environmental impact categories

- Fossil resources
- Mineral resources – recycling of iron
- Mineral resources – recycling of phosphates by compost recycling
- Greenhouse effect

- Acidification
- Eutrophication of soil
- Eutrophication of water
- Risk by the emission of carcinogenic substances
- Risk by emitted small particulate matter (PM10).

The numbers in Table 34 show the impact of the municipal waste management sector minus the avoided impacts by recycling of energy and materials in other sectors as determined by IFEU (2005). For all environmental impact categories investigated but eutrophication of soil, a full implementation of waste legislation provides a net negative impact. That means in almost all environmental impact categories a full implementation of waste legislation brings a relief of environmental impacts.

Table 34: Per capita net environmental impact of municipal waste management in Germany (IFEU 2005)

Impact	Unit	Year		
		1990	2001	2005
Fossil resources	MJ/cap.	-378.4	-1249.1	-1590.3
Mineral resources – recycling of iron	kg/cap	-3.0	-13.4	-16.1
Mineral resources – recycling of phosphates by compost recycling	kg/cap	-0.03	-0.32	-0.32
Greenhouse effect	kg CO_2,e/cap	319.5	7.3	-54.6
Acidification	kg SO_2,e/cap	0.69	-0.05	-0.09
Eutrophication of soil	kg PO_4,e/cap	0.03	0.03	0.02
Eutrophication of water	kg PO_4,e/cap	0.21	-0.07	-0.09
Risk by the emission of carcinogenic substances	mg As,e/cap	2355.9	-36.3	-36.4
Risk by emitted small particulate matter (PM_{10})	kg PM_{10},e/cap	0.20	-0.30	-0.34

Hardacre (2008)

The administrative costs for implementing all public regulations within the EU are estimated to lie with 600 billion €/year.

It is estimated, that 25 % of these costs can be referred to unnecessary administrative burdens such as unnecessary reporting obligations of Businesses and citizens to legislation authorities. Unnecessary administrative burdens:

- Cause business and subsequently consumer costs
- Inhibit competition
- Damage primarily SMEs
- Create barriers to entry into markets
- Can prove to be expensive, if not impossible, to enforce

- All of which reduces welfare in society.

The EU has started a better regulation programme for removing unnecessary administrative burdens.

Better regulation is characterised by seven core principles:

- Necessity
- Proportionality (instruments used should be in proportion to the aims to be achieved)
- Subsidiarity (objectives must be pursued at the most relevant level)
- Transparency
- Accountability (clear identification of responsibility)
- Accessibility (regulation is consistent, comprehensible and communicated)
- Simplicity.

BIOIS et al. (2011)

In BIOIS et al. (2011) a scenario on the generation of waste in EU-27 up to the year 2020 can be found. Based on the reported development of the waste generation in the 27 EU Member States of the years 2004, 2006 and 2008 the waste generation in these states of the year 2020 was extrapolated for the following waste categories: household waste, mineral waste and "other" waste.

The resulting waste generation for the years 2008 and 2020 by country is shown in

Table 35 and by material type in Table 36.

Table 35: EU-27 waste generation in BIOIS et al. (2011) scenario by country in Mt

	Year 2008				Year 2020			
Country	Mineral waste	Household waste	Other waste	TOTAL	Mineral waste	Household waste	Other waste	TOTAL
Austria	37.7	3.8	14.8	56.3	49.7	4.5	16.3	70.6
Belgium	35.2	4.5	19.9	59.5	46.1	5.2	20.3	71.6
Bulgaria	278.0	2.9	5.2	286.1	290.9	2.7	4.6	298.3
Cyprus	1.0	0.4	0.5	1.8	1.6	0.7	1.2	3.5
Czech Republic	14.8	3.2	7.4	25.4	17.3	3.2	8.5	29.0
Denmark	7.1	2.5	5.6	15.2	8.0	3.4	5.5	16.9
Estonia	14.5	0.4	4.6	19.6	24.4	0.5	4.3	29.2
Finland	60.9	1.7	19.2	81.8	72.7	2.1	22.9	97.7
France	253.8	29.3	61.9	345.0	250.7	37.2	66.1	354.1
Germany	270.4	35.6	66.8	372.8	327.1	40.7	98.8	466.6
Greece	59.1	4.0	5.6	68.6	83.1	4.5	4.5	92.1
Hungary	11.6	3.5	5.3	20.4	15.2	3.4	5.7	24.3
Ireland	17.0	1.7	4.9	23.6	27.1	3.2	7.5	37.7
Italy	95.4	31.5	52.2	179.0	113.5	39.4	68.3	221.2
Latvia	0.2	0.6	0.7	1.5	0.3	0.6	0.5	1.4
Lithuania	0.8	1.4	4.7	6.8	1.0	1.3	4.7	7.0
Luxembourg	8.7	0.3	0.6	9.6	13.7	0.4	0.8	15.0
Malta	1.1	0.2	0.2	1.5	1.1	0.3	0.2	1.6
Netherlands	39.5	9.5	50.6	99.6	52.9	11.2	63.2	127.3
Poland	107.4	6.9	26.1	140.3	106.1	6.8	25.1	138.0
Portugal	6.9	5.2	24.4	36.5	6.8	7.0	27.3	41.2
Romania	155.1	8.5	25.8	189.3	153.2	8.7	24.9	186.8
Slovakia	4.5	1.8	5.2	11.5	5.7	1.9	6.8	14.4
Slovenia	1.7	0.7	2.7	5.0	1.6	1.0	3.7	6.3
Spain	85.9	24.5	38.9	149.3	84.9	27.6	39.4	151.9
Sweden	65.7	4.4	16.1	86.2	87.3	5.7	27.2	120.2
United Kingdom	180.6	31.5	122.0	334.1	178.5	33.8	147.3	359.6
EU-27	**1,815**	**220**	**592**	**2,626**	**2,021**	**257**	**706**	**2,984**

Table 36: EU-27 waste generation in BIOIS et al. (2011) scenario by material type in Mt

Year	Mineral	Bio waste	Paper	Plastics	Glass	Metals	Wood	Chemical waste	Sludge	Other
2008	1,815	188	94	45	31	98	65	52	61	178
2020	2,021	192	100	37	29	130	87	69	88	232

Prognos Studies

Prognos (2008) provides an overview of the share of 18 waste streams recycled or treated with energy recovery in the year 2004. These 18 waste streams constitute 82.8% of the total waste generated in 2004 in the EU-27.

Table 37: Overview for alternatives in waste management for 2004 in EU-27 (Prognos 2008)

	Waste/material type	Generation in Mt	Landfilling, incineration without energy recovery and other disposal in Mt	Recycling in Mt	Energy recovery including MSW incineration in waste to energy plants in Mt	Total recycling + energy recovery in Mt	Rate of recycling + energy recovery in %
1	Glass	21.6	10.9	10.7	0.0	10.7	49.5
2	Paper and cardboard	79.5	25.5	44.2	9.8	54.0	67.9
3	Plastics	26.2	12.5	4.5	9.2	13.7	52.3
4	Iron and steel	102.6	24.9	77.7	0.0	77.7	75.7
5	Aluminium	4.6	1.5	3.1	0.0	3.1	67.4
6	Copper	1.4	0.5	0.9	0.0	0.9	64.3
7	Zinc	1.2	0.5	0.7	0.0	0.7	58.3
8	Lead	1.0	0.4	0.6	0.0	0.6	60.0
9	Other metals	1.2	0.7	0.5	0.0	0.5	41.7
10	Waste Wood	70.5	17.5	21.7	31.3	53.0	75.2
11	Textiles	12.2	6.0	2.8	3.4	6.2	50.8
12	Rubber and tyres	3.2	0.6	1.6	1.0	2.6	81.3
13	Biowaste	87.9	41.4	28.8	17.7	46.5	52.9
14	Solid replacement fuels	70.1	40.9	0.0	29.2	29.2	41.7
15	Oil containing waste	7.4	1.8	2.2	3.4	5.6	75.7
16	Spent solvents	1.6	0.1	0.4	1.1	1.5	93.8
17	Ashes and slag	131.4	48.5	82.9	0.0	82.9	63.1
18	Minerals	1,794.4	1,025.2	769.2	0.0	769.2	42.9
	Total considered	**2,418.0**	**1,259.4**	**1,052.5**	**106.1**	**1,158.6**	**47.9**
	Total generation	**2,920.0**					
	Share of total generation considered in %	**82.8**					

Prognos (2008) calculates the avoided greenhouse gas emissions of the recycling/incineration with energy recovery of the 12 most relevant waste streams plus the remaining greenhouse gas emissions from the landfilling and incineration of municipal solid waste in 2004 and the emissions, which would have occurred if the targets of different directives (Table 38) already had been fulfilled in 2004 (Scenario 2).

Table 38: Targets considered in Scenario 2 of Prognos (2008)

Directive	**Targets considered**
Landfill directive	Closing of non-compliant landfills
	35 % biodegradable waste landfilled as compared to 1995
	Used tyres ban on landfills
Packaging directive	Recycling rates: 60 % glass, 60 % paper, 50 % metals, 22.5 % plastics, 15 % wood
ELV directive	85 % re-use and recycling of car
	95 % metal recycling
WEEE directive	Separate collection of 4 kg/cap.a
	75 % recovery
Waste frame work directive	70 % recycling of C&D
	50 % recycling of paper, metal, plastic and glass from households and similar installations

Table 39 shows how much greenhouse gas emission had been already avoided by the recycling/incineration with energy recovery of the 12 selected waste streams in the year 2004 and how much would be avoided in scenario 2. Also shown is the distribution of recycling/incineration with energy recovery between Municipal Solid Waste and other waste.

Table 40 shows how much greenhouse gas was emitted from the landfilling and energy-recovery-free incineration of Municipal Solid Waste in the year 2004 and how much would be emitted in scenario 2.

Table 39: Greenhouse gas emission reduction by the recycling/incineration with energy recovery of 12 selected waste streams (Prognos 2008)

Waste/material type	Total recycling + energy recovery in Mt in 2004	Tonnes of $CO_{2,e}$ emission reduction per tonne of waste recycled/energy recovered	CO_2 reduction in Mt $CO_{2,e}$	
			Year 2004	Scenario 2
Glass	10.7	0.180	1.926	3.086
Paper and cardboard	54.0	0.671	36.258	54.523
Plastics	13.7	0.323	4.425	8.282
Iron and steel	77.7	1.000	77.711	92.016
Aluminium	3.1	10.964	33.989	43.685
Copper	0.9	1.127	1.014	1.377
Waste Wood	53.0	0.440	23.342	29.831
Textiles	6.2	1.560	9.672	19.126
Rubber and tyres	2.6	1.353	3.519	4.297
Biowaste	46.5	0.013	0.617	2.224
Solid replacement fuels	29.2	0.453	13.214	37.309
Total	**297.6**		**205.7**	**295.8**
of these from MSW	96		66.4	104.4
of these from Non MSW	201.6		139.3	191.4

Table 40: Greenhouse gas emission by the landfilling/incineration without energy recovery of residual municipal solid waste (Prognos 2008)

Emission factor (Tonne $CO_{2,e}$ emitted per tonne of MSW landfilled/incinerated without energy recovery)	CO_2 emissions from landfilled/without energy recovery incinerated MSW in Mt $CO_{2,e}$	
	Year 2004	Scenario 2
0.617	113.5	6.5

In 2004 in EU-27 some 206 $Mt_{CO_{2,e}}$ of greenhouse-gas emissions were already saved by recycling and energy recovery. According to Prognos (2008) an additional 197 $Mt_{CO_{2,e}}$ (or 26 % of the EU greenhouse-gas emission saving target for 2020) can be saved by fully achieving the targets shown in Table 38. 90 $Mt_{CO_{2,e}}$ are saved by the replacement of primary raw materials and fuels and 107 $Mt_{CO_{2,e}}$ are saved by reduced greenhouse gas emissions from less landfilled and without-energy-recovery-incinerated MSW. The remaining annual greenhouse gas emission in Scenario 2 from MSW landfilling, incineration and fuel preparation was calculated to be 6.5 $Mt_{CO_{2,e}}$ instead of the 113.5 $Mt_{CO_{2,e}}$ in 2004.

Prognos (2009a) complements the Prognos (2008) data with more detailed information on the origin of waste streams and market price data.

Prognos (2008, 2009a,b) provide a valuable basis for calculating the value of a complete implementation of waste legislation. It, however, does not take into account expected future increases in waste generation and effects of waste prevention initiatives. It also neither calculates the value of the secondary raw materials and fuels nor gives estimates of environmental impacts other than greenhouse gas emissions.

Therefore, for the purpose of this study, mainly based on Arcadis (2010), Prognos (2008) two new, more comprehensive scenarios (Scenario A and Scenario B) of waste generation and treatment in EU-27 for the year 2020 are developed.

Scenario definitions

In order to show the value of a full implementation of EU waste legislation, 2 scenarios for the EU waste management system of the year 2020 are defined:

- Scenario A describes a year 2020 EU-27 waste management system, which would prevail, if no further implementation of the EU-waste legislation occurred which goes beyond what was already implemented in the year 2008.
- In Scenario B, waste legislation as defined by the waste framework directive (2008/98/EC), the landfilling directive (1999/31/EC), the packaging directive (1994/62/EC), the end-of-life vehicles directive (2000/53/EC), the Waste from electric and electronic equipment directive (2002/96/EC), the batteries directive (2006/66/EC), the incineration directive (2000/76/EC) and all regulations regarding the shipment of waste are fully and effectively implemented in all EU-27 Member States. It is also assumed that effective means have been found to prevent illegal waste shipments and the drain of valuable raw materials.

The difference between Scenario B and Scenario o gives the total value of the full implementation of EU-waste legislation.

The difference between Scenario B and Scenario A gives the incremental value of the full implementation of EU-waste legislation as compared to the year 2008 implementation.

The main differences between Scenario A and Scenario B are:

- In Scenario A all waste generated in 2020 in addition to the waste already generated in 2008 is landfilled at sites which correspond to the average year 2008 quality. No waste prevention is undertaken. Recycling rates are not changed as compared to 2008.
- In Scenario B much less waste is landfilled. The remaining waste is either treated for material recycling (including composting) or energy recovery. There is effective waste prevention. Recycling rates are increased. All waste is treated within EU-27.

The amount of waste generated in 2020 is taken respectively derives from BIOIS et al. (2011):

- The waste generation in Scenario A correspond to the BIOIS et al. (2011) scenario shown in

Table 35.

- In Scenario B it is assumed that some 4 % of the waste which is generated in the year 2020 in Scenario A can be prevented by the waste prevention measures which will be taken be the EU Member States in addition to what already has been started till the year 2008. Experience with cleaner production centres in Germany has shown, that some 8 % of waste generation can be prevented by supporting the enterprises through audit, consulting and financing schemes (EFA 2010). It is assumed that this 8 % are a typical waste prevention potential for all waste types. It is further assumed that half of this potential can be activated and thus 4 % of the waste generation can be prevented by the new waste prevention measures till 2020.
- The resulting amounts of waste generated in 2020 together with the assumed recycling rates for Scenario A and B are shown in Table 41.

Table 41: Scenario Parameters for the year 2020

	Scenario A		**Scenario B**	
Parameter	**Definition/value of parameter**	**Source**	**Definition/value of parameter**	**Source**
General description	**Reference Scenario**		**Full waste legislation implementation scenario**	
	No additional waste prevention; treatment and recycling capacity for all waste types stays the same as in 2008, the rest is landfilled.		4 % waste prevented	
Waste generation in EU-27 in Mt	2984	BIOIS et al. (2011)	2864	BIOIS et al. (2011) minus 4 %
Treatment and recycling				
Landfilling	All non treated waste on landfills, share compliant/non compliant same as in 2008		Only non-reactive waste landfilled, only compliant landfills in operation	(landfill directive 1999/31/EC)
			35 % biodegradable waste landfilled as compared to 1995	(landfill directive 1999/31/EC)
Recycling of construciton and demolition waste	Same amount as 2008		70 % recycling of C&D	(waste framework directive 2008/98/EC)
Recycling of paper, metal, plastic and glass from households and similar installations	Same amount as 2008		50 % recycling	(waste framework directive 2008/98/EC)

	Scenario A		Scenario B	
Parameter	**Definition/value of parameter**	**Source**	**Definition/value of parameter**	**Source**
Recycling rates of packaging waste	**Recycling rates in %**		**Recycling rates in %**	
Glass	52	Derived from historic values (Prognos 2008, 2009a,b)	60	(packaging directive 1994/62/EC)
Paper and cardboard	67		67	(packaging directive 1994/62/EC)
Metals	70		70	according to EU-average 2006 (Prognos 2009)
Plastics	36		36	according to EU-average 2006 (Prognos 2009)
Wood			15	(packaging directive 1994/62/EC)
End-of-life vehicles	14 % separately collected/recycled	in Germany 2006 only 14 % of ELV is actually recycled (EEA 2010)	all ELV stay in the country, 85 % re-use and recycling of car, 95 % metal recycling	(ELV directive 2000/53/EC)
Waste from electric and electronic equipment	26.5 % separately collected/recycled	as estimated by EERA (European Electronics Recyclers Association) for 2006 (reported in EC 2008)	separate collection of at least 4 kg/cap.a, 75 % recovery	(WEEE directive 2002/96/EC)
Batteries	14 % separately collected/recycled	coupled to ELV-recycling (in Germany 2006 only 14 % of ELV is actually recycled (EEA 2010))	all ELV stay in the country, 85 % of ELV is recycled (ELV directive 2000/53/EC); 45 % of other batteries are recycled	(batteries directive 2006/66/EC)
Used tyres			No landfill	(landfill directive 1999/31/EC)

In the next step the total waste generated in Scenario A and Scenario B was broken down to the different material/waste streams defined by BIOIS (2011) and Prognos (2008) (see Table 36 and

Table 39), respectively. The resulting waste generations by material/waste type for Scenario A is shown in Table 43 and for Scenario B in Table 44.

The amounts of waste recycled, recovered as secondary material and used for energy recovery for Scenario A were taken from the year 2004/2006 scenarios of Prognos (2008 and 2009a). The balance between generation and (recycling plus energy recovery) was calculated as being landfilled. The resulting waste treatment flows for the year 2020 in Scenario A are shown in Table 43.

For Scenario B, recycling, material and energy recovery rates were taken from Scenario 2 of Prognos (2008) (which also assumes a full implementation of existing EU waste legislation). The resulting waste treatment flows for the year 2020 in Scenario B are shown in Table 44.

Taking the flows of recovered secondary material and of waste used for energy recovery for Scenario A and B, and the energy contents of the different waste streams and the rates of "avoided greenhouse gas emissions per tonne of waste recycled or energy recovered", taken from Prognos 2008 and other sources and shown in Table 42 gives the:

- Energy saved by recovery
- Amount of greenhouse-gases saved by replacing primary raw materials and fuels

as shown Table 43 in and Table 44 for Scenario A and Scenario B, respectively.

The differences in the mass and energy flows of Scenario A and Scenario B are shown in Table 47.

Within the scope of the main scenarios, the effect of waste prevention, and increased recycling and of keeping the waste flows within the European Union for waste from electric and electronic equipment (WEEE), batteries and end-of-life vehicles (ELV) was investigated in some detail. Table 45 shows the scenario assumptions and the resulting increase in secondary raw material recovery. The resulting 5 billion € of secondary metals saved is part of the 40 billion € total secondary material recovered in Scenario B over Scenario A shown in Table 46.

Table 42: Frame assumptions for the year 2020 scenarios

Frame Parameter	**Value**		
Damage costs of 1 tonne greenhouse-gas emitted in €/ $t_{CO2,e}$ [1)]	78		
Value of energy recovered in €/GJ [2)]	4.2		
Material/waste type properties	**Material actually used as secondary raw material / recycled material in %** [3)]	**Energy contents in GJ/t** [4)]	**GHG-emission rates in $t_{CO2,e}$ /t waste (recycled + energy recovered)** [5)]
Glass	90.0		0.18
Paper and cardboard	74.7	10	0.67
Plastics	84.9	42	0.32
Iron and steel	99.0		1.00
Aluminium	96.4		10.96
Copper	91.9		1.13
Zinc	90.0		
Lead	63.9		

Waste Wood	94.0	15	0.44
Textiles	90.0	10	1.56
Rubber and tyres	93.6	42	1.35
Biowaste	98.0	10	0.01
Solid replacement fuels		10	0.45
Oil containing waste	90.0	10	0.45
Spent solvents	90.0	10	0.45
Ashes and slag	90.0		
mineral C&D	90.0		
other minerals	90.0		
Sources:	1) (Stern 2006) 2) Heavy fuel oil price 2009, Austria. http://www.eia.doe.gov/emeu/international/hfoforelec.html, accessed on 03.01.2011. 3) (Prognos 2009a) 4) http://bioenergy.ornl.gov/papers/misc/energy_conv.html 5) (Prognos 2008)		

Table 43: Scenario A – Waste generation, treatment, recycling, material and energy recovery and (avoided) greenhouse-gas emissions

	Generation 2020 in Mt		Treatment in Mt							
	Total	of which MSW	Landfilling/Incineration without energy recovery/other disposal	Recycling + energy recovery	Recycling	Material recovery	Energy recovery	Energy saved in PJ	GHG-emission saved in $Mt_{CO_2,e}$	GHG emitted from MSW landfilled in $Mt_{CO_2,e}$
Glass	29.0	18.2	19.4	10.7	10.7	9.6			1.9	
Paper and cardboard	100.1	50.1	57.3	54.0	44.2	33.0	9.8	98.0	36.3	
Plastics	37.1	18.2	24.1	13.7	4.5	3.8	9.2	386.4	4.4	
Iron and steel	120.1	6.5	43.2	77.7	77.7	76.9			77.7	
Aluminium	5.5	1.2	2.5	3.1	3.1	3.0			34.0	
Copper	1.6	0.1	0.7	0.9	0.9	0.8			1.0	
Zinc	1.6	0.1	0.9	0.7	0.7	0.6				
Lead	0.8		0.2	0.6	0.6	0.5				
Other metals	0.8		0.3	0.5	0.5	0.5				
Waste Wood	86.7	9.4	35.0	53.0	21.7	20.4	31.3	469.5	23.3	
Textiles	12.5	6.6	6.6	6.2	2.8	2.5	3.4	34.0	9.7	
Rubber and tyres	3.7		1.2	2.6	1.6	1.5	1.0	42.0	3.5	
Biowaste	191.6	67.2	145.7	46.5	28.8	28.2	17.7	177.0	0.6	
Solid replacement fuels	68.4	32.7	39.2	29.2			29.2	292.0	13.2	
Oil containing waste	8.5		3.2	5.6	2.2	2.0	3.4	34.0	2.5	
Spent solvents	2.6		1.2	1.5	0.4	0.4	1.1	11.0	0.7	
Ashes and slag	130.8		56.2	82.9	82.9	74.6				
Mineral C&D	2,020.8		1,328.7	769.0	769.0	692.1				
Residual MSW	83.7	83.7	83.7							
WWT sludge	23.0		23.0							
Other fractions	54.7		54.7							
Total	**2,983.6**	**294.2**	**1,927.0**	**1,158.4**	**1,052.3**	**950.5**	**106.1**	**1,543.9**	**208.9**	**141.9**

Table 44: Scenario B – Waste generation, treatment, recycling, material and energy recovery and (avoided) greenhouse-gas emissions

	Generation 2020 in Mt		Treatment in Mt							
	Total	of which MSW	Landfilling/ Incineration without energy recovery / other disposal	Recycling + energy recovery	Recycling	Material recovery	Energy recovery	Energy saved in PJ	GHG-emission saved in $Mt_{CO2,e}$	GHG emitted from MSW landfilled in $Mt_{CO2,e}$
Glass	27.9	17.5	10.2	19.7	19.7	17.7			3.5	
Paper and cardboard	96.1	48.1	19.1	97.1	79.5	59.4	17.6	176.2	65.2	
Plastics	35.7	17.5	4.3	33.0	10.9	9.2	22.2	931.7	10.7	
Iron and steel	115.3	6.2	13.6	102.7	102.7	101.7			102.7	
Aluminium	5.3	1.1	1.0	4.4	4.4	4.3			48.8	
Copper	1.5	0.1	0.3	1.4	1.4	1.3			1.5	
Zinc	1.5	0.1	0.2	1.4	1.4	1.3				
Lead	0.8			1.0	1.0	1.0				
Other metals	0.8			1.0	1.0	1.0				
Waste Wood	83.2	9.0	7.5	77.7	31.8	29.9	45.9	688.1	34.2	
Textiles	12.0	6.4	1.0	11.5	5.2	4.7	6.3	62.9	17.9	
Rubber and tyres	3.6	0.0	0.7	3.0	1.8	1.7	1.1	48.0	4.0	
Biowaste	183.9	64.5	7.4	178.8	110.7	108.5	68.0	680.4	2.4	
Solid replacement fuels	65.6	31.4	2.2	63.4	0.0	0.0	63.4	634.4	28.7	
Oil containing waste	8.2		0.7	7.9	3.1	2.8	4.8	47.7	3.6	
Spent solvents	2.5		0.1	2.5	0.7	0.6	1.8	18.4	1.1	
Ashes and slag	125.6		55.8	77.5	77.5	69.8				
Mineral C&D	1,939.9		717.8		1,358.0	1,222.2				
Residual MSW	80.4	80.4	80.4							
WWT sludge	22.1		22.1							
Other fractions	52.5		52.5							
Total	**2,864.3**	**282.5**	**996.2**	**2,041.9**	**1,810.7**	**1,636.9**	**231.2**	**3,287.9**	**324.3**	**42.4**

Table 45: Detailed scenarios for WEEE, Batteries and ELV

Waste type	Parameter	Unit	Scenario A	Scenario B	Difference Scenario B-A	Scenario assumptions
WEEE	Total generation	Mt	12.3	11.1	-1.2	Scenario A: EC 2008; Scenario B: 10% waste prevention mainly by repair and life time extension.
	separately collected/recycled	Mt	3.3	7.7	4.5	Scenario A: same as 2006 = 26.5% as estimated by EERA (European Electronics Recyclers Association) (reported in EC 2008); Scenario B: 70 % according WEEE directive 2002/96/EC
	exported or in other waste streams	Mt	9.0	3.3	-5.7	
Batteries	Total generation	Mt	1.9	1.7	-0.2	Assumption in 2020 EU per capita average corresponds to German average of 2002 (EC 2003).
	separately collected/recycled	Mt	0.3	1.5	1.2	Scenario A: 14 % coupled to ELV-recycling (as in Germany 2006 only 14 % of ELV is actually recycled) Scenario B: all ELV stay in the country, 85 % of ELV is recycled (ELV directive 2000/53/EC); 45 % of other batteries are recycled (batteries directive 2006/66/EC)
	exported or in other waste streams	Mt	1.7	0.3	-1.4	
ELV	Total generation	Mt	23.7	21.4	-2.4	Assumption in 2020 EU per capita average corresponds to German average of 2006
	separately collected/recycled	Mt	3.3	18.1	14.8	Scenario A: as in Germany 2006 only 14% of ELV is actually recycled (EEA 2010); Scenario B: all ELV stay in the country, 85% is recycled (ELV directive 2000/53/EC)
	exported or in other waste streams	Mt	20.4	3.2	-17.2	
WEEE+batteries+ELV	In Scenario B additionally recycled WEEE, battery and ELV	Mt	6.9	27.4	20.5	
	In Scenario B: additional metals won from WEEE, battery and ELV recycling	Mt	4.8	19.1	14.4	70% of ELV is metals (EEA 2010): assumption that also 70% of WEEE and batteries metals
	In Scenario B: value of additional metals won from WEEE, battery and ELV recycling	M€	**1,679**	**6,702**	**5,023**	**Calculated as metal mix with 350€/t (Prognos 2009a)**

Table 46 shows the amount of secondary materials recovered from waste in Scenarios A and B. In Scenario B a total of 1,637 million tonnes of secondary raw material is recovered in 2020. This is 686 million tonnes more than in Scenario A (than without a full implementation of EU waste legislation). Table 47 provides a direct comparison between the mass and energy flows of Scenarios A and B.

Table 46: Recovery of secondary raw materials in the year 2020 in Mt

	Scenario A	**Scenario B**	**Difference (B-A)**
Glass	9.6	17.7	8.1
Paper and cardboard	33.0	59.4	26.4
Plastics	3.8	9.2	5.4
Iron and steel	76.9	101.7	24.8
Aluminium	3.0	4.3	1.3
Copper	0.8	1.3	0.4
Zinc	0.6	1.3	0.6
Lead	0.5	1.0	0.5
Other metals	0.5	1.0	0.6
Waste Wood	20.4	29.9	9.5
Textiles	2.5	4.7	2.1
Rubber and tyres	1.5	1.7	0.2
Biowaste	28.2	108.5	80.3
Oil containing waste	2.0	2.8	0.8
Spent solvents	0.4	0.6	0.2
Ashes and slag	74.6	69.8	-4.8
Mineral construction material	692.1	1,222.2	530.1
Total	**951**	**1,637**	**686**

Table 47: The balance of full European waste legislation implementation - Difference between macro economic values/costs of Scenario B and Scenario A in the year 2020

		Scenario A	**Scenario B**	**Difference (B-A)**
Waste generation				
Total	Mt	4,854	4,463	-391
Treatment				
Landfilling/Incineration without energy recovery other disposal	Mt	3,799	2,086	-1,713
of which MSW	Mt	272	70	-202
Material recovery	Mt	951	1,637	687
Energy recovery	Mt	106	302	196
Energy recovery	PJ	1,544	4,309	2,765
GHG emissions				
GHG emission avoided by material and energy recovery	$Mt_{CO_2,e}$	209	447	239
GHG emission from MSW landfilling	$Mt_{CO_2,e}$	168	43	-125
Total difference in GHG emission	$Mt_{CO_2,e}$			**363**

Impacts on human health

Emissions of Hazardous Substances from Landfills

Historically the necessity for a proper waste management system derives from the reactive behaviour of waste. For example residual waste from households is a reactive, energy and hazardous substances containing mix (see Table 48). When deposited organic (biodegradable) compounds decompose to organic acids (see Figure 6), which lowers the pH of the deposited from caustic (pH=8-12) to acidic (pH<7) and in combination with rain water at the low pH solves the metals contained in the waste (see Figure 7 and Figure 8). Without proper waste management the leachate containing not only the solved heavy metals but possibly also hazardous organic substances spreads into the water system and contaminates ground and surface water.

Table 48: Typical composition and heating value of residual waste from Bavarian households (Weigand & Marb 2006)

Component/Parameter	Unit	Concentration/Value
Water	g/kg	370
Carbon	g/kg	220
Chlorine	g/kg	4
Sulfur	g/kg	2.5
Heavy metals	g/kg	320
Polycyclic aromatic hydrocarbons (PAC)	mg/kg	2.7
Chlorphenols	µg/kg	170
Polychlorinated biphenyls (PCB)	µg/kg	70
Dioxine/Furane	ng I-TEQ g/kg	5.5
Lower heating value	MJ/kg	9.7

During the degradation of the reactive substances also malodorous landfill gas is formed, which over time chances in composition (see Figure 8, top). Part of the landfill gas is CO_2 and methane, which are both active greenhouse gases. The methane together with the also occurring hydrogen, however, may be used as energy carrier.

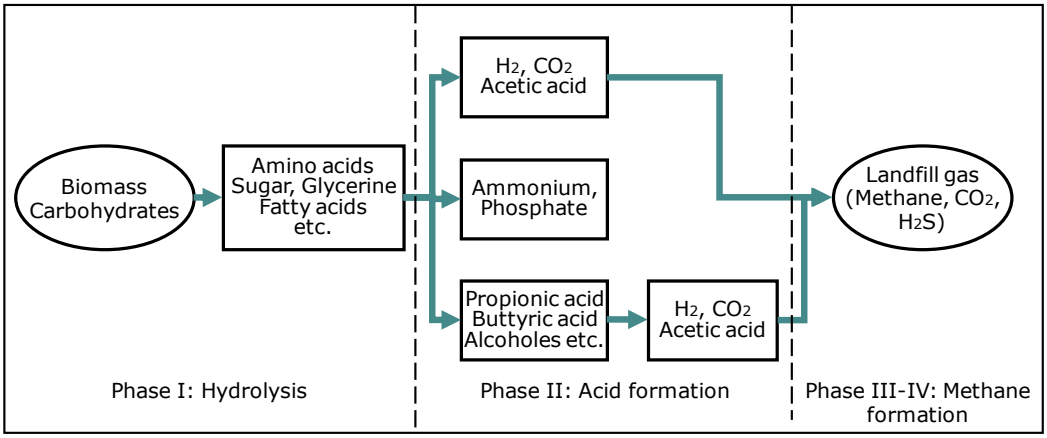

Figure 6: Biodegradation of landfilled waste (Bilitewski et al. 2000)

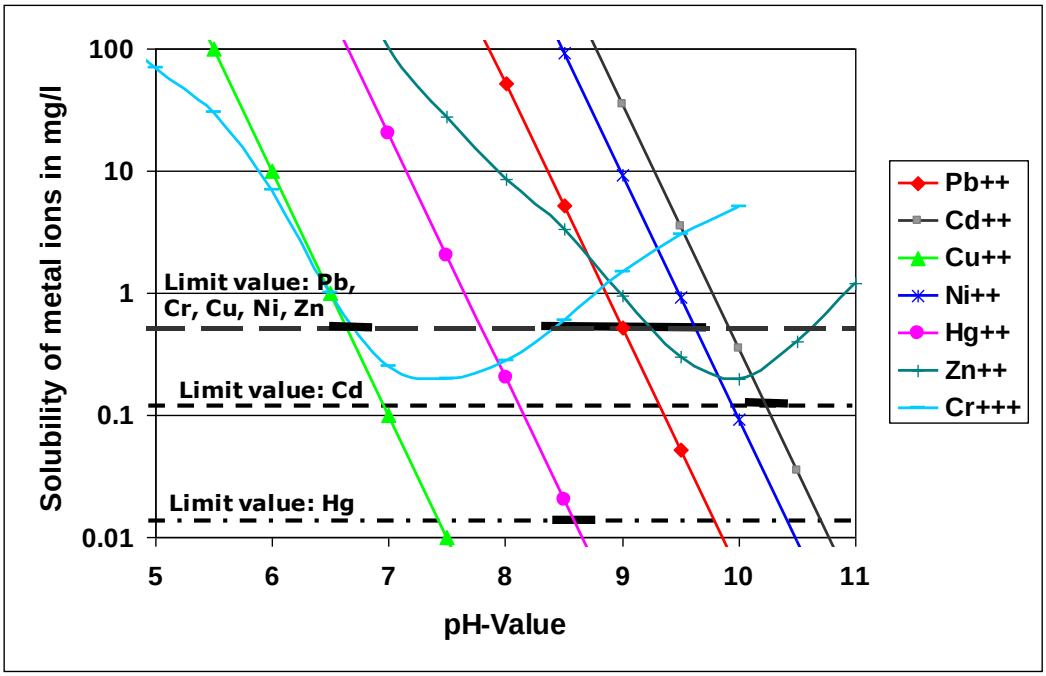

Figure 7: Solubility of heavy metals as function of pH-value (Weißenbach 1999, Seel 1973) – Limit values from Austrian Off-Water-Emission-Ordinance "Landfill-Leachate" 2003.

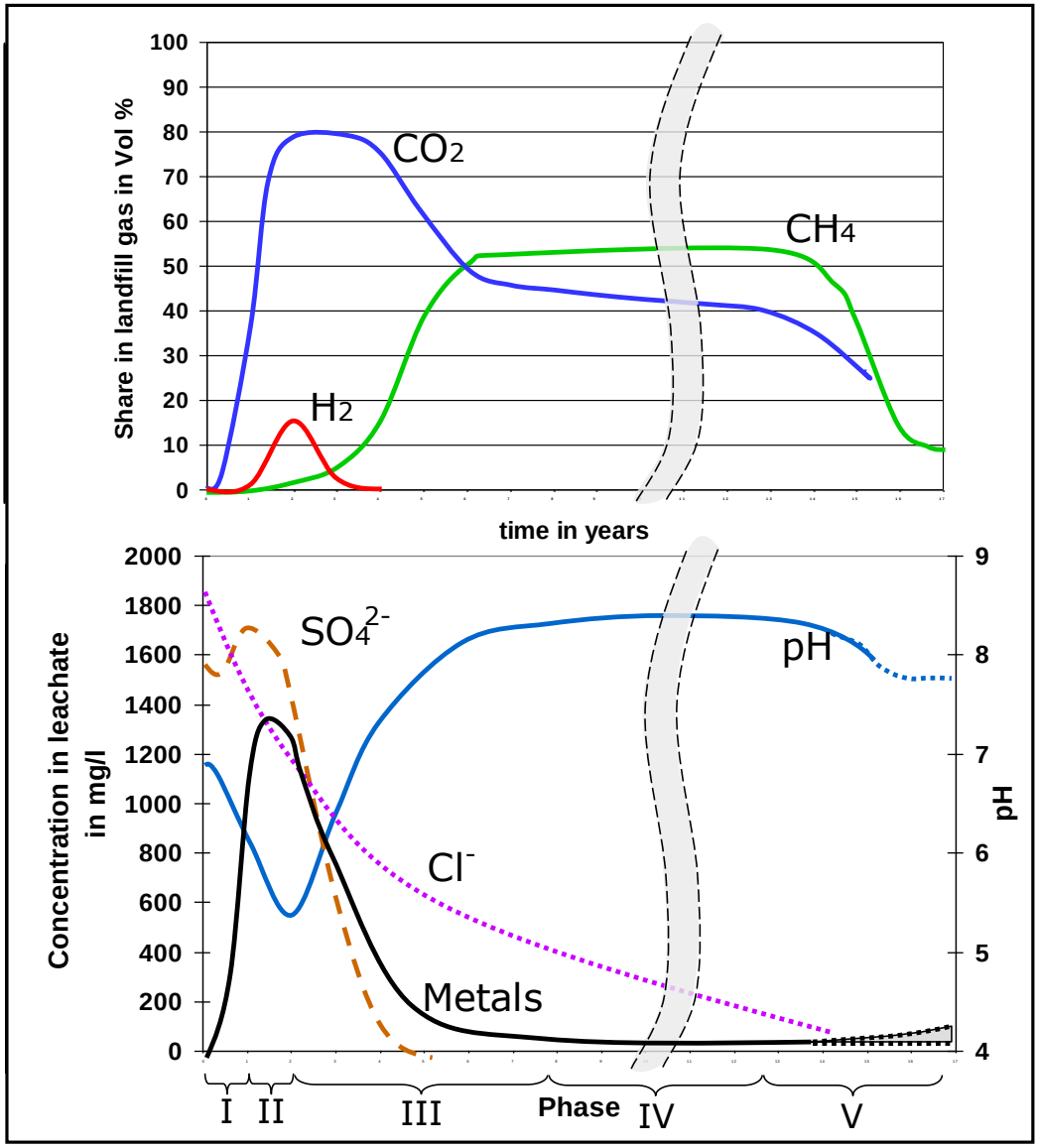

Figure 8: Composition of landfill gas and leachate during the life-time of a landfill (Bilitewski et al. 2000, Umweltbundesamt 2001)

If not covered, landfill waste may also be the source of heavy dust emissions.

Compliant landfills have a system

- of keeping rain water from trickling through the landfill
- of collecting and treating leachate (to achieve hazardous substance concentrations in the leachate which are at or below the values of ordinary municipal sewage)
- of preventing dust emissions
- and of collecting the landfill gas.

The landfill gas may be either flared or used in a gas engine for producing electricity and heat.

This system together with the obligation to reduce the amount of biodegradable waste landfilled to 35 % of the 1995 mass,

- keeps metals separate from reactions which lower the pH and thus keeps landfilled metals mostly at pH-levels where they are virtually insoluble
- reduces the amount of rain trickling through the landfill body during the operation time when the landfill is open and virtually stops rain water from trickling through the landfill body after the landfill is covered
- keeps all pollutants solved in the leachate beyond the set limit concentrations from being emitted into the environment

and thus substantially reduces the amount of metals and hazardous organic compounds emitted from landfills.

Table 49**Erreur ! Source du renvoi introuvable.** shows the mobilisation of selected heavy metals (that is the solution of these metals into leachate) on landfills for reactive waste, measured on actual landfill sites during the 1980s and 1990s. It is assumed that the mobilisation rates shown in Table 49 are typical for non-compliant MSW-landfills, whereas in compliant landfills for MSW and for other waste types, due to the measures described above and due to lack of pH-lowering reactions on these landfills, the mobilisation rate is reduced by a factor 1,000.

The resulting mobilisation of the heavy metals iron, copper and zinc through landfill leaching is shown in Table 50 for Scenario A (assuming that 50% of the MSW landfilling according to Table 43 would be on non-compliant landfills), and for Scenario B (assuming that all landfills are compliant in this scenario and thus all iron and steel, copper and zinc shown Table 44 under the column "Landfilling/ Incineration without energy recovery / other disposal" is landfilled on compliant landfills).

It can be seen, that by the reduction of the landfilled waste and the full compliance with waste legislation (Scenario B), the amount of heavy metals released into water should decrease by a factor of at least 99% as compared to a scenario when all new landfilling capacity required would be non-compliant (Scenario A).

Table 49: Specific metal mobilisation during landfilling on landfills for reactive waste (Belevi & Baccini 1989; Buwal 1995; Fehringer et al. 1997, Umweltbundesamt 2001)

	Substance concentration	**Mobilisation rate**	
Metal	**in mg/kg dry waste**	**in mg/kg dry waste**	**in g/kg metal**
Iron	50,000	30	**0.6**
Copper	400	4	**10**
Zinc	1,200	816	**680**
Lead	800	8	**10**
Cadmium	11	7.26	**660**
Mercury	1.8	1.08	**600**

Table 50: Mobilisation of selected heavy metals through leachate (Scenario A assumption: 50 % of MSW landfilling is on non-compliant landfills)

	Mobilisation of heavy metals in t/a			Difference B – A in %
	Scenario A	Scenario B	Difference B-A	
Iron	724	8	-716	-98.9
Copper	306	3	-304	-99.2
Zinc	29,108	169	-28,939	-99.4

Dust emissions

Winiwarter et al. (2001) report the tilting of dust raising wastes like construction and demolition waste to be the main source of dust emissions from the waste management sector. They report a dust emission coefficient of 20.82 g particulate matter emission per tonne of construction and demolition waste landfilled. Watkiss et al. (2005) determined EU average health damage costs for particulate matter emissions of 979 million € per thousand tonne (979 M€/kt) of emitted particulate matter.

Applying these numbers to the tilting of the construction and demolition waste landfilled in Scenarios A and B, results in 13.000 tonnes of dust less emitted and 12.5 billion Euro reduced health damage costs for the year 2020 in Scenario B (full implementation of EU waste legislation) over Scenario A (see table below).

Table 51: Year 2020 particulate matter emissions and health damage costs of tilting construction and demolition waste in Scenarios A and B.

	Scenario A	Scenario B	Difference B-A
Landfilling of C&D in Mt	1,329	718	-611
PM-emission in kt	28	15	-13
Related health damage costs in M€	27,088	14,633	-12,454

But dust emission from the tilting of construction and demolition waste is not the only dust emission affected by waste management. IFEU (2005) estimated the PM_{10} emission by municipal waste management and the avoided PM_{10} emissions by the energy recovery from municipal waste and recycling of secondary materials from municipal waste. These gave the German net per capita PM_{10} emissions of municipal waste management for 1990 (limited waste management), 2001 (advanced waste management) and 2005 (fully implemented waste management) shown in Table 34. These values were extrapolated to the 495 million EU-27 inhabitants expected for the year 2020 to give the values in the middle row of Table 34 for Scenarios A (extrapolated from Germany 2001) and Scenario B respectively (extrapolated from Germany 2005). In Table 52 also the sum of the health impacts from C&D related and municipal waste related dust emissions is shown.

Table 52: Total year 2020 health impact costs related to particulate matter emissions from waste

	Unit	Scenario A	Scenario B	Difference (B-A)
Health impact costs related to dust emissions from landfilling C&D	Mio €	27,088	14,633	-12,454
Health impact costs related to dust emissions of municipal waste and avoided dust emissions by energy/material recycling	Mio €	-145,259	-164,523	-19,264
Total health impact costs related to dust emissions	Mio €	-118,171	-149,890	**-31,718**

All the numbers related to the health impact of dust emissions are connected to a very high level of uncertainty. Therefore they are not used in the further analyses.

Total health impacts

Health impacts from particulate emissions are not the only potential negative effects of unmanaged waste. Malfunctioning waste management systems are characterised by uncollected waste, open waste fires and non-compliant landfills. These pose serious health and environmental risks through the spread of disease and pollution of air, water and land. While few studies exist, many health endpoints have been considered in epidemiological research for health impacts from landfill sites and older incinerators, including cancer incidence, mortality, birth defects and low birth weight (WH 2007). Uncontrolled dumpsites have been linked to many harmful health effects such as skin and eye infections, respiratory problems in children and adults, vector borne diseases like diarrhoea, dysentery, typhoid, hepatitis and cholera. A UNEP study carried out in Kenya found that about 50 % of the children and adults living to an uncontrolled dump-site head respiratory ailments and blood lead levels exceeding the internationally acknowledged threshold of 10 microgram per decilitre of blood. A further 30 % were confirmed to have a high exposure to heavy metal poisoning detected by red blood cell abnormalities (UNEP 2010).

The impacts of the Italian provinces of Naples and Caserta may serve as an example for the consequences of a mal-functioning waste management system on human health in Europe. In these 2 provinces twenty types of tumours and 11 typologies of congenital malformation described in the scientific literature were found and linked to the presence of dumpsites and incinerators. An 84% increase of stomach and lungs lymphoma and sarcoma tumours was found. Mortality rates increased 9 % with men and 12 % with women (Greyl et al. 2010). The latter numbers suggest that the health damage costs of an economy without a waste management system are 20 times higher than the costs of a fully developed waste management system.

Environmental impacts

In addition to

- the greenhouse gas emissions already calculated in Table 43**Erreur ! Source du renvoi introuvable.** and Table 44 above and the related climate change which not only affect the human economy but also causes severe damage to the environment
- the emissions of poisonous substances which not only damage human health but also the health of animals and plants

also

- acidification by the emission of acidic gases
- eutrophication by the emission of nutritious substances
- ozone depletion and
- land use

affect plants, animals, microorganisms, biodiversity, eco-systems and nature protection areas.

Ecotoxicity

A measure for the ecotoxocity of the hazardous substances emitted from the waste management system is the flow of zinc-emissions determined in Table 50.

TU-Delft (2010) determined for the Netherlands for the year 2010, among others, the "eco-costs" of ecotoxicity in terms of zinc emissions. The "eco-costs" are defined as the marginal system costs for achieving the set emission limits. When assuming that the emission limits are set at a level where marginal prevention costs equal the damage costs, the "eco-costs" can be used as a proxy for the damage costs. TU-Delft (2010) reports the "eco-costs" of ecotoxicity as 802 M€/kt zinc emitted (see Table 55). Applying this factor on the zinc flows determined in Table 50 gives the eco-toxicity costs of the waste management systems in Scenarios A and B shown in Table 56.

Acidification

Incineration of waste is related to the emission of the acidifying gases sulphur dioxide (SO_2) and nitrogen oxide (NO_x), biodegradation of waste with the emission of ammoniac (NH_3). On the other hand, energy recovery and use of secondary materials from waste enable a reduction of these compounds in other sectors, so that the total waste management system may have a positive or negative acidification effect.

The main effect of the acidifying compounds is that they solve nutritious substances from soil and by causing lack of nutrition lead to irreversible damage to eco-systems, plants and animals.

IFEU (2005) estimated the per capita emission of acidifying compounds from the German municipal waste system of the years 1990 (limited waste management), 2001 (advanced waste management) and 2005 (full implemented waste management) (see Table 34). The values from 2001 (advanced waste management) were multiplied by the expected number of inhabitants for the EU-27 in the year 2020 to give the emission of acidifying compounds for Scenarios A. The

values from 2005 (full implemented waste management) gave the emission of acidifying compounds for Scenarios B. The results are shown in Table 54 below.

Hamon et al. (2010) report acidification impact costs of 0.61 M€/kt SO_2,e emitted (see Table 55). The resulting costs of acidification due to damage of the environment are shown in Table 56.

Eutrophication

Emission of nitrogen oxide (NO_x) and ammoniac (NH_3) can lead to eutrophication of soils and waters.

The calculation of the damage costs to the environment due to eutrophication follows the same methodology as the calculation of the damage costs to the environment due to acidification. The emissions of eutrophying compounds from the waste management system in Scenarios A and B are derived from the German values shown in Table 34 reported by IFEU (2005). The resulting eutrophying compounds flows for EU-27 in the year 2020 are shown in Table 54. These flows are multiplied by damage costs of 1.26 M€/kt PO_4,e emitted (or 3 M€/kt nitrogen emitted as reported by Hamon et al. (2010)) to give the environmental damage costs due to eutrophication in Scenarios A and B as shown in Table 56.

In scenario A and especially in Scenario B material recycling and energy recovery lead to a reduction of nitrogen oxide and ammoniac emissions in other sectors which exceed the emissions in the waste management sector, so that in these scenarios the waste management sector is a sink for eutrophication.

Ozone depletion

Ozone depletion, caused by the reaction of tropospheric ozone with chloro-fluoro-gases, which have been mainly used as coolants and insulators for cooling equipment, leads to increased UV-radiation and which in turn causes skin cancer and growth inhibitions. While ozone depletion affects both, human health and the environment, the impacts on both are estimated here.

EC (2008) estimates that without proper treatment of waste from electric and electronic equipment some 6.7 kt of ozone depleting gases would be emitted annually (in the period 2011-2020) causing an annual damage of some 1 billion €. It is assumed that this would be the ozone depleting emissions in a Scenario 0. The according values for Scenarios A and B are calculated based on the WEEE scenarios shown in Table 45 to give the results shown inTable 53.

In addition to the ozone depleting substances in WEEE there are also chloro-fluoro-gases in foams of construction and demolition waste. BIO Intelligence Service (2011) estimates that 4.3 tonnes of chloro-fluoro-gases would be released in the year 2020 if these gases are not destroyed by the proper incineration of the corresponding foams. For Scenario A it is assumed that 50 % of the ozone-depleting substances from C&D is destroyed, for Scenario B that all is destroyed.

In Table 53 the total amount of ozone depleting substance emission from WEEE and from C&D foam is calculated. Taking the 1 billion € damage costs per 6.7 kt of ozone depleting gases emissions from EC (2008) results in the environmental impact costs from ozone depletion for Scenarios A and B shown in Table 56.

Table 53: Scenarios on emissions of ozone depleting substances

	Unit	Scenario A	Scenario B	Difference (B-A)
Ozone depleting substances from WEEE	kt CFC-11, e	5.78	0.91	-4.87
Ozone d depleting substances from C&D foam	kt CFC-11, e	2.15	0.00	-2.15
Total emission of ozone depleting substances	**kt CFC-11, e**	**7.93**	**0.91**	**-7.02**

Environmental impact of land use

Basically land-use can have following impacts on the environment:

- Impacts on species richness and the rarity of ecosystems and vascular plants
- Impacts on 'scenic beauty'
- Impacts on production of food and biomass
- Impacts on the water cycle.

Here we valuate only the first type of impacts, that is the impacts on species richness and the rarity of ecosystems and vascular plants.

TU-Delft (2010) provides following formula for ecocosts of species richness:

Ecocosts of species richness in M€/km² = 4.7*S/1250

with

S = number of vascular plant species per 10.000 km²;

When assuming an EU-average of 1,500 vascular plant species per 10.000 km² (derived from Barthlott et al. (2005)) follows:

Ecocosts of species richness = 5.64 M€/km² (see Table 55).

Non-compliant landfilling usually takes place at smaller sites, while in compliant systems, usually larger landfills, with more height and resulting waste density are used. In the German province Brandenburg, for example, a system of some 2.000 landfill sites in the 1980s (Muenter 2010) was narrowed down to currently just 10 landfill sites[158]. Due to higher height and concentration therefore compliant landfills usually have a lower area consumption per tonne of waste landfilled.

In Scenario A half of the landfilled MSW is assumed to be deposited on non-compliant landfills and in Scenario B all landfilled waste goes on compliant landfills. The resulting area consumption for landfilling is shown in Table 54and the costs of endangering species by the respective land-use in Table 56.

[158] http://brandenburg.de/cms/detail.php/lbm1.c.239262.de

Results of environmental impact assessment

The following tables summarise the environmental impacts (excepting the impacts from greenhouse gas emissions) of the waste management system in Scenarios A and B:

- Table 54 shows the pollutant emissions and land-consumption for landfilling of the 3 scenarios and their differences
- Table 55 shows the factors used for monetarising the environmental damage caused by these flows and land-use
- Table 56 finally shows the resulting environmental impact costs.

Table 54: Scenarios on flows of pollutants with environmental impacts and landfilling area consumption

	Unit	Scenario A	Scenario B	Difference (B-A)
Ecotoxicity of Zn emissions	kt Zn	29	0	**-29**
Acidification	kt SO_2,e	-23,150	-45,754	-22,605
Eutrophication	kt PO_4;e	-21,980	-31,237	-9,258
Ozone depletion	kt CFC-11, e	7.93	0.91	-7
Endangering species richness by landuse	km²	87	31	-56

Table 55: Factors for monetarising environmental impacts

	Impact factors	Source
Ecotoxicity impact of Zn emissions in M€/kt	802	TU-Delft (2010)
Acidification impact of SO_2 in M€/kt	0.61	Hamon et al. (2010)
Eutrophication impact of PO_4 in Mio €/kt	1.26	Hamon et al. (2010)
Ozone depletion impact of CFC-11 in M€/kt	149	EC (2008)
EU-average ecocosts of species richness by land use in Mio €/km²	5.64	TU-Delft (2010)

Table 56: Costs of environmental impacts

	Unit	Scenario A	Scenario B	Difference (B-A)
Ecotoxicity of Zn emissions	Mio €	23,300	100	-23,200
Acidification	Mio €	-14,100	-27,900	-13,800
Eutrophication	Mio €	-27,700	-39,400	-11,700
Ozone depletion	Mio €	1,200	100	-1,100
Endangering species richness by landuse	Mio €	500	200	-300

Economic and social impacts

In the wider sense, that is from the macro economic point of view, also the above shown health impact and environmental impact costs are 'economic costs'. In this subchapter, however, we want to deal with micro economic costs and benefits, that is the costs which someone in the economic system has to pay and benefits which someone may earn in terms of Euro.

These economic costs/benefits in the narrower sense besides:

- The damage costs from climate change and greenhouse gas emissions
- The saved costs from raw material and energy recovery during waste incineration

Which have already been determined above for scenarios A and B (see Table 43 and Table 44) comprise:

- Costs saved from the utilisation of landfill gas as energy carrier
- Costs for the containment of the non-compliant landfills
- Repatriation costs for illegal exports
- And as largest point, the regular costs for the installation and operation of the waste management system

In total the efforts for controlling the waste lead to a waste management system with a certain annual turnover which creates jobs within the sector itself and for other industrial branches.

Utilisation of landfill gas

The calculation on the value of the energy recovered from landfill gas is based on following assumptions:

- for Scenario A that the same amount of landfill gas is used for energy recovery in EU-27 as in the year 2007 (that is 126 PJ, see Table 58) and
- for Scenario B that 50 % of the energy contained in the MSW landfilled in this scenario is used by landfill gas utilisation.

The resulting energy flows are weighted with the price of the cheapest alternative energy carrier, that is heavy fuel oil (see Table 57) to give the value of the energy recovered from landfill gas for the 2 scenarios as shown in Table 58.

Table 57: Frame assumptions for the calculation of landfill gas energy recovery

Parameter	Value	Source
Landfill gas energy recovery in 2007 in PJ	126	SETIS (2010)
Landfill gas yield in PJ per Mt of residual household waste	9.7	Weigand & Marb (2006)
Price of heavy fuel oil in M€/PJ	4.2	Heavy fuel oil price 2009, Austria. http://www.eia.doe.gov/emeu/international/hfoforelec.html, accessed on 03.01.2011.

Table 58: Economic value of landfill gas energy recovery

	Unit	Scenario A	Scenario B	Difference (B-A)
Landfill gas energy recovery	PJ	126	334	208
Value of energy recovered from landfill gas	M€	529	1,401	872

Containment of non-compliant landfills

For calculating the costs of containing the waste deposited on non-compliant landfills following assumptions are taken:

- Scenario A: 50 % of the MSW landfilled need to be contained (while also the non-compliant landfill of industrial and construction waste may require containment, the mix of reactive biodegradable waste and metals make non-compliant MSW landfills the most abundant candidates for containment)
- Scenario B: All landfilled waste is deposited on compliant landfills. No containment is necessary.

Containment costs comprise

- The costs for uncovering and transferring the waste to a compliant landfill
- The costs for depositing the recovered waste on a compliant landfill (see Table 59).

The resulting total costs of containing illegally deposited waste for the 2 scenarios are shown in Table 60.

Table 59: Frame assumptions for calculating the costs of brownfield containment

Parameter	Value	Source
The costs for uncovering and transferring the waste to a compliant landfill in M€/Mt	22.7	Muenter (2010)
The costs for a compliant landfill of MSW in M€/Mt	90	EEA (200)
The costs for a compliant landfill of mixed C&D in M€/Mt	35	Buchinger (2004)
The costs for a compliant landfill of mixed "other waste" in M€/Mt	75	Buchinger (2004)

Table 60: Costs for the containment of non-compliant landfills

	Unit	Scenario A	Scenario B	Difference (B-A)
Containment of landfilled MSW	Mt	115	0	
Total containment costs	**M€**	**12,964**	**0**	**-12,964**

Repatriation costs for illegal exports

For calculating the costs of repatriating the waste illegally exported following assumptions are taken:

- For scenario A the difference between the WEEE, batteries and ELV exported or in other waste streams between Scenarios B and A as shown in Table 61, that is an amount of 24 Mt in the year 2020 is assumed as the waste which needs to be repatriated.
- In Scenario B no repatriation costs occur.

GHK & BIO (2006) estimate the costs for the depollution and dismantling of ELVs to be approximately 410 €/t. Assuming that the collection of WEEE, batteries and ELVs in foreign countries, their repatriation and treatment cost double that amount gives the total costs for repatriating illegal shipment shown in Table 61.

Table 61: Estimation of repatriation costs for illegally exported WEEE, batteries and ELVs

	Unit	Scenario A	Scenario B	Difference (B-A)
Amount of WEEE, batteries and ELV to be repatriated	Mt	24	0	
Repatriation costs for exported WEEE, batteries, ELV	M€	19,900	0	**-19,900**

Turnover of waste management system and jobs created

ECORYS (2009) determined for the year 2008 the turnover and the number of jobs in the European eco-industry. From these data the turnover and the number of jobs in the 'waste management' sector (corresponding to NACE code O 90.02 "collection and treatment of other (non-sewage) waste") and the sector 'recycled materials' (corresponding to NACE code DN 37 "recycling") is taken (see Table 62). These figures provide the basis for year 2020 turnover and number of jobs in the 'waste management' sector and the sector 'recycled materials' of Scenarios A and B. Following assumptions are applied:

- Scenario A: In this scenario waste treatment and landfilling of MSW is frozen at the year 2008 level. However, there is an increase in the landfilling of C&D and other waste. These additional landfilling costs are added to the turnover of the sector 'waste management' for the year 2008 and the number of jobs adapted accordingly. Turnover and jobs of the sector 'recycled materials' are the same as given by ECORYS (2009) data.
- Scenario B: 'Waste management' sector: The waste management system of Brandenburg (managing 0.73 Mt of waste per year) recently made fully compliant achieves an annual turnover of 100 M€ (Kreutzberg 2006). For the year 2008, it is assumed that 48 Mt of European waste was landfilled in not a compliant way. Taking the same specific turnover as in Brandenburg, the turnover of a fully compliant European system in 2008 should have been 6.575 € higher as reported by ECORYS (2009), that is at about 90,575 M€. The number of jobs should have been 1.4 million. The turnover and jobs in the "waste management" in Scenario B of the year 2020 are increased from these values by the ratio waste generation 2020/2008; Turnover and jobs in the "recycled materials" sector are increased from the year 2008 values by the ratio (recovered material Scenario B)/recovered material Scenario A).

The resulting turnover and jobs for Scenarios A and B are shown in Table 63.

Table 62: Frame assumptions for calculating turnover and jobs in waste management and recycling

Parameter	Unit	Value	Source
Year 2008 turnover			
Waste management	M€	92,200	ECORYS (2009)
Recycled materials	M€	54,800	ECORYS (2009)
Year 2008 jobs			
Waste management		1,466,700	ECORYS (2009)
Recycled materials		512,300	ECORYS (2009)
Ratio total waste generation 2020/2008 in Scenario B		0.94	
Ratio material recovery Scenario B/Scenario A		1.72	

Table 63: Turnover, jobs and costs of the sectors 'waste management' and 'recycled materials' in scenarios A and B for the year 2020

Parameter	Unit	Scenario A	Scenario B	Difference (B-A)
Turnover in "waste management" sector	M€	90,200	92,400	2,200
Turnover in "recycled materials" sector	M€	54,800	94,400	39,600
Total turnover	**M€**	**145,000**	**186,800**	**41,800**
Jobs in "waste management" sector		1,434,900	1,469,900	35,000
Jobs in "recycled materials" sector		512,300	882,200	369,900
Total jobs		**1,947,200**	**2,352,100**	**404,900**

Waste prevention costs

In accordance with findings of cleaner production projects (Ökoprofit Graz, Baumhakel et al. 2003), it is assumed that the waste prevention potential which is activated in Scenario B can be activated by investments which have an amortisation period of 1 year. When we further assuming that the lifetime of the waste prevention investment is 10 years, then the waste prevention investment cost corresponds to 10 % of the costs saved by waste prevention. If we further assume that in addition to the investments costs there are additional operation costs and transfer costs (costs for the waste prevention programme) which each also correspond to 10 % of the costs saved by waste prevention, the total cost of waste prevention corresponds to 30 % of the waste management costs avoided. We get these waste management costs avoided by dividing the total gross waste management costs of Scenario A (see Table 64) by the amount of waste generated in this Scenario. This results in average waste management costs avoided of 42

€ per tonne of prevented waste. As the total cost of waste prevention corresponds to 30 % of the waste management costs avoided, the total cost of waste prevention is 18 €/t of waste prevented. Multiplying this with the 119 Mt of waste prevented in Scenario B as compared to Scenario A results in total waste prevention costs of 2.1 billion €/year in Scenario B.

Total micro economic waste management system costs

As in the waste management sector cost covering tariffs are applied which contain only a small profit margin it can be assumed that the base costs of the waste management sector correspond to 98 % of the turnover of the waste management sectors as shown in Table 63.

For the recycling industry it is assumed that its revenues correspond to its turnover shown in Table 63. The recycling system is more market driven than the core waste management sector, the former requiring a higher profit margin. Therefore, in Scenario A a profit margin of 5 % and in Scenario B (with its higher recycling being nearer to the revenue-cost equilibrium) a profit margin of 4 % are assumed. The revenues minus the respective profit margin give the costs as shown in Table 64.

In Table 64

- to these base costs the above determined waste prevention costs, containment costs and repatriation costs are added, to give the gross costs of waste management and
- from the gross costs of waste management, the revenues from recovered materials and energy are subtracted to give the total net costs of waste management.

Table 64: Total micro-economic costs of waste management in the year 2020 (with containment of all non-compliantly landfilled waste and repatriation of all exported ELV/WEEE/batteries)

Parameter	**Unit**	**Scenario A**	**Scenario B**	**Difference (B-A)**
Base costs of waste management	M€	88,400	90,600	2,200
Base costs of recycling	M€	52,200	90,800	38,600
Costs of waste prevention	M€	0	2,100	2,100
Containment costs	M€	13,000	0	-13,000
Repatriation costs	M€	19,900	0	-19,900
Gross costs of waste management	**M€**	173,500	183,500	10,000
Revenues from recovered materials	M€	54,800	94,400	39,600
Revenues from recovered incineration energy	M€	6,500	13,800	7,300
Revenues from recovered landfill gas energy	M€	500	1,400	900
Total revenues	**M€**	61,800	109,600	47,800
Total net costs of waste management	**M€**	112,000	74,000	-38,000

However, it seems to be unrealistic that in a Scenario A, which does not even establish a fully compliant waste management system, all the non-compliantly landfilled waste would by contained and all the exported WEEE, batteries and ELV would be repatriated. As it is not possible to fix a realistic value for containment and repatriation in Table 65 the total net costs of waste management are calculated without containment and repatriation costs.

Table 65: Total micro-economic costs of waste management in the year 2020 (without containment and repatriation costs)

Parameter	**Unit**	**Scenario A**	**Scenario B**	**Difference (B-A)**
Base costs of waste management	M€	88,400	90,600	2,200
Base costs of recycling	M€	52,200	90,800	38,600
Costs of waste prevention	M€	0	2,100	2,100
Gross costs of waste management	**M€**	**140,600**	**183,500**	**42,900**
Revenues from recovered materials	M€	54,800	94,400	39,600
Revenues from recovered incineration energy	M€	6,500	13,800	7,300
Revenues from recovered landfill gas energy	M€	500	1,400	900
Total revenues	**M€**	**61,800**	**109,600**	**47,800**
Total net costs of waste management	**M€**	**78,800**	**73,900**	**-4,900**

Cost-Benefit Analysis

Table 66 shows the net waste management costs when also external (mostly environmental) costs and benefits are taken into account. Taking into account the externalities shown in Table 56 makes Scenario B a much more economic solution than Scenario A.

Table 66: Total macro-economic costs-benefits of waste management in the year 2020

Parameter	Unit	Scenario A	Scenario B	Difference (B-A)
Base costs of waste management	M€	88,400	90,600	2,200
Base costs of recycling	M€	52,200	90,800	38,600
Costs of waste prevention	M€	0	2,100	2,100
GHG emission from MSW landfilling	M€	11,100	3,300	-7,800
Ecotoxicity of Zn emissions	M€	23,300	100	-23,200
Ozone depletion	M€	1,200	100	-1,100
Endangering species richness by land use	M€	500	200	-300
Gross costs of waste management	**M€**	**176,700**	**187,200**	**10,500**
Revenues from recovered materials	M€	54,800	94,400	39,600
Revenues from recovered incineration energy	M€	6,500	13,800	7,300
Revenues from recovered landfill gas energy	M€	500	1,400	900
GHG emission avoided by material and energy recovery	M€	16,300	25,300	9,000
Avoided acidification	M€	14,100	27,900	13,800
Avoided eutrophication	M€	27,700	39,400	11,700
Total value generated	**M€**	**119,900**	**202,200**	**82,300**
Total net costs of waste management	**M€**	**56,800**	**-15,000**	**-71,800**

Not included in

Table 66 are following cost categories:

- Containment and repatriation costs as it is not clear what would be a realistic assumption on how much of the non-compliantly waste would be contained and how much of the exported waste (from electric and electronic equipment, batteries and end-of-life vehicle) would be repatriated in Scenario A
- Health damage costs as no realistic assumption on how many persons would be affected by non-compliant waste management in Scenario A could be made
- Environmental damage costs from ecotoxic-pollutants other than zinc, as no realistic assumption could be made on how much heavy metals and organic pollutants would be set free in Scenario A.
- Health and environmental damage costs in countries outside the EU related to material and fuel imports or waste exports.

Nevertheless, three very important conclusions can be made with respect to health damage and containment/repatriation costs:

- In areas where waste management does not exist at all the health damage costs are 20 times higher than the gross micro economic costs of a fully established, compliant waste management system would be.
- If, in Scenario A all the non-compliantly landfilled waste would be contained and all the exported WEEE, batteries and ELV repatriated even the micro-economic waste management cost of the European waste management system in Scenario A would exceed those of Scenario B by more than 50 %.
- When health damage costs, all environmental damage costs, containment costs and repatriation costs are taken into account the superiority of Scenario B that is of full implementation of waste legislation over Scenario A further increases.

29 September 2011
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