Study on Economic and Social Benefits of Environmental Protection and Resource Efficiency Related to the European Semester

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Author(s)	Teresa Fenn David Fleet Lucy Garrett Elizabeth Daly Chloe Elding Marco Hartman, HKV Job Udo, HKV
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Abstract

This study was undertaken over a period of 13 weeks and represents a rapid review of key data for three tasks:

- Task 1: Financial, economic and social impacts of floods. The main findings were:
  - There were 363 floods recorded in the study, with total damages estimated at €150 billion. The average cost per flood was €360 million.
  - Member States affected by flooding received €1.8 billion from the Solidarity Fund and more than €5.5 billion for projects under the Cohesion Policy.
  - Investment in flood protection typically returns benefits 6-8 times the costs, with green infrastructure projects potentially delivering significant environmental benefits as well as cost savings.

- Task 2: Potential of SME support on resource efficiency. The main findings were:
  - 230+ programmes identified providing general and bespoke support to SMEs to implement measures to become more efficient, resulting in lower costs, energy and water use and decreased waste and CO_2 emissions
  - Investment in support programmes can generate 10-20 times its value in cost and environmental savings
  - Modelling based on savings achieved with support from DG RegioStars 2013 winner ENWORKS indicate significant potential savings across the EU

- Task 3: Relative environmental expenditure. The main findings were:
  - Available data indicate that total (public and private) environmental protection expenditure by Member State ranges from 0.7% to 3.9% of GDP for 2011
  - Environmental goods and services sector jobs are estimated at 4,194 thousand for EU28 (2011)

Cette étude a été réalisée sur une période de 13 semaines et représente un examen rapide des données clés à propos de trois tâches:

- Tâche 1: Les impacts financiers, économiques et sociaux des inondations. Les principales conclusions sont les suivantes:
  - Il y avait 363 inondations enregistrées dans l'étude desquelles des dommages totaux sont estimés à €150 milliards. Le coût moyen par inondation était €360 millions.
  - Les États Membres affectés par les inondations ont reçu €1,8 milliards du Fonds de solidarité et plus de €5,5 milliards pour les projets contribuant à la politique de cohésion.
  - L'investissement dans la protection contre les inondations renvoie généralement des avantages 6-8 fois des coûts, avec des projets d'infrastructure verte éventuellement fournissant des avantages environnementaux importants ainsi que des économies de coûts.

- Tâche 2: Le potentiel de soutien donné aux PME en matière d'efficacité des ressources. Les principales conclusions sont les suivantes:

- Plus de 230 programmes fournissent un appui général et sur mesure aux PME à mettre en œuvre des mesures pour devenir plus efficace, ce qui entraîne une baisse des coûts, de l'énergie et de l'utilisation de l'eau ainsi qu'une diminution des émissions de déchets et de CO_2
- L'investissement dans des programmes de soutien peut générer 10-20 fois sa valeur et achever les économies de coûts et aussi environnementales
- La modélisation basée sur les économies réalisées avec le soutien du gagnant de la DG RegioStars 2013, ENWORKS, indique les économies potentielles importantes dans l'UE

- Tâche 3: Les dépenses relatives environnement. Les principales conclusions sont les suivantes:
  - Les données disponibles indiquent que la somme totale (public et privée) de dépenses pour la protection de l'environnement par État Membre en 2011 varie de 0,7% à 3,9% du PIB
  - Les emplois dans le secteur des biens et services environnementaux sont estimés à 4,194 milles pour l'UE28 (2011)

Executive Summary

Need for the study

The European Semester focuses on a six month period from the beginning of each year and is intended to better coordinate European Union budgetary and economic policies in European Union countries. To ensure Member States align on policies and actions outlined in the Europe 2020 Strategy, it is important that key information is brought together in order to assist the Commission in making its assessment of Member States and producing Country-Specific Recommendations (CSRs).

Risk & Policy Analysts (RPA) in coordination with HKV Consultants was invited by DG Environment to provide data on three tasks relevant to DG Environment's input into the European Semester.

Objectives of the study

As set out in the technical specifications, the study comprises three tasks, each with specific task objectives:

- Task 1: Financial, economic and social impacts of floods, with the objective:
  - to provide empirical data or secondary sources on the potential financial, economic and social impacts of floods.
- Task 2: Potential of SME support on resource efficiency, with the objectives:
  - to identify the key success factors involved in the provision of more hands-on, direct support to SMEs for improving resource efficiency
  - to utilise this and broader information on SME support to assist in estimating more accurately the potential economic and environmental savings as well as the costs of providing such support.
- Task 3: Relative environmental expenditure, with the objectives:
  - to present public (general government) and private sector environmental protection expenditure data for 28 Member States and provide trends since 2008, including data for 2012 and 2013 if available
  - to present a breakdown of environmental protection expenditure data by environmental domain (e.g. waste management)
  - to present, where data are available, the number of additional jobs resulting from the environmental protection expenditure
  - to provide information on environmental related EU funding specifying amounts from EU funding and from Member State co-financing.

Approach to the study

The study was undertaken over a period of 13 weeks and, as such, represents a rapid review of key data sources. For all three tasks, data have been collected through Internet searches, email requests and telephone discussions. The timing of the study meant some email requests had to be sent before full Internet searches had been made. This meant that general questions covering all the requirements of each task had to be asked rather than specific questions to fill data gaps. These were followed up with more specific questions once key data gaps became clear.

Headline findings for financial, economic, and social impacts of floods

Table 1 summarises the key findings in terms of damages from flooding between 2002 and 2013 across the EU28, and funds obtained through the EU Solidarity Fund. The table shows that the total damages (extrapolated across those floods for which quantified damages were not available) are estimated at €150 billion (see Table 1 notes for caveats).

Table 1: Headline findings on the financial, economic and social impacts of floods (2002-2013, EU28)

Member State	No. flood events (2002-2013)[1]	No. with quantified cost data	Total costs (quantified events only) (€ millions) (2002-2013)[2, 3]	Average cost per event (€ millions) (2002-2013)[2,3]	Total costs over all events, extrapolated (€ millions) (2002-2013)[2, 3]	Total no. fatalities (2002-2013)[4]	Total no. people evacuated (2002-2013)[5]	Money provided through EU Solidarity Fund (€ millions)[6]
EU28	**363**	**201**	**€72,000**	**€360**	**€150,000**	**Around 1,000**	**More than 1.7 million**	**€1,800**
Austria	8	7	€ 4,700	€ 660	€ 5,300	19	1,500	€ 171
Belgium	10	1	€ 180	€ 180	€ 1,800	5	0	-
Bulgaria	15	5	€ 480	€ 96	€ 1,400	62	11,00	€ 20.35
Croatia	6	3	€ 240	€ 80	€ 480	0	750	€ 5.23
Cyprus	3	0	€ 0	€ 0	€ 0	0	0	-
Czech Republic	12	6	€ 4,100	€ 690	€ 8,200	66	1.5 million	€ 161
Denmark	3	3	€ 1,400	€ 450	€ 1,400	4	0	-
Estonia	2	2	€ 390	€ 190	€ 390	0	600	-
Finland	11	4	€ 60	€ 15	€ 170	0	120	-
France	48	48	€ 8,700	€ 180	€ 8,700	152	39,000	€ 94
Germany	11	6	€ 19,000	€ 3,100	€ 34,000	52	100,000	€ 804
Greece	22	5	€ 1,000	€ 200	€ 4,500	19	0	€9.306
Hungary	10	5	€ 1,400	€ 270	€ 2,700	3	10,900	€ 37.55
Ireland	16	10	€ 920	€ 92	€ 1,500	2	1,500	€ 13.02
Italy	20	16	€ 8,900	€ 560	€ 11,000	127	3,200	€34.971
Latvia	1	1	€ 3	€ 3	€ 3	0	0	-
Lithuania	5	0	€ 0	€ 0	€ 0	4	70	-
Luxembourg	0	0	€ 0	€ 0	€ 0	0	0	-
Malta	13	1	€ 30	€ 30	€ 390	0	0	€ 0.96
Netherlands	3	3	€ 14	€ 5	€ 14	0	0	-
Poland	10	2	€ 4,800	€ 2,400	€ 24,000	24	32,000	€ 105.57
Portugal	11[7]	2	€ 1,100	€ 550	€ 6,100	51	0	€ 31.26
Romania	20	13	€ 4,100	€ 310	€ 6,300	183	68,000	€ 107.95
Slovakia	24	24	€ 790	€ 33	€ 790	33	380	€26.099
Slovenia	7	5	€ 1,100	€ 220	€ 1,500	11	300	€ 29.80
Spain	23	12	€ 1,500	€ 120	€ 2,800	85	730	-
Sweden	1	1	€ 320	€ 320	€ 320	0	0	-
UK	48	16	€ 7,700	€ 480	€ 23,000	57	3,200	€ 162.39

Notes:

[1] A flood for this study is defined as an event of sufficient magnitude to be recorded in EM-DAT, or Member State databases. An event is identified as a flood in a specific Member State for a discrete period of time

[2] Due to difficulties identifying the years in which the damages are given in some sources, costs from earlier

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Member State	No. flood events (2002-2013)[1]	No. with quantified cost data	Total costs (quantified events only) (€ millions) (2002-2013)[2,3]	Average cost per event (€ millions) (2002-2013)[2,3]	Total costs over all events, extrapolated (€ millions) (2002-2013)[2,3]	Total no. fatalities (2002-2013)[4]	Total no. people evacuated (2002-2013)[5]	Money provided through EU Solidarity Fund (€ millions)[6]

flood events have not been updated to 2013 values. As a result, the total is likely to be an underestimate. The extrapolation has been carried out at the Member State level as this is likely to be less uncertain than extrapolation at the EU level as a whole, hence, the total is greater than €360 multiplied by 363 floods (which would be €130 billion)

3 Since not all of the damages from flooding can be quantified, it is likely that these are underestimates

4 Data only available where reported in databases and in some cases different data sources provide different estimates of number of fatalities; in these cases, later data have been used providing these are considered to be the more reliable sources (e.g. official databases preferred over newspaper reports). Total number of fatalities reported may reflect level of reporting rather than actual number of deaths that occurred across the EU28

5 Data on number of people evacuated only available for 28% of floods and in many cases estimates only are provided such that this figure is likely to be highly uncertain. Note than 1.54 million people were evacuated in 2013 alone

6 Information provided by the European Commission, DG Regio, with 56 applications made between 2002 and 2013. All applications from Spain for funds were rejected

7 The total for Portugal is based on two floods with quantified data from Madeira. There were no quantified data for floods on the mainland, hence, the total for Portugal is highly uncertain

The five years with the highest costs were as follows, with the costs per event and total number of events also given:

- 2002: €18,000 million over 21 events with quantified data, €850 million per event, or €32,000 million when extrapolated over all 38 events
- 2010: €15,000 million over 19 events with quantified data, €790 million per event, or €27,000 million when extrapolated over all 34 events
- 2013: €9,900 million over 15 events with quantified data, €660 million per event, or €16,000 million when extrapolated over all 24 events
- 2007: €6,400 million over 18 events with quantified data, €360 million per event, or €13,000 million when extrapolated over all 38 events
- 2003: €4,600 million over 17 events with quantified data, €270 million per event, or €8,700 million when extrapolated over all 32 events.

Table 2 presents summary information on the number of people and estimated annual average damages at risk now and in the future (2080s). The table also summarises investments made by Member States and from EU funds into flood risk management generally and into green infrastructure.

Table 2: Summary information on risks and investment	
Estimated number of people flooded annually on average - fluvial flooding[1]	Current: 167,000 By the 2080s: 359,000

Table 2: Summary information on risks and investment	
Estimated number of people flooded annually - coastal flooding(1)	Current: 10,000 By the 2080s: additional 121,000 to 425,000 (A1B scenario) or additional 40,000 to 145,000 (E1 scenario)
Estimated expected annual damages from fluvial flooding(1)	Current: €5.5 billion By the 2080s: €97.9 billion (assumes no adaptation)
Estimated expected annual damages from coastal flooding(1)	Current: €1.9 billion By the 2080s: €25.4 billion (A1B scenario) or €17.4 billion (E1 scenario)
Money provided through the EU Cohesion Policy(2)	Risk prevention: Adopted OPs: €5,533 million Allocated to selected projects AIR 2011: €4,031 million Other measures to preserve the environment and prevent risks: Adopted OPs: €1,684 million Allocated to selected projects AIR 2011: €1,299 million
Money provided through research projects under the Framework programmes(3)	5th Framework Programme: €26.9 million EU funds 6th Framework Programme: €36.8 million EU funds 7th Framework Programme: €85.0 million EU funds
Investment made by Member States (total)(4)	Incomplete – data not available for all Member States or for all types of expenditure, not appropriate to provide total as this would be significantly uncertain. Range of expenditure is very wide, with greatest levels in Netherlands and UK and lowest levels countries such as Cyprus and Lithuania (but here information on investment may not be complete). On average, over a large number of projects, the benefits of investment appear to outweigh the costs by 6-8 times, although it is important to note that there is considerable variation between projects such that the actual benefits have to be determined on a project-by-project basis
Investment made by Member States in green infrastructure(5)	Information found suggests this is limited in many Member States, but may be of increasing importance as implementation of the requirements of the EU Floods Directive (2007/60/EC) continues. Progress is more advanced in countries with a longer history of significant flooding, such as the Netherlands, Germany, Belgium and the UK where plans for making room for rivers are already in place and being delivered. Green infrastructure projects found to require significant up-front investment that may require investment to encourage uptake. There is then potential to deliver significantly greater environmental benefits alongside reduction in flood damages and, potentially savings from reduced costs compared with traditional defences, deferment of investment in new defences and, hence, opportunity to use funds in other locations

Notes:

[1] Numbers of people affected and annual projected damages costs are from the ClimateCost study (Brown et al (2011) for coastal flooding and Feyen & Watkiss (2011) for fluvial flooding). The E1 scenario is consistent with the EU's target. Project annual damages are undiscounted, mid estimates. Current damages are based on the baseline scenario of no sea level rise

[2] Information provided by the European Commission, DG Regio

[3] Information taken from the CORDIS database: http://cordis.europa.eu/projects/home_en.html

[4] No data for4 MS (Croatia, Finland, Greece, Luxembourg), partial data for 12 MS (Belgium, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Italy, Lithuania, Portugal, Slovenia, Spain, mostly coastal investments only), more complete data but not necessarily comprehensive for 5 MS (Czech Republic, Hungary, Ireland, Latvia, Malta), reasonably complete information for 6 MS (Austria, Netherlands, Romania, Slovakia, Sweden, UK). For Poland information is available on funding for water management, which includes flood risk measures but also other activities as well

[5] Information available from EU wide projects such as DICE (Naumann et al, 2011), and project specific information)

Headline findings for potential of SME support on resource efficiency

Coverage and outcomes

More than 230 programmes supporting SMEs to implement resource efficiency measures have been identified across the EU during the course of the study. Of these, 102 are classified as providing direct, hands-on services which are tailored to the individual needs of companies supported, with the remaining 128 providing a more centralised and general range of information services across a number of organisations as opposed to individual firms. The distribution of these programmes varies considerably across Member States, with the highest number identified in Germany (24 direct hands-on and 13 general programmes), followed by Spain (with 10 direct, hands-on and 15 general programmes) and the UK (10 each of direct, hands-on and general programmes). No support programmes were identified in Romania or Greece and lower numbers of programmes tended to be observed in smaller and newer Member States.

Availability of data on the economic and environmental outcomes from such programmes is difficult to come by (suggesting improvements in monitoring and evaluation could be introduced) but suggest significant resource efficiency savings can be made in a range of sectors through such programmes. The DG RegioStars 2013 winner in the Sustainable Development category, ENWORKS, provides support to companies in the UK and over a 5 year programme, participating SMEs achieved average annual cost savings of €19,000 in the energy power and utilities sector and €46,000 in environmental technologies. Indicative annual savings for SMEs in other Member States (modelled using ENWORKS data) range from €4,000 to €22,000 and €9,000 to €52,000 per annum in the same sectors. Returns on investment of between 1:10 and 1:20 (based on programmes in Ireland and the UK) have been identified and significant savings in energy consumption, CO_2 emissions, water use and waste generation were also reported.

Scope for engaging with SMEs

Indicative calculations suggest that significant savings can be made from adopting similar programmes across Member States. Surveys[1] of SMEs also indicate that the numbers of companies reporting that they are adopting measures to improve resource efficiency in different areas varies greatly by country, with opportunities existing for support programmes to engage with more companies across Europe. This highlights the potential benefits that can be achieved in those Member States where action is at its lowest.

Good practice

The most successful and cost efficient programmes incorporate a range of good practices, including, among others, adopting holistic and tailored approaches, working together with multiple local partners and technical specialists, providing support over the long-term, focussing on SMEs economic situations, planning (including setting targets) monitoring, evaluating and promoting achievements.

[1] Flash Eurobarometer 381 December 2013, http://ec.europa.eu/public_opinion/flash/fl_381_en.pdf

Headline findings for environmental protection expenditure

Environmental protection expenditure covers money spent on all activities aimed at the prevention, reduction and elimination of pollution or nuisances resulting from the production processes or consumption of goods and services (definition from DG ESTAT). Table 3 uses available data from DG ESTAT to provide an indication of the variability between Member States in terms of total (public and private) environmental protection expenditure as a percentage of GDP.

Table 3: Total environmental protection expenditure as a percentage of GDP (based on Eurostat data)				
Category	**2008**	**2009**	**2010**	**2011**
Member State with lowest percentage of GDP	0.35% (Sweden)	0.70% (Sweden)	0.70% (Sweden)	0.70% (Sweden)
Member State with highest percentage of GDP	3.8% (Austria)	3.9% (Austria)	3.5% (Romania)	3.9% (Romania)
Sources and notes: totals based on environmental protection expenditure by general government, business sector and specialised producers of environmental protection services sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en and GDP data from DG ESTAT, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014				

Table 4 presents estimates for employment in the environmental goods and services sector (EGSS) for EU28. Although data for individual Member States have been identified, the figures are not comparable because different definitions are used for environmental employment.

Table 4: Estimates of employment in the environmental goods and services sector (EGSS) for EU28 (1000s)				
Category	**2008**	**2009**	**2010**	**2011**
EU28	3,705	3,849	4,087	4,194
Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 30 January 2014				

Table 5 presents an overview of some of the environment related EU funding allocated to Member States by type of fund. Additional funds considered by the main report include the European Fisheries Fund and the European Agricultural Fund for Rural Development.

Table 5: Overview of environment related EU funding by type of fund for EU28		
Fund	**No. of projects**	**EU contribution (€ millions)**
Eco-Innovation Fund[1] (funding since 2008)	63	45,600
INTERREG IVC Programme[2] (funding since 2008)	37	56,300
FP7-Environment[3] (funding for 2007 to 2013)	468	1,533
LIFE+[4] (funding from 1992 onwards)	3506	2,800
EU Regional policy funds[5] (only including ERDF, CF & IPA) (funding awarded to individual Member States for environmentally themed projects; 2007 to 2013)	118	85,600
Sources: [1] European Commission (nd): Eco-innovation, accessed at: http://www.eaci-projects.eu/eco/page/Page.jsp) on 1 December 2013. [2] INTERREG IVC (nd): Approved Projects Database, accessed at: http://www.interreg4c.eu/projects/ on 29 November 2013. [3] EU Commission Research & Innovation, FP7 website, accessed at: http://ec.europa.eu/research/fp7/index_en.cfm?pg=budget on 12 February 2014. [4] DG Environment Life Programme country factsheets, accessed at: (http://ec.europa.eu/environment/life/countries/index.htm on 31 January 2014. [5] European Commission (nd): Regional Policy, accessed at: http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=ALL&gv_reg=ALL&gv_obj=ALL&gv_the=72&gv_per=2 on 11 December 2013.		

Note de synthèse

La nécessité de l'étude

Le Semestre Européen se concentre sur une période de six mois, depuis le début de chaque année, et il vise à améliorer la coordination des politiques budgétaire et économique de l'Union européenne dans les pays de l'Union européenne. Pour assurer que les États membres (EM) s'alignent sur les politiques et actions définissent dans la stratégie d'Europe 2020, il est important que l'information pertinent est réuni en vue de aider la Commission faire les évaluations des EM et produire les Recommandations Spécifiques par Pays (CSR). Risk & Policy Analysts (RPA), en coordination avec HKV Consultants, a été invité par DG Environnement de fournir des données sur trois tâches qui sont pertinents pour la contribution de DG Environnement au Semestre Européen.

Les objectifs de l'étude

Comme il était énoncé dans les spécifications techniques, l'étude se compose de trois tâches. Chaque tâche a des objectifs spécifiques :

- Tâche 1: Les impacts financiers, économiques et sociaux des inondations, avec l'objectif :
  - de fournir les données empiriques ou les sources secondaires sur les potentiels impacts financiers, économiques et sociaux des inondations
- Tâche 2: Le potentiel de soutien donné aux PME en matière d'efficacité des ressources, avec l'objectif :
  - d'identifier les facteurs déterminants de succès dans le soutien aux PME directe et pratique
  - d'utiliser cette information pour aider à estimer, avec plus de précision, les économies potentielles et les économies environnementales potentielles, ainsi que les coûts de provision
- Tâche 3 : Les dépenses environnementales relatives, avec l'objectif :
  - de présenter les données sur les dépenses environnementales publiques et du secteur privé pour les 28 EM, et fournir des tendances depuis 2008, y compris les données pour 2012 et 2013 si sont disponibles
  - de présenter une répartition des données sur les dépenses environnementales par domaine environnemental (par exemple gestion des déchets)
  - de présenter, si les données sont disponibles, le nombre d'emplois supplémentaires résultant des dépenses environnementales
  - de fournir information sur les financements UE liés à l'environnement, y compris les sommes des financements UE et des co-financements des EM

Approche de l'étude

Cette étude a été réalisée sur une période de 13 semaines et par conséquent représente un examen rapide des données clés. Pour toutes les tâches, les données ont été recueillies au cours de recherche sur internet, demandes d'email et des discussions téléphoniques. Certaines des demandes pour information ont dû être renvoyées avant de compléter la recherche sur internet. Cela signifie que les questions générales sur tous les objectifs spécifiques de chaque tâche étaient posées plutôt que les questions spécifiques pour combler les lacunes des données.

Résultats principaux des impacts financiers, économiques et sociaux des inondations

Le tableau 1 résume les résultats principaux des dommages d'inondations entre 2002 et 2013 dans l'UE-28, et les fonds obtenus des Fonds de Solidarité de l'UE. Le tableau montre que les dommages totaux (extrapolées pour les inondations sans dommages quantifiées) sont estimés à €150 milliards (voir les notes dans Tableau 1 pour les avertissements).

Tableau 1: Résultats principaux des impacts financiers, économiques et sociaux des inondations (2002-2013, UE-28)

État Membre	Nombre d'inondations (2002-2013)[1]	Nombre avec les données quantifiées	Coûts totaux (événements quantifiées) (€millions) (2002-2013)[2, 3]	Le coût moyen d'événement (€ millions) (2002-2013)[2,3]	Coûts totaux extrapolés pour tous événements (€millions) (2002-2013)[2, 3]	Nombre total des morts (2002-2013)[4]	Nombre total des personnes évacuées (2002-2013)[5]	Fonds viennent de Fonds de Solidarité de l'UE (€ millions)[6]
UE-28	**363**	**201**	**€72,000**	**€360**	**€150,000**	**Environ 1,000**	**Plus de 1.7 millions**	**€1,800**
Autriche	8	7	€ 4,700	€ 660	€ 5,300	19	1,500	€ 171
Belgique	10	1	€ 180	€ 180	€ 1,800	5	0	-
Bulgarie	15	5	€ 480	€ 96	€ 1,400	62	11,00	€ 20.35
Croatie	6	3	€ 240	€ 80	€ 480	0	750	€ 5.23
Chypre	3	0	€ 0	€ 0	€ 0	0	0	-
République Tchèque	12	6	€ 4,100	€ 690	€ 8,200	66	1.5 million	€ 161
Danemark	3	3	€ 1,400	€ 450	€ 1,400	4	0	-
Estonie	2	2	€ 390	€ 190	€ 390	0	600	-
Finlande	11	4	€ 60	€ 15	€ 170	0	120	-
France	48	48	€ 8,700	€ 180	€ 8,700	152	39,000	€ 94
Allemagne	11	6	€ 19,000	€ 3,100	€ 34,000	52	100,000	€ 804
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Hongrie	10	5	€ 1,400	€ 270	€ 2,700	3	10,900	€ 37.55
Irlande	16	10	€ 920	€ 92	€ 1,500	2	1,500	€ 13.02
Italie	20	16	€ 8,900	€ 560	€ 11,000	127	3,200	34.971
Lettonie	1	1	€ 3	€ 3	€ 3	0	0	-
Lituanie	5	0	€ 0	€ 0	€ 0	4	70	-
Luxembourg	0	0	€ 0	€ 0	€ 0	0	0	-
Malte	13	1	€ 30	€ 30	€ 390	0	0	€ 0.96
Pays-Bas	3	3	€ 14	€ 5	€ 14	0	0	-
Pologne	10	2	€ 4,800	€ 2,400	€ 24,000	24	32,000	€ 105.57
Portugal	11[7]	2	€ 1,100	€ 550	€ 6,100	51	0	€ 31.26
Romanie	20	13	€ 4,100	€ 310	€ 6,300	183	68,000	€ 107.95
Slovaquie	24	24	€ 790	€ 33	€ 790	33	380	26.099
Slovénie	7	5	€ 1,100	€ 220	€ 1,500	11	300	€ 29.80
Espagne	23	12	€ 1,500	€ 120	€ 2,800	85	730	-

Tableau 1: Résultats principaux des impacts financiers, économiques et sociaux des inondations (2002-2013, UE-28)								
État Membre	Nombre d'inondations (2002-2013)[1]	Nombre avec les données quantifiées	Coûts totaux (événements quantifiées) (€millions) (2002-2013)[2, 3]	Le coût moyen d'événement (€ millions) (2002-2013)[2,3]	Coûts totaux extrapolés pour tous événements (€millions) (2002-2013)[2, 3]	Nombre total des morts (2002-2013)[4]	Nombre total des personnes évacuées (2002-2013)[5]	Fonds viennent de Fonds de Solidarité de l'UE (€ millions)[6]
Suède	1	1	€ 320	€ 320	€ 320	0	0	-
Royaume-Uni	48	16	€ 7,700	€ 480	€ 23,000	57	3,200	€ 162.39

Notes:

[1] Dans cette étude une inondation est définie comme un événement d'une ampleur suffisante d'être enregistré dans EM-DAT, ou les bases de données des EM. Un événement est une inondation dans un EM spécifique pour un période de temps distinct.

[2] Pour quelques sources c'était difficile d'identifier à quelle année les dommages s'appliquent donc les coûts des inondations antérieurs n'ont pas revalorisées des valeurs 2013. Il est probable que le total est sous-estimé. L'extrapolation a été réalisée au niveau des EM parce qu'il est moins incertain que l'extrapolation au niveau de l'UE, donc, le total est plus grand que €360 multiplié par 363 inondations (qui serait €130 milliards).

[3] Ce n'était pas possible de quantifié les dommages de tous les inondations, donc il est probable que sont sous-estimations

[4] Les données disponibles dans les bases de données seulement et quelquefois autre sources d'information ont des estimations différents; en ce cas on utilise les données plus récentes (s'ils viennent des sources plus fiables par exemple les bases de données sont préférables aux articles dans les journaux). Le nombre total des morts peut refléter le niveau de reportage plutôt que le nombre actuels dans l'UE-28

[5] Les données sur les nombres de personnes évacuées sont disponibles juste pour 28% des inondations et souvent les données sont estimations, par conséquent cette chiffre est très incertain. Notez qu'en 2013 seulement, 1.54 million de personnes étaient évacuées

[6] Information fournie par la CE, DG Regio, 56 demandes entre 2002 et 2013. Toutes les demandes d'Espagne ont été rejetées

[7] Le total pour le Portugal est basé sur deux inondations de Madeira qui ont eu les données quantifiées. Il n'y avaient pas des données quantifiées pour les inondations sur le continent ; par conséquence, le total pour le Portugal est très incertaine

Les cinq années avec les coûts les plus élevés sont les suivants :

- 2002 : €18,000 millions, sur 21 événements avec les données quantifiées, €850 millions par événement, ou €32,000 millions quand il est extrapolé pour l'ensemble des 38 événements
- 2010: €15,000 millions, sur 19événements avec les données quantifiées, €790 millions par événement, ou €27,000 millions quand il est extrapolé pour l'ensemble des 34 événements
- 2013: €9,900 millions, sur 15 événements avec les données quantifiées, €660 millions par événement, ou €16,000 millions quand il est extrapolé pour l'ensemble des 24 événements
- 2007: €6,400 millions, sur 18 événements avec les données quantifiées, €360 millions par événement, ou €13,000 millions quand il est extrapolé pour l'ensemble des 38 événements

- 2003: €4,600 millions, sur 17 événements avec les données quantifiées, €270 millions par événement, ou €8,700 millions quand il est extrapolé pour l'ensemble des 32 événements.

Le Tableau 2 présente un sommaire de l'information sur le nombre de personnes en danger maintenant et dans l'avenir (2080s), estimations des dommages annuels moyens maintenant et dans l'avenir, un sommaire des investissements effectués par les EM et par les fonds de l'UE dans la gestion des risques d'inondation généralement, et dans l'infrastructure verte.

Tableau 2: Sommaire de l'information sur les risques et les investissements	
Le nombre estimatif de personnes inondées par an, en moyenne – inondations fluviales [(1)]	Actuel: 167,000 Dans les années 2080s: 359,000
Le nombre estimatif de personnes inondées par an – inondations côtières[(1)]	Actuel: 10,000 Dans les années 2080s: autres 121,000 à 425,000 (scénario A1B) ou autres 40,000 à 145,000 (scénario E1)
Estimation des dommages annuels prévus des inondations fluviales (1[)]	Actuel: €5.5 milliards Dans les années 2080s: €97.9 milliards (n'assume aucune adaptation)
Estimation des dommages annuels prévus des inondations côtières [(1)]	Actuel: €1.9 milliards Dans les années 2080s: €25.4 milliards (scénario A1B) ou €17.4 milliards (scénario E1)
L'argent fourni par la Politique de Cohésion de l'UE[(2)]	Prévention des risques: OPs adoptés: €5,533 millions Alloué aux projets sélectionnés AIR 2011: €4,031 millions Autres mesures pour préserver l'environnement et prévenir les risques: OPs adoptés: €1,684 millions Alloué aux projets sélectionnés AIR 2011: €1,299 millions
L'argent fourni par les projets de recherche dans les Programmes-cadre[(3)]	5[e] Programme-cadre: €26.9 millions de fonds UE 6[e] Programme-cadre: €36.8 millions de fonds UE 7[e] Programme-cadre: €85.0 millions de fonds UE
Investissements par les États membres (total) [(4)]	Incomplète – données non disponibles pour tous les EM ou pour tous les types de dépenses, ce n'est pas approprié fournir un total (serait incertain). La gamme des dépenses est grande et les plus grands niveaux sont dans les Pays-Bas et le Royaume Uni, les niveaux plus bas dans Chypre, Lituanie (l'information sur l'investissement peut-être incomplète). En moyenne, sur un grande nombre de projets, les avantages d'investissement semblent de compenser les couts de 6-8 fois, mais il est important de noter qu'il existe les différences considérables entre les projets donc les avantages actuels doivent être établi au projet par projet.
Investissements par les États membres dans l'infrastructure verte[(5)]	L'information suggère qu'il est limité dans beaucoup des EM, mais il est possible que sera plus important avec la mise en œuvre continue de la Directive 2007/60/CE (la gestion des risques d'inondation). Le progrès est plus avancé dans les pays avec une longue histoire des inondations grands - le Pays-Bas, Allemagne, Belgique et le Royaume Uni ou déjà il y a des plans pour faire de la place pour les rivières, et quelques plans sont déjà mis en œuvre. Projets d'infrastructure verte qui besoin les investissements significatifs d'avance peuvent nécessiter les investissements pour encourager l'adoption. Puis, il y a la possibilité de fournir les avantages environnementaux plus grands parallèlement à la réduction des dommages des inondations et, potentiellement économies dans l'entretien des

Tableau 2: Sommaire de l'information sur les risques et les investissements	
	défenses traditionnelles et le report des investissements dans les défenses nouvelles et, puis, la chance d'utiliser les fonds dans les autres locations.

Notes:
[1] Nombres de personnes affectés et les dommages annuels prévus viennent de l'étude ClimateCost (Brown et al (2011) pour les inondations côtières et Feyen & Watkiss (2011) pour les inondations fluviales). Le scénario E1 est cohérent avec l'objectif de l'UE. Les dommages annuels prévues ne sont pas escomptés et sont un mi estimation. Dommages actuels sont basés sur le scénario de base – pas de hausse du niveau de la mer.
[2] Information fourni par la Commission européenne, DG Regio
[3] Information de la base de données CORDIS: http://cordis.europa.eu/projects/home_en.html
[4] Il n y a pas des données pour 4 EM (Croatie, Finlande, Grèce, Luxembourg), données partielles pour 12 EM (Belgique, Bulgarie, Chypre, Danemark, Estonie, France, Allemagne, Italie, Lituanie, Portugal, Slovénie, Espagne, pour la plus part les investissements côtières seulement), données plus complète mais pas exhaustif pour 5 EM (République Tchèque, Hongrie, Irlande, Lettonie, Malte), données plus ou moins complètes pour 6 EM (Autriche, Pays-Bas, Romanie, Slovaquie, Suède, Royaume Uni). Pour Pologne, information est disponible sur le financement de la gestion de l'eau, y compris mesures des risques d'inondation et autres activités.
[5] Information est disponible sur projets à l'échelle communautaire comme DICE (Naumann et al, 2011), et information spécifique au projet)

Principales conclusions à propos du potentiel du soutien donne aux PME en matière d'efficacité des ressources

La couverture et les résultats

Plus de 230 programmes de soutien aux PME pour mettre en œuvre des mesures d'efficacité des ressources ont été identifiés dans l'UE au cours de l'étude. Parmi ceux-ci, 102 sont classés comme programmes fournissant des services directs et participatifs qui sont adaptés aux besoins individuels des sociétés prises en charge et le restant 128 comme programmes offrant une gamme plus centralisée et générale des services d'information à travers un certain nombre d'organisations plutôt que des entreprises individuelles. La répartition de ces programmes varie considérablement selon les États Membres, avec le plus grand nombre identifié en Allemagne (24 programmes directs participatifs et 13 programmes généraux), suivie par l'Espagne (avec 10 programmes directs participatifs et 15 programmes généraux) et le Royaume-Uni (10 programmes chacun du soutien direct participatif et général). Aucun de programme de soutien n'a été identifié en Roumanie ou la Grèce et un nombre plus bas de programmes à être observé dans les petites et les nouveaux États Membres.

Des données sur les résultats économiques et environnementaux de ces programmes sont difficiles à trouver (ce qui implique que des améliorations dans le suivi et dans l'évaluation pourraient être introduites) mais suggèrent que d'importantes économies d'efficacité des ressources pourraient être faites dans une variété de secteurs grâce à tels programmes. Le gagnant en 2013 de DG RegioStars dans la catégorie Développement durable, ENWORKS, fournit un soutien aux entreprises au Royaume-Uni; pendant un programme de 5 ans, les PME ont atteint des économies annuelles moyennes de €19,000 dans le secteur de l'énergie et les services publics ainsi que €46,000 dans les technologies environnementales. D'importantes économies de la consommation d'énergie, des émissions de CO_2, de la consommation d'eau et de la production de déchets sont également signalés.

Le potentiel futur

Les calculs indicatifs impliquent que des économies importantes peuvent être faites à partir de l'adoption de programmes similaires dans les États membres. Des enquêtes[2] de PME indiquent également que le nombre d'entreprises adoptant des mesures visant à améliorer l'efficacité des ressources varie considérablement selon le pays et qu'il y a des fortes possibilités d'impliquer d'autres entreprises aussi.

Bonnes Pratiques

Les programmes les plus efficaces et rentables intègrent un éventail de bonnes pratiques, y compris, entre autres, l'adoption d'approches holistiques et adaptés, la collaboration avec plusieurs partenaires locaux et de spécialistes techniques, la fourniture d'un soutien sur le long terme, en mettant l'accent sur les situations économiques des PME, de la planification (y compris en fixant des objectifs), la surveillance, l'évaluation et la promotion de réalisations.

Principales conclusions à propos des dépenses de protection de l'environnement

Les dépenses de protection de l'environnement couvrent l'argent dépensé sur toutes les activités visant à la prévention, la réduction et l'élimination de la pollution ou de nuisances résultant des processus de la production ou de la consommation de biens et de services (définition de la DG ESTAT). Tableau 3 utilise les données disponibles de la DG ESTAT pour fournir une indication de la variabilité entre les États membres en termes de dépenses totales de protection de l'environnement (public et privé) en pourcentage du PIB.

Tableau 3: Le total des dépenses de protection de l'environnement en pourcentage du PIB (sur la base de données d'Eurostat)

Catégorie	2008	2009	2010	2011
Etat membre avec le plus faible pourcentage du PIB	0.35% (la Suède)	0.70% (la Suède)	0.70% (la Suède)	0.70% (la Suède)
Etat membre avec le plus haut pourcentage du PIB	3.8% (l'Autriche)	3.9% (l'Autriche)	3.5% (la Roumanie)	3.9% (la Roumanie)

Notes et sources: totaux basés sur les dépenses de protection de l'environnement par les administrations publiques, le secteur des entreprises et des producteurs spécialisés de services de protection de l'environnement provenant de la DG ESTAT (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en); les données du PIB aussi de DG ESTAT (http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database (les deux consulté le 30 janvier 2014)

Le tableau 4 présente des estimations de l'emploi dans le secteur des biens et services environnementaux (SBSE) pour l'UE28. Bien que les données pour les États membres individuels fussent identifiées, les chiffres ne sont pas comparables en raison des définitions différentes utilisées pour l'emploi en environnement.

[2] Flash Eurobarometer 381 December 2013, http://ec.europa.eu/public_opinion/flash/fl_381_en.pdf

Tableau 4: Estimations de l'emploi total dans le secteur des biens et services environnementaux (SBSE) pour l'UE28 (1000s)				
Catégorie	**2008**	**2009**	**2010**	**2011**
EU28	3,705	3,849	4,087	4,194
Source: Eurostat (2014) L'emploi dans le secteur des biens et services environnementaux (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en) (30 janvier 2014)				

Le tableau 5 présente une vue d'ensemble de financement lié à l'environnement de l'UE alloué aux États membres par type de fonds. Des fonds supplémentaires envisagés par le rapport principal comprennent le Fonds européen pour la pêche et le Fonds européen agricole pour le développement rural.

Tableau 5: Vue d'ensemble de financement lié à l'environnement de l'UE par type de fond pour l'UE28		
Fonds	**Nombre de projets**	**Contribution de l'UE (en millions d'euros)**
Fonds éco-innovation[1] (financement depuis 2008)	63	45,600
Programme INTERREG IVC[2] (financement depuis 2008)	37	56,300
CORDIS[3] (financement de 2007 à 2011)	inconnu	17,500
LIFE+[4] (financement à partir de 1992)	3,506	2,800
Fonds de la politique régionale de l'UE[5] (y compris ne FEDER, CF & IAP) (financement accorde aux différents Etat membres pour de projets à thème environnemental; 2007 to 2013)	118	85,600
Sources: [1] Commission européenne (nd): Éco-innovation (http://www.eaci-projects.eu/eco/page/Page.jsp) (consulté 1 Décembre 2013). [2] INTERREG IVC (nd): Base de données des projets approuvés. (http://www.interreg4c.eu/projects/) (consulté 29 novembre 2013). [3] CORDIS (nd): Recherche élémentaire. (http://cordis.europa.eu/search/index.cfm?fuseaction=search.simple) (consulté 14 décembre 2013) [4] DG Environnement, Programme Vie fiches pays consultées 31 janvier 2014 (http://ec.europa.eu/environment/life/countries/index.htm). [5] Commission européenne (nd): Politique régionale (http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=ALL&gv_reg=ALL&gv_obj=ALL&gv_the=72&gv_per=2) Programmes consultés 11 décembre 2013.		

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Glossary

ADAM	Projects and Products Portal for Leonardo da Vinci
APSFR	Areas of Potential Significant Flood Risk
CAP	Common Agricultural Policy
CEPA	Classification of Environmental Protection Activities
CF	Cohesion Fund
CORDIS	Community Research and Development Information Service
CRED	Centre for Research on the Epidemiology of Disasters
CSR	Country Specific Recommendations
CYSTAT	Statistical Service of Cyprus
CZSO	Czech Statistical Office
DG ECHO	European Community Humanitarian Office
DG REGIO	Directorate General for Regional and Urban Policy
EA	Environment Agency (UK)
EAD	Expected Annual Average Damages
EAFRD	European Agricultural Fund for Rural Development
EAGGF	European Agricultural Guidance and Guarantee Fund
EEA	European Environment Agency
EFF	European Fisheries Fund
EGSS	Environmental Goods and Services Sector
EIP	Entrepreneurship and Innovation Programme
EM-DAT	Emergency Events Database
EMAS	Eco-Management and Audit Scheme
EMIR	Swedish database including information on business activities considered hazardous under the Swedish Environmental Code
ENPI	European Neighbourhood and Partnership Instrument
EPEA	Environmental Protection Expenditure Account

ERDF	European Regional Development Fund
ESF	European Social Fund
ESMI	Environmental Services for Metalworking Industries
ESP	Environmental Service Providers
EU	European Union
EUP	Energy Using Products
EURESP	EURopean Environmental Services Platform
EUSF	European Union Solidarity Fund
FIFG	Financial Instrument for Fisheries Guidance
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
HCSO	Hungarian Central Statistical Office
HGV	Heavy Goods Vehicle
IA	Impact Assessment
ICT-PSP	Information and Communications Technology Policy Support Programme
IEE	Intelligent Energy Europe
IPA	Instrument for Pre-Accession Assistance
IPCC	Intergovernmental Panel on Climate Change
JQ-EPER	Environmental Protection Expenditure and Revenues Joint Questionnaire
JRC	Joint Research Centre
LCEGS	Low Carbon Environmental Goods and Services
LIFE	EU funding instrument for the environment
M&E	Monitoring & Evaluation
MS	Member State(s)
NGO	Non-Governmental Organisation
NISP	National Industrial Symbiosis Programme
OECD	Organisation for Economic Co-operation and Development
OP	Operational Programme

PESETA	Projection of Economic Impacts of Climate Change in Sectors of the EU
PFRA	Preliminary Flood Risk Assessment
PREEMPT	Policy-Relevant Assessment of Economic and Social Effects of Hydro-Meteorological Disasters
REACH	Registration, Evaluation, Authorisation & Restriction of Chemicals
RoHS	Restriction of Hazardous Substances Directive 2002/95/EC
RPA	Risk & Policy Analysts Ltd
SCP	Sustainable Construction and Production
SME	Small and Medium-sized Enterprises
SURS	Statistical Office for the Republic of Slovenia
SWITCH4FOOD	Services for Water and InTegrated teCHniques for FOOD industry
TMR	Total Material Resources
UNISDR	United Nations Office for Disaster Risk Reduction
WEEE	Waste Electrical and Electronic Equipment Directive 2002/96/EC
WRAP	Waste & Resources Action Programme

1 Introduction

1.1 Background to the study

Established in 2010 to better coordinate European Union budgetary and economic policies in European Union countries, the European Semester focuses on a six month period from the beginning of each year. Its main aims are to[3]:

- Ensure sound public finances
- Foster economic growth
- Prevent excessive macroeconomic imbalances in the EU.

The European Semester begins with the publication of the Annual Growth Survey (Figure 1-1), which is then debated by the European Council and the European Parliament. The European Council provide policy guidance for the Member States who then outline their specific plans. The European Commission assesses these plans and provides Country-Specific Recommendations (CSR), which are then adopted by the EU Council. Member States take these recommendations into account for the following year's national budget.

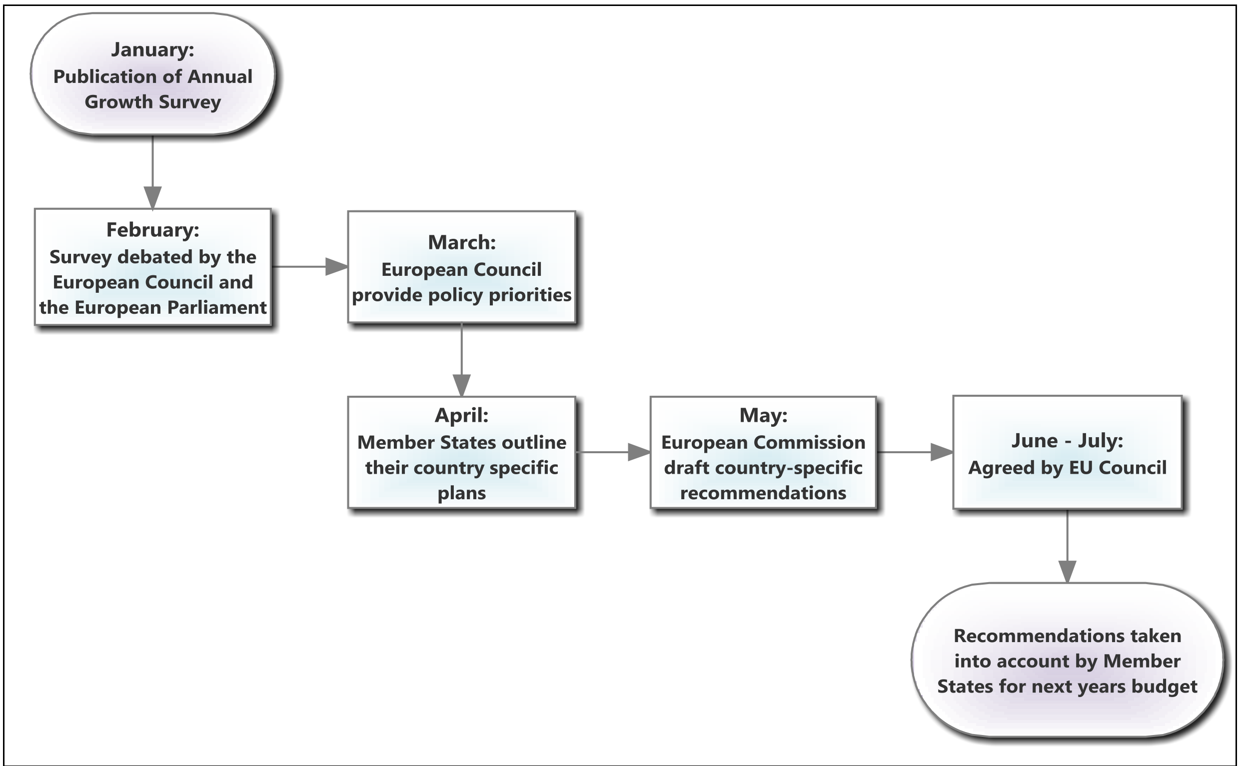

Figure 1-1: European Semester timeline

By aligning policies and priorities between Member States the EU is working towards its Europe 2020 strategy priorities. In order to move forwards from the economic crisis, the

[3] Consilium (nd): What is the European Semester. Council of the European Union, accessed at: http://www.consilium.europa.eu/special-reports/european-semester on 1 November 2013.

goals of the Europe 2020 strategy are to create growth which focuses on improvements to education, sustainability and job creation under the key headings of *smarter*, more *sustainable* and more *inclusive* growth[4].

Sustainable growth is a key priority for the Europe 2020 strategy. Under this priority there are two flagship initiatives for achieving this aim[5]:

1. Resource efficient Europe
2. An industrial policy for the globalisation era.

The first of these covers targets for action on increasing sustainable use of natural resources, both for the long and medium term[6]. These include components to create a low carbon economy, an energy efficiency plan, reform of policies such as the Common Agricultural Policy, the Biodiversity 2020 strategy to halt biodiversity loss, climate change adaptation, etc. The second priority aims to make a *transition to a more sustainable, inclusive and resource-efficient economy* by promoting growth and internalisation of Small and Medium-sized Enterprises (SMEs)[7].

In order to ensure Member States are aligning on these policies and actions outlined in the Europe 2020 Strategy, it is important that key information is brought together in order to assist the Commission in making its assessment of Member States and producing CSRs. This study covers three themes relating to sustainable use of environmental resources to support DG Environment's input to the European Semester.

1.2 Objective of the study

Risk & Policy Analysts (RPA) has been invited by DG Environment to provide data on selected themes relevant to DG Environment's input into the European Semester, with a particular focus on the economic and social impacts of environmental protection and resource efficiency. As set out in the technical specifications, the study will comprise three Tasks:

- Task 1: Financial, economic and social impacts of floods
- Task 2: Potential of SME support on resource efficiency
- Task 3: Relative environmental expenditure.

[4] European Commission (nd): Priorities, accessed at: http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/priorities/index_en.htm on 1 November 2013.

[5] European Commission (nd): Flagship Initiatives, accessed at: http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/flagship-initiatives/index_en.htm, on 1 November 2013.

[6] EU Commission (2011): A resource-efficient Europe-flagship initiative under the European 2020 Strategy. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, accessed at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0021:FIN:EN:PDF on 1 November 2013.

[7] EU Commission (2010): An integrated industrial policy for the globalisation era putting competitiveness and sustainability at centre stage, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, accessed at: http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/files/communication_on_industrial_policy_en.pdf on 1 November 2013.

1.3 Structure of this report

The remainder of this report has been organised as follows:

- Section 2 describes the approach taken for each Task
- Section 3 sets out the findings to date for Task 1
- Section 4 summarises the results from Task 2
- Section 5 provides the outcome of work on Task 3
- Section 6 presents a summary of the results at EU level.

A series of country fiche reports have been prepared, one for each Member State, summarising the key findings from each of the three tasks. These can be found in Annex 1.

2 Approach to the study

2.1 Overview of approach

The study was undertaken over a period of 13 weeks and, as such, represents a rapid review of key data sources. For all three tasks, additional data were collected directly from Member States as well as from Internet searches and review of published documents. This section provides an overview of the specific approaches to each task, including a summary of the difficulties encountered with meeting each task objective and the data needs as requested in the specification.

2.2 Approach to Task 1

2.2.1 Task objective

The objective of Task 1 is to provide empirical data or secondary sources on the potential financial, economic and social impacts of floods.

2.2.2 Task 1 data needs

Task 1 requires five different types of data to be collected and collated. These are:

- The costs of floods between 2002 and 2013. Where possible data on the costs of floods need to be broken down into:
  - Direct and indirect costs
  - Economic, social and environmental costs

  These costs need to be presented as:
  - Total for the EU
  - Average costs per year
  - Costs per Member State

- The impact of economic and social disruption caused by floods, broken down into:
  - Evacuations
  - Health costs
  - Jobs lost
  - Dislocation of housing

- Money from the EU Solidarity Fund for recovery measures, by:
  - Member State
  - Total EU
  - Cost-benefit analysis of these measures and the amount of damage that has been avoided

- Areas where investment in flood prevention is still needed:
  - Per Member State with data on investments in flood prevention and envisaged costs

- Investment on flood prevention measures that have been made:
  - On restoring ecosystem services, green and grey infrastructure
  - Per Member State
  - From co-funding (mainly European Regional Development Fund and Cohesion Fund but also European Agricultural Fund for Rural Development, European Social Fund and others)
  - Whether these investments have had any impact on the costs caused by floods in these Member States

2.2.3 Approach to data collection

Data have been collected through Internet searches, email requests and telephone discussions. The timing of the study meant some email requests had to be sent before full Internet searches had been made. This meant that general questions covering all the requirements of Task 1 had to be asked rather than specific questions to fill data gaps. Following submission of the Interim Report, a more tailored email request was sent with the aim of gathering information on the level of EU funding obtained by each Member State for flood risk management.

Internet searches were carried out in English and in native languages of Member States to ensure the best possible coverage. The volume of information that is available on flood risk means that there was a need to quickly review a large number of documents to identify whether they contained relevant information, particularly, quantitative information on the areas of interest (as listed in Section 2.2.2). These documents covered each of the 28 Member States as well as information for the EU as a whole, specific River Basins (such as the Elbe, Rhine and Danube), and regions or specific areas (including coastal areas, or regions within the EU). A tiered approach has been used, where EU databases and reports were first reviewed, followed by information from Member States (again databases and national reports where available), followed by information at the regional, local or project level. Given the availability of data, this has allowed us to combine a top-down approach with a bottom-up approach. Of course, the bottom-up approach is much more time-consuming and, hence, information gathered in this way is more incomplete than that gathered using a top-down approach. Table 2-1 identifies how and where the different pieces of data needs have been found and used.

For this project the flood occurrences recorded on EM-DAT (CRED, nd) were used as a baseline from which to search for further details on the costs of floods. For a flood to be recorded on EM-DAT at least one of the following criteria must be met:

- 10 or more people reported killed;
- 100 or more people reported affected;
- A state of emergency declared; or
- International assistance is called for.

Table 2-1: Sources of data needs, data availability and implications for this study				
Data need	**EU databases and reports**	**Member States databases and national reports**	**Other reports, regional, local databases and projects**	**Implications for overall findings**
The costs of floods between 2002 and 2013	Some	Some	Most	Mostly complete, but information on indirect costs have been difficult to find
The impact of economic and social disruption caused by floods	Some	Some	Most	Most information has come from other reports (bottom-up) meaning there are lots of data gaps
Money from the EU Solidarity Fund for recovery measures	All	None	None	EU database used, information from the database has also been used to add to the data on the costs of floods
Areas where investment in flood prevention is still needed	Some	Half	Some	Data on investments by MS have been found but data on costs are more difficult, with data gaps existing
Investment from EU funds	Some	Some	Most	Data on EU funded projects have been based on EU databases but information has had to be built up project-by-project such that this dataset is incomplete
Investment on flood prevention measures that have been made	Some	Some	Most	Most information has come from specific reports and projects meaning this data set is mainly based on case studies and is incomplete
Key: Some: some data have been found at this level but this was not sufficient to meet the study requirements Half: a good amount of data has been found at this level, but usually only for specific countries or specific types of flooding (e.g. coastal) such that there are some data gaps and/or inconsistencies Most: the majority of data for this data need has been found at this level but some data gaps still exist meaning other sources also had to be identified All: the full data needs were met by this level				

The EM-DAT thresholds are therefore used as a baseline definition of a flood for this project. Additional floods for which information was found during more general searches have also been included; however these were not searched for specifically.

Emails were sent to all members of the Floods Working Group by the European Commission asking for information on all areas of interest. In addition, emails have been sent to particular projects (including KULTURisk and STAR-FLOOD) and a request for information on flood investment was posted on the Flood Professionals Group using LinkedIn. Response rates to date are as follows:

- Emails were sent to the Floods Working Group asking generic questions covering the specific data needs and then a more specific request covering EU funds obtained and how these have been spent: response rates were generally low. This may be because many of the members will have been involved in preparing the flood hazard and risk maps that were due on 22 December 2013.
- Ad hoc emails sent to specific projects or specific Member States during data collection: response rates were generally good with some follow-on telephone discussions also held.
- Request for information via LinkedIn: eleven responses, including one from Denmark, one from France, and three from the Netherlands with links to example projects. Some very useful additional data were collected through this route.

2.2.4 Approach to data collation

As the Task involved a large number of people reviewing a significant number of documents, a series of proformas were developed to help ensure consistency of the review stage. Proformas were developed to cover:

- Information on the costs of floods: one proforma for each year with a worksheet tab for each Member State.
- Information on each Member State's approach to flood risk management: one proforma for each Member State designed to capture information on current and future (i.e. with climate change) flood risk, current and planned investment, and specific projects and programmes within each Member State and their approach (in particular, whether these involved green or grey infrastructure and if they could be linked to restoration of ecosystem services).
- Summary of the Preliminary Flood Risk Assessments and other projects (e.g. ClimateCost, PESETA) on current and future risks, and the projected costs of managing those risks.

Information recorded in the proformas has been summarised in the tables presented in Section 3 of this report, the country fiches and the supporting annexes.

2.3 Approach to Task 2

2.3.1 Task 2 objectives

The key objectives of this task are:

- To identify the key success factors involved in the provision of more hands-on, direct support to SMEs for improving resource efficiency
- To utilise this and broader information on SME support to assist in estimating more accurately the potential economic and environmental savings as well as the costs of providing such support.

2.3.2 Approach

Following signature of the contract on 4 November 2013 and the kick-off meeting in Brussels on 19 November 2013, the study team began identifying SME resource efficiency support programmes in Member States across the EU as well as programmes which had an EU focus or focus across a number of Member States.

Literature review

The specifications outlined a number of documents which could be used to identify specific resource efficiency support programmes across the EU. The study team utilised these documents and carried out a wider literature search (including reviewing the source documents used for the reports identified in the specification as well as additional Internet searches) to identify as many programmes as well as sources of information regarding the outcomes of these as possible in the time available.

Other literature searches focused on gathering data on existing levels of resource efficiencies across Member States, specifically for water, waste, material and energy efficiency to inform the study questions regarding potential future benefits and, as the study developed, the calculation of indicative savings that might arise in Member States based on published savings achieved elsewhere. Much of the data was sourced from Eurostat but country level information was also sourced from the World Bank.

Internet searches

Many of the documents reviewed during the literature review, whilst identifying different programmes and providing a description of their activities, did not provide any significant information regarding outcomes in terms of economic and environmental savings. Consequently, extensive Internet searches were made to identify SME support programmes focussing on resource efficiency. Whilst the majority of websites reviewed were in English, additional RPA staff members fluent in other EU languages were engaged to conduct additional searches and review websites in other EU languages (i.e. French, German, Spanish, Italian, Bulgarian and Polish).

Consultation

Following the initial identification of programmes by literature review and Internet searches and their categorisation according to the services they provided, the study team approached a range of different organisations involved with resource efficiency issues in order to identify specific direct, hands-on support programmes. Approximately 50 programmes considered to be providing primarily hands-on, direct support were contacted directly via email and by phone to request information. This was in the form of a one page proforma set of questions requesting information on programme operation, outcomes achieved and to identify specific approaches which may be considered innovative and/or good practice.

2.3.3 Data limitations

The first issue encountered by the study team was the lack of any consolidated information regarding resource efficiency programmes in general and programmes supporting SMEs in particular. A number of studies identified in the specifications for this assignment provided some limited but incomplete information on a number of programmes operating in Member States, and reviews of further studies, general Internet searches and searches of databases of a number of EU and national funding instruments quickly revealed that there are a large number of sources of *potential* information. The challenge then was to identify specific programmes which would fall into the "direct, hands-on" category of resource efficiency support programmes, and as mentioned below, this proved to be a challenge due to the multi-faceted nature of resource efficiency and the range of support programmes in existence, past and present.

The lack of consolidated data on resource efficiency programmes has meant that the study team has had to rely on information obtained from a number of different sources via programme websites and referred to in other studies. These sources have not proved very comprehensive in providing data on the economic and environmental outcomes of programme support and often provide information covering different time periods and using different units of measurement. Furthermore, many programmes do not specifically concentrate on SMEs, or at least do not break down any data on coverage, cost or benefits generated by SMEs and large companies. Since opportunities for savings in large companies are likely to be greater in absolute terms, this makes it difficult to extrapolate the level of savings achieved from support programmes (or econometric projections) that cover both small and large companies to programmes which are focused on delivering direct, hands-on support to SMEs.

Consequently, very little quantitative information on the outcomes of the different SME support programmes has been identified through literature review and Internet searches. This is not totally unexpected and OECD (2010)[8] recognises that there are very few formal monitoring and evaluation procedures associated with promotional activities designed to improve resource efficiency. Whilst this observation may apply more to programmes

[8] OECD (2010): Green Transformation of Small Business: Achieving and Going Beyond Environmental Requirements, OECD Working Party on Integrating Environmental and Economic Policies, p32.

providing more general information and tools, the experience of the study team in trying to locate hard information on outcomes suggests that it applies more widely to programmes providing direct, hands-on support as well. Oakdene Hollins (2011) in their report on the resource efficiency savings potential of the UK economy also highlighted the fact that very few company, or sector-level resource efficiency case studies and site audits were undertaken by delivery bodies (such as Envirowise) during the period from 2006-2009.

Whilst some resource efficiency programmes provide outcome data on specific companies supported, primarily through case study examples posted on their websites, very little programme-wide results are reported regarding economic and environmental outcomes from programme support. We have been able to identify only a very few programmes, such as ENWORKS in the UK and the ÖkoBusinessPlan Wien in Austria, which have published comprehensive evaluation reports on programme outcomes which provide information on the number of SMEs supported, identify a clear timeframe over which benefits are attributed and provide quantitative data for cost savings and economic benefits, as well as environmental savings in a number of areas (energy, waste, water, CO_2, etc.). Other programmes report some aspects on a programme wide basis but there are significant gaps in information as can be seen in Table 4-19 in Section 4.4.5 below.

It may well be the case that such programme-wide information covering a much wider range of indicators is held by different programmes, but unfortunately, the consultation requests for information from specific programmes also only generated a very limited range of data. One reason may have been due to the fact that many programmes were identified in the run up to the Christmas break. A number of them responded to requests for information by indicating that they were unable to spare the time to collate information as they were too busy completing other work before the break.

2.4 Approach to Task 3

2.4.1 Task 3 objectives

Task 3 has four main objectives including:

1. Present public and private sector environmental protection expenditure data for 28 Member States and provide trends since 2008, including data for 2012 and 2013 if available. Foreseen public and private sector environmental protection expenditure after 2014 should also be presented where possible.

2. Present a breakdown of environmental protection expenditure data by environmental domain[9]. Data could be presented as follows:
    - Public environmental protection expenditure as a percentage of total public expenditure
    - Total amounts of a public and private sector environmental protection expenditure as well as amounts for each environmental domain

[9] Environmental domains are those defined by CEPA (Classification of environmental protection activities) and include, for example, protection of ambient air and climate, wastewater management and waste management.

- Percentage change since 2008 of public and private environmental protection expenditure by environmental domain.

3. Where data are available, the number of additional jobs resulting from the environmental protection expenditure should be presented.

4. Provide information on environmental related EU funding specifying amounts from EU funding and from Member State co-financing.

2.4.2 Approach

The approach followed five sub-tasks as follows:

- Subtask 3a – Identification of sources of data and information
- Subtask 3b – Collection and collation of data and information
- Subtask 3c – Identification of data gaps and actions to fill them
- Subtask 3d – Analysis of data and information
- Subtask 3e – Reporting

The following text provides a brief overview of the activities carried out under each sub-task.

Identification of sources of data and information

A large amount of information on environmental protection expenditure and related employment within Member States was identified from Internet sources (e.g. DG ESTAT/Eurostat and national government statistical authorities). For the objective on environment related EU funding, many data were identified from European Commission Internet sites (e.g. DG Environment LIFE programme). Data in languages other than English were identified by members of the core team and others who have relevant language skills.

Collection and collation of data and information

Once collected, data were collated by Member State to enable the easy identification of gaps. A spreadsheet was developed to record which data were available for each Member State. Environmental protection expenditure data from DG ESTAT (Eurostat) were kept separate from national data, to avoid any misleading comparisons between data which may not necessarily be measuring the same thing (for example, some environmental protection expenditure which was identified for the private sector only included NACE divisions relating to industry (i.e. NACE Rev. 2 Sections B, C and D and Division E36), as opposed to all economic activities).

Identification of gaps and actions to fill them

Following initial data collation, all Member States were sent emails with requests for information on expenditure and employment to ensure that the latest data were identified where available. Furthermore, each Member State was also contacted to identify total amounts of funding received under each programme or initiative, since publically available data were often only available on a project-by-project basis. Details of all consultation carried out for Task 3 is provided in Annex 9: Consultation under Task 3.

Analysis of data and information

For the environmental protection expenditure data, analysis covered the production of a range of tables which brought together the information for each Member State. Where possible, EU28 totals were also included (note however that for several tables, totals were only identified for EU27). Percentages were calculated where appropriate to facilitate comparisons in environmental protection expenditure between different Member States. Furthermore, a series of graphs were also produced to help identify and illustrate any trends in environmental protection expenditure over time. Consideration was given to both total environmental protection expenditure and expenditure by environmental domain (e.g. air and climate, wastewater management).

For environmental jobs, Eurostat data were only available for a limited number of Member States (many national data were identified, but as noted above, these were not necessarily comparable). This affected the extent of the analysis possible. However, consideration was given to the reasons behind the trends at the EU28 level.

For environment related EU funding, work involved determining totals for each fund for each Member State, since many funds only provided information at the project level.

Reporting

This report provides the findings for Task 3, with two sets of results tables for environmental protection expenditure given in Section 5 below: one set based on DG ESTAT (Eurostat data) and one set based on national data. The Eurostat tables enable comparisons between Member States (where appropriate), whereas the national data tables provide additional information for later years or a greater number of environmental domains but are not necessarily comparable. The results for environmental employment are also presented with Eurostat data first, then national data second. Findings for environment related EU funding are summarised in a series of tables organised by type of funding programme.

3 Task 1: Financial, economic and social impacts of floods

3.1 Costs of floods between 2002 and 2013

For this project it was not possible to gather quantitative data on the costs of all floods due in part to the short time scale and also the fact that not all floods are quantified by the Member States. Some Member States hold more detailed records and therefore are more likely to have specific costs, for example records were available for the costs of floods in France for every year between 2002 and 2013.

The database EM-DAT (CRED, nd) was used to determine the number of flood occurrences, therefore the criteria used by this database to define a flood is also used by this study as a baseline definition for what is included as a flood. For a flood to be included on EM-DAT at least one of the following criteria must be met:

- 10 or more people reported killed;
- 100 of more people reported affected;
- A state of emergency declared; or
- International assistance called for.

Data on additional floods not found on EM-DAT have been included where these have been identified during more general searches, however further additional floods were not searched for specifically due to the short time scale of the project. Where responses were received from Member States the information on flood occurrences is considered more robust, and for countries such as France for which a database of flood events was identified, the completeness of information recorded improves further.

In total, there were 363 floods identified of which quantified data were available for 201. This illustrates the fact that any information on flood costs will be an underestimate as a large proportion (for some Member States more than twice the number of floods) are not quantified. Annex 2 presents a table showing the number of quantified and unquantified flood events by Member State.

The quantified costs of floods in each Member State in each year between 2002 and 2013 are shown in Table 3-1. The total costs shown for each year have been rounded to two significant figures to account for uncertainty within the estimates and to highlight that these are estimated costs. As noted above, they are likely to be underestimates since not all of the flood events have been quantified and because not all of the costs could be monetised.

Table 3-1: Cost of flood events by Member State between 2002 and 2013 (€ millions)

Member State	Year											
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Austria	€866[1]	€10[14]			€14[40]			€71.5[52]	€592[55]			€3,100[69]
Belgium			N/Q	€180[3]			N/Q		N/Q	N/Q	N/Q	N/Q
Bulgaria		€44[15]		N/Q			N/Q	N/Q	€436[56]			€1.06[3]
Croatia		€38.1[16]		€200[28,29]				€1.2[52]	N/Q			
Cyprus												
Czech Republic	€637[2]			€600[30]	€320[30]		N/Q	€220[30]	N/Q		N/Q	€2,340[70]
Denmark	€62[77]		€671[25]						€617[57,c]			
Estonia									€48[58,c]		€339[48]	
Finland	N/Q	€10[17]					€22[46]	N/Q	€20[58,c]	€8[62]	€0.3[66]	
France	€493[3]	€100[18]	€530[18]	€3,278[29,31]	€1,350[18]	€210[18]	€565[47]	€90[18]	€150[18]		€1,500[18]	€834.5[71]
Germany	€8,154[4]		N/Q	€839[32]	€14[3]		€175[48]	N/Q	€175[59]		N/Q	€9,200[72]
Greece	€5[5]	N/Q		N/Q	€83[41]		N/Q	€402[53]	N/Q		€531[3]	€1.4[73]
Hungary	€28[6]			€719[33]	N/Q			€519[54]	€38.6[3]	N/Q	N/Q	€47.72[3]
Ireland		€54[19]	€127[19]		€521[42]	€96[19]		N/Q	N/Q	€38[19]	N/Q	€87[19]
Italy	€25[7]	€1,205[20]	€722[26]	€995[34]	€811[43]	€1[20]	€161[20]	€466[20]	N/Q	€223[63]	€2,184[67]	€2,131[74]
Latvia									€2.9[57,c]			
Lithuania				N/Q			N/Q		N/Q			
Luxembourg												
Malta			N/Q	N/Q			N/Q	N/Q		N/Q	€30[68,c]	N/Q
Netherlands			€3[27]								€11[28]	
Poland	N/Q			€4,696[35]	€72[3]			N/Q	N/Q	N/Q		
Portugal	N/Q			N/Q		N/Q		N/Q			N/Q	N/Q
Portugal - Madeira		€26[21]		€1,080[36]								
Romania	€ 12[8]	€143.7[8]	€32[8]	€879[8]	€36.9[8]	€555.3[8]	€183.3[8]	€419[8]	€1,636.9[8]	€89.4[8]	€25.5[8]	€71.8[8]
Slovakia	€ 12.4[9]	€2.4[9]	€20[9]	€481[9]	€8.4[9]	€40.0[9]	€33.7[9]	€62.7[9]	€38.5[9]	€37.2[9]	€1.5[9]	€49.4[9]

Table 3-1: Cost of flood events by Member State between 2002 and 2013 (€ millions)												
Member State	**Year**											
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Slovenia		€593[22]		€251[37]		N/Q	€233[49]		€23[60]			
Spain	€6[10]	€409[23]	N/Q	€710[38]	N/Q		€248[50]	N/Q	€21[61]	€72.9[64]	N/Q	€20[75]
Sweden									€323[57,d]			
UK- England	€ 0.2 [11,12,13]	€1,480[24, a]	N/Q	€23.3[39]	€309.7[44]	€12[45,b]	€4,770[51]		€365[57,e]	€738[65,a]	N/Q	€1.59[76]
UK- Northern Ireland		[a]	N/Q		N/Q	N/Q	N/Q		N/Q	[a]		N/Q
UK- Scotland	N/Q	[a]						N/Q	N/Q		N/Q	N/Q
UK- Wales	N/Q	[a]			N/Q	[b]	N/Q		N/Q	[a]		N/Q
TOTAL (2sf)	**€10,000**	**€4,100**	**€2,100**	**€15,000**	**€3,500**	**€910**	**€6,400**	**€2,300**	**€4,500**	**€1,200**	**€ 4,600**	**€18,000**

Notes: N/Q = not quantified; only includes those floods where data were available showing they exceeded the thresholds for inclusion in the EM-DAT database. This will underestimate the total number of floods, and hence, the total damages as many smaller floods (which may still be significant locally) are not included

[a] costs cover the whole UK; [b] costs include England and Wales; [c] costs for storm damage including floods; [d] costs for storm damage, mainly wind related; [e] costs for storm damage, mainly flood related

Sources: [1] Austrian Federal Ministry of the Interior (2013); [2] Minister of Finance of the CR (2013); [3] CRED (nd); [4] Germany Federal Ministry of Finance (2013); [5] Keeptalkinggreece (2013); [6] Ministry of the Interior of Hungary (2013); [7] Mackenzie & O'Leary (2013); [8] Pers. Comm. (Ministry of Environment and Climate Change); [9] Pers. Comm. (Ministry of Environment of the Slovak Republic) ; [10] The Olive Press (2013); [11] Bale (2013); [12] EDP Reporters (2013); [13] Carroll (2013); [14] Bundesministerium für Inneres (2012); [15] Leviev-Sawyer (2012); [16] Ministry of Agriculture for the Republic of Croatia (2012); [17] UUTISET (2012); [18] Ministère de l'Ecologie, du Développement durable et de l'Energie (2012); [19] Pers. Comm. Mark Adamson 10/12/13; [20] Berti et al (2012); [21] Governo Regional Da Madeira (2012);[22] Government Office for Local Self-Government and Regional Policy of Slovenia (2012); [23] Ministerio de Hacienda y Administraciones Públicas (2012); [24] RMS (2012); [25] Mufti (2012); [26] Liguria and Tuscany Region through the Italian National Department of Civil Protection (2011); [27] Pers. Comm. Marc Bokkerink 09/12/13; [28] Ministry of Regional Development, Forestry and Water Management (2010); [29] European Commission (2011); [30] Naše Voda (2012); [31] European Commission (2010); [32] Bundesministerium der Finanzen (2010); [33] Ministry of Interior of Hungary (2010); [34] Italian Government (2010); [35] Polish Government (2010); [36] Government of the Portuguese Republic (2010); [37] Government Office for Local Self-Government and Regional Policy of the Republic of Slovenia (2010); [38] Ministerio de Economia y Hacienda (2010); [39] Chartered Institute of Loss Adjusters (2010); [40] Chapman (2009); [41] The Government of the Hellenic Republic (2009); [42] Department of Finance, Ireland (2009); [43] Dipartmento della Portezione Civile (2009) and Tuscany Region (2009); [44] BBC News Cumbria (2010); [45] NERC (nd); [46] Tampereen Yliopisto Johtamiskorkeakoulu (2012); [47] Ministère de L'Intérieur (2007); [48] DFO (nd); [49] European Commission (2007); [50] Ministry of the Economy and Finance (Spain) (2007); [51] EA (2010); [52] ICPDR (2008); [53] The Government of the Hellenic Republic (2006); [54] Ministry of

Table 3-1: Cost of flood events by Member State between 2002 and 2013 (€ millions)

Member State	Year											
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Local Government and Regional Development of Hungary (2006); [55] Bundesministerium für Inneres (2005); [56] Bulgarian Government (2005); [57] Carpenter (2005); [58] Haanpaa et al (2006); [59] ICPDR (nd); [60] Samardzija-Matul (2005); [61] Barrera et al (2007); [62] Elinkeino-, likenne- ja ympäristökeskus Närings-, trafik- och miljöcentralen (2011); [63] Regione Autonoma della Sardegna (2004); [64] Ministerio de Economia y Hacienda (2004); [65] Lumbroso & Vinet (2012); [66] Maa- ja metsätalousministeriölle (2009); [67] Lastoria et al (2006); [68] Government of Malta (2003); [69] Republic of Austria (2002); [70] Czech Republic (2002); [71] France (2002); [72] Bundesministerium der Finanzen (2002); [73] Special Secretariat for Water in the Ministry of the Environment, Energy and Climate Change (nd); [74] Italian Government (2002); [75] Cana et al (2003); [76] Camden Sustainability Team (2013); [77] Pers. Comm. (Danish Ministry of Environment)												

Analysis of the data provided in Table 3-1 enables the average cost per event per Member State to be estimated. The results are shown in Table 3-2. The costs per event are calculated based on the quantified costs shown in Table 3-1 divided by the number of quantified events (shown in Table 3-2, and also in Annex 2 for each Member State by year). Table 3-2 uses the costs per event to extrapolate across those flood events for which cost data are not available to give an estimate of the potential total of all floods recorded in this study (i.e. those that meet the thresholds for recording in the EM-DAT database; floods that do not exceed these thresholds or where data were not available meaning they could not be judged against these thresholds have not been included in the estimates). This overall total, €150 billion, is likely to be highly uncertain as quantified information is more likely to be recorded on larger floods rather than smaller floods (and because many of the smaller floods have not been included as they do not exceed the thresholds for inclusion in the EM-DAT database). In such cases, the extrapolated totals given in Table 3-2 are likely to be overestimates of the costs across all of the floods. However, it also has to be noted that not all of the costs of flooding will have been monetised and, as a result, the extrapolated totals could also be underestimates. It is also important to note that the costs have not been normalised or inflated to take account of varying prices. This means that costs for 2002 may be lower than costs for 2013 due to inflation. However, it was not possible to update the costs to 2013 prices because the base year for many of the damages was not given in the range of original sources that have been used. To reflect uncertainties, the costs are given to a maximum of two significant figures.

Figure 3-1 shows the total extrapolated costs per Member State based on data on costs that have been collected during this study, starting from the country with the highest extrapolated costs. The Figure shows that the overall damages are greatest for Germany, followed by Poland and the UK. Damages for these three Member States alone make up 55% of the total costs of flooding identified in this study. Three Member States (Cyprus, Lithuania and Luxembourg) are not shown in Figure 3-1 as there was no quantified information found on floods in those countries. Data for Portugal are based on costs for Madeira, with no quantified information found for floods in mainland Portugal or the Azores. As a result, the estimated costs for Portugal are highly uncertain.

Figure 3-2 shows the total quantified costs and total extrapolated costs per event, per year. The figure shows that the greatest costs are estimated to have occurred in 2002, with peaks in 2010, 2013 and 2007. The quantified costs are taken from what are considered to be the most reliable sources, such as the EUSF applications, rather than sources such as newspaper reports. It is noticeable that, even without uprating of the 2002 costs to 2013 values (due to uncertainties over the year that the cost values are in), the floods in 2002 are still the most expensive. However, when the costs per event[10] per year are considered (Figure 3-3) it can be seen that the differences between the years when there were major, widespread floods are much smaller. The costs per event are still highest in 2002, closely followed by 2010 and 2013.

[10] Events are recorded by Member State, i.e. the number of floods is counted in terms of the number of Member States affected and the discrete time periods that they were affected for.

Table 3-2: Cost per event by Member State					
Member State	Total costs of floods (€million)[a]	Number of events for which quantified data were available[a]	Cost per event (€million)	Total number of floods recorded[a]	Extrapolated damages based on costs per event per Member State (€million)[a]
Austria	€ 4,700	7	€ 660	8	€ 5,300
Belgium	€ 180	1	€ 180	10	€ 1,800
Bulgaria	€ 480	5	€ 96	15	€ 1,400
Croatia	€ 240	3	€ 80	6	€ 480
Cyprus	€ 0	0	€ 0	3	€ 0
Czech Republic	€ 4,100	6	€ 690	12	€ 8,200
Denmark	€ 1,300	3	€ 450	3	€ 1,400
Estonia	€ 390	2	€ 190	2	€ 390
Finland	€ 60	4	€ 15	11	€ 170
France	€ 8,700	48	€ 180	48	€ 8,700
Germany	€ 19,000	6	€ 3,100	11	€ 34,000
Greece	€ 1,000	5	€ 200	22	€ 4,500
Hungary	€ 1,400	5	€ 270	10	€ 2,700
Ireland	€ 920	10	€ 92	16	€ 1,500
Italy	€ 8,900	16	€ 560	20	€ 11,000
Latvia	€ 3	1	€ 3	1	€ 3
Lithuania	€ 0	0	€ 0	5	€ 0
Luxembourg	€ 0	0	€ 0	0	€ 0
Malta	€ 30	1	€ 30	13	€ 390
Netherlands	€ 14	3	€ 5	3	€ 14
Poland	€ 4,800	2	€ 2,400	10	€ 24,000
Portugal	€ 1,100	2	€ 550	11[b]	€ 6,100
Romania	€ 4,100	13	€ 310	20	€ 6,300
Slovakia	€ 790	24	€ 33	24	€ 790
Slovenia	€ 1,100	5	€ 220	7	€ 1,500
Spain	€ 1,500	12	€ 120	23	€ 2,800
Sweden	€ 320	1	€ 320	1	€ 320
UK	€ 7,700	16	€ 480	48	€ 23,000
TOTAL	**€ 72,000**	**201**	**€ 360**	**363**	**€ 150,000**[c]

Notes:
[a] only includes floods that meet the criteria for inclusion on the EM-DAT database, or Member State databases that have been used in this study as the main source for identifying what is counted as a flood event
[b] includes eight floods in mainland Portugal and one flood in the Azores; costs have been extrapolated for these events based on the average for 2 events in Madeira, hence, these damages may be highly uncertain
[c] given as sum of extrapolations across all Member States as this is considered to be less uncertain than extrapolating at the EU level

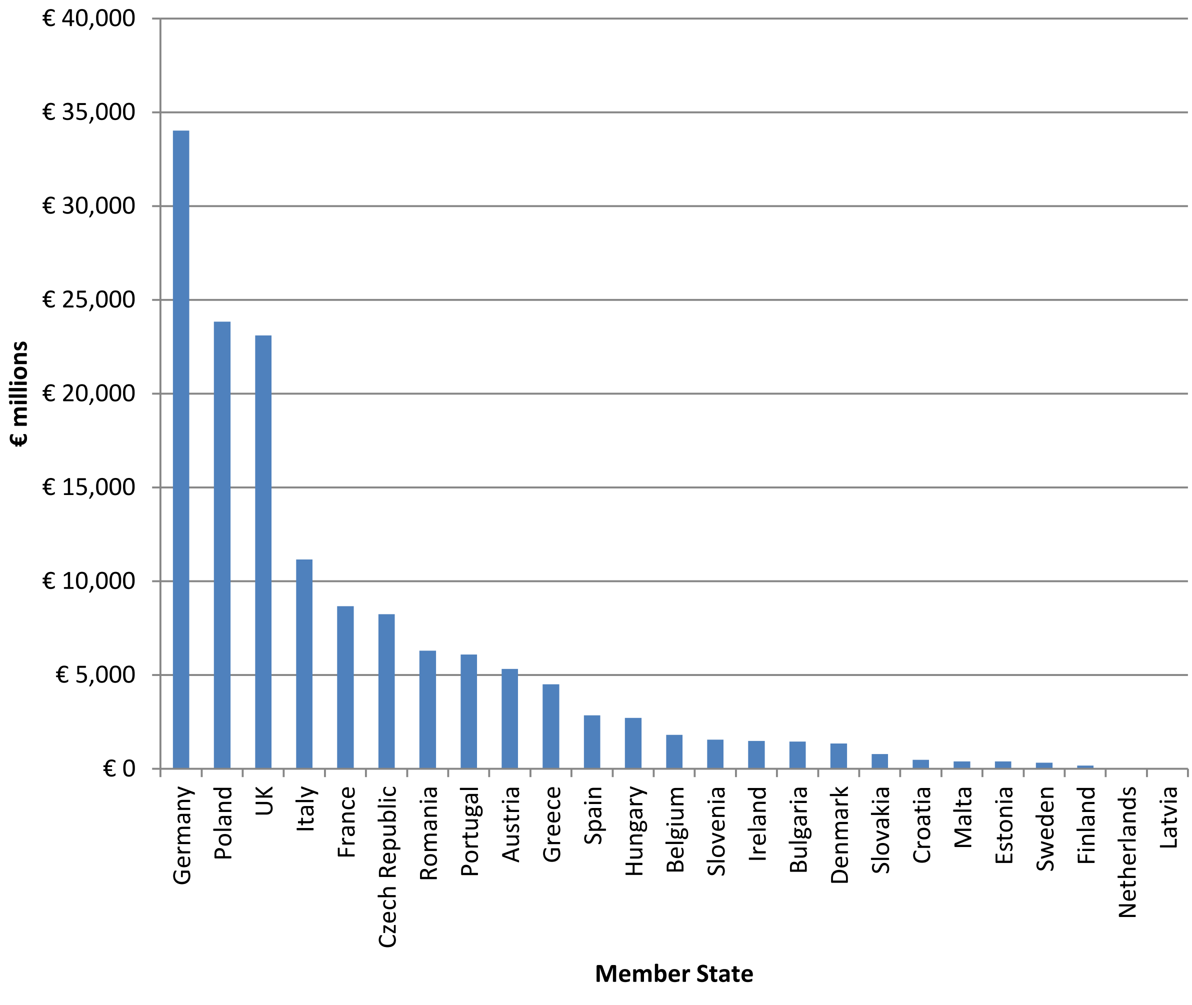

Figure 3-1: Total extrapolated costs per Member State, from largest to smallest costs

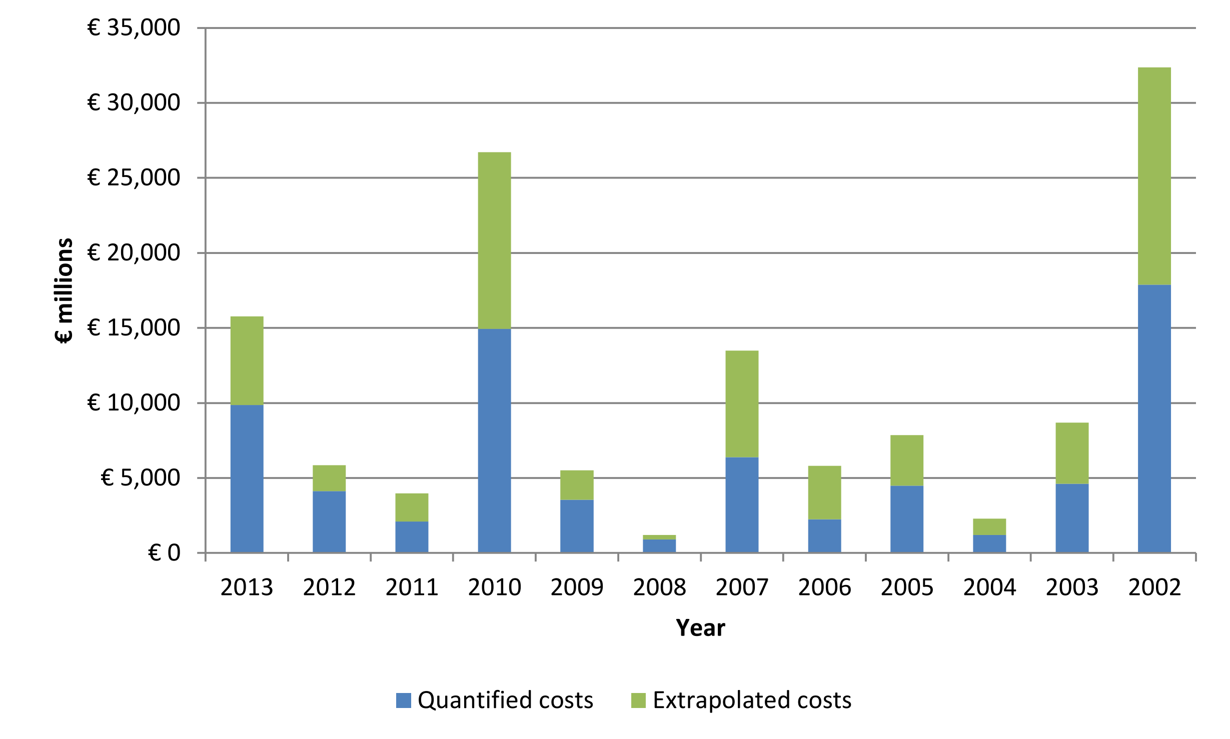

Figure 3-2: Quantified and extrapolated costs per year across the EU28

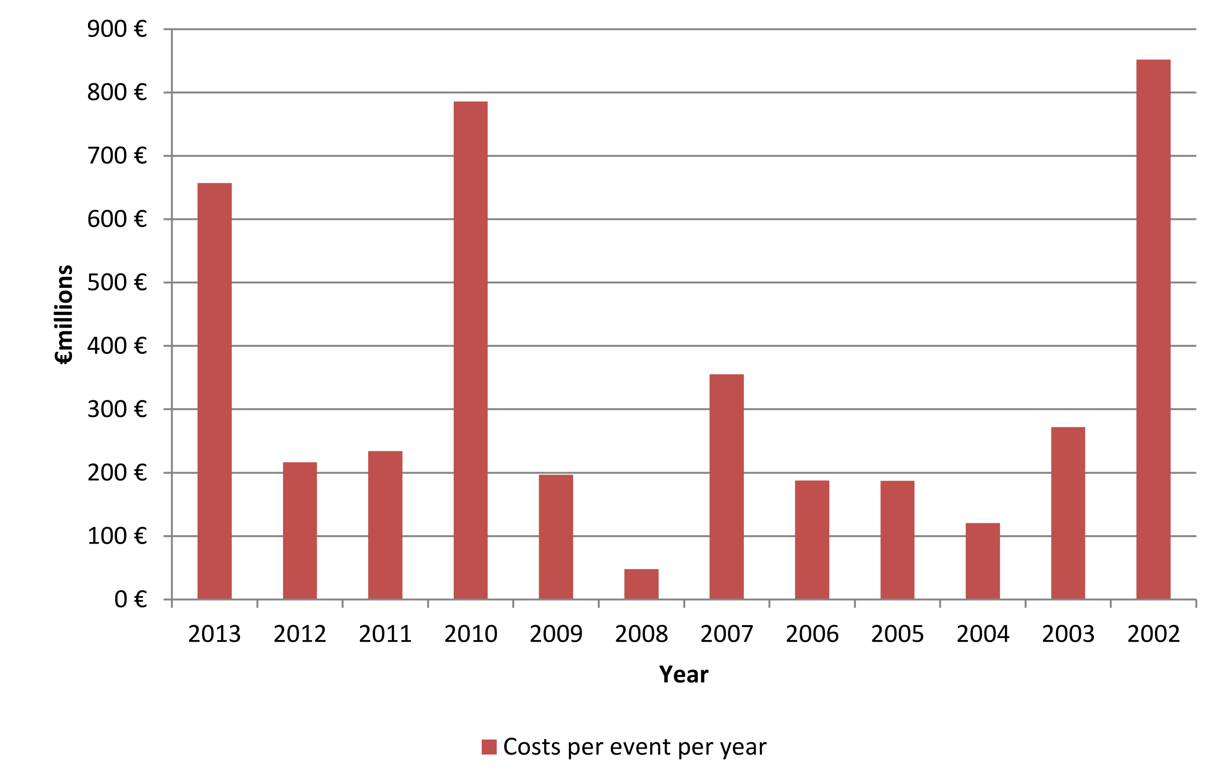

Figure 3-3: Cost per event per year (quantified costs and flood events only)

It is useful to compare events that have occurred in the same locations over the period 2002-2013. Box 3-1 provides an assessment of the damages from the 2002 and 2013 floods in Central Europe, as well as an overview of actions that were taken following the 2002 floods.

Box 3-1: Case study example: Comparison of damages between 2002 and 2013 floods in Central Europe

Damages from the 2002 floods

The 2002 floods caused around €6 billion of damages across Austria, Czech Republic, Slovakia, and Hungary[1], plus €9 billion of damages in Germany of which €6.2 billion were in Saxony[2]. The total number of deaths from the 2002 floods was 110[3], with around 337,000 people affected in Germany and 220,000 people evacuated in the Czech Republic[4]. All three Metro lines in Prague, were affected[4].

Damages in Austria totalled around €3.1 billion, made up of damages to[5]:

- private property, including businesses: €1,420 million
- infrastructure: €573 million
- long-term direct and indirect damages (estimate): €687 million
- loss in productivity: €180 million
- water resources damages (rivers, canals and mountain protection): €78 million
- agriculture and forestry: €71 million
- damages to urban water supply and sewage disposal systems: €41 million
- cost of relief and replacement of equipment: €35 million
- damage to Government property (federal government): €29 million

Total damages in Saxony, Germany were estimated at €6.2 billion, with a breakdown of damages as follows[5]:

- family dwellings: €1,706 million
- businesses: €1,420 million (total of 12,000 small businesses with 110,000 employees)
- infrastructure of communes: €1,287 million
- infrastructure of states and federal government: €928 million (including €590 million damages to watercourses, including to 35 dams and 185km of dikes, €113 million for damage associated with 170km of highways and 466 bridges, €106 million for damage to public buildings, including €24 million to universities and other research institutions)
- household inventories: €529 million
- disaster relief and assistance: €136 million
- other infrastructure: €111 million
- agriculture and forestry: €70 million

Action taken following 2002 floods

Immediately after the flood, Germany developed an emergency fund of €6.5 billion, including €185 million from the EU. This money was spent in three main areas[5]:

- program reconstruction of infrastructures for communities: €1.64 billion with €845 million federal funds for 711 communities
- program infrastructure reconstruction for rural areas: €730 million with €316 million for watercourse reconstruction and €414 million for rural highways
- program reconstruction of private homes: €923 million half federal and half state financed for about 23,000 housing units

Following the floods around €3.3 billion was invested by the CEE countries in flood protection and better regulation of rivers[1]:

- Germany: Saxony is investing around €1.3 billion across more than 1,000 measures including moving back levees, reinforcing levees, remodelling bridges and building reservoirs[6]. Dike relocation projects covering a potential area of 26,000 ha were discussed. By 2013, 700ha had been completed and a

Box 3-1: Case study example: Comparison of damages between 2002 and 2013 floods in Central Europe

further 2,600ha were at the concrete stages of planning[7].

- Hungary: €168 million spent on flood protection and €101 million on rebuilding dams[1,a]

In Germany, a five point plan was drawn up to improve flood protection[5]:

1. flood laws and regulations of federal government and states were to be combined into a common flood protection program, which included giving more room to rivers, retaining flood water on land in the basins, reinstating natural river courses, and improving the infiltration capacity of rural and urban areas
2. flood protection measures were to be planned and implemented basin-wide, across state and international borders
3. international cooperation in Europe on common river basins was to be intensified through common projects
4. the functionality of existing and planned river training measures was to be reinvestigated in light of flood protection, with further development of inland navigation to be undertaken in accordance with environmental regulations
5. immediate action was to be co-funded by Government and States to overcome flood damages.

One of the outcomes is the Hochwasserschutzgesetz (Flood Protection Law) which includes aspects that[5]:

1. flood protection should start in the river basin, avoiding sealing of soils, adjustment to agricultural practices, etc.
2. floodplains should be identified, based on the maximum flood observed over the past 100 years, with no new building permits for private dwellings or industrial sites allowed in this floodplain
3. regional planning has to take account of flooding (previously this was not required)
4. no more straightening of rivers and creeks, natural measures are to be given preference above technical measures
5. states are required to pass their own flood protection laws, in which details for Flood Action Plans are presented.

One of the measures implemented includes action at Röderau Süd. The Government of Saxony decided that this housing development should be removed and the population resettled. The Federal Government financed the resettlement programme. A total of 185 measures were implemented in 2003 at a total cost of €38.5 million[5].

Damages from the 2013 floods

The estimated damages are:

- Austria: €1 billion, lower than 2002[1]
- Czech Republic: €0.5 billion (preliminary)[1], €1.1 to €1.3 billion (CZK 30-35 billion) (predicted property damages)[8]
- Germany: potential loss of up to €12 billion[9], with 52,500 people evacuated in the Elbe and Danube catchment areas. Utilities such as the electrical grid and local water supply either failed or had to be shut down as a precautionary measure. Long distance lines of the Deutsche Bahn also had to be shut down in the district of Stendal, Saxony-Anhalt.
- Slovakia: €0.6 billion, similar to 2002 but water levels were higher[1]
- Hungary: €0.3 billion[1]

Temporary flood barriers were successfully used in Austria and along the Rhine[9].

Figure 3-4, overleaf, shows the relationship between damages in 2002, investment following the 2002 floods and damages in 2013, showing that investment appears to have resulted in significant reductions in damages.

Box 3-1: Case study example: Comparison of damages between 2002 and 2013 floods in Central Europe

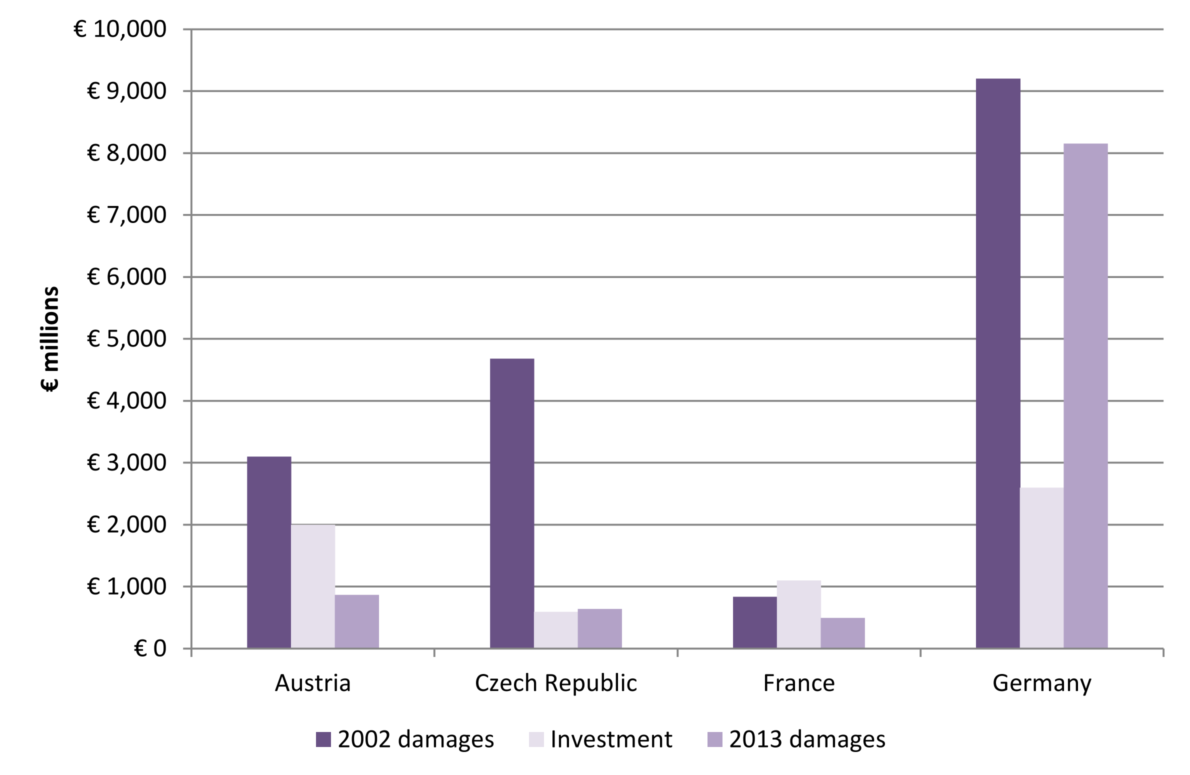

Figure 3-4: Apparent benefit of investment following the 2002 floods on damages in 2013

Assumptions and caveats:

[a] HUF50 billion on flood protection and HUF30 billion on rebuilding dams spent over the last 10-12 years, assumed updated to 2013 values, exchange rate HUF/EUR 296.87

References:

[1] Erste Group (2013): Impact of floods on CEE economies, Short Note, 14 June 2013, accessed at: http://www.erstegroup.com/en/Downloads/9c5b78e6-1629-4689-84e7-553ba99fb9ed.pdf on 28 January 2014.

[2] Mueller M (2003): Damages of the Elbe flood 2002 in Germany – a review, paper presented at the EGS-AGU-EUG Joint Assembly, 6-11 April 2003, Nice, France (abstract only), accessed at: http://adsabs.harvard.edu/abs/2003EAEJA....12992M on 29 January 2014.

[3] Yeager-Kozacek C (2013): Central Europe: Flood defences and responses yield mixed results, 26 June 2013, accessed from the Circle of Blue website: http://www.circleofblue.org/waternews/2013/world/draft-flood-defenses-responses-yield-mixed-results-in-central-europe/ on 28 January 2014.

[4] DKKV (2004): Flood risk reduction in Germany, Lessons learned from the 2002 disaster in the Elbe Region, Summary of the study, February 2004, accessed at: http://www.dkkv.org/de/publications/ressource.asp?ID=94 on 28 January 2014.

[5] Chavoshian A & Takeuchi K (Eds) (2011): Large-scale floods report, ICHARM Book Series No. 1, accessed at: http://www.ifi-home.info/icfm-icharm/Large_Scale%20Flood%20Report_Web.pdf on 28 January 2014.

[6] Deutsche Welle (2013): German flood prevention still can't prevent floods, article accessed at Deutsche Welle website: http://www.dw.de/german-flood-prevention-still-cant-prevent-floods/a-16876765 on 28 January 2014.

[7] Helmholtz Centre For Environmental Research - UFZ (2013): Placing flood mitigation on four pillars: Conclusions from 2013 central European floods, *ScienceDaily*, accessed at: http://www.sciencedaily.com-/releases/2013/06/130627102542.htm on 9 January 2014.

[8] Erste Group (2013a): Czech floods – how much of an impact? CEE Special Report, 4 June 2013, accessed at: https://www.erstegroup.com/de/Downloads/9c5b78e6-1629-4689-84e7-553ba99fb9ed.pdf;GPJSESSIONID=pQ2XSVmVWywG8hn2d5WLvk7FpYynj0SdTMvmWzLMyJpghyRnkyW1!1226

Box 3-1: Case study example: Comparison of damages between 2002 and 2013 floods in Central Europe
17071 on 29 January 2014. [9] Zurich (2013): European floods: using lessons learned to reduce risks, accessed at: http://www.zurich.com/internet/main/sitecollectiondocuments/insight/european-floods-using-lessions-learned-en.pdf on 28 January 2014.

It is possible in some cases to interrogate the costs in more detail and, where possible, the costs of floods have been broken down into direct and indirect costs to Member States, these are shown in Table 3-3. There was much less information available on the indirect costs of flooding, and the information presented below represents only what was available rather than an estimate of the actual costs. It is anticipated that the indirect costs are significantly underestimated. Qualitative descriptions of costs that were identified but could not always be monetised have been included in Table 3-3 to provide an indication of the type of costs that could be incurred.

Further break down of the costs into economic costs, social costs and environmental costs are presented in the Table 3-4. The costs that are quantified tend to be economic therefore the social costs and environmental costs present only the information which is available rather than providing an estimate of the actual costs. Again, therefore, it is likely that the mionetary estimates of the social and environmental costs are significantly underestimated. As above, qualitative descriptions of costs that could not be monetised have been included in Table 3-4 to provide an indication of the damages that occurred. For environmental costs in particular, there is little if any information for most of the flood events. As a result, even the qualitative descriptions are incomplete.

Table 3-3: Direct and indirect costs of floods between 2002 and 2013 (€ millions)				
Year	Direct damages		Indirect damages	
	Quantitative	Qualitative	Quantitative	Qualitative
2013	€6,835[1,2,3,4,5,6,7,8,9,10,11]	77 fatalities [4,12,13,14,15,16,17,18,19,138] 129 injuries[4,17] Additional qualitative data available, e.g. Czech Republic – several tens of people were injured and more than 23,000 had to be evacuated[13] Finland – hundreds of hectares of land and a number of roads were underwater[20] Germany – more than 430,000 ha of agricultural and forestry land flooded or affected by heavy rainfall[4]	€0.54[5,a,8,b]	Qualitative data available, e.g. Hungary – national parks and elements of cultural heritage were severely affected, Margaret Island (a tourist attraction) closed[5] Spain – traffic light damage caused major travel delays[21] Italy – flights between Italy and Sardinia disrupted[22]
2012	€3,224[23,24,25,27,28,29,30,31,32]	52 fatalities [12,30,31,33,34,35,36,138] 38 injuries[12,37] Additional qualitative data available, e.g. Bulgaria – widespread damage to river vessels[38] Croatia – more than 100 houses flooded in Otok Virke, over 2,000 buildings flooded across the country[39] Ireland – routes impassable in Douglas, Glanmire and Greenmount[40]	€49.65[31,c,24,d]	Qualitative data available, e.g. Greece – in some areas there were power cuts for several hours[44] Bulgaria – railway transport suspended on the Radnevo-Lyubenovo-Simeonovgrad-Harmanli and Harmanli-Svilengrad-Lyubimets stretches[45]
2011	€511[43]	46 fatalities [12,35,43,44] 4 injuries[44,45,e] Additional qualitative data available, e.g. Germany – dozens of basements filled with water[17] Italy – 28,858 people directly affected by flooding[43] Malta – damage to infrastructure[46]	None quantified	Qualitative data available, e.g. France – about 3,900 homes were without electricity[47] UK (England) – sewage washed into the Cornish village of Par[48] Republic of Ireland – Dublin Dart train service was suspended[48]
2010	€14,289[49,50,51,52,53,54,55,56,57,58,59,60]	233 fatalities[12,17,35,36,61,62,63] 799 injuries[50,64,65] Additional qualitative data available, e.g. Belgium – a pharmaceutical factory closed due to flooding[66] Greece – more than 15,000 ha of farmland flooded[17] Lithuania – around 200 cars damaged or lost[71] Slovakia – 39 towns affected in the Trnava region[139]	None quantified	Qualitative data available, e.g. Czech Republic – seeding of crops delayed, recovery of farmland expected to take a year[50] Germany – several villages were completely cut off for some time[51] Portugal – travel time and costs significantly increased[55]

Table 3-3: Direct and indirect costs of floods between 2002 and 2013 (€ millions)				
Year	Direct damages		Indirect damages	
	Quantitative	Qualitative	Quantitative	Qualitative
				Slovakia – 4,782 people evacuated from the Presovsky region and 1,107 from the Banskobystricky region[139]
2009	€957[68,69,70,71]	75 fatalities[12,17,61,68,70,72,73,74,138] 124 injuries[68,70] Additional qualitative data available, e.g. Austria – hundreds of houses uninhabitable, thousands badly damaged[75] Czech Republic – vast stretches of roadways underwater flooded[17] Romania – 600 ha of crops flooded[76]	€16.85[71,f]	Qualitative data available, e.g. Italy – 14,500 people suffered direct damage or consequences to their health, lost goods or suffered economic damage[70] Spain – 18,000 homes in Jerez cut off from water[77] UK (Northern Ireland) – several health concerns and difficulties for the care of vulnerable groups[78]
2008	€477[79,80]	36 fatalities[12,17,36,72,95,138] No injuries recorded Additional qualitative data available, e.g. Republic of Ireland – 53 houses flooded[81] Romania – 14,644 households destroyed[82] Slovenia – the sea flooded parts of a coastal town[83]	None quantified	Qualitative data available, e.g. Romania – complete isolation of around 100 municipalities[82] Portugal – 38 people homeless[12]
2007	€4,309[84,85,86,87,88]	63 fatalities[12,17,36,85,89,138] 22 injuries[12,85] Additional qualitative data available, e.g. Bulgaria – a bridge was demolished in Pisanets and one of the main streets in Tsenovo was partially destroyed[90] UK (England) – between 46,000 and 48,000 households and 7,000 to 8,000 businesses flooded[88] UK (Wales) – sewage flooding and watercourse flooding caused inundation of 3 properties[91]	€1,293[84,85,88]	Qualitative data available, e.g. Finland – some skin infections[84] France – jobs affected: 2,210 in agriculture, 354 in hotel/restaurants, 751 in commerce[85] UK (England) – 70% of people flooded felt their physical or emotional health had been affected, loss of water supply for 350,000 consumers for up to 16 days, loss of electricity supply for 170,000 households[88]
2006	€313[92,93,94]	44 fatalities[12,17,36,95,138] 2 injuries[12] Additional qualitative data available, e.g. Austria – around 460 homes were heavily affected or destroyed[92]	None quantified	Qualitative data available, e.g. Hungary – 37,210 ha broad-leaved woodland, 60 ha coniferous woodland, 266 ha of mixed forest and 12,062 ha of natural grassland flooded[94]

Table 3-3: Direct and indirect costs of floods between 2002 and 2013 (€ millions)				
Year	Direct damages		Indirect damages	
	Quantitative	Qualitative	Quantitative	Qualitative
		Croatia – 7 industrial facilities flooded, as well as 14 other business facilities[96] Poland – 10,000 ha of farmland flooded[17]		Malta – January and December floods caused traffic disruptions[46]
2005	€1,294[97,98,99,100,101,102]	153 fatalities[12,17,72,100,103,138] 142 injuries[12,100,103,104] Additional qualitative data available, e.g. Bulgaria – 6,000 buildings damaged in May/June, over 14,000 flooded in August[99] Estonia – 294 cars were destroyed or damaged by flood or fallen trees[100,g] Finland – some 63,000 m³ of untreated sewage was released into the sea due to flooding[105]	None quantified	Qualitative data available, e.g. Denmark – around 60,000 households lost power in northern Jutland[100] Lithuania – widespread power cuts[100,g] Romania – 800 people homeless[12]
2004	€228[106,107,108,109,110,111]	50 fatalities[12,17,138] No injuries recorded Additional qualitative data available, e.g. Hungary – 1,200 ha planted land under water[112] Republic of Ireland – flooding of over 50 dwellings and commercial premises[81] Romania – 213 bridges and overpasses damaged as well as 230 km of road[17]	None quantified	Qualitative data available, e.g. Finland – cattle and fur animals moved[106] Republic of Ireland – thousands of homes without electricity[113]
2003	€1,127[114,115,116,117]	36 fatalities[12,17,118,138] No injuries recorded Additional qualitative data available, e.g. Belgium – hundreds of homes inundated[119] Estonia – Saka village completely underwater[17] Greece – sewerage system damaged[120]	None quantified	Qualitative data available, e.g. France – the loss of 4,000 jobs feared[115] Malta – traffic disruption[46] UK (England) – 30 residents cut off[121]
2002	€14,625[122,123,124,125,126,127,128,129,130]	115 fatalities[12,35,130,131,133,135,138] 316 injuries[12,134,136] Additional qualitative data available, e.g. Bulgaria – 200 buildings flooded[17] Romania – 5,000 houses seriously damaged[129]	€416[137,h,125,i]	Qualitative data available, e.g. Bulgaria – 800 inhabitants isolated[17] Czech Republic – decrease in tourism estimated at between €300 and €500 million for 2002[123] UK (Wales) – the town of Crickowell was

Table 3-3: Direct and indirect costs of floods between 2002 and 2013 (€ millions)

Year	Direct damages		Indirect damages	
	Quantitative	Qualitative	Quantitative	Qualitative
		UK (Wales) – a number of schools in South Wales shut due to flooding and storm damage[136]		completely cut off[136]

Notes: only those damages which could be allocated as either direct or indirect are included here, therefore the total damages will be less than in Table 3-1 as for some floods only an overall total was available

[a] further damages to agriculture from floods in Hungary; [b] money spent spraying for mosquitos and public lighting in Slovakia; [c] insurers paid out £40 million in business interruption payments; [d] money raised to assist the people of Biser; [e] 2 injures due to a motorcycle accident, not clear if directly due to flooding; [f] tourism estimated to have been reduced by £15 million in England; [g] some damages may be due to wind as this reference considers storm Erwin/Gudrun; [h] flooding closed 13 metro stations in Prague causing an estimated €230 million damages; [I] operational costs of flooding on transport network in Germany estimated at € 186 million

Sources:

Austria [1,12,23,33,75,92,97,98,122]; **Belgium** [12,66,119]; **Bulgaria** [12,24,34,38,42.90,99]; **Croatia** [25,39,49,92,96]; **Cyprus; Czech Republic** [2,3,12,13,17,50,61,123,134,137]; **Denmark** [100]; **Estonia** [17,100]; **Finland** [20,26,84,100,106,114]; **France** [12,17,35,47,64,85,115,124]; **Germany** [4,12,17,51,125]; **Greece** [12,14,17,41,66,68,89,91,120,131]; **Hungary** [5,12,52,94,103,105,126]; **Ireland** [12,40,48,69,113, 127]; **Italy** [6,15,17,22,27,36,43,53,70,79,107,116,118,128]; **Latvia** [100]; **Lithuania** [12,67]; **Luxembourg; Malta** [46,117]; **Netherlands; Poland** [12,54]; **Portugal** [12,16,28,55,65,95]; **Romania** [7,12,56,62,76,80,82,101,129,132,138]; **Slovakia** [8,12,17,57,92,108,109,130, 139]; **Slovenia** [29,58,63,72,83,86,102]; **Spain** [12,16,17,21,30,44,59,73,77,87,110,131]; **Sweden** [89]; **UK** [9,10,11,12,17,18,19,31,32,37,45,48,60,71,74,78,88,91,98,121,135,136,138]

[1] Austrian Federal Ministry of the Interior (2013); [2] ParlamentniListy.cz (2013); [3] Aktuálně.cz (2013); [4] Germany Federal Ministry of Finance (2013); [5] Ministry of the Interior of Hungary (2013); [6] Mackenzie & O'Leary (2013); [7] International Federation of Red Cross and Red Crescent Societies (2013); [8] Vilikovská (2013); [9] Bale (2013); [10] EDP Reporters (2013); [11] Carroll (2013); [12] CRED (nd); [13] Government of the Czech Republic (2013); [14] BBC News (2013a); [15] BBC News (2013b); [16] naturaldisastersnews.net (2013); [17] DFO (nd); [18] Macgregor (2013); [19] BBC News (2013c); [20] Finland Times (2013); [21] The Olive Press (2013a); [22] euronews.com (2013); [23] Bundesministerium für Inneres (2012); [24] Leviev-Sawyer (2012); [25] Ministry of Agriculture for the Republic of Croatia (2012); [26] UUTISET (2012); [27] Reuters (2012); [28] Governo Regional Da Madeira (2012); [29] Government Office for Local Self-Government and Regional Policy of Slovenia (2012); [30] Ministerio de Hacienda y Administraciones Públicas (2012); [31] Penning-Rowsell (2013); [32] Carrington (2013); [33] Austrian Times (2012); [34] Cursty (2012); [35] Ministère de l'Ecologie, du Développement durable et de l'Energie (2012); [36] Berti et al (2012); [37] BBC News (2012); [38] Sofia Echo (2012a); [39] AFP (2012); [40] Thejournal (2012); [41] Keeptalkinggreece (2012); [42] Sofia Echo (2012c); [43] Liguria and Tuscany Region through the Italian National Department of Civil Protection (2011); [44] BBC News (2011); [45] Davies (2011); [46] Malta Resources Authority (2013); [47] news24.com (2011); [48] BBC News (2011); [49] Ministry of Regional Development, Forestry and Water Management (2010); [50] Minister of Finance of the Czech Republic (2010); [51] Bundesministerium der Finanzen (2010); [52] Hungarian Ministry of Interior (2010); [53] Italian Government (2010); [54] Polish Government (2010); [55] Government of the Portuguese Republic (2010); [56] Government of Romania (2010); [57] Government of the Slovak Republic (2010); [58] Government Office for Local Self-Government and Regional Policy of the Republic of Slovenia (2010); [59] Ministerio de Economia y Hacienda (2010); [60] Chartered Institute of Loss Adjusters (2011); [61] Naše Voda (2012); [62] Ministry of Administration and Interior, General Inspectorate for Emergency Situations (nd); [63] Cerni & Kuzmanovic (2010); [64] Kolen et al (2010); [65] Reuters (2010); [66] euronews.com (2010); [67] Mullett (2010), [68] The Government of the Hellenic Republic (2009); [69] Department of Finance, Ireland (2009); [70] Dipartmento della Portezione Civile (2009); [71] BBC News Cumbria (2010); [72] Cipovová (nd); [73] BBC News (2009); [74] NERC (nd); [75] Austrian Times (2009); [76] UPI.com (2009); [77] The Olive Press (2009); [78] Rivers Agency (2011); [79] Audisio & Turconi (2011); [80] Government of Romania (2008); [81] Flood Relief & Risk Management Division, Engineering Services, Office of Public Works (2012); [82] European Commission (2009); [83] WHO (2013); [84] City of Pori (2009); [85] Ministère de L'Intérieur (2007); [86] Statistical Office of the Republic of Slovenia (2009); [87] Ministry of the Economy and Finance (Spain) (2007);

Table 3-3: Direct and indirect costs of floods between 2002 and 2013 (€ millions)				
Year	Direct damages		Indirect damages	
	Quantitative	Qualitative	Quantitative	Qualitative
[88] EA (2010); [89] Diakakis et al (nd); [90] Sofia Echo (2007); [91] Neath Port Talbot County Borough Council (2011); [92] ICPDR (2008); [93] The Government of the Hellenic Republic (2006); [94] Ministry of Local Government and Regional Development of Hungary (2006); [95] Pers. Comm. (Portuguese Ministry of Environment, Spatial Planning and Energy); [96] Croatian Bureau of Statistics (2007); [97] Bundesministerium für Inneres (2005); [98] Huttenlau et al (2010); [99] Bulgarian Government (2005); [100] Carpenter (2005); [101] Government of Romania (2005); [102] Samardzija-Matul (2005); [103] index.hu (2005); [104] Mossa (2007); [105] Haanpää et al (nd); [106] Elinkeino-, likenne- ja ympäristökeskus Närings-, trafik- och miljöcentralen (2011); [107] Regione Autonoma della Sardegna (2004); [108] Government of the Slovak Republic (2004); [109] The Slovak Spectator (2004); [110] Ministerio de Economia y Hacienda (2004); [111] North Cornwall District Council (2004); [112] index.hu (2004); [113] Irish Examiner (2004); [114] Maa- ja metsätalousministeriölle (2009); [115] Ministère de L'Intérieur (2003); [116] Italian Government (2003); [117] Government of Malta (2003); [118] Lastoria et al (2006); [119] heatisonline.org (2003); [120] Diakakis (2010); [121] The Royal Windsor Website (2003); [122] Republic of Austria (2002); [123] Czech Republic (2002); [124] France (2002); [125] Bundesministerium der Finanzen (2002); [126] ICPDR (nda); [127] Office of Public Works (2003); [128] Italian Government (2002); [129] WMO/GWP Associated Programme on Flood Management (nd); [130] Ministerstvo Životného Prostredia Slovenskej Republiky (2002); [131] Diakakis (2013); [132] ICPDR (nd); [133] Cana et al (2003); [134] Ústecký kraj (2010); [135] BBC News (2002); [136] BBC News (2002a); [137] Risk Management Solutions (2003); [138] Pers. Comm. (Ministry of Environment and Climate Change); [139] Ministry of Environment and Climate Change (nd)				

Table 3-4: Economic, social and environmental costs of floods between 2002 and 2013						
Year	Economic costs		Social costs		Environmental costs	
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
2013	€6,645[1,2,3,4,5,6,7,8,9,10,11]	Qualitative data available, e.g. Finland – hundreds of hectares of land and a number of roads were underwater[12] Germany – traffic obstructions lasted for more than 4,900 hours (average disruption of around 20 hours). Factories at Leipzig (Porsche), Zwickau (Volkswagen), Zeitz (Südzucker) stopped production due to damage to facilities or supply chains[13]	€191[1,4,5,8]	Qualitative data available, e.g. Czech Republic – several tens of people were injured and more than 23,000 had to be evacuated[15] Germany – at least 52,500 people evacuated in Elbe and Danube catchment areas including hospitals, children's home, old people's home[13] Denmark – residential areas considered safe from storm surges were heavily flooded, requiring temporary resettlement of affected residents[99]	€0.12[9]	Qualitative data available, e.g. Germany – pollution from spillage of oil from domestic heating containers, also pollution from flooding of sewage treatment works[14] UK (England) – 263 seal pups lost from Horsey Gap[16]
2012	€3,265[17,18,19,20,21,22,23,24,25,26]	Qualitative data available, e.g. Austria – 3 months after the flood 16 businesses were still unable to resume full operations[17] Bulgaria – widespread damage to river vessels[27]	€9.18[22,23,24,26,28]	Qualitative data available, e.g. Croatia – 180 people evacuated[19] Slovenia – significant damage to the partisan hospital Franja in Dolenju Novaki[23]	None quantified	No data found
2011	€698[29]	Qualitative data available, e.g. Germany – commercial shipping banned on the Rhine[30] Italy – 605 enterprises suffered documented damages[29]	€13.25[29]	Qualitative data available, e.g. France – about 3,900 homes without electricity[31] UK (Northern Ireland) – patients from Tyrone and Fermanagh Hospital relocated[32]	None quantified	Qualitative data available, e.g. Italy – damage to beaches and trekking routes in the UNESCO World Heritage site of 5 Terre[29]

Table 3-4: Economic, social and environmental costs of floods between 2002 and 2013						
Year	Economic costs		Social costs		Environmental costs	
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
2010	€13,937[33,34,35,36,37,38,39,40,41,42,43]	Qualitative data available, e.g. Czech Republic – total fall in the economy of the Liberec Region of approximately 15%[34] Germany – flooding caused damage to more than 2,000 ha of farmland[35]	€351[34,35,36,37,38,39,40,41,42,43]	Qualitative data available, e.g. Croatia – 112 families evacuated[33] Italy – half a million people without drinking water[30]	€0.63[34]	Qualitative data available, e.g. Croatia – nature park Kopcki Rit was flooded[44] Hungary – national parks and elements of cultural heritage were severely affected[36]
2009	€965[44,45,46,47,48]	Qualitative data available, e.g. Czech Republic – vast stretches of road ways underwater[30] France – hundreds of homes and farms flooded[30]	€0.12[45]	Qualitative data available, e.g. Republic of Ireland - 1,500 people forced to evacuate their homes[30] Italy – 14,500 people suffered direct damage or consequences to their health, lost goods, or suffered economic damage[37]	€8.50[44]	Qualitative data available, e.g. Austria – many storks in Burgenland and Upper and Lower Austria killed in storm[49]
2008	€472[50,51]	Qualitative data available, e.g. Romania – 88 km of banks and dams totally damaged[51]	€4.75[51]	Qualitative data available, e.g. Romania – 78 schools, 6 kindergartens, 3 hospitals and 8 churches damaged[51]	None quantified	No data found

Table 3-4: Economic, social and environmental costs of floods between 2002 and 2013						
Year	Economic costs		Social costs		Environmental costs	
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
2007	€4,917[52,53,54,56,57]	Qualitative data available Greece – hundreds of hectares of cotton and tobacco crops destroyed[58] Slovenia – more than 17km of water infrastructure, 10km of electricity grid and 48 water reservoirs damaged[54] UK (England) – six motorways closed, with M1 (junction 31 to 34) closed for 40 hours because of danger of dam breach at Ulley reservoir[55]; more than 42,000 ha of farmland flooded[55]	€614[53,56,57]	Qualitative data available, e.g. France – 1 week after the flood 60,000 people still without electricity[53] Spain – damage to site of cultural interest of Guinea[56] UK (England) – 14,500 households provided with alternative accommodation; 140,000 properties without piped clean water for up to 16 days, 42,000 homes without electricity for up to 24 hours in Gloucester, 130,000 homes experienced a total of 1.9 million hours of power interruptions over 5 day period, 400,000 school pupil days lost[55]	€72[53]	No data found
2006	€313[59,60,61]	Qualitative data available, e.g. Bulgaria – over 50,000 ha of agricultural land flooded[62] Croatia – 7 industrial facilities and 14 other business facilities flooded[63]	None quantified	Qualitative data available, e.g. Germany – 1,000 people evacuated along the Czech Border[30] Greece – repair of water supply network and identification of alternative sources created a critical situation for more than a year[60] Slovakia – between May and December 2006, properties of 26 people were damaged, mainly in socially-disadvantaged regions[100]	None quantified	Qualitative data available, e.g. Finland – sea water flooded a freshwater lake and killed almost the entire fish stock[64] Hungary – 37,210 ha broad-leaved woodland, 60 ha coniferous forest, 266 ha mixed forest and 12,062 ha of natural grassland flooded[61]

Table 3-4: Economic, social and environmental costs of floods between 2002 and 2013						
Year	Economic costs		Social costs		Environmental costs	
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
2005	€1,223[65,66,67,68,69,70,71]	Qualitative data available, e.g. Bulgaria – 60,300 ha flooded[67] Estonia – some 42 business buildings affected[68,a]	€71[65,67,69]	Qualitative data available, e.g. Denmark – around 60,000 households lost power in northern Jutland[68] France – 1,000 people evacuated[30]	None quantified	Qualitative data available, e.g. Finland – some 63,000m[3] of sewage was released into the sea due to flooding[72]
2004	€226[73,74,75,76,77]	Qualitative data available, e.g. Hungary – 1,200 ha planted land and 2 ha meadow and pasture underwater[79] Republic of Ireland – planes diverted and ferries cancelled[80]	€4.58[75,78]	Qualitative data available, e.g. Italy – a village near Salerno had to be evacuated[30] Republic of Ireland – thousands of homes left without electricity[81]	€0.19[76]	Qualitative data available, e.g. Republic of Ireland – 1,300 tons of diesel began leaking from a cargo ship which ran aground[81]
2003	€1,180[82,83,84,85]	Qualitative data available, e.g. France – fear of loss of 4,000 jobs[83] Greece – 21 businesses damaged[86]	€5.30[84,85]	Qualitative data available, e.g. Czech Republic – 20 homes without electricity[87] Estonia – Saka village completely underwater[30]	None quantified	Qualitative data available, e.g. France – green woodpecker showed a population decrease of 30%, however in the longer term some species numbers increased[88]
2002	€14,219[89,90,91,92,93,94,95]	Qualitative data available, e.g. Austria – more than 10,000 homes were damaged[92] Greece – 9 businesses damaged, mainly greenhouses[96]	€822[89,90,93,96,97]	Qualitative data available, e.g. Bulgaria – 800 inhabitants isolated[30] Czech Republic – approximately 220,000 people evacuated, all three Metro lines affected in Prague[94] Romania – a school and a dispensary were destroyed[98] Germany – more than 337,000 people affected with many cultural assets affected[98]	None quantified	No data found

Notes: only those damages which could be allocated as economic, social or environmental are included here, therefore the total damages will be less than in Table 3-1 as for some floods only an overall total was available
[a] effects of windstorm, not all damages are from flooding;

Table 3-4: Economic, social and environmental costs of floods between 2002 and 2013						
Year	Economic costs		Social costs		Environmental costs	
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative

Sources:
Austria [1,17,49,59,65,66,89]; **Belgium; Bulgaria** [18,27,28,30,59,62,67]; **Croatia** [19,33,44,63]; **Cyprus; Czech Republic** [2,3,15,30,34,87]; **Denmark** [68, 99]; **Estonia** [30,68]; **Finland** [12,20,52,64,72,73,82]; **France** [30,31,53,83,88,90]; **Germany** [4,13,14,30,35,91,98]; **Greece** [45,58,60,86,96]; **Hungary** [5,36,61,79,92]; **Ireland** [30,46,80,81,97]; **Italy** [**6,21**,29,30,37,47,50,74,84,93]; **Latvia** [68]; **Lithuania; Luxembourg; Malta** [85]; **Netherlands ; Poland** [38]; **Portugal** [22,39]; **Romania** [7,40,51,69,94]; **Slovakia** [8,41,59,75,76,100]; **Slovenia** [23,42,54,70,95]; **Spain** [24,43,56,77]; **Sweden; UK** [9,10,11,16,25,26,32,48,55,57,71,78]

[1] Austrian Federal Ministry of the Interior (2013); [2] ParlamentniListy.cz (2013); [3] Aktuálně.cz (2013); [4] Germany Federal Ministry of Finance (2013); [5] Ministry of the Interior of Hungary (2013); [6] Mackenzie & O'Leary (2013); [7] International Federation of Red Cross and Red Crescent Societies (2013); [8] Vilikovská (2013); [9] Bale (2013); [10] EDP Reporters (2013); [11] Carroll (2013); [12] Finland Times (2013); [13] CEDIM (2013); [14] Chavoshian & Takeuchi (2011); [15] Government of the Czech Republic (2013); [16] EDP Reporters (2013a); [17] Bundesministerium für Inneres (2012); [18] Leviev-Sawyer (2012); [19] Ministry of Agriculture for the Republic of Croatia (2012); [20] UUTISET (2012); [21] Reuters (2012); [22] Governo Regional Da Madeira (2012); [23] Government Office for Local Self-Government and Regional Policy of Slovenia (2012); [24] Ministerio de Hacienda y Administraciones Públicas (2012); [25] Penning-Rowsell (2013); [26] Carrington (2013); [27] Sofia Echo (2012a); [28] Sofia Echo (2012); [29] Liguria and Tuscany Region through the Italian National Department of Civil Protection (2011); [30] DFO (nd); [31] news24.com (2011); [32] BBC News (2011a); [33] Ministry of Regional Development, Forestry and Water Management (2010); [34] Minister of Finance of the Czech Republic (2010); [35] Bundesministerium der Finanzen (2010); [36] Ministry of Interior of Hungary (2010); [37] Italian Government (2010); [38] Polish Government (2010); [39] Government of the Portuguese Republic (2010); [40] Government of Romania (2010); [41] Government of the Slovak Republic (2010); [42] Government Office for Local Self-Government and Regional Policy of the Republic of Slovenia (2010); [43] Ministerio de Economia y Hacienda (2010); [44] Begovic & Schrunk (2011); [45] The Government of the Hellenic Republic (2009); [46] Department of Finance, Ireland (2009); [47] Dipartmento della Portezione Civile (2009); [48] BBC News (2010); [49] Austrian Times (2009a); [50] Audisio & Turconi (2011); [51] Government of Romania (2008); [52] City of Pori (2009); [53] Ministère de L'Intérieur (2007); [54] Statistical Office of the Republic of Slovenia (2009); [55] EA (2010); [56] Ministry of the Economy and Finance (Spain) (2007); [57] EA (2007); [58] living in Crete (2007); [59] ICPDR (2008); [60] The Government of the Hellenic Republic (2006); [61] Ministry of Local Government and Regional Development of Hungary (2006); [62] ICPDR (2006); [63] Croatian Bureau of Statistics (2007); [64] Elinkeino-, likenne- ja ympäristökeskus Närings-, trafik- och miljöcentralen (2011); [65] Bundesministerium für Inneres (2005); [66] Huttenlau et al (2010); [67] Bulgarian Government (2005); [68] Carpenter (2005); [69] Government of Romania (2005); [70] Samardzija-Matul (2005); [71] Wass et al (nd); [72] Haanpää et al (2006); [73] Elinkeino-, likenne- ja ympäristökeskus Närings-, trafik- och miljöcentralen (2011); [74] Regione Autonoma della Sardegna (2004); [75] Government of the Slovak Republic (2004); [76] The Slovak Spectator (2004); [77] Ministerio de Economia y Hacienda (2004); [78] North Cornwall District Council (2004); [79] index.hu (2004); [80] RTE News (2004); [81] Irish Examiner (2004); [82] Maa- ja metsätalousministeriölle (2009); [83] Ministère de L'Intérieur (2003); [84] Italian Government (2003); [85] Government of Malta (2003); [86] Diakakis (2010); [87] radio.cz (2003); [88] Rocha (nd); [89] Republic of Austria (2002); [90] France (2002); [91] Bundesministerium der Finanzen (2002); [92] ICPDR (nda); [93] Italian Government (2002); [94] WMO/GWP Associated Programme on Flood Management (nd); [95] Ministerstvo Životného Prostredia Slovenskej Republiky (nd); [96] WHO (2013); [97] Office of Public Works (OPW) (2004); [98] DKKV (2004); [99] Pers. Comm. (Danish Ministry of Environment); [100] Ministry of Environment and Climate Change (nda)

3.2 The impact of economic and social disruption caused by floods

3.2.1 Evacuations

Information available on evacuations is very variable, in some cases the number of houses flooded is available, for others the number of people affected or displaced is available. Floods for which the Member State has submitted an application to the EUSF often have more information, for example in 2010 for the flood in Hungary the application provides the information that 5,259 people were forced to leave their houses, and 317 residential buildings were destroyed or uninhabitable due to the flooding. In comparison in the same year Greece was flooded and no information on evacuations or building damage has been found. This is likely to relate to the differing flood intensities, as well as inconsistencies in reporting.

Data on evacuations in relation to flooding has been collected for the majority of flood events and is presented in Table 3-5. The table shows that the number of people evacuated in 2013 was much greater than for any of the other years. This may reflect increased awareness of flooding, better warning and better preparedness, especially when the damages caused by the 2013 floods appear to be lower than those from 2002 and 2010. This is reinforced by the lower number of fatalities in 2013 (79) compared with 2002 (110), see also Table 3-4. The highest number of fatalities occurred in 2010 (233). The majority of these were in France (79) and Madeira, Portugal (43), although Spain (36) and Romania (23) also suffered significant numbers of fatalities. The high fatalities in France in 2010 were due to storm Xynthia.

Table 3-5 : Evacuations (approximate numbers of people evacuated) (to 2 significant figures)												
Country	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Austria	No data	590[7]			No data			500[23]	450[26]			No data
Belgium			No data	No data			No data		No data	No data	No data	No data
Bulgaria		No data		No data			No data	>2,000[23]	8,900[27]			No data
Croatia		300[8]		450 (112 families)[13]				No data	No data			
Cyprus												
Czech Republic	1,300,000[1]			2,500[14]	1,400[21]		No data	No data	No data		No data	220,000[33]
Denmark			No data						No data			
Estonia									600[28]			
Finland	No data	20[9]					No data	No data	100 [29]	No data	No data	
France	750[2]	No data	1,600[11]	No data	No data	No data	No data	No data	1,000[2]		35,000[31]	470[34]
Germany	>100,000[3]		No data	2,000[15]	No data		No data	1,000[2]	No data		No data	No data
Greece	No data	No data		No data	No data		No data	No data	No data		No data	No data
Hungary	No data			5,300[16]	No data			2,800[24]	No data	No data	No data	2,000[35]
Ireland		No data	No data		1,500[2]	No data		No data	No data	No data	No data	No data
Italy	No data	800[10]	350[12]	No data	2,000[22]	No data	No data	No data	No data	No data	No data	No data
Latvia									No data			
Lithuania				70[17]			No data		No data			
Luxembourg												
Malta			No data	No data			No data	No data		No data	No data	No data
Netherlands			No data								No data	
Poland	No data			31,000[18]	600[2]			500[2]	No data	No data		
Portugal	No data					No data		No data			No data	
Romania	6,900[4]			15,000[19]	No data	No data	4,260[1]	>15,000[25]	>12,000[30]	No data	No data	15,000[36]
Slovakia	40[5]	No data	No data	5,889[39]	No data	No data	No data	No data	No data	No data	No data	340[37]
Slovenia		No data		300[20]		No data	No data		No data			
Spain	130[2]	No data	No data	No data	No data		No data	No data	No data	600[1]	No data	No data
Sweden									No data			
UK	>100[6]	No data	No data	No data	No data	No data	No data	No data	3,000[28]	No data	20[32]	80 (20 families)[38]

Table 3-5 : Evacuations (approximate numbers of people evacuated) (to 2 significant figures)											
Total	**1,400,000**	**1,700**	**2,000**	**63,000**	**5,500**	**No data**	**4,300**	**22,000**	**26,000**	**600**	**35,000**	**240,000**

References:
[1] CRED (nd); [2] DFO (nd); [3] Germany Federal Ministry of Finance (2013); [4] International Federation of Red Cross and Red Crescent Societies (2013); [5]Slovak Spectator (2013); [6] Reuters (2013); [7] RTE News (2012); [8] AFP (2012); [9] Helsingin Sanomat (2012); [10] Reuters (2012); [11] news24.com (2011); [12] Liguria and Tuscany Region through the Italian National Department of Civil Protection (2011); [13] European Commission (2010); [14] Minister of Finance of the Czech Republic (2010); [15] Bundesministerium der Finanzen (2010); [16] Ministry of Interior of Hungary (2010); [17] Mullett (2010); [18] Polish Government (2010); [19] European Commission (2010); [20] Government Office for Local Self-Government and Regional Policy of the Republic of Slovenia (2010); [21] Aktuálně.cz (2013); [22]Dipartmento della Portezione Civile (2009); [23] ICPDR (2008); [24] Ministry of Local Government and Regional Development of Hungary (2006); [25] ICPDR (2006); [26]Pfurtscheller & Schwarze (2008); [27] Bulgarian Government (2005); [28]Carpenter (2005); [29]Uudenmaan Ely-Keskus Y-Vastuualue (2010); [30] ICPDR (nd); [31] Ministère de L'Intérieur (2003); [32] The Royal Windsor Website (2003); [33] Czech Republic (2002); [34] Ministère de l'Ecologie, du Développement durable et de l'Energie (2012); [35] ICPDR (nda); [36] Sofia Echo (2002); [37] Ministerstvo Životného Prostredia Slovenskej Republiky (nd); [38] BBC News (2002a), [(39)] Ministry of Environment and Climate Change (nd)

3.2.2 Health costs

As with evacuations the quality and quantity of information available on the health costs related to flooding are variable between years and between Member States. The EUSF applications provide varying levels of detail on this subject, for example the Czech Republic in 2010 quotes that following the flood 1,200 people had psychological counselling and 290 people were treated for mental harm. In the same year France suffered a significant flood event yet there was no information on health costs recorded in their application. Yet in 2007 France recorded 2 deaths due to a virus and 4,000 people infected by this virus due to the flooding. This illustrates the difficulties of data collection as not only does the level of recording vary by Member State but also within each Member State by year.

Additional considerations with this task are the indirect effects of floods on health, for example, shortages of safe water, injuries or disruption of access to health services. These effects have not been quantified or recorded for the floods considered here due to the lack of any such information. Impacts caused by pollution following flooding could also cause health impacts. Flooding in Germany in 2013 was associated with oil leaks from domestic heating containers buried in gardens, and release of contaminants from flood sewage treatment works. However, analysis of soils following the floods did not find elevated levels of heavy metals and the main impact was on water quality due to reduced oxygen levels (Chavoshian & Takeuchi, 2011).

Box 3-2 provides a summary of the health issues from flooding identified in the PESETA report, while Box 3-3 summarises the health risks that could arise from flooding as identified in Sweden.

Box 3-2: Case study example: PESETA estimate of future health impacts of flooding
The PESETA project estimates that there may be as many as 5 million cases of psychological stress due to flooding by 2100 under the A2 scenario and 4 million under the B2 scenario. The annual cost of flood-related depression is estimated at between €1 billion and €1.4 billion (A2 scenario) and €0.8 billion to €1.1 billion (B2 scenario). Acclimatisation could help to reduce these effects.
Reference: Ciscar J-C et al (2010): Physical and economic consequences of climate change in Europe, accessed at: http://www.pnas.org/content/early/2011/01/27/1011612108.full.pdf on 3 January 2014.

Box 3-3: Case study example: Potential risks of pollution in Sweden
Health effects can be caused by increased risk of infectious diseases through insufficient refrigeration of food due to power cuts or contamination of drinking and bathing water. The risk of exposure to chemical substances can also occur where these leak from industrial sites. The Swedish Geotechnical Institute surveyed business activities and polluted ground in areas at risk of flooding on a 1:100 year event. Business activities identified as potentially polluting include those identified on the Swedish EMIR database, which contains information on business activities considered hazardous under the Swedish Environmental Code (A and B activities). The study found 376 A and B activities in the 1:100 flood risk zone and 932 areas of land that may be polluted. These potential sources of pollution could result in increased pollutant dispersion in the event of flooding. Various studies have estimated the cost per case of illness of SEK160 (€17) and SEK28,000 (€3,000) with the range reflecting different costs included in different studies. An assumption of an increase of disease outbreaks of 10% and an average cost of SEK10,000 (€1,100) per case of illness suggests costs of around SEK250 million (€27 million) due to spread of infection via water.
Reference: Swedish Geotechnical Institute (Andersson-Sköld et al, 2007 and 2007b) in Swedish Commission on Climate and Vulnerability (2007): Sweden facing climate change - threats and opportunities, Final Report. Exchange rate of 0.108 SEK to €1 (2007 value).

3.2.3 Jobs lost

Research for this project has found that the numbers of jobs affected by the floods varies significantly based on the country in which the flood occurs, the area within that country and the predominant industry there. The information is not generally recorded by most Member States. The most detailed record of jobs lost through flooding is for the floods in France in 2007. Here, the EUSF application states that 2,210 jobs in agriculture, 354 jobs in hotels and restaurants, 751 jobs in commerce and 29 jobs in transport and other sectors were affected.

Box 3-4 shows a case study example of the effects of flooding on job losses identified following flooding in the UK.

Box 3-4: Case study example: Impact on businesses and jobs in Devon and Somerset, UK
Flooding occurred in Devon and Somerset between April 2012 and March 2013 following unprecedented wet weather over this period. Seven flood events were recorded: 29 April 2012, 7 July 2012, 23 September 2012, 11 October 2012, 21 November 2012, 23 December 2012 and 21 March 2013. These floods affected 2,535 businesses, mainly in the sectors of agriculture, tourism (including food and drink), retail, distribution and construction. Total losses for businesses are estimated at £7.4 million (€8.9 million) across the worst hit areas in Devon and Somerset and £8.5 million (€10.2 million) taking into account the effect on suppliers to businesses that lost trade. It was the recurrent flooding that caused the more significant effects, with businesses feeling that they were typically able to cope with occasional events. As well as the direct costs, businesses were concerned about the publicity in terms of attracting investment and, for the tourism sector, in attracting visitors. The impacts on businesses included: • Four businesses having to move premises temporarily • 18 businesses having to close because of flooding. These businesses were closed for a total period of

Box 3-4: Case study example: Impact on businesses and jobs in Devon and Somerset, UK
342 days with one pub having to close for 130 days • The average cost of damage was £23,700 (about €28,500) The loss of GVA is estimated at £2.7 million (€3.3 million), of which £1.2 million (€1.4 million) is in Devon and £1.5 million (€1.8 million) in Somerset. Taking into account displacement of sales to other businesses, the value of lost sales is estimated at £2.2 million (€2.6 million). For 90% of companies in Devon and Somerset, the floods had no effect on the number of people employed, although 2% of businesses in Devon and 2% in Somerset said that they might reduce number of employees in the future. In total, 3% of businesses in Devon and 2% in Somerset reported that they had reduced the number of people they employed as a result of flooding. In addition, 1% of businesses had considered closing the business permanently. This could be the equivalent of 40 businesses potentially closing across the flooded areas as a whole were the survey responses to be accurate of the responses of all affected businesses. The total number of jobs potentially affected is not given, however. Impacts were greater on larger businesses with 20% of those with a one person business reporting a negative impact from flooding, increased to 45% for those with 4 or 5 employees, and to 60% for those with more than 15 employees. This may be explained by the likelihood that more staff are likely to be personally affected by flooding where there is a greater number.
Reference: Devonomics (2013): Impact of flooding on key business sectors in Devon and Somerset 2012-13, Final Report, 16 July 2013, accessed at: http://www.devonomics.info/sites/default/files/documents/Devon%20&%20Somerset%20Flood%20Results%20Final%20Report.pdf on 6 January 2014.

3.2.4 Dislocation of housing

Dislocation of housing also relates to evacuations and therefore the same caveats and issues are present. Data for the UK from 2007 suggests that 14,500 people had to move to temporary accommodation (from 46,000 to 48,000 residential properties that were flooded) and that by the end of May 2008, 4,750 of these people were still not back in their homes (some 11 months after the floods) (EA, 2010). From the information collected, data on number of houses flooded and those which are then stated as being 'uninhabitable' or 'destroyed' can be used to present an impression of the dislocation of housing. Table 3-6 provides some example information on dislocation of housing, focusing on where there was information on the number of houses damaged or destroyed.

Table 3-6: Number of houses damaged or destroyed by flooding

Year	Country	Dislocation of housing	Source
2002	Austria	10,000 houses damaged or destroyed	ICPDR (nd)
	Germany	Over 24,000 homes damaged to destroyed	Bundesministerium der Finanzen (2002)
2005	Bulgaria	Over 14,000 buildings flooded	Bulgarian Government (2005)
	Romania	43,900 houses damaged	ICPDR (nd)
2013	Germany	More than 32,000 houses damaged or destroyed	Germany Federal Ministry of Finance (2013)

Box 3-5 provides a summary of the implications of floods in Hungary, including the costs for water authorities and restoration and repair costs.

Box 3-5: Case study example: Impact of floods in Hungary

Floods: In May and June two cyclones hit Hungary: "Zsófia" (15-18 May) and "Angéla" (31 May – 4 June). Within these two months the amount of rainfall (294 mm) exceeded the highest ever recorded during such a time-period. Smaller cyclones arrived as well later on that year however; they did not cause such floods as these two.

On 19 May, the Cuhai-Bakony-stream destroyed one of the bridges of motorway M1, also breaking the road track. Defending various areas necessitated the redeployment of considerable assets: machines, materials and most importantly personnel. Throughout the country 842 towns were involved in flood defence actions. At its peak around 25,000 people took part in flood defence works and 5,259 people had to be evacuated. In terms of police resources, flood related operations cost 2.3 billion HUF (approximately €8.5 million).

Inland inundations: Between October 2009 and June 2010 rainfall exceeded normal amounts by 225 mm (or by 65% up to the end of May 2010). As a result inland inundations covered 107,000 ha by 12 January. The area of inundated land rose to 170,000 ha by 1 March as a result of snow melt. An intensive period of rain also occurred in the middle of May, which was excessively harmful as the soil was already saturated. Altogether 500,000 ha of land suffered serious harm.

Water authorities spent 400 million HUF (€1.5 million) on defence works with 62 million HUF (€230 000) spent on essential repairs of pumps. The treatment of inland inundations is estimated to have cost 5.2 billion HUF (approximately €20 million) in total.

Costs:

- Defence costs: Between 15 May and 17 June 2010, costs of flood defence work carried out by water authorities exceeded 9.5 billion HUF (€35 million).
- Restoration costs: Damages to the flood defence systems were just below 6 billion HUF (€22 million).
- Replacing assets: By law the authorities are required to stock a defined volume of flood defence assets (sand bags, torches, etc.). The costs of replacing the depleted assets is estimated to be 700 million HUF (€2.6 million).
- Compensations: Water authorities are expected to pay 2.5 billion HUF (€9.2 million) in compensation mainly due to damages caused by the opening of water reservoirs.

In 2010 floods and inland inundations covered many – previously unmapped – polluting sources, which was a new challenge for the authorities. Such pollution may considerably increase the harmful effects of floods.

Reference:
Jelentés a Kormány részére (2010): Május-júniusban elrendelt veszélyhelyzetekkel kapcsolatos rendkívüli árvízvédekezésről (részletes jelentés) Budapest, 27 July 2010.

3.3 People and property at risk of flooding

To identify where investment is still needed, it is necessary to identify the current level of risk. Table 3-7 provides an overview of the risks, by Member State. Where possible information has been gathered on the number of people and property at risk, and the current expected annual average damages. However, such data were not available for all Member States (Annex 3 provides a table showing other information such as area at risk and a more detailed breakdown than is provided in Table 3-7, where this is available). One further issue relates to the flood event, return period or probability that is reported. In line with the EU Floods Directive (2007/60/EU), there is no consistent definition of the term 'significant' and Member States are able to define this term within the national context. As a result, the flood event reported varies across Member States (and in many cases the event is not specified), again making it difficult to draw direct comparisons.

One of the key issues with flood risk is that this is likely to change into the future due to economic growth and climate change. Table 3-7 also presents how the risks are expected to change into the future, in the 2080s wherever possible for consistency with information at the EU level from the ClimateCost project, although again information were not always available for each Member State.

Given differences between data sources, it is not possible to sum the number of people and property at risk, or to aggregate the annual average damages. Data are also included from the ClimateCost project, which indicates the number of people and annual average damages that could be caused by fluvial and coastal damages. These data are also included in Table 3-7 to give an indication of the overall risk at the EU level.

Table 3-7: Number of people, property and expected annual damages of flooding now and in the future							
Location/ Member State	Risk of flooding: current			Risk of flooding: future			
	Number of people at risk	Number of properties at risk	Expected annual damages	Number of people at risk	Number of properties at risk	Expected annual damages	Reference(s)
Austria	No data found	242,000 (1:200) 19,000 (1:30)	No data found	No data found	No data found	No data found	Sinabell & Url (2008)
Belgium	400,000 (coastal only)(1)	No data found	€331 million (Meuse) (1:100)(2) €25 million (coastal only)(3)	No data found	No data found	€334 to €462 million ('dry' scenario)(2) €2,124 to €2,408 million ('wet' scenario)(2)	[1] Kellens et al (2009) [2] Beckers et al (2013) [3] Kellens (2011)
Bulgaria	No data found	No data found	No data found	No data found	No data found	No data found	-
Croatia	87,000 (river flooding)	No data found	No data found	No data found	No data found	No data found	EU & UNDP (2013)
Cyprus	No data found	No data found	No data found	No data found	No data found	No data found	-
Czech Republic	75,000 (1:20) 368,000 (1:100)	26,031 (1:20) 90,381 (1:100)	No data found	No data found	No data found	No data found	Drbal & Stepankova (2008)
Denmark	No data found	60,000 to 70,000 (coastal only)	No data found	No data found	No data found	No data found	Fenger et al (2008)
Estonia	No data found	No data found	No data found	No data found	No data found	No data found	-
Finland	50,000 (1:250)	No data found	No data found	No data found	No data found	No data found	Ymparisto (2011)
France	18,500,000	17,100,000	€400 million	No data found	No data found	Increase of €1 billion to €4 billion per year	MEDDE (2011) MEDDE (2012)
Germany	3,200,000 (coastal only)	No data found	No data found	No data found	No data found	€3.8 billion per year (without adaptation)	Sterr (2008)
Greece	No data found	No data found	No data found	No data found	No data found	No data found	-
Hungary	2,660,000	No data found	No data found	No data found	No data found	No data found	BOVF (2012) GHK (2006)
Ireland	No data found	No data found	€75 million	No data found	No data found	No data found	OPW (2004)
Italy	3,500,000	No data found	No data found	No data found	No data found	No data found	Mysiak et al (2013)
Latvia	No data found	No data found	No data found	No data found	No data found	No data found	-

Table 3-7: Number of people, property and expected annual damages of flooding now and in the future							
Location/ Member State	Risk of flooding: current			Risk of flooding: future			Reference(s)
	Number of people at risk	Number of properties at risk	Expected annual damages	Number of people at risk	Number of properties at risk	Expected annual damages	
Lithuania	No data found	28,000 ha	No data found	No data found	No data found	No data found	Lithuanian Minister for the Environment (2012)
Luxembourg	No data found	No data found	No data found	No data found	No data found	No data found	-
Malta	16,700	4,520	No data found	No data found	No data found	No data found	Malta Resources Authority (2013)
Netherlands	9,000,000[(1)]	No data found	€135 million[(2)]	No data found	No data found	40% to 70% increase depending upon the economic growth scenario[(2)]	[1] Aerts (2009) [2] Klijn et al (2012)
Poland	1,000,000	No data found	No data found	No data found	No data found	No data found	National Audit Office (2007)
Portugal	No data found	No data found	No data found	No data found	No data found	No data found	-
Romania	1,200,000	No data found	No data found	No data found	No data found	No data found	UNISDR (2008)
Slovakia	No data found	No data found	No data found	No data found	No data found	No data found	-
Slovenia	480,000 (1:50)	No data found	No data found	No data found	No data found	No data found	GHK (2006)
Spain	No data found	No data found	No data found	No data found	No data found	No data found	-
Sweden	No data found	No data found	No data found	No data found	No data found	No data found	-
UK - England	4,300,000[(1)] 900,000 (1:75)[(1)]	2,800,000[(2)] (surface or river) 469,000 (1:75)[(1)]	£1.1 billion[(1)]	No data found	Additional 350,000 properties at risk (1:75)[(2)]	£1 billion to £12 billion[(2,3)]	[1] National Audit Office (2007) [2] Environment Agency (2009); House of Commons EFRA Committee (2013) [3] Environment Agency (2009a)
UK - Northern Ireland	16,800 (all sources)	46,000 (fluvial 1:100, coastal 1:200) 22,000 (pluvial)	£290.9 million (all sources)	8,600 (fluvial) 2,000 (coastal) 9,100 (pluvial) (2030)	No data found	£341.1 million (all sources) (2030)	Rivers Agency (2011)

Table 3-7: Number of people, property and expected annual damages of flooding now and in the future							
Location/ Member State	Risk of flooding: current			Risk of flooding: future			Reference(s)
	Number of people at risk	Number of properties at risk	Expected annual damages	Number of people at risk	Number of properties at risk	Expected annual damages	
UK - Scotland	No data found	1:22 residential 1:13 non-residential	£720 to £850 million	No data found	No data found	No data found	SEPA & Natural Scotland (2012)
UK - Wales	357,000	220,000	£200 million	No data found	No data found	No data found	Environment Agency Wales (2010) Environment Agency Wales (2009)
EU-wide (coastal)	10,000 flooded annually (average)	No data found	€1.9 billion	121,000 to 425,000 (A1B(I)) scenario) or 40,000 to 145,000 (E1 scenario) additional people flooded each year	No data found	€7.0 billion per year (with no adaptation) (2080s, damages in 2006 values)	Brown et al (2011)
EU-wide (fluvial)	167,000 flooded annually (average)(1)	No data found	€5.5 billion(1) €6.4 billion (EU27)(2)	359,000 people flooded annually (average)(1) Additional 250,000 to 400,000 people affected by floods(2)	No data found	€97.9 billion per year (with no adaptation) (2080s, damages in 2006 values)(1) €14 billion to €15 billion (B2 scenario) or €18 billion to €21.5 billion (A2 scenario) (EU27, 2006 prices)(2)	1 Feyen & Watkiss (2011) 2 Feyen et al (2012)

3.4 Assistance provided by EU Funds and civil protection mechanism

3.4.1 EU Solidarity Fund

Table 3-8 presents the amount of Solidarity Funding received by Member States for recovery measures related to flooding. Flood events for which applications for funding were rejected are also included. Total funding from the Solidarity Fund for flood related recovery measures between 2002 and 2013 stands at €1.815 billion.

Table 3-8: Applications to and money granted from the EU Solidarity Fund for recovery measures by Member State

Member State	Year of flood event	Total direct damage (€ millions)	Funds received (€ millions)	Reasons for application
Austria	2002	€2,900	€134	Major flooding
	2005	€592	€14.799	Regional flooding (Tyrol/Vorarlberg)
	2012	€9.6	€0.24	Floods (neighbouring country)
	2013	€866.4	€21.662	Floods (neighbouring country)
Belgium	-	-	-	-
Bulgaria	2005	€222	€9.722	Major flooding
	2005	€237	€10.632	Major flooding
Croatia	2010	€153.04	€3.826	Floods (neighbouring country)
	2010	€47	€1.1175	Floods (neighbouring country)
	2012	€11.5	€0.287	Floods (neighbouring country)
Cyprus	-	-	-	-
Czech Republic	2002	€2,300	€129	Major flooding
	2010	€204.5	€5.111	Floods (neighbouring country)
	2010	€436.5	€10.912	Regional flooding
	2012	€637.1	€15.928	Floods (neighbouring country)
Denmark	-	-	-	-
Estonia	-	-	-	-
Finland	-	-	-	-
France	2002	€835	€21	Regional flooding (Le Gard)
	2003	€785	€19.625	Regional flooding (Vallée du Rhône)
	2007	€211	€5.29	Regional flooding (Cyclone Gamède - la Réunion)
	2007	€509	€12.78	Regional flooding (Hurricane Dean - Martinique)
	2010	€1,425	€35.636	Regional flooding (Storm Xynthia –

Table 3-8: Applications to and money granted from the EU Solidarity Fund for recovery measures by Member State				
Member State	**Year of flood event**	**Total direct damage (€ millions)**	**Funds received (€ millions)**	**Reasons for application**
				coastal flooding)
	2012	€740.70	Rejected	Regional (Var)
Germany	2002	€9,100	€444	Major flooding
	2010	€937.7	Rejected	Regional flooding (Sachsen)
	2013	€8,154	€360.454	Major flooding
Greece	2005	€112	Rejected	Regional floods (Evros)
	2006	€372	€9.306	Regional floods (Evros)
	2009	€83.2	Rejected	Regional flooding (Evia)
Hungary	2006	€519	€15.064	Major flooding
	2010	€719.3	€22.486	Major flooding
	2013	€28	Rejected	Regional flooding
Ireland	2009	€28	€13.022	Regional flooding
Italy	2003	€1,900	Rejected	Regional flooding (North Italy)
	2003	€525	Rejected	Regional flooding (Friuli Venezia-Giulia)
	2004	€223 (overestimate)	Rejected	Regional flooding (Sardinia)
	2009	€598.9	Rejected	Regional (Messina mudslide combined with flooding)
	2010	€211.7	Rejected	Regional flooding (Tuscany)
	2010	€676.36	€16.909	Regional flooding (Veneto)
	2011	€722.5	€18.062	Regional flooding (Liguria and Tuscany)
Latvia	-	-	-	-
Lithuania	-	-	-	-
Luxembourg	-	-	-	-
Malta	2003	€30	€0.961	Major flooding (and storm)
Netherlands				
Poland	2010	€2,994	€105.567	Major flooding
Portugal	2010	€1,080	€31.256	Major mud and landslides (Madeira)
	2012	€25.7	Rejected	Regional mudslides (Madeira)
Romania	2005	€489	€18.798	Major flooding
	2005	€1,050	€52.4	Major flooding
	2008	€471.4	€11.785	Regional flooding
	2010	€875.75	€24.968	Major flooding
Slovakia	2004	€29	Rejected	Regional flooding
	2004	€203	€5.668	Major flooding (Tatras)
	2010	€649.9	€20.431	Major flooding

Table 3-8: Applications to and money granted from the EU Solidarity Fund for recovery measures by Member State				
Member State	**Year of flood event**	**Total direct damage (€ millions)**	**Funds received (€ millions)**	**Reasons for application**
Slovenia	2007	€233	€8.254	Major flooding
	2010	€251.3	€7.460	Major flooding
	2012	€360	€14.081	Major flooding
Spain	2004	€73	Rejected	Regional flooding (Malaga)
	2007	€18	Rejected	Regional flooding (El Hierro)
	2007	€66	Rejected	Regional flooding (La Mancha)
	2010	€709.7	Rejected	Regional flooding (Andalucia)
	2012	€409	Rejected	Regional flooding (Andalucia, Murcia, Valencia)
Sweden	-	-	-	-
UK	2007	€4,612	€162.387	Major flooding
TOTAL	**56 applications**	**€52,440**	**€1,815**	**N/A**

Sources:
Information on funding granted provided by: Inforegio (2013)
Information on funds granted and rejected applications supplied by DG REGIO for this study, and also given in the following document for 2002-2011: European Commission (2012)

3.4.2 Assistance provided within the Union Civil Protection Mechanism

The Union Mechanism for Civil Protection facilitates cooperation in civil protection assistance interventions following major emergencies, including flooding. The mechanism enables pooling of civil protection capabilities of participating states (which includes all 28 Member States) and making support available upon request. Table 3-9 provides a summary of requests for assistance between 2002 and 2013, assistance received, and actions and outcomes.

Table 3-9: Requests for assistance from the Monitoring and Information Centre via the Civil Protection Mechanism for flood events			
Member State	**Year**	**Requested assistance**	**Assistance received**
Bulgaria	2005	Several requests for assistance received and notifications distributed	
	2005	Second request for assistance	Assistance provided by several countries
	2006	Requested assistance	Offers from 7 Member States
	2012	-	-
Czech Republic	2002-2005	Assistance requested	Assistance delivered
France	2002	Requested satellite image No request for assistance	
	2003	High Capacity Pump (HCP)	Request processed and support facilitated
	2013	-	-
Germany	2003	No request	

Table 3-9: Requests for assistance from the Monitoring and Information Centre via the Civil Protection Mechanism for flood events			
Member State	Year	Requested assistance	Assistance received
Greece	2002	Requested assistance	Request handled
Hungary	2006	Requested assistance	Offers from 7 Member States
	2010	5 million sandbags	1,888,000 sandbags
Italy	2008	-	-
	2011	-	-
	2013	No request	
Poland	2010	17 HCP min 600m^3/h 20 slurry pumps min 300m^3/h 500 dryers	3 pumps 1 HCP module 180 people
Romania	2005	Request for assistance	In-kind assistance provided and expert assessment dispatched
	2005	Second request for assistance	Several countries provided assistance
	2006	Requested assistance	Offers from 10 Member States
	2008	200 power generators 500 modular kit houses (prefabricated houses) 11,000m of inflatable dikes 66,000m^2 geotextile	59 power generators 15,000m^2 geotextile
	2010	10km inflatable dams 120 pumps (100m^3/h) 10 power generators 20,000m^3 geotextile 10 WPU (500l/h) 100 life jackets 10 lighting kits	31 pumps 10 power generators 1 Water Purification Unit WPU) 9 pax team 8 light kits 26,000m^3 geotextile
Slovakia	2006	Request for assistance	Offers from 5 Member States
	2013	-	-
Slovenia	2007	-	-
Central Europe	2002	No request for assistance	Germany handled situation bilaterally
	2013	Germany requested assistance	Poland assistance awarded to Germany

3.4.3 Cohesion Policy

Funds under the Cohesion Policy include the Structural Funds (European Regional Development Fund and European Social Fund) and the Cohesion Fund.

Table 3-10 provides a summary of the Cohesion Policy funds by Member State for the 2007-2013 programme, based on funds allocated to risk prevention and/or measures to protect the environment and prevent risks. A total of €49 billion was available through the environmental protection and risk prevention theme for this programming period. Box 3-6 provides examples of projects from Bulgaria, Poland and Romania.

Table 3-10: Funds under Cohesion Policy 2007-2013 and allocated to projects by Member State				
Member State	Cohesion Policy (2007-2013): Risk prevention (€millions)		Cohesion Policy (2007-2013): Other measures to preserve the environment and prevent risks (€millions)	
	Total (adopted Ops)	Allocated to selected projects (AIR 2011)	Total (adopted Ops)	Allocated to selected projects (AIR 2011)
Austria	€9.6	€9.4	No project allocation recorded	
Belgium	No project allocation recorded		€7.2	No data
Bulgaria	€62.3	€49.5	No project allocation recorded	
Croatia	No data		No data	
Cyprus	No project allocation recorded		No project allocation recorded	
Czech Republic	€477.0	€161.2	€17.1	€31.5
Denmark	No project allocation recorded		No project allocation recorded	
Estonia	€38.3	€38.0	€67.1	€42.2
Finland	€1.9	€0.3	€13.8	€13.7
France	€164.7	€85.4	€92.4	€70.2
Germany	€400.0	€342.1	€124.4	€77.9
Greece	€296.0	€438.2	€82.8	€113.5
Hungary	€968.3	€1034.7	€362.8	€154.6
Ireland	No project allocation recorded		No project allocation recorded	
Italy	€451.0	€184.0	€101.6	€222.7
Latvia	€25.2	€7.7	€5.4	No data
Lithuania	No project allocation recorded		€73.7	€81.6
Luxembourg	No project allocation recorded		No project allocation recorded	
Malta	€38.4	€43.1	€4.1	€4.1
Netherlands	No project allocation recorded		€3.5	€2.3
Poland	€847.6	€488.3	€42.8	€32.3
Portugal	€504.5	€293.7	€69.8	€67.8
Romania	€240.7	€150.4	€143.3	€6.6
Slovakia	€140.0	€87.6	€124.8	€91.6
Slovenia	€97.5	€29.7	No project allocation recorded	
Spain	€495.4	€352.1	€40.8	€35.4
Sweden	No project allocation recorded		€1.1	No data
UK	€0.1	No data	€18.4	€4.4
Source: Spreadsheet provided by EC, DG Regio				

Box 3-6: Case study example: Projects under Cohesion Policy in Bulgaria, Poland, Romania and Slovakia

Bulgaria

The Cohesion Policy programme allocated €2.8 billion for protection of environment, investment in risk prevention and energy, which is the relevant theme for flood related investments.

In Bulgaria flood related projects under the cohesion and structural funds 2007-2013 are implemented within Objective 4: *Activation of regional and local technical and institutional opportunities and resources to implement the regional development policies.* The investments are made via the Ministry of Regional Development and Infrastructure.

The absorption of the funds available during the 2007-2013 programming period was limited. Flood related projects approved for CSF were:

- BG161PO001/1.4-06/2010 "Support for small-scale investments to prevent floods in urban agglomerations" : €21.176 million
- BG161P0001/4.1-04/2010 "Support for small-scale measures for flood prevention in 178 small municipalities": €15.241 million

Several pre-accession funds were available for flood protection investments in Bulgaria. The most important being:

- ISPA (Instrument for Structural Policies for Pre-Accession)
- SAPARD (Special accession programme for agriculture and rural development)
- PHARE (Poland and Hungary: Assistance for Restructuring their Economies), project example: Technical assistance flood forecasting and early warning systems Maritsa and Tundja Rivers, Bulgaria. Budget €0.150 million (2007-2008) (http://maritsa.meteo.bg/apache2-default/maritsa/indexbg.php)

Poland

According to the Operational Programme INFRASTRUCTURE AND ENVIRONMENT, The National Strategic Reference Framework for the years 2007-2013, managed by the Ministry of Regional Development, had a budget of €556.788 million was earmarked under priority axis 3, resource management and counteracting environmental risks.

The following types of projects were identified:

- Projects concerning protection against natural hazards: €40 million
- Created or modernised water management facilities: €6 million
- Number of new or modernised measurement posts or other environmental monitoring instruments: €170 million
- Number of newly built small retention facilities: €380 million
- Number of posts and specialist equipment used for analysis, forecasting and effective emergency response: €494 million

It is stated that additional funds under other (EU) programs and projects are more focused on the environment and will be used to support the financing.

Other planned projects are:

- Flood reservoirs Malzcyce (€82.91 million) and Swinna Poreba (€284.21 million)
- Odra 2006 program (Drypolder and Wroclaw Junction: €326.44 million)
- Wloclawec dam on Vistula (€440.44 million)

Romania

In Romania the planned and more or less realised flood related investments in the period 2007-2013 can be summarised as follows: €329 million for which €195 million is for flood protection and €134 million is for

Box 3-6: Case study example: Projects under Cohesion Policy in Bulgaria, Poland, Romania and Slovakia

coastal protection. The Ministry of Environment attracts the funds and the National Administration Apelor Romana (National Water Directorate) implements the projects.

Flood protection can be divided into:

- €49 million for 10 contracts to implement the EU Floods Directive (2007/60/EC) (that plan to prevent, protect and mitigate the effect of floods including flood hazard map development in the following basins): Someș-Tisa, Crișuri, Mureș, Banat, Jiu, Olt, Arges-Vedea, Buzău-Ialomița, Siret, Dobrogea-Litoral.
- WATMAN Integrated water management system, phase 1: €53 million from EU funds.
- Flood risk reduction Prut-Barlad €65 million (plans, maps and infrastructure).

Coastal erosion is related to the Black Sea only:

- Coastal erosion project: €6.5 million

Slovakia

100 flood protection measures were completed, undertaken or planned between 2002 and 2013. Total expenditure of dikes and pumping stations was €130 million, with €7.3 million for retention measures. Of the total expenditure of €140 million:

- €65.5 million was from the Council of Europe Development Bank
- €32.8 million from the Cohesion Fund (2002-2006)
- €29.4 million from the Cohesion Fund (2007-2013)
- €8.8 million from the European Regional Development Fund (2002-2006)
- €2.7 million from the European Regional Development Fund (2007-2013)
- €0.81 million was from the Instrument for Structural Policies for Pre-Accession (ISPA)

The five largest projects included:

- €32.8 million for flood protection for Bratislava town urban area (2007-2010; Cohesion Fund 2007-2013)
- €12.5 million for flood protection of the urban area of Záhor. Ves Suchohrad (1999-2004; Council of Europe Development Bank)
- €6.1 million for Váh river flood protection Kolárovo-Komoča (2009-2013; Cohesion fund 2007-2013)
- €4.6 million for increasing and stablising the Morava River dike (2001-2005; Council of Europe Development Bank)
- €4.1 million for Vel'ke Kozmárovce municipality regulation of flood discharges and sedimentation elimination in reservoir (2009-2012; Cohesion Fund 2007-2013)

Reference: Information collected through direct discussions and from European Commission Cohesion Policy for Bulgaria: http://ec.europa.eu/regional_policy/sources/docgener/informat/country2009/bg_en.pdf, and the Romanian Waters website: www.rowater.ro. Information for Slovakia taken from Anon (nd)

3.4.4 LIFE funds

Aggregated information on LIFE projects provides information on funds for 'environment policy and governance' and 'nature and biodiversity'. However, there is no readily accessible information on projects that are related to reducing flood risk. The data can only be obtained by considering each project in turn and with more than 2,100 projects for environment policy and governance, it has not been possible to undertake a comprehensive assessment for this study within the available timescale.

LIFE+ is an important source of funding for green infrastructure projects, as are ERDF and EAFRD (Pillar 2 of the Common Agricultural Policy). Of the 127 projects identified in a study by Naumann et al (2011), 77 projects were either fully or partially funded with EU financing[11]. Some project examples funded by LIFE are included in Section 3.7 (Tables 3-15 and 3-16).

3.4.5 Framework programmes

Table 3-11 provides details on the research programmes (under the 5th, 6th and 7th Framework Programmes). As data are not readily available on the funds provided to each partner country, the results are shown as a total for each programme with the number of projects that each country is involved in given as a sum across each of the programmes. All of the information is taken from the CORDIS database, with projects identified through searches for 'flood' and 'risk' and those projects that are related to flood risk reduction then being included within the total shown. As a result, it is likely that some relevant projects have not been picked up during the searches.

3.4.6 Other EU funds

This study has also looked at funds from a number of other sources including the European Agricultural Fund for Rural Development and the European Fisheries Fund. However, there is little if any information available at an aggregated level on how these funds have been used to help Member States co-fund investment in flood risk management. A small number of project examples have been identified illustrating use of these funds for flood risk management measures. These are presented in Table 3-12 as project examples.

[11] Based on those projects for which data on financing were available

Table 3-11: Summary of research projects in 5th, 6th and 7th Framework Programmes			
Member State	**5th Framework Programme**	**6th Framework Programme**	**7th Framework Programme**
No. projects found	23	20	39
Total cost	€43.5 million	€48.3 million	€110 million
Total EU funds	€26.9 million	€36.8 million	€85.0 million
Member State	**No. projects MS is involved in**	**No. projects MS is involved in**	**No. projects MS is involved in**
Austria	5	5	6
Belgium	2	4	8
Bulgaria	1	1	5
Croatia	0	0	0
Cyprus	1	1	2
Czech Republic	1	4	2
Denmark	6	1	5
Estonia	0	0	1
Finland	1	3	2
France	6	10	19
Germany	15	12	18
Greece	4	9	6
Hungary	2	4	3
Ireland	2	1	3
Italy	11	12	19
Latvia	0	0	2
Lithuania	1	0	1
Luxembourg	0	0	0
Malta	0	0	0
Netherlands	10	7	18
Poland	6	3	7
Portugal	4	4	5
Romania	2	3	2
Slovakia	2	2	2
Slovenia	1	1	2
Spain	8	9	18
Sweden	3	1	3
UK	11	12	26
Reference: Information taken from the CORDIS database: http://cordis.europa.eu/projects/home_en.html			

Table 3-12: Project examples of support from other EU funds for flood risk management projects			
Other EU Fund	**Member State**	**Project examples**	**Reference**
European Agricultural Fund for Rural Development	Bulgaria	€70 million available budget, but mainly for first afforestation and restoring forestry potential	Agrotec (2010)
	Greece	Funds on flood prevention measures through operational programme on Agricultural Development: actual investment €429 million (2000-2006)	GHK (2006)
	Hungary	€17.87 million (ARDOP, development and improvement of infrastructure connected to agriculture)	GHK (2006)
	Latvia	€1,748 million (2000-2006) but mainly focused on forestry following natural disaster	GHK (2006)
	Lithuania	€1.435 million (2000-2006) plus national co-finance of €0.524 million, but mainly focused on forestry following natural disaster	GHK (2006)
	Malta	Budgeted amount of €18.1 million (allocated to one project)	ADI associates (2010)
	Slovakia	€3.22 million (full cost €4.075 million) but mainly focused on forestry restoration following natural disaster	GHK (2006)
European Fisheries Fund	UK	£1.2 million (€1.4 million) provided for regeneration of Southwold Harbour of total costs of £3.2 million (€3.9 million), including work to strengthen the harbour walls under Priority Axis 3 (fishing ports, landing sites and shelters)	MMO (2012)
Other funds	Croatia	World Bank loan €105 million IPA community contribution €1.05 million (development of flood risk and flood)	World Bank (nd)
	Romania	€10 million from the Council of Europe Development Bank for period 2008-2010 (refundable)	Ministry of Environment and Forests (nd)

3.5 Investment made by Member States

The occurrence and recurrence of flooding across many Member States (see Section 3.1) has resulted in significant investment in many countries within the EU28. Table 3-13 provides a summary of average investments made per year by each Member State (more detailed information on investments can be found in Annex 4). In many cases, the data available are incomplete or inconsistent across Member States. This means that a total across the EU28 cannot be provided. The years over which data on expenditure and investment are available are also variable across Member States. The most complete data are for coastal flooding and erosion, from Policy Research Corporation (2009). This report provides data that enables some comparable information to be presented.

Table 3-13: Average investment in flood prevention by Member States

Member State	Total investment	Time period	Average annual investment	Flood risk covered	Reference
Austria	€1,859 million	2002-2011	€186 million	Not specified	Lebensministerium (2012)
Belgium	€419 million	1998-2015	€23 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Bulgaria	€18 million	1998-2015	€1 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Croatia	No data	No data	No data	No data	-
Cyprus	€15 million	1998-2015	€0.85 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Czech Republic	€98.6 million	Not specified	-	Preventative measures	GHK (2006)
Denmark	€315 million	1998-2015	€16.8 million (2002-2007) €18.6 million (projected, 2009-2015)	Coastal flooding and erosion	Policy Research Corporation (2009)
Estonia	€2 million	2002-2015	€0.2 million (2002-2007) €0.1 million (projected, 2009-2015)	Coastal flooding and erosion	Policy Research Corporation (2009)
Finland	Unknown, currently being evaluated regionally				
France	€79 million	2006-2013	€9.9 million	Flood Prevention Action Programmes (PARIs)	WMO & GWP (2011)
	€207 million	1998-2015	€11.5 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Germany	€2.3 billion	1998-2015	€128 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Greece	No data	No data	No data	No data	-
Hungary	€19.3 million	Not specified	-	Vásárhelyi Plan and other flood control	GHK (2006)
Ireland	Difficult to aggregate	2012-2016	€45 million	Continued funding for flood risk management and mitigation, capital programme	Ireland Stat (nd)

Table 3-13: Average investment in flood prevention by Member States					
Member State	**Total investment**	**Time period**	**Average annual investment**	**Flood risk covered**	**Reference**
Italy	€4.6 billion	1998-2015	€260 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Latvia	€70 million	2008-2015	€8.8 million	Prevention and reduction of flood risks	Minister for the Environment (2007)
	€1.4 million	1998-2015	€0.08 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Lithuania	€10.5 million	1998-2015	€0.6 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Luxembourg	No data	No data	No data	No data	-
Malta	€91 million	1998-2015	€5.1 million	Coastal flooding and erosion	Policy Research Corporation (2009)
	€71 million (€56 million from EU funds)	2010-2013	€18 million	Infrastructural works	Policy Research Corporation (2009)
Netherlands	-	To year 2050 2050-2100	€1.2 billion to €1.6 billion per year €0.9 billion to €1.5 billion per year	Implementation of Delta Programme	WMO & GWP (2011)
Poland	€443 million	1997-2003	€56 million	Funding for water management, including flood risk measures	National Audit Office (2007)
Portugal	€131 million	1998-2015	€7.3 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Romania	€730 million (€400 million secured from EU and international donors)	2004-2013	€73 million	Total needed to implement comprehensive overall master plan	World Bank (2004)
Slovakia	€63.8 million	2002-2013	€5.3 million	Flood security measures	Pers. Comm. (Ministry of Environment for the Slovak Republic)
Slovenia	€21 million	1998-2015	€1.2 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Spain	€935 million	1998-2015	€52 million	Coastal flooding and erosion	Policy Research Corporation (2009)
Sweden	€127 million	1998-2015	€7.1 million	Coastal flooding and erosion	Policy Research Corporation (2009)

Table 3-13: Average investment in flood prevention by Member States					
Member State	Total investment	Time period	Average annual investment	Flood risk covered	Reference
Sweden	-	1980s to 2005 2007-2009	€1.68 million €2.68 million	Annual budget for preventative measures against natural disasters (temporary increase to appropriation 2007-2009)	SCCV (2007)
UK – England	€2.7 billion	2011-2015	€0.54 billion	Flooding and erosion	HM Government (2013) House of Commons Environment Food and Rural Affairs Committee (2013)
UK – Northern Ireland	€18.6 million	2011/12-2014/15	€4.7 million	Flood defence capital works and drainage infrastructure	DARD (2011)
UK – Scotland	€255 million	2002/03-2007/08	€42.5 million	Cost of new flood prevention schemes	Scottish Parliament (2010)
UK – Wales	€36 million	2009-10	-	Maintenance	Environment Agency Wales (2010)

3.6 The case for investing in flood risk management

Information on the shortfall in investment, i.e. where investment needs are not being met, is difficult to identify. Without knowledge of the types of measures that need to be implemented to address current and future flood risks, it is difficult to predict what, if any, additional future investment needs might be. In addition, there are increasing moves towards working more with natural processes and use of green infrastructure rather than building new embankments and dikes. Information on the costs and benefits of adaptation can be used to give an indication of the economic worth of investment in flood risk management. Table 3-14 provides estimated costs of adaptation for a small number of Member States where these data were found and, where possible, compares them against the projected damages to identify the potential benefit-cost ratios. Table 3-14 shows that, where the necessary cost and benefit data are available, the benefit-cost ratios of adaptation are high to very high. This is supported by various reports, including:

- EFDRR (2013): each €1 spent on flood protection could save €6 in damage costs, giving an average benefit-cost ratio of 6.
- Environment Agency (2009) (UK only): each £1 spent on flood protection returns £8 in benefits, giving an average benefit-cost ratio of 8.

While countries such as the Netherlands identify the need for high levels of investment in flood risk management through the Delta Programme, they also recognise the need for economic efficiency. Box 3-7 presents work undertaken to identify the optimal flood protection standards for all dike ring areas in the Netherlands.

Box 3-7: Case study example: Identifying optimal flood protection standards in the Netherlands
Existing flood protection standards for dike ring areas along the Rhine and Meuse were set based on the advice of the Commissie Toetsing Uitgangspunten Rivierdijkversterking in 1993. Concerns over the environmental damage caused by dike improvement projects resulted in standards of 1:500 and 1:1250 being assessed, and no higher standards. The flood protection standards on all rings were made statutory in 1996 and, since then, every six years the defences are tested to see if the standards are met. A review of Dutch national flood risk management policy in 2004 asked the question of whether the policy helped obtain the objective of a safe and habitable Netherlands. This required a critical review of the level of the existing protection standards. This included an analysis of economic damages and fatality risk, and resulted in the conclusion that the existing legal protection standards did not properly reflect the economic damages in the dike ring areas. A cost-benefit analysis for the Room for the River project was undertaken in 2005 to help ensure that the flood protection standards could be met. The study included a novel approach to determine the economically efficient flood protection standards for dike ring areas and development of a dike optimisation model. This concluded that the current legal flood protection standards were on average economically efficient but that further research was required. The appointment of the second Delta Committee in 2008 resulted in recommendations to increase the flood protection standards of all dike rings by (at least) a factor of 10. The recommendation was based on the increase in value of the dike ring areas, but was not based on an analysis of the costs and benefits of flood protection. A research project was launched to determine economically efficient (optimal) flood protection standards for all dike rings in the Netherlands. The cost-benefit analysis is based on the costs and benefits of dike reinforcements as this is generally the cheapest structural measure to reduce flood risks in the Netherlands. The damages included financial and economic losses, but also intangible damages such as impacts on nature, landscape and cultural heritage and impacts on people, including loss of life. The outcome of the research was that the recommendation to increase flood protection standards by (at least) a factor of 10 was not supported.
Reference: Kind JM (2013): Economically efficient flood protection standards for the Netherlands, Journal of Flood Risk Management, doi: 10.1111/jfr3.12026.

Table 3-14: Costs of adaptation measures and damages avoided				
Member State	**Adaptation costs**	**Damages avoided**	**Projected benefit-cost ratio**	**Reference**
Greece	Breakwaters: €381.6 million to €3,346 million Expenditure for protection of coastal systems: 2025-2050: €1,864 million 2050-2070: €1,482 million Expenditure for raising the level of breakwaters in ports: 2025-2050: €600 million Total (not summed in report, assumed undiscounted: €3.95 billion)	Damages to housing and tourism €348 billion (0.5 m sea level rise) to €631 billion (1m sea level rise) 60% to 70% of the impact of climate change is avoided (€209 billion to €442 billion)	Very high benefit-cost ratios based on information given, not clear that costs and benefits can be directly compared	Bank of Greece (2011)
Netherlands	2040: €9 billion 2100: €46 billion Excludes costs of upgrading the existing flood protection systems	2040: €400 to €800 billion 2100: €3,700 billion	Difficult to compare costs and benefits as amount of damages reduced by protection measures is not known and costs exclude upgrade of current defences	Aerts et al (2008)
		2050: €4.5 million per year 2100: €6.95 million per year	Median benefit-cost ratios range between 2.1 and 2.9 (for raising elevation of buildings), 4.9 to 8.0 (dryproofing) and 2.8 to 6.7 (wetproofing) Benefit-cost ratios even higher with adaptation measures taken on new buildings (9 to 23 for elevation, 4.9 to 8.0 for dryproofing, 2.8 to 6.7 wetproofing)	De Moel (2013)

Table 3-14: Costs of adaptation measures and damages avoided				
Member State	**Adaptation costs**	**Damages avoided**	**Projected benefit-cost ratio**	**Reference**
Sweden	Cost of additional repairs estimated at €980 million to €1.4 billion by 2100. Cost of preventing 50% of the damages estimated at €220 million to €380 million Costs of preventing serious erosion and flood damage on roads increasing to €110 million to €220 million) (but uncertain)	Low scenario: €8.8 billion High scenario: €12 billion 50% of damages avoided: Low scenario: €4.4 billion High scenario: €6 billion	Very high benefit-cost ratios based on costs and benefits of avoiding 50% of damages: Low scenario: 20 High scenario: 16	SCCV (2007)
UK (England and Wales)	Costs of £1 billion to £2 billion per year for river and coasts (very approximate estimates of capital sums needed (£20 billion to £70 billion) spread over the next 50 years) Capital costs to achieve risk reduction of £500 million per year to £1.6 million per year (2080s)	2080: £1 to £12 billion per year Risk reduction per year: £570 million to £18,700 million	Based on annual capital costs to reduce risk and EAD of benefits: Local stewardship scenario: 1.1 Global sustainability scenario: 5.6 National enterprise scenario: 8.8 World markets scenario: 11.7	National Audit Office (2007) Evans et al (2008)
UK (all)	No costs given	2060: £11 to £17 billion per year assuming a linear increase in damage cost over time	Not possible to estimate	Morris & Camino (2011)
EU-wide ClimateCost (coastal)	2080s: A1B(I) mid scenario: €1.6 billion per year E1 mid scenario: €0.7 billion Hard adaptation has been the dominant form of	A1B(I) scenarios: 2020s: €5.2 billion per year 2050s: €10.6 billion per year 2080s: €25.4 billion per year E1 scenarios: 2020s: €5.6 billion per year	Very high benefit-cost ratios: A1B(I): 13 E1: 21	Brown et al (2011)

Table 3-14: Costs of adaptation measures and damages avoided				
Member State	**Adaptation costs**	**Damages avoided**	**Projected benefit-cost ratio**	**Reference**
	protection around the EU (96% of costs as sea dikes)	2050s: €11.7 billion per year 2080s: €17.4 billion per year (mid estimates, undiscounted, 2006 values) Avoided damages 2080s: A1B(I): €21.1 billion E1: €14.7 billion Approx. 70% of damages can be avoided		
EU-wide ClimateCost (river flooding)	Costs of adaptation: A1B scenario: 2020s: €1.1 billion per year (climate change only) to €1.7 billion per year (climate change and socio-economic change) 2050s: €1.4 to €3.4 billion per year 2080s: €2.4 to €7.9 billion per year E1 scenario: 2020s: €0.8 billion per year (climate change only) to €12 billion per year (climate change and socio-economic change) 2050s: €1.1 to €3.2 billion per year 2080s: €1.1 to €4.7 billion per year	2020s: €20.4 billion per year 2050s: €45.9 billion per year 2080s: €97.9 billion per year (2006 values, undiscounted) Damages avoided: A1B scenario: 2020s: €8 billion per year 2050s: €19 billion per year 2080s: €50 billion per year (2006 values, undiscounted)	Suggests high benefit-cost ratios for A1B scenario of: 2020s: 4.7 to 7.3 2050s: 5.6 to 7.9 2080s: 6.3 to 21	Feyen & Watkiss (2011)

3.7 Investment in green, grey and soft infrastructure

As well as identifying what future investments needs might be, many Member States are already implementing measures to reduce flood risk. These include projects based on building new defences (embankment, dikes and walls) but also looking to restore river floodplains and create room for rivers. This section discusses some of these projects, by Member State, including (where available) the costs and benefits to people, to properties, and to ecosystem services. The different types of action can be defined as relating to grey or green infrastructure, or soft approaches, with these terms defined below (based on EEA, 2012):

- **Grey infrastructure**: physical interventions or construction measures that use engineering services to make buildings and infrastructure essential for the social and economic well-being of society more capable of withstanding extreme events.
- **Green infrastructure**: contribute to the increase of ecosystems resilience and can halt biodiversity loss, degradation of ecosystem and restore water cycles. At the same time, green infrastructure uses the functions and services provided by the ecosystems to achieve a more cost effective and sometimes more feasible adaptation solution than grey infrastructure.
- **Soft approaches**: design and application of policies and procedures and employing, inter alia, land-use controls, information dissemination and economic incentives to reduce vulnerability, encourage adaptive behaviour or avoid maladaptations. They require careful management of the underlying human systems.

Table 3-15 provides case study projects that have been identified by Member State including, where available, information on costs and benefits and the type of infrastructure and approaches utilised. The projects set out in Table 3-15 are examples of the types of projects being carried out in each Member State. The large number of projects that have been delivered or are being planned across the EU28 means it is not possible to record information on all projects.

For those projects listed in Table 3-15 as having an element of green infrastructure, Table 3-16 provides an overview of the type of ecosystem services that may be delivered. Where possible, quantitative information is provided (for example, on the area of habitat) along with any monetary estimates of the value of those ecosystem services. However, very limited quantitative information and very few monetary values have been found for benefits to ecosystem services.

Further details on each of these projects can be found in the country fiches (Annex 1).

As well as project examples, this study has also looked for information on the costs and benefits of green infrastructure projects versus those of grey infrastructure projects. Box 3-8 provides an overview of the costs of green infrastructure and highlights that the high initial upfront costs could be a barrier to uptake of green infrastructure options without additional funding. Box 3-9 provides a summary of project examples that have been found that compare the costs of green infrastructure projects with those of grey infrastructure. Box 3-10 provides an example from the Netherlands that considers the difference in costs between eco-variants of embankments compared with traditional variants. Box 3-11 provides an example from Germany that quantifies the ecosystem services benefits provided by dike relocation.

Green infrastructure for flood protection does not yet exist in many countries, for example, Poland and Romania. Here, infrastructural measures tend to be directed towards technical measures such as dike improvement and dam rehabilitation. Green measures might become more relevant after the flood risk management plans are finished (following completion of step 3 of the EU Floods Directive, 2007/60/EC).

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	Project	Grey	Green	Soft	Investment made	EU funds	References
Austria	Restoration of the Danube alluvial floodplain and riverbanks	None reported	Reconnection of side channels by removing dams and weirs Removal of 3km of hard river bank enforcement(1)	None reported	€4.6 million(2)	€2.1 million (LIFE)(2)	1 Natura2000 exchange.eu 2 Mohl (nd)
Belgium	SIGMA Plan II	None reported	The creation of estuarine nature with muds and marshes and the creation of wetlands, dike realignment	None reported	€521 million (2006-2030)	None	De Nocker & Mazza (nd)
Bulgaria	Water Management and Flood Protection in Trakiets Village, Haskovo Municipality	Correction of Olu Dere river bed and construction of protective dike(1)	Afforestation(1)	Experience exchange visits and planning of future joint water management initiatives(1, 2)	€0.598 million(2)	None reported	1 Keep (nd) 2 European Territorial Cooperation Programme – Greece-Bulgaria 2007-2013 (nd)
Croatia	Reconstruction project for Eastern Slavonia, Baranja and Western Srijem	Repair of 140 km of levees	804km of primary and secondary canals cleared	None reported	€54.6 million	None	World Bank (2005)
Cyprus	SATFLOOD project	None	None	Development of digital maps of urban development and flood mapping in order to create flood hazard maps	No data found	European Regional Development Fund	Technological University of Cyprus (2014)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	**Project**	**Grey**	**Green**	**Soft**	**Investment made**	**EU funds**	**References**
Czech Republic	Strategy for protection against floods	Construction or maintenance of reservoirs and dams, increase in flow capacity of watercourse channels, protective dams, discharge channels, etc. (1)	De-sludging and upgrading of existing pond systems to better utilise them for retention of flood waters(2)	None reported	€750 million (2002-2012)(3)	None	[1] European Investment Bank (2006) [2] European Investment Bank (2006a) [3] Climate Finance Options (nd)
Denmark	Flood-proof an area around a river	An emergency pump will be installed at Ishøj Harbour to pump river water over the sluice during prolonged high water levels	To avoid flooding of residential neighbourhood, controlled flooding will be performed on the marsh	None reported	DKK 40 million (€5.4 million) (plans began in 2013)	None	Climate Change Adaptation (2013)
Estonia	Low-cost shoreline management for a large harbour city and adjacent eroded shorelines	Construction of seawall/slope protection at Tallinn-Pirita, Pringi-Puunsi and Kakumae	Re-vegetation of forestry to reduce erosion, nourishment of Pirita beach	None reported	€2,500/ha for coastal forest maintenance €70,000 for cost of seawall/slope protection	No data	Povilanskas et al (2002)
Finland	'Stormwater': in search of better stormwater management	In Kouvola a large barrier structure is being tested to see if it can prevent flooding	In Lahti a terrain structure is being tested which will absorb and delay water before it reaches the lake	None reported	€1.54 million (2008-2030)	€1.08 million (ERDF)	The EU Unit for Southern Finland (nd)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	**Project**	**Grey**	**Green**	**Soft**	**Investment made**	**EU funds**	**References**
France	Projet d'amenagement de la Bassée	Creation of 10 'lockers' by 58km of embankments, to provide 2,300ha of water storage(1)	Green/bio-engineering techniques have been explored along 50-70% of the line(2)	Inform and educate on the risks(3)	~€500 million (estimated cost of total project)(1) Annual cost of operation €4.95 million(1)	€1.42 million (ERDF) (4)	[1] Seine Grands Lacs (2013) [2] Seine Grand Lacs (nd) [3] Seine Grand Lacs (2010) [4] NW Europe (nd)
Germany	River Elbe dike relocation project	Creation of polders considered	Potential for up to 26,000ha of dike relocation	None reported in project	€407 million (dike relocation)	Application for LIFE funding declined	Teichmann & Berghöfer (2010)
Greece	Re-arrangement of Eshatia river bed from Iliou square to the junction with the Efpiridon pipeline	3,300m anti-flood culvert	A small stream is being constructed on top of the culvert, on both sides of which will be green areas, trails and bike paths	None reported	€84 million (2013)	€71 million (ERDF)	European Commission (2013)
Hungary	Sustainable use and management of rehabilitation of floodplain in the Middle Tisza District	Clack valves and a culvert were constructed	Habitat restoration (forest restoration and destruction of alien species), clay pit restoration, floodplain channels were excavated	None reported	€1.399 million (2003-2007)	€0.69 million (LIFE III)	DG Environment (2009)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	**Project**	**Grey**	**Green**	**Soft**	**Investment made**	**EU funds**	**References**
Ireland	Greater Dublin Strategic Drainage Study, River Tolka	Construction of embankments and culverts. Widening and deepening of river channels	No data	A more effective flood forecasting system relying on linking weather radars, rainfall stations, river/tidal gauging stations and eyewitness accounts	€32.3 million (€100,000 per year maintenance costs)	None	Dublin City Council (nd)
Italy	Risk reduction and environmental rehabilitation of the Sarno River, Campania	Construction and hydraulic works, construction of storage reservoirs and adaptation of existing reservoirs	Environmental rehabilitation along the river banks and canal network; construction of flood control areas	Monitoring and civil protection measures	€217.5 million	€150.6 million (ERDF)	European Commission (2014)
Latvia	HydroClimate Strategy Riga	None reported	None reported	Provision of a flood risk management plan for Riga City and implementation of public awareness events	€0.66 million (2010 to 2012)	€0.33 million (LIFE+)	Life Programme (nd)
Lithuania	Creating Flood Emergency Response Team in Latvia and Lithuania Cross Border Region	Effective equipment for pumping water	None reported	Training and exchanges of information to deal with floods	€1.16 million (2011-2013)	€0.989 million (ERDF)	Latvia-Lithuania Programme (2008)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	Project	Grey	Green	Soft	Investment made	EU funds	References
Luxembourg	Ecologically oriented flood protection in the River Sauer/Sûre in Ralingen (Germany) and Steinheim (Luxembourg)	None reported	Aimed to introduce flood control measures in as natural a manner as possible, existing artificial embankments were largely removed(1)	Cooperation in disaster response, workshops for local residents(1)	€5.92 million(1) (estimated €3.1 million in Steinheim)(2)	€1.77 million (ERDF, INTERREG IV)(1)	[1] Grand-Duché de Luxembourg (2012) [2] Ökologisch orientierter Hochwasserschutz Steinheim/Ralingen (2009)
Malta	National Flood Relief Project	Network of 65km[2] underground tunnels, canals and bridges to provide storm drainage	None reported	None reported	€62.5 million (2007-2013)	€44.9 million (Cohesion Fund)	European Commission (nd)
Netherlands	The Sand Engine (Sand Motor)	None reported	Sand deposited on the beach and ocean currents gradually distribute it(1) Includes a lake(2)	None reported	€70 million (2011)(1)	None	[1] Katz (2013) [2] Rijkswaterstaat and Deltares (2011)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	Project	Grey	Green	Soft	Investment made	EU funds	References
Poland	Wroclaw Floodway System	Increase capacity of diversion structure and channel, improve embankments and removal of material to increase river capacity[1] Creation of the Bukow Polder and Raciborz Polder, which act as water storage areas[1, 2]	None reported	Improved flood forecasting and warning systems[1]	Over US$ 400 million[1] (€290 million)	US$ 130 million[3] (€90 million)	[1] Jha et al (2011) [2] DHV Hydroprojekt (nd) [3] World Bank (2014)
Portugal	HIDRALERTA – Flood Forecast and Alert System in Coastal and Port Areas	None reported	None reported	Development of a forecast, alert and long-term risk analysis system to enable more effective mitigation and management of coastal flood events[1]	€0.16 million[2]	None reported	[1] Rospeiro P et al (2013) [2] CITI (2012)
Romania	Implementation of a plan for flood prevention, protection and mitigation in Argeș-Vedea basin	None reported	None reported	Surveying, mapping and production of flood prevention plans	€2.8 million (2011-2014)	No data	Rowater (nd); Rowater (nda)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	**Project**	**Grey**	**Green**	**Soft**	**Investment made**	**EU funds**	**References**
Slovakia	Bratislava Flood Protection Project, Danube and Morava Rivers	Construction of flood protection lines along various sections of the Danube and Morava Rivers (consisting of concrete walls and earth dikes)[1, 2]	None reported	None reported	€32.7 million[1]	€26.6 million (Cohesion Fund)[2]	[1] ICPDR (2009) [2] Hirnerová & Sabo (2010)
Slovenia	Upgrade of the system for monitoring and analysing the water environment in Slovenia (BOBER)	None reported	None reported	Constructing new or upgrading existing precipitation stations and weather radar and installing flood forecasting systems for the Sava and Soča Rivers	€32.7 million	€27.8 million	European Commission (2013)
Spain	AQUAVAL retrofitted SUDS in Valencia	Re-paving of areas with porous concrete	Construction of retention-infiltration basins, wetland areas, vegetated swales and installation of green roofs	None reported	€1.2 million	€1.2 million (LIFE)	Perales-Momparler et al (2013)

Table 3-15: Flood protection project examples by type (grey, green and soft)							
Member State	Project	Grey	Green	Soft	Investment made	EU funds	References
Sweden	Ekostaden Augustenborg Flood Prevention (Malmo)	Open storm water system (including canals and ponds)[1]	Creation of ponds and wetlands to act as storage areas for rain water (increase in green spaces). Green roofs have been installed on all developments built post 1998 to intercept rain water and aid in flood prevention[1, 2]	None reported	SEK 200 million (€23 million)[1, 3]	SEK 6 million (€0.68 million) from the EU LIFE programme[1, 3]	[1] Kazmierczak & Carter (2010) [2] City of Malmo (2013) [3] Malmo Stad (nd)
UK	Medmerry managed realignment scheme	Realignment of the existing shingle bank and construction of a 7km earth embankment[1]	Formation of 183 ha of intertidal habitats and 80 ha of new transitional grassland[1]	None reported	£20 million (€24 million) design and construction £9 million (€11 million) land purchase[2]	None reported	[1] Higuchi et al (2013) [2] Gilham & Maplesden (2013)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Austria	Restoration of the Danube alluvial floodplain and riverbanks	Restoration of wetlands that had been drying up	Restoration of natural dynamics to Danube floodplain	None reported	None reported	Allows river to erode river banks, reducing energy	Reconnection of river to floodplain; improvement to waterway navigation	Natura2000 exchange.eu
Belgium	SIGMA Plan II	Creation of estuarine nature with muds and marshes and the creation of wetlands	Reducing nutrient emissions: €130 million	None reported	None reported	None reported	Flood protection benefits: €740 million. Recreational benefits: €22 million	De Nocker & Mazza (nd)
Bulgaria	Water Management and Flood Protection in Trakiets Village, Haskovo Municipality	Afforestation activities will lead to habitat creation and likely enhancement of local biodiversity(1, 2)	None reported	Afforestation is likely to increase soil stability	None reported	Flood protection measures should help prevent environmental damage(1, 2)	Improved flood protection and water management (including trans-border water management(1, 2)	[1] European Territorial Cooperation Programme – Greece-Bulgaria 2007-2013 (nd) [2] Keep (nd)
Croatia	Reconstruction project for Eastern Slavonia, Baranja and Western Srijem	The population of a number of species increased during the project life	None reported	None reported	Rebuilding of the Vinkovic waste water treatment plant	None reported	Net Present Value of the project US$17.5 million (€ 14 million)	World Bank (2005)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Cyprus	SATFLOOD project	None reported	None reported	None reported	None reported	Project aims to assist with reduction of future flood risks	Project will create flood hazard maps and assist in reduction of risk to people, property and the environment	Technological University of Cyprus (2014)
Czech Republic	Strategy for protection against floods	None reported	None reported	None reported	None reported	None reported	None reported	-
Denmark	Flood-proof an area around a river	Preserving the grazing area by Vallensbaek Marsh	Establish flood retention basins to treat the stormwater before discharge	None reported	None reported	None reported	None reported	Climate Change Adaptation (2013)
Estonia	Low-cost shoreline management for a large harbour city and adjacent eroded shorelines	None reported	None reported	None reported	None reported	Works to maintain the socio-economic functions of the coast	Total capital at risk €0.4-0.6 million if coastal erosion remains the same. If it increases capital at risk increases to €20-40 million	Povilanskas et al (2002)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Finland	'Stormwater': in search of better stormwater management	Better use of green space in cities	The quality of stormwater is being analysed with a view to using it to water plants	None reported	None reported	Lower risk of flooding	None reported	The EU Unit for Southern Finland (nd)
France	Projet d'amenagement de la Bassée	Restoration and maintenance of the wetlands of the Bassée	None reported	None reported	None reported	Reduces vulnerability of the land	Damages avoided of €17 billion	Seine Grand Lacs (ndb)
Germany	River Elbe dike relocation project	€924 million (restoration of riparian ecosystem)	Not quantified	Not quantified	€488 million (nutrient retention)	€177 million (flood damages avoided)	None reported	Teichmann & Berghöfer (2010)
Greece	Re-arrangement of Eshatia river bed from Iliou square to the junction with the Efpiridon pipeline	None reported	Includes reconstruction of water supply, sanitation and storm-water networks	None reported	None reported	116,000 local residents expected to benefit from flood protection	Implementation of project expected to create 712 jobs	European Commission (2013)
Hungary	Sustainable use and management of rehabilitation of floodplain in the Middle Tisza District	Wetland habitats and spawning ponds were created for the river's fish population	None reported	None reported	None reported	None reported	Establishment of new job opportunities	DG Environment (2009)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Ireland	Greater Dublin Strategic Drainage Study, River Tolka	None reported	None reported	None reported	None reported	Potential damage to aquatic and riparian habitats due to channel widening and deepening	€34.5 million	Dublin City Council (nd)
Italy	Risk reduction and environmental rehabilitation of the Sarno River, Campania	Rehabilitation of river banks; creation of new flood control areas could improve habitat value(1)	Storage of water plus opportunity for water purification during storage(1)	Flooding could improve local soil quality, although high levels of pollutants in the river could reduce soil quality(2)	None reported	Flood risks reduced in an area that has been regularly flooded over 20 years(1)	900,000 people benefiting from reduced flood risk; 240 jobs expected to be created	[1] based on European Commission (2014) [2] based on Albanese S et al (2012)
Latvia	HydroClimate Strategy Riga	None reported	None reported	None reported	None reported	Provides solutions to prevent the negative effects of flooding	None reported	Life Programme (nd)
Lithuania	Creating Flood Emergency Response Team in Latvia and Lithuania Cross Border Region	None reported	None reported	None reported	None reported	More effective response to floods	None reported	Latvia-Lithuania Programme (2008)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Luxembourg	Ecologically oriented flood protection in the River Sauer/Sûre in Ralingen (Germany) and Steinheim (Luxembourg)	Creation of new structures for floodplain flora and fauna(1)	None reported	None reported	None reported	Specific local areas were largely unaffected during the January 2011 flood(2)	None reported	[1] Grand-Duché de Luxembourg (2012) [2] Ökologisch orientierter Hochwasserschutz Steinheim/Ralingen (2009)
Malta	National Flood Relief Project	None reported	Pilot project exploring the possibility of re-use of storm water from urban and rural areas	None reported	None reported	None reported	None reported	European Commission (nd)
Netherlands	The Sand Engine (Sand Motor)	Reduced frequency of beach nourishment will allow nature systems to recover	None reported	None reported	None reported	Problems associated with dredging the sand	Coast no longer requires replenishment every 5 years, Sand Engine will feed beaches for about 20 years at half the price	Katz (2013)
Poland	Wroclaw Floodway System	None reported	None reported	None reported	None reported	The drying up/flooding of polders may impact established habitat	None reported	Jha et al (2011)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Portugal	HIDRALERTA – Flood Forecast and Alert System in Coastal and Port Areas	Better forecasting should help to more effectively mitigate the environmental damages caused by coastal flooding	None reported	Better forecasting should help to more effectively mitigate the impacts caused by coastal flooding to soil	None reported	None reported	Forecast overtopping and flood events in coastal and port areas to enable more effective management decisions and mitigation measures	Rospeiro et al (2013)
Romania	Implementation of a plan for flood prevention, protection and mitigation in Argeș-Vedea basin	None reported	None reported	None reported	None reported	None reported	None reported	Rowater (nd); Rowater (nda)
Slovakia	Bratislava Flood Protection Project, Danube and Morava Rivers	None reported	None reported	None reported	None reported	None reported	None reported	-

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
Slovenia	Upgrade of the system for monitoring and analysing the water environment in Slovenia (BOBER)	None reported	Improved monitoring should allow better management of resources	None reported	None reported	Contributes to decreasing response times to flood disasters, enabling better flood predictions and preparation	None reported	European Commission (2013)
Spain	AQUAVAL retrofitted SUDS in Valencia	Creation of bio-retention zones and green roofs considered to enhance local biodiversity(1)	Prevention of sewage overflow will improve water quality within the Albaida and Turia rivers(1)	None reported	Measures will reduce the frequency of overflows from each of the towns sewage networks(2)	None reported	None reported	[1] Perales-Momparler et al (2013) [2] European Commission (2013)
Sweden	Ekostaden Augustenborg Flood Prevention (Malmo)	Creation of ponds, wetlands and installation of green roofs has increased habitat and biodiversity of the area (1, 2)	The increased capacity of the new open SUDS should prevent untreated water from entering watercourses(1)	None reported	The green roofs provide insulation and reduce urban heat islands(3)	Reduced flood risk	None reported	[1] Kazmierczak & Carter (2010) [2] DAC & Cities (2014) [3] City of Malmo (2013)

Table 3-16: Ecosystem service benefits delivered by flood protection projects								
Member State	**Project**	**Biodiversity, flora, fauna, landscape**	**Water quality and resources**	**Soil quality and resources**	**Waste production, generation, recycling**	**Likelihood of environmental risks**	**Other benefits**	**References**
UK	Medmerry managed realignment scheme	Creation of intertidal habitat and transitional grassland(1)	None reported	None reported	The scheme will help protect a wastewater treatment works(1)	None reported	£90 million direct benefits (€110 million)(2) Protection of local road links, and electricity substations)(1)	[1] Higuchi et al (2013) [2] Gilham & Maplesden (2013)

Box 3.8: Case study example: The costs of green infrastructure
The Design, Implementation and Cost Elements of green infrastructure (DICE) project identified 127 projects, the majority of which (84%) were implemented in the EU15, but all EU27 were covered by at least one green infrastructure project. Most of the projects took place in rural areas or urban fringe locations. About 50% of the projects were embedded in a regulation and planning framework and are based on specific strategies and plans. Information on costs was available for 90 of the 127 projects. Most projects had a budget of between €0.5 and €5.0 million, with five very large projects with an overall budget of more than €25 million. All of these very large projects were in the UK. Average project value was €8.15 million. The largest elements of one-off costs for the six in-depth studies relate to land management and restoration works, typically at 43% of the overall total, followed by land purchase (21%), project management and administration (12%), and compensation payments (10%). Costs associated with buildings and infrastructure (6%), planning, surveying and preparatory studies (3%), creation of connectivity features (2%) and other/unspecified (3%) make up more minor proportions of total costs. In terms of recurrent costs, it is land management, buildings and maintenance (68%) that is the major cost, followed by project management and administration (25%). All other costs are much smaller: transport, equipment and fuel (3%), communications and education (2%), research and monitoring (2%), and rent (1%). Overall, it was found that green infrastructure projects have a high proportion of capital costs which are incurred up-front, with benefits that are delivered into the future. As a result, the creation, restoration and maintenance of green infrastructure projects often require substantial investment. This highlights the importance of taking account of the future flow of benefits when appraising green infrastructure projects, but also identifies that funding opportunities may be important in encouraging uptake of green infrastructure projects.
Reference: Naumann S et al (2011): Design, implementation and cost elements of Green Infrastructure projects, Final report to the European Commission, DG Environment, Contract no. 070307/2010/577182/ETU/F, 1, Ecologic institute and GHK Consulting, accessed at: http://ec.europa.eu/environment/enveco/biodiversity/pdf/GI_DICE_FinalReport.pdf on 31 January 2014.

Box 3-9: Case study example: Comparison of the costs of green and grey infrastructure
Surface water runoff had been increasing since expansion of the city at Nummela, Finland. Management of surface runoff via natural means (through wetland restoration) was found to be more sustainable and cost-effective than man made solutions. The approach also resulted in recreational benefits. The restoration costs for 1ha of wetland were €62,000 (including infrastructure for recreation) versus costs of €50,000/100m of man made infrastructure[1]. Providing flood storage at Alkborough Flats, Humber Estuary, England, made it possible to defer investments to other flood defences upstream that would otherwise be needed sooner. This resulted in many millions of pounds in savings which could then be used to provide flood protection elsewhere. In addition, the benefits from natural hazard regulation were estimated at £12.3 million (€14 million) (discounted over 100 years)[2].
References: [1] Kettunen M (2011): Water, ecosystem services and nature: putting the 'green' into green economy, paper presented at the Stockholm World Water Week: Water and Green Growth: Examining the Links, 23 August 2011, Stockholm, accessed at: http://www.worldwaterweek.org/documents/WWW_PDF/2011/Tuesday/T5/Water-and-Green-Frowth-Examing-the-Links/Water-ecosystem-services-and-nature.pdf on 31 January 2014. [2] Environment Agency (2009b): Ecosystem services case studies, report by Everard M, SCH00409BPVM-E-P, accessed at: http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/scho0409bpvm-e-e.pdf on 31 January 2014.

Box 3-10: Case study example: Costs and benefits of green infrastructure in the Netherlands

A cost-benefit analysis conducted by Royal Haskoning on behalf of Rijkswaterstaat focuses on ecological variants of dikes or embankments as opposed to traditional flood defence. Three cases are assessed to identify whether the ecological variant of the flood defences saves costs as compared to conventional dikes. The three cases include two 'fresh-water' and one 'salty' example: 'Markermeer'-embankment, the 'Noordwaard' and the 'Oesterdam'. The benefits of the ecological variants were not estimated. The results are expressed in net present value in €/m [m = (running) metre] for the eco-variant relative to the traditional variant, as shown below.

Case	Variant	Net present value & management and maintenance (€/m)	Construction costs (€/m)	Management and maintenance (€/m/year)	Uncertainty
Markermeer	Embankment ("reed-land")	2,000 – 3,500 cheaper	2,250 – 3,550 cheaper	2.5 – 10 more expensive	40%
	Embankment ("balanced")	2,500 cheaper	2,750 cheaper	7 more expensive	Not specified
Noordwaard	Gentle slope; with osier	1,500 cheaper	1,550 cheaper	2 more expensive	25%
Oesterdam	Salt marshes	16 to 875 cheaper	540 more expensive to 414 cheaper	5 – 10 more expensive	25%

The results shown that the eco-variants are less expensive than traditional variants over the longer term (net present value) and in terms of construction costs. They are more expensive in terms of management and maintenance costs alone.

Reference:

Rijkswaterstaat Waterdienst (2011): Meerwaarde Levende Waterbouw: Een maatschappelijke kostprijsanalyse, report by Royal Haskoning, 's-Hertogenbosch.

Box 3-11: Case study example: Costs and benefits of dike relocation in Germany

An assessment by Grossmann et al (2010 in Teichmann & Berghöfer, 2010) compared various flood protection options for the river Elbe:

- To relocate selected dikes, thereby enlarging the river bed
- To establish flood polders, specially designed flood retention areas that can be opened for flooding on demand
- A combination of the above

The benefits of the options include damages avoided and also ecosystem service benefits of nutrient retention through water purification function by biological decomposition, and biodiversity and riparian habitat benefits. Benefits from nutrient retention are based on replacement costs (cost of a waste water treatment plant if the ecosystem services were lost), while the benefits of restoration of the riparian ecosystem are based on willingness to pay for biodiversity value.

The project costs include planning, construction, communication, and compensation payments for those who would need to be resettled. The costs and benefits for three options are shown below as €millions over 90 years using a discount rate of 3%.

Option	Project costs (including maintenance saved)	Annual average damages avoided	Benefits from restoration of riparian ecosystem	Benefits from nutrient retention
Dike relocation	-€407	€177	€926	€488

Box 3-11: Case study example: Costs and benefits of dike relocation in Germany				
Polder	-€42	€415	€0	€0
Polder with dike relocation	-€124	€427	€202	€54

The above figures show that, although dike relocation is more expensive than the other options it delivers significantly greater benefits when environmental benefits are included.

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4 Task 2: Potential of SME support on resource efficiency

4.1 Introduction

4.1.1 Background

Europe faces a dual challenge of stimulating growth to provide jobs and well-being to its citizens while ensuring that the quality of its growth leads to a sustainable future (European Commission, 2011). Resource efficiency is instrumental for decoupling economic growth from the consumption of natural resources and to promote sustainable development (Van der Voert, 2005). This is recognised in the EU28 policy framework and in different initiatives at the Member State level.

4.1.2 Policy framework

The Europe 2020 strategy for smart, sustainable and inclusive growth, launched in 2010, provides the EU's growth strategy for the coming decade. The strategy seeks to ensure that the EU economy delivers high levels of employment, productivity and social cohesion in a sustainable way. It sets out objectives in the fields of employment, innovation, education, social inclusion and climate/energy which are to be achieved by 2020[12]. To catalyse progress, seven flagship initiatives have been proposed by the European Commission. The most relevant communications related to resource efficiency from these flagship strategies include:

- Innovation Union flagship initiative
- The Resource Efficient Europe flagship initiative and The Resource Efficiency Roadmap;
- Communication on 'Tackling the Challenges in Commodity Markets and on Raw Materials'
- Communication on 'Making raw materials available for Europe's future well-being: Proposal for a European innovation partnership on raw materials'
- Communication on 'Innovative and sustainable forest-based industries in the EU – a contribution to the EU's Growth and Jobs Strategy'
- EU Commission Communication 'Small Business Act'.

The overall goal of the initiative and its relevant policies is best summarised by the European Commission:

"it is necessary to develop new products and services and find new ways to reduce inputs, minimise waste, improve management of resource stocks, change consumption patterns, optimise production processes, management and business methods, and improve logistics. This will help stimulate technological innovation, boost employment in the fast developing

[12] EC (2013): Europe 2020 website, online resource accessed at http://ec.europa.eu/europe2020/index_en.htm

'green technology' sector, sustain EU trade, including opening up new export markets, and benefit consumers through more sustainable products[13]".

EU Cohesion Policy has been recognised as having the potential to play a key role in the delivery of the Europe 2020 strategy, with its ability to guide the transition to a more sustainable development path through policies and strategies as well as through finance. IEEP (2011) points to its key role as a catalyst in promoting and securing progress towards achieving a resource efficient, low carbon, equitable green economy, as well as the importance of the EU funding instruments in supporting this process through making investments to strengthen natural, human, social and man-made capital and ensuring that they are geared to meet differing regional needs and make use of local skills and resources.

In the period 2007-13, the Cohesion Fund allocated €66 billion to activities covering trans-European transport networks and the environment, under which support included initiatives which provide benefits to the environment (e.g. energy efficiency and the use of renewable energy).

The European Regional Development Fund (ERDF) aims to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions. Two of its priority areas include support for SMEs and the low-carbon economy.

SMEs and resource efficiency

The size of the SME sector and its criticality to the EU economy means that improving resource efficiency in the SME sector is paramount for meeting economy-wide goals. The vast majority (98%) of enterprises active within the EU28's non-financial business economy in 2012 were SMEs (some 20.7 million). They accounted for two out of every three jobs (66.7%) and for 58.6% of total EU value added within the non-financial business economy. More than nine out of ten (92.2%) enterprises in the EU27 are micro enterprises (Ecorys, 2012).

The 2008 Communication 'Small Business Act' (SBA) and its corresponding 2011 update recognise the central role of SMEs in the EU economy. They aim to strengthen the role played by SMEs in the European economy by removing potential barriers that hamper their development. Increasing resource efficiency, by increasing competitiveness in the EU SME sector, is one of the ten key principles of the SBA.

Policy in practice

Macro-economic policies have traditionally been the most common tool for resource efficiency and environmental protection in the EU SME sector. These often include fiscal policy, resource charges and incentives for R&D, the provision of institutional arrangements sensitive to SMEs (such as private-public regulatory arrangements) and sector-specific policies aiming to improve efficiency in key parts of supply chains (mainly product design and waste prevention and recovery) (EEA, 2011).

[13] EC (2011): A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy COM(2011)21.

Meyer et al (2011) analysed potential problems in relation to resource availability and estimated the potential gains of becoming more resource efficient at the EU level through the use of several of the macro-level policies described above. They estimate that a reduction of Total Material Resources (TMR) of 1% is accompanied by GDP growth between 0.04% and 0.08%. This is equivalent to €12 to €23 billion and the creation of between 100,000 and 200,000 jobs. Significant potential gains often found in this kind of study reinforce current centrally planned policies.

SMEs, however, are extremely heterogeneous and this is often overlooked in macro-level studies. Recent work on the types of environmental issues affecting SMEs suggests that most companies (about 80%) are mainly concerned by only two environmental issues: energy savings and waste recycling. Only larger SMEs in the fields of manufacturing, transport, construction and extraction may encounter serious environmental problems (European Commission, 2007). Thus, resource efficiency as a means to an environmental end is not regarded as a priority by large parts of the SME sector in the EU (European Commission, 2007; 2012). In addition, SME resource efficiency gain is a slow and progressive process of change. According to a recent study that investigated three key sectors at the European level (Food & Drink Manufacture, Fabricated Metal Products and Hospitality and Food Services) it is unlikely for SMEs to implement major changes from the outset, as is sometimes assumed under different scenarios (AMEC, 2013). This is consistent with grounded studies interested in the relationship between SMEs and the adoption of innovation (Ecorys, 2011). Rademaekers et al (2011) explain this progressive change by distinguishing between 'first' and 'second order' learning. First order learning consists of incremental changes in production, by implementing 'short-term' investments (e.g. end-of-pipe technology, staff training, improving resource monitoring and audit). Second order learning involves SMEs adopting fundamental changes to the way they operate, involving longer-term investments in higher level technology, undertaking major structural changes, etc. Thus, there is reason to believe that, while some types of macro-level policies might encourage SMEs to make short-term changes (such as resource charges or environmental taxation on energy resources), they might not be as effective in promoting long-term ones (COWI, 2011).

Hence, policies also concentrate on the drivers/barriers influencing environmental protection and resource efficiency at sector- and region-specific level. In a way, this reduces the gap between what Rademaekers et al (2011) call first and second order learning efforts, by encouraging a deep change and facilitating resources to speed up the process.

Generally, key drivers identified in the literature across a wide range of sectors and regions include:

1.1 the rising price of commodities and key raw materials
1.2 supply-side partnerships and collaborative initiatives
1.3 competitiveness and potential bottom-line cost savings.

Key limitations for increasing resource efficiency include:

1.4 limited access to funding
1.5 uncertain market demand
1.6 lack of technical capabilities for the adoption of best practices.

Figure 4-1: Key drivers and bbbarriers for SMEs on the road to resource efficiency
Sources: AMEC (2013); European Commission (2007)

Policies and interventions to support SMEs to become more resource efficient range from centrally planned strategies, such as 'one stop shops' and communication hubs, to sectoral- or industry-based initiatives. Amongst other things, the emphasis is on providing information, administrative support and capacity building in environmental expertise at low or no extra cost in order to assist SMEs in becoming more resource efficient.

Varied policies and initiatives across the EU28 form a complex and intricate policy environment. The EEA has identified 127 different SME-related environmental protection and resource efficiency policies across the EU28 (EEA, 2011). The scope of such policies ranges from improving material efficiency in SMEs through dissemination of information on best practices to strict environmental regulation. Most policies concentrate on specific resources (see Figure 4-2). A lack of coherent resource efficiency policies is identified in the majority of Member States (COWI, 2011).

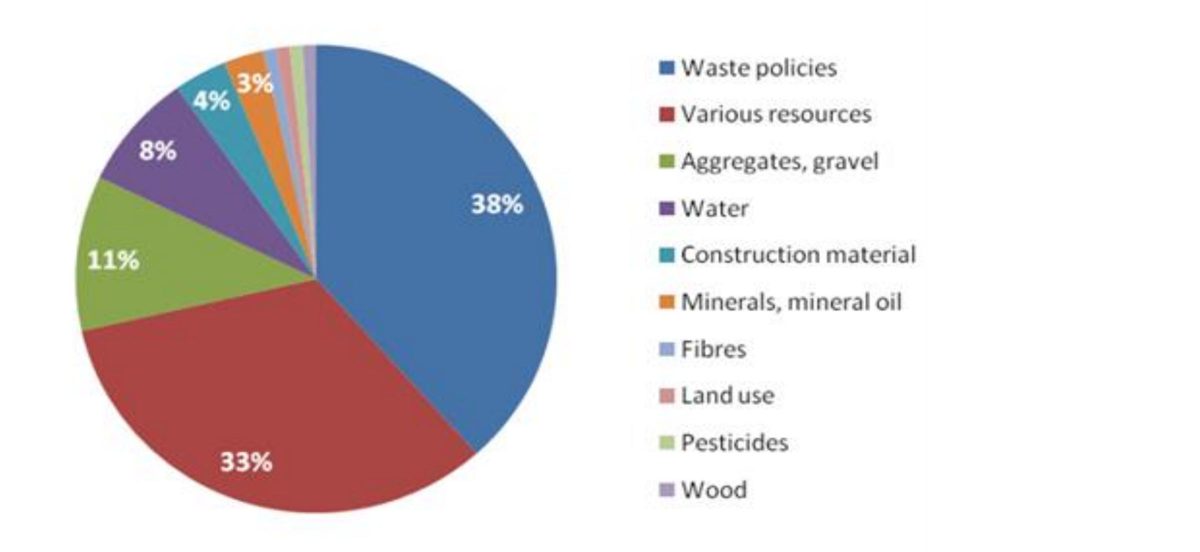

Figure 4-2: Economic analysis of resource efficiency policies
Source: COWI (2011)

4.2 Resource efficiency support programmes providing hands-on, direct support to SMEs

Almost 230 programmes supporting the identification and implementation of resource efficiency measures for businesses have been identified during the course of this study. These programmes were reviewed in terms of the services provided, with a view to categorising them into direct, hands-on support programmes and those which provide more general information and self-help tools. The results of this review have revealed that the resource efficiency support programmes identified are often multi-faceted, with a number of those providing bespoke, face-to-face services to individual companies also providing general access to information, self-assessment tools, case studies, etc. and it is often difficult to distinguish between the two different types of programme. Table 4-1 below sets out the number of programmes identified in different Member States, classified under each category. A summary of the services provided by each programme, in accordance with the information identified during the study, is provided in Annex 5, while Annex 6 includes detailed descriptions of a sample of programmes classified as direct, hands-on support programmes.

Table 4-1: Identified programmes providing resource eficiency support		
Member State	**No. of general programmes providing information, grants etc.**	**No. of direct, hands-on support programmes**
Austria	4	9
Belgium	10	9
Bulgaria	2	-
Croatia	1	-
Cyprus	1	-
Czech Republic	5	2
Germany	13	24
Denmark	9	4
Estonia	3	-
Finland	3	1
France	9	6
Greece	-	-
Hungary	2	-
Ireland	9	8
Italy	2	3
Latvia	1	-
Lithuania	-	1
Luxembourg	1	-
Malta	3	-
Netherlands	8	7
Poland	-	4
Portugal	1	1
Romania	-	-
Spain	15	10
Sweden	3	3
Slovakia	4	-
Slovenia	1	-
United Kingdom	10	10
Total	**126**	**102**

In addition to the programmes identified in Table 4-1, a number of EU wide programmes have been identified and detailed descriptions of these are also included in Annex 6.

Table 4-1 shows that, in the majority of Member States (with the exception of Austria and Germany), more programmes concentrating on the provision of information and generic support were identified than those providing direct, hands-on support.

Figure 4-3 presents a breakdown of services provided by the different types of support programme. As can be seen, a significant number of programmes which provide a hands-on service offer bespoke face-to-face consulting services. They also tend to provide access to a range of information resources that SMEs can access freely. In many programmes, provision of general information services appears to be backed-up by the offer of grants, which SMEs can apply for in addition to accessing general information regarding resource efficiency.

Whilst general programmes also provide assistance with efficiency audits and setting up EMAS schemes, these tend to be provided mostly on a one-to-many basis (for example, through workshops or training events, e.g. providing information on general approaches and/or information on how to conduct audits), rather than working with individual companies to develop their own tailored audit or EMAS scheme.

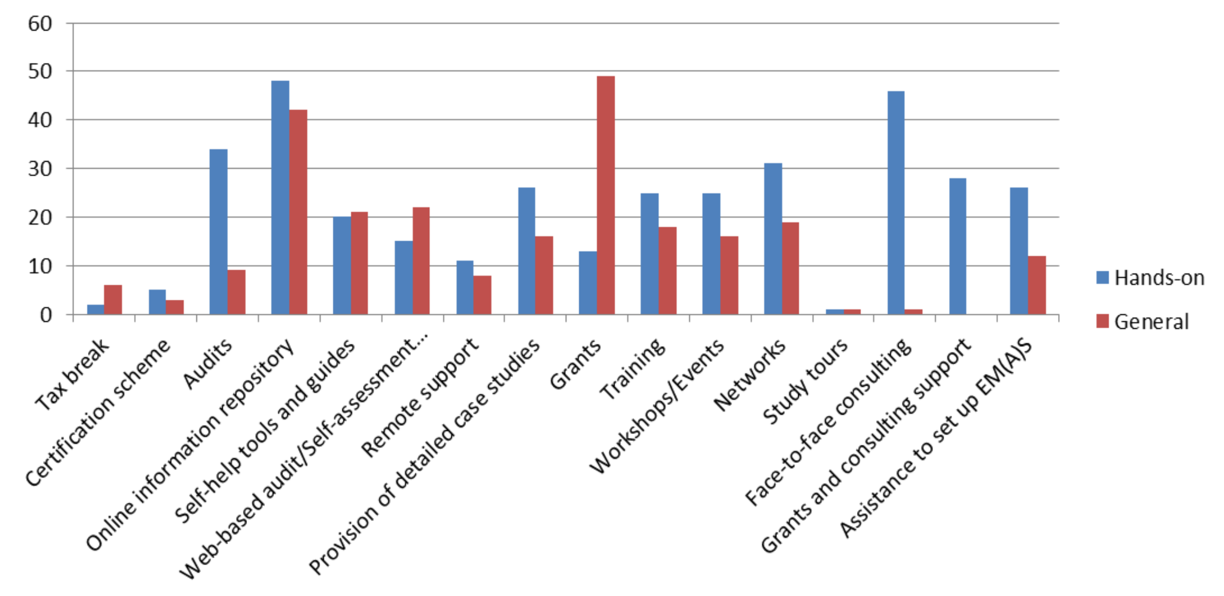

Figure 4-3: Services provided by resource efficiency support programmes

4.2.1 Relationship between the number of support programmes and take up of resource efficiency measures

Flash Eurobarometer Survey No. 381 on SMEs, Resource Efficiency and Green Markets (conducted in 2013) surveyed SMEs across the EU on their attitudes to and adoption of different resource efficiency measures. In general, the survey found that, compared with the previous year (2012), SMEs are investing less per year in measures to improve resource efficiency. The survey showed that most SMEs (72%) invested 5% or less of their annual turnover in resource efficiency measures, but noted that there had been a 4% decrease in the number of SMEs investing 6-10% of their annual turnover, and an 11% increase in those investing 5% or less.

The survey also looked at reasons for inaction on resource efficiency. Approximately 26% of SMEs across the EU said that administrative or legal procedures were complex and 24% said the cost of environmental actions posed problems. Twenty percent (20%) indicated that they were hampered by a lack of specific environmental expertise and 17% experienced problems in adapting legislation to their specific company circumstances or had problems in choosing the right actions for their company.

Against this backdrop of SMEs investing less overall in resource efficiency and identifying a number of reasons why they have been unable to put in place measures to improve efficiency, an analysis has been carried out to explore any relationship between the existence of programmes providing resource efficiency support to SMEs and the level of uptake of resource efficiency measures. Tables 4-2 and 4-3 below are based on the country data gathered for the Flash Eurobarometer 381 survey and the data in Table 4-1 above which shows the distribution of direct, hands-on and general resource efficiency support programmes identified across Member States.

The tables clearly indicate that:

- Both the average (mean) and the median number of support programmes is higher in Member States where the percentage of companies implementing MANY resource efficiency measures is above the EU average. This applies to both direct, hands-on support programmes, as well as those providing more general support.
- The average (mean) and median number of resource efficiency support programmes is lower in Member States where the percentage of SMEs implementing NO resource efficiency measures is above the EU average. Again, this applies both to direct, hands-on and more general support programmes.

Whilst it is not possible to draw any causal relationship from the data included in the Eurobarometer 381 survey between the number of resource efficiency support programmes and the proportion of companies likely to implement many or no resource efficiency measures, the figures consistently show that there are higher numbers of programmes in Member States where SMEs are implementing many measures above the EU average. A number of possible factors might interact to explain this, they include:

- A larger number of programmes in those Member States has assisted a larger number of SMEs to implement more measures.
- The larger number of programmes may reflect a greater emphasis on resource efficiency in those Member States which perform above the EU average (in terms of implementing many measures) and resource efficiency improvements are also driven by a number of other public initiatives and polices that have been implemented. In this sense, a higher profile for SME support programmes can contribute to the wider policy debate on resource efficiency, influencing policy makers to place a greater emphasis (in terms of policy, strategies and financing) on supporting resource efficiency initiatives.
- Demand from SMEs already taking measures to improve their own resource efficiency may have also put pressure on Member State authorities to fund larger numbers of support initiatives.

It is noted that the number of support programmes identified in this study is not totally comprehensive and, if more are missing from those Member States where SMEs implement many measures below the EU average (mean) and median than those that do above the EU average, then the conclusions from the following tables might be somewhat different.

Table 4-2: Average No. of resource efficiency support programmes and MANY measures implemented			
	Hands on	General	Total
Ave. No. of support programmes in countries where % of firms implementing MANY measures is above EU average	8.11	7.89	16.00
Ave. no. support programmes in countries where % of firms implementing MANY measures is below EU average	1.53	2.58	4.11
Median above EU median	9.00	9.00	17.00
Median below EU median	0.00	2.00	2.00
Source: Own calculations based on Flash Eurobarometer 381 SMEs, Resource Efficiency and Green Markets, December 2013, p.T13			

Table 4-3: Average No. of resource efficiency support programmes and NO measures implemented			
	Hands on	General	Total
Ave. No. of support programmes in countries where % of firms implementing NO measures is above EU average	1.61	2.83	4.44
Ave. no. support programmes in countries where % of firms implementing NO measures is below EU average	6.00	5.69	11.69
Median above EU median	0.00	2.00	3.00
Median below EU median	4.00	4.00	7.00
Source: Own calculations based on Flash Eurobarometer 381 SMEs, Resource Efficiency and Green Markets, December 2013, p.T13			

4.3 Relative merits of general Iinformation and direct, hands-on support

Lack of information regarding resource efficiency opportunities is often cited as a market failure and cause for SMEs not implementing those measures that would improve both their economic situation and the environmental outcomes of their operations.[14]

Oakdene Hollins (2011) note that whilst businesses may be aware of potential resource efficiency opportunities, they may not be fully able to identify the particular costs and benefits of implementing different alternatives. Whilst large-scale information provision programmes may be able to provide significant information, by their very nature the information provided is often of a general nature or stems from particular case examples which are specific to the individual business concerned. Hands-on, direct resource efficiency support programmes seek to bridge the gap between general knowledge provision and its applicability to the specific circumstances of individual SME businesses by assisting firms to identify both opportunities and means for implementing resource efficiency measures, as well as their potential costs and benefits.

Due to the lack of monitoring and evaluation data on both hands-on, direct support and more general information provision support programmes, it is very difficult to assess the relative merits of one type of programme over the other. Consultation with a number of

[14] Oakdene Hollins 2011, Section 8.13 Market Failures

programmes providing more direct, hands-on support confirms that there is a strong belief among such programmes as regards the benefit of providing a bespoke, tailored service over a period of time and that the relationships that develop between the programme service provider and SMEs, based on a detailed knowledge of the company's business operations and market situation, are a key factor in delivering success.

Some anecdotal information has been obtained from individual programmes. Data provided for the Yorkshire and Humber National Industrial Symbiosis Programme (NISP) in the UK (see Figure 4-4 below) indicates that savings of virgin materials rose significantly during the programme's roll-out between 2005 and 2008-9, and the development of this knowledge and relationship was claimed to be a significant factor in this growth. Since 2008-9, however, following a period of rising funding and hence contact hours, the funding for the Yorkshire and Humber NISP has been reduced to below the original 2005 starting level, with a corresponding decrease in the level of material savings being achieved. Whilst it is noted that it is more difficult to track changes in any savings that may arise from a more general provision of information, as opposed to the situation where programme staff have a much more involved relationship with companies, telephone discussions with programme staff support the view that the programme's change of emphasis from providing direct, hands-on support, to one which has moved more towards the provision of information and a database of contacts, has been a major contributing factor in the decline in savings.

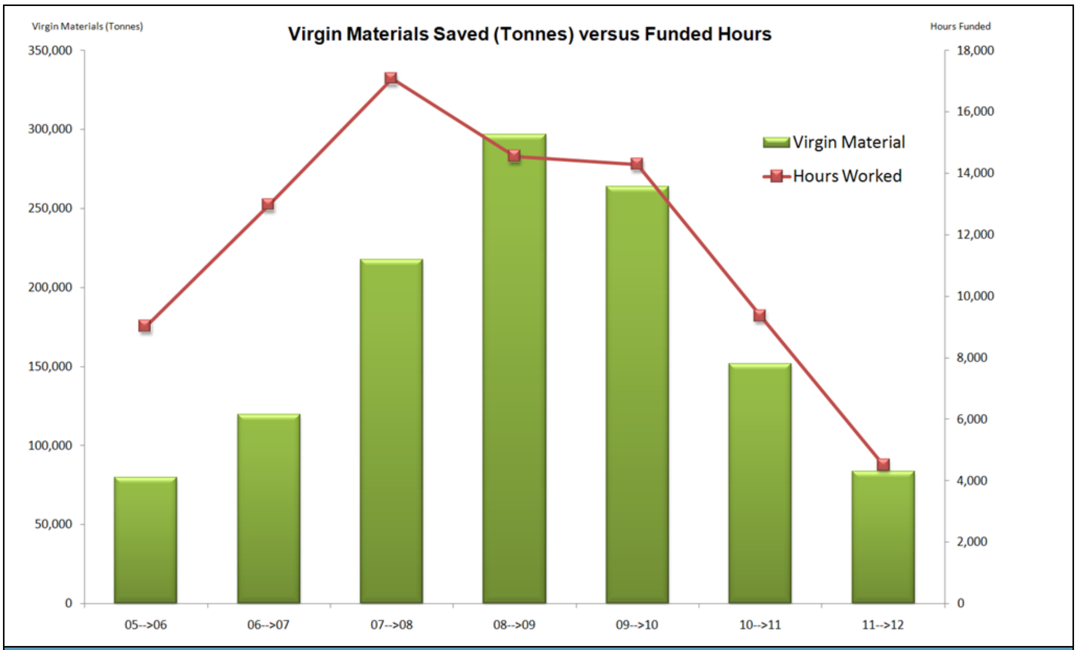

Figure 4-4: Comparison of savings and funded hours, Yorkshire & Humber NISP
Source: pers. comm. Y&H NISP programme staff

It is noted that the NISP programme permitted the matching of SMEs with large companies and, consequently, all the savings identified did not accrue to small companies. This kind of matching was allowed under the funding of the programme, since SME-SME matching alone would have significantly reduced the savings that were achieved. Consultation indicates that a large number of the job creation figures were related to entrepreneurial SMEs responding to issues that larger companies had with disposing of their waste.

4.4 Outcomes from SME resource efficiency support programmes

The following sections set out the information on economic and environmental outcomes gathered on the identified direct, hands-on support programmes. Firstly, outcomes from programmes where it has been possible to gather a greater amount of information and level of detail on economic and environmental savings are described, followed by a summary table of all other information obtained from other programmes. It should be noted that, in some cases, the latter is very partial and contains significant gaps.

Annex 6 provides individual descriptions of a number of support programmes, describing the services offered along with any information on outcomes (where available). Details on good practice are also set out, where information has been found, and this information has informed Section 4.7 later in this report.

4.4.1 PIUS-CHECK Programme, Germany and National Industrial Symbiosis Programme, UK

COWI (2011) identified two case studies of programmes that can be considered hands-on direct support for SMEs to make improvements in terms of resource efficiency: the PIUS-CHECK Programme in Germany and the National Industrial Symbiosis Programme in the UK. Detailed descriptions of both programmes are provided in Annex 6. Illustrations of programme savings achieved are set out below in Tables 4-4 to 4-6.

Table 4-4: Programme outcomes

Programme	Description	Savings/benefits
PIUS-Check (Produktionsintegrierter Umweltschutz), Germany	Launched in 1998 by the North Rhine-Westphalia Ministry, the Effizienz-Agentur (EFA) initiative has developed a toolbox with a range of consulting services to assist SMEs to improve resource conservation in production.	Estimated €333,000 in economic benefits to participating SMEs over 10 years. Extrapolating EU27-wide, based on same share of manufacturing SMEs benefitting from a PIUS-check, economic benefits would be €776 million.
National Industrial Symbiosis Programme, UK	Free to business advice and networking programme aimed at reducing waste by partnering waste producers with waste users.	Applying a similar system across the EU27 would generate €1,411 million in cost savings and additional sales for participating companies of €1,591 million.

Table 4-5: Outcomes identified from PIUS-Check Programme, Germany		
Result	**Total**	**Per SME**
Investments (€)	€36 million	€167,000
Annual savings in production processes (€)	€10.4 million	€50,000
Water/wastewater savings (m^3/y)	1.169 million	6,000
Annual energy savings (MWh)	50,500	300
CO_2 reductions (tonnes)	20,000	113

It is noted that approximately 43% (216) of the 500 companies that had received a PIUS check since 2000 had implemented measures and that 75% of the companies employed less than 250 people. However, 25% of the companies employed between 300 and 600 workers (i.e. were large companies). This is because the SME definition used by the programme was based on companies with 20 to 500 employees. As a result, it is not possible to identify the savings accruing to SMEs according to the EU definition of the term.

Table 4-6: Estimated average economic costs/benefits to SMEs participating in the PIUS-programme, with a 10-year persistence of the achieved cost saving	
Result	**Value/€**
Cost of PIUS-Check	€5,000
Investments	€167,000
Total costs	€172,000
Savings achieved over 10 years	€500,000
Economic benefit over 10 years	€333,000

Extrapolating EU27-wide, based on the same share of manufacturing SMEs benefitting from a PIUS-check (some 4.2% of the total number companies in the area), the same 43% implementing measures and using a 5% discount rate and a 10 year time horizon, economic benefits were estimated at €776 million. If all SMEs went through the PIUS check and 43% implement measures, this would then translate to economic benefits of €22.5 billion across the EU27.

4.4.2 ENWORKS Programme, UK

The ENWORKS programme in the UK was set up in 2001 in response to a recognised need to co-ordinate environmental support services in the North West Region and to provide direct support to companies to improve resource efficiency. Its longevity and the direct implementation support provided over a period of time is perceived as a major strength by the programme in comparison to other approaches which have adopted a more "one-off" or "opportunity identification" approach (Pers. Comm.). ENWORKS won a RegioStars award in 2013 in the category for Sustainable Development and has been recognised as an example of best practice.

Its primary objective is to deliver environmental advice and support businesses to increase their competitiveness through improvements in the management of environmental performance and risk, and to provide services to businesses through a network of local delivery organisations and specialist consultants with up-to-date knowledge of the immediate business environment. Whilst the ENWORKS programme coverage includes both SMEs and large companies, 75% of support during the most recent programme was targeted at SMEs (ENWORKS, 2013)

The programme supports businesses to identify and implement resource efficiency measures in order to improve profitability and reduce resource use, and has adopted an holistic approach working with companies to achieve reductions in resource use across their business portfolios and at all stages in the value chain (ENWORKS, 2013). ENWORKS has developed a robust toolkit for measuring the economic and environmental benefits that arise from such opportunities.

ENWORKS works across multiple agencies (at both board and delivery levels) with a focus on co-ordination, alignment and partnership and has adopted a delivery model which is based on providing support through a network of local organisations. Its Central Management Team works closely with a wide variety of organisations, including, but not limited to, working with the Regional Leaders Board, the Business Support Transition Group and the European Economic Strategy Group (EESG) to input into their strategic priorities.

Tables 4-7 to 4-16 present figures from the ENWORKS programme covering five years of the programme's activities in the UK, from 2004 to 2009, and provide the most comprehensive set of data identified during the study. Savings are recorded by the programme via the ENWORKS toolkit, online bespoke software that was developed by the programme and has recently been adopted by regional and national bodies delivering similar programmes across the UK. The toolkit records and monitors across the full set of indicators for resource efficiency improvement opportunities covered by the programme as well as their resulting economic and environmental savings. It is noted that data is based only on those companies entering data in the ENWORKS online toolkit and which were able to provide baseline data and consequently able to record a change. However, savings recorded are annual savings and reflect persistence of benefits over time.

Whilst other data on savings is available in ENWORKS evaluation reports and in the programme's database, this data was the only set available at the time to the study team which broke savings down on a sectoral basis and therefore incorporated the differing potentials of different sectors to achieve cost and environmental saving.

Tables 4-7 to 4-12 provide data on actual cost savings, energy, water waste and materials reductions.

Table 4-7: ENWORKS achieved annual cost savings from resource reduction[15]						
	Number of businesses	Number of SMEs	Annual savings per opportunity* (£)	Annual savings per business (£)	% Capital investment of annual savings	Payback period (Years)
Environmental Technologies	18	11	27,386	51,729	12.79	0.13
Food and Drink	112	67	18,886	37,941	83.01	0.83
Textiles	54	34	12,673	34,733	32.50	0.33
Construction	74	40	12,329	27,323	49.39	0.50
Chemicals	47	22	10,827	26,722	36.25	0.36
Aerospace	18	14	9,832	25,127	6.18	0.06
Automotive	66	41	8,767	18,464	141.23	1.41
Energy, Power and Utilities	14	8	6,610	21,245	345.36	3.45
Note: * An opportunity equates to each improvement action identified within a business						

Table 4-8: ENWORKS achieved annual cost savings from diversion of waste from landfill						
	Number of businesses	Number of SMEs	Annual savings per opportunity* (£)	Annual savings per business (£)	% Capital investment of annual savings	Payback period (Years)
Environmental Technologies	3	2	25,190	125,948	26.00	0.26
Food and Drink	18	11	6,494	10,462	21.00	0.21
Textiles	11	5	9,253	17,665	15.00	0.15
Construction	11	6	6,978	11,411	40.00	0.4
Chemicals	8	5	624	1,014	25.00	0.25
Aerospace	3	0	1,634	3,812	0.87	0.01
Automotive	15	8	3,518	6,801	16.00	0.16
Energy, Power and Utilities	2	2	411	1,437	0.00	0.00
Note: * An opportunity equates to each improvement action identified within a business						

[15] Source: Tables 4-7 to 4-16 in this report are derived from Tables A5-A13, pp.8-17 in BIS (2010). Research was carried out in February to March 2009.

Table 4-9: ENWORKS achieved savings from resource efficiency through resource reduction (Energy)						
	Number of businesses	Number of SMEs	CO_2 Savings per opportunity* (tonnes)	Unit savings per opportunity (kwh/year)	Unit savings per business (kwh/year)	CO_2 savings per business (tonnes/year)
Aerospace	8	1	41	110,047	206,338	77
Energy, Power and Utilities	6	3	387	506,861	675,814	516
Textiles	22	13	140	548,927	923,195	235
Food and Drink	32	22	149	369,938	762,997	307
Automotive	24	15	71	222,547	417,276	133
Chemicals	14	9	104	416,128	1,397,000	350
Environmental Technologies	4	4	4	11,237	25,282	10
Construction	19	14	51	144,908	427,097	151

Table 4-10: ENWORKS achieved savings from resource efficiency through resource reduction (Water)				
	Number of businesses	Number of SMEs	Unit savings per opportunity (m^3/year)	Unit savings per business (kwh/year)
Aerospace	10	6	6,686	7,355
Energy, Power and Utilities	7	5	142	182
Textiles	28	18	4,902	6,653
Food and Drink	69	42	3,809	4,195
Automotive	37	21	397	440
Chemicals	32	12	2,638	3,215
Environmental Technologies	11	8	34	37
Construction	151	18	123	131

Table 4-11: ENWORKS achieved savings from resource efficiency through resource reduction (Materials)				
	Number of businesses	Number of SMEs	Unit savings per opportunity (tonnes/year)	Unit savings per business (kwh/year)
Aerospace	6	1	28	61
Energy, Power and Utilities	6	2	112	205
Textiles	18	6	2,702	6,754
Food and Drink	33	17	47,672	66,451
Automotive	24	8	36	53
Chemicals	16	5	250	328
Environmental Technologies	7	3	1,395	1,594
Construction	25	7	2,042	2,777

Table 4-12: ENWORKS achieved savings from diverting waste from landfill				
	Number of businesses	Number of SMEs	Unit savings per opportunity (tonnes/year)	Unit savings per business (kwh/year)
Aerospace	3	0	12	27
Energy, Power and Utilities	2	2	8	28
Textiles	11	5	64	128
Food and Drink	17	11	61	100
Automotive	15	8	13	26
Chemicals	8	5	10	17
Environmental Technologies	3	2	1,179	5,897
Construction	11	6	401	657

Pipeline changes set out in the following four tables reflect additional opportunities not yet realised. At the time of the data (2010), some of these opportunities would have been feasible and may have subsequently materialised. On the other hand, some opportunities may not have materialised because action was not practicable, affordable or the technology involved not proven. Economic conditions at the time will have influenced decisions as to whether or not to go ahead.

Table 4-13: ENWORKS PIPELINE savings from resource efficiency through resource reduction (Energy)						
	Number of businesses	Number of SMEs	CO_2 Savings per opportunity (tonnes)	Unit savings per opportunity (kwh/year)	Unit savings per business (kwh/year)	CO_2 savings per business (tonnes/year)
Aerospace	23	11	56	174,295	659,291	213
Energy, Power and Utilities	11	7	136	321,621	1,023,341	433
Textiles	66	45	55	239,335	881,187	203
Food and Drink	133	58	78	280,810	1,150,689	321
Automotive	67	43	36	98,427	376,079	136
Chemicals	51	28	107	299,124	1,026,406	366
Environmental Technologies	21	13	19	46,730	160,217	65
Construction	101	77	23	67,454	235,086	80

Table 4-14: ENWORKS PIPELINE savings from resource efficiency through resource reduction (Water)				
	Number of businesses	Number of SMEs	Unit savings per opportunity (m^3/year)	Unit savings per business (kwh/year)
Aerospace	17	7	9,005	11,124
Energy, Power and Utilities	6	5	103	172
Textiles	36	22	3,361	5,602
Food and Drink	101	34	5,904	9,119
Automotive	60	39	1,301	1,865
Chemicals	39	23	3,956	7,101
Environmental Technologies	17	13	169	209
Construction	59	40	970	1,365

Table 4-15: ENWORKS PIPELINE savings from resource efficiency through resource reduction (Materials)				
	Number of businesses	Number of SMEs	Unit savings per opportunity (tonnes/year)	Unit savings per business (kwh/year)
Aerospace	8	2	381	524
Energy, Power and Utilities	3	1	518	518
Textiles	19	8	57	93
Food and Drink	25	7	103	177
Automotive	24	10	193	286
Chemicals	33	14	692	1,028
Environmental Technologies	4	3	3	7
Construction	33	14	1,634	1,981

Table 4-16: ENWORKS PIPELINE savings from diverting waste from landfill				
	Number of businesses	Number of SMEs	Unit savings per opportunity (tonnes/year)	Unit savings per business (kwh/year)
Aerospace	8	2	97	181
Energy, Power and Utilities	6	5	679	905
Textiles	23	12	39	76
Food and Drink	48	33	115	182
Automotive	18	11	31	49
Chemicals	17	8	117	165
Environmental Technologies	8	5	332	373
Construction	43	34	399	594

In all of the tables relating to ENWORKS achieved and pipeline savings above, the number of SMEs and total number of companies is identified (allowing the number of non-SME companies to be calculated). However, the unit savings per opportunity and per company are calculated on the basis of all companies supported i.e. for both SMEs and large companies. It is likely that greater savings will accrue to larger companies due to the scale of their operations. However, information from a subsequent evaluation of the ENWORKS programme, from 2007-2010, shows that the ratio of the average resource cost savings achieved by SMEs compared to large companies was £9,635 to £34,029. Assuming that this ratio is comparable across the two phases of the programme, average savings per SME can be calculated for each of the indicated sectors.

4.4.3 ÖkoBusinessPlan Wien

The data in Table 4-17 below are sourced from an evaluation of the ÖkoBusinessPlan Wien Programme[16], carried out for the year 2010, and relate to programme outcomes from 1,234 measures implemented (1,277 opportunities were identified) across the 144 companies supported by the programme during that year. It is to be noted that the results do not cover all outcomes from the programme and that outcomes from 66% of the measures implemented by companies had not been quantified. In addition, as pointed out in the evaluation, no distinction is made between those savings resulting from measures specifically implemented with programme support and savings corresponding to measures that companies would have implemented anyway. Consequently, the savings attributable to the programme will have been lower than set out in Table 4-17. Finally, whilst the programme is seeking to increase its involvement with micro-level companies, and has worked with companies with 21-50 employees, it also worked with companies that had 201-500 employees and the figures do not distinguish between savings accruing to companies of each different size.

Table 4-17: Savings identified from the ÖkoBusinessPlan Wien Programme, 2010

Category	Units	Amount saved
Raw materials	Tonnes/year	192.90
Materials	Tonnes/year	1,468.43
Water	‘000 m^3/year	10.72
Dangerous waste (incl. oil)	Tonnes/year	288.58
Non-dangerous waste	Tonnes/year	1,852.24
Waste water	‘000 m^3/year	0.03
Electricity	GWh/year	6.20
Electricity from renewable sources	GWh/year	2.88
Gas	GWh/year	2.85
Oil	GWh/year	0.15
Biomass	GWh/year	0.08
Heating	GWh/year	0.63
Other energy	GWh/year	0.04
CO_2 emissions – energy	Tonnes/year	7,042.99
CO_2 emissions - transport	Tonnes/year	283.59

4.4.4 Return on investment

A wide range of programmes of different sizes and scope were reviewed during the course of this study and, as mentioned throughout this report, it has been difficult to compare and

[16] Evaluation des ÖkoBusinessPlan Wien, Programmjahr 2010, May 2011, Wuppertal (Germany).

contrast them in terms of the results achieved due, in many cases, to the lack of monitoring and evaluation information identified. Additionally, the information on outcomes that has been identified often differs in the way it is measured and the time period over which the programmes have been providing support services. In the vast majority of cases, information on programme costs has been completely lacking, making it impossible to make any assessment of the efficiency of programmes in achieving the outcomes recorded.

However, some limited information has been obtained from some programmes and Table 4-18 sets out information on the return on investment in terms of a range of indicators, as calculated by a small number of programmes. It is noted that the figures presented are not necessarily directly comparable. For example, ENWORKS figures for return on investment are based on net additional value added where others may not be.

Table 4-18: Return on investment for a selection of hands-on resource efficiency support programmes

Programme	MS	Nature	Return on investment		
			Investment	Return	Ratio
Green Business Initiative	IE	Waste prevention	€0.34m	€3m	1:9
NISP	UK	Waste reduction	€0.03 €0.03 €0.57 €0.48 €0.87 €0.87 €0.13	€2 new income generated for industry €2 saved by UK industry 1 tonne of virgin material saved 1 tonne of water saved 1 tonne of CO^2 emissions reduced 1 tonne of waste diverted from landfill 1 tonne of hazardous waste eliminated	1:67 1:67
Envirowise	UK	Multiple	€1 €1 €1 €1 €1 €1	€9.68 Cost savings 0.00415 tonnes raw materials saved 0.00567 tonnes CO_2 emissions saved 0.031 tonnes waste reduced 0.0000652 tonnes hazardous waste reduced 0.761m^3 water savings	1:9.7
Envirowise Resource Efficiency Clubs	UK	Multiple	€1 €1 €1 €1 €1 €1	€3.99 in cost savings 0.0032 tonnes raw materials saved 0.0042 tonnes CO_2 emissions saved 0.019 tonnes waste reduced 0.00021 tonnes hazardous waste 0.22m^3 water savings	1:3.99
ENWORKS[17]	UK	Multiple	€6		1:9 1:20

Regarding the NISP in the UK, an Economic Impact Assessment for 2005-10[18] calculated the Total Economic Value Added was in the region of €2.058m to €3.430m, giving an investment

[17] Based on £5m (exchange rate £1 = €1.2) investment in SMEs and reported in ENWORKS evaluation 2007-10. Ratio 1:9 excludes environmental externalities and 1:20 includes them. This evaluation used a high price for carbon based on ETS and more recent evaluations of the ENWORKS programme have used lower carbon prices, resulting in even higher returns on investment.

[18] Laybourn P (2010): Environmental Good and Services and Green Business Models (Presentation), accessed at http://ec.europa.eu/enterprise/policies/sustainable-business/sustainable-industry/forums/pastforums/files/6_is_nsip_laybourn_en.pdf

multiplier of 53.2 to 88.6 and generating €207m to €346m to the Treasury in direct receipts. The benefit cost ratio (BCR) was in the range of 32:1 to 53:1. It is worth noting that a BCR of 3:1 was considered good by a previous UK Government and 8:1 excellent by Regional Development Agencies. Clearly the figures in Table 4-18 provide evidence that such programmes can provide value for money in achieving the economic benefits that arise to individual companies as well as the overall environmental benefits.

4.4.5 Other programme outcomes

The following table sets out the information that the study team has been able to compile on a number of other direct, hands-on resource efficiency support programmes. As mentioned previously in this report, significant difficulties were encountered in obtaining data on outcomes from the different programmes identified and the data presented in Table 4-19 shows significant gaps. The study team was hampered in its efforts to obtain information directly from programmes, despite attempting to contact more than 50 individually. The fact that the study was carried out over a short period of time in the run up to and just after the Christmas period was a significant hindrance, with a number of contacts responding that they were either unavailable to extract the information requested or were too busy with other work at the time. Outcome data are provided for some indicators from programmes in Belgium (1), Germany (2), United Kingdom (7), Ireland (4), France (3, but only programme coverage and cost) and 1 EU-wide programme.

Table 4-19: Quantitative information on outcomes of programmes providing hands-on, direct support to SMEs												
Programme	**Period**	**Coverage**	**Cost/€**	**Energy saved**	**Materials saved /tonnes**	**Cost savings/€**	**Increased turnover /€**	**CO_2 emission savings / tonnes**	**Waste reduction / tonnes**	**Water reduction /m^3**	**Jobs created**	**Jobs safeguarded**
Eco-Efficiency Scan, Belgium	2006-10	1,000 SMEs	€2.6m	8% per company						4% per company		
PIUS-Check, Germany	2000-10	216 (implemented)	€36m (to firms)	50.5 GWh per year, 300 MWh per SME				20,000 (total at 2008) 113 per SME		1.2m per year, 6,000 per SME		
Effnet, Germany	2006-13	80				€5.9m per year		20,810				
National Industrial Symbiosis Programme (UK)	2005-13	By 2008, 8,000 (all) and 7,600 SMEs By 2010, 13,400 (all) and 12,730 SMEs	€21.8m (2005-8) €33.2m (2005-10)		950,137 (2005/6) 9.7m (2005/10)	€44m (2005/6) €188.5m (2005-10)	19.9m (2005/6) 211.3m (2005-10)	328,964 (2005/6) 6m (2005-10)	636,852 and 221,625 hazardous waste, 2005/6 7m and 363,626 hazardous waste, 2005-10	264,475 (tonnes, 2005/6) 9.6m (tonnes, 2005-10)	3,683 (2005-10)	5,087 (2005-10)
National Industrial Symbiosis Programme (Yorkshire, UK)	2005-9				609,629	€35.8m		474,478	£21.4m invested in waste diversion 813,376 (diverted from landfill)		310	723
Bright Green Business (UK)	2001-13	700 placements in 500 firms				€12m potential		33,000	80,000		80	
Green Business Network, UK[19]		2,000 over 15 years Project 1,200 from 2011-14	€420,000 per year			€100,000 (2011-14)		5,000 (2011-14)			21	

[19] Estimates for savings, jobs etc. cover 2011 -14

Table 4-19: Quantitative information on outcomes of programmes providing hands-on, direct support to SMEs												
Programme	**Period**	**Coverage**	**Cost/€**	**Energy saved**	**Materials saved /tonnes**	**Cost savings/€**	**Increased turnover /€**	**CO_2 emission savings / tonnes**	**Waste reduction / tonnes**	**Water reduction /m^3**	**Jobs created**	**Jobs safeguarded**
Envirowise, UK	2006-7		€15.1m (2006-7)		62,700 (2006-7)	€146m (2006-7)		85,500 (2006-7)	466,000 (2006-7) 986 hazardous waste (2006-7)	11.5m (2006-7)		
Envirowise Resource Efficiency clubs, UK	2006-7		€1.98m (2006-7)		6,340 (2006-7)	€7.9m		8,360 (2006-7)	37,800 (2006-7) 409 hazardous waste (2006-7)	435,000 (2006-7)		
WRAP, UK	2008-11					€2.28 billion (business, consumers and public sector)	451m per year	6.6m	12.6m per year	5.7m per year		
B2B Green Mentors, Ireland	01/05 – 06/06	60	€109,855			€24,000 p.a. (1 case study						
Green Business Initiative, Ireland	2008-12	700 members 300 resource efficiency assessments		€12.8m	€2.7m	€1.35m (2010) €4m (2011) 18m (2008-12)			1.3m	1.3m		
SME Programme, Ireland	2007-11	1,470 from 2007-11 (97% SMEs in 2009)	€1.2m per year	Cumulative value of energy, CO2 and other saved: €6m in 2009, €15m in 2010		Average 10.3% per year		19,500 (2009) 51,800 (2010)				

Table 4-19: Quantitative information on outcomes of programmes providing hands-on, direct support to SMEs												
Programme	**Period**	**Coverage**	**Cost/€**	**Energy saved**	**Materials saved /tonnes**	**Cost savings/€**	**Increased turnover /€**	**CO_2 emission savings / tonnes**	**Waste reduction / tonnes**	**Water reduction /m^3**	**Jobs created**	**Jobs safeguarded**
SMILE, Ireland	2010-13	1,000 users, 2,318 potential exchanges identified, 550 directly supported	€0.15m per year			€81,200 (actual and potential in 2011)			25,721 potentially diverted (2010-13)			
EnVol, France		160										
PBE+, France	2010	1,700	€493,117 per year									
Plan PME, France	2011 – 07/2013	>1,500	€15m per year									
GREEN, covering Italy, Romania, Greece, Bulgaria, Slovenia, Montenegro, Croatia, Macedonia, Serbia, Turkey	04/2010 – 04/2012	Varied for different programme services			8.54% reduction in amount of water/raw materials/ electricity	9.66% reduction in cost of water/materials/elect. 9.6% reduction in fines			9.35% (8.25% increase in re-use, 22.18% increase in amount sold)			

4.5 Identification of potential future benefits

4.5.1 Measuring the baseline and identifying the number of SMEs that might implement resource efficiency measures

The extent to which resource efficiency benefits may accrue in the future will be dependent partially on the extent to which companies are already resource efficient today – the scope for making further improvements will reduce as additional measures are implemented. Oakdene Hollins (2011) noted that, in comparison with an earlier study on the potential for resource efficiency savings for no-cost/low-cost measures conducted in 2006, the overall estimate of potential financial savings had decreased by 19% overall, with the estimate for potential CO_2 savings decreasing by 37%. Their conclusion was that, even whilst improvements in resource efficiency would be expected as a result of technological change over this period (estimated at 1% per year[20]), there had been significant improvements in resource efficiency over the period.

AMEC (2013) conclude that "*evidence and data on exactly where the resource efficiency baseline lies for all EU27 businesses in the industrial sectors is at present insufficient to provide a more precise estimate*" (p.v) and the current study team have not identified any comprehensive assessments of current levels of resource efficiency among SMEs. However, the recent Flash Eurobarometer Survey (No. 381) does provide an indication of the relative levels of measures being implemented by companies across the EU and within different Member States. The following table provides data on the percentage of SMEs in Member States that have implemented a number of different resource efficiency measures.

Table 4-20: Percentages of SMEs responding that they are implementing resource efficiency measures

Member State	Saving energy	Minimising waste	Saving materials	Saving water
EU28	**67%**	**67%**	**59%**	**51%**
Austria	80%	75%	63%	56%
Belgium	68%	79%	62%	59%
Bulgaria	41%	27%	38%	31%
Croatia	64%	54%	44%	39%
Cyprus	45%	24%	34%	38%
Czech Republic	75%	78%	66%	56%
Denmark	59%	39%	45%	33%
Estonia	27%	18%	34%	13%
Finland	70%	80%	80%	38%
France	62%	60%	41%	54%
Germany	74%	68%	61%	53%

[20] Based on study by Stockholm Environment Institute and the University of Durham for Defra (2009), "*Understanding Changes in UK CO2 emissions 1992-2004: A structural decomposition approach*".

Table 4-20: Percentages of SMEs responding that they are implementing resource efficiency measures				
Member State	Saving energy	Minimising waste	Saving materials	Saving water
Greece	69%	41%	68%	54%
Hungary	71%	46%	53%	52%
Ireland	62%	77%	46%	43%
Italy	44%	65%	40%	32%
Latvia	73%	49%	61%	51%
Lithuania	61%	34%	55%	50%
Luxembourg	69%	70%	61%	49%
Malta	76%	60%	50%	42%
Netherlands	67%	66%	65%	27%
Poland	64%	48%	56%	51%
Portugal	90%	73%	85%	77%
Romania	72%	52%	60%	57%
Slovakia	74%	79%	77%	68%
Slovenia	40%	40%	27%	32%
Spain	91%	85%	91%	78%
Sweden	59%	61%	58%	29%
UK	79%	94%	71%	63%

Figures in Table 4-20 above indicate that the percentage of SMEs implementing resource efficiency measures differs significantly from Member State to Member State and that the Member States with higher percentages implementing measures to address efficiency for one particular resource are not necessarily the same for each resource. Table 4-21 below summarises the performance of Member States in terms of the percentage of SMEs implementing measures in comparison with the EU wide average.

Table 4-21: Comparative implementation of resource efficiency measures across Member States			
Member States below EU average for all categories	Member States above EU average in limited no. of categories (shown in brackets)	Member States above EU average in most categories (shown in brackets)	Member States above EU average for all categories
Estonia **Cyprus** **Italy** **Slovenia** **Lithuania** **Bulgaria** **Denmark** **Croatia**	**France** (Water) **Hungary** (Water, Energy) **Latvia** (Water, Materials, Energy) **Romania** (Water, Materials, Energy) **Sweden** (Recycling) **Netherlands** (Recycling, Materials, Energy) **Poland** (Scrap) **Malta** (Scrap, Energy)	**Luxembourg** (Recycling, Materials, Waste, Energy) **Austria** (Recycling, Water, Materials, Waste, Energy) **Ireland** (Scrap, Recycling, Waste) **Belgium** (Scrap, Water, Materials, Waste, Energy) **Finland** (Scrap, Materials, Waste, Energy) **Greece** (Scrap, Water, Materials, Energy) **Czech Republic** (Scrap, Water, Materials, Waste, Energy)	**Slovakia** **Portugal** **Spain** **Germany** **United Kingdom**

It is recognised that data on resource efficiency measures being implemented by SMEs rely heavily on the response and interpretation of the questions by respondents and that all might not respond in the same manner. It should also be understood that the survey responses represent a reflection of how those companies that responded to the survey perceive themselves and that the self-selecting sample may in itself distort relative results between Member States. However, the figures do provide a high level indication of where large proportions of SMEs are reporting that they are implementing a range of efficiency measures (Slovakia, Portugal, Spain Germany and United Kingdom) and where SMEs are consistently implementing fewer measures (suggesting that there may be a particular need for support programmes in these Member States).

Even in those Member States where SMEs have reported the highest percentages having implemented measures to improve resource efficiency, there are still significant percentages not doing so in some categories, highlighting the potential for direct, hands-on support programmes to engage with greater numbers of SMEs across the EU.

4.5.2 Estimating future benefits for SMEs from direct, hands-on resource efficiency orogrammes

The potential future benefits that may arise from direct, hands-on resource efficiency support programmes are likely to be influenced by a range of factors which will determine overall levels of savings:

- the extent to which firms are already resource efficient and therefore need to engage in resource efficiency improvement actions
- the potential savings (economic and environmental) for individual firms in different sectors
- the number of firms within different sectors

- the proportion of firms that are likely to take part in and be supported by hands-on, direct support programmes
- the intensity/quality of support that is provided
- the ability to finance hands-on, direct support programmes.

Sectoral potentials

Various studies have attempted to assess overall potential for resource efficiency savings and have concluded that different sectors have different levels of potential. AMEC (2013) provides estimates of potential gross annual benefits (i.e. not taking into account the investment costs required to achieve the resource efficiency savings) at both the EU27 level and the firm level. These estimates are reproduced in Table 4-22 below.

Table 4-22: Benefits of implementing resource efficiency measures

Sector	Annual benefit (EU27) € billions	Average Annual Benefit (per company) € 000s / % avg. turnover
Food & Drink Manufacturing	€64 - 118	€424 (11%)
Fabricated Metal Products	€44 – 82	€164 (17%)
Hospitality and Food Services	€18 - 43	€27.5 (27.5%)

The report notes that the difference in the levels of savings for each of the sectors is, in part, down to the fact that the average size of companies in each of these sectors differs significantly and that the savings estimated assume that all measures identified are indeed implemented by companies. In this sense, the estimates are likely to be overestimates, particularly for SMEs. The report notes that larger companies will benefit from a greater proportion of the overall benefits identified, although smaller companies may gain proportionally more (in terms of their own turnover, for example) than larger ones from action on resource efficiency. The projected benefits above are also likely to be overestimated due to the fact that, in practice, not all identified measures will be implemented and companies will cherry-pick those measures that they believe will provide the greatest benefit and value for money where investment is required. The PIUS-Check programme in Germany (referred to above) for example, indicated that only 43% of companies benefitting from a PIUS check actually implemented the resource efficiency measures identified. However, this study did not include benefits resulting from energy savings measures.

The study goes on to make further estimates of potential net benefits (based on simple assumptions regarding the cost of investment required to achieve benefits) under different scenarios which attempt to account for different baseline levels of existing resource efficiency across companies.

Two of the key objectives of the Oakdene Hollins (2011) report focused on identifying potential savings to UK business from resource efficiency measures. These were:

- Identify the total potential financial and environmental (energy/waste/water/raw materials etc.) savings for UK business from implementing resource efficiency measures requiring investment with less than a one year payback period.
- Identify the total potential financial and environmental (energy/waste/water/raw materials etc.) savings for UK business from implementing resource efficiency measures requiring investment with greater than a one year payback period.

The projected savings opportunities are presented in Table 4-23 below[21].

Table 4-23: Estimated resource efficiency opportunities for 2009

Type	Resource	Estimated savings ipportunity	
		£bn	$MtCO_2$
No cost/low cost	Energy	€4	13
	Waste	€18	16
	Water	€1	0
	Sub-total	*€23*	*29*
Payback greater than 1 year	Energy	€7	30
	Waste	€22	29
	Water	€4	1
	Sub-total	*€33*	*61*
Total		**€55**	**90**
Notes: Figures rounded to nearest £bn			

Differences in potential savings for each resource from low-cost/no-cost measures were observed across sectors and Table 4-24 presents a breakdown of the potential savings for water, waste and energy identified in Table 4-23 above.

[21] Oakdene Hollins 2011: The Further Benefits of Business Resource Efficiency, March 2011, p.6.

Table 4-24: Sectoral breakdown of potential savings from resource efficiency		
Resource	**Sector**	**% of savings**
Energy	Freight (mainly own account)	27%
	Freight: HGV	27%
	Freight: LGV	18%
	Retail	4%
	Commercial Offices	3%
	Hotels	3%
	Others	19%
	Total	**100%**
Waste	Chemicals/non-metallic minerals	24%
	Metal Manufacturing	20%
	Power & Utilities	19%
	Construction	14%
	Textiles/wood/paper/publishing	8%
	Transport & Storage	5%
	Others	10%
	Total	**100%**
Water	Public administration	29%
	Agriculture	16%
	Food & Drink	14%
	Other services	8%
	Education	7%
	Health & Social Work	5%
	Others	20%
	Total	**100%**

The results projected in terms of the potential for resource efficiency savings focus on the UK economy as a whole, including both SMEs and large businesses, with no breakdown as to what might accrue in each group. Results also incorporate a wide range of policy measures that will have an influence on the measures and technologies adopted in different sectors, as well as the number of firms likely to adopt different measures.

What is clear from the above sectoral data is that there are likely to be significant differences in the potential for economic and environmental savings in different sectors and that this will need to be taken into account when estimating the potential benefits in Member States (as their economies are structured differently with different numbers and proportions of SMEs represented in different sectors). Sectoral data on SMEs in Member States presented in Annex 7 confirms this.

Additional data on SMEs is presented in Tables 4-25 and 4-26. These tables set out information on the overall number of SMEs in the EU, as well as specific information on the extent to which they have taken measures to improve resource efficiency. Information is also provided on the extent to which SMEs have benefitted from public resources to implement resource efficiency measures. This information may be of relevance and potential assistance when considering baseline resource efficiency positions and the potential for gaining benefits from investing in support programmes for SMEs.

Table 4-25: Selected SME statistics, EU27 (Average) (2012)	
Number of SMEs	20.4 million
Employment	86.8 million
Value Added at factor cost	€3.4 trillion
% SMEs with comprehensive systems for energy efficiency	4.26%
Calculated number of SMEs with comprehensive systems for energy efficiency	867,159
% of SMEs applying simple measures to save energy	28.44%
Calculated no. of SMEs applying simple measures to save energy	5.8 million
% SMEs that have taken resource efficiency measures	93%
Calculated no. of SMEs that have taken resource efficiency measures	18.9 million
% SMEs that have benefited from public support measures for their resource efficiency	9%
Calculated no. of SMEs that have benefited from public support measures for their resource efficiency	1.8 million
Source: A Recovery on the Horizon: Annual Report on European SMEs 2012/2013, PWC et al 2013 p.10, own calculations, SBA Fact Sheets available at http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/#	

Table 4-26: SME performance review statistics

Member State	% of SMEs having comprehensive systems for energy efficiency	% of SMEs applying simple measures to save energy	% of SMEs that have benefited from public support measures for their resource efficiency actions (2012)
EU28	**4.26**	**28.44**	**9**
Austria	5	23	11
Belgium	4	39	14
Bulgaria	4	29	2
Croatia	N/A	N/A	6
Cyprus	5	16	3
Czech Republic	5	43	7
Denmark	5	23	7
Estonia	4	16	2
Finland	2	37	22
France	5	33	8
Germany	4	24	11
Greece	4	22	5
Hungary	2	25	7
Ireland	3	41	2
Italy	4	21	5
Latvia	6	15	6
Lithuania	5	26	3
Luxembourg	10	39	8
Malta	3	30	6
Netherlands	4	21	15
Poland	2	18	14
Portugal	5	34	4

Table 4-26: SME performance review statistics			
Member State	% of SMEs having comprehensive systems for energy efficiency	% of SMEs applying simple measures to save energy	% of SMEs that have benefited from public support measures for their resource efficiency actions (2012)
Romania	4	34	3
Slovakia	3	15	4
Slovenia	3	40	6
Spain	4	26	7
Sweden	7	50	9
UK	3	43	17
Source: SBA Fact sheets, European Commission SME Performance Review website, http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/			

4.5.3 Selection of data to assist in identifying potential savings in EU Member States

The data on economic and environmental savings arising from the support provided by direct, hands-on SME support programmes are patchy and incomplete. In many Member States, no quantitative information has been identified and, in others, the identified information is not comparable across Member States due to differences in terms of format, time period, etc.

Table 4-27 below sets out the various sets of information available to assist with making an informed and practical estimate of the potential future benefits for SMEs from direct, hands-on resource efficiency support programmes, along with advantages and disadvantages associated with each.

Table 4-27: Potential data sources for projecting future potential savings from direct, hands-on SME resource efficiency support programmes		
Potential source	**Advantages**	**Disadvantages**
A. Extent to which firms are already resource efficient and therefore need to engage in resource efficiency improvement actions		
Eurobarometer data on uptake of different resource efficiency measures by SMEs (Table 4-20) SBA Factsheet data	Data available on all Member States from a large survey of SMEs. Includes data on adoption of individual measures as well as combinations of measures. Provides data on companies with comprehensive systems for energy efficiency.	Does not capture the fact that some firms are not engaging in resource efficiency measures as they are already very resource efficient and so can only be used as a proxy for existing resource efficiency. Data only focused on energy efficiency and does not include other aspects of resource efficiency.
B. Potential savings (economic and environmental) for individual firms in different sectors		
ENWORKS data	Comprehensive programme data set covering a wide range of outcomes. Beneficiaries identified on sectoral basis, as are actual benefits. Average per-firm outcomes already	Data is only from one area of UK. Sample for each sector is limited.

Table 4-27: Potential data sources for projecting future potential savings from direct, hands-on SME resource efficiency support programmes		
Potential source	**Advantages**	**Disadvantages**
	calculated. Possible to calculate SME-specific savings. Separates achieved from potential savings. Information on programme cost available.	
Case studies	Provides specific real-life examples of benefits that can be achieved for individual companies.	Limited number of examples, often without context of the percentage of companies that had received support. Therefore difficult to extrapolate across whole programme, let alone MS and EU. Different units applied (sometimes €, sometimes % reduction). Often not broken down by SMEs/large companies.
ÖkoBusinessPlan Wien	Fairly comprehensive programme data set covering wide range of outcomes.	Not possible to identify SME-specific data. Savings identified include initiatives that would have been taken anyway. No information on programme cost.
AMEC (2013)	High level scenario estimates for potential savings across EU27 and for average firms. Estimates also provided in terms of % of turnover. Breakdown of estimates for 3 sectors with major potential for resource efficiency improvement.	Estimates of savings are theoretical maximums, minimums and mid-ranges, do not distinguish between large and small companies, and assume all potential measures identified are taken up. Figures exclude energy savings.
Other resource efficiency programme data	Covers programmes in a number of different Member States.	Sporadic and not comprehensive across outcomes. Utilises data from different programmes with different levels and types of support so difficult to compare. Very limited information on programme costs.
Oakdene Hollins (2011) data	Provides Member State wide projections of savings across a number of different sectors.	Potential savings not broken down by SMEs and large companies and only based on the UK economy. Potential savings based on theoretical technical possibilities as opposed to likely take up.
C. The number of firms within different sectors		
DG Enterprise & Industry SME Programme Review data (Tables 3.25 and 3.26	Provides SME numbers data across sectors and across Member States.	Sectoral data on savings from programmes does not always map across to the sectors used in the SME Programme Review.
D. The proportion of firms that are likely to take part in and be supported by hands-on, direct support programmes		
Coverage of ENWORKS and other programmes	Provides more realistic and practical view of potential than simply	Coverage is not only determined by willingness of firms to participate but is also

Table 4-27: Potential data sources for projecting future potential savings from direct, hands-on SME resource efficiency support programmes		
Potential source	**Advantages**	**Disadvantages**
where information is available	calculating savings on the basis of all SMEs.	restricted by programme budgets and economic situation of SMEs.
E. The intensity/quality of support that is provided		
Limited information on programmes and outcomes means difficult to compare. Use of a single set of outcome data (such as ENWORKS) would provide projections based on that level of support	Since ENWORKS has been identified as a good practice programme (RegioStars winner 2013), would indicate high scenario projection for outcomes.	The outcomes generated in the UK are only partially a result of the ENWORKS programme. The strong policy culture and public emphasis on resource efficiency would have influenced firms' willingness to participate. Differing turnover/income levels of firms across Member States will influence ability to implement measures and therefore levels of potential savings.
F. The ability to finance hands-on, direct support programmes		
GDP and turnover levels of SMEs in different Member States to generate scenario estimates	Provides general indication of relative abilities of Member States and SMEs to finance implementation of resource efficiency measures.	Scenario estimates are only indicative.

Discussions held with the Commission services at an interim meeting for the study recognised the limitations in the data identified across Member States outlined above. The most comprehensive set of data on savings generated as a result of the provision of assistance to SMEs comes from the ENWORKS programme in the UK and it was agreed that a simplified approach using ENWORKS data might provide informative results regarding the potential savings from implementing similar programmes in other Member States. Our specific approach, and resulting indicative figures, are presented in the following sections.

4.6 Indicative savings across Member States

4.6.1 Introduction to the approach adopted

The methodology adopted is a simplified one and applies various ratios in relation to performance (for efficiency indicators, such as energy and waste) in other Member States to ENWORKS data on per business savings in different sectors. The outcomes are suggestions (rather than estimations) of the scale of benefits that might be achieved at the firm level. The resulting data are presented alongside other information from EU surveys of SMEs[22] regarding the adoption of different resource efficiency measures by SMEs. These data are not used to make any predictions (or calculations) based on the numbers of SMEs that might participate in an ENWORKS-type programme, but are instead presented in order to suggest

[22] Survey data is from Flash Eurobarometer 381 Report on SMEs, Resource Efficiency and Green Markets, December 2013, http://ec.europa.eu/public_opinion/flash/fl_381_en.pdf.

the scope from within which a programme similar to ENWORKS might identify and engage small companies to participate.

As discussed in Table 4-27 above, there are inherent problems in taking this approach due to the different structures of economies, sectors and small companies across Member States. Wide disparities in cost structures faced by companies in different Member States (for example, in terms of water, materials and waste disposal prices) will significantly affect the relative benefits that might be achieved and the consequent incentives to implement resource efficiency measures. These differences lead to significant uncertainty in terms of the specific numbers that are derived using this approach. The figures can, therefore, only be taken as indicative; however, they do provide an indication of the order of magnitude of potential savings that could be achieved as a result of participation in an intensive direct support programme, such as ENWORKS, bearing in mind current levels of resource efficiency in different areas (water, waste, material resources) and the different steps that SMEs themselves are reportedly taking to improve efficiency.

It is also important to note that calculations are based on carefully monitored outcomes resulting from the delivery of the ENWORKS programme in the North West of the UK. The programme is based on a particular approach with a history in the area and has been implemented by a particular group of individuals, utilising specific partner organisations with their own staff, skills and experience and the programme has worked within a particular context (legislative, institutional, economic and social) in the North West of England. Whilst it may be possible to design programmes in other Member States in line with the approach developed under ENWORKS it would be impossible to replicate the programme identically elsewhere. This, again, implies that the figures generated for savings in other Member States should be treated as purely indicative.

4.6.2 General Methodology

Companies, both large and small, are currently operating with different levels of resource efficiency across Member States. Varying levels of knowledge (in terms of how to make improvements and the benefits that actions might provide to the individual company and for the environment) along with a range of internal and external factors combine to influence the extent to which SMEs and large companies are able and willing to take action to improve resource efficiency. Such factors include:

- a company's historical performance with respect to resource efficiency and its current "baseline" level
- a company's internal financial situation
- general economic conditions and market demand
- differing levels of competition within sectors and across Member States
- access to different resources/technologies
- availability of external finance
- general attitudes to resource efficiency and the environment.

All the above factors will combine to influence company performance in terms of resource efficiency, and the combination of all companies' performance across sectors will translate into an overall impact on a country's performance in terms of efficiency in the use of different resources (water, energy, materials, etc.).

Direct, hands-on resource efficiency support programmes for SMEs, such as ENWORKS, focus on targeting internal barriers (as they exist within individual companies) to improving resource efficiency (e.g. lack of knowledge of what measures can be taken and how; knowledge of the benefits they can bring; market awareness), providing support to identify and implement different improvements. However, external barriers are outside the influence of such programmes and differ significantly from Member State to Member State. This means that the benefits and savings achieved under the ENWORKS programme cannot be simply translated to other Member States, due to the differences highlighted. This fact has informed the study's basic approach to calculating indicative comparative benefits that might arise in other Member States and, due to the limited time available to conduct this exercise, the approach utilises relative, national-level indicators for water, material and energy efficiency to act as a proxy for the combined effects of all the different factors.

There are, of course, numerous issues associated with this approach in terms of applying other Member States' efficiency ratios to UK savings data generated by the ENWORKS programme. Since individual Member States have differently structured economies when compared with the UK, some of the values calculated might not be valid. For example, Luxembourg has a very strong services sector when compared with the UK and other economies. As a result, some of the ratios calculated on the basis of GDP figures and economy-wide efficiency indicators (which cover all sectors) might not present a good comparison from the point of view of looking at comparable industry savings from resource efficiency measures.

Similarly, the approach recognises that the potential for savings to be made from efficiency measures are of a different scale in different industries and utilises sectoral data based on the results of the ENWORKS programme. However, different industries are of different importance in different Member States, with larger and smaller numbers of SMEs operating in those sectors. Consequently, predicted levels of savings for certain sectors in some Member States might not be relevant because SMEs are either not present in those sectors and Member States, or are only present in limited numbers. For example, data on savings in the aerospace or chemical industry (as provided by ENWORKS) would only apply to a limited number of countries (i.e. those with a strong aerospace or chemical industry) and could not be used to compare potential results across the EU. With this in mind, the calculations have excluded these sectors, focussing on four main sectors: construction, food and drink, environmental technologies, and energy, power and utilities.

The ENWORKS data available for per business savings apply to both large companies and SMEs. Whilst the efficiency ratios applied to the ENWORKS savings data are compiled at the national level and, therefore, incorporate performance of both large and small companies, the level of savings that can be achieved by small companies is clearly less than that of larger companies. Therefore, data has been recalculated to apply it to SMEs only, using the average resource cost savings per large and small business identified in a recent evaluation (ENWORKS, 2011) of the ENWORKS programme for 2007-10 which overlaps the period for which savings data are available. The data have been adjusted based on this ratio for all of the efficiency categories described in this report and, whilst it is problematic to use the same ratio across different efficiency categories and different industries, no other data for adjustment have been identified.

The following sub-sections outline the methodology adopted to calculate the different ratios for comparing Member States and highlight the key issues that result in uncertainty over the final figures generated. The same ratios were applied to ENWORKS data on achieved savings (those savings actually achieved as a result of companies implementing measures identified through ENWORKS support) as well as those for potential or “pipeline” savings (i.e. savings which had been identified through programme support but, at the time of BIS (2010) had not yet been implemented). Savings calculated across Member States in this report have been generated using data on actual realised savings under the ENWORKS programme, and potential “pipeline” savings which are presented in Annex 8.

4.6.3 Water use efficiency

In order to use ENWORKS data on water resource reduction to calculate the scope of likely savings in other Member States, a ratio to indicate comparable water efficiency levels between Member States was used. There are several water productivity indicators available. Data on water productivity from Eurostat (output produced per cubic metre of fresh water abstracted - €/m^3), was determined to be a good proxy of water efficiency use across the EU. However, the data available from Eurostat are incomplete for several countries. As an alternative, World Bank data on water productivity (constant 2005 US$ GDP per cubic metre of total freshwater withdrawal) was reviewed. This ratio is calculated as GDP in constant prices divided by annual total water withdrawal. Data are complete for the EU27, however, data are missing for Croatia.

Data for 2007 was selected and used as a proxy for the 2004-09 period covered by the ENWORKS programme and applied to the ENWORKS data for water savings after adjusting for SMEs. The main problem in using an efficiency indicator with a GDP component and using it to compare across different Member States is that the structure of the different economies is not the same. For example, some have a very strong services sector (e.g. Luxembourg) or a very strong water-based agricultural sector, in which case the water efficiency ratio used would lead to an over- or under-valuation of water efficiency savings.

The calculations of savings in other Member States were then made based on water efficiency indices, UK being indexed at 100 (ENWORKS data is assumed to represent the UK as a whole).

4.6.4 Energy use efficiency

Eurostat data on greenhouse gas emissions per capita (tonnes of CO_2 equivalent) were used as an indicator to compare energy use efficiency. This indicator shows trends in man-made emissions of the Kyoto basket of greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the so-called F-gases (hydro fluorocarbons, perfluorocarbons and sulphur hexafluoride (SF_6)). The aggregated greenhouse gas emissions are expressed in units of CO_2 equivalents. The ratio used was calculated based on a 5 year average (2004-09) and the savings figures for EU Member States were then calculated using the UK as a (100) base index.

4.6.5 Material (resource) use efficiency

Resource productivity was used as an indicator for material (resource) use efficiency based on data provided by Eurostat. Resource productivity is defined as GDP divided by domestic material consumption (DMC). DMC measures the total amount of materials directly used by an economy and it is defined as the annual quantity of raw materials extracted from the domestic territory of the focal economy, plus all physical imports minus all physical exports. It is important to note that the term "consumption" as used in DMC denotes apparent consumption and not final consumption. DMC does not include upstream flows related to imports and exports of raw materials and products originating outside of the focal economy. The figures used were calculated as an average for the 2004-09 period in accordance with ENWORKS data. Since comparisons of resource productivity between countries are made, we used GDP in purchasing power standards. Indices were used across the board to generate data for individual EU Member States, again using the UK as a base (100) index.

4.6.6 Waste efficiency

Waste efficiency savings across Member States were calculated based on the ENWORKS data and by applying relative landfill efficiency data across Member States as a proxy for waste efficiency. It was not possible to identify measurement indicators specifically for industrial landfill and consequently, municipal landfill ratios were assumed to be comparative indicators. An average figure for the 2004-09 period was calculated and applied to ENWORKS data to generate savings achievable, again using the UK as a base (100) index. The use of municipal recycling rates is not only problematic as it refers to mostly non-industrial waste, but also in certain Member States (e.g. The Netherlands), landfill is not permitted.

4.6.7 Comparison of efficiency indicators

Figures 4-5 and 4-6 below set out the relative indices for Member States that were combined with ENWORKS data on savings to generate the different levels of savings across Member States that might be generated from implementing a similar programme. The savings are presented in Section 4.6.8.

Figures 4-5 and 4-6 give an overview of the efficiency level of EU Member States with regards to several different categories (energy efficiency (CO_2 emissions), water use efficiency, material and resource efficiency and municipal recycling).

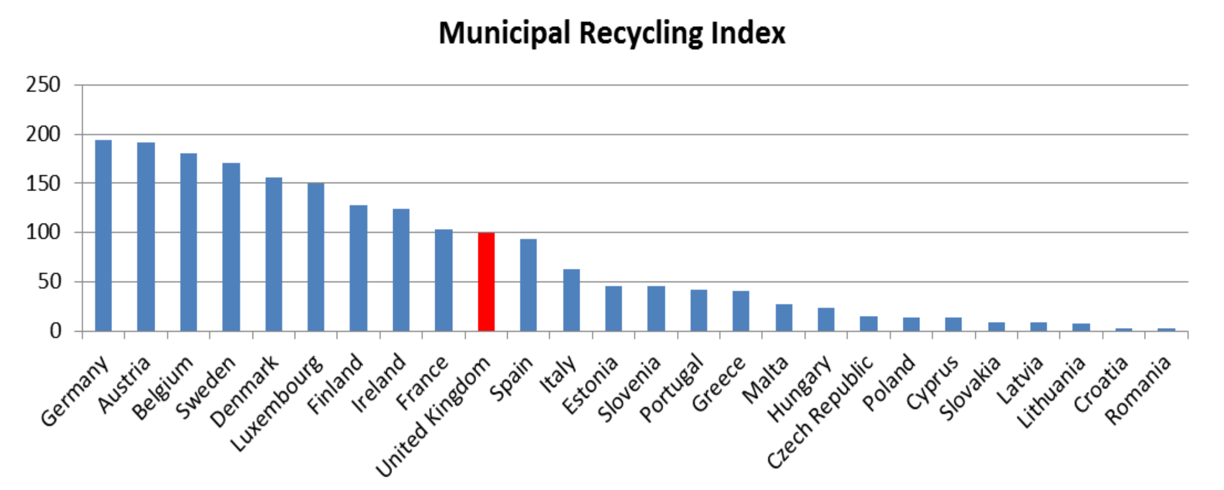

Figure 4-5: Indices for municipal recycling[23][24]

[23] Data for Bulgaria and Netherlands unavailable.

[24] Data used to generate indices in both Figures originated from Eurostat and World Bank sources which were then used to generate the indices by own calculations. Explanation provided in Section 4.6.6 above. Sources as follows:

–Greenhouse gas emissions per capita (Eurostat, own calculations):
http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=t2020_rd300&plugin=0
-Water productivity (World Bank, own calculations): http://data.worldbank.org/indicator/ER.GDP.FWTL.M3.KD?page=1
-Resource/material productivity (Eurostat, own calculations):
http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=tec00114&plugin=0 (GDPPPS per capita)
http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=t2020_rl110&plugin=0 (DMC per capita)
-Municipal recycling rate as proxy for landfill efficiency (Eurostat, own calculations):
http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=t2020_rt120&plugin=0

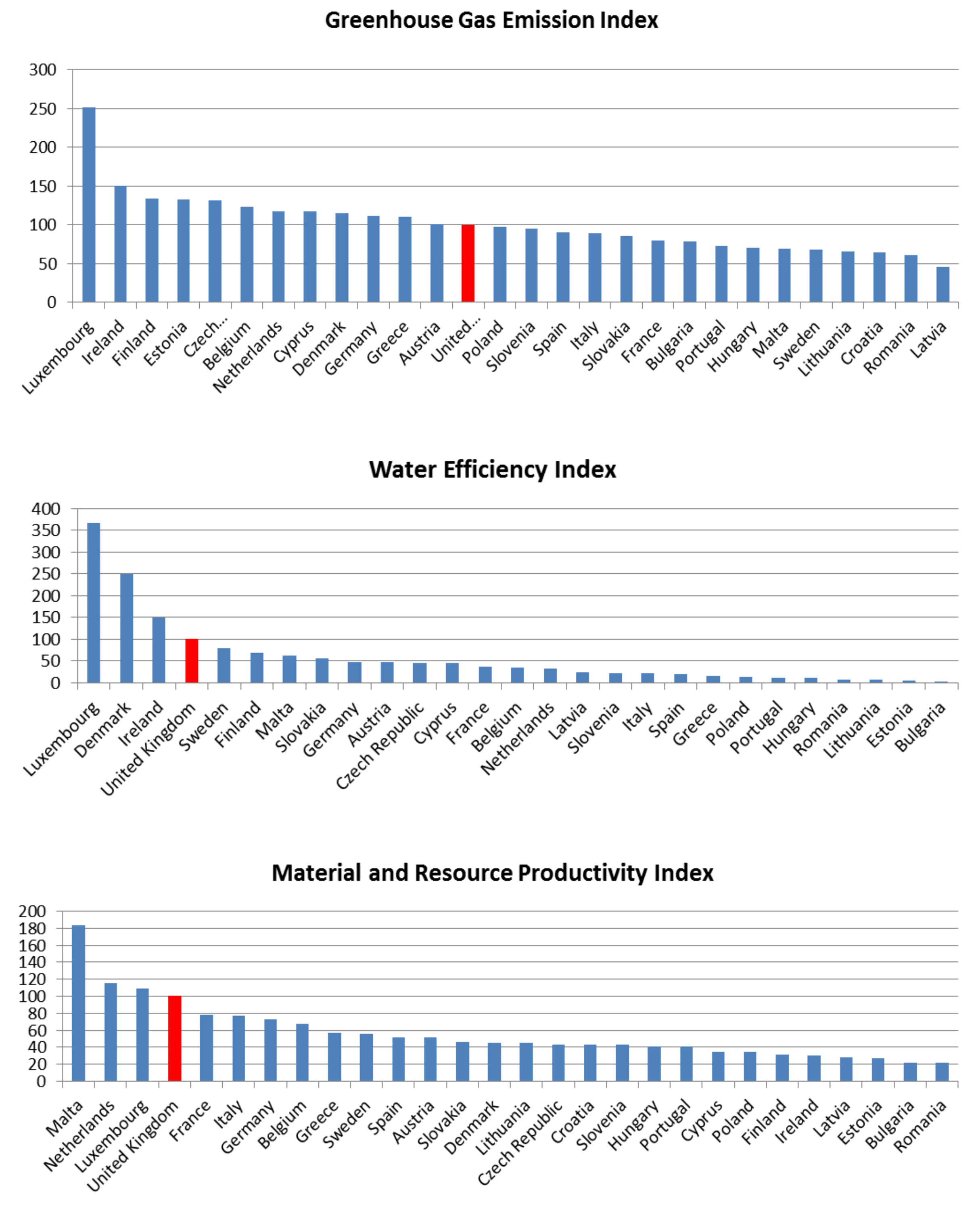

Figure 4-6: Indices for greenhouse gas emissions, water efficiency and material resource productivity[25]

[25] Data on Water Efficiency unavailable for Croatia. Methodology clarified in Sections 4.6.3 to 4.6.5.

In general there are certain countries, particularly a number of new Member States, which appear lower down on most or all of the indices. Romania, Bulgaria and Lithuania are particular examples. While, on the one hand, this could suggest that potential savings from an ENWORKS-type programme in these countries might be lower than elsewhere (due to the current situation of the economy, industry structure and practices adopted in companies), it may also indicate that there is a great deal of potential for improvement with respect to different categories of resource efficiency.

As mentioned in the methodology discussion above, some of the indicators for some countries (e.g. Luxembourg) may be overvalued in terms of industry performance because more resource efficient sectors make up a large proportion of the economy. As also mentioned previously, some of the indicators (energy efficiency-CO_2 emissions and water efficiency) are GDP based so the ratios may be overestimated. In this context, certain countries with a strong water-based agricultural sector may appear to have too low efficiency ratios.

4.6.8 Calculated savings and potential (pipeline) savings

The following tables show the calculated savings that might be achieved across Member States based on the savings recorded as achieved under the ENWORKS programme over the period 2004-09. Additional calculations are presented in Annex 8, based on “pipeline” savings identified under ENWORKS. These represent opportunities that have been identified through the support provided by the programme, but which were yet to be implemented at the time of the BIS (2010) report.

Various factors are likely to have contributed to the non-implementation of identified opportunities, including the global financial crisis in 2008, when a number of investment plans are likely to have been put on hold, as well as the probability that the easier, low-cost opportunities were implemented first, with the more costly, potentially technically more difficult solutions being left until later.

In addition to presenting calculated savings in costs, energy, CO_2 emissions, water and waste, each table also presents survey data from SMEs[26] which indicate the percentage of SMEs which reported that they were already taking measures to save resources in the respective efficiency area (water, materials and waste). Whilst this information is not able to determine the scope (in nature, quantity and potential for making savings), it provides a very broad indication of the extent of SME’s current action and the opportunity to engage with SMEs through support programmes.

Cost savings

Table 4-28 calculates annual cost savings on a per business basis, representing a general indicator of the benefits of taking measures to improve resource efficiency across all areas.

[26] Source: Flash Eurobarometer 318, SMEs, Resource Efficiency and Green Markets, Report, December 2013.

However, a material resource efficiency index (GDP_{PPP}/DMC) was used as a proxy for the calculations.

Table 4-28: Cost savings per business (SMEs) due to resource efficiency measures						
Member State	Average (2004-9) resource productivity (UK base)	Savings per business (€)[27]				*Companies taking action in terms of material efficiency*
		Energy, power and utilities	Food and drink	Environmental technologies	Construction	
Austria	0.5176	€9,709	€17,339	€23,640	€12,487	*63%*
Belgium	0.6734	€12,630	€22,556	€30,754	€16,244	*62%*
Bulgaria	0.2175	€4,080	€7,286	€9,934	€5,247	*38%*
Croatia	0.4280	€8,027	€14,336	€19,546	€10,324	*44%*
Cyprus	0.3514	€6,591	€11,771	€16,049	€8,477	*34%*
Czech Republic	0.4307	€8,079	€14,428	€19,671	€10,390	*66%*
Denmark	0.4481	€8,406	€15,012	€20,467	€10,811	*45%*
Estonia	0.2717	€5,097	€9,102	€12,410	€6,555	*34%*
Finland	0.3087	€5,790	€10,341	€14,099	€7,447	*80%*
France	0.7802	€14,635	€26,136	€35,634	€18,822	*41%*
Germany	0.7309	€13,710	€24,484	€33,382	€17,632	*61%*
Greece	0.5665	€10,627	€18,978	€25,875	€13,667	*68%*
Hungary	0.4136	€7,758	€13,856	€18,891	€9,978	*53%*
Ireland	0.3014	€5,653	€10,096	€13,764	€7,270	*46%*
Italy	0.7664	€14,375	€25,673	€35,002	€18,488	*40%*
Latvia	0.2801	€5,254	€9,383	€12,792	€6,757	*61%*
Lithuania	0.4464	€8,374	€14,955	€20,389	€10,770	*55%*
Luxembourg	1.0909	€20,462	€36,542	€49,822	€26,316	*61%*
Malta	1.8385	€34,484	€61,585	€83,966	€44,350	*50%*
Netherlands	1.1472	€21,518	€38,428	€52,393	€27,674	*65%*
Poland	0.3463	€6,495	€11,600	€15,815	€8,354	*56%*
Portugal	0.4078	€7,649	€13,661	€18,625	€9,838	*85%*
Romania	0.2155	€4,043	€7,220	€9,844	€5,200	*60%*
Slovakia	0.4642	€8,707	€15,550	€21,202	€11,199	*77%*
Slovenia	0.4265	€8,001	€14,288	€19,481	€10,290	*27%*
Spain	0.5234	€9,817	€17,533	€23,904	€12,626	*91%*
Sweden	0.5622	€10,545	€18,832	€25,676	€13,562	*58%*
United Kingdom	1	€18,757	€33,498	€45,672	€24,124	*71%*

In a number of cases, the relatively low calculated cost savings on a per firm basis (based on an efficiency indicator of less than 0.5) coincide with a relatively low percentage of SMEs (less than 50%) reporting that they were taking resource efficiency measures. Examples

[27] Figures calculated based on ENWORKS data in £. An average ECB £/EUR exchange rate for the period between 6 January 2004 and 29 December 2008 was used (i.e. 1 EUR is £ 0.70451): http://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-gbp.en.html.

include Bulgaria, Croatia, Cyprus, Denmark, Estonia, Ireland and Slovenia. Whilst it is not possible to describe a direct correlation between the two indicators, it may suggest that there is scope within these countries to work with SMEs to increase the numbers of companies taking measures.

Energy efficiency

Table 4-29: Energy savings per business for SMEs (kwh/year)

Member State	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*Measures taken to save energy*
Austria	425,444	480,328	15,916	268,869	*80%*
Belgium	519,501	586,519	19,434	328,311	*68%*
Bulgaria	331,309	374,049	12,394	209,379	*41%*
Croatia	272,640	307,812	10,199	172,302	*64%*
Cyprus	492,159	555,649	18,412	311,032	*45%*
Czech Republic	553,717	625,149	20,714	349,935	*75%*
Denmark	481,612	543,742	18,017	304,367	*59%*
Estonia	558,873	630,971	20,907	353,194	*27%*
Finland	561,920	634,410	21,021	355,119	*70%*
France	337,324	380,840	12,619	213,180	*62%*
Germany	471,144	531,924	17,625	297,751	*74%*
Greece	464,895	524,868	17,392	293,801	*69%*
Hungary	300,451	339,211	11,240	189,877	*71%*
Ireland	636,213	718,287	23,801	402,070	*62%*
Italy	373,884	422,117	13,987	236,285	*44%*
Latvia	195,301	220,496	7,306	123,425	*73%*
Lithuania	276,312	311,957	10,337	174,622	*61%*
Luxembourg	1,057,438	1,193,852	39,558	668,273	*69%*
Malta	290,217	327,657	10,857	183,410	*76%*
Netherlands	496,533	560,588	18,575	313,796	*67%*
Poland	407,632	460,219	15,249	257,613	*64%*
Portugal	307,638	347,325	11,509	194,419	*90%*
Romania	257,641	290,878	9,638	162,823	*72%*
Slovakia	362,557	409,328	13,563	229,127	*74%*
Slovenia	401,305	453,075	15,013	253,614	*40%*
Spain	376,228	424,763	14,075	237,766	*91%*
Sweden	287,249	324,305	10,746	181,534	*59%*
United Kingdom	420,366	474,595	15,726	265,660	*79%*

Table 4-30: Energy savings per business for SMEs (tonnes of CO_2/year)

Member State	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*Measures taken to save energy*
Austria	325	193	6	95	*80%*
Belgium	397	236	8	116	*68%*
Bulgaria	253	151	5	74	*41%*
Croatia	208	124	4	61	*64%*
Cyprus	376	224	7	110	*45%*
Czech Republic	423	252	8	124	*75%*

Table 4-30: Energy savings per business for SMEs (tonnes of CO_2/year)					
Member State	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*Measures taken to save energy*
Denmark	368	219	7	108	*59%*
Estonia	427	254	8	125	*27%*
Finland	429	255	8	126	*70%*
France	258	153	5	75	*62%*
Germany	360	214	7	105	*74%*
Greece	355	211	7	104	*69%*
Hungary	229	136	4	67	*71%*
Ireland	486	289	9	142	*62%*
Italy	285	170	6	84	*44%*
Latvia	149	89	3	44	*73%*
Lithuania	211	126	4	62	*61%*
Luxembourg	807	480	16	236	*69%*
Malta	222	132	4	65	*76%*
Netherlands	379	226	7	111	*67%*
Poland	311	185	6	91	*64%*
Portugal	235	140	5	69	*90%*
Romania	197	117	4	58	*72%*
Slovakia	277	165	5	81	*74%*
Slovenia	306	182	6	90	*40%*
Spain	287	171	6	84	*91%*
Sweden	219	130	4	64	*59%*
United Kingdom	321	191	6	94	*79%*

Material resource efficiency

Table 4-31: Savings from material resource reduction for SMEs						
Member State	Average (2004-9) resource productivity (UK base)	Unit savings per business (tonnes/year)				*Companies taking action in terms of material efficiency*
		Energy, power and utilities	Food and drink	Environmental technologies	Construction	
Austria	0.5176	66	21,395	513	894	*63%*
Belgium	0.6734	86	27,832	668	1,163	*62%*
Bulgaria	0.2175	28	8,990	216	376	*38%*
Croatia	0.4280	55	17,689	424	739	*44%*
Cyprus	0.3514	45	14,525	348	607	*34%*
Czech Republic	0.4307	55	17,803	427	744	*66%*
Denmark	0.4481	57	18,523	444	774	*45%*
Estonia	0.2717	35	11,231	269	469	*34%*
Finland	0.3087	39	12,760	306	533	*80%*
France	0.7802	99	32,249	774	1,348	*41%*
Germany	0.7309	93	30,211	725	1,263	*61%*
Greece	0.5665	72	23,417	562	979	*68%*
Hungary	0.4136	53	17,096	410	714	*53%*
Ireland	0.3014	38	12,457	299	521	*46%*

Table 4-31: Savings from material resource reduction for SMEs						
Member State	**Average (2004-9) resource productivity (UK base)**	**Unit savings per business (tonnes/year)**				***Companies taking action in terms of material efficiency***
		Energy, power and utilities	**Food and drink**	**Environmental technologies**	**Construction**	
Italy	0.7664	98	31,678	760	1,324	*40%*
Latvia	0.2801	36	11,577	278	484	*61%*
Lithuania	0.4464	57	18,453	443	771	*55%*
Luxembourg	1.0909	139	45,090	1,082	1,884	*61%*
Malta	1.8385	234	75,990	1,823	3,176	*50%*
Netherlands	1.1472	146	47,417	1,137	1,982	*65%*
Poland	0.3463	44	14,313	343	598	*56%*
Portugal	0.4078	52	16,856	404	704	*85%*
Romania	0.2155	27	8,909	214	372	*60%*
Slovakia	0.4642	59	19,188	460	802	*77%*
Slovenia	0.4265	54	17,630	423	737	*27%*
Spain	0.5234	67	21,634	519	904	*91%*
Sweden	0.5622	72	23,237	557	971	*58%*
United Kingdom	1	128	41,333	991	1,727	*71%*

Table 4-32 below represents water savings in m^3 following measures taken to improve efficiency. The highest proportion of companies taking measures in terms of water efficiency are located in Spain and Portugal. The availability and cost of water is likely to play a significant role in cases where the demand is high and may in some way affect companies' incentives to take up water efficiency measures. This may be the case particularly in southern European countries, for example, where water resources tend to be scarcer. In this case, the efficiency ratio for water used is constant, 2005 US$ GDP per cubic metre of total freshwater withdrawal (2007). This means that certain structural particularities of individual economies may also come into play. For instance, some countries have a very strong and water-based agricultural sector (e.g. Spain, Portugal) and some countries also have a very strong services sector (e.g. Luxembourg). In these cases, the water efficiency indicator (ratio) might be fairly low or very high respectively. An indicator using industrial output or production would have been better suited to produce the calculation, however, no appropriate data were found.

Water use efficiency

Table 4-32: Savings from reduction in water usage per business (m^3/year) for SMEs

Member State	Constant 2005 US$ GDP per cubic metre of total freshwater withdrawal (2007)	Ratio -UK base	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*SMEs taking measure for water efficiency*
Austria	89.66	0.47	53	1,232	11	38	*56%*
Belgium	64.12	0.34	38	881	8	28	*59%*
Bulgaria	5.20	0.03	3	72	1	2	*31%*
Croatia	NA	NA	NA	NA	NA	NA	*39%*
Cyprus	86.14	0.45	51	1,184	10	37	*38%*
Czech Republic	86.62	0.46	52	1,190	10	37	*56%*
Denmark	474.81	2.50	455	10,488	93	328	*33%*
Estonia	9.16	0.05	5	126	1	4	*13%*
Finland	131.77	0.69	79	1,810	16	57	*38%*
France	70.82	0.37	42	973	9	30	*54%*
Germany	91.71	0.48	55	1,260	11	39	*53%*
Greece	27.69	0.15	17	380	3	12	*54%*
Hungary	20.53	0.11	12	282	2	9	*52%*
Ireland	285.00	1.50	170	3,916	35	122	*43%*
Italy	40.88	0.22	24	562	5	18	*32%*
Latvia	47.94	0.25	29	659	6	21	*51%*
Lithuania	12.93	0.07	8	178	2	6	*50%*
Luxembourg	699.39	3.68	417	9,609	85	300	*49%*
Malta	118.28	0.62	71	1,625	14	51	*42%*
Netherlands	59.86	0.32	36	822	7	26	*27%*
Poland	27.19	0.14	16	374	3	12	*51%*
Portugal	23.54	0.12	14	323	3	10	*77%*
Romania	13.42	0.07	8	184	2	6	*57%*
Slovak Republic	106.71	0.56	64	1,466	13	46	*68%*
Slovenia	43.63	0.23	26	599	5	19	*32%*
Spain	37.32	0.20	22	513	5	16	*78%*
Sweden	152.64	0.80	91	2,097	18	65	*29%*
United Kingdom	189.92	1.00	113	2,609	23	81	*63%*

Waste efficiency

Table 4-33: Annual savings from reduction in waste (SMEs) per business (€)[28]						
Member State	Recycling indices adjusted for price level[29]	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*Rate of recycling of municipal waste*
Austria	1.9238	€2,441	€17,770	€213,931	€19,382	*60%*
Belgium	1.8134	€2,301	€16,750	€201,647	€18,269	*43%*
Bulgaria[1]	NA	NA	NA	NA	NA	*20%*
Croatia	0.0256	€32	€236	€2,845	€258	*39%*
Cyprus	0.1295	€164	€1,196	€14,397	€1,304	*39%*
Czech Republic	0.1525	€194	€1,409	€16,961	€1,537	*49%*
Denmark	1.5613	€1,981	€14,422	€173,622	€15,730	*22%*
Estonia	0.4580	€581	€4,230	€50,928	€4,614	*14%*
Finland	1.2761	€1,619	€11,788	€141,906	€12,857	*41%*
France	1.0326	€1,310	€9,538	€114,821	€10,403	*41%*
Germany	1.9364	€2,457	€17,887	€215,333	€19,509	*57%*
Greece	0.3965	€503	€3,662	€44,089	€3,994	*45%*
Hungary	0.2332	€296	€2,154	€25,932	€2,349	*20%*
Ireland	1.2356	€1,568	€11,413	€137,396	€12,448	*81%*
Italy	0.6322	€802	€5,840	€70,306	€6,370	*40%*
Latvia	0.0904	€115	€835	€10,054	€911	*23%*
Lithuania	0.0775	€98	€716	€8,618	€781	*19%*
Luxembourg	1.5014	€1,905	€13,868	€166,952	€15,126	*52%*
Malta	0.2665	€338	€2,462	€29,637	€2,685	*44%*
Netherlands[2]	NA	NA	NA	NA	NA	*55%*
Poland	0.1342	€170	€1,239	€14,918	€1,352	*28%*
Portugal	0.4170	€529	€3,852	€46,376	€4,202	*78%*
Romania	0.0162	€21	€150	€1,807	€164	*32%*
Slovakia	0.0915	€116	€846	€10,180	€922	*52%*
Slovenia	0.4547	€577	€4,200	€50,564	€4,581	*19%*
Spain	0.9266	€1,176	€8,559	€103,041	€9,336	*78%*
Sweden	1.7140	€2,175	€15,832	€190,600	€17,269	*56%*
United Kingdom	1	€1,269	€9,237	€111,200	€10,075	*83%*
Notes: [1] Data not available [2] According to our information landfilling is not allowed in The Netherlands						

[28] Figures calculated based on ENWORKS data in £. An average ECB £/EUR exchange rate for the period between 6 January 2004 and 29 December 2008 was used (i.e. 1 EUR is £ 0.70451): http://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-gbp.en.html.

[29] Source: Eurostat and own calculations http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=tec00120&plugin=0 (Comparative price levels).

Tables 4-34 and 4-35 present achieved annual cost savings (in EUR) and achieved annual savings (tonnes/year) from diversion of waste from landfill. The ratios used in these Tables to extrapolate data for EU Member States (based on UK data) differ slightly. The ratio used in Table 4-34 to calculate savings in EUR is the recycling rate of municipal waste adjusted for price level differences across the EU. This is the average municipal recycling index for the period 2004-09, divided by comparative price indices. This ratio has been used in order to take into account monetary value measurements and differences in price levels across the EU (purchasing power parity). The ratio used in Table 4-35 is the recycling of municipal waste. This ratio has been used because no data on industrial waste recycling are available. It has, therefore, been assumed that municipal waste recycling might be an indicator of the general trends in recycling in individual EU Member States and, hence, may also give a good comparison of the industrial recycling trends across the EU. The recycling rates indicate that municipal waste tends to be recycled more in the United Kingdom, Portugal and Spain. Countries with the lowest recycling ratios tend to be concentrated in the eastern part of Europe.

Table 4-34: Annual cost savings from diversion of waste from landfill (SMEs) per business (€)[30]

Member State	Recycling indices adjusted for price level[31]	Energy, power and utilities	Food and drink	Environmental technologies	Construction	*Rate of recycling of municipal waste*
Austria	1.9238	€2,441	€17,770	€213,931	€19,382	*60%*
Belgium	1.8134	€2,301	€16,750	€201,647	€18,269	*43%*
Bulgaria[1]	NA	NA	NA	NA	NA	*20%*
Croatia	0.0256	€32	€236	€2,845	€258	*39%*
Cyprus	0.1295	€164	€1,196	€14,397	€1,304	*39%*
Czech Republic	0.1525	€194	€1,409	€16,961	€1,537	*49%*
Denmark	1.5613	€1,981	€14,422	€173,622	€15,730	*22%*
Estonia	0.4580	€581	€4,230	€50,928	€4,614	*14%*
Finland	1.2761	€1,619	€11,788	€141,906	€12,857	*41%*
France	1.0326	€1,310	€9,538	€114,821	€10,403	*41%*
Germany	1.9364	€2,457	€17,887	€215,333	€19,509	*57%*
Greece	0.3965	€503	€3,662	€44,089	€3,994	*45%*
Hungary	0.2332	€296	€2,154	€25,932	€2,349	*20%*
Ireland	1.2356	€1,568	€11,413	€137,396	€12,448	*81%*
Italy	0.6322	€802	€5,840	€70,306	€6,370	*40%*
Latvia	0.0904	€115	€835	€10,054	€911	*23%*
Lithuania	0.0775	€98	€716	€8,618	€781	*19%*

[30] Figures calculated based on ENWORKS data in £. An average ECB £/EUR exchange rate for the period between 6 January 2004 and 29 December 2008 was used (i.e. 1 EUR is £ 0.70451): http://www.ecb.europa.eu/stats/exchange/eurofxref/html/eurofxref-graph-gbp.en.html.

[31] Source: Eurostat and own calculations http://epp.eurostat.ec.europa.eu/tgm/Table.do?tab=Table&init=1&language=en&pcode=tec00120&plugin=0 (Comparative price levels).

Table 4-34: Annual cost savings from diversion of waste from landfill (SMEs) per business (€)[30]						
Member State	**Recycling indices adjusted for price level[31]**	**Energy, power and utilities**	**Food and drink**	**Environmental technologies**	**Construction**	***Rate of recycling of municipal waste***
Luxembourg	1.5014	€1,905	€13,868	€166,952	€15,126	*52%*
Malta	0.2665	€338	€2,462	€29,637	€2,685	*44%*
Netherlands[2]	NA	NA	NA	NA	NA	*55%*
Poland	0.1342	€170	€1,239	€14,918	€1,352	*28%*
Portugal	0.4170	€529	€3,852	€46,376	€4,202	*78%*
Romania	0.0162	€21	€150	€1,807	€164	*32%*
Slovakia	0.0915	€116	€846	€10,180	€922	*52%*
Slovenia	0.4547	€577	€4,200	€50,564	€4,581	*19%*
Spain	0.9266	€1,176	€8,559	€103,041	€9,336	*78%*
Sweden	1.7140	€2,175	€15,832	€190,600	€17,269	*56%*
United Kingdom	1	€1,269	€9,237	€111,200	€10,075	*83%*
Notes: [1] Data not available [2] According to our information landfilling is not allowed in The Netherlands						

Table 4-35: Annual cost savings from diversion of waste from landfill (SMEs) per business (tonnes/year)						
Member State	**Municipal recycling index (UK base)**	**Energy, power and utilities**	**Food and drink**	**Environmental technologies**	**Construction**	***Rate of recycling***
Austria	2.0368	35	127	7,471	832	*60%*
Belgium	1.8369	32	114	6,738	751	*43%*
Bulgaria[1]	NA	NA	NA	NA	NA	*20%*
Croatia	0.0394	1	2	145	16	*39%*
Cyprus	0.1578	3	10	579	64	*39%*
Czech Republic	0.2647	5	16	971	108	*49%*
Denmark	1.2253	21	76	4,494	501	*22%*
Estonia	0.7219	13	45	2,648	295	*14%*
Finland	1.1410	20	71	4,185	466	*41%*
France	1.0328	18	64	3,788	422	*41%*
Germany	2.0481	36	127	7,513	837	*57%*
Greece	0.4846	8	30	1,778	198	*45%*
Hungary	0.3951	7	25	1,449	161	*20%*
Ireland	1.0742	19	67	3,940	439	*81%*
Italy	0.6651	12	41	2,440	272	*40%*
Latvia	0.1564	3	10	574	64	*23%*
Lithuania	0.1451	3	9	532	59	*19%*
Luxembourg	1.4686	26	91	5,387	600	*52%*
Malta	0.3890	7	24	1,427	159	*44%*
Netherlands[2]	NA	NA	NA	NA	NA	*55%*
Poland	0.2380	4	15	873	97	*28%*

Table 4-35: Annual cost savings from diversion of waste from landfill (SMEs) per business (tonnes/year)						
Member State	**Municipal recycling index (UK base)**	**Energy, power and utilities**	**Food and drink**	**Environmental technologies**	**Construction**	***Rate of recycling***
Portugal	0.5281	9	33	1,937	216	*78%*
Romania	0.0314	1	2	115	13	*32%*
Slovakia	0.1658	3	10	608	68	*52%*
Slovenia	0.6364	11	40	2,334	260	*19%*
Spain	1.0949	19	68	4,016	447	*78%*
Sweden	1.5922	28	99	5,840	651	*56%*
United Kingdom	1.0000	17	62	3,668	409	83%
Notes: [1] Data not available [2] According to our information landfilling is not allowed in The Netherlands						

4.7 Identification of good practice

4.7.1 Introduction

Before considering the merits and demerits of individual support programmes, it is necessary to define what constitutes good practice. Generally speaking, good practice refers to approaches that increase the likelihood of a particular programme being effective and/or efficient. In the context of measures supporting SME resource efficiency, good practice is deemed to be any approach that contributes to:

- maximising environmental benefits and/or cost savings for SMEs (**effectiveness**)
- achieving the best possible outcomes at the lowest possible cost (**efficiency**).

The purpose of this chapter is to provide an overview of practices that contribute to the schemes examined in this report being effective and efficient.

This could possibly be achieved by focussing on existing evaluations of best practice, such as the different prizes awarded to resource efficiency programmes. For example, the UK National Industrial Symbiosis Programme (NISP) has been recognised as best practice several times, including accreditation by the European Commission as an Exemplar of Eco-Innovation through its Environmental Technologies Action Plan (ETAP, 2007) and has won Best of Carbon Reduction project at edie.net Environmental Excellence Awards 2010[32]. However, due to the high number and diversity of the programmes identified in this report, an approach based on prizes awarded is not deemed appropriate. For example, some programmes cover a wide range of environmental aspects but many awards focus on achievements in a relatively narrow field, e.g. carbon reduction or eco-innovation. This chapter therefore relies on an alternative approach that consists of the following steps:

[32] International Synergies website: National Industrial Symbiosis Programme (NISP Network), accessed at http://www.international-synergies.com/projects/national-industrial-symbiosis-programme-nisp

- identification of approaches that could be considered good practice, based on literature review and judgement of the study team (Section 4.7.2)
- assessment of the extent to which these practices have been applied across the schemes considered in this report (Table 4-37 in Section 4.7.3)
- more detailed consideration of several examples of best practice themes (Section 4.7.4).

4.7.2 Definition of good practice

Information collected on different resource efficiency support programmes, supplemented by the judgement of the study team, was used to develop a list of programme characteristics that can be considered good practice (see Table 4-36). All other things being equal, programmes performing well on these criteria can be expected to have a comparatively higher chance of maximising environmental benefits and delivering cost savings for SMEs.

Table 4-36: Characteristics constituting good practice

Aspect	Reason for selection
Adopting an **holistic approach** rather than concentrating on a single resource efficiency area or theme	Leads to multiple savings that can support each other and achieve an overall more significant impact. This approach also means that any company can become involved, rather than only those that have issues with, say, water.
Multiple agencies/organisations involved in programme implementation, design or strategic oversight	Provides wider perspective and potential for co-ordinating support to businesses in an holistic fashion, creates synergies and enables achievement of cumulative effects across a region.
Long-term support	Provides longer periods for beneficiaries to access advice and support in which to identify and implement improvements. Experience and knowledge of advisers improves and is fine tuned to the companies and sectors they support. In addition, long-term support increases the potential to establish long-term relationships and reap long-term gains.
Consideration of **economic aspects**	Consideration of economic aspects (cost savings for companies, employment, competitiveness) increases the uptake of the programme and the likelihood that the measures will be sustained.
Promoting achievements (including through publicising success **case studies**)	Publicising the outcomes of support can encourage others to take up the service and/or implement resource efficiency measures within their own companies. Utilisation of case studies which are relevant to SMEs in terms of sector and locality can be an effective way of publicising the programme.
Services are **tailored to SMEs or bespoke** rather than product-led	Bespoke services, or those that are tailored to SMEs, ensure that specific needs and limitations of SMEs are addressed.
Linkages with one-stop-shops	Assists in the marketing of the service (e.g. direct referrals) and helps to prevent duplication.

Table 4-36: Characteristics constituting good practice	
Aspect	**Reason for selection**
Using **local delivery partners**	Provides local knowledge, accountability and credibility. Enables the business support agency to respond quickly to funding changes at a local as well as a national level.
Utilising **collaborative approaches** (includes **peer-to-peer** learning or involvement of peer-to-peer networks)	Collaborative approaches and peer-to-peer learning can be more effective than manual or classroom-based learning and can encourage a higher uptake of resource efficiency measures. The involvement of peer-to-peer networks increases credibility.
Specific/quantitative targets	Information on target programme take-up and/or expected environmental improvements is important for the assessment of success and useful for the design of other programmes.
Programme evaluation	Regular, independent and impartial evaluation can lead to service improvements, where required.
Site visits	Interactive approaches, such as on-site evaluation, can be more engaging and can deliver better results.
Services are provided to SMEs **free of charge or at preferential rates**	Affordability is a key consideration for SMEs.
Multiple sources of funding	Decreases dependency on a single source and increases the likelihood that the programme will remain active should one of the sources of funding be discontinued.

4.7.3 Extent of application

Table 4-37 provides an overview of the extent to which the schemes considered in this report have applied the approaches identified in Table 4-36. This table should only be taken as indicative of the extent to which best practice approaches have been applied by a sample of resource efficiency programmes. Given the limited time and resources available for this study, this table should not be taken as exhaustive – it is possible that some programmes apply best practice approaches more extensively than indicated in this table.

Table 4-37: Best practice approaches used by resource efficiency programmes

Scheme	Holistic approach	Multiple agencies	Long-term support	Economic aspects	Promoting achievements	Tailored to SMEs	Linkages with one stop shops	Local delivery partners	Collaborative approaches	Quantifiable targets	Programme evaluation	Site visit	Free/ preferential rates for SMEs	Multiple donors
Eco-Management (AT)					Yes							Yes		
Eco-Efficiency Scan (BE)					Yes	Yes					Yes	Yes	Yes	
Premio Grants (BE)													Yes	
Union Wallone (BE)			Yes										Yes	
EffNet Rheinland-Pfalz (DE)				Yes	Yes	Yes					Yes		Yes	
Umweltpakt Bayern (DE)				Yes	Yes				Yes		Yes			
Green Network (DK)		Yes	Yes		Yes									
Plan PME (FR)	Yes					Yes	Yes	Yes	Yes					Yes
PBE+ (FR)	Yes	Yes	Yes								Yes		Yes	Yes
B2B Green Mentors (IE)					Yes				Yes				Yes	Yes
Green Business Initiative (IE)	Yes	Yes	Yes	Yes	Yes	Yes					Yes		Yes	
Green Start and Green Plus (IE)			Yes	Yes								Yes	Yes	
SEAI SME Programme (IE)				Yes	Yes						Yes		Yes	
SMILE (IE)					Yes						Yes		Yes	
Giada Project (IT)		Yes												Yes
Energiecentrum (NL)				Yes	Yes					Yes		Yes		
MIA/Vamil (NL)				Yes	Yes						Yes			
Syntens Innovatiecentrum (NL)								Yes			Yes			
Clean Business Programme (PL)	Yes	Yes		Yes	Yes	Yes		Yes	Yes		Yes			Yes
Hackefors Model (SE)			Yes						Yes		Yes			
CECO2PYME (ES)				Yes		Yes				Yes			Yes	
INHOBE (ES)				Yes	Yes				Yes	Yes				Yes
Proyecto Asoclym (ES)			Yes	Yes					Yes				Yes	Yes
SUSTEEN (Int.)		Yes			Yes			Yes					Yes	Yes
Bright Green Business (UK)	Yes	Yes			Yes		Yes				Yes	Yes		

Table 4-37: Best practice approaches used by resource efficiency programmes

Scheme	Holistic approach	Multiple agencies	Long-term support	Economic aspects	Promoting achievements	Tailored to SMEs	Linkages with one stop shops	Local delivery partners	Collaborative approaches	Quantifiable targets	Programme evaluation	Site visit	Free/ preferential rates for SMEs	Multiple donors
Envirowise - WRAP (UK)				Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
ENWORKS (UK)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Green Business Network (UK)										Yes	Yes		Yes	
NISP (UK)			Yes	Yes	Yes		Yes	Yes	Yes		Yes		Yes	

Note: Given the limited time and resources available for this study, this table should not be taken as exhaustive – it is possible that some programmes apply best practice approaches more extensively than indicated in this table.

4.7.4 Examples of best practice

Holistic approach to resource efficiency

At least five of the 29 programmes considered in Table 4-37 can be characterised by an holistic approach to resource efficiency. Where available, more detailed information on these schemes is provided in the table below. Note that programmes that focus on a particular resource efficiency area or theme often deal with waste or CO_2 emissions.

Table 4-38: Examples of programmes with an holistic approach to resource efficiency

Programme	Details
Plan PME (FR)	The initiative aims to reduce the environmental impacts of a business, thereby targeting several resources simultaneously.
PBE+ (FR)	Assesses all aspects of resource efficiency.
Green Business Initiative (IE)	The initiative provides a range of services, all of which lead to an holistic approach towards resource efficiency.
Green Business Network (UK)	The initiative takes an holistic approach to resource efficiency and also operates programmes which focus on other business topics, such as recruitment and human resources.
ENWORKS (UK)	Core activity focuses on reducing energy, water, fuel and material use at all stages in the value chain – from product design to manufacture and distribution and within the business premises.

Involvement of multiple agencies/organisations

The involvement of multiple agencies/organisations in programme implementation, design or strategic oversight can provide a broader perspective and potential for co-ordinating supports to businesses in an holistic and synergistic fashion. A significant proportion of the programmes considered in this report (at least eight) involve multiple agencies or organisations. These often include public sector organisations and industry associations. Examples are given in Table 4-39.

Table 4-39: Examples of programmes implemented or designed by multiple agencies/organisations

Programme	Details
Green Network (DK)	The Green Network is a regional network that comprises both municipalities and private companies. The chairman of the Green Network is always appointed from the private sector (Bio IS, 2009). One half of the board is from the public sector with the other half being from the private sector. Multi-agency involvement is considered best practice.
PBE+ (FR)	Established and supported by several agencies, including the Chamber of Commerce and Industry, Regional Council of Brittany and the Departmental Patron Unions.
Green Business Initiative (IE)	Led by the Environmental Protection Agency but has partnerships with other resource efficiency initiatives.
Giada Project (IT)	A number of partners were involved, including the environmental agency, regional government, industry and SME association.
SUSTEEN (Int.)	Multi-national – six regions in five countries are taking part. Different stakeholders – government and non-governmental bodies, local chambers of commerce.

Table 4-39: Examples of programmes implemented or designed by multiple agencies/organisations	
Programme	**Details**
Green Business Network (UK)	The programme is partnered and sponsored by several organisations including the Scottish Environment Protection Agency. Whilst it is not clear how they are involved with the day-to-day operation of the programmes, it no doubt provides credibility and awareness (word of mouth).
ENWORKS (UK)	The model adopted by ENWORKS has included multiple agencies at both 'board' level and 'delivery' level across its history since 2001. This has ensured a wide perspective in terms of project design, implementation and strategic oversight.

Long-term support

Programmes that provide longer periods for beneficiaries to access advice and support in which to identify and implement improvements can also be expected to have a longer-lasting impact. In addition, long-term interactions enable these programmes to fine-tune their services to the companies and sectors they support. At least nine programmes provide long-term support. In addition, four other programmes provide services for periods ranging from six to 18 months. Where available, information on the length of service provision is given below.

Table 4-40: Examples of programmes providing long-term support	
Programme	**Details**
Eco-Efficiency Scan (BE)	It was considered crucial to follow up on the participating companies following the initial audit: after six and twelve months to ensure that changes had been made and importantly were being sustained.
Premio Grants (BE)	The duration of the support will last no longer than 12 months.
Union Wallone des Enterprises - Environment Consultants (BE)	The project offers on-going support in the form of assistance in recognising opportunities and the development of recommendations for improvement.
Green Network (DK)	Companies are re-certified every three years. Support is therefore provided on a long-term basis.
Plan PME (FR)	Long term support is provided (16-18 months).
PBE+ (FR)	Provides long-term support through clubs and thematic days.
B2B Green Mentors (IE)	The project lasted for 18 months, during this time SMEs were provided with on-going support through events and face-to-face consulting.
Green Business Initiative (IE)	Long-term support through follow up visits (after six months).
Green Start and Green Plus (IE)	Flexible in terms of length of support provided.
Hackefors Model (SE)	Long-term support is provided. Further support provided post certification if the company requires (and pays for) additional services.
INHOBE (ES)	This is a short-term tool (4 months).
Proyecto Asoclym (ES)	Personalised advice short-term but also long-term support through network of companies and online training.
ENWORKS (UK)	Support is tailored to individual business needs and is offered on an ongoing basis for periods ranging from weeks to years.
NISP (UK)	Annual membership to the network allows businesses to receive long-term support.

Consideration of economic aspects

Consideration of the economic impacts of resource efficiency measures (cost savings for companies, employment, competitiveness, etc.) can be expected to increase the uptake of the programme and the likelihood that resource efficiency measures will be sustained in the long-run. At least fourteen programmes take into account economic impacts of resource efficiency measures when providing advice to companies. Some programmes aim to improve both the environmental and business performance of their members, while others restrict their advice to recommending only low cost measures.

Table 4-41: Examples of programmes providing consideration of economic aspects

Programme	Details
EffNet Rheinland Pfalz (DE)	Participating companies are assessed as regards possible cost savings. It is expected that cost savings per year by participating companies will be almost €6 million.
Umweltpakt Bayern (DE)	Certified companies can receive 30% fee reduction for emission control licensing, 50% reduction of water use charges and a 50% reduction of waste disposal fees.
Green Business Initiative (IE)	Recommendations to SMEs include no or low cost measures.
Green Start and Green Plus (IE)	Ultimately aims to improve competitiveness of business in the world market.
SEAI SME Programme (IE)	Aims to help SMEs reduce energy use and cut costs.
Energiecentrum (NL)	One of the aims of this programme is to reduce companies' energy consumption and operational costs.
MIA/Vamil (NL)	This is a tax scheme that encourages companies to invest in environmentally friendly measures.
Clean Business Programme (PL)	Aims to help improve both environmental and business performance – these, according to this programme, go hand-in-hand. This programme encourages SMEs to treat environmental improvements as a business opportunity rather than bureaucracy and additional cost.
CECO2PYME (ES)	SMEs can use this tool as a way to improve their competiveness as the actions to lower CO_2 emissions are often linked to a reduction in costs (e.g. energy costs) which allows the development of other business opportunities. This programme takes economic aspects into consideration to improve competitiveness and generate employment.
INHOBE (ES)	Aims to provide measurable financial and environmental results in the short-term.
Proyecto Asoclym (ES)	The Asoclym project aimed to improve the profitability and environmental impact of companies in Ceuta. The project aims to show SMEs in the area that sustainability and the fight against climate change can be turned into a business opportunity.
Envirowise- WRAP (UK)	Aims to reduce environmental impacts and costs.
ENWORKS (UK)	Advice takes into account profitability of recommendations.
NISP (UK)	Where the exchange of materials is ongoing, businesses are likely to gain lasting benefits through avoided disposal and/or raw material costs.

Publicising achievements

Promoting the programme's achievements (including through publicising success as case studies) can encourage other companies to take up the service and/or implement resource efficiency measures within their own companies. At least eighteen programmes publicise their achievements, usually by means of case studies of successful implementation of cost-saving resource efficiency measures.

Table 4-42: Examples of programmes that promote achievements

Programme	Details
Eco-Management (AT)	Successful case studies publicised.
Eco-Efficiency Scan (BE)	At least one example of success publicised.
EffNet Rheinland Pfalz (DE)	Information on cost savings accrued by companies is publicised and at least one case study is provided (including payback periods for investments, etc.)
Umweltpakt Bayern (DE)	At least one case study published.
Green Network (DK)	Several success stories are provided on Green Network's Internet site.
B2B Green Mentors (IE)	Case studies on some participating companies have been documented (including outcomes).
Green Business Initiative (IE)	Successful case studies published.
SEAI SME Programme (IE)	Case studies are documented.
SMILE (IE)	Successful case studies documented.
INHOBE (ES)	The scheme provides information on cost savings made by SMEs as a result of the programme's recommendations.
SUSTEEN (Int.)	Has published a book of success stories.
Energiecentrum (NL)	Information on overall energy savings achieved and at least one case study is available.
MIA/Vamil (NL)	At least one case study is available. Total funding available is also published.
Bright Green Business (UK)	Successful case studies available.
ENWORKS (UK)	The programme publishes a series of case studies on its dedicated website and regularly provides twitter updates on achievements in particular sectors and geographic areas.
Envirowise- WRAP (UK)	Achievements of audits and other activities within individual businesses are promoted through case studies; these can be found on the WRAP website.
NISP (UK)	Case studies and best practice examples can be accessed via the NISP network and members only websites.

Services tailored to SMEs/individual companies

Bespoke services or those that are tailored to SMEs ensure that specific needs and limitations of SMEs are addressed and increase the likelihood that the programme will be accessed by SMEs. At least eight programmes provide services specifically designed for SMEs or customise their services to the needs of individual clients.

Table 4-43: Examples of programmes providing services tailored to SMEs/individual companies

Programme	Details
Eco-Efficiency Scan (BE)	The programme was available in Dutch to businesses with less than 250 employees.
EffNet Rheinland Pfalz (DE)	Whilst the programme is targeted at companies of all sizes, it focuses mostly on SMEs.
Plan PME (FR)	Bespoke hands-on advice given during individual consultation.

Table 4-43: Examples of programmes providing services tailored to SMEs/individual companies	
Programme	**Details**
Green Business Initiative (IE)	A bespoke service in the form of a customised report based on their baseline data and processes.
CECO2PYME (ES)	Specifically aimed at SMEs and therefore tailored to SME needs. This service includes face-to-face advice and personalised remote support.
INHOBE (ES)	'Eco-efficient action' is a method specifically designed to be applied by SMEs. It establishes a plan of action focused on the implementation of simple measures for saving resources and reducing CO_2 emissions.
Envirowise- WRAP (UK)	Many of the services available to SMEs are bespoke and customised to their needs, for example during on-site audits, consultants will analyse processes and produce an action plan based on this information along with baseline data from the company's facility.
ENWORKS (UK)	The core focus of activity has been targeted at SMEs as it was recognised that this is where market failure is most significant. Project services have been constantly updated based on an understanding of what is the most effective way to support SMEs and deliver results. 75% of funding support was targeted at SMEs in ENWORKS' most recent programme (Pers. Comm.).

Linkages with one-stop shops

Linkages with one-stop-shops are beneficial in that they contribute to an effective marketing of the service, e.g. direct referrals. At least five programmes appear to have established such linkages or are a part of a one stop-shop programme. Two of these programmes (Envirowise and NISP in the UK) have been subsumed into the WRAP programme.

Table 4-44: Examples of programmes providing linkages with one-stop shops	
Programme	**Details**
Plan PME (FR)	There are several programmes under Plan PME which address the environmental impacts of SMEs.
Bright Green Business (UK)	There are several programmes operating under the Bright Green Business initiative, three of which deal with resource efficiency. This 'one-stop-shop' provides obvious benefits to businesses.
Envirowise- WRAP (UK)	With the subsuming of several programmes into WRAP, it effectively provides a one-stop-shop facility to businesses for information and advice on resource efficiency, specifically sustainable waste management. This combining of programmes under one body should foster improved efficiency in terms of support service delivery, avoid duplication and highlight service gaps.
NISP (UK)	From 2010 onwards, NISP has operated under the Waste and Resources Action Programme (WRAP), along with other resource efficiency programmes, including Envirowise. Acting as a one-stop-shop, WRAP can ensure businesses receive the most from the support programmes available to them.
ENWORKS (UK)	The programme proactively maintains outward links to partners providing information of benefit to business beneficiaries.

Using local delivery partners

Using local delivery partners enables resource efficiency programmes to gain local knowledge, accountability and credibility. At least six programmes rely on local/regional partners for the delivery of their services, with the details provided below.

Table 4-45: Examples of programmes using local delivery partners

Programme	Details
Plan PME (FR)	Programmes are delivered at a local/regional level.
Clean Business Programme (PL)	Implemented though Clean Business Clubs – organised regionally, at the moment there are 16, each has a co-ordinator.
SUSTEEN (Int.)	Project partners have established cooperation agreements which include consultancies, public research bodies, research clusters, among others.
Syntens Innovatiecentrum (NL)	From 2014, this programme will be delivered through regional Chambers of Commerce.
NISP (UK)	Whilst NISP is a national programme, it gains benefits from also operating at a regional level. Within each regional office, there are Industrial Symbiosis Practitioners, who are on hand to assess the circumstances of businesses and facilitate exchanges.
ENWORKS (UK)	ENWORKS works with Sub-Regional delivery partners which have a track record of delivering high-quality and effective environmental advice to businesses and have in-house teams of qualified environmental auditors, using formal Service Level Agreements.

Collaborative approaches

Collaborative approaches and peer-to-peer learning can be more effective than manual or classroom based learning and can encourage a higher uptake of resource efficiency measures. The involvement of peer-to-peer networks also increases credibility. At least ten programmes rely on collaborative approaches, either in whole or in part. For example, the B2B Green Mentors programme in Ireland facilitated the flow of expertise from large companies to SMEs, thus relying wholly on peer-to-peer learning. Similarly, the “self-help” nature of the Clean Business Programme in Poland is said to reduce costs for participants. On the other hand, programmes such as Proyecto Asoclym in Spain only rely on peer-to-peer exchanges for the provision of some of its services.

Table 4-46: Examples of programmes using collaborative approaches

Programme	Details
Umweltpakt Bayern (DE)	Participants meet regularly in so called “work forums”.
Plan PME (FR)	Collective support is offered through networks and seminars.
B2B Green Mentors (IE)	Local contacts were established between larger mentor companies and smaller companies in the immediate neighbourhood and throughout the region. This made for beneficial networking among the different businesses, as well as facilitating local transfer of information.
Clean Business Programme (PL)	This is a self-help scheme. There is a lot of peer-to-peer learning and the programme even fosters collaboration after the end of the programme. Emphasis is on self-help, which is more affordable to SMEs than expensive consultancy services.

Table 4-46: Examples of programmes using collaborative approaches	
Programme	**Details**
Hackefors Model (SE)	A collaborative approach. Companies pool resources and the implementation of these systems thus becomes more economical. Companies are supported by Altea AB and an accredited certification company. An internal evaluation of the Hackefors Model concluded that the programme has resulted in increased interest in training and led to participating companies engaging in collaborative undertakings in many other areas, such as training and recycling. Over one third of companies that participated in the Hackefors Model subsequently engaged in collaborative projects in other areas.
INHOBE (ES)	Companies that take part report the results and disclose/share their experiences with other organisations in the Basque Country.
Proyecto Asoclym (ES)	Some support is provided through a network of SMEs.
ENWORKS (UK)	Services include networking events. ENWORKS has delivered additional services through, for example, Resource Efficiency Clubs and ISO14001 Clubs to facilitate peer-to-peer learning.
NISP (UK)	The sharing of information is also fostered in the regional workshops and networking events.

Specific and quantifiable targets

Some programmes have published information on their target uptake or the environmental improvements that they aim to achieve, often together with the time period within which these are to be attained. Examples are provided below. Please note that this table should not be taken to mean that other programmes have not defined/quantified any targets.

Table 4-47: Examples of programmes publishing specific and quantifiable targets	
Programme	**Details**
CECO2PYME (ES)	CECO2PYME in Spain has set itself a target in terms of the number of companies to be included.
INHOBE (ES)	The INHOBE Eco-Efficiency programme has clear targets for 2014 (1000 companies participating, 100 EMAs registrations, 150 companies implementing cleaner technologies, 100,000 tonnes, amount of waste valorised 100,000 tonnes, and 200,000 tonne reduction in raw material consumption).
Clean Business Programme (PL)	Clear goals and has quantitative targets (200 environmental audits and 150 improvement programmes) also 100 companies achieving a reduction in energy use (average 10%); reduction in water consumption (average 20%); reduction in materials use (average 5%); and minimising waste and emissions (average 10%).
The Green Business Network (UK)	The Green Business Network (UK) has clear targets (e.g. for 2011-2014 – direct support to 100 businesses, 120 energy and resource use audits, etc. leading to 5,000 tonnes of CO_2 saved per year from baseline).
ENWORKS (UK)	Every project delivered since inception has had quantifiable targets. The most recent programme targeted number of business assists, numbers of people assisted in skills development, numbers of jobs created/safeguarded, value of increased sales, value of cost savings, etc.

Programme evaluation

Regular, independent and impartial evaluation can lead to service improvements, where required. This includes evaluation of the programme at large as well as assessments of measures implemented by individual companies. At least sixteen programmes carry out such evaluations, which in some cases quantify the savings achieved by companies. For example, the results of the Green Business Network in the UK include:

- £100,000 saved through identified measures
- 120 people attending training schemes
- 2 new jobs directly funded by the proposal
- 4 new jobs through social enterprise development
- 30 existing businesses expanding into green industries resulting in increased income
- 15 new jobs created[33].

Table 4-48: Examples of programmes including programme evaluation

Programme	Details
Eco-Efficiency Scan (BE)	Has follow-up audits six and twelve months after advice provision which means that there are data on how many participating companies took action and what the improvements were.
EffNet Rheinland Pfalz (DE)	Information is available on the number of EffChecks, participating companies, cost savings, investment, annual CO_2 savings (tonnes) and investment payback period. Detailed data are also available for financial support provided by the state.
Umweltpakt Bayern (DE)	Interim report available. Information on the status of each project published (successfully completed, ongoing, implementation not possible).
Green Network (DK)	Sustainability reports produced by companies are publically available; companies are also required to draw up reports documenting their achievements. It is recommended that environmental statements drawn up by companies rely on key indicators for the assessment of the company's environmental performance and comparisons with other companies. Key figures/ratios may include for example, environmental performance per weight, volume and production time (e.g. kg CO_2 per kg product). This facilitates the measure's effectiveness. The environmental statement drawn up by companies includes targets and evaluation criteria thus making its success measurable.
PBE+ (FR)	There are feedback questionnaires of participants and data on participation are collected.
Green Business Initiative (IE)	Independent evaluation of processes, etc. by Green Business Advisors. Information on savings accrued by businesses is available.
SEAI SME Programme (IE)	Data on participation, savings by each company, cost of measures, etc. are collected.
SMILE (IE)	Analysis of actual/potential savings has been carried out.
Energiecentrum (NL)	Information on number of participating companies, total energy savings as well as some company specific information available.

[33] Calderdale Council (2011): Calderdale performance reward grant – Business case template, accessed at http://www.calderdaleforward.org.uk/archive/documents/business%20cases/105%20-%20CMBC%20E&E%20Green%20Business%20Network.doc.

Table 4-48: Examples of programmes including programme evaluation	
Programme	**Details**
MIA/Vamil (NL)	Annual report(s) published.
Syntens Innovatiecentrum (NL)	Annual report(s) published.
Clean Business Programme (PL)	There is an annual survey of Clean Business members that is used to evaluate the programme and this information is used to improve the advice provided to members. There has been assessment of how efficient the programme is – each euro invested generates at least an additional euro for members. There is also an online benchmark tool so that companies can assess their performance.
Hackefors Model (SE)	The programme has been assessed in the past. This included a survey of companies undergoing certification.
Bright Green Business (UK)	Uptake and achievements (e.g. CO_2 saved) are documented.
Envirowise- WRAP (UK)	Some outcomes (including money and materials saved) published.
ENWORKS (UK)	ENWORKS has commissioned a number of evaluations of its activities by external consultants and these are available online at http://www.enworksinabox.com/evaluation. The latest evaluation (ICF GHK, 2013)[34] assessed ENWORKS' Embedding Resource Efficiency in Key Sectors Programme on a range of criteria including cost savings, environmental benefits, economic impacts (sales, jobs), additional GVA, etc. Clearly, such evaluations constitute best practice as they provide programme administrators with independent, comprehensive and robust assessment of the impacts of their projects.
Green Business Network (UK)	Detailed evaluation available.
NISP (UK)	Programme evaluation (including estimates of material savings, hazardous waste eliminated, water savings, jobs created and saved) are available.

Site visits

Interactive approaches, such as on-site evaluation, can be more engaging and, as such, can deliver better results. This has been recognised by at least seven programmes which have incorporated site visits into their assessment procedures.

Table 4-49: Examples of programmes incorporating site visits	
Programme	**Details**
Eco-Management (AT)	Advisers visit companies.
Eco-Efficiency Scan (BE)	The assessment includes a site visit.
Energiecentrum (NL)	Companies can request a site visit which highlights potential savings.
Green Start and Green Plus (IE)	Site visits are carried out.
Bright Green Business (UK)	On-site assessments take place as a part of the programme.
Envirowise - WRAP (UK)	Includes site visits.
ENWORKS (UK)	Services include on-site reviews and these have been a core element of the programme. All business advisors are IEMA registered Environmental Auditors.

[34] ICF GHK (2013): Evaluation of the ENWORKS Project: "Embedding Resource Efficiency in Key Sectors 2009-2013": http://www.enworksinabox.com/sites/default/files/EREiKS%20Evaluation%20FR.pdf.

Free services or preferential rates for SMEs

Affordability is a key factor influencing the uptake of these services by SMEs. It can therefore be expected that programmes that provide free services or charge SMEs reduced fees will attract more members. Over half (at least 17) of the programmes in Table 4-50 provide their services to SMEs free of charge or at reduced rates.

Table 4-50: Examples of programmes providing free services or at reduced rates

Programme	Details
Eco-Efficiency Scan (BE)	The scan is provided to SMEs in the Flanders region free of charge (funded by OVAM). Advice is free of charge to SMEs but investment in the possible eco-efficiency measures was funded by the SMEs.
Premio Grants (BE)	The grant will cover 75% of consultancy fees for SMEs.
Union Wallone des Enterprises - Environment Consultants (BE)	The group provide services which are almost free of charge - companies are required to pay a small fee and commit to meeting some or all of the recommendations.
EffNet (DE)	The federal state covers for the EffCheck a maximum of 70% of the consultation costs (no more than €4,800). Larger companies can also participate but without the financial aid of the federal state.
PBE+ (FR)	No fees charged to SMEs.
B2B Green Mentors (IE)	The service was free of charge to participating companies.
Green Business Initiative (IE)	All services are free of charge to SMEs.
Green Start and Green Plus (IE)	All services are available at no cost to businesses.
SEAI SME Programme (IE)	All services are free to SMEs.
SMILE (IE)	Free service facilitating exchange of materials.
CECO2PYME (ES)	The service is free.
Proyecto Asoclym (ES)	The service is provided free of charge to companies.
SUSTEEN (Int.)	Regional Environmental Services Providers provide interested SMEs with free of charge consultancy services and environmental audits.
Envirowise - WRAP (UK)	The services available to SMEs are free of charge and as far as can be discerned a particular business can use as many of these services as they wish.
ENWORKS (UK)	On principle, all publically funded projects have not charged for the majority of services. In particular, the initial interventions are always free. ERDF funding has meant that SMEs are exempt from any charges where they are part of such programmes.
Green Business Network (UK)	All services are available free of charge.
NISP (UK)	Membership fee differs depending on the size of the company.

Multiple sources of funding

Funding from multiple sources decreases dependency on a single source and increases the likelihood that the programme will remain active should one of the sources of funding be discontinued. For example, the Giada Project in Italy was initially funded by the LIFE programme but when funding from the LIFE fund ceased, on-going costs were covered by local authorities with no external funding. Similarly, the Hackefors Programme in Sweden was initially funded both from the public purse and member contributions. When public funding was discontinued, the programme continued using member contributions to cover all costs. In total, at least ten programmes rely on multiple sources of funding.

Table 4-51: Examples of programmes with multiple sources of funding	
Programme	**Details**
Plan PME (FR)	Funded from different sources (regional government, EU ERDF, consular chamber, company contributions)
PBE+ (FR)	Financed from a range of sources.
B2B Green Mentors (IE)	Funding secured from multiple sources.
Giada Project (IT)	Mainly funded by the LIFE project but some co-financing nationally. The initial funding of the initiative was provided by the LIFE project, which covered the high costs of the implementation phase. However, the project continued when the funding from the LIFE project ceased with on-going costs funded by local authorities with no external funding. The project has continued beyond its original time frame, using funding from local authorities rather than external sources.
Clean Business Programme (PL)	Funding from different sources – public and private, including from the LIFE Fund.
INHOBE (ES)	Different sources of funding – part from companies, part from the government.
Proyecto Asoclym (ES)	Different sources of financing (City of Ceuta and ESF).
SUSTEEN (Int.)	Multiple sources of funding – co-funded by the EU.
Envirowise- WRAP (UK)	Funded from different sources depending on region of delivery.
ENWORKS (UK)	ENWORKS has been funded from a number of sources over the years, including ERDF, UK Government single Programme Fund (managed by the Northwest Regional Development Agency), Department of Business Innovation and Skills.

Other good practice approaches

In addition to the best practice approaches dealt with above, the following practices can also be seen as contributing to the effectiveness and efficiency of the different programmes:

- **Increasing ambition:** The Green Network (DK) certificate is valid for two years. The renewal process involves drawing up a new statement which assesses whether existing goals have been attained and sets more demanding goals for the upcoming two years.
- **Consideration of the supply chain:** The Environmental and Climate Handbook encourages companies to describe the environmental performance of their supply chain, including the proportion of suppliers that have established environmental and climatic requirements for their operations and a description of these requirements (Green Network).
- **Funding for resource efficiency measures:** The Green Network has links with a bank and thus can assist in linking companies with providers of loans for improvements. The SEAI SME Programme in Ireland provides financial support for resource efficiency measures. Similarly, the SUSTEEN (Int.) local advisor can also discuss funding opportunities.
- **Consideration of best practice approaches:** The Clean Business Programme in Poland daws on best practice examples from elsewhere (the Polish Environmental Partnership Foundation teamed up with BP and Groundwork UK).
- **Consideration of corporate image:** Proyecto Asoclym (ES) provides companies with lessons on corporate image, which maximises gains for companies from resource efficiency.

- **Focus on innovation:** Feedback received from one Member State highlights that the role of innovation is coming to be seen as being an increasingly significant factor in advancing economic adaptation and development. Consequently programmes which incorporate innovation elements into supporting SMEs may potentially achieve higher savings for SMEs and the environment.

4.7.5 Summary

Almost all programmes considered in this report have applied several best practice approaches, with the most popular being publicising achievements and successful case studies (17 programmes), provision of free/preferentially priced services for SMEs (16 programmes), undertaking programme evaluations (16 programmes) and consideration of economic aspects of resource efficiency (14 programmes).

4.8 References

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5 Task 3: Relative environmental expenditure

5.1 Introduction

5.1.1 Overview

Task 3 involves identifying data for 2008 onwards for four main areas:

- public and private sector environmental protection expenditure data for 28 Member States
- breakdown of environmental protection expenditure data by environmental domain (e.g. waste management)
- number of jobs resulting from environmental protection expenditure
- environment related EU funding.

5.1.2 Definitions

Environmental protection expenditure is defined by DG ESTAT (Eurostat) as follows[35]:

- Money spent on all activities directly aimed at the prevention, reduction and elimination of pollution or nuisances resulting from the production processes or consumption of goods and services. Excluded are activities that, while beneficial to the environment, primarily satisfy technical needs or health and safety requirements.

Data on environmental protection expenditure are collected from Member States every two years through the use of the OECD/Eurostat Joint Questionnaire on Environmental Protection Expenditure and Revenues (JQ-EPR). The information is gathered for several sectors including[35]:

- Public sector: covering central, regional and local governments (also referred to as general government)
- Business sector: covering all activities in NACE Revision 2 divisions 01-99 with the exception of the public sector (division 84), materials recovery (group 38.3) and specialised producers (in divisions and groups 37, 38.1, 38.2 and 39)
- Specialised producers: mainly including activities within sewerage (NACE Revision 2 division 37), waste collection (group 38.1), waste treatment (38.2) and remediation activities (division 39)
- Households: including units which belong to the institutional sector of households within the national accounts (i.e. final consumers).

[35] See DG ESTAT Internet site accessed at: http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/env_ac_exp1r2_esms.htm on 30 January 2014.

For the purposes of this study, when using data from Eurostat (DG ESTAT), public sector (general government) data are used for public sector environmental protection expenditure whilst business sector data are used for private sector environmental expenditure. Data for specialised producers are not allocated to either the public or private sectors because it is not possible to identify the amount of expenditure which is public or private. However, total environmental protection expenditure is taken as the sum of the expenditure by the public sector, the business sector and specialised producers[36].

Environmental protection expenditure data may additionally be classified by domain, with nine environmental domains defined by the Classification of Environmental Protection Activities (CEPA)[37] as follows:

- protection of ambient air and climate
- wastewater management; waste management
- protection and remediation of soil, groundwater and surface water
- noise and vibration abatement
- protection of biodiversity and landscape
- protection against radiation
- research and development
- other environmental protection activities.

Although this study attempts to identify data for all nine domains for each Member State, figures for several domains are sometimes grouped together in the original dataset and are not available separately.

5.1.3 Organisation of results from Task 3 Section 5

The results for Task 3 are organised into four sections as follows:

- Environmental protection expenditure data from DG ESTAT (Eurostat) are given in Section 5-2 (note that the latest year for which data are currently available from Eurostat is 2011)
- Environmental protection expenditure data from national sources are provided in Section 5-3 (for some Member States, data are available for 2012)
- Data on employment in the environmental protection sector are presented in Section 5-4
- Details of environment related EU funding are given in Section 5-5.

36 It is noted by DG ESTAT that summing the totals for environmental protection expenditure for the public sector, business sector and private and specialised producers may result in some double counting due to the inclusion of subsidies and grants. Work is being undertaken by Eurostat to develop more comprehensive indicators (see DG ESTAT accessed at: http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/env_ac_exp1r2_esms.htm on 30 January 2014).

37 See DG ESTAT accessed at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:European_standard_statistical_classification_of_environmental_protection_activities_%28CEPA%29 accessed 30 January 2014.

Within each section, the findings are summarised by Member State and for the EU as a whole in tabular format, with the order of the tables relating to the four main areas listed in the overview (Section 5.1.1). All monetary values are presented in € millions, with currency conversion where required using rates given by DG ESTAT[38]. Conversion rates have been used according to the year to which the data relate (e.g. data for 2012 have been converted to Euros using the average exchange rates for 2012 for the various currencies). No attempt has been made to convert all monetary values to a single year (e.g. EUR2012), since it is not always possible to identify the year in which the initial data are presented. Thus care should be taken when comparing values between years. Data sources are available at the end of each table.

5.2 Findings based on Eurostat data

5.2.1 Public and private sector environmental protection expenditure data

Table 5-1 presents data from Eurostat on public and private sector environmental protection expenditure for the 28 Member States (where available) for the years 2008 to 2011. The public environmental expenditure data relate to the expenditure of general government, whilst the private environmental expenditure data represent expenditure by the business sector excluding the public sector (NACE Revision 2 division 84), materials recovery (NACE Revision 2 group 38.3) and specialised producers (in NACE Revision 2 divisions and groups 37, 38.1, 38.2 and 39). Data are generally less available for later years, in particular, 2011. However, there are still gaps for several Member States for 2008.

Environmental protection expenditure by the public sector (general government) is also reported under the Classification of the Functions of Government (COFOG)[39]. These data are provided in Table 5-2, since they provide greater coverage of Member States and thus facilitate comparisons between Member States. Indeed, the data for 2011 indicate that expenditure by general government on environmental protection ranges from tens of millions (e.g. Malta) to several billion Euros (e.g. France and Germany). Such differences would be expected given the variability in Member State areas and populations.

Note that the data in Table 5-2 should not be compared with those in Table 5-1, since Table 5-1 is based on NACE classifications. Furthermore, the numbers in Table 5-2 are not used elsewhere in this report (e.g. to calculate percentage of GDP) to avoid mixing data sources and presenting data collected using COFOG and NACE classifications as comparable.

Where available, regional (i.e. sub-Member State) level data on environmental protection expenditure can be found in Annex 10.

[38] See DG ESTAT (http://epp.eurostat.ec.europa.eu/portal/page/portal/exchange_rates/data/main_tables) (accessed 30 January 2014).

[39] Further information on COFOG is available at DG ESTAT's Internet site (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Classification_of_the_functions_of_government_%28COFOG%29) (accessed 30 January 2014).

Table 5-1: Public and private sector environmental protection expenditure (Eurostat data based on NACE Revision 2)								
Member State	**Expenditure (€ millions)**							
	2008		**2009**		**2010**		**2011**	
	Public	**Private**	**Public**	**Private**	**Public**	**Private**	**Public**	**Private**
EU27	**€81,316**	unavailable	**€86,409**	unavailable	**€85,910**	unavailable	**€83,408**	unavailable
Austria	**€1,653**	**€1,986**	**€1,643**	**€1,983**	unavailable	unavailable	unavailable	unavailable
Belgium	**€1,602**	unavailable	**€1,660**	unavailable	**€1,566**	unavailable	unavailable	unavailable
Bulgaria	**€209**	**€434**	**€224**	**€313**	**€184**	**€334**	**€231**	**€297**
Croatia	**€10**	**€430**	**€11**	**€415**	**€33**	**€418**	**€143**	**€402**
Cyprus	unavailable	**€28**	unavailable	**€68**	unavailable	**€62**	unavailable	unavailable
Czech Republic	**€542**	**€1274**	**€610**	**€1,208**	**€774**	**€1,260**	**€795**	**€1,438**
Denmark	**€1,552**	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	**€25.68**	**€129**	**€41**	**€81**	**€23**	unavailable	unavailable	unavailable
Finland	**€1,045**	**€721**	**€1,014**	**€726**	**€1,146**	**€666**	unavailable	unavailable
France	**€12,760**	unavailable	**€13,286**	unavailable	**€13,829**	**€4624**	unavailable	unavailable
Germany	**€8,070**	**€11,960**	**€8,110**	**€11,770**	unavailable	unavailable	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	**€270**	unavailable	**€284**	**€968**	**€447**	**€921**	**€390**	**€982**
Ireland	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	**€13,190**	**€19,118**	**€13,562**	**€18,557**	**€13,624**	**€20,490**	**€13,860**	**€22,464**
Latvia	**€201**	**€181**	**€157**	**€131**	**€140**	**€84**	unavailable	**€66**
Lithuania	**€275**	**€225**	**€319**	**€137**	**€372**	**€117**	unavailable	**€172**
Luxembourg	**€252**	unavailable	**€306**	unavailable	**€284**	unavailable	**€335**	unavailable
Malta	**€95**	unavailable	**€102**	unavailable	**€128**	unavailable	**€96**	unavailable
Netherlands	unavailable	unavailable	**€8505**	unavailable	unavailable	unavailable	no data	unavailable
Poland	**€1,470**	**€3,728**	**€1,491**	**€3,354**	**€1,751**	**€3,736**	**€1,967**	**€3,989**
Portugal	**€936**	**€456**	**€1,001**	**€420**	**€889**	**€403**	**€829**	**€395**

Table 5-1: Public and private sector environmental protection expenditure (Eurostat data based on NACE Revision 2)								
Member State	Expenditure (€ millions)							
	2008		2009		2010		2011	
	Public	Private	Public	Private	Public	Private	Public	Private
Romania	**€805**	**€1,226**	**€699**	**€927**	**€1,013**	**€1,075**	**€1,255**	**€1,130**
Slovakia	**€156**	**€535**	**€169**	**€470**	**€187**	**€452**	**€214**	**€449**
Slovenia	**€301**	**€538**	**€359**	**€377**	**€293**	**€388**	unavailable	unavailable
Spain	**€3,186**	**€5,838**	**€3,507**	**€5,777**	**€3,191**	**€5,220**	unavailable	unavailable
Sweden	**€1,163**	unavailable	**€1,063**	**€983.08**	**€1,184**	**€1,249**	**€1,307**	**€1,394**
UK	unavailable	**€4,811**	unavailable	**€4,364**	unavailable	**€3,773**	unavailable	unavailable

Sources: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.
Notes: Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Totals for EU28 are not currently available, so data for EU27 are included instead. Where individual cells are marked as unavailable, data have not been identified from the above source for that particular category

Table 5-2: Public sector (general government) environmental protection expenditure (Eurostat data based on COFOG)				
Member State	Expenditure (€ millions)			
	2008	2009	2010	2011
EU27	**€108,629**	**€108,118**	**€108,034**	**€108,629**
Austria	**€1,251**	**€1,504**	**€1,692**	**€1,529**
Belgium	**€2,125**	**€2,204**	**€2,317**	**€2,806**
Bulgaria	**€251**	**€394**	**€255**	**€284**
Croatia	unavailable	unavailable	unavailable	unavailable
Cyprus	**€52**	**€54**	**€58**	**€61**
Czech Republic	**€1,447**	**€1,002**	**€1,534**	**€2,102**
Denmark	**€1,167**	**€1,097**	**€998**	**€944**
Estonia	**€176**	**€148**	**-€34**	**-€55**
Finland	**€586**	**€608**	**€506**	**€471**
France	**€19,124**	**€20,539**	**€21,396**	**€21,126**
Germany	**€13,780**	**€18,880**	**€15,960**	**€16,300**
Greece	**€1,432**	**€1,529**	**€1,224**	**€1,059**

Table 5-2: Public sector (general government) environmental protection expenditure (Eurostat data based on COFOG)				
Member State	Expenditure (€ millions)			
	2008	2009	2010	2011
Hungary	€916	€597	€577	€725
Ireland	€2,101	€1,897	€1,713	€1,573
Italy	€13,415	€13,791	€13,824	€14,072
Latvia	€202	€35	€56	€144
Lithuania	€275	€319	€376	€291
Luxembourg	€417	€470	€452	€492
Malta	€94	€96	€128	€87
Netherlands	€9,928	€10,705	€10,422	€10,322
Poland	€2,257	€2,132	€2,560	€2,514
Portugal	€1,113	€1,017	€1,043	€910
Romania	€678	€679	€910	€1,231
Slovakia	€422	€427	€614	€715
Slovenia	€286	€334	€270	€290
Spain	€9,907	€10,424	€10,385	€9,903
Sweden	€1,163	€1,074	€1,195	€1,299
UK	€16,743	€16,671	€17,687	€16,839

Sources: Environmental protection expenditure of general government by COFOG groups and economic transactions available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?lang=en&dataset=env_ac_cofog on 30 January 2014.
Notes: Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Where individual cells are marked as unavailable, data have not been identified from the above source for that particular category. No information has been identified to explain why negative values have been recorded in some instances

5.2.2 Public environmental protection expenditure in relation to total public expenditure

Table 5-3 presents data from Eurostat showing public (general government) environmental protection expenditure as a percentage of total public expenditure by Member State for years 2008 to 2011 (where available). Note that the public environmental protection expenditure figures used for the calculations are those from Table 5-1 which are based on NACE Revision 2 classifications. Data availability declines over time, with fewer Member States having figures for 2011 than for 2008. This affects the extent to which trends over time can be determined.

Table 5-3: Public environmental protection expenditure as a percentage of total public expenditure (based on Eurostat data)

Member State	2008	2009	2010	2011
EU27	**1.38%**	**1.44%**	**1.38%**	**1.34%**
Austria	**1.18%**	**1.13%**	unavailable	unavailable
Belgium	**0.93%**	**0.91%**	**0.84%**	unavailable
Bulgaria	**1.54%**	**1.55%**	**1.36%**	**1.69%**
Croatia	**0.05%**	**0.05%**	**0.15%**	**0.71%**
Cyprus	unavailable	unavailable	unavailable	unavailable
Czech Republic	**0.85%**	**0.96%**	**1.18%**	**1.18%**
Denmark	**1.28%**	unavailable	unavailable	unavailable
Estonia	**0.40%**	**0.66%**	**0.40%**	unavailable
Finland	**1.14%**	**1.05%**	**1.15%**	unavailable
France	**1.24%**	**1.24%**	**1.26%**	unavailable
Germany	**0.74%**	**0.71%**	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable
Hungary	**0.52%**	**0.60%**	**0.93%**	**0.79%**
Ireland	unavailable	unavailable	unavailable	unavailable
Italy	**1.72%**	**1.72%**	**1.74%**	**1.76%**
Latvia	**2.25%**	**1.94%**	**1.79%**	unavailable
Lithuania	**2.28%**	**2.67%**	**3.18%**	unavailable
Luxembourg	**1.72%**	**1.90%**	**1.66%**	**1.88%**
Malta	**3.68%**	**4.02%**	**4.81%**	**3.46%**
Netherlands	unavailable	2.89%	unavailable	unavailable
Poland	**0.94%**	**1.08%**	**1.09%**	**1.22%**
Portugal	**1.21%**	**1.19%**	**1.00%**	**0.98%**
Romania	**1.47%**	**1.44%**	**2.03%**	**2.43%**
Slovakia	**0.67%**	**0.65%**	**0.71%**	**0.81%**
Slovenia	**1.82%**	**2.05%**	**1.63%**	unavailable
Spain	**0.71%**	**0.72%**	**0.66%**	unavailable
Sweden	**0.67%**	**0.66%**	**0.65%**	**0.66%**
UK	unavailable	unavailable	unavailable	unavailable

Sources: Figures have been calculated by taking public environmental protection expenditure as a percentage of total government expenditure. Public environmental protection expenditure data are sourced from DG ESTAT , accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014 and relate to environmental protection expenditure by general government. Total government expenditure figures are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014).

Table 5-3: Public environmental protection expenditure as a percentage of total public expenditure (based on Eurostat data)				
Member State	**2008**	**2009**	**2010**	**2011**
Notes: Where individual cells are marked as unavailable, data on public environmental protection expenditure have not been identified from the above source for the particular Member State and year				

When looking at the overall trends for EU27, though the percentage change is small, public environmental expenditure as a percentage of total public expenditure declined after 2009, being the lowest in 2011 (Figure 5-1).

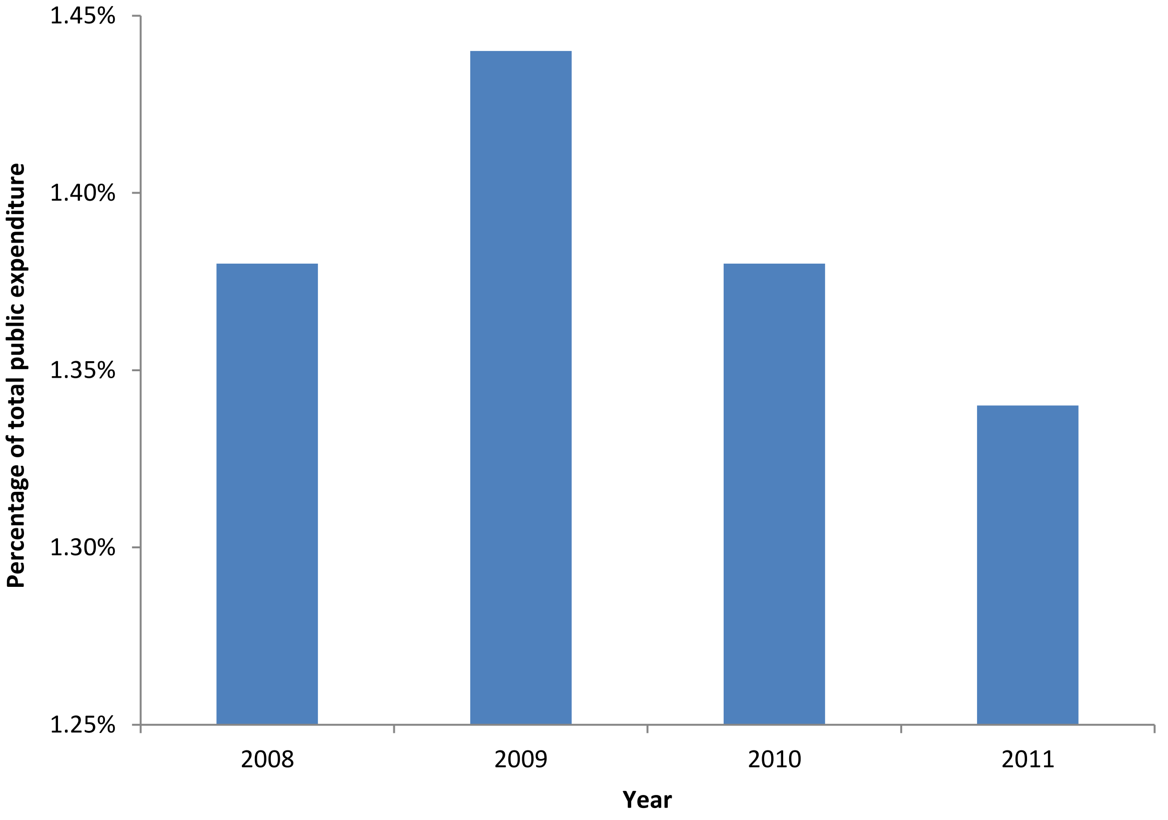

Figure 5-1: Public environmental expenditure as a percentage of total public expenditure for EU27 by year.
Sources: Public environmental protection expenditure data sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014; total government expenditure figures are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014. Data were not available for all Member States and years.

To enable comparisons between Member States, the change between 2008 and 2010 is used in preference to that between 2008 and 2011 to maximise the number of Member States considered. Of the 20 Member States for which data are available for 2008 and 2010, the majority (60%) show an increase in public environmental protection expenditure as a percentage of total public expenditure. Malta showed the greatest increase in public environmental protection expenditure as a proportion of total public expenditure (increasing by 1.1%), followed by Lithuania (0.9%) and Romania (0.6%) (Figure 5-2). Public environmental protection expenditure as a percentage of total public expenditure declined the most between 2008 and 2010 in Latvia (-0.5%), followed by Portugal and Slovenia (both -0.2%). Member States with the highest levels of public environmental protection expenditure as a proportion of total public expenditure in 2008 and 2010 were Malta (2008 = 3.7%, 2010 = 4.8%) and Lithuania (2008 = 2.3%, 2010 = 3.2%). Member States with the lowest levels of public environmental protection expenditure as a proportion of total public expenditure in 2008 and 2010 were Croatia (2008 = 0.05%, 2010 = 0.2%) and Estonia (0.4% in both 2008 and 2010).

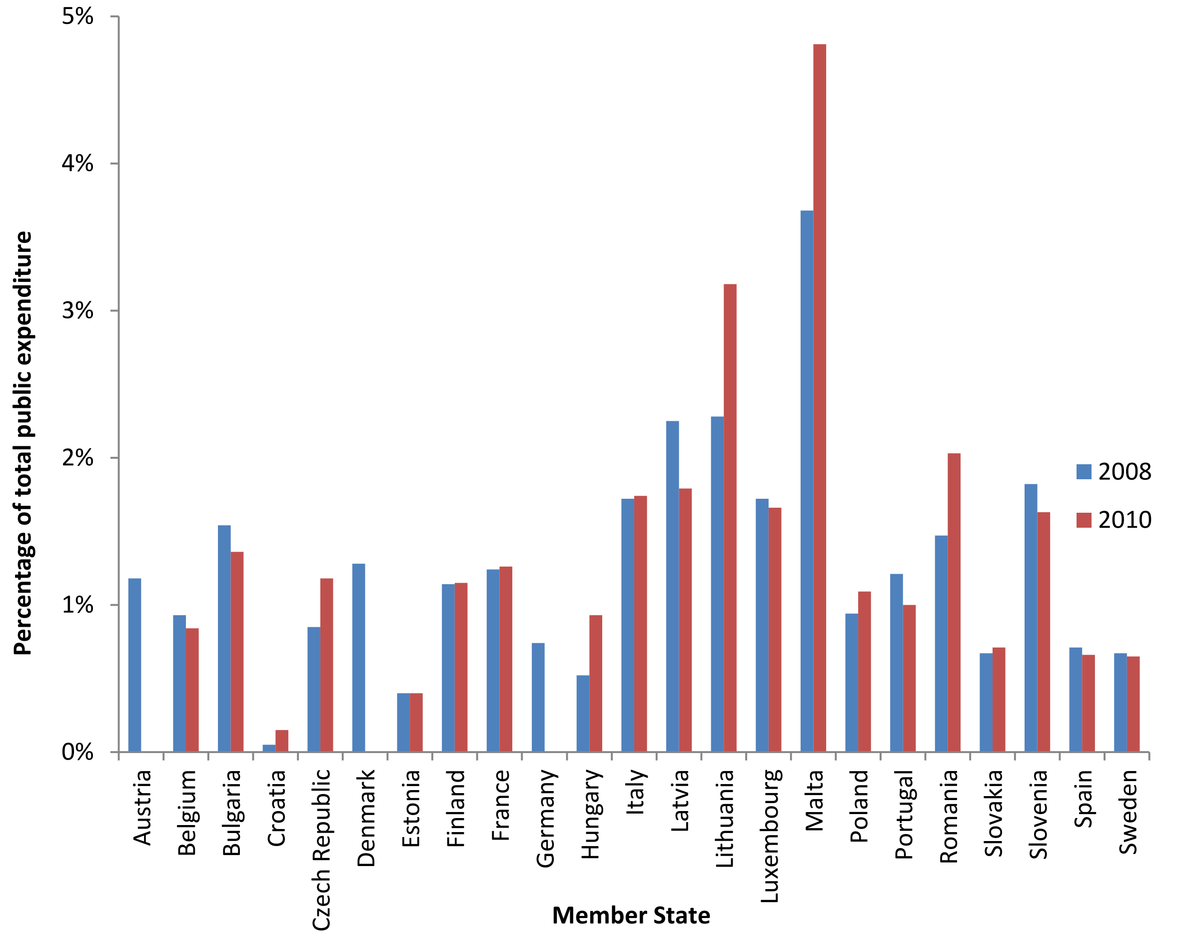

Figure 5-2: Public environmental protection expenditure as a percentage of total public expenditure by Member State for EU28 in 2008 and 2010
Sources: Public environmental protection expenditure data sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014; total government expenditure figures are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014. Data were not available for all Member States and years.

5.2.3 Public environmental protection expenditure in relation to GDP

Table 5-4 presents public (i.e. general government) environmental protection expenditure as a percentage of GDP for each Member State and for EU27 (data for EU28 are not currently available). Data are sourced directly from Eurostat. Table 5-4 shows that public environmental protection expenditure as a percentage of GDP does vary between Member States. Considering the Member States for whom data are available for the years 2008 to 2011, the lowest percentage is recorded for Croatia in 2008 (0.02%)[40], whilst the highest percentage of 2.02% is recorded by Malta for 2010. Although several other Member States have relatively high values (Lithuania: 1.20% in 2009; 1.35% in 2010; Netherlands: 1.48% in 2009), public environmental protection expenditure is less than 1% of GDP for the majority of Member States.

Table 5-4: Public environmental protection expenditure as a percentage of GDP (Eurostat data)

Member State	2008	2009	2010	2011
EU27	**0.65%**	**0.74%**	**0.70%**	**0.66%**
Austria	**0.58%**	**0.59%**	unavailable	unavailable
Belgium	**0.46%**	**0.49%**	**0.44%**	unavailable
Bulgaria	**0.59%**	**0.64%**	**0.51%**	**0.60%**
Croatia	**0.02%**	**0.02%**	**0.07%**	**0.32%**
Cyprus	unavailable	unavailable	unavailable	unavailable
Czech Republic	**0.35%**	**0.43%**	**0.52%**	**0.51%**
Denmark	**0.66%**	unavailable	unavailable	unavailable
Estonia	**0.16%**	**0.30%**	**0.16%**	unavailable
Finland	**0.56%**	**0.59%**	**0.64%**	unavailable
France	**0.66%**	**0.70%**	**0.71%**	unavailable
Germany	**0.33%**	**0.34%**	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable
Hungary	**0.26%**	**0.31%**	**0.46%**	**0.39%**
Ireland	unavailable	unavailable	unavailable	unavailable
Italy	**0.84%**	**0.89%**	**0.88%**	**0.88%**
Latvia	**0.88%**	**0.85%**	**0.78%**	unavailable
Lithuania	**0.85%**	**1.20%**	**1.35%**	unavailable
Luxembourg	**0.67%**	**0.85%**	**0.71%**	**0.79%**
Malta	**1.59%**	**1.7%**	**2.02%**	**1.46%**
Netherlands	unavailable	1.48%	unavailable	unavailable
Poland	**0.40%**	**0.48%**	**0.49%**	**0.53%**
Portugal	**0.54%**	**0.59%**	**0.51%**	**0.48%**
Romania	**0.58%**	**0.59%**	**0.81%**	**0.96%**
Slovakia	**0.24%**	**0.27%**	**0.28%**	**0.31%**
Slovenia	**0.81%**	**1.01%**	**0.82%**	unavailable
Spain	**0.29%**	**0.33%**	**0.30%**	unavailable
Sweden	**0.35%**	**0.36%**	**0.34%**	**0.34%**
UK	unavailable	unavailable	unavailable	unavailable

Sources: Percentages sourced directly from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do) on 30 January 2014.
Notes: Where individual cells are marked as unavailable, data have not been identified from the above source for the particular Member State and year

[40] Note that this value was recorded prior to Croatia joining the EU on 1 July 2013.

5.2.4 Environmental protection expenditure as a percentage of GDP

Table 5-5 uses Eurostat data to present total (public and private) environmental protection expenditure for each Member State, as well the percentage of GDP which this represents. Total environmental protection expenditure has been obtained by summing expenditure for general government, business sector (all NACE activities except E37, E38.1, E38.2, E39 and O) and specialised producers (E37, E38.1, E38.2, E39). These totals have then been taken as a percentage of the GDP for each Member State, using data from Eurostat[41]. Figures for EU27 are not presented because expenditure by the business sector is not available[42].

Of the Member States for which data are available for both 2008 and 2010, the majority (8 out of 14 countries or 57%) show an increase in total environmental expenditure as a percentage of GDP between 2008 and 2010. Lithuania showed the greatest increase in environmental expenditure as a proportion of GDP (increasing by 0.5%), followed by Romania (0.4%) (Figure 5-3). Environmental expenditure as a percentage of GDP declined the most between 2008 and 2010 in Bulgaria (-0.6%), followed by Latvia (-0.5%) and Portugal (-0.5%). Member States with the highest levels of environmental protection expenditure as a proportion of GDP in 2008 were Estonia (4.5%), Austria (3.8%) and Italy (3.4%), whilst the highest in 2010 were Italy (3.5%), Romania (3.5%) and Poland (2.7%). Member States with the lowest levels of environmental expenditure as a proportion of GDP in 2008 were Sweden (0.4%), Croatia (1.1%) and Finland (1.1%), whilst the lowest in 2010 were Sweden (0.7%), Portugal (0.8%) and Slovakia (1.1%).

[41] Note that Eurostat provides environmental protection expenditure as a percentage of GDP for several different sectors (for example, see the dataset Environmental protection expenditure in Europe – € per capita and % of GDP, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp2&lang=en on 30 January 2014. However, these tables do not present figures for total environmental protection expenditure as a percentage of GDP.

[42] Note that expenditure by industry is available, but only covers NACE Revision 2 Sections B, C and D, and Division E36.

Table 5-5: Total environmental expenditure (€ millions) and as a percentage of GDP (based on Eurostat data)								
Member State	2008		2009		2010		2011	
	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP
Austria	**€10,605**	**3.75%**	**€10,709**	**3.88%**	unavailable	unavailable	unavailable	unavailable
Belgium	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Bulgaria	**€869**	**2.45%**	**€655**	**1.87%**	**€651**	**1.81%**	**€735**	**1.91%**
Croatia	**€509**	**1.07%**	**€492**	**1.10%**	**€510**	**1.15%**	**€639**	**1.44%**
Cyprus	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Czech Republic	**€2,878**	**1.87%**	**€2,733**	**1.92%**	**€3,009**	**2.01%**	**€3,409**	**2.19%**
Denmark	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	**€734**	**4.52%**	**€485**	**3.47%**	unavailable	unavailable	unavailable	unavailable
Finland	**€2,062**	**1.11%**	**€2,055**	**1.19%**	**€2,044**	**1.14%**	unavailable	unavailable
France	unavailable	unavailable	unavailable	unavailable	**€46,985**	**2.43%**	unavailable	unavailable
Germany	**€39,700**	**1.60%**	**€39,050**	**1.64%**	unavailable	unavailable	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	unavailable	unavailable	**€1,837**	**2.01%**	**€1,893**	**1.97%**	**€1,919**	**1.94%**
Ireland	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	**€54,043**	**3.43%**	**€51,007**	**3.36%**	**€54,862**	**3.54%**	**€58,655**	**3.71%**
Latvia	**€456**	**1.99%**	**€338**	**1.83%**	**€266**	**1.48%**	unavailable	unavailable
Lithuania	**€665**	**2.05%**	**€684**	**2.56%**	**€709**	**2.56%**	unavailable	unavailable
Luxembourg	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Malta	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Netherlands	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Poland	**€9,474**	**2.61%**	**€8,404**	**2.71%**	**€9,463**	**2.67%**	**€10,260**	**2.77%**
Portugal	**€2,130**	**1.24%**	**€2,350**	**1.39%**	**€1,292**	**0.75%**	**€1,224**	**0.72%**
Romania	**€4,293**	**3.07%**	**€3,265**	**2.76%**	**€4,363**	**3.51%**	**€5,160**	**3.93%**
Slovakia	**€771**	**1.20%**	**€728**	**1.16%**	**€734**	**1.11%**	**€785**	**1.14%**
Slovenia	**€957**	**2.57%**	**€903**	**2.55%**	**€828**	**2.33%**	unavailable	unavailable
Spain	**€20,742**	**1.91%**	**€21,211**	**2.03%**	**€19,878**	**1.90%**	unavailable	unavailable

Table 5-5: Total environmental expenditure (€ millions) and as a percentage of GDP (based on Eurostat data)								
Member State	2008		2009		2010		2011	
	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP	Total environmental protection expenditure € millions	% of GDP
Sweden	**€1,163**	**0.35%**	**€2,046**	**0.70%**	**€2,433**	**0.70%**	**€2,701**	**0.70%**
UK	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable

Sources: Total environmental protection expenditure calculated by summing environmental protection expenditure by general government, business sector (all NACE activities except E37, E38.1, E38.2, E39 and O) and specialised producers of environmental protection services (E37, E38.1, E38.2 and E39) sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014. GDP data sourced from DG ESTAT, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014.
Notes: percentages have not been calculated where either public or private sector data are missing in the above datasets to avoid data being incomparable or misleading. These cells have been marked as "unavailable".

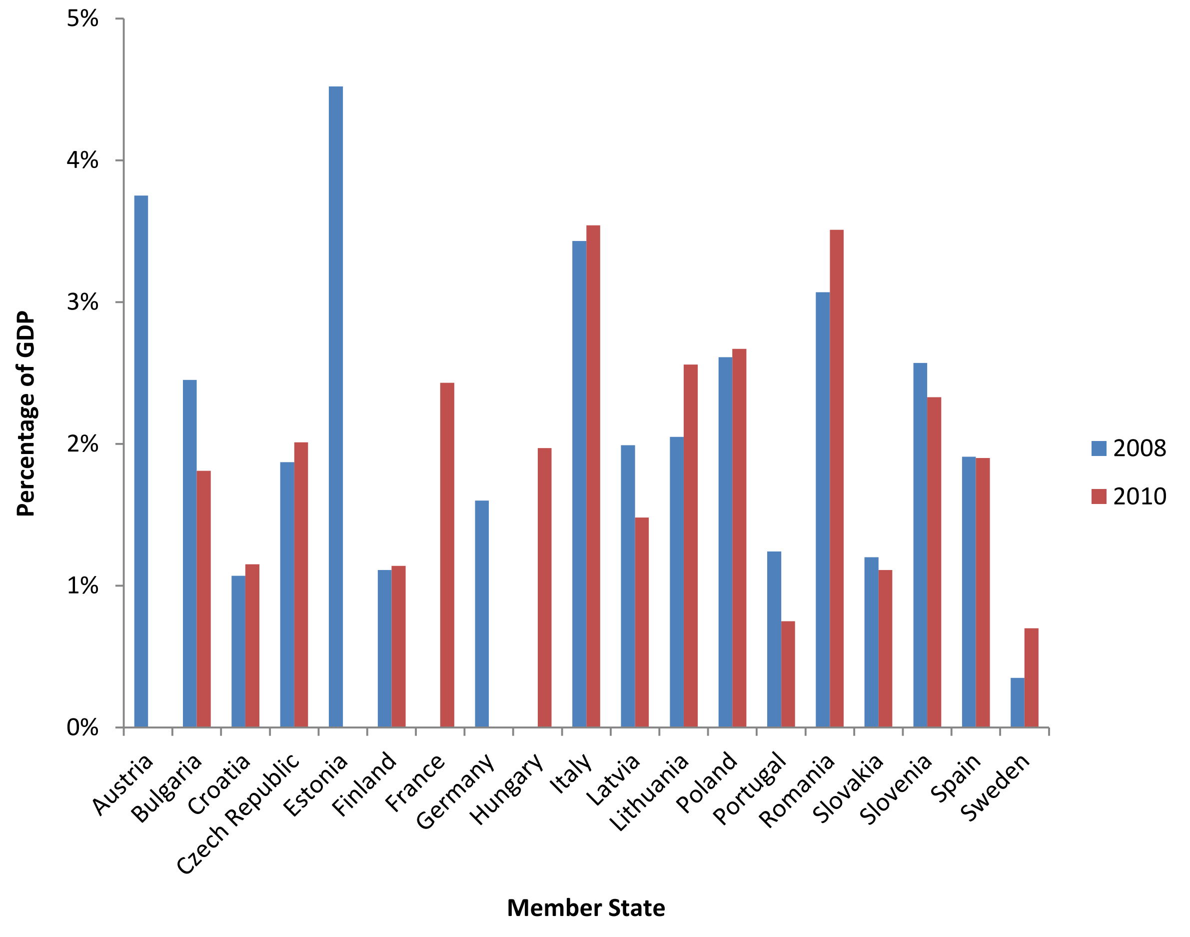

Figure 5-3: Total environmental protection expenditure as a percentage of GDP by Member State for EU28 in 2008 and 2010

Sources: Total environmental protection expenditure calculated by summing environmental protection expenditure by general government, business sector (all NACE activities except E37, E38.1, E38.2, E39 and O) and specialised producers of environmental protection services (E37, E38.1, E38.2 and E39) from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014. GDP data from DG ESTAT, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014. Data were not available for all Member States and years from the above sources.

5.2.5 Changes in environmental protection expenditure over time

Table 5-6 presents the percentage change in public and private sector environmental protection expenditure since 2008 using available Eurostat data. Percentages have been calculated by determining the difference between expenditure in any given year (e.g. 2009) and that in 2008, and then taking this difference as a percentage of the appropriate 2008 value. Numbers used are taken from the dataset environmental protection expenditure in Europe – detailed data (NACE Rev.2) available from DG ESTAT. Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O).

Table 5-6: Percentage change in environmental protection expenditure using 2008 as the base year (based on available Eurostat data)						
Member State	Year and sector (public or private)					
	2009		2010		2011	
	Public	Private	Public	Private	Public	Private
Austria	**-0.59%**	**-0.10%**	unavailable	unavailable	unavailable	unavailable
Belgium	**3.64%**	no data	**-2.20%**	unavailable	unavailable	unavailable
Bulgaria	**6.99%**	**-27.9%**	**-12.2%**	**-23.2%**	**10.7%**	**-31.7%**
Croatia	**9.08%**	**-3.52%**	**227%**	**-2.63%**	**1,310%**	**-6.39%**
Cyprus	unavailable	**146.15%**	unavailable	**125%**	unavailable	unavailable
Czech Republic	**12.5%**	**-5.17%**	**42.9%**	**-1.07%**	**46.8%**	**12.8%**
Denmark	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	**60.1%**	**-36.7%**	**-9.93%**	unavailable	unavailable	unavailable
Finland	**-2.97%**	**0.77%**	**9.67%**	**-7.54%**	unavailable	unavailable
France	**4.12%**	unavailable	**8.38%**	unavailable	unavailable	unavailable
Germany	**0.50%**	**-1.59%**	unavailable	unavailable	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	**5.21%**	unavailable	**65.4%**	unavailable	**44.2%**	unavailable
Ireland	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	**2.82%**	**-2.93%**	**3.29%**	**7.18%**	**5.08%**	**17.5%**
Latvia	**-21.8%**	**-27.8%**	**-30.2%**	**-53.3%**	unavailable	**-63.8%**
Lithuania	**16.0%**	**-39.0%**	**35.3%**	**-48.1%**	unavailable	**-23.7%**
Luxembourg	**21.3%**	unavailable	**12.8%**	unavailable	**33.1%**	unavailable
Malta	**7.10%**	unavailable	**34.4%**	unavailable	**0.76%**	unavailable
Netherlands	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Poland	**1.44%**	**-10.0%**	**19.1%**	**0.23%**	**33.8%**	**7.02%**
Portugal	**6.92%**	**-8.00%**	**-4.97%**	**-11.7%**	**-11.4%**	**-13.4%**
Romania	**-13.2%**	**-24.4%**	**25.8%**	**-12.3%**	**55.9%**	**-7.86%**
Slovakia	**8.21%**	**-12.3%**	**20.1%**	**-15.5%**	**37.3%**	**-16.1%**
Slovenia	**19.4%**	**-30.0%**	**-2.52%**	**-27.9%**	unavailable	unavailable
Spain	**10.1%**	**-1.05%**	**0.16%**	**-10.6%**	unavailable	unavailable
Sweden	**-8.56%**	unavailable	**1.83%**	unavailable	**12.4%**	unavailable
UK	unavailable	**-9.30%**	unavailable	**-21.6%**	unavailable	unavailable

Table 5-6: Percentage change in environmental protection expenditure using 2008 as the base year (based on available Eurostat data)						
Member State	Year and sector (public or private)					
	2009		2010		2011	
	Public	Private	Public	Private	Public	Private

Source: Percentages calculated from figures given in Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Notes: Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Where individual cells are marked as unavailable, data have not been identified from the above source for that particular category.

The majority of Member States showed an increase in public environmental protection expenditure between 2008 and 2010 (14 out of 20 Member States, or 70%) (note that data are available for more Member States for this change than for that between 2008 and 2011). The Member States with the greatest change in public environmental protection expenditure between 2008 and 2010 were Croatia (increasing by €23 million or 227% from a 2008 baseline of €10 million) followed by Hungary (increasing by €117 million or 65%) and the Czech Republic (increasing by €233 million or 43%) (Figure 5-4). Public expenditure on environmental protection between 2008 and 2010 decreased by the greatest percentage in Latvia (-30%), followed by Bulgaria (-12%).

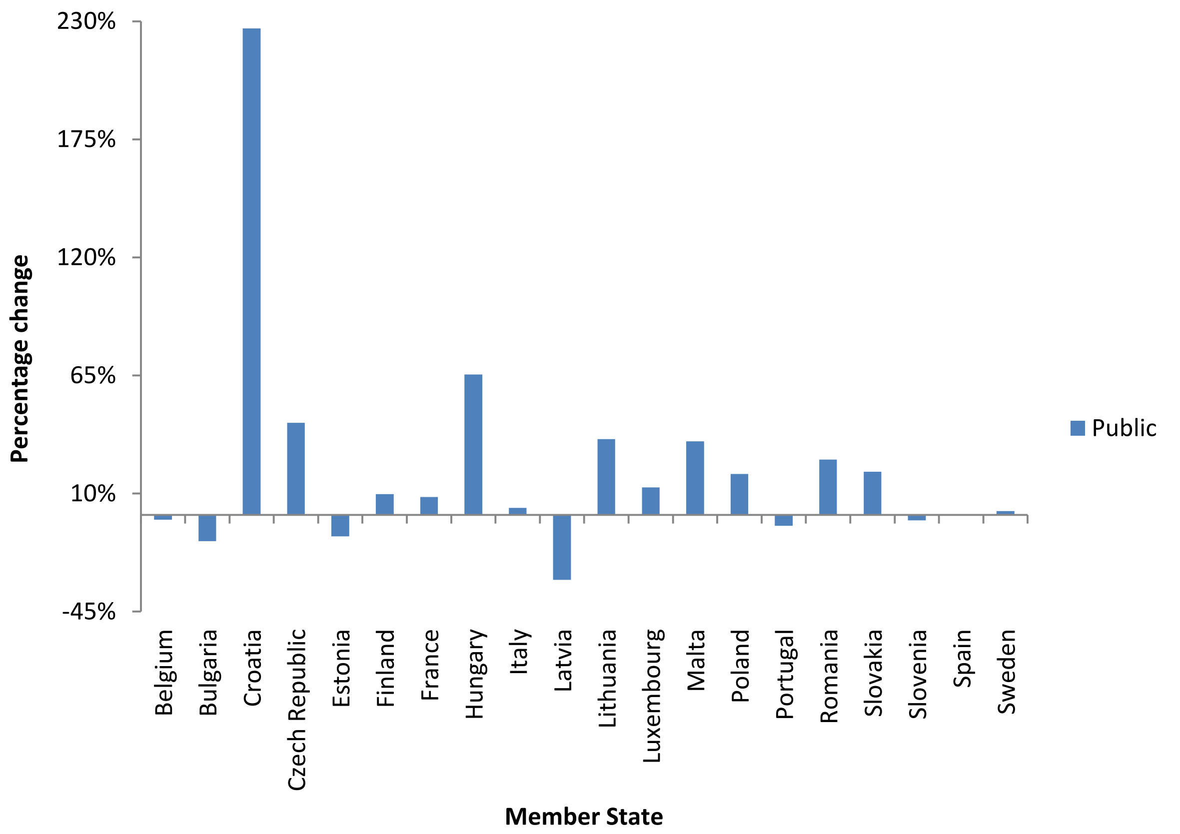

Figure 5-4: Percentage change in public sector environmental expenditure by Member State between 2008 and 2010

Source: Percentages calculated from figures given in Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Notes: Public data are environmental protection expenditure by general government. Data are unavailable for some Member States from the above source.

The majority of Member States showed a decline in private sector environmental expenditure between 2008 and 2010 (12 out of 15 countries, or 80%) (see Figure 5-5). The Member State with the greatest decrease in private sector environmental protection expenditure was Latvia (-54%), closely followed by Lithuania (-48%). Of the Member States where private sector environmental protection expenditure increased, the most significant increase was shown by Cyprus (126%).

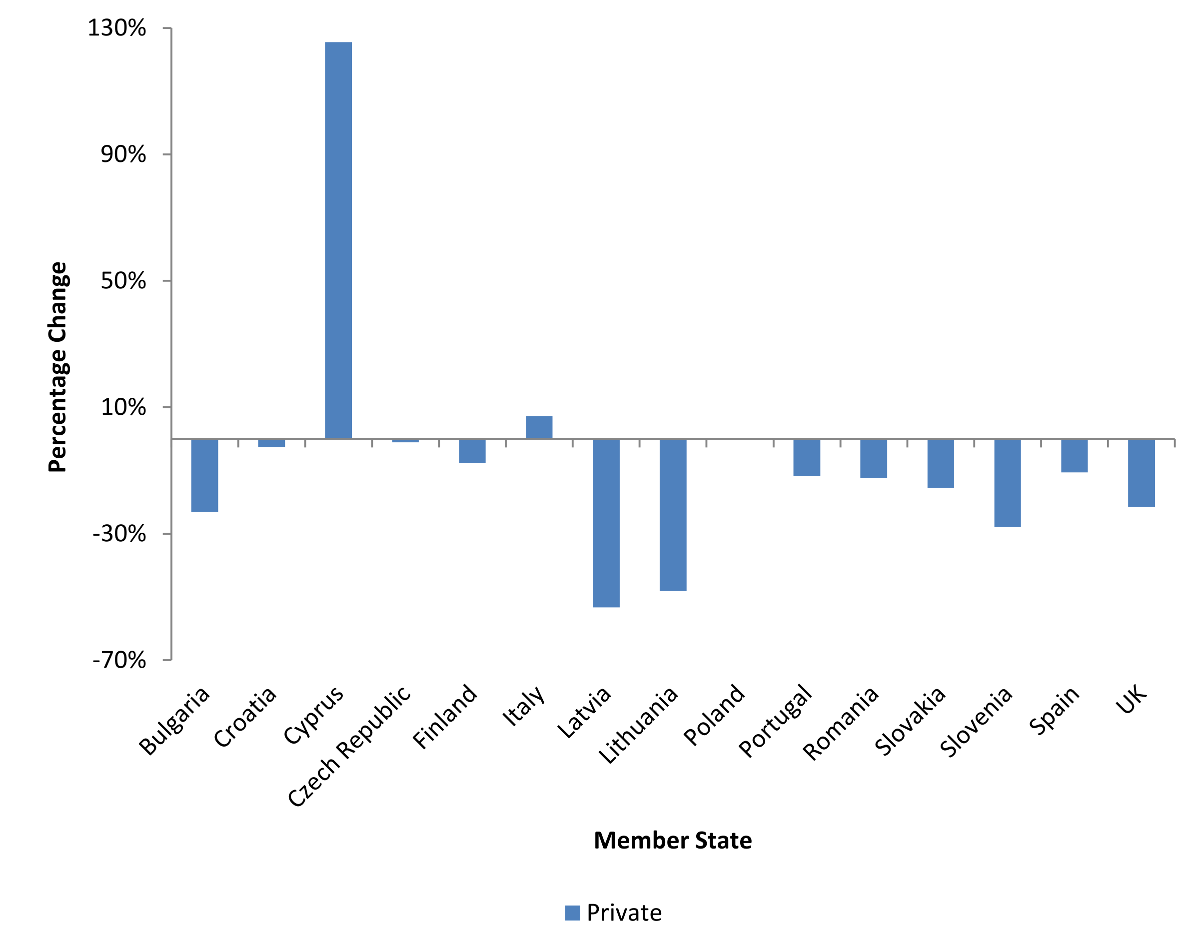

Figure 5-5: Percentage change in private sector environmental expenditure by Member State between 2008 and 2010

Source: Percentages calculated from figures given in Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Notes: Private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Data are unavailable for some Member States from the above source.

In terms of the overall trends, there are several Member States which showed declines in both public and private sector environmental protection expenditure between 2008 and 2010 (for example, Bulgaria, Latvia and Portugal). For a few of these Member States, total environmental protection expenditure as a percentage of GDP also declined over this period (e.g. Latvia, Slovenia).

Conversely, for several of the Member States where private sector environmental protection expenditure decreased between 2008 and 2010, the concurrent increase in public sector environmental protection expenditure meant that total environmental protection expenditure as a percentage of GDP actually increased. These Member States include the Czech Republic and Lithuania.

Amongst those Member States for which comparative data are available for 2008 and 2010, Italy alone reported increased public and private sector environmental protection expenditure, as well as an increase in total environmental protection expenditure as a percentage of GDP.

5.2.6 Environmental protection expenditure by environmental domain

Public and private sector environmental protection expenditure by domain

Table 5-7 presents a breakdown of environmental protection expenditure by environmental domain for the latest year for which Eurostat data are available for each Member State. Note that of the nine CEPA environmental domains, separate figures are not available for two categories: protection against radiation; and research and development for environmental protection, so these are omitted from Table 5-7. Public data represent environmental protection expenditure by general government, whilst private data are expenditure by business for NACE Revision 2 divisions 01-99 with the exception of the public sector (division 84), materials recovery (group 38.3) and specialised producers (in divisions and groups 37, 38.1, 38.2 and 39).

Table 5-7: Breakdown of environmental protection expenditure by environmental domain by Member State (data from Eurostat for latest year available)									
Member State	Year	Public or private sector environmental protection expenditure	Expenditure by category (€ millions)						
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Other environmental protection expenditure activities
Austria	2009	Public	**€244**	**€474**	**€468**	**€33**	**€7.5**	**€231**	**€186**
	2009	Private	**€466**	**€238**	**€276**	**€453**	**€50**	**€479**	**€21**
Belgium	2010	Public	**€39**	**€34**	**€875**	**€88**	unavailable	**€115**	**€415**
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Bulgaria	2011	Public	**€0.35**	**€70**	**€146**	**€5.8**	**€0.08**	**€0.44**	**€9.1**
	2011	Private	**€118**	**€39**	**€88**	**€11**	**€0.02**	**€0.25**	**€39**
Croatia	2011	Public	**€0.41**	**€24**	**€97**	**€15**	**€0.2**	**€4.3**	**€1.4**
	2011	Private	**€450**	**€152**	**€68**	**€42**	**€6.0**	**€7.3**	**€77**
Cyprus	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2010	Private	**€6.6**	**€8.8**	**€13**	included elsewhere	**€1.1**	included elsewhere	**€32**
Czech Republic	2011	Public	**€11**	**€348**	**€333**	**€33**	**€26**	**€20**	**€25**
	2011	Private	**€313**	**€436**	unavailable	unavailable	unavailable	unavailable	unavailable
Denmark	2008	Public	**€111**	**€0.26**	**€40**	**€92**	**€3.4**	**€496**	**€810**
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	2010	Public	unavailable	**€9.6**	**€8.6**	**€0.16**	**€0**	**€1.6**	unavailable
	2010	Private	**€54**	unavailable	unavailable	unavailable	**€0.22**	unavailable	unavailable
Finland	2010	Public	unavailable	**€523**	**€152**	unavailable	unavailable	**€55**	**€415**
	2010	Private	**€200**	**€201**	**€163**	**€56**	**€2.4**	unavailable	**€44**
France	2010	Public	**€1,194**	**€1,816**	**€1,853**	**€859**	**€198**	**€1,409**	**€6,501**
	2010	Private	**€515**	**€693**	**€1,377**	**€246**	**€34**	**€155**	**€1605**
Germany	2009	Public	unavailable	**€3,380**	**€2,870**	unavailable	**€180**	**€1,350**	**€330**
	2009	Private	**€4,660**	**€3,430**	**€3,100**	**€190**	**€210**	**€180**	unavailable
Greece	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable

Table 5-7: Breakdown of environmental protection expenditure by environmental domain by Member State (data from Eurostat for latest year available)									
Member State	**Year**	**Public or private sector environmental protection expenditure**	**Expenditure by category (€ millions)**						
			Protection of ambient air and climate	**Wastewater management**	**Waste management**	**Protection and remediation of soil, groundwater and surface water**	**Noise and vibration abatement**	**Protection of biodiversity and landscapes**	**Other environmental protection expenditure activities**
Hungary	2011	Public	**€1.5**	**€99**	**€91**	**€30**	**€8.7**	**€13**	**€20**
	2011	Private	**€93**	**€456**	**€289**	**€54**	**€18**	**€4.6**	**€67**
Ireland	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	2011	Public	unavailable	**€732**	**€7,312**	unavailable	unavailable	**€1,770**	**€4,045**
	2011	Private	**€2,039**	**€1,934**	**€12,776**	unavailable	unavailable	unavailable	**€5,714**
Latvia	2010	Public	**€7.3**	**€8.6**	**€66**	unavailable	unavailable	**€3.5**	**€55**
	2011	Private	**€16**	**€29**	**€6.9**	**€9.6**	unavailable	**€2.4**	**€2.3**
Lithuania	2010	Public	**€11**	**€189**	**€113**	unavailable	unavailable	**€12**	**€48**
	2011	Private	**€98**	**€34**	**€26**	**€3.7**	**€0.22**	**€0.4**	**€8.5**
Luxembourg	2011	Public	**-€50**	**€276**	**€75**	**-€2.1**	**-€0.52**	**€36**	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Malta	2011	Public	**€8.7**	**€19**	**€44**	unavailable	unavailable	**€18**	**€6.5**
	no data	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Netherlands	2009	Public	**€705**	**€2,826**	**€2,401**	**€288**	**€46**	**€893**	**€1,345**
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Poland	2011	Public	**€54**	**€1215**	**€134**	**€55**	**€55**	**€168**	**€286**
	2011	Private	**€1,082**	**€1,378**	**€824**	**€198**	**€34**	**€135**	**€341**
Portugal	2011	Public	**€7.2**	**€1.0**	**€506**	**€94**	**€1.4**	**€169**	**€51**
	2011	Private	**€115**	**€85**	**€121**	**€21**	**€3.6**	**€22**	**€27**
Romania	2011	Public	**€42**	**€610**	**€374**	**€4.7**	**€5.2**	**€174**	**€45**
	2011	Private	**€186**	**€148**	**€181**	**€69**	**€19**	**€102**	**€424**
Slovakia	2011	Public	**€21**	**€22**	**€164**	**€2.1**	Unavailable	**€4.0**	unavailable
	2011	Private	**€95**	Unavailable	**€112**	Unavailable	**€4.3**	unavailable	**€31**
Slovenia	2010	Public	**€0**	**€181**	**€61**	unavailable	unavailable	**€33**	**€18**

Table 5-7: Breakdown of environmental protection expenditure by environmental domain by Member State (data from Eurostat for latest year available)									
Member State	Year	Public or private sector environmental protection expenditure	Expenditure by category (€ millions)						
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Other environmental protection expenditure activities
	2010	Private	**€109**	**€95**	**€140**	**€11**	**€14**	**€6.3**	**€13**
Spain	2010	Public	unavailable	unavailable	unavailable	unavailable	unavailable	**€1,825**	**€1,366**
	2010	Private	**€643**	**€1,057**	**€2,573**	**€172**	**€38**	**€268**	**€469**
Sweden	2011	Public	**€3.8**	**€0.44**	**€742**	unavailable	unavailable	**€131**	**€430**
	2011	Private	**€357**	**€430**	**€287**	unavailable	unavailable	unavailable	**€320**
UK	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2010	Private	**€439**	**€713.42**	**€1,091**	**€372**	**€439**	**€134**	**€588**

Sources: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Notes: Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Where individual cells are marked as unavailable, data have not been identified from the above source for that particular category. For Cyprus, data on "protection and remediation of soil, groundwater and surface water" and "protection of biodiversity and landscapes" are included within the category "other environmental protection activities".

Changes in public environmental protection expenditure by domain

The following graphs provide a visual guide to trends within the data from DG ESTAT (Eurostat) for environmental protection expenditure for EU27 and selected Member States (dependent on data availability) for the period 2008-2011. Only public (general government) expenditure has been presented since trends in private sector (business data) would be affected by the number of businesses within a Member State. Public and private specialised producer data have not been used since the information available is sparse and unlikely to produce clear trends. Note also that this study does not attempt to draw links between environmental protection expenditure and taxation, or consider the level of expenditure in relation to the state of the environment. Additional data and analysis would be needed at the national level to try to determine whether high environmental protection expenditure was due to a high regard for the environment, the existence of many environmental problems requiring solutions, or perhaps poor spending decisions.

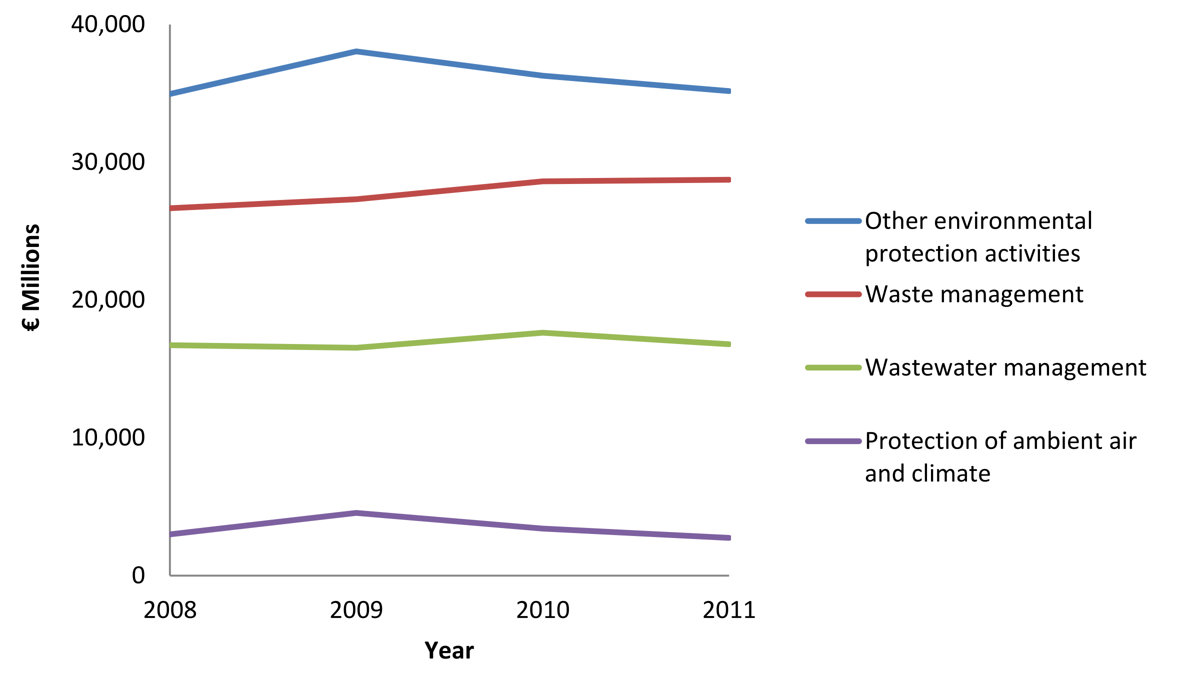

Figure 5-6: EU27 public environmental protection expenditure in € millions
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.
Notes: Data are environmental protection expenditure by general government (public); 'Other environmental protection activities' include protection of soil, groundwater, noise abatement, protection of biodiversity, landscape and other combined.

Figure 5-6 presents governmental expenditure in EU27 for environmental protection by environmental domain for the years 2008 to 2011. There are no clear trends present, suggesting that for each environmental domain, expenditure is influenced by different parameters or that key trends are hidden by combining Member State data. There is relatively little fluctuation for any one domain, suggesting that each domain requires a certain amount of expenditure, i.e. spending on wastewater management will always be higher than spending on the protection of ambient air and climate. One trend that was expected was a fall in all expenditure in each domain from 2008-2011 due to the financial crisis and austerity measures brought in place to deal with government debts. However, expenditure in 2011 for waste management, wastewater management and other environmental protection activities stayed above 2008 expenditure, with expenditure on protection of ambient air and climate only falling by 8% (€243.9 million).

Due to data being unavailable for certain years for a significant number of Member States, it is not possible to present trends over time for all Member States and environmental domains. Therefore, Figures 5-7 to 5-13 present data for the Czech Republic, Hungary, Poland, Portugal and Romania, which had data present across all four years (2008 to 2011, the latest year available) for seven environmental domains.

Protection of ambient air and climate – public environmental protection expenditure

Public environmental protection expenditure by Hungary, Portugal and the Czech Republic were all below €20 million between 2008 and 2011 (Fig. 5-7). Expenditure in Portugal and the Czech Republic rose slightly by similar amounts, whilst Hungary's expenditure remained fairly constant. Poland's expenditure almost doubled from 2008 to 2011 with 2010 to 2011 being the steepest incline. Romania's expenditure varies significantly over the four year period. Although not depicted in Figure 5-7, expenditure in France for the protection of ambient air and climate was the highest amongst the EU28 Member States, with expenditure rising from €834 million in 2008 to €1,194 million in 2010.

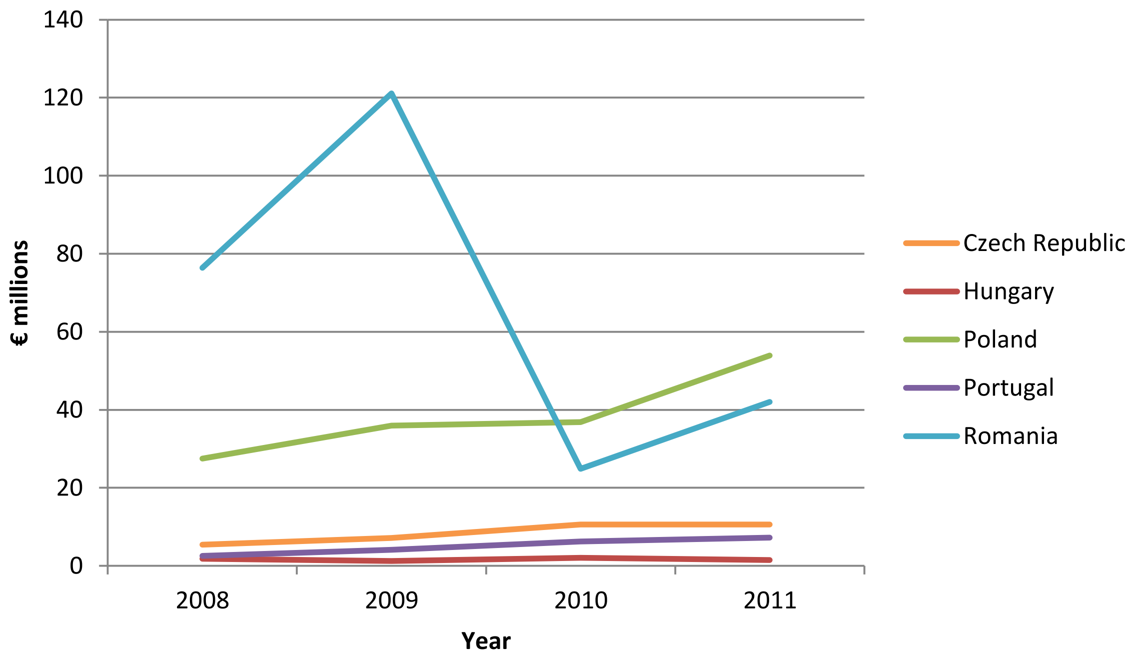

Figure 5-7: Public environmental expenditure in € millions on the protection of ambient air and climate by year for Member States where comparable data are available for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Wastewater management – public environmental protection expenditure

Public environmental expenditure by the Czech Republic and Poland both rose during the four year period; however, expenditure in Poland was approximately €800 million more than the Czech Republic in 2011 (Figure 5-8). Expenditure in Portugal fell from 2008 to 2011, with the sharpest decline between 2009 and 2010 (falling to €6.25 million in 2010). Hungary and Romania's expenditure fell in 2009 and then rose from 2009 to 2010. Romania's expenditure continued to rise in 2011, whilst Hungary's fell again. Although not depicted in Figure 5-8, Germany's expenditure for wastewater management was the highest amongst the EU28 Member States, with expenditure of €3,440 million in 2008, falling slightly to €3,380 million in 2009.

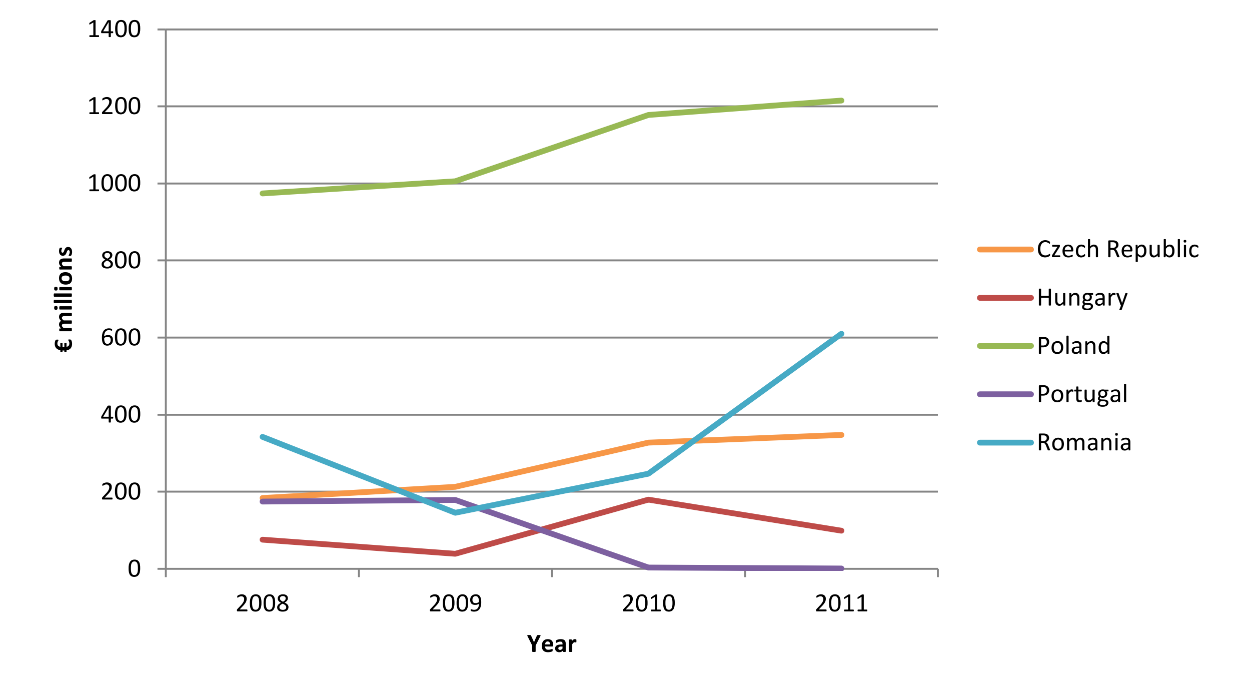

Figure 5-8: Public environmental protection expenditure in € millions on wastewater management by year for Member States where comparable data are available for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Waste management- public environmental protection expenditure

Public environmental protection expenditure for waste management by the Czech Republic, Poland, Hungary and Portugal varied by very little in comparison with expenditure in Romania (Figure 5-9). The Czech Republic's expenditure did however show a slight rise each year. Romania's expenditure fell between 2009 and 2010, but more than doubled from 2010 to 2011. Although not depicted in Figure 5-9, Italy's expenditure for waste management was the highest amongst the EU28 Member States, with expenditure rising from €6,022 million in 2008 to €7,312 million in 2011.

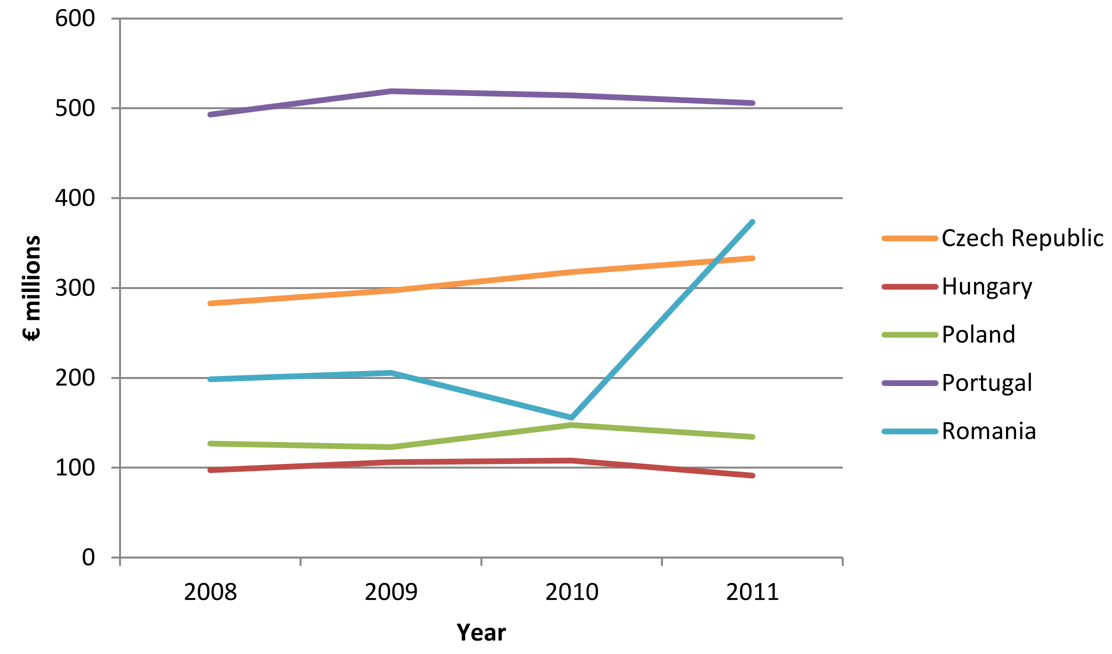

Figure 5-9: Public environmental expenditure in € millions on waste management by year for Member States where comparable data are available for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Protection of soil, groundwater and surface water – public environmental protection expenditure

In 2008, public environmental protection expenditure for the protection of soil, groundwater and surface water was below €15 million for the Czech Republic, Romania, Hungary and Poland (Figure 5-10). Expenditure had more than doubled for Czech Republic, Hungary and Poland by 2011 compared with 2008. Expenditure in Romania fell by almost €10 million from 2008 to 2011. Portugal's expenditure tripled between 2008 and 2010, but was followed by a fall of just over €24 million between 2010 and 2011. Although not depicted in Figure 5-10, France's expenditure for the protection of soil, groundwater and surface water was the highest amongst the EU28 Member States, with expenditure at €1,017 million in 2008, falling to €859 million in 2010.

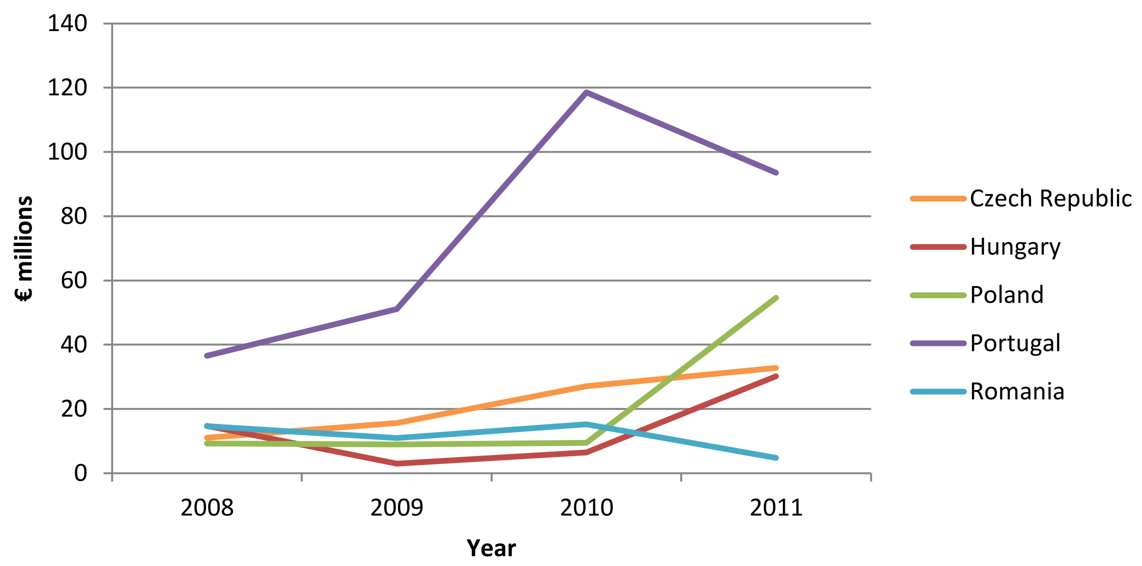

Figure 5-10: Public environmental expenditure in € millions on the protection of soil, groundwater and surface water by year for Member States with comparable data for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014

Noise and vibration abatement – public environmental protection expenditure

Expenditure for noise and vibration abatement stayed below €10 million between 2008 and 2011 for Hungary, Portugal and Romania (Figure 5-11). The Czech Republic saw a steady fall in expenditure from €34 million in 2008 to €26 million in 2011. Expenditure in Romania more than halved between 2008 and 2009, but then saw a sharp rise from 2010 to 2011 with expenditure rising by more than €40 million. Although not presented in Figure 5-11, France's expenditure for noise and vibration abatement was the highest amongst the EU28 Member States, at €237 million in 2008, falling to €198 million in 2010.

Protection of biodiversity and landscapes – public environmental protection expenditure

Expenditure for the protection of biodiversity and landscapes stayed fairly consistent for Hungary and the Czech Republic over the four year period (Figure 5-12). Portugal's expenditure also stayed relatively consistent, with fluctuations of no more than €20 million between consecutive years. Expenditure within Romania and Poland rose between 2008 and 2011. Poland's expenditure rose consistently, whereas Romania's expenditure varied over the time period. Although not presented in Figure 5-12, Spain and Italy's expenditures for the protection of biodiversity and landscapes were the highest amongst the EU28 Member States, with expenditure staying between €1,600 million and €2,000 million.

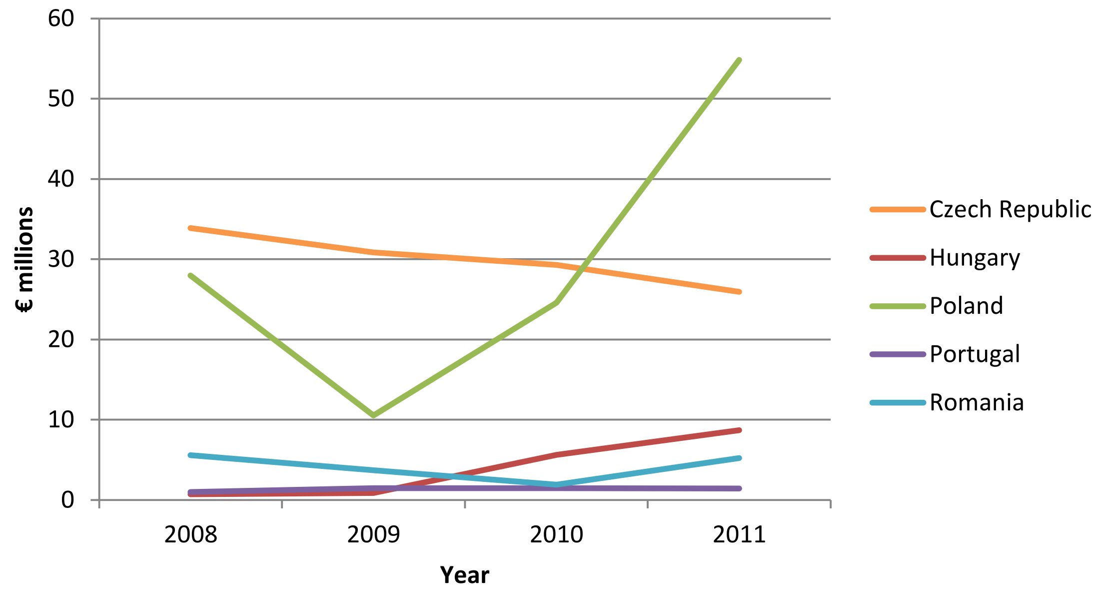

Figure 5-11: Public environmental expenditure in € millions on noise and vibration abatement by year for Member States with comparable data for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

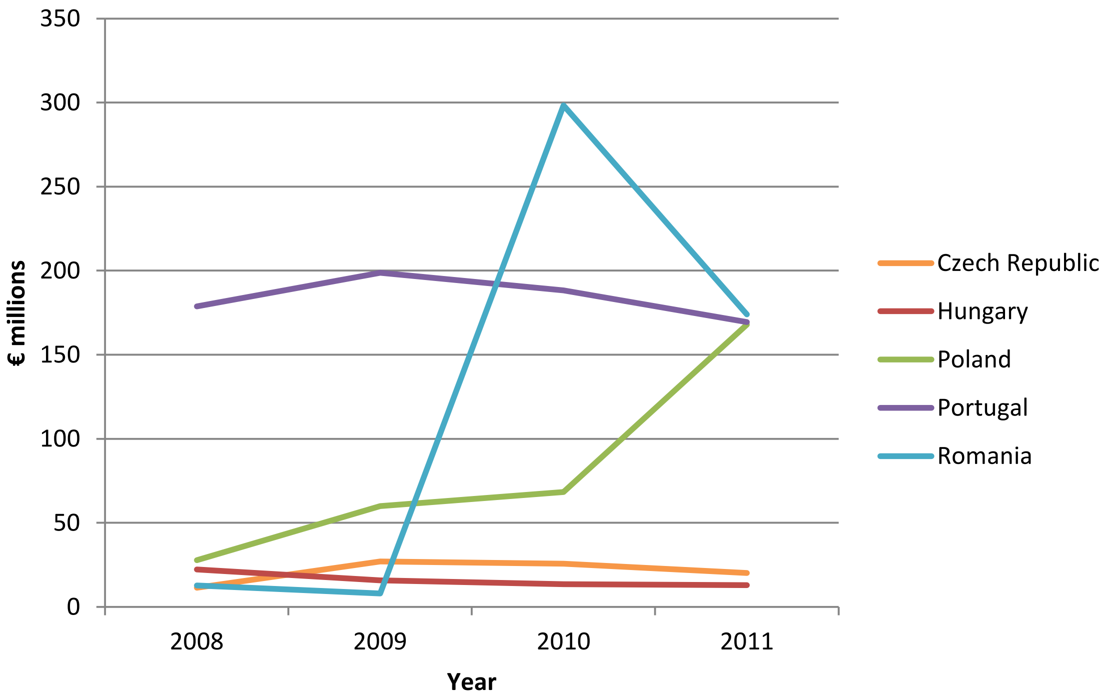

Figure 5-12: Public environmental protection expenditure in € millions on the protection of biodiversity and landscapes by year for Member States with comparable data for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Other environmental protection activities

Public expenditure on other environmental protection activities rose within Portugal, the Czech Republic and Hungary between 2008 and 2010, then fell in 2011 (Figure 5-13). Expenditure within Romania rose and then fell within the four year period, with 2011 expenditure being less than half the expenditure in 2008. Poland saw expenditure fall, then rise, then fall again throughout the four year period. Although not presented in Figure 5-13 France's expenditure for other environmental protection activities is again the highest amongst the EU28 Member States, with expenditure rising from €5,965 million in 2008 to €6,501 million in 2011.

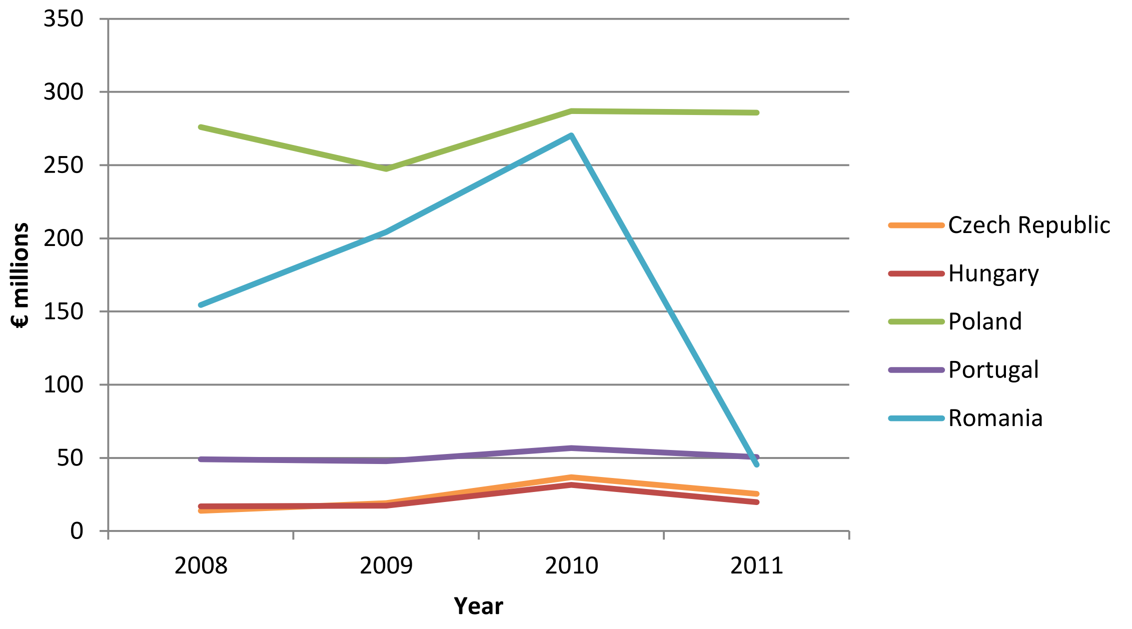

Figure 5-13: Public environmental expenditure in € millions on the domain 'other environmental protection' by year for Member States with comparable data for 2008 to 2011
Source: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Percentage changes in public and private sector environmental protection expenditure by domain

Table 5-8 presents the percentage change in environmental protection expenditure by environmental domain. Changes have been calculated using Eurostat data, assuming 2008 as the base year. Where 2008 data are not available, changes have been assessed from 2009 or 2010. Note that data are not available for the environmental domains: protection against radiation; and research and development for environmental protection.

Table 5-8: Percentage change in environmental protection expenditure by environmental domain (based on Eurostat data)

Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain (€ millions)						
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Other environmental protection expenditure activities
Austria	2008/09	Public	118%	-20.2%	-2.32%	77.1%	-65.4%	24.9%	-23.3%
	2008/09	Private	1.95%	-21.2%	8.57%	3.08%	14.1%	3.56%	-18.3%
Belgium	2008/10	Public	25.6%	-62.5%	3.99%	-0.31%	unavailable	-1.21%	4.24%
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Bulgaria	2008/11	Public	150%	-18.2%	47.0%	-56.9%	unavailable	-67.9%	-6.01%
	2008/11	Private	-42.9%	-56.6%	17.8%	-22.8%	-75.0%	127%	-17.1%
Croatia	2008/11	Public	173%	2,440%	4,150%	777%	900%	30.4%	-18.6%
	2008/11	Private	-30.7%	40.6%	11.7%	-16.8%	115%	9.06%	-40.1%
Cyprus	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/10	Private	-6.24%	20.7%	36.4%	included elsewhere	664%	included elsewhere	911%
Czech Republic	2008/11	Public	96.3%	89.3%	17.8%	198%	-23.5%	74.8%	83.6%
	2008/11	Private	22.3%	3.53%	unavailable	unavailable	unavailable	unavailable	unavailable
Denmark	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	2008/10	Public	unavailable	-4.94%	-20.1%	-73.8%	value of 0 for 2010	-14.5%	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Finland	2008/10	Public	unavailable	14.1%	5.86%	unavailable	unavailable	25.7%	4.14%
	2008/10	Private	-14.3%	-4.21%	2.27%	-1.83%	-52.8%	unavailable	-21.9%
France	2008/10	Public	43.1%	10.1%	-0.06%	-5.65%	15.1%	8.45%	2.64%
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Germany	2008/09	Public	Unavailable	-1.74%	-1.03%	unavailable	50.0%	3.85%	13.8%
	2008/09	Private	-1.48%	0.00%	-3.13%	5.56%	-12.5%	0.00%	unavailable
Greece	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable

Table 5-8: Percentage change in environmental protection expenditure by environmental domain (based on Eurostat data)									
Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain (€ millions)						
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Other environmental protection expenditure activities
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	2008/11	Public	-19.9%	31.2%	-6.03%	105%	1,110%	-41.7%	16.8%
	2009/11	Private	36.6%	7.92%	-3.81%	-22.5%	108%	-60.9%	-22.2%
Ireland	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	2008/11	Public	unavailable	-15.1%	21.4%	unavailable	unavailable	-6.30%	-8.40%
	2008/11	Private	-20.1%	35.0%	26.9%	unavailable	unavailable	unavailable	12.9%
Latvia	2008/10	Public	-83.0%	-90.1%	92.1%	unavailable	unavailable	-81.9%	211%
	2008/11	Private	-5.90%	-75.5%	-67.5%	73.5%	unavailable	8.64%	87.7%
Lithuania	2008/10	Public	19.2%	79.7%	13.6%	unavailable	unavailable	-29.9%	7.17%
	2008/11	Private	33.5%	-49.7%	-18.8%	12.4%	91.1%	33.3%	80.7%
Luxembourg	2008/11	Public	-17.6%	27.3%	17.5%	-17.7%	-18.8%	5.44%	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Malta	2008/11	Public	4,250%	-9.54%	-21.5%	unavailable	unavailable	18.8%	117%
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Netherlands	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Poland	2008/11	Public	95.8%	24.7%	6.04%	486%	96.0%	503%	3.61%
	2008/11	Private	24.2%	-7.26%	-0.70%	10.5%	0.691%	48.3%	42.7%
Portugal	2008/11	Public	181%	-99.4%	2.58%	156%	44.4%	-5.18%	2.95%
	2008/11	Private	-41.0%	14.5%	1.58%	0.663%	-28.6%	39.7%	3.44%
Romania	2008/11	Public	-45.0%	78.1%	88.2%	-67.7%	-5.94%	1,270%	-70.7%
	2008/11	Private	-44.9%	-30.7%	-38.0%	-58.7%	689%	165%	143%
Slovakia	2008/11	Public	38.2%	26.4%	36.1%	68.3%	unavailable	408%	unavailable
	2008/11	Private	unavailable	unavailable	unavailable	unavailable	37.8%	unavailable	-35.5%

Table 5-8: Percentage change in environmental protection expenditure by environmental domain (based on Eurostat data)									
Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain (€ millions)						
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Other environmental protection expenditure activities
Slovenia	2008/10	Public	unavailable	**29.3%**	**-27.4%**	unavailable	unavailable	**88.1%**	**-69.7%**
	2008/10	Private	**-15.0%**	**-42.6%**	**-10.0%**	**-60.3%**	**-34.1%**	**-49.2%**	**-52.9%**
Spain	2008/10	Public	unavailable	unavailable	unavailable	unavailable	unavailable	**5.80%**	**-6.50%**
	2008/10	Private	**-44.0%**	**2.29%**	**4.66%**	**-10.1%**	**-11.1%**	**-12.5%**	**-5.06%**
Sweden	2008/11	Public	**-39.6%**	**-53.2%**	**0.27%**	unavailable	unavailable	**5.50%**	**47.8%**
	2009/11	Private	**64.6%**	**45.0%**	**32.3%**	unavailable	unavailable	unavailable	**26.6%**
UK	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/10	Private	**-46.3%**	**-47.2%**	**1.33%**	**299%**	**1,910%**	**-7.19%**	**-54.8%**

Sources: Environmental protection expenditure in Europe – detailed data (NACE Rev.2), available from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014.

Notes: Public data are environmental protection expenditure by general government; private data are environmental protection expenditure for the business sector (all NACE activities except E37, E38.1, E38.2, E39 and O). Where individual cells are marked as unavailable, data have not been identified from the above source for that particular category for one or more years. For Cyprus, data on "protection and remediation of soil, groundwater and surface water" and "protection of biodiversity and landscapes" are included within the category "other environmental protection activities".

5.3 Findings based on national data

5.3.1 Public and private sector environmental protection expenditure data

Table 5-9 provides the most recent national data on public and private sector environmental protection expenditure where these data are available for a later year than those provided by Eurostat. Note that these data are not necessarily comparable with those given in Section 5-2 due to the different methods used by Member States to collect and analyse the data. Furthermore, given that Table 5-9 presents absolute numbers and not percentages, the figures are likely to vary by Member State size and population. No data have been identified for the year 2013[43].

Table 5-9: Public and private sector environmental protection expenditure: national data for the most recent year available (if later than Eurostat)

Member State	Year	Public or private sector	Environmental protection expenditure (€ millions)	Sources and notes
Austria	2010	Public	€729	Data from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expenditure_accounts_epea/index.html) on 30 January 2014. Private sector is NGOs and Enterprises combined
	2010	Private	€7,656	
Belgium	-	Public	-	Latest data from Eurostat (2010)
	2011	Private	€1,111	Data are from Statistics Belgium, accessed at: http://statbel.fgov.be/fr/modules/publications/statistiques/environnement/fichiers_telechargeables/depenses_et_investissement_de_l_environnement_2011.jsp) on 30 January 2014 and relate to industry NACE codes 5-36
Bulgaria	-	Public	-	Latest data from Eurostat (2011)
	-	Private	-	Latest data from Eurostat (2011)
Croatia	2012	Combined	€149	Data from Croatian Bureau of Statistics, accessed at: http://www.dzs.hr/default_e.htm on 5 November 2013
Cyprus	2010	Public	€94	Data from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/energy_environment_82main_en/energy_environment_82main_en?OpenForm&sub=2&sel=1) on 30 January
	2011	Private	€32	

[43] Note that some data do exist for 2013, for example, in Fedrigo-Fazio et al (2013): Steps towards greening in the EU, Monitoring Member States achievements in selected environmental policy areas - EU summary report, prepared for DG Environment. Brussels. 2013. However, these data are not included in this table because they are not comparable with the data from other years (for instance, the data combine spending on environment, resource efficiency and green growth).

Table 5-9: Public and private sector environmental protection expenditure: national data for the most recent year available (if later than Eurostat)				
Member State	**Year**	**Public or private sector**	**Environmental protection expenditure (€ millions)**	**Sources and notes**
				2014
Czech Republic	2012	Public	€872	Data from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014
	2012	Private	€2,392	
Denmark	2012	Public	€760	Data from Statistics Denmark, accessed at: http://www.statbank.dk/OFF24) on 30 January 2014
	-	Private	-	No data identified
Estonia	2011	Public	€51	Statistics Estonia matrices EN65, EN064 and EN063, accessed at: http://www.stat.ee/en on 30 January 2014
	2011	Private	€645	
Finland	2011	Public	€1,354	Data from Statistics Finland (Tilastokeskus), accessed at: http://www.tilastokeskus.fi/til/ymp_en.html) on 30 January 2014
	2011	Private	€876	
France	2011	Public	€15,217	Data from Statistical Service of the Ministry of Sustainable Development (2013): Expenses environmental protection, 2013, accessed at: http://www.statistiques.developpement-durable.gouv.fr/accueil.html) on 30 January 2014
	2011	Private	€17,591	
Germany	2010	Public	€8,270	Preliminary data provided by Statistisches Bundesamt (accessed at: https://www.destatis.de on 30 January 2014). Private sector data comprise the sum of expenditure for 'production industries' and 'privatised public enterprises'
	2010	Private	€27,500	
Greece	-	Public	-	No data identified
	-	Private	-	No data identified
Hungary	2012	Public	€253	Data from Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/stadat_annual_5 on 30 January 2014. Private sector covers environmental protection investments by industry (excluding NACE codes O Public administration, P Education and Q Human health and social work). Public data consist of NACE codes O, P and Q
	2012	Private	€224	
Ireland	2010	Public	€202	Data from Central Statistics Office (2012): Environmental Indicators Ireland 2012, Dublin, the Stationery Office, available from the Central Statistics Office, accessed at:

Table 5-9: Public and private sector environmental protection expenditure: national data for the most recent year available (if later than Eurostat)				
Member State	**Year**	**Public or private sector**	**Environmental protection expenditure (€ millions)**	**Sources and notes**
				http://www.cso.ie/en/index.html on 29 January 2014
	-	Private	-	No data identified
Italy	-	Public	-	Latest data from Eurostat (2011)
	-	Private	-	Latest data from Eurostat (2011)
Latvia	2012	Combined	€186	Data from Central Statistical Bureau of Latvia, accessed at: http://www.csb.gov.lv/en/dati/statistics-database-30501.html on 30 January 2014
Lithuania	-	Public	-	Latest data from Eurostat (2010)
	-	Private	-	Latest data from Eurostat (2010)
Luxembourg	-	Public	-	Latest data from Eurostat (2011)
	-	Private	-	No data identified
Malta	-	Public	-	Latest data from Eurostat (2011)
	-	Private	-	No data identified
Netherlands	-	Public	-	Latest data from Eurostat (2009)
	2012	Private	€620	Data from Statistics Netherlands, The Hague, accessed at: http://www.cbs.nl/infoservice on 30 January 2014
Poland	2012	Combined	€2,420	Data from Central Statistical Office of Poland, accessed at: http://www.stat.gov.pl/gus/index_ENG_HTML.htm on 24 January 2014. Data refer to outlays on fixed assets serving environmental protection and water management.
Portugal	2012	Public	€837	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014
	2012	Private	€83	
Romania	2012	Public	€801	Data from National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014. Public sector data are local and central public administration figures; private data are expenditure for specialised and non-specialised producers
	2012	Private	€3,352	
Slovakia	2012	Public	€166	Data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014
	2012	Private	€385	
Slovenia	2011	Public	€304	Data by request from Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014
	2011	Private	€208	

Table 5-9: Public and private sector environmental protection expenditure: national data for the most recent year available (if later than Eurostat)				
Member State	**Year**	**Public or private sector**	**Environmental protection expenditure (€ millions)**	**Sources and notes**
Spain	-	Public	-	Latest data from Eurostat (2010)
	2011	Private	€2,389	Data are sourced from INE (2013): Press Release, Survey on Industry Expenditure on Environmental Protection Year 2011, available from INE, accessed at: http://www.ine.es/ on 3 January 2014 Data relate to industry (NACE sectors B, C and D) only and cover current expenditure and investment.
Sweden	-	Public	-	Latest data from Eurostat (2011)
	2012	Private	€1,435	Data from Statistics Sweden (2013): Total environmental protection expenditure 2002-2012 in industry, accessed at: http://www.scb.se/en on 30 January 2014
UK	2011	Public	€14,802	Public data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013
	2011	Private	€3,458	Private data from Defra (2012): Environmental Protection Expenditure by Industry 2011, accessed at: https://www.gov.uk/government/publications/environmental-protection-expenditure-survey on 14 November 2013

Where available, regional (i.e. sub-Member State) level data on environmental protection expenditure can be found in Annex 10.

Table 5-10 provides national data on foreseen public and private sector expenditure for 2014 where available. These data have only been identified for Spain and Sweden.

Table 5-10: Foreseen environmental protection expenditure for 2014			
Member State	**Expenditure**	**Details**	**Reference**
Spain	0.8% GDP	Expected expenditure on environmental protection (COFOG code 5)	2014 Draft Budgetary Plan of the Kingdom of Spain, produced 15 October 2013
Sweden	€534 million	General environmental protection and nature conservation for 2014	Proposed central government expenditure for 2014 (see Government Offices of Sweden, accessed at: http://www.government.se/sb/d/2798/a/223352 on 30 January 2014

5.3.2 Public environmental protection expenditure in relation to total public expenditure

Table 5-11 presents public environmental protection expenditure as a percentage of total public expenditure using national public environmental expenditure data where such data are more recent than those sourced through Eurostat. To calculate the figures, national public environmental protection expenditure has been taken as a percentage of total public expenditure sourced from Eurostat through the Annual Summary of Government Finance Statistics. Any comparisons between Member States should take into consideration the fact that the data are from different sources and thus may not necessarily be measuring the same thing.

Table 5-11: Public environmental protection expenditure as a percentage of total public expenditure (based on national environmental protection expenditure data for the most recent year available)

Member State	Year	Public environmental protection expenditure as a % of total public expenditure	Notes
Austria	2010	0.48%	Public environmental protection expenditure for 2010 from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expenditure_accounts_epea/index.html on 30 January 2014
Belgium	-	-	Eurostat data are most recent available (2010)
Bulgaria	-	-	Eurostat data are most recent available (2011)
Croatia	-	-	Eurostat data are most recent available (2011)
Cyprus	2010	1.17%	Public environmental protection expenditure for 2010 from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/index_en/index_en?OpenDocument on 30 January 2014
Czech Republic	2012	1.28%	Public environmental protection expenditure for 2012 includes investment and non-investment expenditure from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014
Denmark	2012	0.52%	Public environmental protection expenditure for 2012 from Statistics Denmark, accessed at: www.statbank.dk/OFF24 on 30 January 2014
Estonia	2011	0.83%	Public environmental protection expenditure data for 2011 from Statistics Estonia, accessed at: http://www.stat.ee/en on 30 January 2014
Finland	2011	1.3%	Public environmental protection expenditure data for 2011 from Statistics Finland (Tilastokeskus), accessed at: http://www.tilastokeskus.fi/til/ymp_en.html on 30 January 2014
France	2011	1.57%	Public environmental protection expenditure data from statistical service of the Ministry of sustainable development, accessed at:

Table 5-11: Public environmental protection expenditure as a percentage of total public expenditure (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Public environmental protection expenditure as a % of total public expenditure**	**Notes**
			http://www.statistiques.developpement-durable.gouv.fr/lessentiel/ar/375/1257/depense-autres-activites-protection-lenvironnement.html) on 30 January 2014
Germany	2010	0.69%	Preliminary public environmental protection expenditure data provided by Statistisches Bundesamt, accessed at: https://www.destatis.de/DE/Startseite.html on 30 January 2014
Greece	-		No national data identified
Hungary	2012	0.53%	Public environmental expenditure data taken as expenditure by NACE Sections O (public administration), P (education) and Q (human health and social work activities), with data sourced from the Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/stadat_annual_5 on 30 January 2014
Ireland	2010	0.20%	General government environmental protection expenditure from Central Statistics Office (2012): Environmental Indicators Ireland 2012, Dublin, the Stationery Office, available from the Central Statistics Office, accessed at: http://www.cso.ie/en/index.html on 29 January 2014
Italy	-	-	Eurostat data are most recent available (2011)
Latvia	-	-	Eurostat data are most recent available (2010). National data for later years combine public and private environmental protection expenditure
Lithuania	-	-	Eurostat data are most recent available (2010)
Luxembourg	-	-	Eurostat data are most recent available (2011)
Malta	-	-	Eurostat data are most recent available (2011)
Netherlands	-	-	Eurostat data are most recent available (2009)
Poland	-	-	Eurostat data are most recent available (2011)
Portugal	2012	1.07%	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014
Romania	2012	1.67%	Public administration environmental protection expenditure from National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014
Slovakia	2012	0.62%	Data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014
Slovenia	2011	1.66%	Public environmental expenditure data by

Table 5-11: Public environmental protection expenditure as a percentage of total public expenditure (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Public environmental protection expenditure as a % of total public expenditure**	**Notes**
			request from the Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014
Spain	-	-	Eurostat data are most recent available (2010)
Sweden	-	-	Eurostat data are most recent available (2011)
UK	2011	1.74%	Public environmental protection expenditure data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013
Sources: National data on public environmental protection expenditure obtained from sources listed in the notes column. Total government expenditure figures (used to calculated percentages) are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014.			

5.3.3 Public environmental protection expenditure in relation to GDP

Table 5-12 presents public environmental protection expenditure as a percentage of GDP for each Member State using national data for expenditure and Eurostat data for GDP. Note that values are only provided where national data have been identified for a more recent year than those available through Eurostat. The greater variability seen with these percentages than with those in Table 5-4 (Public environmental expenditure in relation to GDP; Eurostat data) can probably be explained through the use of different data sources from different Member States. Thus, higher percentages could partly be due to a greater number of activities being classed as public environmental protection expenditure at the national level as opposed to under the general government classification used by Eurostat.

Table 5-12: Public environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Public environmental protection expenditure as a % of GDP**	**Notes**
Austria	2010	2.94%	Public environmental protection expenditure for 2010 from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expenditure_accounts_epea/index.html) on 30 January 2014
Belgium	-	-	Eurostat data are most recent available (2010)
Bulgaria	-	-	Eurostat data are most recent available (2011)
Croatia	-	-	Eurostat data are most recent available (2011)
Cyprus	2010	0.54%	Public environmental protection expenditure for 2010 from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/index_en/index_en?OpenDocument on 30 January 2014

Table 5-12: Public environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Public environmental protection expenditure as a % of GDP**	**Notes**
Czech Republic	2012	0.57%	Public environmental protection expenditure for 2012 includes investment and non-investment expenditure from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014
Denmark	2012	0.31%	Public environmental protection expenditure for 2012 from Statistics Denmark, accessed at: www.statbank.dk/OFF24 on 30 January 2014
Estonia	2011	0.31%	Public environmental protection expenditure data for 2011 from Statistics Estonia, accessed at: http://www.stat.ee/en on 30 January 2014
Finland	open	0.72%	Public environmental protection expenditure data for 2011 from Statistics Finland (Tilastokeskus), accessed at: http://www.tilastokeskus.fi/til/ymp_en.html on 30 January 2014
France	2011	0.76%	Public environmental protection expenditure data from statistical service of the Ministry of Sustainable Development, accessed at: http://www.statistiques.developpement-durable.gouv.fr/lessentiel/ar/375/1257/depense-autres-activites-protection-lenvironnement.html on 30 January 2014)
Germany	2010	0.33%	Public environmental protection expenditure data provided by Statistisches Bundesamt, accessed at: https://www.destatis.de/DE/Startseite.html on 30 January 2014
Greece	-	-	No data identified
Hungary	2012	0.26%	Public environmental expenditure data taken as expenditure by NACE Sections O (public administration), P (education) and Q (human health and social work activities), with data sourced from the Hungarian Central Statistical Office (http://www.ksh.hu/stadat_annual_5) (accessed 30 January 2014)
Ireland	2010	0.13%	General government environmental protection expenditure data from Central Statistics Office (2012): Environmental Indicators Ireland 2012, Dublin, the Stationery Office, available from the Central Statistics Office (accessed at http://www.cso.ie/en/index.html on 29 January 2014)
Italy	-	-	Eurostat data are most recent available (2011)
Latvia	-	-	Eurostat data are most recent available (2010). National data for later years combine public and private environmental protection expenditure
Lithuania	-	-	Eurostat data are most recent available (2010)
Luxembourg	-	-	Eurostat data are most recent available (2011)
Malta	-	-	Eurostat data are most recent available (2011)
Netherlands	-	-	Eurostat data are most recent available (2009)

Table 5-12: Public environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Public environmental protection expenditure as a % of GDP**	**Notes**
Poland	-	-	Eurostat data are most recent available (2011)
Portugal	2012	0.51%	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014
Romania	2012	0.61%	Public administration environmental protection expenditure from National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014
Slovakia	2012	0.23%	Data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014
Slovenia	2011	1.42%	Public environmental expenditure data by request from the Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014
Spain	-	-	Eurostat data are most recent available (2010)
Sweden	-	-	Eurostat data are most recent available (2011)
UK	2011	0.84%	Public environmental protection expenditure data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013
Sources: National data on public environmental protection expenditure obtained from sources listed in the notes column. GDP data (used to calculated percentages) sourced from Eurostat, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014.			

5.3.4 Environmental protection expenditure as a percentage of GDP

Table 5-13 presents total environmental protection expenditure as a percentage of GDP, using national data on expenditure and Eurostat data for GDP. Note that figures are only presented where national data on expenditure have been identified for a later year than those available through Eurostat. Comparisons between Member States should be undertaken with caution since the national data may not necessarily be including the same types of activities.

Table 5-13: Total environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Total environmental protection expenditure as a % of GDP**	**Notes**
Austria	2010	2.94%	Environmental expenditure data from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expen

Table 5-13: Total environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Total environmental protection expenditure as a % of GDP**	**Notes**
			diture_accounts_epea/index.html on 30 January 2014. Private sector data are NGOs and enterprises combined
Belgium	-	-	National data only provide figures for private sector environmental expenditure (2011); Eurostat data are only available for public environmental protection expenditure (2010)
Bulgaria	-	-	Latest data are from Eurostat (2011)
Croatia	2012	0.34%	Environmental protection expenditure data from Croatian Bureau of Statistics, accessed at: http://www.dzs.hr/default_e.htm on 30 January 2014
Cyprus	2010	0.90%	Environmental protection expenditure data from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/energy_environment_82main_en/energy_environment_82main_en?OpenForm&sub=2&sel=1 on 30 January 2014
Czech Republic	2012	2.14%	Environmental protection expenditure data from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014
Denmark	-	-	Private data are unavailable
Estonia	2011	4.29%	Environmental protection expenditure data from Statistics Estonia matrices EN65, EN064 and EN063, accessed at: http://www.stat.ee/en on 30 January 2014
Finland	2011	1.18%	Environmental protection expenditure data from Statistics Finland (Tilastokeskus), accessed at: http://www.tilastokeskus.fi/til/ymp_en.html on 30 January 2014
France	2010	1.64%	Environmental protection expenditure data from Statistical Service of the Ministry of Sustainable Development (2013): Expenses environmental protection, 2013, accessed at: http://www.statistiques.developpement-durable.gouv.fr/accueil.html on 30 January 2014
Germany	2010	1.43%	Preliminary data on environmental protection expenditure provided by Statistisches Bundesamt, accessed at: https://www.destatis.de on 30 January 2014
Greece	-	-	No data identified
Hungary	2012	1.32%	Environmental protection expenditure data from Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/stadat_annual_5 on 30 January 2014. Private sector covers environmental protection investments by industry (excluding NACE codes O Public administration, P Education and Q Human health and social work). Public data consist of NACE codes O, P and Q.
Ireland	-	-	Only public sector data identified at the national level
Italy	-	-	Latest data from Eurostat (2011)
Latvia	2012	0.84%	Data from Central Statistical Bureau of Latvia, accessed

Table 5-13: Total environmental protection expenditure as a percentage of GDP (based on national environmental protection expenditure data for the most recent year available)			
Member State	**Year**	**Total environmental protection expenditure as a % of GDP**	**Notes**
			at: http://www.csb.gov.lv/en/dati/statistics-database-30501.html on 30 January 2014
Lithuania	-	-	Latest data from Eurostat (2010)
Luxembourg	-	-	Private sector data have not been identified
Malta	-	-	Private sector data have not been identified
Netherlands	2009	1.57%	Environmental protection expenditure data from Statistics Netherlands, The Hague, accessed at: http://www.cbs.nl/infoservice on 30 January 2014
Poland	2012	0.63%	Data refer to outlays on fixed assets serving environmental protection and water management. Data from Central Statistical Office of Poland, accessed at: http://www.stat.gov.pl/gus/index_ENG_HTML.htm on 30 January 2014
Portugal	2012	0.56%	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014
Romania	2012	3.55%	Percentage given by National Institute of Statistics (2013): Press Release, Environmental Protection expenditure in 2012, No. 253 of 22 October 2013, available through the National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014
Slovakia	2012	0.77%	Environmental protection expenditure data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014
Slovenia	2010	1.42%	Environmental protection expenditure data by request from Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014
Spain	-	-	Public sector data have not been identified
Sweden	-	-	Latest data from Eurostat (2011)
UK	2011	1.03%	Public sector data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013; Private sector data from Defra (2012): Environmental Protection Expenditure by Industry 2011, accessed at: https://www.gov.uk/government/publications/environmental-protection-expenditure-survey on 14 November 2013
Sources: National data sources are listed in the notes column. GDP data used to calculate the percentages were sourced from Eurostat, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database) on 30 January 2014.			

5.3.5 Changes in public and private sector environmental protection expenditure over time

Table 5-14 shows the percentage change in environmental protection expenditure over time for public and private sectors using national data. Note that where possible, percentages have been calculated for the difference between 2008 and the most recent year available. However, for some Member States, this has not been possible due a lack of data. In such instances, the change has been calculated using data from other years (e.g. 2009-2011).

Table 5-14: Percentage change in environmental protection expenditure (based on national data where available)

Member State	Years over which % calculated	Public or private sector	Percentage change	Notes
Austria	2008/10	Public	-41%	Data from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expenditure_accounts_epea/index.html on 30 January 2014. Private sector is NGOs and Enterprises combined
	2008/10	Private	-2.3%	
Belgium	-	Public	-	National data unavailable
	2008/11	Private	-16%	Data are for industry (NACE codes 5-36) only, representing end of pipe investments and integrated technologies. Source: Statistics Belgium, accessed at: http://statbel.fgov.be/fr/modules/publications/statistiques/environnement/fichiers_telechargeables/depenses_et_investissement_de_l_environnement_2011.jsp on 30 January 2014
Bulgaria	2008/11	Public	11%	Data for public administration from Republic of Bulgaria National Statistical Institute, accessed at: http://www.nsi.bg/en/content/5071/environment on 30 January 2014
	2008/11	Private	-24%	Data from Republic of Bulgaria National Statistical Institute, accessed at: http://www.nsi.bg/en/content/5071/environment on 30 January 2014. Includes totals for: Agriculture, forestry and fishing; Industry; Construction; and Other activities.
Croatia	2008/12	Combined	-18%	Data from Croatian Bureau of Statistics, accessed at: http://www.dzs.hr/default_e.htm on 30 January 2014
Cyprus	-	Public	-	Data only available for 2010
	2008/11	Private	17%	Data from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/energy_environment_82main_en/energy_environment_82main_en?OpenForm&sub=2&sel=1 on 30 January 2014

Table 5-14: Percentage change in environmental protection expenditure (based on national data where available)				
Member State	**Years over which % calculated**	**Public or private sector**	**Percentage change**	**Notes**
Czech Republic	2008/12	Public	62%	Data from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014. Includes investment and non-investment expenditure. Public sector is environmental protection expenditure on public administration and defence, and compulsory social security. Private environmental protection expenditure is all categories excluding public administration and defence, and compulsory social security
	2008/12	Private	2.2%	
Denmark	None	Public	0.09%	Data from Statistics Denmark, accessed at: www.statbank.dk/OFF24 on 30 January 2014
	-	Private	-	National data unavailable
Estonia	2008/11	Public	97%	Data from Statistics Estonia, accessed at: http://www.stat.ee/en on 30 January 2014
	2008/11	Private	-5.9%	
Finland	2008/11	Public	0.9%	Data from the Statistics Finland (Tilastokeskus) website environment and natural resources section, accessed at: http://www.tilastokeskus.fi/til/ymp_en.html on 30 January 2014
	2008/11	Private	20%	
France	2008/10	Public	2.5%	Data from Statistical Service of the Ministry of Sustainable Development (2013): Expenses environmental protection, 2013, accessed at: http://www.statistiques.developpement-durable.gouv.fr/accueil.html on 30 January 2014
	2008/11	Private	9.2%	
Germany	2008/10	Public	2.6%	Preliminary data from Statistisches Bundesamt (accessed at https://www.destatis.de on 30 January 2014). Private sector data comprise the sum of expenditure for 'production industries' and 'privatised public enterprises'
	2008/10	Private	1.7%	
Greece	-	Public	-	National data unavailable
	-	Private	-	National data unavailable
Hungary	2008/12	Combined	-6.0%	Data relate to environmental protection investments. Sourced from Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/stadat_annual_5 on 30 January 2014)
Ireland	2008/10	Public	15%	General government environmental protection expenditure data from Central Statistics Office (2012): Environmental Indicators Ireland 2012, Dublin, the Stationery Office, available from the Central Statistics Office, accessed at: http://www.cso.ie/en/index.html on 29 January 2014
	-	Private	-	National data unavailable
Italy	-	Public	-	National data unavailable
	2009/10	Private	-7.2%	Percentage change for industry (NACE Rev. 2 Sections B-E expect divisions 37, 38 and 39) source from Istat (2013): Investments of industry on

Table 5-14: Percentage change in environmental protection expenditure (based on national data where available)				
Member State	**Years over which % calculated**	**Public or private sector**	**Percentage change**	**Notes**
				environmental protection, accessed at: http://www.istat.it/en/archive/79436) on 30 January 2014
Latvia	2008/12	Combined	-32%	Data from Central Statistical Bureau of Latvia, accessed at: http://www.csb.gov.lv/en/dati/statistics-database-30501.html on 30 January 2014
Lithuania	2008/10	Public	37%	Data received by email from the Official Statistics Portal, accessed at: http://osp.stat.gov.lt/en/home on 30 January 2014
	2008/11	Private	-33%	Private sector expenditure and investment data obtained from Statistics, Lithuania, accessed at: http://www.stat.gov.lt/en/ on 30 January 2014
Luxembourg	-	Public	-	National data unavailable
	-	Private	-	National data unavailable
Malta	2008/11	Public	-7.4%	Data from National Statistics Office, accessed at: http://www.nso.gov.mt/site/page.aspx on 30 January 2014
	-	Private	-	National data unavailable
Netherlands	-	Public	-	National data unavailable
	2008/2012	Private	-19%	Data represent environmental burden to industry (enterprises with 20 or more employees) from Statistics Netherlands, accessed at: http://www.cbs.nl/infoservice on 30 January 2014
Poland	2008/12	Combined	-0.3%	Data refer to outlays on fixed assets serving environmental protection and water management. Data from Central Statistical Office of Poland, accessed at: http://www.stat.gov.pl/gus/index_ENG_HTML.htm on 30 January 2014
Portugal	2008/12	Public	-15%	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014
	2008/12	Private	-67%	
Romania	2010/12	Public	-33%	Data from National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014. Public sector data are local and central public administration figures; private data are expenditure for specialised and non-specialised producers
	20120/12	Private	20%	
Slovakia	2008/12	Public	22%	Data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014
	2008/12	Private	12%	
Slovenia	2008/11	Public	10%	Environmental protection expenditure data by request from Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014
	2008/11	Private	-28%	
Spain	-	Public	-	National data unavailable

Table 5-14: Percentage change in environmental protection expenditure (based on national data where available)				
Member State	Years over which % calculated	Public or private sector	Percentage change	Notes
	2010/11	Private	0.2%	Data relate to industry (NACE sectors B, C and D) only and cover current expenditure and investment. Data are sourced from INE (2013): Press Release, Survey on Industry Expenditure on Environmental Protection Year 2011, available from INE, accessed at: http://www.ine.es/ on 3 January 2014
Sweden	-	Public	-	National data unavailable
	2008/12	Private	42%	Data from Statistics Sweden (2013): Total environmental protection expenditures 2002-2012 in industry, accessed at: http://www.scb.se/en on 30 January 2014
UK	2008/11	Public	12%	Data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013
	2008/11	Private	-43%	Data from Defra (2012): Environmental Protection Expenditure by Industry 2011, accessed at: https://www.gov.uk/government/publications/environmental-protection-expenditure-survey on 14 November 2013

5.3.6 Environmental protection expenditure by environmental domain

Table 5-15 presents environmental protection expenditure by environmental domain for each Member State for the most recent year for which national data are available. Data are presented for public (government) and private sectors where possible. Note that comparisons between Member States should not be made using these data because the data collection and recording methods may differ between Member States. Furthermore, for some Member States it has not been possible to identify data for the whole of the private sector. In some cases, data are only available for a proportion of the economy (e.g. NACE codes B, C and D).

Table 5-16 presents changes in environmental protection expenditure by domain by public and private sectors for each Member State where national data have been identified. As previously, attempts have been made to calculate changes between 2008 and the latest year for which data are available. However, for some Member States, it has not been possible to use 2008 as the base year. In such cases, percentage changes may be given for other years (e.g. 2000 to 2011).

Note that the data sources and notes for both Tables 5-15 and 5-16 are presented by Member State in Table 5-17.

Table 5-15: Breakdown of environmental protection expenditure by environmental domain by Member State (national data for latest year available)											
Member State	Year	Public or private sector	Environmental protection expenditure by domain (€ millions)								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
Austria	2010	Public	**€124**	**€406**	**€72**	**€11**	**€1.7**	**€84**	**€0.3**	**€1.1**	**€28**
	2010	Private	**€497**	**€1,310**	**€2,601**	**1,277**	**€58**	**€765**	**€0**	**€168**	**€981**
Belgium	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2011	Private	**€116**	**€58**	**€24**	unavailable	unavailable	unavailable	unavailable	unavailable	**€67**
Bulgaria	2011	Public	**€0.4**	**€70**	**€146**	**€5.8**	**€0.08**	**€0.4**	unavailable	**€0.02**	**€16**
	2011	Private	**€121**	**€88**	**€237**	**€12**	**€0.02**	**€0.4**	unavailable	**€1.7**	**€17**
Croatia	2012	Combined	**€20**	**€67**	**€19**	**€22**	**€5.0**	**€4.6**	**3.9**	unavailable	**€7.7**
Cyprus	2010	Public	**€5.0**	**€27**	**€12**	**€2.5**	**€3.0**	unavailable	unavailable	unavailable	**€44**
	2011	Private	**€13**	**€8.6**	**€9.3**	Included elsewhere	**€0.23**	Included elsewhere	unavailable	unavailable	**€1.0**
Czech Republic	2012	Public	**€8.8**	**€411**	**€351**	**€21**	**€0.25**	**€22**	unavailable	unavailable	**€13**
	2012	Private	**€298**	**€491**	**€1,211**	**€212**	**€2.4**	**€34**	unavailable	unavailable	**€35**
Denmark	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	2011	Public	**€51**	**€0.19**	**€38**	**€8.5**	**€0.60**	**€0.003**	**1.8**	**€0.015**	**€0.10**
	2011	Private	**€645**	**€59**	**€121**	**€428**	**€30**	**€0**	**1.4**	**€0.057**	**€0.16**
Finland	2011	Public	unavailable	**€720**	**€154**	included in wastewater manage-ment	unavailable	**€67**	unavailable	Unavailable	**€413**
	2011	Private	**€281**	**€224**	**€269**	unavailable	unavailable	unavailable	unavailable	**€5.2**	**€98**
France	2011	Public	**€714**	**€3,742**	**€2,830**	**€486**	**€217**	**€1,589**	**180**	**€1,518**	**€3,941**
	2011	Private	**€1,404**	**€3,623**	**€7,532**	**€881**	**€509**	**€405**	**534**	**€2,703**	unavailable
Germany	2010	Public	unavailable	**€3,050**	**€3,280**	unavailable	**€160**	**€1,370**	**420**	unavailable	unavailable

Table 5-15: Breakdown of environmental protection expenditure by environmental domain by Member State (national data for latest year available)

Member State	Year	Public or private sector	Environmental protection expenditure by domain (€ millions)								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
	2010	Private	**€4,800**	**€11,910**	**€10,480**	**€90**	**€190**	**€30**	unavailable	unavailable	unavailable
Greece	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	2012	Combined	**€37**	**€278**	**€39**	**€38**	**€11**	**€15**	unavailable	**€1.1**	**€60**
Ireland	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	2010	Combined	**€701**	**€2,196**	**€952**	**€3,102**	**€286**	**€2,897**	**253**	**€69**	**€158**
Latvia	2012	Combined	**€31**	unavailable	**€90**	**€49**	unavailable	unavailable	unavailable	unavailable	**€17**
Lithuania	2010	Public	unavailable	**€190**	**€114**	unavailable	unavailable	**€12**	unavailable	**€0.93**	**€59**
	2011	Private	**€86**	**€141**	**€24**	unavailable	unavailable	unavailable	unavailable	unavailable	**€9.8**
Luxembourg	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Malta	2011	Public	unavailable	**€19**	**€44**	unavailable	unavailable	**€18**	unavailable	**€0.052**	**€6.5**
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Netherlands	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2012	Private	**€450**	**€65**	**€35**	**€45**	**€20**	**€5**	unavailable	unavailable	unavailable
Poland	2011	Combined	**€554**	**€1,352**	**€182**	**€40**	**€123**	**€48**	**0**	**€0.65**	**€121**
Portugal	2012	Public	**€7.3**	**€0.4**	**€451**	**€63**	**€2.3**	**€237**	unavailable	**€3.5**	**€72**
	2012	Private	**€34**	**€19**	**€13**	unavailable	unavailable	unavailable	unavailable	unavailable	**€17**
Romania	2012	Public	**€38**	**€318**	**€213**	**€3.2**	unavailable	**€1.0**	unavailable	unavailable	**€14**
	2012	Private	**€231**	**€412**	**€2,047**	**€70**	unavailable	**€41**	unavailable	unavailable	**€551**
Slovakia	2012	Public	**€13**	**€5.5**	**€143**	**€0.3**	**€0**	**€3.6**	unavailable	unavailable	**€0.63**
	2012	Private	**€40**	**€90**	**€205**	**€29**	**€1.0**	**€2.3**	unavailable	unavailable	**€18**
Slovenia	2011	Public	**€0**	**€178**	**€47**	**€0**	**€0**	**€33**	unavailable	unavailable	**€46**

Table 5-15: Breakdown of environmental protection expenditure by environmental domain by Member State (national data for latest year available)

Member State	Year	Public or private sector	Environmental protection expenditure by domain (€ millions)								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
	2011	Private	**€141**	**€24**	**€23**	**€5.9**	**€3.9**	**€2.7**	unavailable	unavailable	**€6.8**
Spain	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2011	Private	**€274**	**€174**	**€63**	**€57**	**€9.4**	**€42**	unavailable	unavailable	**€65**
Sweden	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2012	Private	**€451**	**€419**	**€268**	unavailable	unavailable	unavailable	unavailable	unavailable	**€297**
UK	2011	Public	**€287**	**€13**	**€11,548**	unavailable	unavailable	**€568**	unavailable	**€419**	**€1,967**
	2011	Private	**€547**	**€764**	**€1,020**	**€123**	**€41**	**€488**	unavailable	**€302**	**€173**

Sources: See Table 5-17 for a list of data sources by Member State

Notes: A dash (-) in the "Year" column indicates that national data have not been identified for any year for that sector (public or private). Where individual cells are marked as unavailable, data have not been identified from the national sources for that particular category. For Cyprus, data on "protection and remediation of soil, groundwater and surface water" and "protection of biodiversity and landscapes" are included within the category "other environmental protection activities".

Table 5-16: Percentage change in environmental protection expenditure by environmental domain (based on national data where available)											
Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
Austria	2008/10	Public	645%	-54.7%	-25.0%	-44.4%	-90.5%	-28.5%	-93.2%	-15.4%	-52.8%
	2008/10	Private	-4.61%	-22.5%	14.9%	1.53%	-60.8%	9.72%	unavailable	-14.5%	-7.44%
Belgium	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/11	Private	-19.7%	31.6%	-24.3%	unavailable	unavailable	unavailable	unavailable	unavailable	-29.5%
Bulgaria	2008/11	Public	146%	-18.2%	47.0%	-56.9%	unavailable	15.6%	unavailable	0.56%	67.9%
	2008/11	Private	-41.8%	-46.7%	19.9%	-26.5%	unavailable	-9.41%	unavailable	-29.6%	-26.4%
Croatia	2008/12	Combined	49.2%	71.9%	-76.1%	71.4%	1,240%	-29.7%	541%	unavailable	-74.8%
Cyprus	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/11	Private	85.1%	18.5%	-5.59%	included elsewhere	59.7%	included elsewhere	unavailable	unavailable	-68.5%
Czech Republic	2008/12	Public	66.8%	125%	24.2%	109%	no data for 2008	no data for 2008	unavailable	unavailable	-76.6%
	2008/12	Private	10.3%	7.22%	-6.67%	-1.09%	no data for 2008	no data for 2008	unavailable	unavailable	-65.2%
Denmark	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Estonia	2008/11	Public	97.0%	-50.5%	270%	-21.1%	-64.7%	-95.8%	125%	value for 2008 is 0	-59.9%
	2008/11	Private	6.28%	5.07%	-13.9%	456%	value for 2011 is 0	value for 2008 is 0	-88.2%	462%	-52.3%
Finland	2008/11	Public	unavailable	-2.58%	-3.51%	Included in waste-water manage-	unavailable	51.8%	unavailable	unavailable	3.59%

Table 5-16: Percentage change in environmental protection expenditure by environmental domain (based on national data where available)

Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
						ment					
	2008/11	Private	**20.8%**	**6.28%**	**24.1%**	unavailable	unavailable	unavailable	unavailable	**-77.6%**	**96.5%**
France	2008/11	Public	**-39.1%**	**-9.61%**	**19.0%**	**-17.4%**	**-15.2%**	**34.1%**	**4.05%**	**6.83%**	**11.4%**
	2008/11	Private	**-6.40%**	**-7.48%**	**13.3%**	**-13.8%**	**25.7%**	**11.9%**	**6.37%**	**53.8%**	unavailable
Germany	2008/10	Public	unavailable	**-4.65%**	**5.17%**	unavailable	**33.3%**	**4.58%**	**44.8%**	unavailable	unavailable
	2008/10	Private	**11.6%**	**-4.64%**	**-3.87%**	**50%**	**-9.52%**	**0.00%**	unavailable	unavailable	unavailable
Greece	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Hungary	2008/12	Combined	**-8.73%**	**0.20%**	**-41.3%**	**34.0%**	**106%**	**-67.2%**	unavailable	**73.2%**	**7.69%**
Ireland	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Italy	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Latvia	2008/12	Combined	**79.0%**	unavailable	**51.7%**	**-69.9%**	unavailable	unavailable	unavailable	unavailable	**-51.0%**
Lithuania	2008/10	Public	unavailable	**80.7%**	**15.4%**	unavailable	unavailable	**-29.3%**	unavailable	**-86.2%**	**25.2%**
	2008/11	Private	**16.8%**	**8.21%**	**-82.4%**	unavailable	unavailable	unavailable	unavailable	unavailable	**-81.0%**
Luxembourg	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Malta	2008/11	Public	unavailable	**-9.53%**	**-21.5%**	unavailable	unavailable	**18.8%**	unavailable	**420%**	**199%**
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Netherlands	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/12	Private	**-28.3%**	**27.5%**	**12.9%**	**15.4%**	**66.7%**	**66.7%**	unavailable	unavailable	unavailable
Poland	2008/12	Combined	**-1.14%**	**-12.6%**	**4.33%**	**106%**	**193%**	**5,530%**	value is 0 for 2008	**-56.4%**	**46.3%**

Table 5-16: Percentage change in environmental protection expenditure by environmental domain (based on national data where available)											
Member State	Years over which change is calculated	Public or private sector	Percentage change in environmental protection expenditure by domain								
			Protection of ambient air and climate	Wastewater management	Waste management	Protection and remediation of soil, groundwater and surface water	Noise and vibration abatement	Protection of biodiversity and landscapes	Protection against radiation	Research and development for environmental protection	Other environmental protection activities
									and 2012		
Portugal	2008/12	Public	**176%**	**-99.7%**	**-5.37%**	**66.4%**	**103%**	**-15.8%**	unavailable	**120%**	**33.0%**
	2008/12	Private	**-79.2%**	**-37.8%**	**6.02%**	unavailable	unavailable	unavailable	unavailable	unavailable	**-63.2%**
Romania	2010/12	Public	**69.6%**	**33.9%**	**168%**	**-65.6%**	unavailable	**-100%**	unavailable	unavailable	**-94%**
	2010/12	Private	**-8.04%**	**24.9%**	**14.8%**	**-23.6%**	unavailable	**51.2%**	unavailable	unavailable	**83.5%**
Slovakia	2008/12	Public	**-10.4%**	**36.5%**	**23.1%**	**163%**	value is 0 for 2008 and 2012	**356%**	unavailable	unavailable	**5.73%**
	2008/12	Private	**-14.9%**	**13.1%**	**31.8%**	**89.8%**	**129%**	**-0.743%**	unavailable	unavailable	**-58.2%**
Slovenia	2008/11	Public	value is 0 for 2008 and 2011	**40.0%**	**-35.0%**	value is 0 for 2008 and 2011	value is 0 for 2008 and 2011	88.6%	unavailable	unavailable	**-22.0%**
	2008/11	Private	**46.6%**	**-66.6%**	**-60.4%**	**-72.3%**	**-81.0%**	**-76.1%**	unavailable	unavailable	**-27.2%**
Spain	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	-	Private	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
Sweden	-	Public	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable	unavailable
	2008/12	Private	**71.8%**	**68.4%**	**15.1%**	unavailable	unavailable	unavailable	unavailable	unavailable	**10.3%**
UK	2008/11	Public	**12.7%**	**57.1%**	**10.1%**	unavailable	unavailable	**-3.14%**	unavailable	**36.8%**	**22.5%**
	2008/11	Private	**-25.6%**	**-42.1%**	**-8.42%**	**-46.2%**	**-7.05%**	**170%**	unavailable	unavailable	**-84.6%**

Sources: See Table 5-17 for a list of data sources by Member State

Notes: A dash (-) in the column "Years over which change is calculated" indicates that two years of comparable data have not been identified for a Member State. Where individual cells are marked as unavailable, data have not been identified from national sources for that particular category. For Cyprus, data on "protection and remediation of soil, groundwater and surface water" and "protection of biodiversity and landscapes" are included within the category "other environmental protection activities".

Table 5-17: Data sources and associated notes for national level data on environmental protection expenditure by environmental domain (presented in Tables 5-15 and 5-16)	
Member State	**Data sources and notes**
Austria	Data from Statistics Austria, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/environmental_protection_expenditure_accounts_epea/index.html on 30 January 2014. Private sector is NGOs and Enterprises combined.
Belgium	Data are from Statistics Belgium, accessed at: http://statbel.fgov.be/fr/modules/publications/statistiques/environnement/fichiers_telechargeables/depenses_et_investissement_de_l_environnement_2011.jsp) on 30 January 2014. Data are for industry (NACE codes 5-36) only, representing end of pipe investments and integrated technologies.
Bulgaria	Data from Republic of Bulgaria National Statistical Institute, accessed at: http://www.nsi.bg/en/content/5071/environment on 30 January 2014. Note that public sector is public administration and private sector is combined totals for: Agriculture, forestry and fishing; Industry; Construction; and Other activities.
Croatia	Data from Croatian Bureau of Statistics, accessed at: http://www.dzs.hr/default_e.htm on 30 January 2014.
Cyprus	Data from Republic of Cyprus Statistical Service, accessed at: http://www.mof.gov.cy/mof/cystat/statistics.nsf/energy_environment_82main_en/energy_environment_82main_en?OpenForm&sub=2&sel=1 on 30 January 2014.
Czech Republic	Data from Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/2005-13 on 30 January 2014. Values represent sum of investment and non-investment expenditure. Note that summing the expenditure figures given against each category will not provide the overall totals since some categories are marked "i.d." or individual data, meaning that they cannot be released (see Czech Statistical Office, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engp/1303-13c on 30 January 2014).
Denmark	No national data identified for environmental protection expenditure by environmental domain.
Estonia	Data from Statistics Estonia, accessed at: http://www.stat.ee/en on 30 January 2014.
Finland	Data from the Statistics Finland (Tilastokeskus) website environment and natural resources section, accessed at http://www.tilastokeskus.fi/til/ymp_en.html on 30 January 2014.
France	Data from Statistical Service of the Ministry of Sustainable Development (2013): Expenses environmental protection, 2013, accessed at: http://www.statistiques.developpement-durable.gouv.fr/accueil.html on 30 January 2014.
Germany	Preliminary data provided by email by Statistisches Bundesamt (Statistisches Bundesamt Internet site accessed at: https://www.destatis.de on 30 January 2014). Private sector data comprise the sum of expenditure for 'production industries' and 'privatised public enterprises'.
Greece	No national data identified for environmental protection expenditure by environmental domain.
Hungary	Data sourced from Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/stadat_annual_5 on 30 January 2014. Data relate to environmental protection investments.
Ireland	No national data identified for environmental protection expenditure by environmental domain.
Italy	Data from Istat, accessed at: http://www.istat.it/en on 30 January 2014. Data related to environmental expenditure by domain and region by head of population. Data converted to € millions for Italy using population for 2010 from Eurostat, accessed at: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00001&plugin=1 on 30 January 2014.
Latvia	Data from Central Statistical Bureau of Latvia, accessed at: http://www.csb.gov.lv/en/dati/statistics-database-30501.html on 11 November 2013.
Lithuania	Public expenditure data for 2008-2010 were received by email from the Official Statistics Portal, accessed at: http://osp.stat.gov.lt/en/home on 30 January 2014. Private sector expenditure and investment data were obtained from Statistics Lithuania, accessed at: http://www.stat.gov.lt/en/ on 30 January 2014.

Table 5-17: Data sources and associated notes for national level data on environmental protection expenditure by environmental domain (presented in Tables 5-15 and 5-16)	
Member State	**Data sources and notes**
Luxembourg	No national data identified for environmental protection expenditure by environmental domain.
Malta	Data from National Statistics Office, accessed at: http://www.nso.gov.mt/site/page.aspx on 30 January 2014.
Netherlands	Data from Statistics Netherlands, accessed at: http://www.cbs.nl/infoservice on 30 January 2014). Private sector data represent environmental burden to industry (enterprises with 20 or more employees).
Poland	Data from Central Statistical Office of Poland, accessed at: http://www.stat.gov.pl/gus/index_ENG_HTML.htm on 30 January 2014. Data refer to outlays on fixed assets serving environmental protection and water management.
Portugal	Data from Statistics Portugal (2013): Environmental Statistics 2012, Publication by Instituoto Nacional De Estatistica, Statistics Portugal, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_main on 31 January 2014. Note that data from the cities are not available for 2012 for wastewater management.
Romania	Data from National Institute of Statistics, accessed at: http://www.insse.ro/cms/ on 30 January 2014. Public sector data are local and central public administration figures; private data are expenditure for specialised and non-specialised producers.
Slovakia	Data from the Statistical Office of the Slovak Republic, accessed at: http://portal.statistics.sk/showdoc.do?docid=7815 on 30 January 2014.
Slovenia	Environmental protection expenditure data by request from Statistical Office of the Republic of Slovenia, accessed at: http://www.stat.si/eng/ on 30 January 2014.
Spain	Data are sourced from INE (2013): Press Release, Survey on Industry Expenditure on Environmental Protection Year 2011, available from INE, accessed at: http://www.ine.es/ on 3 January 2014. Data relate to industry (NACE sectors B, C and D) and only relate to investment.
Sweden	Data from Statistics Sweden (2013): Total environmental protection expenditures 2002-2012 in industry, accessed at: http://www.scb.se/en on 30 January 2014.
UK	Public data from HM Treasury in Office for National Statistics (2013): UK Environmental Accounts, 2013, available from The ONS, accessed at: www.ons.gov.uk on 14 November 2013; Private data from Defra (2012): Environmental Protection Expenditure by Industry 2011, accessed at: https://www.gov.uk/government/publications/environmental-protection-expenditure-survey on 14 November 2013.

5.4 Employment in the environmental protection sector

5.4.1 Overall employment figures

There are many jobs within the EU28 which are created and supported through protection and management of the environment. Table 5-18 presents available data from DG ESTAT on total employment in the environmental goods and services sector (EGSS) for seven Member States and EU28 as a whole for 2008 to 2011. Any national activities (market, non-market and own activities) which produce products for environmental protection or management are recorded within the EGSS. The data are represented as full time equivalent (FTE) which is defined as “total hours worked divided by average annual hours worked in a full-time job”. Data for EU28 are given as estimates as the full dataset is not yet available for all categories or countries. Therefore, caution should be taken if comparing EU28 estimates with country specific data.

Table 5-18: Total employment in the environmental goods and services sector for EU28 and available Member States (FTE) (1000s)				
Country	**FTE 1000s**			
	2008	**2009**	**2010**	**2011**
EU28	3,705	3,849	4,087	4,194
Bulgaria	-	-	-	27
Austria	168	170	170	171
France	-	-	-	417
Germany	-	348	386	-
Latvia	28	23	-	-
Netherlands	-	-	120	-
Romania	-	128	0.1	-

Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 30 January 2014.
Note: a dash (-) indicates that data are not available for a Member State for a particular year.

Table 5-19 presents the same data for the EU28 but splits the data by category of industry. This indicates that the largest category for EGSS jobs is that containing electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management and remediation activities. However, construction also provides a considerable number of EGSS jobs. Indeed, it is important to acknowledge that the size of the environmental goods and services market cannot be estimated from environmental protection expenditure alone. EGSS data incorporate activities relating to both protection and management and thus could include activities which enhance the environment, for example, management of wild flora and fauna to increase biodiversity. In contrast, environmental protection expenditure only represents money spent preventing, reducing and eliminating pollution or nuisances resulting from production or consumption.

Table 5-19: EU28 employment in the environmental goods and services sector by category of industry (FTE) (1000s)				
Category	**FTE 1000s**			
	2008	**2009**	**2010**	**2011**
Total - All NACE activities	3,705	3,849	4,087	4,194
Agriculture, forestry and fishing	355	372	399	407
Mining and quarrying; manufacturing	415	461	485	551
Electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	1,374	1,395	1,464	1,458
Construction	923	983	1,072	1,137
Services	637	638	667	640

Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss3&lang=en on 30 January 2014.

The estimated totals provided in Tables 5-18 and 5-19 suggest that the number of FTEs in the EGSS has increased in recent years, this is despite an increase in overall unemployment in the EU28 from just under 17 million people (7.1%) in 2008 to around 25.5 million people (10.5%) in 2012[44].

[44] See Eurostat: Unemployment rate by sex and age groups - annual average, percentage, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_a&lang=en on 20 January 2014 and Eurostat:

The rise in EGSS jobs seems to have occurred despite apparent job losses in other sectors, as well as cuts to programmes and initiatives in the EGSS or green sector. Indeed, such cuts have been seen in the renewable energy sector with several countries reducing funding towards subsidised green energy programmes[45].

There are indications that the green sector has fared better than other sectors of the economy through the economic crisis due to the growing demand for recovery through green and sustainable growth[46]. Investment in green growth can have several effects on employment, however, it is generally seen to have a positive effect within a country[47]. In addition to this, many green sub-sectors are currently more labour intensive than traditional equivalents (e.g. organic farming is estimated to employ 10-20% more people per hectare than intensive farming)[45].

In some industries, movement towards environmental protection and greener technologies can lead to certain "dirty" operations becoming undesirable. This can lead to job losses through decreased demand or banning of certain operations and processes. Movement towards more environmental protection activities will require the relocation of employees from non-green jobs to green jobs. This can pose the problem of skills matching and often leads to the need for increased job training[46]. This in turn creates new temporary green employment through the need for the provision of training. Further temporary employment can also been seen in the initial stages of greening where there is a need for high labour intensity e.g. building of infrastructure for increasing green transport options[45].

Although it is not possible to determine the cause of the apparent increase in the number of FTEs in EGSS despite a parallel increase in unemployment in recent years, it is likely that some of the above factors are having an influence.

5.4.2 Breakdown by environmental domain (Eurostat data)

More detailed data on the breakdown of EGSS jobs are available from DG ESTAT. Table 5-20 presents a breakdown of the EU28 employment in EGSS by environmental domain (to cover environmental protection expenditure) and also by management activity (to cover resource management). Table 5-21 provides the breakdown between environmental protection and environmental management for those Member States for which data are available. Again, it should be borne in mind that the EU28 totals are estimates and that all data are presented as FTE (as defined above) with the exception of Romania, where data are reported as employees.

Unemployment by sex and age groups - annual average, 1 000 persons, accessed at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_nb_a&lang=en on 20 January 2014.

[45] Sustain Labour (2013): Green Jobs and related policy frameworks: An overview of the European Union, February 2013.

[46] OECD (2011): Towards Green Growth summary (http://www.oecd.org/greengrowth/47984000.pdf on 20/01/2014) (accessed 20 January 2014).

[47] GHK (2011): Evaluating the Potential for Green Jobs in the next Multi-annual Financial Framework, Final Report produced 10 August 2011.

Table 5-20: Estimated EU28 environmental employment 2008-2011 (FTE) (1000s) by environmental domain					
Category	**FTE 1000s**				**% change**
	2008	**2009**	**2010**	**2011**	**2008-2011**
Protection of ambient air and climate	115	121	116	107	-7%
Wastewater management	615	649	637	640	4%
Waste management	925	931	956	932	1%
Protection and remediation of soil, groundwater and surface water	410	420	446	451	10%
Noise and vibration abatement	9	9	10	10	11%
Protection of biodiversity and landscape	115	120	119	117	2%
Protection against radiation	-	-	-	-	-
Environmental protection R&D	-	-	-	-	-
Other environmental protection activities	253	256	262	236	-7%
Total environmental protection activities	***2,442***	***2,506***	***2,546***	***2,493***	**2%**
Management of waters	455	432	440	421	-7%
Management of forest resources	-	-	-	-	-
Management of wild flora and fauna	-	-	-	-	-
Management of energy resources	-	-	-	-	-
of which: Renewable energy	448	552	717	870	94%
of which: Heat/energy saving	359	359	385	409	14%
Management of minerals	-	-	-	-	-
Resource management R&D	-	-	-	-	-
Other natural resource management activities	-	-	-	-	-
Total resource management activities	***1,263***	***1,343***	***1,541***	***1,700***	**35%**
Overall total	***3,705***	***3,849***	***4,087***	***4,194***	**13%**

Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 20 January 2014.
Note: a dash (-) indicates that data are not available for a particular category.

Table 5-21: Breakdown of environmental employment by environmental protection and environmental management for 2008-2011 for EU28 and Member States (where data are available) (FTE) (1000s)					
Member State	**Area of employment**	**FTE 1000s**			
		2008	**2009**	**2010**	**2011**
EU28	Total environmental protection activities	2,442	2,506	2,546	2,493
	Total resource management activities	1,263	1,343	1,541	1,700
	Total	**3,705**	**3,849**	**4,087**	**4,194**
Austria	Total environmental protection activities	88	91	91	93
	Total resource management	79	78	79	79

Table 5-21: Breakdown of environmental employment by environmental protection and environmental management for 2008-2011 for EU28 and Member States (where data are available) (FTE) (1000s)					
Member State	**Area of employment**	**FTE 1000s**			
		2008	**2009**	**2010**	**2011**
	activities				
	Total	**168**	**170**	**170**	**172**
Bulgaria	Total environmental protection activities	-	-	-	19
	Total resource management activities	-	-	-	7.8
	Total	**-**	**-**	**-**	**27**
France	Total environmental protection activities	-	-	-	289
	Total resource management activities	-	-	-	128
	Total	**-**	**-**	**-**	**417**
Germany	Total environmental protection activities	-	-	-	-
	Total resource management activities	-	-	-	-
	Total	**-**	**348**	**386**	**-**
Latvia	Total environmental protection activities	10	10	-	-
	Total resource management activities	18	13	-	-
	Total	**28**	**23**	**-**	**-**
Netherlands	Total environmental protection activities	-	-	79	-
	Total resource management activities	-	-	42	-
	Total	**-**	**-**	**120**	**-**
Romania	Total environmental protection activities	-	84	0.07	-
	Total resource management activities	-	44	0.05	-
	Total	**-**	**128**	**0.12**	**-**

Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 20 January 2014.
Note: a dash (-) indicates that data are not available for a Member State for a particular year and category.

Table 5-22 presents available data showing the breakdown of EGSS employment by environmental domain for EU28 and the eight Member States for which data are available.

Table 5-22: Environmental employment 2008-2011 (FTE) (1000s) for EU28 and available Member States					
Member State	**Category**	**FTE 1000s**			
		2008	**2009**	**2010**	**2011**
EU28	Protection of ambient air and climate	115	121	116	107
	Wastewater management	615	649	637	640
	Waste management	925	931	956	932
	Protection and remediation of soil, groundwater and surface water	410	420	446	451

Table 5-22: Environmental employment 2008-2011 (FTE) (1000s) for EU28 and available Member States					
Member State	**Category**	**FTE 1000s**			
		2008	**2009**	**2010**	**2011**
	Noise and vibration abatement	9.	9	10	10
	Protection of biodiversity and landscape	115	120	119	117
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	-	-	-
	Other environmental protection activities	253	256	262	236
	Total environmental protection activities	**2,442**	**2,506**	**2,546**	**2,493**
Austria	Protection of ambient air and climate	8.1	9.9	9.8	10
	Wastewater management	15	16	14	15
	Waste management	20	19	20	20
	Protection and remediation of soil, groundwater and surface water	32	33	34	34
	Noise and vibration abatement	2.9	2.4	2.2	2.4
	Protection of biodiversity and landscape	4.5	4.5	4.8	4.9
	Protection against radiation	0	0	n/a	n/a
	Environmental protection R&D	3.3	3.2	3.5	3.5
	Other environmental protection activities	2.4	2.4	2.3	2.4
	Total environmental protection activities	**88**	**91**	**91**	**93**
Bulgaria	Protection of ambient air and climate	-	-	-	0.5
	Wastewater management	-	-	-	2.2
	Waste management	-	-	-	14
	Protection and remediation of soil, groundwater and surface water	-	-	-	1.5
	Noise and vibration abatement	-	-	-	0.2
	Protection of biodiversity and landscape	-	-	-	0.087*
	Protection against radiation	-	-	-	0.007*
	Environmental protection R&D	-	-	-	-
	Other environmental protection activities	-	-	-	0.2
	Total environmental protection activities	**-**	**-**	**-**	**19**
France	Protection of ambient air and climate	-	-	-	22
	Wastewater management	-	-	-	81
	Waste management	-	-	-	95
	Protection and remediation of soil, groundwater and surface water	-	-	-	43
	Noise and vibration abatement	-	-	-	13
	Protection of biodiversity and landscape	-	-	-	16
	Protection against radiation	-	-	-	4.2
	Environmental protection R&D	-	-	-	15
	Other environmental protection activities	-	-	-	-
	Total environmental protection activities	**-**	**-**	**-**	**289**
Italy	Protection of ambient air and climate	-	-	-	-
	Wastewater management	-	14	-	-
	Waste management	-	118	-	-
	Protection and remediation of soil, groundwater and surface water	-	-	-	-
	Noise and vibration abatement	-	-	-	-
	Protection of biodiversity and landscape	-	-	-	-
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	-	-	-

Table 5-22: Environmental employment 2008-2011 (FTE) (1000s) for EU28 and available Member States					
Member State	Category	FTE 1000s			
		2008	2009	2010	2011
	Other environmental protection activities	-	-	-	-
	Total environmental protection activities	**-**	**-**	**-**	**-**
Latvia	Protection of ambient air and climate	0.6	0.5	-	-
	Wastewater management	2.4	2.2	-	-
	Waste management	5.7	6.3	-	-
	Protection and remediation of soil, groundwater and surface water	0.7	0.7	-	-
	Noise and vibration abatement	-	-	-	-
	Protection of biodiversity and landscape	0.2	0.2	-	-
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	-	-	-
	Other environmental protection activities	0.5	0.4	-	-
	Total environmental protection activities	**10**	**10**	**-**	**-**
Netherlands	Protection of ambient air and climate	-	-	2.8	-
	Wastewater management	-	-	12	-
	Waste management	-	-	27	-
	Protection and remediation of soil, groundwater and surface water	-	-	7.7	-
	Noise and vibration abatement	-	-	0.6	-
	Protection of biodiversity and landscape	-	-	0.4	-
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	-	-	-
	Other environmental protection activities	-	-	27	-
	Total environmental protection activities	**-**	**-**	**79**	**-**
Romania	Protection of ambient air and climate	-	9.3	0.004*	-
	Wastewater management	-	16	0.012*	-
	Waste management	-	42	0.042*	-
	Protection and remediation of soil, groundwater and surface water	-	11	0.003*	-
	Noise and vibration abatement	-	3.5	0.003*	-
	Protection of biodiversity and landscape	-	0.5	0.001*	-
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	0.2	0*	-
	Other environmental protection activities	-	1.4	0.005*	-
	Total environmental protection activities	**-**	**84**	**0.07***	**-**
Spain	Protection of ambient air and climate	1	-	-	-
	Wastewater management	20	-	-	-
	Waste management	66	-	-	-
	Protection and remediation of soil, groundwater and surface water	33	-	-	-
	Noise and vibration abatement	-	-	-	-
	Protection of biodiversity and landscape	-	-	-	-
	Protection against radiation	-	-	-	-
	Environmental protection R&D	-	-	-	-
	Other environmental protection activities	30	-	-	-
	Total environmental protection activities	**-**	**-**	**-**	**-**

Source: Eurostat (2014): Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 20 January 2014.

Table 5-22: Environmental employment 2008-2011 (FTE) (1000s) for EU28 and available Member States					
Member State	Category	FTE 1000s			
		2008	2009	2010	2011
Note: a dash (-) indicates that data are not available for a Member State for a particular year. *These figures appear anomalous but were double checked with the source on 28 January 2014.					

5.4.3 National employment data

The following tables present identified national data on employment in EGSS where available. Note that comparisons between Member States are not possible since the categories against which the data are recorded may be different.

Austria

Table 5-23 provides figures for employment within the EGSS in Austria. Employment figures are shown for all nine CEPA environmental domains as well as management of environmental resources.

Table 5-23: Employment within the Environmental Goods and Services Sector (EGSS) for Austria (1000 persons)

Environmental domain	1000s persons				
	2008	2009	2010	2011	Change 2008-2011 %
Protection of ambient air and climate	8.1	9.9	9.8	10	23%
Wastewater management	15	16	14	15	-5.4%
Waste management	20	19.4	20	21	6.9%
Protection and remediation of soil, groundwater and surface water	32	33	34	33	3.8%
Noise and vibration abatement	2.9	2.4	2.2	2.3	-18%
Protection of biodiversity and landscape	4.5	4.5	4.8	5	9.2%
Protection against radiation	0	0	0	0.003	1%
Environmental protection R&D	3.3	3.2	3.5	3.6	8.2%
Other environmental protection activities	2.4	2.4	2.3	2.2	-6.4%
Management of waters	1.9	2.0	1.9	2.1	7.2%
Management of forest resources	3.5	3.7	3.4	3.4	-4.5%
of which: Management of natural forest areas	*0.1*	*0.1*	*0.1*	*0.1*	*-12%*
of which: Minimisation of the intake of forest resources	*3.5*	*3.6*	*3.3*	*3.3*	*-4.4%*
Management of wild flora and fauna	0.4	0.4	0.4	0.4	-0.8%
Management of energy resources	65	64	64	65	-0.3%
of which: Renewable energy	*34*	*35*	*39*	*39*	*15%*
of which: Heat/energy saving	*31*	*28*	*25*	*25*	*-17%*
of which: Minimisation of the intake of fossil resources for uses other than energy production"	*0.3*	*0.3*	*0.3*	*0.4*	*34%*
Management of minerals	3.5	3.6	3.5	3.6	2.6%

Table 5-23: Employment within the Environmental Goods and Services Sector (EGSS) for Austria (1000 persons)					
Environmental domain	1000s persons				
	2008	2009	2010	2011	Change 2008-2011 %
Resource management R&D	3.1	3.2	3.8	3.8	21%
Other natural resource management activities	1.9	1.9	1.9	1.9	0.7%
Total	**168**	**170**	**170**	**172**	**2.5%**
Source: Statistics Austria (2013): Environmental output and employment 2008 to 2011, Environmental domains, accessed at: http://www.statistik.at/web_en/statistics/energy_environment/environment/eco_industries_environmentally_goods_and_services/index.html on 30 January 2014.					

Belgium

Table 5-24 provides figures for the number of people employed in the environmental sector (according to Eurostat's definition of Environmental Protection Expenditure Account) for Belgium.

Table 5-24: Persons employed in environmental employment in Belgium (1000s)				
Sector	1000s persons			
	2008	2009	2010	2011
Number of people employed in the sector environmental (Nace Rev. 2: 37, 38, 39 and 46.7.7)	19	20	21	19
Source: Statistics Belgium (2013): Environnement et économie, accessed at: http://statbel.fgov.be/fr/statistiques/chiffres/environnement/ecomilieu/ on 30 January 2014.				

Bulgaria

Table 5-25 provides figures for the number of people employed in the areas listed under NACE codes A-F for Bulgaria. The NACE categories included within the table are deemed to best match those given within Table 5-19 above (EU28 employment in EGSS). However, Table 5-25 shows total employment (i.e. environmental and non-environmental employment) as data specific to environmental goods and services were not available.

Table 5-25: Number of people employed by economic activity in Bulgaria (NACE Rev. 2) (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	737	737	711	690	649
Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	852	768	720	713	700
Construction	298	277	225	198	186
Source: Republic of Bulgaria National Statistical Institute (2012): Employed persons - Total of economy, accessed at: http://www.nsi.bg/en/content/5519/employed-persons-total-economy on 30 January 2014. **Note:** data for 2012 are preliminary.					

Croatia

Table 5-26 provides figures for the number of people employed in Croatia in the sectors listed under the National Classification of Economic Activities (NKD 2007) codes A-F. The NKD categories shown in Table 5-26 are a "best match" to the NACE categories shown in the Table 5-19 (EU28 employment in EGSS) above. However, Table 5-26 shows total employment (i.e. environmental and non-environmental employment) as data specific to EGSS were not available.

Table 5-26: Annual Averages for employment by sector in Croatia (NKD 2007) (1000s)			
Economic activity	1000s persons		
	2010	2011	2012
(A) Agriculture, forestry and fishing	66	65	63
(B) Mining and quarrying	7.5	6.5	5.8
(C) Manufacturing	257	249	241
(D) Electricity, gas, steam and air conditioning supply	17	17	17
(E) Water supply; sewerage, waste management & remediation activities	22	22	23
(F) Construction	120	110	102
Source: Croatian Bureau of Statistics (2013): Statistical information 2013 (CODEN SIDHEO ISSN 1330-335X), accessed at: http://www.dzs.hr/default_e.htm on 30 January 2014.			

Cyprus

Table 5-27 provides figures for the number of people employed in environmental protection activities within Cyprus. The total number of people employed declined each year from 1,202 in 2008 to 972 in 2011.

Table 5-27: Number of persons engaged in environmental protection activities for 2008 to 2011				
Position	Number of persons			
	2008	2009	2010	2011
Managerial staff	120	136	164	149
Production staff	912	870	851	724
Other staff	170	151	129	99
Total	**1,202**	**1,157**	**1,144**	**972**
Source: Statistical Service of Cyprus (2013): data provided on request via email (Statistical Service of Cyprus website accessed at: http://www.cystat.gov.cy/ on 12 February 2014).				

Czech Republic

Table 5-28 provides figures for the number of people employed in the sectors listed under NACE codes A-F within the Czech Republic. These sectors are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-28 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-28: Employed persons by sector in the Czech Republic (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, Forestry and Fishing	159	154	151	146	149
Mining and Quarrying	55	52	48	46	43
Manufacturing	1,379	1,243	1,236	1,288	1,299
Electricity, Gas, Steam and Air Conditioning Supply	60	58	57	58	51
Water supply; Sewerage, Waste Management and Remediation Activities	53	54	50	51	46

Table 5-28: Employed persons by sector in the Czech Republic (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Construction	481	497	465	431	425
Source: Czech Statistical Office (2014): Labour Market in the Czech Republic 1993-2012, Employed persons by industry, accessed at: http://www.czso.cz/csu/2013edicniplan.nsf/engkapitola/3104-13-eng_r_2013-20400 on 30 January 2014. **Note:** 2011 data were weighted by demography before projecting the Census 2011 results.					

Denmark

The Danish Government aims to promote green jobs and innovation (focusing on the export potential of new solutions) when investing in flood prevention measures[48]. Table 5-29 provides figures for the number of people employed in environmental protection within the public (government) sector in Denmark. The figures have been determined according to the COFOG (Classification of the Functions of Government) groups.

Table 5-29: Average public sector (government) employees in Denmark in environmental protection, FTE (1000s)						
	FTE 1000s					
	2008	2009	2010	2011	2012	2013
Total employees	4.7	4.5	4.5	4.6	4.8	4.9
Source: Statistics Denmark (2013): Employment: Key figures. Public full-time employees, accessed at: http://www.dst.dk/en/Statistik/emner/beskaeftigelse.aspx on 30 January 2014						

Table 5-30 presents the number of people employed in the sectors listed under NACE codes A-F in Denmark. These sectors are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-30 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-30: Average full-time employees in Denmark by sector (1000s)						
Economic activity	FTE 1000s					
	2008	2009	2010	2011	2012	2013
Agriculture, forestry and fishing (A)	32	32	30	31	32	33
Mining and quarrying (B)	4.8	4.9	4.6	4.9	5.3	4.2
Manufacturing (C)	329	289	266	266	263	255
Electricity, gas, steam and air conditioning supply (D)	12	11	11	10	10	10
Water supply, sewerage and waste management (E)	11	11	10	10	10	10
Construction (F)	147	129	118	120	121	118
Source: Statistics Denmark (2013): Employment: Key figures. Full-time employees by industry, accessed at: http://www.dst.dk/en/Statistik/emner/beskaeftigelse.aspx on 30 January 2014. **Note:** Data include the following sectors: Central government, Regional government, Municipal government, Social security funds, Public corporations, Private corporations, Private non-profit organisations and Sector not stated.						

[48] Pers. Comm. Mikkel Stenbæk Hansen 20/02/14

Estonia

Table 5-31 presents the number of people employed in the sectors listed under NACE codes A-F in Estonia. These sectors are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-31 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-31: Employed persons by economic activity in Estonia (EMTAK 2008) (1000s)

Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	25	24	24	27	29
Mining and quarrying	6	6.4	6.9	6.1	5.2
Manufacturing	135	114	108	121	118
Electricity, gas, steam and air conditioning supply	8.2	7.7	8.7	8.2	9.3
Water supply; sewerage, waste management and remediation activities	2.3	2.4	2.3	3.9	3.5
Construction	81	58	48	59	59

Source: Statistics Estonia (2013): Annual Statistics, ML02001: employed persons by economic activity (EMTAK 2008), accessed at: http://pub.stat.ee/px-web.2001/I_Databas/Social_life/09Labour_market/04Employed_persons/02Annual_statistics/02Annual_statistics.asp) on 30 January 2014.

Finland

Table 5-32 provides figures for employment in EGSS in Finland for 2012 based on standard industrial classifications (TOL2008). Table 5-33 presents EGSS employment figures for specific industries for 2009 and 2011. Note that the tables are not combined to avoid misleading comparisons between years (because there are slight differences in the categories included within the two tables).

Table 5-32: Employment in EGSS in Finland by industry for 2012 (employment in staff years) (1000s)

Industry (TOL2008)	2012 (1000s persons)
Manufacturing (B + C)	51
- Forest industry	5.8*
- Chemical industry	4.2*
- Metal industry	38
- Other manufacturing activities and mining and quarrying	3.0*
Energy supply (D)	2.1
Water supply and waste management (E)	5.4
- Water supply and sewerage	1.2
- Waste management, materials recycling and other waste management services	4.1
Construction(F)	10
Services (G – N)	9.7
Total	**78**

Source: Statistics Finland (2012): Environmental goods and services sector [e-publication]. ISSN=1799-5108. Appendix table 1. Environmental goods and services sector by industry 2012 Helsinki, accessed at: http://www.stat.fi/til/ylt/2012/ylt_2012_2013-12-05_tau_001_en.html on 31 January 2014.
Note: * indicates that data are uncertain.

Table 5-33: Employment in EGSS in Finland in main industries for 2009 and 2011 (employment in staff years) (1000s)		
Industry (TOL2008)	**1000s persons**	
	2009	**2011**
35111 Production of electricity with hydropower and wind power	0.4	0.3
3700 Sewerage	0.4	0.4
381, 382 Waste collection, treatment and disposal activities	3.6	3.9
383 Materials recovery	1.2	1.3
3900 Remediation activities and other waste management services	0.3	0.4
Main industries total	**5.9**	**6.3**
Source: For 2009: Statistics Finland (2010): Environmental goods and services sector 2009, Appendix table 1. Environmental goods and services sector in main industries 2009, accessed at: http://www.stat.fi/til/ylt/2009/ylt_2009_2010-12-21_en.pdf on 31 January 2014. For 2011: Statistics Finland (2012) Environmental goods and services sector 2011, Appendix table 1. Environmental goods and services sector in main industries 2011, accessed at: http://www.stat.fi/til/ylt/2011/ylt_2011_2012-12-07_en.pdf on 31 January 2014.		

France

Table 5-34 provides figures for environmental jobs by domain and sub-domain in France for 2008 to 2011. Table 5-35 presents the same figures by sector.

Table 5-34: Environmental employment by domain in France FTE (1000s)					
Environmental domain		**FTE 1000s**			
		2008	**2009**	**2010**	**2011**
Multi-disciplinary activities	Environmental Engineering	12	13	13	13
	R&D	16	16	18	19
	General Public Services	33	33	34	35
	Total	61	61	66	68
Resource Management	Management of water resources	6.8	9.0	7.5	8.0
	Energy Management	21	21	20	21
	Salvage/Recovery	33	31	33	33
	Renewable Energy	45	51	60	74
	Total	105	113	120	136
Environmental Protection	Radioactive Waste	3.6	3.6	3.5	3.7
	Air Pollution	9.6	8.7	7.9	8.2
	Noise	9.3	12	12	13
	Nature, Landscape and Biodiversity	13	13	13	14
	Recovery/Rehabilitation of Soil & Water	29	38	47	54
	Waste Water	80	82	74	73
	Waste	76	80	82	86
	Total	219	238	240	251
Total		**385**	**412**	**426**	**455**
Source: Commissariat Général au Développement Durable (2013): L'économie de l'environnement en 2011 – edition 2013 Observation Et Statistiques, accessed at: http://www.statistiques.developpement-durable.gouv.fr/publications/p/2013/1097/leconomie-lenvironnement-2011-edition-2013.html on 30 January 2014. **Notes:** data for 2010 are semi-final whilst those for 2011 are preliminary.					

Table 5-35: Environmental employment by type of activity in France FTE (1000s)				
Type of activity	**FTE 1000s**			
	2008	**2009**	**2010**	**2011**
Public Services	94	100	103	108
Private Services	155	165	178	185
Internal Services	23	26	25	26
Product Manufacturing	43	46	41	44
Civil Engineering	70	76	79	92
Total	**385**	**412**	**426**	**455**

Source: Commissariat Général au Développement Durable (2013): L'économie de l'environnement en 2011 – edition 2013 Observation Et Statistiques, accessed at: http://www.statistiques.developpement-durable.gouv.fr/publications/p/2013/1097/leconomie-lenvironnement-2011-edition-2013.html on 30 January 2014.

Germany

Table 5-36 provides figures on the number of employees within the EGSS in Germany. Data are separated by economic activity. Note that data for 2010 were not available at the time of producing this report.

Table 5-36: Number of employees in EGSS in Germany (1000s)			
Economic activities	**Employees (1000s)**		
	2008	**2009**	**2011**
Industry including:	142	154	202
-Manufacturing including;	105	113	155
-Manufacture of machinery and equipment n. e. c.	34	34	58
-Repair & installation of machinery and equipment	-	-	7.4
-Manufacture of computer, electronic & optical products	12	14	18
-Manufacture of electrical products	13	14	18
Construction	35	40	46
Other branches of economic activity including:	22[1]	26[2]	34[2]
-Service industries	2	23	31
Total	**166**	**180**	**236**

Source: Statistisches Bundesamt (2011): Environmental economics. Goods and services for environmental protection overview by economic activities and types of services, accessed at: https://www.destatis.de/EN/FactsFigures/NationalEconomyEnvironment/Environment/EnvironmentalSurveys/EnvironmentalEconomics/Tables/GoodsServicesEnvironment2011.html on 30 January 2014.

Notes: Data for 2008 are for the Statistical Classification of Economic Activities in the European Community, Revision 2 (NACE Revision2), 2-digit-Level. [1] Covers economic activities 45 to 68, 84 to 99; [2] Covers economic activities G (wholesale and retail trade; repair of motor vehicles and motorcycles) to U (activities of extraterritorial organisations and bodies). A dash (-) indicates that data are not available for a particular year and category.

Greece

Table 5-37 provides figures for FTE employment in Greece in sectors related to the environment. These sectors are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-37 presents total employment within the sectors rather than data specific to EGSS (which are unavailable). Note that these figures have been calculated from quarterly data to create annual averages.

Table 5-37: Employment in Greece by selected economic activity FTE (1000s)			
Economic activity	FTE 1000s		
	2008	2009	2010
Agriculture	496	519	528
Forestry	7	6.6	5.4
Fishing	12	11	16
Mining and Quarrying	59	15	14
Manufacturing	341	358	326
Source: Hellenic Statistical Authority (2013): Employment by Education, Occupation in last job, Permanent/temporary job, Reference Period, Sex, NUT II, Age Group, Economic activity, Professional status, accessed at: http://www.statistics.gr/portal/page/portal/ESYE/PAGE-database on 31 January 2014.			

Hungary

Table 5-38 provides figures for the number of people employed in the activities listed under NACE codes A-F within Hungary. These sectors are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-38 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-38: Employment in Hungary by selected economic activity (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	169	176	172	185	200
Mining and quarrying	8.5	8.5	11	11	9
Manufacturing	853	795	787	809	802
Electricity, gas, steam and air conditioning supply	34	39	37	38	36
Water supply, sewerage, waste management and remediation activities	47	45	48	52	64
Construction	312	293	278	264	246
Total	**1,423**	**1,356**	**1,333**	**1,359**	**1,357**
Source: Hungarian Central Statistical Office (2013): Society, Labour Market- 2.1.5. Number of employed persons by industries, economic branches and sex (2008–). Hungarian Central Statistical Office, accessed at: http://www.ksh.hu/docs/eng/xstadat/xstadat_annual/i_qlf005a.html on 31 January 2014.					

Ireland

Table 5-39 provides figures of employment by branches of NACE Rev. 2. The NACE categories shown in the table are similar to those in Table 5-19 (EU28 employment in EGSS); however, Table 5-39 presents total employment within the sectors rather than data specific to EGSS (which are unavailable). No annual averages were available and figures are presented as the annual quarter April to June.

Table 5-39: Employment in Ireland by selected economic activity (NACE Rev.2) for the annual quarter April to June (1000s)						
Economic Activity (NACE Rev.2)	1000s persons employed during annual quarter (April – June)					
	2008	2009	2010	2011	2012	2013
Agriculture, Forestry & Fishing	116	98	85	86	87	103
Industry	291	263	245	240	232	238
Construction	246	158	127	106	100	103
Source: Central Statistical Office Ireland (2013): Principal Statistics, Employment and Unemployment (ILO) '000s, accessed at: http://www.cso.ie/en/statistics/labourmarket/principalstatistics/ on 31 January 2014.						

Italy

Table 5-40 provides figures on employment by branches of ATECO2007 and ATECO2002 for Italy. The ATECO categories are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-40 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-40: Employment in Italy by selected economic activity (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	406	396	409	413	428
Total industry excluding construction	4305	4161	4012	4089	4030
Construction	1261	1227	1213	1138	1073
Total	**5972**	**5783**	**5635**	**5639**	**5530**
Source: IStat (2014): Occupati, accessed at: http://dati.istat.it/Index.aspx?DataSetCode=DCCV_OCCUPATIT&Lang on 31 January 2014.					

Latvia

Table 5-41 provides figures on employment for selected NACE Rev. 2 activities for Latvia. These activities are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-41 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-41: Employment in Latvia by selected economic activity (1000s)					
Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	84	80	73	77	73
Industry and energetic	186	149	139	137	143
Construction	124	72	58	61	62
Total	**394**	**301**	**270**	**274**	**279**
Source: Latvijas Statistika (2013): NBG082. Employed by Economic Activity (Groups) and Sex (NACE Rev. 2.), accessed at: http://data.csb.gov.lv/Menu.aspx?selection=Sociala\Ikgad%C4%93jie+statistikas+dati\Nodarbin%C4%81t%C4%ABba&tablelist=true&px_language=en&px_type=PX&px_db=Sociala&rxid=200dd2d1-786f-482f-a73c-924b935005bc on 31 January 2014.					

Lithuania

Table 5-42 provides figures on employment for selected NACE Rev. 2 activities for Lithuania. These activities are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-42 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-42: Employment in Lithuania by selected economic activity (1000s)

Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing	115	118	121	109	114
Mining and quarrying	3.5	3.1	3.3	2.7	2.4
Manufacturing	244	209	208	194	201
Electricity, gas, steam and air conditioning supply	20	17	15	13	13
Water supply; sewerage, waste management and remediation activities	14	12	11	12	15
Construction	155	113	93	86	89

Source: Statistics Lithuania (2013): Employed population, accessed at: http://www.osp.stat.gov.lt/en/web/guest/statistiniu-rodikliu-analize?id=1717&status=A on 31 January 2014.

Luxembourg

Table 5-43 provides figures on employment for selected NACE Rev. 2 activities for the Grand Duchy of Luxembourg. These activities are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-43 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-43: Employment in Luxembourg by selected economic activity (1000s)

Economic activity	1000s persons				
	2008	2009	2010	2011	2012
Industry (extractive, manufacturing, energy and waste management)	37	37	37	37	38
Construction	39	39	38	38	38
Total	**76**	**76**	**75**	**75**	**76**

Source: Statistics portal of the Grand Duchy of Luxembourg (2013): Domestic payroll employment by activity 1995 – 2013, accessed at: http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=7250&IF_Language=eng&MainTheme=2&FldrName=3&RFPath=92 on 31 January 2014.

Malta

Table 5-44 provides figures on employment for selected NACE Rev. 2 activities for Malta. No annual averages were available and figures are presented for the 3rd quarter (July to September). These activities are similar to those used within Table 5-19 (EU28 employment in EGSS). However, Table 5-44 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-44: Employment in Malta by economic activity for the 3rd quarter (July to September) (1000s)		
Economic activity	1000s persons employed during 3rd quarter (July to September)	
	2012	2013
Agriculture, forestry and fishing	2.2[1]	2.1[1]
Manufacturing, mining, quarrying and other industry	29	29
Construction	11	11

Source: National Statistics Office Malta (2014): News Release, Labour Force Survey: Q3/2013, accessed at: http://www.nso.gov.mt/themes/theme_page.aspx?id=77#statbase on 31 January 2014
Note: [1] = under-represented

Netherlands

Table 5-45 presents data on employment within the EGSS in the Netherlands, with data broken down by economic activity. Table 5-46 provides the same data, but categorised by type of environmental activity, such as organic agriculture or production of renewable energy.

Table 5-45: Employment in EGSS in the Netherlands FTE (1000s)				
Economic activity	FTE 1000s			
	2008	2009	2010	2011
A Agriculture, forestry and fishing	2.9	3	3.1	3.3
B-E Industry (no construction), energy	-	-	-	-
B Mining and quarrying	-	-	-	-
C Manufacturing	5.6	5.5	5.5	5.5
D Electricity and gas supply	-	-	-	-
E Water supply and waste management	26	27	27	26
F Construction	10.9	10.1	9.4	9.1
G-I Trade, transport, hotels, catering	7.1	6.9	7.4	7.6
J Information and communication	-	-	-	-
K Financial institutions	-	-	-	-
L Renting, buying, selling real estate	-	-	-	-
M-N Business services	8.5	8.7	8.3	8.5
O-Q Government and care	7.7	6.8	7	6.9
R-U Culture, recreation, other services	-	-	-	-
A-U All economic activities	71	70	69	69
In-house environmental activities	5.2	5.1	5.1	4.9
Total environmental sector	**76**	**75**	**74**	**74**

Source: Statistics Netherlands (2013): Environmental Goods and Services Sector; industries, economic indicators, accessed at: http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=82273ENG&D1=0&D2=a&D3=a&D4=13-16&LA=EN&HDR=T,G3&STB=G2,G1&VW=T on 31 January 2014.
Notes: data are provisional. Dash (-) indicates that data not available (data may be confidential)

Table 5-46: Environmental goods and services sector; activities, economic indicators FTE (1,000s)				
Environmental activity	FTE 1000s			
	2008	2009	2010	2011
Organic agriculture	2.9	3	3.1	3.2
Energy systems and energy saving	-	-	-	-
Wholesale trade in waste and scrap	5.8	5.7	6	6.2
Philanthropic envir organisations	-	-	-	-

Table 5-46: Environmental goods and services sector; activities, economic indicators FTE (1,000s)				
Environmental activity	**FTE 1000s**			
	2008	**2009**	**2010**	**2011**
In-house environmental activities	5.2	5.1	5.1	4.9
Insulation activities constr. industry	-	-	-	-
Environmental consultancy, engineering	8.1	7.7	7.4	7.6
Environmental services	27	28	28	27
Environmental inspection, certification	1.9	2.4	2.4	2.5
Environmental related constr. activities	11	10	9.4	9.1
Education about the environment	0.4	0.4	0.5	0.5
Gov. administration for environment	7.2	6.2	6.4	6.2
Production of renewable energy	-	-	-	-
Production of industrial envir equipment	5.1	5	5.1	5.1
Second-hand shops (not antiques)	-	-	-	-
Preparation for recycling	-	-	-	-
Water quantity management	-	-	-	-
Total environmental sector	**76**	**75**	**74**	**74**

Source: Statistics Netherlands (2013): Environmental goods and services sector; activities, economic indicators, accessed at: http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=82264ENG&D1=0&D2=a&D3=1&D4=13-16&LA=EN&HDR=T,G2,G3&STB=G1&VW=T on 31 January 2014.
Notes: data are provisional. Dash (-) indicates that data not available (data may be confidential)

Poland

Table 5-47 provides figures for employment in environmental protection within the processing industries in Poland in 2007. More recent data have not been identified.

Table 5-47: Employment figures for environmental protection in the processing industries in Poland in 2007	
Area of environmental protection	**Number of employees (1000s)**
Air and climate protection	30
Wastewater management and water conservation	9.7
Waste management	25
Conservation & reconditioning of soil, underground & surface water	5.2
Abatement of noise and vibration	0.5
Protection of biological and landscape diversity	0.2
Protection against ion radiation	1.0
R&D	3.3
Management of inland waters	1.2
Management of natural forestry resources	1.7
Management of wild fauna and flora	6.5
Mineral energy management	3.0
Raw mineral energy management	8.3
Renewable energy	19
Ecological farming	50
Others	26
Total	**191**

Source: Friedrich-Ebert-Stiftung (2012): Green Jobs in Poland: Potentials and Prospects, accessed at: http://www.fes-asia.org/media/publication/2012_GreenJobsInPoland_FES-EoT_Study_Szweed_Maciejewska.pdf) on 31 January 2014.

Portugal

Table 5-48 provides employment by branches of CAE-Rev. 3 (Classificação Portuguesa de Actividades Económicas, Revisão 3) for Portugal for 2008 to 2012. These activities are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-48 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-48: Employed population by primary sector activity (1000s)

Economic activity	1000s persons				
	2008	2009	2010	2011	2012
A: Agriculture, livestock, hunting, forestry and fishing	581	565	542	479	486
B to F: Industry, construction, energy and water	1,525	1,426	1,378	1,323	1,188

Sources:
For 2008 to 2010: Statistics Portugal (2011): Employment Statistics - 4th Quarter 2010, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=102265240&PUBLICACOEStema=5414314&PUBLICACOESmodo=2 on 31 January; For 2011 to 2012: Statistics Portugal (2013): Employment Statistics - 4th Quarter 2012, accessed at: http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=153368774&PUBLICACOEStema=5414314&PUBLICACOESmodo=2 on 31 January 2014.

Romania

Table 5-49 provides figures for the number of employees in environmental industries in Romania. Figures comprise all people being paid at regular intervals for working in or for an enterprise producing environmental goods, technologies or services as a main, secondary or ancillary activity.

Table 5-49: Number of employees (1000s) in environmental industries in Romania

	1000s persons		
	2008	2009	2010
Number of employees	172	128	117

Source: Institutul National De Statistica (2014): Sustainable Development Indicators in Romania, Objective no 4. Sustainable production and consumption, Number of employees in environmental industries, accessed at: http://www.insse.ro/cms/files/Web_IDD_BD_en/index.htm on 31 January 2014.

Slovakia

Table 5-50 provides total employment by selected economic activity (NACE Rev. 2) for Slovakia. These activities are similar to those used within Table 5-19 (EU28 employment in EGSS); however, Table 5-50 presents total employment within the sectors rather than data specific to EGSS (which are unavailable).

Table 5-50: Total employment by selected economic activities (NACE Rev. 2) for Slovakia (1000s)

NACE Rev. 2 category	1000s persons				
	2008	2009	2010	2011	2012
Agriculture, forestry and fishing (A)	82	78	73	73	69
Industry total (B,C,D,E)	592	531	512	529	525
Manufacturing (C)	538	480	462	479	478

Table 5-50: Total employment by selected economic activities (NACE Rev. 2) for Slovakia (1000s)					
NACE Rev. 2 category	1000s persons				
	2008	2009	2010	2011	2012
Construction (F)	181	188	184	179	174
Source: Statistical Office of the Slovak Republic (2013): Total employment (ESA95) by branches of NACE Rev. 2 in persons, indices (1995 - 2012), accessed at: http://portal.statistics.sk/showdoc.do?docid=359 on 31 January 2014. **Note**: data for 2010 onwards are preliminary.					

Slovenia

Table 5-51 provides figures for employment within EGSS in Slovenia. Data were compiled from the industry survey (IND-L), agricultural census 2010 and estimations; however, general government employees were not included in overall totals.

Table 5-51: Environmental employment in EGSS in Slovenia in 2008-2010 (1000s)			
NACE category	1000s persons		
	2008	2009	2010
NACE A	2.9	3.0	3.1
NACE B	0.1	0.1	0.1
NACE C	25	25	26
Total	**28**	**28**	**29**
Source: Statistical office of the Republic of Slovenia (2013): Environmental Goods and Services Sector in Slovenia - Improvements and upgrading of the existing Environmental Accounts – Environmental Goods and Services Sector (https://circabc.europa.eu/sd/d/a952d004-519e-43f8-9404-450a0ea93a49/ares_FINAL_REPORT_EGSS-SI_2012.pdf) (accessed 31 January 2014).			

Spain

Table 5-52 provides figures for employment in the EGSS (environmental protection and resource management) for Spain for 2008. More recent data have not been identified.

Table 5-52: Employment in EGSS (environmental protection and resource management) for Spain FTE (1000s)	
Domain	2008 (FTE 1000s)
Environmental Protection Activities: CEPA 1: Air and climate	1
Environmental protection activities: CEPA 2: Wastewater	20
Environmental protection activities: CEPA 3: Waste	66
Environmental protection activities: CEPA 4: Floors, groundwater and water	33
Environmental protection activities: CEPA 9: Other activities	30
Total environmental protection	*149*
Services Management Resources: CReMA 13: Fossil energy resources	7.7
Services Management Resources: CReMA 16: Other activities	21
Total management resources	*29*
Total environmental protection and management resources	**178**
Source: INE (2011): Other environmental accounts, Environmental goods and services sector, accessed at: http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft26%2Fp067&file=inebase&L=1 on 31 January 2014.	

Sweden

Table 5-53 presents the number of people employed in the EGSS in Sweden for 2008 to 2011. Data is collected in line with Eurostat's definition of an environmental establishment as given in the environmental goods and services sector data collection handbook.

Table 5-53: Total employed in EGSS in Sweden (1000s)

Environmental area	1000s persons			
	2008	2009	2010	2011
Air pollution control	1.2	1.1	1.1	1
Wastewater management	6.9	6.9	6.4	6.3
Waste management	16	16	16	16
Soil and groundwater	1.3	1.2	1.3	1.4
Noise and vibration	0.2	0.2	0.1	0.2
Environmental consultants	6.9	6.3	6.4	6.6
Education, research and monitoring	6.0	6.1	5.9	5.8
Recycled materials	7.0	6.3	6.7	7.1
Renewable energy	14	14	13	13
Heat/energy saving	6.2	5.6	5.4	5.6
Sustainable agricult./fishery	3.2	3.4	4.5	3.5
Sustainable forestry	0.8	0.9	0.8	0.8
Other resource man. (incl. eco-tourism)	1.2	1.2	1.1	1.1
Total	**71**	**69**	**69**	**68**

Source: Statistics Sweden (2013): System of Environmental and Economic Accounts, accessed at: http://www.scb.se/en_/Finding-statistics/Statistics-by-subject-area/Environment/Environmental-accounts-and-sustainable-development/System-of-Environmental--and-Economic-Accounts-/Aktuell-Pong/38171/Environmental-sector/257461/ on 31 January 2014.

United Kingdom

Table 5-54 provides figures for employment within the UK Low Carbon Environmental Goods and Services sector (LCEGS); specifically the environmental sub-sectors, which are level 2 markets. The LCEGS sector has an evolving definition and intends to capture the broad range of activities that aim to reduce environmental impact. Analysis is done under a hierarchical system; Level 1 refers to a sector (LCEGS), level 2 refers to a sub-sector and level 3 refers to a sub sub-sector). The 24 sub-sectors currently included are split under three headings as follows (Business, Innovation and Skills, 2012):

- Environmental: air pollution, contaminated land, environmental consultancy, environmental monitoring, marine pollution control, noise and vibration control, recovery and recycling, waste management, water supply and waste water treatment
- Renewable energy: biomass, geothermal, hydro, photovoltaic, wave and tidal, wind, renewable consulting
- Low carbon: additional energy sources, alternative fuel/vehicle, alternative fuels, building technologies, carbon capture and storage, carbon finance, nuclear power, energy management.

Table 5-54: UK Low Carbon Environmental Goods and Services (LCEGS) employment (1000s persons)					
Environmental category	Employment in 1000s persons			% growth	
	2008/2009	2009/2010	2010/2011	2008/2009 to 2009/2010	2009/2010 to 2010/2011
Air Pollution	9.2	9.2	9.5	0.3%	3%
Contaminated Land	8.2	8.2	8.5	0.3%	3.3%
Environmental Consultancy	7.1	7.1	7.3	0.7%	3%
Environmental Monitoring	1.5	1.5	1.5	0%	2.9%
Marine Pollution Control	1	1	1.1	0.8%	2.9%
Noise & Vibration Control	2	1.9	2	-0.9%	3.2%
Recovery and Recycling	54	55	56	0.3%	3.1%
Waste Management	44	44	45	-0.6%	2.9%
Water Supply and Waste Water Treatment	71	71	73	0.1%	3%
Source: Business, Innovation and Skills (2012): Low Carbon Environmental Goods & Services (LCEGS) Report for 2010/11, accessed at: http://www.bis.gov.uk/assets/biscore/business-sectors/docs/l/12-p143-low-carbon-environmental-goods-and-services-2010-11.pdf on 31 January 2014.					

5.5 Information on environment related EU funding

5.5.1 Overview

Several EU funds have been identified as providing money for environment related projects and initiatives, including:

- Eco-Innovation Fund
- INTERREG IVC Fund
- FP7-Environment;
- LIFE+ (includes operating grants to European environmental NGOs)
- European Structural Fund (SF), composed of:
  - European Regional Development Fund (ERDF)
  - European Social Fund (ESF)
  - European Agricultural Guidance and Guarantee Fund (EAGGF)
  - Financial Instruments for Fisheries Guidance (FIFG).
- Cohesion Fund (CF)
- Instrument for Pre-Accession Assistance (IPA)
- European Neighbourhood and Partnership Instrument (ENPI)
- European Fisheries Fund (EFF)
- European Agricultural Fund for Rural Development (EAFRD).

Further details of these programmes and their contributions where available are provided in the following sections.

5.5.2 Eco-Innovation Fund

The Eco-Innovation Fund[49] was launched in 2008 as part of the EU's Entrepreneurship and Innovation Programme. Its aim was to support innovation in SMEs and to improve competitiveness. Between 2008 and 2013 nearly € 200 million were available to projects from this fund. Table 5-55 provides a summary of Eco-Innovation funding since 2008.

Table 5-55: Summary of Eco-Innovation funding awarded by Member State and environmental themes

Country	Theme	No. of projects	Total budget € millions	EU contribution € millions	Example
Austria	Recycling	2	€3	€1.2	Economically viable solution for the energy autarkic treatment of sewage sludge to multi usable ash (ECO SLUDGE)
Belgium	Recycling	4	€11	€5	Bio-hydrometallurgical beneficiation of non-ferrous concentrate from shredder residue (BIOLIX)
Cyprus	Recycling	1	€0.2	€0.1	Cyprobell - Grey Water Recycling Plant (CYPROBELL)
Denmark[(a)]	Recycling	2	€3.2	€1.6	Efficient sorting of solid waste by novel sensor technology (ECOSORT)
France	Recycling	2	€2.3	€1.1	Market Replication by European Metal Working SMEs of Demineralised Water Recovery and Re-use under Atmospheric Conditions (METAL-WATER)
Germany	Recycling	4	€6	€2.9	Sensor-sorting Automated Technology for advanced Recovery of Non-Ferrous metals from waste (SATURN)
	Water	1	€1.6	€0.8	NEWTEC Umweltechnik Gmbh E-Greenwater
	Total	**5**	**€7.5**	**€3.8**	
Greece	Recycling	1	€1.6	€0.8	Techno-economical design and pilot production of advanced and high-added value materials from rice husk ash (Pyrice II)
Italy[(a)]	Recycling	13	€18	€8.8	Agricultural Reuse of Polluted Dredged Sediments (AGRIPORT)
	Water	2	€3	€1.5	Breakthrough Water Spray System for Front loading washing machines (SPRAY)
	Total	**15**	**€21**	**€10**	

[49] European Commission (nd): Eco-innovation: When business meets the environment. The programme, accessed at: http://ec.europa.eu/environment/eco-innovation/discover/programme/index_en.htm on 2 January 2014.

Table 5-55: Summary of Eco-Innovation funding awarded by Member State and environmental themes					
Country	**Theme**	**No. of projects**	**Total budget € millions**	**EU contribution € millions**	**Example**
Netherlands	Recycling	6	€15	€5.8	Recovery of Electronic Waste through Advanced Recycling and Demonstration (REWARD)
	Water	1	€1.7	€0.9	Increased Water Efficiency with Ceramic membrane technology (IWEC)
	Total	**7**	**€17**	**€6.6**	
Slovenia	Recycling	3	€3.6	€2	Conversion of paper mill sludge into absorbent material (CAPS)
Spain[(a)]	Recycling	11	€13	€6.3	Implementation of a eco efficient and cost effective extended lifecycle management service for artificial turf based on improved maintenance operations and waste revalue (ECOTURF)
	Water	3	€3.8	€1.9	Efficient Management of Small and Medium Wastewater Treatment Plants (OPTIMEDAR)
	Total	**14**	**€17**	**€8.3**	
Sweden	Recycling	1	€1.4	€0.7	ACE – Advanced Pre-Commercialization of Eco Rubber
UK	Recycling	6	€9	€4.2	Sustainable Ultrasonically Enhanced Chemical Processes (SUSONENCE)
Total	***Recycling***	***56***	***€88***	***€41***	
	Water	***7***	***€10***	***€5.1***	
	All	***63***	***€98***	***€46***	

Source: European Commission (nd): Eco-innovation, accessed at: http://www.eaci-projects.eu/eco/page/Page.jsp on 1 December 2013.
Notes: Only countries for which projects were found have been included, no projects found in Bulgaria, Croatia, Czech Republic, Estonia, Finland, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania and Slovakia.
(a) Note that these Member States had one project where the total project budget was zero; these have not been included in the total number of projects.

5.5.3 The INTERREG IVC Programme

The INTERREG IVC Programme[50], which provides funding for interregional cooperation, is financed through the European Regional Development Fund (ERDF) and has a total budget for 2007-2013 of €321 million, €302 million of which could be used by EU partners. The additional funds are available for the participation of Norwegian and Swiss partners. The Programme's main aim is to

[50] INTERREG IVC (nd): Funding, accessed at: http://www.interreg4c.eu/programme/funding/ on 19 December 2013.

improve the effectiveness of regional policies and instruments. Table 5-56 presents INTERREG IVC funding by Member State and environmental theme since 2008.

Table 5-56: Summary of INTERREG IVC funding awarded by Member State and environmental theme

Country	Theme	No. of projects	Total budget € millions	EU contribution € millions	Example
Austria	Biodiversity	1	€1.6	€1.2	Sustainable use of regional funds for nature
	Water management	1	€1.8	€1.4	Sustainable hydro assessment and groundwater recharge projects
	Total	**2**	**€3.4**	**€2.7**	
Belgium	Natural and technological risks	1	€0.1	€0.9	Network of European delta regions - sustainable delta governance
Cyprus	Natural and technological risks	1	€2	€1.6	Regional cooperation towards adaptation to climate change
Finland	Water management	2	€3.8	€3	Regional administration of lake restoration initiatives
France	Biodiversity	4	€8.2	€6.3	Common information to European air
	Waste management	1	€2.1	€1.6	Regions for recycling
	Water management	1	€1.6	€1.3	Sustainable management for European local ports
	Natural and technological risks	1	€2.1	€1.7	Regions for climate protection: toward governance, from knowledge to action
	Total	**7**	**€18**	**€14**	
Germany	Water management	1	€2.5	€2	Water scarcity and droughts; coordinated actions in European regions
	Natural and technological risks	1	€1.9	€1.5	Future forest - Woodlands for Climate Change
	Total	**2**	**€4.5**	**€3.5**	
Greece	Natural and technological risks	4	€6.9	€5.6	European forest fire monitoring using information systems
Hungary	Natural and technological risks	1	€2.1	€1.7	Regions for sustainable change
Italy	Biodiversity	1	€2.3	€1.8	Periurban parks - improving environmental conditions in suburban areas
	Waste management	1	€1.9	€1.4	Improving the effectiveness of waste prevention policies in EU territories
	Total	**2**	**€4.2**	**€3.2**	
Netherlands	Biodiversity	1	€1.5	€1.2	Green Infrastructure network

Table 5-56: Summary of INTERREG IVC funding awarded by Member State and environmental theme					
Country	**Theme**	**No. of projects**	**Total budget € millions**	**EU contribution € millions**	**Example**
	Waste management	2	€5.1	€3.9	Sustainable use of former and abandoned landfills network for you
	Water management	4	€8.9	€6.9	Deploying the added value of water in local and regional development
	Natural and technological risks	3	€5.4	€4.3	Forms for: adapting to climate change through territorial strategies
	Total	**10**	**€21**	**€16**	
Spain	Natural and technological risks	1	€1.7	€1.3	Fire risk prevention and improvement of the fire extinction systems of the historic town centres of named World Heritage cities
Sweden	Waste management	1	€1.1	€0.8	Waste to energy
	Natural and technological risks	1	€1.9	€1.4	Climate neutral urban districts in Europe
	Total	**2**	**€3**	**€3**	
UK	Natural and technological risks	2	€4.5	€3.5	European river corridor improvement plans
Total	***Biodiversity***	***7***	***€14***	***€11***	
	Water Management	***9***	***€19***	***€15***	
	Waste Management	***5***	***€10***	***€7.8***	
	Natural and technological risks	***16***	***€29***	***€24***	
	All	***37***	***€71***	***€56***	

Source: INTERREG IVC (nd): Approved Projects Database, accessed at: http://www.interreg4c.eu/projects/ on 29 November 2013.
Note: Only countries for which projects were found have been included, no projects found in Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

5.5.4 FP7-Environment

The 7th Framework Programme for Research and Technological Development (FP7) lasts for 7 years between 2007 and 2013 and a total budget of over €50 billion[51]. Research under FP7 is split into ten key thematic areas which include the Environment (including climate change). With a total budget of €1,890 million (2007-2013) the primary focus of the Environment programme under FP7 is to enhance sustainable management of the environment and its resources, delivered under the following key activities and areas: Climate change, pollution and risks; Sustainable management of resources; Environmental technologies; and Earth observation and assessment tools[52].

Funding awarded to Member States between 2007 and 2013 under the Environment programme is given in Table 5-57, whilst Figure 5-14 presents the same data graphically. Note that total funding awarded by Member State is not available, though there were 468 projects funded under the Environment programme between 2007 and 2013[53].

Table 5-57: Summary of FP7 – Environment (including climate change) programme funding awarded by year, in € millions

Year	Amount awarded in € millions
2008	€219
2009	€216
2010	€224
2011	€252
2012	€285
2013	€337
Total	**€1,533**

Source: EU Commission Research & Innovation, FP7 website, accessed at: http://ec.europa.eu/research/fp7/index_en.cfm?pg=budget on 12 February 2014.

[51] FP7 in Brief How to get involved in the EU 7th Framework Programme for Research, accessed at: http://ec.europa.eu/research/fp7/understanding/fp7inbrief/home_en.html on 12/02/2014 on 12 February 2014.

[52] FP7 Environment, EU Commission Research & Innovation website, accessed at: http://ec.europa.eu/research/fp7/index_en.cfm?pg=env on 12 February 2014.

[53] EU Commission EU Research Projects, FP7-ENVIRONMENT website accessed at: http://cordis.europa.eu/projects/index.cfm?fuseaction=app.search&FRM=1&STP=10&LNG=en&Search=Search&TXT=&PROJACR=&PGA=FP7-ENVIRONMENT on 12 February 2014.

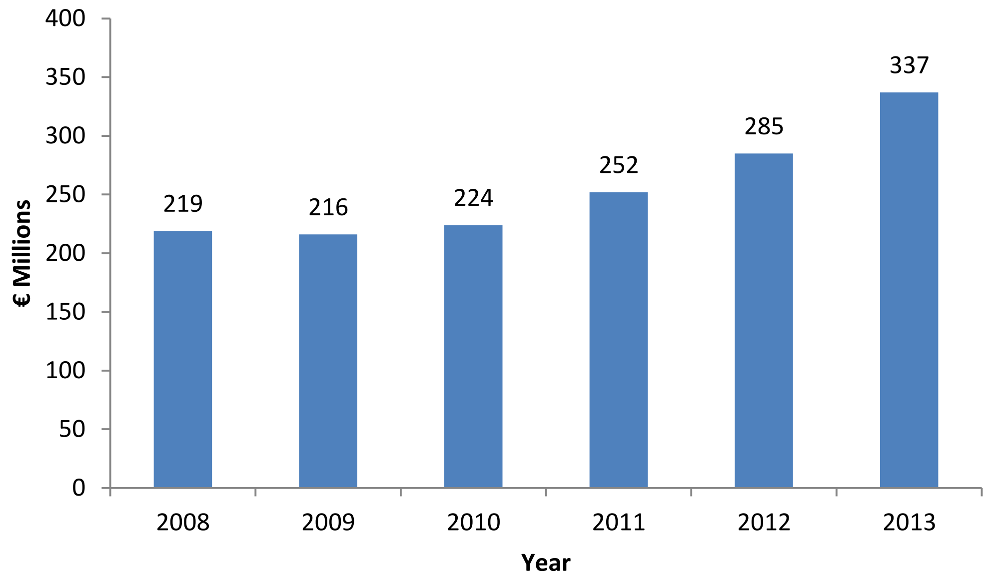

Figure 5-14: FP7 Environment (including climate change) programme funding awarded in the EU by year in € millions. Total funding awarded across all years is €1,533 million.
Source: EU Commission Research & Innovation, FP7 website, accessed at: http://ec.europa.eu/research/fp7/index_en.cfm?pg=budget on 12 February 2014.

5.5.5 LIFE+

The LIFE programme is the EU's instrument for the environment[54]. It aims to contribute to the implementation, updating and development of EU environmental policy and legislation. LIFE began in 1992. Table 5-58 provides a summary of the number of LIFE projects from 1992.

Table 5-58: LIFE funding for Environment Policy and Governance, Nature and Biodiversity and Third countries from 1992

Member State	No of projects	Total budget € millions	EU Funds € millions	% of total investment from EU funds
Austria	90	€249	€102	41%
Belgium	158	€393	€169	43%
Bulgaria	16	€27	€16	59%
Croatia	14	€9	€6	67%
Cyprus	14	€17	€9.5	56%
Czech Republic	8	€26	€14	54%
Denmark	87	€223	€97	43%
Estonia	26	€30	€14	47%
Finland	123	€205	€91	44%
France	316	€682	€229	34%
Germany	316	€794	€312	39%
Greece	200	€265	€139	52%
Hungary	45	€82	€47	57%

54 European Commission (nd): Environment. LIFE Programme. The LIFE Programme, accessed at: http://ec.europa.eu/environment/life/about/index.htm on 2 January 2014.

Table 5-58: LIFE funding for Environment Policy and Governance, Nature and Biodiversity and Third countries from 1992				
Member State	**No of projects**	**Total budget € millions**	**EU Funds € millions**	**% of total investment from EU funds**
Ireland	55	€112	€48	43%
Italy	659	€980	€432	44%
Latvia	35	€37	€22	58%
Lithuania	9	€14	€7.5	56%
Luxembourg	17	€49	€17	35%
Malta	6	€9.6	€4.6	48%
Netherlands	160	€448	€116	26%
Poland	47	€122	€65	53%
Portugal	134	€118	€65	55%
Romania	59	€46	€25	54%
Slovakia	23	€41	€21	50%
Slovenia	24	€34	€19	53%
Spain	549	€901	€403	45%
Sweden	118	€340	€141	41%
UK	198	€386	€170	44%
Total	***3,506***	***€6,639***	***€2,800***	***42%***
Source: Information sourced from Life Programme country factsheets available via the DG Environment Internet site, accessed at http://ec.europa.eu/environment/life/countries/index.htm on 31 January 2014.				

Environmental funding is also provided to European environmental NGOs under the LIFE+ Regulation[55]. This funding has been available since 1997 and is provided to NGOs whose operational activities are primarily active in protecting and enhancing the environment at the European level and that are involved in the development and implementation of Community policy and legislation. Table 5-59 presents a summary of the operating grants to European NGOs. Data are given by Member State and year.

Table 5-59: Summary of operating grants to European environmental NGOs awarded by Member State (primarily active in protecting and enhancing the environment)				
Country	**No. of projects**	**Year**	**Total budget €**	**EU contribution €**
Austria	2	2008	€2,062,988	€462,829
	2	2009	€1,504,042	€4,636,908
	2	2010	€1,568,592	€446,618
	1	2011	€541,755	€244,494
	2	2012	€1,472,626	€411,166
	2	2013	€1,346,775	€421,116
	Total	***2008-2013***	***€8,496,778***	***€6,623,131***
Belgium	11	2008	€10,626,164	€3,887,947
	15	2009	€13,649,478	€4,636,908
	14	2010	€13,373,130	€4,516,187
	13	2011	€13,157,783	€4,979,188
	15	2012	€15,021,607	€4,968,522
	16	2013	€13,910,242	€4,992,291
	Total	***2008-2013***	***€79,738,404***	***€27,981,043***

[55] DG Environment (2014): Operating grants to European environmental NGOs, accessed at: http://ec.europa.eu/environment/ngos/index_en.htm on 4 January 2014.

Table 5-59: Summary of operating grants to European environmental NGOs awarded by Member State (primarily active in protecting and enhancing the environment)				
Country	**No. of projects**	**Year**	**Total budget €**	**EU contribution €**
Czech Republic	3	2008	€1,137,613	€776,563
	1	2009	€660,985	€422,700
	2	2010	€758,693	€465,274
	2	2011	€869,531	€557,291
	2	2012	€802,904	€509,493
	3	2013	€950,818	€617,334
	Total	***2008-2013***	***€5,180,544***	***€3,348,655***
Denmark	1	2008	€136,677	€87,446
	1	2009	€143,244	€90,000
	1	2010	€149,522	€84,510
	Total	***2008-2010***	***€429,443***	***€261,956***
France	1	2008	*€103,004*	*€72,000*
	Total	***2008***	***€103,004***	***€72,000***
Germany	2	2008	€824,656	€259,874
	2	2009	€884,724	€267,625
	2	2010	€854,059	€251,299
	1	2011	€285,245	€191,200
	3	2012	€1,308,762	€683,697
	3	2013	€1,968,763	€998,310
	Total	***2008-2013***	***€6,126,209***	***€2,652,005***
Greece	1	2008	€540,246	€378,172
	1	2009	€556,000	€389,200
	1	2010	€522,383	€365,459
	1	2012	€615,635	€406,319
	Total	***2008-2010, 2012***	***€2,234,264***	***€1,539,150***
Hungary	2	2008	€443,357	€310,151
	1	2009	€51,897	€32,700
	2	2010	€462,873	€322,065
	1	2011	€321,305	€224,817
	1	2012	€302,780	€211,734
	1	2013	€310,131	€217,096
	Total	***2008-2013***	***€1,892,343***	***€1,318,563***
Italy	1	2011	€1,405,433	€439,760
	1	2012	€1,394,549	€414,460
	2	2013	€1,616,458	€478,086
	Total	***2011-2013***	***€4,416,440***	***€1,332,306***
Latvia	1	2008	€813,743	€360,000
	Total	***2008***	***€813,743***	***€360,000***
Netherlands	6	2008	€3,711,568	€1,448,687
	7	2009	€4,947,465	€2,082,504
	4	2010	€2,215,532	€1,151,569
	5	2011	€2,142,831	€834,206
	5	2012	€2,917,860	€920,494
	4	2013	€2,655,109	€881,867
	Total	***2008-2013***	***€18,590,365***	***€7,319,327***

Table 5-59: Summary of operating grants to European environmental NGOs awarded by Member State (primarily active in protecting and enhancing the environment)				
Country	**No. of projects**	**Year**	**Total budget €**	**EU contribution €**
Sweden	1	2008	€402,436	€256,110
	1	2009	€398,535	€263,790
	1	2010	€383,376	€247,699
	1	2011	€381,056	€252,183
	1	2013	€561,423	€392,997
	Total	***2008-2011, 2013***	***€2,126,826***	***€1,412,779***
UK	2	2008	€299,247	€196,030
	1	2009	€150,519	€88,430
	3	2010	€2,822,635	€1,378,527
	2	2011	€2,804,248	€1,274,145
	1	2012	€677,167	€473,746
	Total	***2008-2012***	***€6,753,816***	***€3,410,878***
Total	***187***	***2008-2013***	***€136,902,179***	***€57,631,793***
			100%	***42.10%***

Source: DG Environment (2014): Operating grants to European environmental NGOs, accessed at: http://ec.europa.eu/environment/ngos/index_en.htm on 11 December 2013.
Note: Only countries for which projects were found have been included, no projects found in Bulgaria, Croatia, Cyprus, Estonia, Finland, Ireland, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

5.5.6 Structural Funds and Cohesion Fund (Regional Policy)

The European Structural Fund and the Cohesion Fund (CF) were created by the European Commission to drive economic and social cohesion within the EU. Both funds are part of EU regional policy (Inforegio), and part-finance operations in Member States. The two main Structural Funds are[56]:

- The European Regional Development Fund (ERDF). This provides support, generally for businesses, for infrastructure and job creation
- The European Social Fund (ESF), which aims to assist the unemployed and disadvantaged sections of the population predominantly through funding training measures.

There are two other Structural Funds, namely, the European Agricultural Guidance and Guarantee Fund (EAGGF) and the Financial Instruments for Fisheries Guidance (FIFG)[57]. The Cohesion Fund is for Member States who have a Gross National Income per inhabitant of less than 90% of the EU average[58]. The intentions of the fund are to decrease economic and social disparities and to encourage sustainable development. Other funds which provide finance for environmentally themed projects and are part of EU Regional policy (Inforegio) include:

56 European Commission (nd): Glossary: Structural Funds and Cohesion Fund, accessed at: http://europa.eu/legislation_summaries/glossary/structural_cohesion_fund_en.htm on 31 January 2014.
57 European Commission (nd): General provisions on the Structural Funds, accessed at: http://europa.eu/legislation_summaries/regional_policy/provisions_and_instruments/l60014_en.htm on 1 December 2013.
58 European Commission (Inforegio): The Funds – Cohesion Fund, accessed at: http://ec.europa.eu/regional_policy/thefunds/cohesion/index_en.cfm on 31 January 2014.

- the Instrument for Pre-Accession Assistance (IPA)[59], which provides assistance to countries involved in the EU accession process for 2007 to 2013
- the European Neighbourhood and Partnership Instrument (ENPI)[60]. The ENPI supports the European Neighbourhood Policy which aims to strengthen the European neighbourhood through improving stability and security, to avoid any division between the EU and its direct neighbours.

A summary of the above funds which have been allocated to individual Member States for environmentally themed projects is presented in Table 5-60. Funds allocated to groups of Member States are given in Table 5-61.

Table 5-60: Summary of European funds (ERDF, CF & IPA) awarded to Member States for environmentally themed projects 2007-2013

Country	No. of projects/ programmes	Total budget € millions	EU contribution € millions
Austria	4	€228	€134
Belgium	1	€312	€125
Bulgaria	2	€2,395	€1,971
Croatia	1	€331	€281
Cyprus	1	€184	€156
Czech Republic	2	€5,855	€4,977
France	23	€4,367	€2,122
Germany	10	€4,371	€3,051
Greece	3	€3,676	€2,901
Hungary	4	€6,626	€5,631
Ireland	2	€140	€64
Italy	17	€12,617	€6,051
Latvia	1	€2,006	€1,851
Lithuania	1	€2,330	€1,974
Luxembourg	1	€32	€12
Poland	12	€20,611	€14,110
Portugal	4	€827	€561
Romania	3	€6,953	€5,710
Slovakia	1	€1,919	€1,631
Slovenia	1	€813	€691
Spain	19	€8,784	€6,351
United Kingdom	5	€247	€118
Total	***118***	***€85,624***	***€60,472***

Source: European Commission (nd): Regional Policy – INFOREGIO. In your country. Programmes, accessed at: http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=ALL&gv_reg=ALL&gv_obj=ALL&gv_the=72&gv_per=2 on 11 December 2013.
Note: Only countries for which projects were found have been included. No projects were found in Denmark, Estonia, Finland, Malta and Sweden.

[59] European Commission (nd): Instrument for Pre-Accession Assistance (IPA), accessed at: http://europa.eu/legislation_summaries/agriculture/enlargement/e50020_en.htm on 1 December 2013.

[60] European Commission (nd): Development and Coordination – EUROPEAID. How does ENPI work? Accessed at: http://ec.europa.eu/europeaid/where/neighbourhood/overview/how-does-enpi-work_en.htm on 1 December 2013.

Table 5-61: Summary of Structural Funds (ERDF, ENPI & IPA) awarded to groups of Member States for environmentally themed projects 2007-2013						
Fund	**No. of projects/ programmes**	**No. of priority axes**	**Example priority axes**	**Countries receiving funding**	**Total budget € millions**	**EU contribution € millions**
ERDF	47	47	• Protect, secure and enhance the marine and coastal environment sustainably • Environmental protection and promotion of sustainable territorial development • Nature and environment, energy, natural resources and mobility • Strengthening of Accessibility, Environmental Protection and Risk Prevention	Albania, **Austria**, **Belgium**, Bosnia and Herzegovina, Brazil, **Bulgaria**, **Croatia**, **Cyprus**, **Czech Republic**, **Denmark**, **Finland**, **France**, **Germany**, **Greece**, **Hungary**, **Ireland**, **Italy**, **Latvia**, Liechtenstein, **Lithuania**, **Luxembourg**, **Malta**, Moldova, Montenegro, **Netherlands**, Norway, **Poland**, **Portugal**, **Romania**, Serbia, **Slovakia**, **Slovenia**, **Spain**, Suriname, **Sweden**, Switzerland, the former Yugoslav Republic of Macedonia, Ukraine and **United Kingdom**	€2,599	€1,890
ERDF & ENPI	1	1	• Management of the Baltic Sea as a common resource	**Denmark**, **Germany**, **Estonia**, **Latvia**, **Lithuania**, **Poland**, **Finland**, **Sweden**, Belarus, Norway and Russia	€76	€63
IPA	9	9	• Sustainable management of natural resources • Promotion and Development of the Environment and Natural and Cultural Resources • Infrastructure and environment	**Italy**, Former Yugoslav Republic of Macedonia, Albania, **Bulgaria**, **Croatia**, **Greece**, Bosnia and Herzegovina, **Hungary**, Montenegro, Serbia, **Slovenia** and Turkey	€169	€143
Total	***57***	***57***			***€2,845***	***€2,096***
Source: European Commission (nd): Regional Policy – INFOREGIO. In your country. Programmes, accessed at: http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=ALL&gv_reg=ALL&gv_obj=ALL&gv_the=72&gv_per=2 on 11 December 2013.						

5.5.7 European Fisheries Fund

The European Fisheries Fund (EFF)[61] provides funding to both the fishing industry and coastal communities. It aims to help recipients adapt to changing conditions in the fishing sector and to meet the requirements of the Common Fisheries Policy (CFP). Table 5-62 presents the allocation of the EFF from 2007 to 2013.

Table 5-62: Allocation of EFF aid from 2007 to 2013 by Member State

Member State	Allocation of EFF aid € millions
Austria	€5.3
Belgium	€26
Bulgaria	€80
Cyprus	€20
Czech Republic	€27
Denmark	€134
Estonia	€85
Finland	€40
France	€216
Germany	€156
Greece	€208
Hungary	€35
Ireland	€43
Italy	€424
Latvia	€125
Lithuania	€55
Malta	€8.4
Netherlands	€49
Poland	€734
Portugal	€247
Romania	€231
Slovenia	€22
Slovakia	€14
Spain	€1,132
Sweden	€55
UK	€138
Total	***€4,305***

Source: European Commission (nd): European Fisheries Fund Fact Sheet, accessed at: http://ec.europa.eu/fisheries/documentation/publications/cfp_factsheets/european_fisheries_fund_en.pdf on 17 January 2014.

Note: Only countries for which projects were found have been included. No projects were found in Croatia and Luxembourg.

[61] European Commission (nd): Fisheries. The European Fisheries Fund (EFF), accessed at: http://ec.europa.eu/fisheries/cfp/eff/index_en.htm on 4 January 2014.

5.5.8 European Agricultural Fund for Rural Development

The European Agricultural Fund for Rural Development (EAFRD)[62] is the European fund created to help strengthen the EU's rural development policy in line with the Common Agricultural Policy (CAP) reforms of 2003 and 2004. In particular this instrument aims to improve the management of the rural development policy for the period of 2007 to 2013. Table 5-63 presents the allocation of funds for rural development from the EAFRD between 2007 and 2013.

Table 5-63: Allocation of funds for Rural Development from the EAFRD 2007 to 2013

Member State	Amount of funds from the EAFRD € millions
Austria	€3,912
Belgium	€419
Bulgaria	€2,609
Czech Republic	€2,816
Cyprus	€163
Denmark	€445
Estonia	€715
Finland	€2,080
France	€6,442
Germany	€8,113
Greece	€3,707
Hungary	€3,806
Ireland	€2,340
Italy	€8,292
Latvia	€1,041
Lithuania	€1,743
Luxembourg	€90
Malta	€77
Netherlands	€487
Poland	€13,230
Portugal	€3,929
Romania	€8,023
Slovenia	€901
Slovakia	€1,969
Spain	€7,214
Sweden	€1,826
UK	€4,599
Total	***€90,983***

Source: DG Agriculture and Rural Development (2008): Synthesis of Ex Ante Evaluations of Rural Development Programmes 2007-2013. Final Report, accessed at: http://ec.europa.eu/agriculture/eval/reports/rurdev/fulltext_en.pdf on 17 January 2014.
Note: Only countries for which projects were found have been included. No projects were found in Croatia.

[62] European Commission (nd): European Agricultural Fund for Rural Development (EAFRD), accessed at: http://europa.eu/legislation_summaries/agriculture/general_framework/l60032_en.htm on 17 January 2014.

6 Headline findings at the EU level

6.1 Overview

This Section presents the key findings at the EU level. The main assumptions and caveats are given highlighting the uncertainties in the results.

6.2 Headline findings for financial, economic, and social impacts of floods

Table 6-1 summarises the key findings in terms of damages from flooding between 2002 and 2013 across the EU28, number of people at risk now and in the future, expected annual damages now and in the future, EU funds provided to help following flooding and to prevent flooding in the future, and investment made by Member States.

Table 6-1: Headline findings on the financial, economic and social impacts of floods (2002-2013, EU28)

Total number of flood events[(1)]	363
Total number of floods with quantified damages estimates	201 (55% of total number of floods reported in this study)
Total costs of flood for which damages were reported[(2, 3)]	€72 billion, or on average €360 million per flood event. Highest costs per event (top 5) were in 2002 (€850 million), 2010 (€790 million), 2013 (€660 million), 2007 (€360 million) and 2003 (€270 million)
Total cost of floods extrapolated across all 363 floods[(2, 3)]	€150 billion
Total number of fatalities[(4)]	Around 1,000
Number of people evacuated[(5)]	More than 1,700,000 (with 1,400,000 evacuated in 2013)
Estimated number of people flooded annually on average - fluvial flooding[(6)]	Current: 167,000 By the 2080s: 359,000
Estimated number of people flooded annually - coastal flooding[(6)]	Current: 10,000 By the 2080s: additional 121,000 to 425,000 (A1B scenario) or additional 40,000 to 145,000 (E1 scenario)
Estimated expected annual damages from fluvial flooding[(6)]	Current: €5.5 billion By the 2080s: €97.9 billion (assumes no adaptation)
Estimated expected annual damages from coastal flooding[(6)]	Current: €1.9 billion By the 2080s: €25.4 billion (A1B scenario) or €17.4 billion (E1 scenario)
Money provided through the EU Solidarity Fund[(7)]	Total direct damage: €52.4 billion Total EU funds received by Member States: €1.8 billion
Money provided through the EU Cohesion Policy[(8)]	Risk prevention: Adopted OPs: €5,533 million Allocated to selected projects AIR 2011: €4,031 million Other measures to preserve the environment and prevent risks: Adopted OPs: €1,684 million Allocated to selected projects AIR 2011: €1,299 million
Money provided through research projects under the Framework programmes[(9)]	5th Framework Programme: €26.9 million EU funds 6th Framework Programme: €36.8 million EU funds 7th Framework Programme: €85.0 million EU funds

Table 6-1: Headline findings on the financial, economic and social impacts of floods (2002-2013, EU28)	
Investment made by Member States (total)[10]	Incomplete – data not available for all Member States or for all types of expenditure, not appropriate to provide a total as this would be significantly uncertain. Range of expenditure is very wide, with greatest levels in Netherlands and UK and lowest levels countries such as Cyprus, Lithuania (but here information on investment may not be complete). On average, over a large number of projects, the benefits of investment appear to outweigh the costs by 6-8 times, although it is important to note that there is considerable variation between projects such that the actual benefits have to be determined on a project-by-project basis
Investment made by Member States in green infrastructure[11]	Information found suggests this is limited in many Member States, but may be of increasing importance as implementation of the requirements of the EU Floods Directive (2007/60/EC) continues. Progress is more advanced in countries with a longer history of significant flooding, such as the Netherlands, Germany, Belgium and the UK where plans for making room for rivers are already in place and being delivered. Green infrastructure projects were found to require significant up-front costs that may require investment to encourage uptake. There is then potential to deliver significantly greater environmental benefits alongside reduction in flood damages and, potentially savings from construction of traditional defences, deferment of investment in new defences and, hence, opportunity to use funds in other locations

Notes:

1 A flood for this study is defined as an event of sufficient magnitude to be recorded in EM-DAT, or Member State databases. An event is identified as a flood in a specific Member State for a discrete period of time

2 Due to difficulties identifying the years in which the damages are given in some sources, costs from earlier flood events have not been uprated to 2013 values. As a result, the total is likely to be an underestimate. The extrapolation has been carried out at the Member State level as this is likely to be less uncertain than extrapolation at the EU level as a whole, hence, the total is greater than €360 multiplied by 363 floods (which would be €130 billion)

3 Since not all of the damages from flooding can be quantified, it is likely that these are underestimates

4 Data only available where reported in databases and in some cases different data sources provide different estimates of number of fatalities; in these cases, later data have been used providing these are considered to be the more reliable sources (e.g. official databases preferred over newspaper reports)

5 Data on number of people evacuated only available for 28% of floods and in many cases estimates only are provided such that this figure is likely to be highly uncertain

6 Numbers of people affected and annual projected damages costs are from the ClimateCost study (Brown et al (2011) for coastal flooding and Feyen & Watkiss (2011) for fluvial flooding). The E1 scenario is consistent with the EU's target. Project annual damages are undiscounted, mid estimates. Current damages are based on the baseline scenario of no sea level rise

7 Information provided by the European Commission, DG Regio, with 56 applications made between 2002 and 2013

8 Information provided by the European Commission, DG Regio

9 Information taken from the CORDIS database: http://cordis.europa.eu/projects/home_en.html

10 No data for4 MS (Croatia, Finland, Greece, Luxembourg), partial data for 12 MS (Belgium, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Italy, Lithuania, Portugal, Slovenia, Spain, mostly coastal investments only), more complete data but not necessarily comprehensive for 5 MS (Czech Republic, Hungary, Ireland, Latvia, Malta), reasonably complete information for 6 MS (Austria, Netherlands, Romania, Slovakia, Sweden, UK). For Poland information is available on funding for water management, which includes flood risk measures but also other activities as well

11 Information available form EU wide projects such as DICE (Naumann et al, 2011), and project specific information: Environment Agency (2009b), Kettunen (2011), Rijkswaterstaat Waterdienst (2011) and Teichmann & Berghöfer (2010)

6.3 Headline findings on support programmes assisting SMEs to implement resource efficiency measures

6.3.1 Coverage

More than 230 programmes supporting SMEs to implement resource efficiency measures have been identified across the EU during the course of the study. Of these, 102 are classified as providing direct, hands-on services which are tailored to the individual needs of companies supported, with the remaining 128 providing a more centralised and general range of information services across a number of organisations as opposed to individual firms. Figure 6-1 provides details on the support services provided by the two different types of support programme.

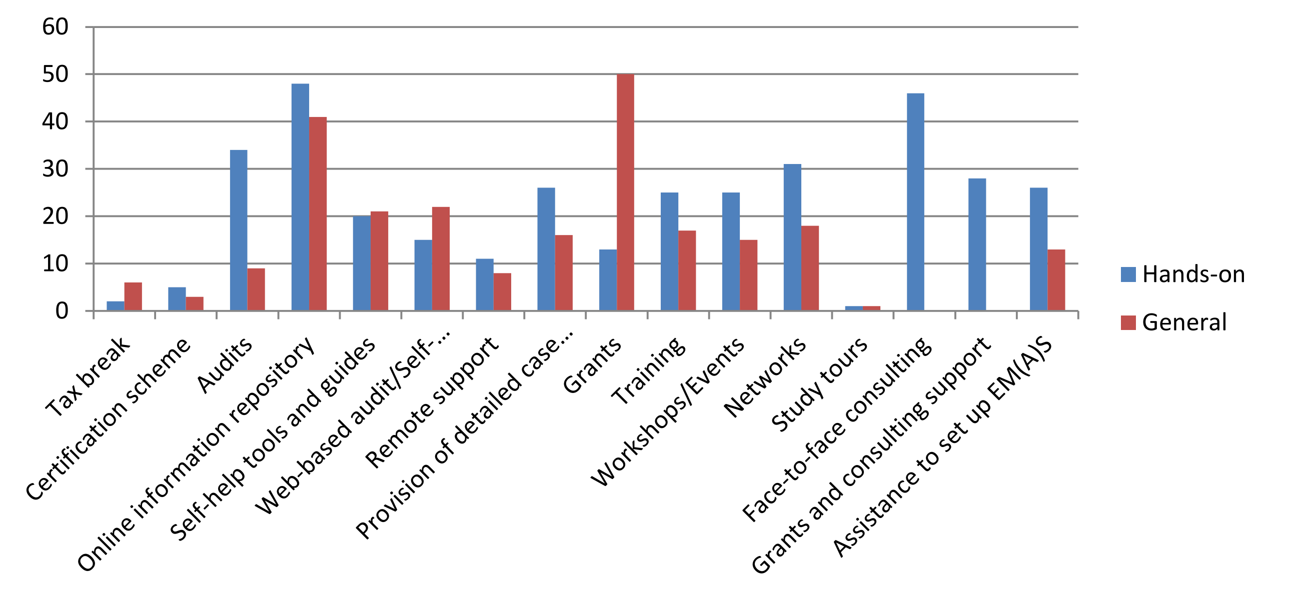

Figure 6-1: Services provided by resource efficiency support programmes

The distribution of these programmes varies considerably across Member States, with the highest number identified in Germany (24 direct hands-on and 13 general programmes), followed by Spain (with 10 direct, hands-on and 15 general programmes) and the UK (10 each of direct, hands-on and general programmes. No support programmes were identified in Romania or Greece and lower numbers of programmes tended to be observed in smaller and newer Member States.

This imbalance in terms of provision of support may make some contribution to the fact that in some Member States, fewer SMEs are undertaking measures to improve resource efficiency than in others. The number of SME support programmes may also reflect a wider concern for resource efficiency and be one of a number of policy and strategy initiatives which together combine to provide increased momentum towards becoming resource efficient. As such, direct, hands-on support programmes can be considered part of a toolbox of policy and programme options available to Member States.

6.3.2 Outcomes

Very limited information was obtained regarding quantified outcomes from direct, hands-on support programmes in terms of cost savings, reductions in energy consumption and CO_2 emissions, savings in water use and savings in waste generation, which may suggest limited monitoring and evaluation has been carried out for such programmes. Whilst some programmes may collect information on results, in most cases this was not publically available. One of the good practices identified in Section 4.7 focuses on the generation of detailed and accurate information in monitoring and evaluating programmes, to provide both learning and accountability as well as being able to contribute to "passing the message on" and encouraging more companies to join in implementing resource efficiency measures. It is therefore recommended that robust monitoring systems be established at the outset of the design of future programmes in order to ensure that baseline data is identified as well as that the required monitoring and evaluation system generates the information required to assess economic and environmental outcomes.

Detailed information was available for a long-term programme in the UK, ENWORKS, and data from the programme suggest significant resource efficiency savings can be made in a range of sectors through such programmes. Examples of the highest average savings generated through ENWORKS programme support over the 2004-09 period on a per firm basis are presented in Table 6-2.

Table 6-2: Potential per firm savings resulting from provision of direct, hands-on support to SMEs to improve resource efficiency

	Energy, power and utilities	Food and drink	Environmental technologies	Construction
Cost savings (€)	€18,757	€33,498	€45,672	€24,124
Energy savings (kwh/year)	420,366	474,595	15,726	265,660
CO2 savings (tonnes/year)	321	191	6	94
Waste savings (tonnes/year)	17	62	3,668	409
Materials savings (tonnes/year)	128	41,333	991	1,727
Water savings (m^3/year)	113	2,609	23	81
Source: Calculations based on realised savings from ENWORKS programme in UK from 2004-9				

The report provides simplified estimates of savings based on these per firm benefits that might materialise from a similar programme if implemented in other Member States. Adjustments are made for current efficiency levels in terms of water, energy and material use and waste management based national level indicators. However these calculations are highly uncertain and rely on high level efficiency indicators generated at national levels and which do not take into consideration specific sectoral, economic and structural variations between countries. Due to the uncertainties over the individual calculations and that the level of future allocation of resources for such programmes is unknown, no extrapolations have been made at either the EU or Member State levels, and the firm level benefits are indicative only.

6.3.3 Good practice

A range of good practices which are considered to contribute to achieving successful and cost efficient outcomes from the provision of direct, hands-on support to SMEs to improve resource efficiency have been identified during detailed analysis of individual programmes and these are presented in Table 6-3 below. These practices have been observed in successful programmes in a number of EU Member States already and might be carefully considered when designing potential new support programmes.

Table 6-3: Characteristics constituting good practice	
Aspect	**Reason for selection**
Adopting an **holistic approach** rather than concentrating on a single resource efficiency area or theme	Leads to multiple savings that can support each other and achieve an overall more significant impact. This approach also means that any company can become involved, rather than only those that have issues with, say, water.
Multiple agencies/organisations involved in programme implementation, design or strategic oversight	Provides wider perspective and potential for co-ordinating support to businesses in an holistic fashion, creates synergies and enables achievement of cumulative effects across a region.
Long-term support	Provides longer periods for beneficiaries to access advice and support in which to identify and implement improvements. Experience and knowledge of advisers improves and is fine tuned to the companies and sectors they support. In addition, long-term support increases the potential to establish long-term relationships and reap long-term gains.
Consideration of **economic aspects**	Consideration of economic aspects (cost savings for companies, employment, competitiveness), increases the uptake of the programme and the likelihood that the measures will be sustained.
Promoting achievements (including through publicising successful **case studies**)	Publicising the outcomes of support can encourage others to take up the service and/or implement resource efficiency measures within their own companies. Utilisation of case studies which are relevant to SMEs in terms of sector and locality can be an effective way of publicising the programme.
Services are **tailored to SMEs or bespoke** rather than product led	Bespoke services or those that are tailored to SMEs ensure that specific needs and limitations of SMEs are addressed.
Linkages with one-stop-shops	Assists in the marketing of the service, e.g. direct referrals and helps to prevent duplication.
Using **local delivery partners**	Provides local knowledge, accountability and credibility. Enables the business support agency to respond quickly to funding changes at a local as well as a national level.
Utilising **collaborative approaches** (includes **peer-to-peer** learning or involvement of peer-to-peer networks)	Collaborative approaches and peer-to-peer learning can be more effective than manual or classroom based learning and can encourage a higher uptake of resource efficiency measures. The involvement of peer-to-peer networks increases credibility.
Specific/quantitative targets	Information on target programme take-up and/or expected environmental improvements is important for the assessment of success and useful for the design of other programmes.
Programme evaluation	Regular, independent and impartial evaluation can lead to service improvements, where required.
Site visits	Interactive approaches, such as on-site evaluation, can be more engaging and as such they can deliver better results.
Services are provided to SMEs **free of charge or at preferential rates**	Affordability is a key consideration for SMEs.
Multiple sources of funding	Decreases dependency on a single source and increases the likelihood that the programme will remain active should one of the sources of funding be discontinued.

6.4 Headline findings on environmental expenditure

6.4.1 Environmental protection expenditure in EU28

Total environmental protection expenditure

Table 6-4 uses DG ESTAT (Eurostat) data to present total (public and private) environmental protection expenditure for each Member State as a percentage of GDP between 2008 and 2011 (where data are available). Total environmental protection expenditure (obtained by summing expenditure for general government, business sector and specialised producers), was calculated as a percentage of GDP for each Member State, using data from Eurostat[63].

Table 6-4: Total environmental protection expenditure as a percentage of GDP (based on Eurostat data)

Member State	2008	2009	2010	2011
Austria	3.75%	3.88%	unavailable	unavailable
Belgium	unavailable	unavailable	unavailable	unavailable
Bulgaria	2.45%	1.87%	1.81%	1.91%
Croatia	1.07%	1.10%	1.15%	1.44%
Cyprus	unavailable	unavailable	unavailable	unavailable
Czech Republic	1.87%	1.92%	2.01%	2.19%
Denmark	unavailable	unavailable	unavailable	unavailable
Estonia	4.52%	3.47%	unavailable	unavailable
Finland	1.11%	1.19%	1.14%	unavailable
France	unavailable	unavailable	2.43%	unavailable
Germany	1.60%	1.64%	unavailable	unavailable
Greece	unavailable	unavailable	unavailable	unavailable
Hungary	unavailable	2.01%	1.97%	1.94%
Ireland	unavailable	unavailable	unavailable	unavailable
Italy	3.43%	3.36%	3.54%	3.71%
Latvia	1.99%	1.83%	1.48%	unavailable
Lithuania	2.05%	2.56%	2.56%	unavailable
Luxembourg	unavailable	unavailable	unavailable	unavailable
Malta	unavailable	unavailable	unavailable	unavailable
Netherlands	unavailable	unavailable	unavailable	unavailable
Poland	2.61%	2.71%	2.67%	2.77%
Portugal	1.24%	1.39%	0.75%	0.72%
Romania	3.07%	2.76%	3.51%	3.93%
Slovakia	1.20%	1.16%	1.11%	1.14%
Slovenia	2.57%	2.55%	2.33%	unavailable
Spain	1.91%	2.03%	1.90%	unavailable
Sweden	0.35%	0.70%	0.70%	0.70%
UK	unavailable	unavailable	unavailable	unavailable

Sources:
Total environmental protection expenditure includes environmental protection expenditure by general government,

[63] Note that Eurostat provides environmental protection expenditure as a percentage of GDP for several different sectors (for example, see the dataset Environmental protection expenditure in Europe – € per capita and % of GDP, accessed at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp2&lang=en on 30 January 2014. However, these tables do not present figures for total environmental protection expenditure as a percentage of GDP.

Table 6-4: Total environmental protection expenditure as a percentage of GDP (based on Eurostat data)				
Member State	**2008**	**2009**	**2010**	**2011**
business sector (all NACE activities except E37, E38.1, E38.2, E39 and O) and specialised producers of environmental protection services (E37, E38.1, E38.2 and E39) sourced from DG ESTAT at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014. GDP data sourced from DG ESTAT, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014.				

Of the Member States for which data are available for both 2008 and 2010, the majority (eight out of 14 Member States or 57%) show an increase in total environmental protection expenditure as a percentage of GDP between 2008 and 2010. Lithuania showed the greatest increase in environmental protection expenditure as a proportion of GDP (increasing by 0.5%) (see Figure 6-2). Environmental expenditure as a % of GDP declined the most between 2008 and 2010 in Bulgaria (-0.6%). The Member State with the highest levels of environmental expenditure as a proportion of GDP in 2008 was Estonia (4.5%), and in 2010: Italy (3.5%). The Member State with the lowest levels of environmental expenditure as a proportion of GDP in both 2008 and 2010 was Sweden (0.4% in both years).

Figure 6-2: Total environmental expenditure as a percentage of GDP by Member State for EU28 in 2008 and 2010. (Data were not available for all Member States and years)
Source: Total environmental protection expenditure includes both public and private expenditure using DG ESTAT data, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014. GDP data sourced from DG ESTAT, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database on 30 January 2014.

Public (general government) environmental protection expenditure

Figure 6-3 presents data from DG ESTAT (Eurostat) showing public (general government) environmental protection expenditure as a percentage of total public expenditure by Member State for years 2008 to 2011 for EU27 (based on NACE Revision 2 classifications). Though the percentage change is small, public environmental expenditure as a percentage of total public expenditure declined after 2009, being the lowest in 2011, perhaps as a result of the financial crisis and austerity measures.

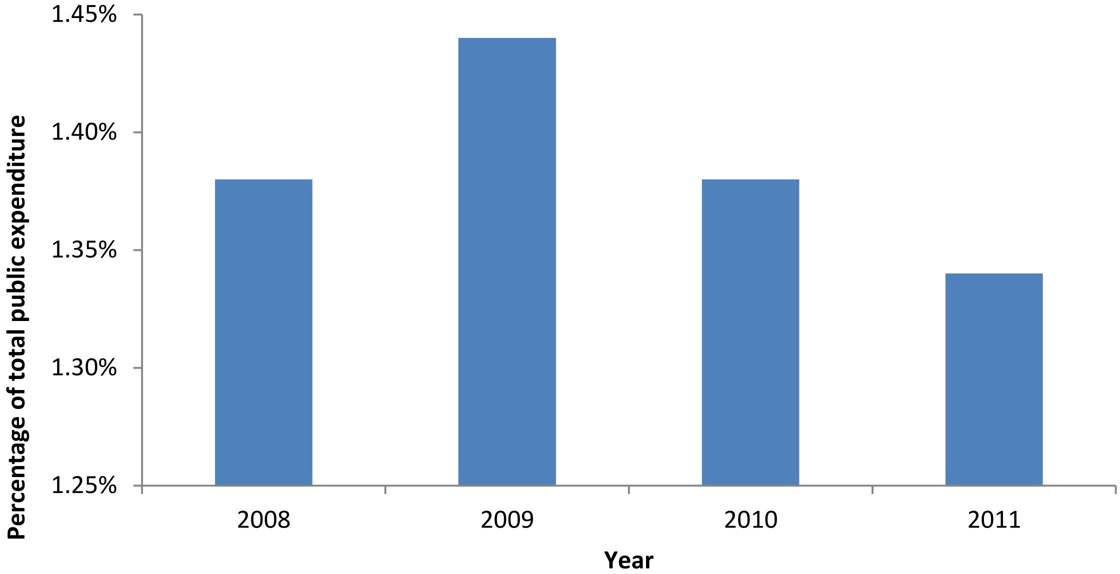

Figure 6-3: Public environmental protection expenditure as a percentage of total public expenditure for EU27 by year.
Source: Public environmental protection expenditure data sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014; total government expenditure figures are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014. Note that EU28 data are not currently available.

Figure 6-4 presents public environmental protection expenditure as a percentage of total public expenditure for 2008 and 2010 for the Member States for whom data are available. The majority (12 out of 20 countries or 60%) show an increase in public environmental protection expenditure as a percentage of total public expenditure between 2008 and 2010. Malta showed the greatest increase in public environmental protection expenditure as a proportion of total public expenditure (increasing by 1.1%) and Latvia the greatest decrease (-0.5%). The Member State with the highest levels of public environmental protection expenditure as a proportion of total public expenditure in 2008 and 2010 was Malta (3.7% in 2008; 4.8% in 2010), whilst Croatia had the lowest levels of public environmental protection expenditure as a proportion of total public expenditure (0.05% in 2008; 0.2% in 2010).

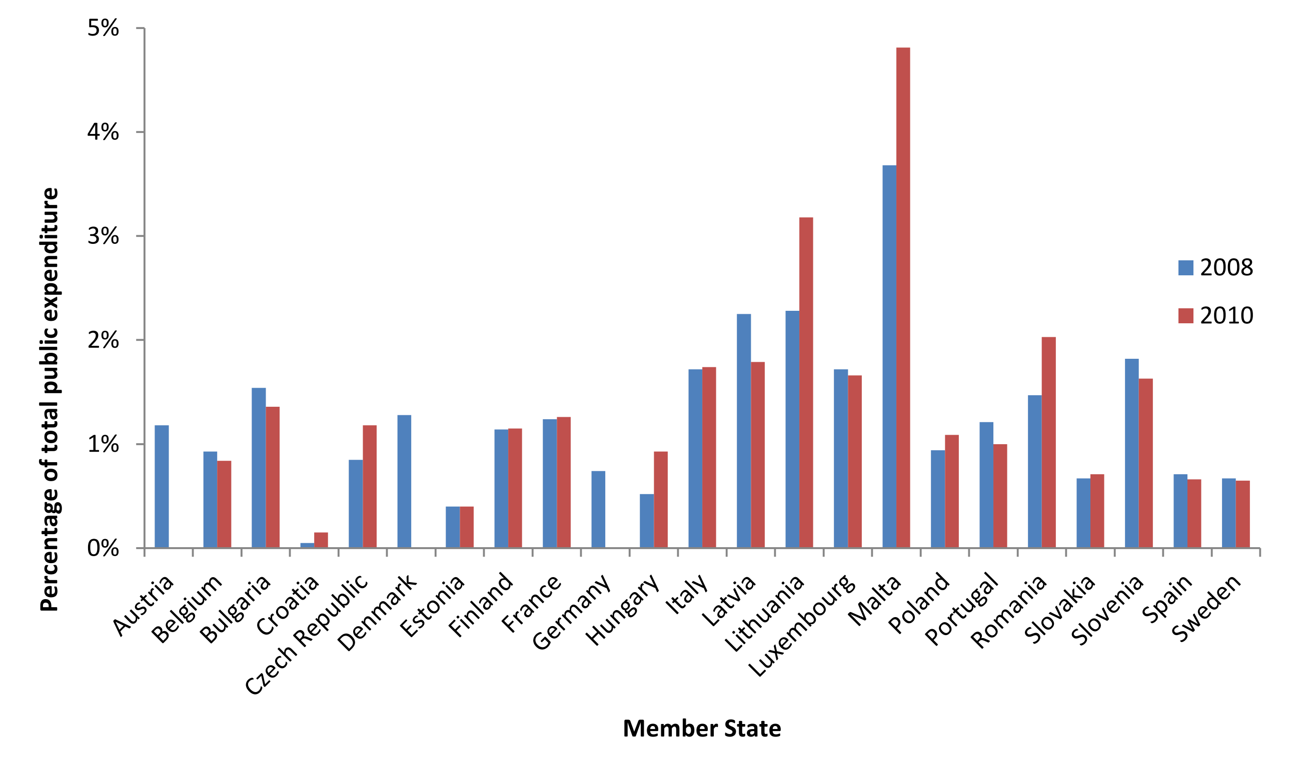

Figure 6-4: Public environmental protection expenditure as a percentage of total public expenditure by Member State for EU28 in 2008 and 2010
Sources: Public environmental protection expenditure data sourced from DG ESTAT, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_exp1r2&lang=en on 30 January 2014; total government expenditure figures are from Eurostat (2013): Annual Summary of Government Finance Statistics, accessed at: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data on 30 January 2014. Data were not available for all Member States and years.

6.4.2 Employment in the environmental protection sector

The EU28 has many jobs which are created and supported through the protection and management of the environment. Table 6-5 presents available data from DG ESTAT on total employment in the environmental goods and services sector (EGSS) for seven Member States and the EU28 as a whole for 2008 to 2011. The EGSS includes any national activities (market, non-market and own activities) which produce products for environmental protection or management. The data are presented as full time equivalents (FTE) which are defined as "total hours worked divided by average annual hours worked in full-time job". Note that since the full dataset is not yet available for all categories or countries, the figures for EU28 are given as estimates. Therefore, caution should be taken when comparing EU28 estimates with country specific data.

Table 6-5: Total employment in the environmental goods and services sector (EGSS) for EU28 and available Member States (FTE) (1000s)

Country	2008	2009	2010	2011
EU28	3,705	3,849	4,087	4,194
Bulgaria	-	-	-	27
Austria	168	170	170	171
France	-	-	-	417

Table 6-5: Total employment in the environmental goods and services sector (EGSS) for EU28 and available Member States (FTE) (1000s)				
Country	**2008**	**2009**	**2010**	**2011**
Germany	-	348	386	-
Latvia	28	23	-	-
Netherlands	-	-	120	-
Romania	-	128	0.1	-
Source: Eurostat (2014) Employment in the environmental goods and services sector, accessed at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_egss1&lang=en on 30 January 2014.				

The estimated totals suggest that the number of FTEs in the EGSS has increased in recent years, while overall unemployment in the EU28 has risen from just under 17 million people (7.1%) in 2008 to around 25.5 million people (10.5%) in 2012[64]. The rise in EGSS jobs seems to have occurred despite apparent job losses in other sectors, as well as cuts to programmes and initiatives in the EGSS or green sector. Although it is not possible to determine the cause of the apparent increase in the number of FTEs in EGSS despite a parallel increase in unemployment in recent years, it is likely to be due to a number of factors. Investment in green growth can have several effects on employment, however, it is generally seen to have a positive effect within a country (GHK, 2011). Green investment is estimated to lead to a 1-1.5% increase in employment when compared with no investment (GHK, 2011). In addition to this, many green sub-sectors are currently more labour intensive than traditional equivalents (e.g. organic farming is estimated to employ 10-20% more people per hectare than intensive farming) (Sustain Labour, 2013).

6.4.3 Environment related EU funding

Several EU funds have been identified as providing money for environment related projects and initiatives, including:

- Eco-Innovation Fund – this aims to support innovation in SMEs and to improve competitiveness
- INTERREG IVC Fund – this provides funds for interregional cooperation
- FP7-Environment (The 7th Framework Programme for Research and Technological Development – Environment theme) – provides funding for research focusing on the sustainable management of the environment and its resources
- LIFE+ (includes operating grants to European environmental NGOs) – this is the EU's instrument for the environment
- European Structural Fund (SF), composed of:
  - European Regional Development Fund (ERDF), which provides support for infrastructure and job creation
  - European Social Fund (ESF) which assists the unemployed and disadvantaged sections of the population

[64] See Eurostat: Unemployment rate by sex and age groups - annual average, percentage, accessed at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_a&lang=en on 20 January 2014 and Eurostat: Unemployment by sex and age groups - annual average, 1 000 persons, accessed at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_nb_a&lang=en on 20 January 2014.

- European Agricultural Guidance and Guarantee Fund (EAGGF) which assists with the development and structural adjustment of rural areas
  - Financial Instruments for Fisheries Guidance (FIFG) which supports restructuring in the fisheries sector.
- Cohesion Fund (CF) – this aims to decrease economic and social disparities
- Instrument for Pre-Accession Assistance (IPA) – this provides assistance to countries involved in accession negotiations (to 2013)
- European Neighbourhood and Partnership Instrument (ENPI) – this supports the European Neighbourhood Policy which aims to strengthen the European neighbourhood through improving stability and security
- European Fisheries Fund (EFF) – this provides funding to the fishing industry and coastal communities
- European Agricultural Fund for Rural Development (EAFRD) – this aims to help strengthen the EU's rural development policy in line with the Common Agricultural Policy (CAP).

Table 6-6 provides a summary of some of the funding received by Member States for environmentally related projects under the above initiatives.

Table 6-6: Summary of environment related EU funding by type of fund for EU28

Fund	No. of projects	Total budget (€ millions)	EU contribution (€ millions)
Eco-Innovation Fund[1] (amounts cover funding since 2008)	63	97,818	45,604
INTERREG IVC Programme[2] (amounts cover funding since 2008)	37	71,035	56,309
FP7 - Environment[3] (for period 2007 to 2013)	468	-	1,533
LIFE+[4] (amounts cover funding from 1992 onwards)	3506	6,639	2,800
EU Regional policy funds[5] (only including ERDF, CF & IPA) (monetary amounts cover funding awarded to individual Member States for environmentally themed projects for 2007 to 2013)	118	60,472	85,623
European Fisheries Fund[6] (aid allocated from 2007 to 2013)	-	-	4,305
European Agricultural Fund for Rural Development (allocation of funds between 2007 and 2013	-	-	90,983

Sources:
[1] European Commission (nd): Eco-innovation, accessed at: http://www.eaci-projects.eu/eco/page/Page.jsp on 1 December 2013. Note: Only countries for which projects were found have been included, no projects found in Bulgaria, Croatia, Czech Republic, Estonia, Finland, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania and Slovakia.
[2] INTERREG IVC (nd): Approved Projects Database, accessed at: http://www.interreg4c.eu/projects/ on 29 November 2013.
[3] EU Commission Research & Innovation, FP7 website, accessed at: http://ec.europa.eu/research/fp7/index_en.cfm?pg=budget on 12 February 2014.
[4] Information sourced from Life Programme country factsheets available via DG Environment, accessed at: http://ec.europa.eu/environment/life/countries/index.htm on 31 January 2014.
[5] European Commission (nd): Regional Policy – INFOREGIO. In your country. Programmes, accessed at: http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=ALL&gv_reg=ALL&gv_obj=ALL&gv_the=72&gv_per=2 on 11 December 2013.

Table 6-6: Summary of environment related EU funding by type of fund for EU28			
Fund	No. of projects	Total budget (€ millions)	EU contribution (€ millions)

[6] European Commission (nd): European Fisheries Fund Fact Sheet, accessed at: http://ec.europa.eu/fisheries/documentation/publications/cfp_factsheets/european_fisheries_fund_en.pdf on 17 January 2014.

[7] DG Agriculture and Rural Development (2008): Synthesis of Ex Ante Evaluations of Rural Development Programmes 2007-2013. Final Report, accessed at: http://ec.europa.eu/agriculture/eval/reports/rurdev/fulltext_en.pdf on 17 January 2014.