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EXIOPOL

A NEW ENVIRONMENTAL ACCOUNTING FRAMEWORK USING EXTERNALITY DATA AND INPUT-OUTPUT TOOLS FOR POLICY ANALYSIS

Deliverable D IV.1.a-b

Final report on the role of research within and outside the EU in the areas of: (a) energy and transport externalities, (b) forestry externalities, (c) national level environmental accounts on related national policies and regulations

Report of the EXIOPOL project

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Introduction

This report for the EXIOPOL project on evaluating the impact of the past research on externality valuation on policy making represents is the deliverable for WP IV.1.a (EU context) and WP IV.1.b (international context). We broadly define an externality as the impact of an economic activity on a party that is not directly involved in the transaction. Since prices do not fully reflect these external costs or benefits of economic activity, the discipline of environmental economics has developed in recent years a number of techniques to make monetary valuations of externalities which can be used in a number of policy contexts. The subject of this report is the assessment of the impacts on policy of such research (EC funded and otherwise) related to externalities and their valuation.

A number of sector and country case studies have been developed by partners in this Workpackage to address this question of policy impacts. Sectors included cover agriculture, energy, forestry, marine resource and waste across a number of countries. The main focus of the case studies has been the EU Member State context (WP IV.1.a), but the assessment has been informed by some further analysis in the non EU context (WP IV.1.b). The case studies chapters have the following focus.

- Chapter 2 by Ecologic gives an overview of research on the external costs and benefits of agriculture and discusses its influence on policy-making, focusing on Germany but also including the EU perspective.

- Chapter 3 by University of Bath analyses how research on the valuation of externalities has influenced policy-making in the UK. An overview of policy impact in all sectors is given with particular focus on energy and waste policy.

- Chapter 4 by ZEW provides an analysis of how research on external effects has influenced policy making in the energy sector in Germany and includes an overview of EU energy policies.

- Chapter 5 by FEEM look t the impact of externality research in the Italian energy sector and include examples of relevant external cost estimates for energy at European level.

- Chapter 6 by the Finnish Environment Institute covers externalities in Finland's forest policy.

- Chapter 7 the Finnish Environment Institute also provide a case study in the context of Canadian forest policy.

- Chapter 8: by the University of Palma analyzes the impact of research on externalities in the field of marine resource management. To inform this analysis the study conducts expert consultations with stakeholders in Italy and the USA.

- Chapter 9: by CAAG focuses on environmental externalities in agriculture in the case of Hungary.

In order to aid comparative analysis, guidelines (given in Annex 1) were produced suggesting a common format for the case studies as follows: (i) policy context, (ii) background to external cost research relevant to the case study, (iii) policy impacts of this research, (iv) analysis of policy impact findings from stakeholder consultations, and (v) recommendations flowing from the analysis. These are followed to the extent feasible in the case study chapters with some variation due to varying policy contexts.

When considering how externality valuation concepts and studies have impacted on policy decision making we have used a typology in this report based on the literature on policy analysis (see for example, Gudmundsson, 2003) and a policy impact framework using this typology is given in Table 1. The four types of policy use identified in this are:

(i) Direct/instrumental use: Direct impact on policy – initiation of actions, decision influenced, identification of policy instruments (at legislative design and policy paper level).
(ii) Conceptual use: Awareness raising, formation of opinions, identification of policy instruments (at conceptual level).
(iii) Political use: justification of decisions already taken and existing policies. Tactical use to postpone decision-making by referring to an on-going study.
(iv) Symbolic use: Research used to give rationale for decisions but results not inherent in actual decisions.

In cases of direct use, political and symbolic use it is more possible to identify a direct link to specific studies, research data and policy statements. Considering direct/instrumental policy uses for externality values[1] these include: (i) project appraisal (principally cost-benefit analysis), (ii) policy appraisal (e.g. higher level cost-benefit analysis), (iii) environmental costing in policy design (such as environmental taxes) and (iv) environmental accounting[2] (for inclusion of non-market impacts). In the case of conceptual use the link is not necessarily as clear cut and the assessment may be based more on interviews and qualitative research sources.

[1] See for example the discussion on policy uses for externality adders in Pearce (2001) .

[2] To aid case study research a guidance document was produced on green accounting and national level estimates of external costs. This is given in Annex 3.

As part of the analysis of policy uses semi structured interviews with stakeholders were undertaken in the case studies. A guidance document was produced for selection of interviewees and conducting semi structured interviews and this is reproduced in Annex 2. We regard these interviews as a key part of the original research in this report. While the size and comprehensiveness of the sample interviewed varies across case studies, a large number key government and non government experts were consulted and, therefore, this process has provided useful insights on this subject.

It should be noted that this report does not attempt to enter the in depth methodological debates regarding market and non market valuations of externalities and their appropriate use in the policy arena. Thus we do not make a judgement about challenges to assigning monetary values to externalities and the use of cost benefit analysis in policy appraisal[3]. Rather, this report assesses these challenges in terms of their impact on the policy take up of monetary valuations of externalities.

The general types of challenge can be summarised as follows (Fisher 2007):

- Political and philosophical argument on making valuations of environmental benefits. Ethical issues are discussed in, for example (O'Neill and Spash, 2000). Philosophical debates over the use of contingent valuation are discussed for example in Veisten (2007).
- Conceptual. e.g. distributional and equity concerns, appropriate use of discounting and arguments on collective values differing from aggregated individual valuations obtained through stated preference surveys.
- Technical. Relating to uncertainties and robustness of the methodologies employed in valuation of non market externalities, such as contingent valuation method and choice experiments. Also issues relating to how the results of different methodologies can aid decision making in practice.

Chapter 10 by NERI provides a comparative analysis of policy impact of external cost research across countries and sectors based on a review of the case studies outlined above.

Finally, we thank the officials and experts interviewed in the course of this study for their valuable contributions to the findings presented here.

[3] See Ackerman (2008) for an example of these challenges.

Table 1: Policy Impact Framework

Policy Use Category	Function of Research	Where in Policy Cycle	Context of Policy Use	Studies/Data Used	Administrative Level of Impact	Possible Evidence
Direct/Instrumental	Initiation of actions, decisions influenced, identification of policy instruments	Possible at all parts of the cycle	CBA of policies or projects, design of policy instruments, emissions trading schemes	Sources (academic, consultancy, in-house Government Department) and funding of data used (EU, National Government, NGO, private sector)	EU/National/Local	Legislation, policy papers, policy statements. Research studies Interviews
Conceptual	Awareness raising, formation of opinions, identification of policy instruments?	Agenda setting Prioritisation Formulation				Interviews Qualitative research studies
Political	Justification of existing decisions, Tactical use to postpone decision-	Possible at all parts of the cycle				Policy statements. Interviews

	making.					
Symbolic	Justification of existing decisions	Evaluation				Policy statements. Interviews

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2 Externality Research in the Area of Agriculture and its Impact on Policy-Making: German Case Study

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Introduction

Since the establishment of the European Community, agriculture has been a controversial issue on the political agenda. Despite the fact that only five percent of the EU's population works on farms and the sector contributes only 1.2 percent to the EU's gross domestic product (GDP), the Common Agricultural Policy (CAP) accounts for almost half of the EU's budget and continues to be one of the most important EU policies. At the same time, the utilised agricultural area in the EU corresponds to 47 percent of the EU's total surface area (European Commission 2009a).[4]

Agricultural production causes a wide range of positive and negative externalities. This report gives an overview of past and ongoing research on the external costs and benefits of agriculture and discusses whether research results have influenced the decisions of policy-makers in the agricultural domain. In this context, the following questions can be asked: If studies on the assessment of these external effects are commissioned, are the results used to inform the political debate? Have policies been designed on the basis of research results? If not, what are the reasons why research results are not used in policy-making and what should scientists do to improve usability of their research?

To answer these questions, this report summarises the information retrieved from 20 expert interviews. The interviewed stakeholders all stem from the agricultural policy domain. They are either policy-makers (the intended recipients of research results), researchers (the producers of research results), or are engaged in civil society organisations (often the communicators of research results). The stakeholders were asked to state their opinion on three broad questions with reference to externality research in the area of agriculture:

1. **What is the current state of knowledge?**
    - What sort of knowledge does exist (qualitative, quantitative, monetary)?
    - Is the existing knowledge sufficient?

2. **How is the existing knowledge used in policy-making?**
    - Are there examples of policy impacts?
    - If yes, which models have been applied in these cases?
    - Why have these modelling results been used by policy-makers?

3. **What can be done to increase usability of EU research results?**
    - What are promising areas of research?

[4] Reference year 2007 (EU-27).

- How should research results be designed to ensure their use in policy-making?

Among the interviewed experts, the term externality was generally understood to describe the "positive or negative effects caused by agricultural activities." Instead of talking about "external costs and benefits", some experts preferred the more general notion of "positive or negative impacts." It is noteworthy that the provision of public goods by farmers was unanimously regarded as the "production of positive externalities". In this context, policy instruments such as agri-environmental measures, which compensate farmers for providing public goods by implementing environmentally-friendly practices, can be classified as instruments that result in positive external effects.[5]

This report describes the situation in Germany. However, the special structure of the European agricultural sector required including the EU perspective in the analysis. Therefore, experts from EU institutions such as the European Commission and the European Environment Agency (EEA) were included in the survey. Furthermore, the focus was not only on externality research that had been carried out in Germany; European research projects and international studies have also been taken into account in the evaluation. In this context, it needs to be pointed out that assessments of external effects can take place in a qualitative, quantitative or monetary manner. Quantitative assessments (e.g. measuring material flows such as nitrate emissions) can be regarded as the prestage for economic (monetary) evaluations, which represent only the final stage in an overall assessment of external effects.

Section 1 of this report outlines the concept of externalities and how it relates to the agricultural sector. Section 2 then describes the political context in the EU and in Germany and gives an overview of the policy framework with a focus on policies aiming at the internalisation of agricultural externalities. Section 3 summarises the most important research projects and studies commissioned by public agencies that assess the external costs and benefits arising from agriculture. Sections 4 and 5 then summarise the information retrieved from the 20 expert interviews, present examples of the policy impacts of research results, and discuss the respective facilitators and barriers. Also based on the expert interviews, Section 6 presents recommendations for both policy-makers and researchers on the better use of externality research in the policy-making process.

2.1 EU agriculture externalities

Most economic activities affect the environment, either through the use of natural resources as an input or by using the environment as a sink for pollution and waste (Pretty et al. 2001: 114). Agriculture is no exception to this; and since all agricultural activity implies the use of natural resources, there are a number of ways in which agriculture affects the natural environment. These include, for instance, pesticide contamination of water, excess nitrate and phosphate in soils arising from fertilizers and manures, air pollution from farm vehicles and transport of food, climate change impacts

[5] Classical policy instruments aiming at the internalisation of negative externalities are taxes, output-reduction subsidies, restrictions, standards, and quotas (Zilberman 2002).

through methane emissions from livestock and nitrous oxide from fertilizer (manure), and reduction in biodiversity.

All of these affects are cases of diffuse pollution: small amounts of pollutants enter the environment in a number of locations, which may be spread out across a wide area. This sort of pollution is more difficult to monitor than the release of pollution from a point source – a fact which poses difficulties when it comes a) to the identification of the polluter, and b) to the design of appropriate policy instruments to reduce pollution (Kahn 2005: 571). Obviously, it will depend on the specific agricultural practices applied whether, and to what extent, positive and negative externalities occur: highly intensive mass production will generally produce fewer benefits in terms of rural biodiversity or landscape conservation than, for instance, traditional small-scale animal husbandry in mountain regions.

Table 2-1 gives an overview of the external effects arising from agricultural activities. Food provision is not mentioned as a positive externality here, since an essential feature of an external effect is that "the effect produced is not a deliberate creation, but an unintended or incidental by-product of some otherwise legitimate activity" (Mishan 1971: 2). In general, agricultural products such as food, animal feedstuff or biofuels are marketed goods, and do not fall under the category of external effects. Moreover, as Glebe (2007: 89) points out, "multifunctional aspects, such as food safety, food security, or rural development are distinguishable from agricultural production and could therefore be detached from agricultural production." Still, as Section 3 will show, these aspects are sometimes part of cost-benefit analyses of the agricultural sector.

Table 2-1 *External effects caused by agricultural activities*

Media Concerned	Negative external effects	Positive external effects
Water	Input of pesticides	Water accumulation and supply
	Input of nitrogen (N)	Flood protection
	Input of phosphates	Recycling and fixation of nutrients
	Transfer of zoonoses	-
Air and climate change	Carbon dioxide emissions (CO_2)	Carbon sequestration (soil, biomass)
	Ammonia emissions (NH_3)	-
	Nitrous oxide emissions (N_2O)	-
	Methane emissions (CH_4)	-
Soil	Erosion due to missing soil cover	-
	Salinisation caused by improper irrigation practices	-
	Contamination by dangerous substances (organic pollutants, pesticides)	-
	Compaction due to use of heavy machinery	-
	Decline in soil organic matter due to missing crop rotation or arable stubble management	-
Biodiversity and Landscape	Habitat destruction	Support of wildlife dwelling
	Loss of landscape elements	Conservation of agricultural landscape and aesthetic value
	Loss of genetic diversity among agricultural crops	Recreation and amenity

Source: Ecologic Institute

According to Pretty et al. (2001: 265), externalities encountered in agriculture have four characteristics: (1) their costs are often neglected, (2) they often occur with a time lag, (3) they often damage groups whose interests are not represented, and (4) the identity of the producer of the externality is not always known. As will become clear from the survey results (cf. Sections 5 and 6), these characteristics do not only complicate the assessment of agricultural externalities, but also raise scepsis among decision-makers regarding the usage of global assessments for local or regional contexts.

2.2 Policy context

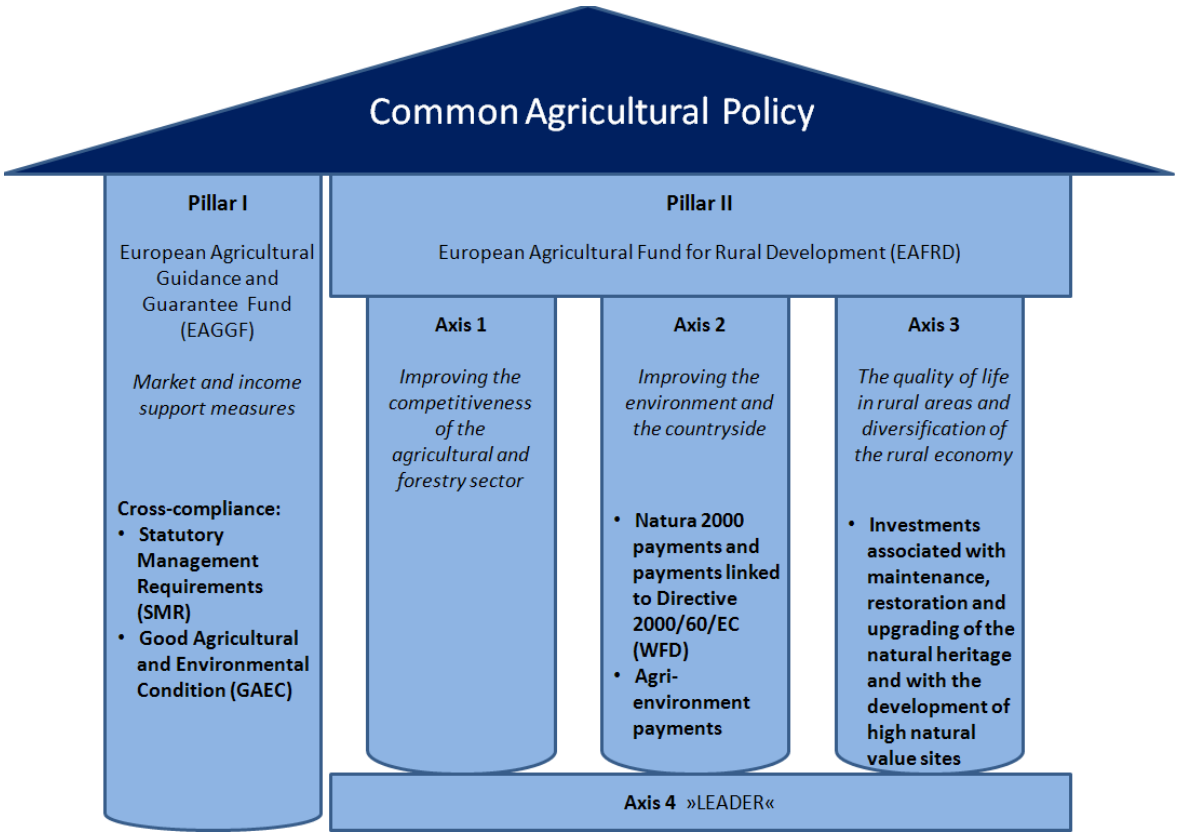
This section outlines the agricultural policy framework in the EU and in Germany. It describes where environmental aspects are of relevance to agricultural decision-making and how funding is allocated over the different policy objectives. In this, the areas in which policies aiming at the internalisation of agricultural externalities can be designed and implemented will be identified.

2.2.1 EU agricultural policy

The Common Agricultural Policy formulates common objectives and priorities to be pursued across European rural areas and sectors. The CAP's initial aim was not only to ensure a stable food production and supply, but also to enable free trade of agricultural goods in the common European market. To achieve these aims, the CAP provided support to European farmers through subsidies and price guarantees, coupled to the production of particular commodities. This policy led to considerable excess production in the 1980's, following which production quotas and a ceiling on European expenditure on farmers were introduced.

A thorough revision of the CAP, which became known as the MacSharry reform, took place in 1992. The CAP shifted away from market subsidisation and onto maintaining farmers' incomes by means of direct payments. This reform also substantially increased the importance of European agri-environmental policy within the CAP, which increasingly focused on the provision of public goods. In 2003, another fundamental reform of the CAP was adopted. The CAP was split into two components or "pillars": today, the first pillar covers market and income support measures and the second pillar provides support for the development of rural areas in the form of nationally or regionally defined rural development programmes.

Figure 2-1 *The CAP and its environmental components*



Source: Ecologic Institute

Both pillars comprise environmental aspects. In the first pillar, the receipt of direct payments depends on cross-compliance with defined environmental rules and standards.[6] Farmers have to comply with a total of 19 EU Directives and Regulations, such as the Birds Directive (79/409/EEC), the Habitats Directive (92/43/EEC), the Groundwater Directive (80/68/EEC) and the Nitrates Directive (91/676/EEC). Furthermore, they have to follow the guidelines on good agricultural and environmental conditions (GAEC) which are defined by the Member States. While cross-compliance within the first pillar only defines minimum standards, the second pillar holds available a number of financing instruments, which aim at preserving the environment (and at supporting the provision of public goods).[7]

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[6] Council Regulation (EC) No 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers and amending Regulations (EEC) No 2019/93, (EC) No 1452/2001, (EC) No 1453/2001, (EC) No 1454/2001, (EC) 1868/94, (EC) No 1251/1999, (EC) No 1254/1999, (EC) No 1673/2000, (EEC) No 2358/71 and (EC) No 2529/2001

[7] Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)

Over the current programming period (2007-2013), the first pillar of the CAP received approximately €300 billion from the European Agricultural Guidance and Guarantee Fund (EAGF). In comparison, the second pillar was allocated €88.3 billion from the European Agricultural Fund for Rural Development (EAFRD) over the same period. Measures under the second pillar are subject to co-financing by the Member States (between 25 and 50 percent).

The decision-making procedure in the agricultural policy domain differs from that in other EU policy domains. While in most policy areas the European Parliament (EP) and the Council of Ministers decide jointly and on equal footing according to the co-decision procedure on Commission proposals, this is not the case under the CAP. Here, based on the consultation procedure, the EP delivers its opinion on proposals, which is (or is not) taken into account by the Council of Ministers and the Commission (Dinan 1999: 337). In practice, this procedure renders the EP marginal in the process and leaves the decision-making to the national governments.

2.2.2 German agricultural policy

The German federal system provides for a division of competencies between the federal government and the 16 state (*Länder*) governments. In the agricultural domain, this means that the general executive framework for market and price policies (first pillar of the CAP) is set at the federal level, while implementation takes place in at the *Länder* level. Structural policies (second pillar of the CAP), which are to a large part designed at the EU level, are implemented at the federal level. However, the practical execution of these structural policies and of further EU regulations takes place at the *Länder* level.

As described in the previous section, the general outline of national agricultural policies is set at the EU level. Accordingly, the framework of agricultural policy in Germany is heavily determined by European statutory provisions. However, the implementation of EU rural development policy is largely left to national and regional discretion. German authorities (at the federal and the regional level) are thus responsible for drawing up rural development programmes and thus for choosing the measures of rural development support proposed at EU level. Agri-environmental measures (AEMs) fall under this category.

AEMs can be separated in two groups: those related to productive and those related to non-productive land management. The first group includes such measures as the reduction of inputs (e.g. pesticides, fertilizers); organic farming; livestock extensification; conversion of arable land to grassland; rotation measures; undersowing and cover crops; initiatives in areas of special biodiversity/nature interest; genetic diversity; maintenance of existing sustainable and extensive systems; farmed landscape; and water use reduction measures. The second group includes set-aside measures, upkeep of abandoned farmland and woodland areas, maintenance of the countryside and landscape features (European Commission 2005: 12).

In Germany, AEMs may take the form of extensification programmes, landscape maintenance programmes, or contract-based nature protection (BfN 2001). Analyses have shown that AEMs are rarely implemented in Germany (Berger et al. 2006; Breuer and Holm-Müller 2006), the main reason being their insufficient financial endowment. For farmers, it is often financially disadvantageous to abandon their fields. Compensation payments under the AEMs are often not sufficient to offset the income

foregone. Recently, farmers tend to grow profit-yielding energy crops on their farmland instead of taking it out of agricultural production for a period of years. This results in the loss of potential fallow land, which holds high ecological benefits.

There are no specifications from the European Commission concerning to the evaluation of AEMs, leaving the *Länder* in charge. When it comes to the evaluation of agricultural policies (and practices) with regard to their environmental impact, economic valuation and economic approaches more generally play a very minor role. Rather, the responsible authorities resort to quantitative assessments of material flows and physical parameters (cf. Section 3.3). The lack of economic assessments can be explained by the political culture in Germany. While the Anglo-Saxon policy style focuses on detecting trade-offs (cf. Section 3.2), German authorities are more interested in identifying safe margins (no-effect level) without carrying out monetary assessments. This can also be observed within the environmental-economic accounts (*Umweltökonomische Gesamtrechnung*) of the German Statistical office, which are not based on monetary assessments, but on quantitative indicators.[8]

2.3 Research on agriculture externalities

Assessments of agricultural externalities can be carried out in a qualitative, quantitative, or monetary manner. The type of assessment applied depends on several factors, of which the most important are the need for accuracy as determined by the policy issue at stake, the political culture within the respective administration, and the available resources (time and money). This section presents an overview of research on external effects that has been carried out at the EU level, on the Member State level (with a focus on the UK), and in Germany. This overview does not claim to be exhaustive; the selection of studies and research projects presented here is based on their mention in the expert interviews (cf. Section 4).

2.3.1 EU-financed studies and research projects

At the EU level, assessments of agricultural externalities may take place in three different contexts: firstly, as part of the impact assessment procedure; secondly, within large-scale research projects funded by DG Research; and thirdly, within ad-hoc studies commissioned by individual DGs of the European Commission or by the European Environment Agency (EEA).

Impact assessments

All policy initiatives by the European Commission – including in the field of agriculture – are subject to an ex-ante impact assessment. The Commission Impact Assessment Guidelines lay down the procedures to be applied for assessing the potential impacts of proposed policies, in particular their economic, social and environmental consequences. Environmental impacts assessed include impacts on climate (e.g. through greenhouse gas emissions), on air quality (e.g. through acidifying, eutrophying, photochemical or otherwise harmful air pollutants), on biodiversity and landscapes (e.g. through habitat

[8] Agriculture and Environment in the German environmental-economic accounts: http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Publikationen/Fachveroeffentlichungen/UmweltoekonomischeGesamtrechnungen/LandwirtschaftUmwelt,templateId=renderPrint.psml

destruction or the deterioration of landscapes), on water quality (e.g. through discharges of sewage, nutrients, oil, heavy metals, and other pollutants) and on land use (e.g. through the cultivation of fallow land and greenfields) (European Commission 2009b: 36-37). The potential impacts listed in the guidelines correspond approximately with those negative external effects identified in Table 2-1.

The guidelines specify that it is necessary to "consider all the relevant positive and negative impacts alongside each other, regardless of whether they are expressed in qualitative, quantitative or monetary terms." For this purpose, Commission services must carry out a cost-benefit analysis (CBA). A full CBA is carried out "when the most significant part of both costs and benefits can be quantified and monetised, while a partial CBA is carried out "if only a part of the costs and benefits can be quantified and monetised" (European Commission 2009b: 44). Besides CBA, cost-effectiveness analyses (CEA) and multi-criteria analyses (MCA) can be applied if they are deemed more appropriate for the policy question at hand.

Applied to the field of agriculture, the compulsory impact assessment thus ensures that the potential negative effects of agricultural policies are considered. A proposed policy should only go through if its negative effects, including external effects, are outweighed by its positive effects. The concept of externalities is therefore inherent to the EU policy process. However, the consideration (and quantification) of environmental impacts in this process leaves much to be desired. In many instances, environmental impacts and external effects are not adequately quantified, let alone monetised.

Research projects

Under the EU's 6th Framework Programme for Research (FP-6), the Specific Targeted Research Project *Impact of Environmental Agreements on the Common Agricultural Policy* (MEACAP)[9] was conducted over a period of three years, from April 2004 until March 2007. The project did not explicitly deal with the external effects of agriculture and is thus of smaller relevance for this analysis. It aimed to assess the effects of implementing the Kyoto Protocol and the Convention on Biological Diversity on the agricultural sector. With regard to economic research, the project focussed inter alia "on efficiency, particularly in economic terms, effectiveness concerning different environmental outcomes and compatibility with other objectives and constraints, at the farm and wider national and EU levels" (IEEP 2007).

The objective of the SEAMLESS[10] project was to build a *System for Environmental and Agricultural Modelling*. The project ran from 2005 until March 2009 and was funded under the EU's 6th Framework Programme for Research. It aimed at "developing a computerised, integrated and working framework to assess and compare, ex-ante, alternative agricultural and environmental policy options." To achieve this, it developed a set of economic, social and environmental indicators of the sustainability and

[9] Impact of Environmental Agreements on the Common Agricultural Policy: http://www.ieep.eu/projectminisites/meacap/index.php

[10] System for Environmental and Agricultural Modelling; Linking European Science to Society: http://www.seamless-ip.org/

multifunctionality of systems, policies and innovations in agriculture and agroforestry, and provided quantitative and qualitative tools and databases for the integrated evaluation of agricultural systems. This provides the basis for a software-based modelling exercise. However, the concept of externalities has not been directly applied in the project. As the project was only completed in 2009, it is too early to assess whether the modelling framework developed within the project will produce relevant output that can used by decision-makers; this will only become evident after a few years' time. The project consortium has established the so-called SEAMLESS Association, which aims at disseminating the project results.

Also under the 6th Framework Programme for Research, the project *Methods and data on environmental and health externalities* (MethodEx)[11] aimed to "advance best practice in external cost assessment, and extend the ExternE[12] analysis to agriculture, industry, waste and other sectors." The project focussed on harmonising information with existing approaches in other sectors, and on extending the ExternE methodology to the aforementioned sectors. The project results include a "benefit transfer guidance", which provides "externality advice and values for a range of different potential applications, and for use by researchers and policy makers." Regarding the agricultural sector, a case study from Hungary examines environmental damages associated with crop production, estimating the total damage costs at €6.4-13.6 per ton of autumn wheat, 4.6-8.3 per ton of corn, €5.8-13.3 per ton of peas and €7.7-15.2 per ton of sunflowers (Szabó and Pál, a). A second case study, also from Hungary, examines environmental damages associated with animal farming. The authors estimate the total quantified damage costs at €0.15-0.17 per kilogram of beef, €0.04 per litre of milk and €0.28-0.37 per kilogram of pork (Szabó and Pál, b).

Funded under the 6th Framework Programme for Research, the project *Sustainability Impact Assessment: Tools for Environmental, Social and Economic Effects of Multifunctional Land Use in European Regions* (SENSOR)[13] aimed at developing 'Sustainability Impact Assessment Tools' (SIAT) that support ex-ante assessment of new policies on six land use sectors, including agriculture. Externalities are included among the impacts, whereby the definitions from the Commission's Impact Assessment Guidelines were applied. The aim was to make SENSOR results available as a tool for the EU impact assessment procedure. Twelve distinct themes have been identified and analysed with regard to their relevance for land use. Three to six indicators were assigned to each theme, resulting in a total of 88 indicators. In the following, policy and land-use scenarios were developed and their impacts on the indicators was analysed. Some of the indicators have been monetised, but this turned out to be rather complicated. In some cases, indicators have been expressed quantitatively (PPM, birds per hectare, GDP etc.). Data were broken down to NUTS-X, which is a combination of NUTS-2 and NUTS-3 in the Nomenclature of Territorial Units for Statistics)

[11] Methods and data on environmental and health externalities: harmonizing and sharing operational estimates: http://www.methodex.org/

[12] Externalities of Energy – Project series financed by DG Research between 1991 and 2005.

[13] Sustainability Impact Assessment: Tools for Environmental, Social and Economic Effects of Multifunctional Land Use in European Regions: http://www.zalf.de/home_ip-sensor/index.html

Studies commissioned by Commission DGs

The project Scenar2020[14] depicts itself as a *scenario study on agriculture and the rural world*. It was carried out by a consortium of institutes for the Commission's Directorate-General for Agriculture and Rural Development (DG Agriculture) and ended in December 2006. Scenar2020 reviews four variables related to rural and agricultural policies, namely rural demographic patterns, agricultural technology, agricultural markets, and natural and social constraints on land use that are likely to exist in 2020, with the aim of "identifying future trends and driving forces that will be the framework for the European agricultural and rural economy on the horizon of 2020." Thus, besides the identification of trends, an impact analysis formed the core of the project. Within this impact analysis, environmental conditions were also considered. However, the concept of externalities in its strict sense was not addressed in the project.

Apart from the Scenar2020 project, few of the external studies commissioned by DG Agriculture deal with the effects of the agricultural sector on the environment. Those studies which take environmental impacts into account do not apply the concept of externalities.

2.3.2 Research conducted in individual Member States

Pretty et al. (2000) carried out an assessment of the total external costs of UK agriculture. They calculated that the total annual costs in 1996 were £2.343 billion (€2.680 billion in 2009 equivalent) or £208 (€238) per hectare of arable and permanent pasture. According to the study, significant costs arise from (amongst others) the contamination of drinking water, from damage to wildlife, habitats, hedgerows and drystone walls, from gas emissions, from soil erosion and from organic carbon losses. In order to assess total environmental and health costs, they estimated two types of damage costs, namely the treatment of prevention costs as well as administration and monitoring costs. Positive externalities created by farming were not estimated. In a follow-up study, Pretty et al. (2001) assessed the relative scale of the various external costs associated with modern agriculture in the UK. The authors highlight the need for policy reform and indicate possible policy priorities for reducing total external costs. They propose a redirection of public aid from polluting activities to sustainable practices, encouraged by a mix of advisory and institutional mechanisms, regulatory and legal measures, and economic instruments.

In a response to Pretty's work, Hartidge and Pearce (2001) re-estimated the contribution of the agricultural sector to the UK economy using economic valuation techniques and adjusting for prevailing subsidies. The authors find that negative externalities amount to at least £1 billion (€1.14 billion), whilst positive externalities (defined as the amenity value of the agricultural countryside, excluding non-use values) offset approximately half of these negative effects.

In 2002, the UK Environment Agency (EA) reviewed the costs and benefits resulting from the UK agricultural sector and proposed potential policy measures to address environmental problems in agriculture. These include, inter alia, regulation and

[14] Scenar2020 – Scenario study on agriculture and the rural world: http://ec.europa.eu/agriculture/publi/reports/scenar2020/index_en.htm

economic instruments, such as taxes and subsidies. The study provides, in monetary terms, a detailed overview of the annual cost and the feasible reductions in the negative environmental impacts caused by UK agriculture. According to the estimation, the total damage costs amount to £1.226 billion (€1.400 billion). In a subsequent study, the EA updated the estimates on the external environmental costs and benefits of agriculture in the UK. References were the EA study from 2002, a study by Eftec/IEEP from 2004, and the estimates contained in the Periodic Review of the Water Industry 2004.

The most recent attempt to assess the costs and benefits associated with UK agriculture was undertaken by the consultancy Jacobs UK Ltd on behalf of the Department for Environment, Food and Rural Affairs (Defra)[15] in 2008. The study did not involve any primary research but used estimates from previous research, in particular building on findings on the framework for environmental accounts for agriculture as developed by Eftec/IEEP (2004). According to the updated estimates, the net (measurable) income to society resulting from the annual flows from agriculture amounts to £654 million (€748 million). Thus, the positive external effects (£1,027 million / €1,175 million) from agriculture outweigh the negative external effects (£373 million / €247 million), resulting in a net positive effect.

2.3.3 Research conducted in Germany

As argued in section 2.2, the political culture in Germany is sceptical of economic and monetary assessments as tools for policy analysis and design. In this regard, it comes as no surprise that only two studies could be identified that described the negative impacts of agricultural practices in monetary terms.

Waibel and Fleischer (1998) estimated that the external costs of pesticide use in Western Germany amount to €128.4 million per year. The study was conducted between 1992 and 1996 and was commissioned by the Federal Ministry of Agriculture. According to the authors, the calculations were based on documented cost figures only, implying that the estimated negative effects are largely underestimated. In response to this study, subsequent publications tried to show that the external cost estimated by Waibel and Fleischer were overestimated (see Kißling and Schmitz (1999) and Kuhl, Schmitz and Wiegand (2001)).

Table 3-1 *External costs of pesticide use in Western Germany*

[15] For further background information on the monetary assessments carried out in the UK, see Defra's website on Environmental Accounts for Agriculture: https://statistics.defra.gov.uk/esg/reports/envacc/default.asp

Impact category	Annual cost (million Euros in 2009 equivalent)
Fresh water protection	65.4
Impacts on animals and plants	6.1
Damage to human health and cases of cancer	11.6
Control and inspection of foodstuffs	11.6
Government institutions	33.7

Korbun et al. (2004) carried out an ecological-economic comparison of conventional and organic pig fattening in Germany. The study assessed the external costs related to the production of 1 kilogram pork (cutlet). The authors applied concepts from life-cycle assessments (LCA) in combination with an analysis of the environmental effects of representative farms. According to the study results, the ecological damage costs caused by conventional pig breeding amount to approximately €50 per pig. The authors concluded that meat from organic pig fattening would actually be cheaper than meat from conventional pig fattening if the external costs were added to the actual producer prices. At the time of the assessment, the price difference between conventional and organic pork cutlets was €6 per kilogram.

In general, research commissioned by ministries and public agencies focuses on material flows and physical parameters. Rather than explicitly applying the concept of externalities, this kind of research focuses on the steps that precede any economic assessment, namely the identification and quantification of environmental changes. For instance, the Federal Research Institute for Rural Areas, Forestry and Fisheries (vTI) – one of the four research institutes under the auspices of the Federal Ministry of Agriculture (BMELV) – deals with agricultural economics, technology, material use, climate, biodiversity, and organic farming. The vTI regularly advises the BMELV on topics related to land use and environmental implications.

In this context, the RAUMIS[16] model has been applied by the BMELV and the vTI since 1993. Its general purpose is to support national decision-makers in the implementation of agricultural reforms, specifically in the context of policy impact assessments. RAUMIS projects the effects of alternative agricultural policies in a regionally differentiated manner. By applying various environmental indicators, the model also takes account of ecological effects, such as diffuse nutrient inputs into ground and surface water. Infrequently, economic assessments, including the monetary valuation of externalities, are commissioned by the Federal Ministry of Education and Research (BMBF). The research funding provided by the BMBF for such economic assessments is usually more substantial than the funding provided by the BMU and BMELV for ad-hoc studies. At the *Länder* level, the available funds are usually not sufficient to conduct empirical assessments of agricultural externalities.

[16] Regionalised Agricultural and Environmental Information System for Germany: http://www.vti.bund.de/de/institute/lr/forschung/raumis_steckbrief.htm

2.4 Policy impacts of research

This section summarises the findings regarding the use of research results on agricultural externalities in policy-making. The following two sections present the groups of stakeholders that were contacted and define the nature of the policy impacts identified.

2.4.1 Overview of experts interviewed

As a document search did not provide reliable information on the issue, the following analysis of the impacts of valuation research on policy for the agricultural sector is based on the results of interviews held with different stakeholders. A total of 20 phone interviews were conducted with stakeholders between June and September 2009. The contacted stakeholders can be divided into the following groups:

Governmental institutions:

- Federal Ministry of Agriculture
- Ministries of agriculture at the *Länder* level
- Federal authorities in charge of the environment
- European Commission (DG Environment and DG Agriculture)
- European Environment Agency (EEA)

Science and academia:

- University departments of agricultural and resource economics
- University departments of agricultural and rural policy
- Agricultural research institutes

Civil society:

- Non-governmental organisations (NGOs)
- Policy consultancies and think tanks
- Trade associations

As mentioned in sections 2.2 and 3.3, externality research in Germany has predominantly been of qualitative and quantitative nature, with a focus on the physical processes; very few monetary evaluations of externalities have been carried out. In consequence, interviewees working in the German context (15 out of the 20 total interviewees) usually had little or no work experience with, or even direct knowledge of, studies using a monetary approach. Their evaluation of the research landscape and of the possibilities for influencing policy processes is thus to a large extent based on their experience with qualitative and quantitative externality studies; this should be kept in mind when reading the results of this study.

As the interviews have shown, attitudes and opinions regarding externality research, as well as the perceptions of related subjects such as the nature of policy and decision-making processes, is strongly determined by which stakeholder group the interviewee belongs to. In particular, the understanding of how the political decision-making in the field of agricultural policy works, and in consequence the understanding of the kind of role that externality research could possibly play in these processes, depends on the stakeholder group.

2.4.2 Nature of policy impacts identified

For the purposes of this study, the classifications of the nature of policy impact of externality research given in Section 1 are used.

Stakeholders interviewed reported having witnessed an impact of externality research on the development of Rural Development Programmes, and on legislation addressing water and nature protection. One interviewee could provide an example of **direct use** of externality research in the past: Externality research is reported to have had an impact on a parliamentary group in the development of a legal initiative in the German Bundestag related to greenhouse gas (GHG) emissions in the agricultural sector.

The models applied to project material flows are also examples of direct use of externality research, at least on the policy paper level. The RAUMIS model, for instance, is used by the BMELV and the Federal Environment Agency (UBA) to assess nitrate flows and to develop nitrate mitigation strategies. The model is also applied within the framework of German environmental-economic accounts.

The most common perception among stakeholders is that externality research has been **used conceptually** in the past. Externality research results are seen to have stimulated political discussions on externalities in several instances, and have sometimes even initiated them. Awareness-raising is also a frequently mentioned result of externality studies. A few interviewees suggest that externality research has provided basic knowledge input for the discussions, as well as establishing arguments and thus determining the framework for argumentation. Examples are the monetary assessments by Waibel and Fleischer (1998) and Pretty et al. (2000). Surprisingly, the study by Waibel and Fleischer received much more awareness with regard to the problems related to pesticide use in the wider public than among policy-makers. The study by Pretty et al. has been mentioned in speeches of BfN officials. Also, the study on the external effects of pig fattening by Korbun et al. (2004) was used by environmental NGOs in the campaign for a more stringent pesticide law.

Political use is mentioned only marginally less frequently than conceptual use, and is frequently seen as the predominant use for this kind of study. The main use referred to is the justification of decisions. Interviewees reported that political decision-makers increasingly demand studies on external costs (particularly quantitative research on material flows and physical parameters, cf. the RAUMIS model).

On the other hand, and again concerning political use, externality research is seen as highly vulnerable to tactically motivated dismissals of results. Dismissal frequently takes the form of highlighting methodological issues in a particular study (e.g. questioning some of the general or broad assumptions made). Problems in the transposition of study results to other regions are also used to question and/or dismiss the validity of results for a certain context; examples are the problem of relating large-scale studies to smaller regions, the reference to different conditions/structures in the region of study (e.g. the possibility of dismissing the results of a studies carried out in the UK with reference to the different structures in place in Germany), and the reference to geographical difference (e.g. type of terrain) between the study region and other regions.

An interviewee reported that studies are also explicitly commissioned for political purposes, i.e. to provide scientific backing for policy initiatives that have already been decided on.

No interviewee mentioned **symbolic use** of externality results.

There is consensus among stakeholders that a huge potential exists for externality research to influence agricultural policy processes in the future, particularly once methodological issues have been solved (more details in Sections 5 and 6). Many stakeholders also highlighted the possibilities for externality research – especially economic assessments – in the 2013 CAP revision process, expecting important conceptual and political use for research results in the process.

2.5 Analysis of policy impact findings

In the following, explanatory factors for the type and extent of policy impact of externality research in the agricultural sector are presented. The factors are all derived from the opinions and evaluations of interview partners.

1. **Characteristics of the agricultural policy sector in the European Union**:

- In general, discussions in the European political process are strongly dominated by discussions on Member States' contributions to the EU budget and the funds they then receive from that budget. Agricultural policy in particular is very strongly influenced by the lobbies of farmers and milk and meat producers; these stakeholders provide the arguments for decisions on agricultural policies. At the *Länder* level especially, agricultural ministers are under constant pressure from the farmer lobby (opinion of representatives of agricultural ministries at the *Länder* level). Agricultural policy in the EU is called by some stakeholders an "income policy", due to one of its objectives being income-support of farmers; the very strong lobbies make the sector is very resistant to change. Past policy developments that aimed at internalising externalities, such as the Nitrates Directive and the Cross Compliance scheme, faced strong opposition and needed both strong environmental lobbying efforts and continuous pressure over an extended period of time to become reality. Due to the predominant influence of interest groups on agricultural policies, and the strong resistance to change, there is relatively little room for externality research, or other research, to influence this discussion.

- A distinction is made between organisations such as the European Commission and government agencies, where decisions are based on, or at least informed by, empirical evidence and ministries of agriculture (and politicians in general), where decisions are mainly political and taken to benefit specific groups (opinion voiced by representatives of environmental organisation and of agriculture ministry at *Länder* level). Agriculture ministries are seen as being strongly pro-farmer. At the more local level (*Länder*), the political process would be very influenced by the traditional policy constellation, with only minor changes from year to year and strong path dependencies. Focal points where research results can influence the policy process are environmental groups and ministries in charge of elaborating policy proposals and; both of these stakeholders have a

tradition of relying on scientific arguments (opinion voiced by academic with research experience at *Länder* level).

2. **Perception/level of contention of policy makers and other actors about the use/role of externality data:**

- Stakeholders' perception of the robustness and relevance of externality research is an important limiting factor to the use of externality research. According to the interviewees, the current level of knowledge covers the major links in the physical and chemical processes that give rise to externalities, but does not yet extend to the details of these processes (opinion of representative of agricultural research institute). The evaluation of the degree of knowledge depends on the kind of study: there are a good number of studies available for non-point sources, but far fewer for the topic of multi-functionality (opinion of academic). A similar lack of studies exists for monetising benefits in cost-benefit analyses, which raises questions on the validity of methodologies and previous results and reduces the possibility of influencing the policy process (opinion of academic).

- In some fields of research there is still too much dispute among academics on how to measure externalities; instruments are still too blunt (opinion of representative of DG Environment). A particular methodological problem is exemplified by the extreme variety of GHG emissions depending on soil type and regional climate, which makes the transposition of results from one geographical region to another highly questionable. Stakeholders also frequently mentioned the methodological problems associated with monetising benefits, for instance of biodiversity, in a cost-benefit analysis.

- Due to these perceptions of methodological limitations, many stakeholders acknowledge that the results of externality research can provide a good indicator of the order of magnitude of a problem (e.g. opinion of representative of DG Agriculture), but do not believe in the precise numbers obtained (when result is not qualitative). Another opinion is that the methodology is promising but still in its early stages and not yet developed enough to influence policy processes; however, policy makers and other actors are keenly interested in this kind of information (opinion of academics). This perception of the informational value and of the reliability of externality research results sets limits to the uses that stakeholders see for such results; stakeholders perceive these results as appropriate for conceptual and political uses, but not as reliable and precise enough for direct use (see Section 4 for definitions of these terms).

3. **Political agenda and constellation of political will over time:**

- According to a representative of an environmental organisation, at this moment in time (interview conducted in July 2009) there is no interest in making public arguments against agriculture, which would affect the possibility of externality research of influencing the policy process. However, the agenda does change occasionally, and some of these changes can be anticipated: a clear future role for externality research is seen in the revision of the CAP scheme in 2013 (opinion voiced by representatives of government agency responsible for environmental management, of environmental organisations, and of agriculture ministries at the

Länder level). The opinion on the extent and type of influence that externality research may achieve in that process varies, however, ranging from direct use to symbolic use.

4. **Existence and type of link between political decision-makers and the source of the study:**

- Whereas some stakeholders do not distinguish between the sources of the studies when evaluating them, others suggest that the reception of a study is very dependent on its commissioner, and that studies are often commissioned with concrete expectations as to what their findings should be.

5. **Perceived lack of relevance of results for the policy process:**

- According to interviewees, externality research systematically fails to deliver policy suggestions, which is considered a major drawback for taking up these results in policy processes. In addition, research frequently encounters problems concerning the clarity of results and their presentation. Scientists have been criticised for their alleged lack interest in the diffusion of their results (see also Section 6: Recommendations).

6. **Level of knowledge and experience of externality data by different groups (policy makers, academics and other experts):**

- The level of stakeholder knowledge of externality data seems to be of minor importance in explaining the lack of uptake of externality research in agricultural policy processes. All stakeholders have some knowledge of both methodology and previous studies in the field, as well as evaluating positively the interest and knowledge of other stakeholder groups. Knowledge tends to centre on emissions and physical studies. Knowledge of externality research does not in general extend to monetary valuation methods, where there is clearly less familiarity with the methodology (opinion of representative of environmental organisation). Politicians are judged as having strong knowledge of externality research of the qualitative and quantitative kinds (less or no knowledge of monetary studies), as reflected by their increasing demand for externality studies (opinion of academic).

- This notwithstanding, only few of the stakeholders interviewed (or their organisations) worked directly on externality research; direct experience in working with externality data seems more limited. In ministries, knowledge of research predominantly concerns the studies commissioned by the own ministry and other ministries, both at *Länder* and at federal level. However, there is little awareness of research produced at universities, for instance. German stakeholders tend to have good knowledge of German research initiatives, but little or no knowledge of international or EU-funded research, including research projects under the Framework Programmes for Research (opinion of representatives of federal ministry of agriculture, agriculture ministries at *Länder* level, and government agencies responsible for environmental management). The situation is different in academia, where there is good knowledge of both international and EU research.

7. **Vulnerability of research results to criticism and dismissal:**

- The predominant opinion among the interviewees was that externality research results are highly prone to criticism and consequent dismissal due to the lack of established and (at least up to a certain degree) consensual methodologies in a number of fields (opinion of inter alia representatives of agriculture policy think tank and of DG Agriculture). Studies such as Pretty et al. (2000) can be easily attacked in view of the methodology used (opinion of representative of DG Agriculture). Both the complexity of the physical processes involved and the methodological limitations imply that the transposition of results from one region to another (or from one scale to another) is fraught with serious difficulties; this implies that politicians can for instance refer to the difference between Germany and the UK to dismiss the validity of results such as those of Pretty et al. (2000) (opinion of representative of agriculture policy think tank). Particular methodological problems, such as the valuation of benefits in monetary research, are also frequently mentioned in this context.

- Research is considered by some stakeholders as (still) too theoretical, and in consequence of little or no value for the work on the ground (opinion of representative of DG Environment).

8. **Other barriers to use of valuation data:**

- Time constraints and work load may hinder the use of externality data, particularly considering it is still too removed from day-to-day work (opinion of representatives of federal ministry of agriculture, agriculture ministries at *Länder* level, representative of DG Environment).

2.6 Recommendations

The following recommendations for future externality research were collated from the interviews and are classified in terms of technical recommendations, institutional recommendations, and recommendations addressing perceptions of externality research among stakeholders.

2.6.1 Technical recommendations

Numerous stakeholders mentioned requirements that externality research must meet in the future to achieve broader acceptance. The importance of a certain degree of consensus on methodology was highlighted (opinion of representative of DG Agriculture); an example in which such a consensus was achieved is the process of establishing a methodical and scientific consensus for evaluating climate change impacts (opinion of representative of government agency in charge of the environment). Achieving a certain degree of consensus would diminish the risk of research results being questioned (opinion of representative of EEA). In addition, the importance of a methodology that is sound (opinion of representative of EEA), resilient (opinion of representative of environmental NGO), and which provides results that are highly reliable (representative of agricultural research institute) were stressed. At the level of individual studies, the constitution of the research group is important to ensure credibility and acceptance of research results (representative of agricultural research institute).

The importance of transparency regarding the assumptions underlying a particular methodology and/or individual study (laying open a study's assumptions, clearly stating what is included and what is excluded from the study) was also highlighted by stakeholders (representative of agricultural policy think tank, representative of agricultural ministry at the *Länder* level).

The level of data aggregation was also frequently mentioned as a problem for the applicability of externality research. The importance of counting with region-specific results was justified with a distrust of general indicators providing blanket answers, in view of the strong local variability of processes affecting externalities (opinion of representative of agricultural ministry at the federal level). Representatives of *Länder* ministries also reported problems in "carrying over" research results to the *Länder* level. This was also mentioned as a problem of EU research on the subject: the highly aggregated level of data is not useful for decision-taking at the local level (opinion of representative of agricultural ministry at the federal level).

2.6.2 Institutional recommendations

Major deficiencies were identified in the link between research results and the development of policy initiatives. Much research was considered as just not applicable for policy processes (representative of agricultural ministry at the *Länder* level). Research design should consider that results should be delivered close to practical implementation requirements; this also facilitates political reception of the study (representative of a European association related to water). Research should place an additional focus on proposing instruments to address the issues highlighted, identifying the possibilities for action (opinion of representative of environmental NGO). Another opinion highlights the importance of research providing specific recommendations, particularly in view of the 2013 CAP revision (representative of agricultural ministry at the federal level). In general, research results should be tailored to the consumer; the demand for research originates from policy-makers, who should work with researchers on how to transform the results into policy suggestions (representative of EEA).

In the particular case of the 2013 CAP revision, an interviewee highlighted the fact that it is the aggregated research which provides the basis for discussions of external costs and benefits, whereas the results of individual studies can influence the design of individual measures (opinion of representative of DG Agriculture).

Communication issues were also highlighted frequently in the interviews. Results of studies should be presented clearly by their authors; otherwise political perception is not achieved (representative of agricultural policy think tank). Results should also be easier to use, summing up the information concisely and avoiding mathematical data (representative of DG Agriculture). The presentation of results should be attractive, in a document not exceeding two pages, and should include recommendations for action (representative of agricultural ministry at the *Länder* level).

Related to the previous aspects are problems related to the dissemination of research results. Researchers are often not sufficiently interested in disseminating the results of their studies, and are not sufficiently interested in their results being put into practice (opinion of academic). On another front, relying on the Internet as sole communication platform of research results is not sufficient (representative of agricultural ministry at the federal level). One stakeholder highlighted positive results achieved via meetings

between research teams and policy-makers; after a brief (20-30 minutes) presentation of results, these were discussed with the policy-makers (opinion of academic).

A specific recommendation for raising the profile and acceptance of externality research is to "sell" the concept to the Member States, which could then apply pressure for its acceptance at the European level. These efforts would also give impulse to discussions concerning externalities in general, and thus contribute to raise their profile (representative of agricultural research institute).

2.6.3 Perceptions

Externality research, and/or issues associated with it, has conflicting evaluations among stakeholders. This is particularly the case with monetarisation of positive and negative externalities. This section presents stakeholder perception of the methodology.

A few of the stakeholders interviewed made reference to distrust of monetarisation approaches in their institutions. Results are seen with some skepticism, particularly in view of perceived methodological weaknesses and the possibilities of political instrumentalisation of research. There is considerable acceptance of qualitative and quantitative approaches, in spite of the recognition of methodological deficiencies. The strong distinction in the acceptance of these two groups was particularly clear among stakeholders active in the German context.

An additional indication that the acceptance of monetarisation approaches is still low is the absence of departments or experts in the institutions questioned which performed this kind of evaluation.

The only additional allusion to negative perceptions was related to the distrust of general indicators providing blanket answers; the stakeholder highlighted once again the importance of counting with region-specific results (representative of agricultural ministry at the federal level).

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List of abbreviations

AEMs	Agri-environmental measures
BfN	Federal Agency for Nature Conservation
BMBF	Federal Ministry of Education and Research
BMELV	Federal Ministry of Food, Agriculture and Consumer Protection
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CAP	Common Agricultural Policy
CBA	Cost-benefit analysis
CEA	Cost-effectiveness analyses
Defra	Department for Environment, Food and Rural Affairs (UK)
DG	Directorate-General
EA	Environment Agency (UK)
EAFRD	European Agricultural Fund for Rural Development
EAGF	European Agricultural Guidance and Guarantee Fund
EC	European Community
EEA	European Environment Agency
EEC	European Economic Community
EP	European Parliament
GAEC	Good agricultural and environmental condition
GDP	Gross domestic product
GHG	Greenhouse gas
LCA	Life-cycle assessment
MCA	Multi-criteria analyses
NGOs	Non-governmental organisations
NUTS	*Nomenclature Des Unit Territoriales Statistiques*
PPM	Parts per million
SIAT	Sustainability Impact Assessment Tools
SMR	Statutory Management Requirements
UBA	Federal Environment Agency
UK	United Kingdom
vTI	Federal Research Institute for Rural Areas, Forestry and Fisheries (*Johann Heinrich von Thünen-Institut*)
WFD	Water Framework Directive

3 Sector Case Study: UK – Energy and Waste Sectors

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Introduction

This chapter analyses how research on the valuation of externalities has influenced policy-making in the UK. The policy context in the UK is first discussed briefly, including official requirements for policy appraisal and the capacities for environmental economics of government departments. Next, externality valuation research and policy use in general across all sectors in the UK are reviewed, with some key examples of policy uses outlined. Examination in greater depth is made for the cases of energy and waste policy. Within the energy section the development of the use of research on the social cost of carbon in policy is explained in some detail. The analysis in the waste section focuses on the landfill tax and the aggregates levy, which are rare examples of the use of externality valuation data in the design of policy measures. The chapter then presents findings from the semi-structured interviews undertaken for this case study on the use externality valuation research in UK policy. These cover the diversity of such impacts in UK policy not only in energy and waste policy. Finally, overall conclusions are given for the UK case.

3.1 Policy Context

Policy style

UK environmental policy over the last three decades has evolved from a reliance on a "command and control" approach to regulation (e.g. through IPC and more recently IPPC), in particular for reducing air and water pollution, to greater use of economic instruments. The result of this evolution of environmental policies is that currently there is a variety of older and newer approaches to regulation (POST, 2004). Key examples of the use of economic instruments are in the context of climate change policy, including the Climate Change Levy, the pioneering UK Emissions Trading Scheme (prior to introduction of the EU ETS) and differential tax on fuels. In the case of waste policy key use of economic instruments have been the landfill tax and aggregates levy, as outlined below. While most UK environmental policy is driven by EU Directives, for example in the need to meet targets of the 1999 European Landfill Directive, the UK is recognised as having been innovative in the use of new instruments for these objectives.

Official requirements and guidance

In the UK there are not at present official requirements to use monetary valuation methods in the development and appraisal of policies, although it is recommended in official documents such as the HM Treasury Green Book on Appraisal and Evaluation in Central Government (HM Treasury, 2003) *where feasible*. Additionally, Impact Assessments are generally necessary for all Government interventions affecting the private sector, public services and the third sector, which must take account of the full range of economic, social and environmental costs and benefits and these should be

monetised *as far as possible*. Thus, the Better Regulation Executive (BRE) includes in its toolkit advice to use willingness to pay surveys for valuation of environmental, health and social benefits[17].

A number of other documents provide sector and issue specific advice on valuing external costs such as the Department for Transport (DfT) guidance on conducting transport studies[18] ***and*** the Environment Agency guidance on economic valuation of environmental effects in the context of flood and coastal erosion risk management (Eftec, 2007). The UK Climate Impacts Programme (UKCIP) funded by the Department for Environment, Food and Rural Affairs (DEFRA) has provided guidance for calculating the costs of climate impacts including methodologies for valuation of external costs. These are intended for application across a wide range of sectors and at a local, regional and national scale in the UK (Metroeconomica, 2004).

It is noted by Nilsson et al (2008) in a review of the use of policy appraisal tools across EU that in general for the UK: "the use of simple tools was prevalent despite the relatively strong political commitment to use more advanced tools". However, for the UK examples examined in the review, where there was active use of formal tools these were centred on CBA and the standard cost model. As may be expected, the scope of impact assessments and tools used was found in the Nilsson study to be influenced by the departmental functions. Thus, assessments carried out by the Department of Environment Food and Rural Affairs, did not include social impacts very well, while assessments of policy proposals by the Department for Health and Department for Transport ignored or played down environmental aspects. In our consultation with DEFRA it was suggested that the process of including valuation of non market benefits in impacts assessments, as well as specific results, was useful in itself for understanding the scope of policy impacts.

Departmental capacities

The use of environmental economic techniques as an aid to UK Government policy has steady grown over the last two decades since publication of the first "Blueprint for a Green Economy" (Pearce, Markandya & Barbier, 1989) helped to raise awareness of their potential role in policy.

There is now significant expertise of environment economic approaches in some specific departmental units of the UK Government and quite widespread awareness of these techniques among other related policy units. Within DEFRA, the Environmental Protection Economics Division has advanced knowledge and is active along with other units in the use of valuation in the context of ecosystems, flood, wildlife, landscape, marine, rural, air quality, noise and health. It is especially involved in collecting data sources on environmental valuation and is a participant in the EVRI database[19]. DEFRA

[17] http://www.berr.gov.uk/whatwedo/bre/policy/scrutinising-new-regulations/preparing-impact-assessments/toolkit/page44199.html

[18] UK Department for Transport gives guidance on conducting transport studies including some valuation techniques. http://www.dft.gov.uk/webtag/

[19] The Environmental Valuation Reference Inventory (EVRI). http://www.evri.ca/english/default.htm

are developing a benefits transfer strategy to facilitate the valuation of ecosystem services which is intended to provide guidelines and to aid identification of gaps in available data.

Targeted valuation studies by DEFRA and other departments are generally commissioned from academic and consultancy experts when advice on specific policy questions is needed. A small community of research bodies in the UK s, including specialist university units and research consultancies, is involved in this policy focused work. A DEFRA Environmental Economics Academic Panel (of which some members have been interviewed for this case study) also provides advice to the Department.

Beyond DEFRA, respondents in this case study agreed that specialists in the Department for Transport (DfT) have good knowledge in valuation of specific issues such as noise, safety and time, as part of the options appraisal process. The newly established Department of Energy and Climate Change (DECC) has a Climate Change Economics division. Other departments such as BERR (Department for Business, Enterprise and Regulatory Reform)[20], and the Treasury have less in house expertise in environmental economics. It should be noted, however, that one respondent in the consultations highlighted differences in knowledge between officials in different units within a department (rather than between departments) as also being an important element in understanding policy take up.

The Environment Agency also has considerable expertise in environmental economics, though a relatively small number of economists. Particular experience has been gained in CBAs, for example in the context of the WFD and agriculture (outlined below), and the agency has undertaken many such studies in-house. The EA expert consulted suggested that they are more experienced than Government departments, including Defra, at practical application of valuation techniques at level of project CBAs (rather than at strategic level), and at connecting technical and economic aspects of such analysis.

Some project coordination between organisations occurs where there are shared agendas, for example between DEFRA and DfT (on noise and health), and DEFRA and EA (on ecosystems). There is also some coordination on methodological issues through the Interdepartmental Group on Costs and Benefits (IGCB), a Defra-led group of government analysts, including leading academics in the field, which provides analysis and advice on the valuation of local environmental impacts[21]. A further development in inter-departmental coordination is the review on behalf of the Government Economic Service, led by Richard Price (Defra's Chief Economist) of the economics of sustainable development, including use of valuation techniques. The Steering Group for the review includes economists and sustainable development experts from across the government, and is informed by leading academics and specialists (GES & Defra, 2009).

3.2 Externality Valuation Research and Policy Use in the UK

This section briefly outlines the development of externality valuation research in the UK. A number of key examples of the actual use of valuation methods in policy across a

[20] Now part of the Department for Business, Innovation and Skills (BIS) created in June 2009.

[21] See publications at: http://www.defra.gov.uk/evidence/economics/igcb/index.htm

number of sectors are then presented. Specific detail of research and policy use in energy and waste policy cases is given in following sections.

In the UK a small but active research community is engaged in studies that develop and use externality valuation methodologies, and this includes some of the leaders in this academic field. This community is an active part of the wider body of environmental economists worldwide and collaboration in research activities is strong, including through organisations such as the European Association of Environmental and Resource Economists (EAERE).

There are many available sources of data on external costs of health and environmental effects both at UK, EU and global level. We focus here on sources intended for use in the policy arena in the UK. Responses from interviews in this case study indicate that the type of research commissioned from the research community by Government has developed over the last two decades. In the early 1990s much of this work was at the level of literature reviews and conceptual papers on externality valuation, based on the body of existing academic work on the subject. As such this could be seen as playing more of a convincing role rather than as primary research in policy application. Through the 1990s the amount of policy specific studies for Government departments (in particular, DEFRA and DfT) and for the private sector (in particular, water companies) increased. Much of this was in the context of implementing national regulation resulting from EU Directives, including the Water Framework Directive and Bathing Water Directive. To answer policy specific questions there was an increase in valuation projects using stated preference methods and revealed preference methods such as hedonic pricing. The last decade has seen an acceleration in the amount of policy specific studies in this area especially with developing requirements for impact assessments of policies that include full assessment of costs and benefits and generally increased need to follow the sustainable development agenda in Government.

A comprehensive list of relevant studies would be very extensive and beyond this study. Based on responses given in interviews for this case study and a review of literature we set out below some key examples of UK policy use of externality valuation research across different sectors and environmental issues:

Water

A significant amount of valuation work has been done in context of Water Framework Directive. For example, the study by NERA (2007) of the benefits of the Water Framework Directive was used to inform the programme of measures for the first round of River Basin Management Plans (RBMP) in England and Wales. Defra used the results as input to the draft Ministerial Guidance for implementing the WFD. The Interwies et al (2005) report on how valuation studies can support WFD related decision making processes was used to inform priority setting.

There has also been considerable work on valuing costs and benefits in water industry periodic reviews. In the PRO4 programme for water quality and water resource improvement schemes the Environment Agency conducted CBAs for nearly 500 environmental water quality and water resource improvement schemes in order to inform advice to Government ministers (Fisher & Horton, 2004)(EA, 2003). For the price

review of 2009 (PRO9) much work was undertaken to demonstrate costs and benefits taking full account of social and environmental impacts, including the carbon impact.

Agriculture

Defra is developing a framework of environmental accounts for agriculture incorporating monetised valuations for environmental impacts[22] for use in priority setting and in specific policy contexts. The current framework is based on data and methodologies in the research commissioned from Eftec (2004) and Jacobs (2008). The Environment Agency has also produced its own study of the external environmental costs and benefits of agriculture in the UK (EA, 2007). The purpose of the study was to inform the development of environmental and economic policies for agriculture, including measures for implementing the Water Framework Directive (WFD) and input to the reporting of environmental and resource costs under Article 5 of the WFD.

An example of policy specific research is the study commissioned by DEFRA on the reform of support mechanisms for upland farming. This was a choice experiment study to estimate willingness to pay for different landscape features in four severely disadvantaged areas of England (Eftec, 2006). Results were used as an input to policy decision on the allocation of the Hill Farm Allowance.

Landscape

Several related studies have analysed non use and use values across a range of rural landscape categories to develop an Environmental Landscape model. This has not been aimed at a policy specific purpose but rather to provide evidence data for all stages of policy-making and as an input for green accounts (IERM, 1999 and 2001, and Oglethorpe, 2005).

Air Quality

A number of studies for DEFRA give analysis of the monetary valuation of air pollution impacts on health and environment. These include a valuation of health benefits associated with reductions in air pollution using the contingent valuation approach DEFRA (2004), an evaluation of the air quality strategy (DEFRA, 2005) and an economic analysis to inform the review of the Air Quality Strategy (DEFRA, 2007a). The 2005 study quotes extensively from the ExternE project though UK studies have been further used in more recent work by DEFRA. The use of externality valuation techniques in the CBA for the Clean Air for Europe (CAFE) programme of the European Commission is discussed in **Section?**.

Transport

Department for Transport project and policy appraisal includes methodology for costing externalities such as congestion, accident and air quality impacts. The Department for Transport review of the New Approach to Appraisal (NATA) was partly to adapt NATA

[22] https://statistics.defra.gov.uk/esg/reports/envacc/default.asp

to the new Delivering a Sustainable Transport System policy goals, especially the challenges of the environmental and social impacts of policies or interventions. Appraisal methods use theshadow price of carbon approach but this is to be updated in light of the new DECC approach (DfT, 2009a) (see discussion in social cost of carbon in Energy Sector section below).

Flood risk management

The handbook for DEFRA on Economic Valuation of Environmental Effects for Flood and Coastal Erosion Risk Management (Eftec 2007) has been used extensively by Environment Agency to inform scheme appraisals.

Ecosystems Services

As noted above DEFRA and EA are coordinating on development of valuation of ecosystem services. DEFRA are developing a benefits transfer strategy to facilitate the valuation of ecosystem services.

Forestry

Research on valuation of forestry in the UK includes work sponsored by the Forestry Commission. For example, a valuation of the economic and social contribution of forestry in Scotland undertaken by Edwards et al (2009) for the Forestry Commission Scotland includes economic analysis of market and non-market benefits. The study aimed to provide a set of indicators on policy relevant themes including an indicator for the non market value of visits to forests.

Marine

The study for DEFRA on monetary values for use and non-use of marine biodiversity (SAC, 2008) was used to inform preparation of the impact assessment for the Marine Bill 2009.

Energy

For discussion of energy sector use of valuation studies see below.

Waste

For discussion of research influencing the landfill tax and aggregates levy see below.

These examples demonstrate active research on externality valuation across a broad range of sectors in the UK, albeit at varying levels of intensity. They also indicate a range of policy uses from ad hoc support for specific policy measures, to sector wide initiatives aimed at informing policy priorities and as support for identifying research gaps. A significant level of policy relevant research has been in the form of CBAs for policy appraisal (in particular for the water sector). Examples of specific use in the design of policy instruments are rarer but do exist (see examples of waste sector below). And while there are some examples of engagement by UK Government Departments with development of environmental accounts (for example, in the case of the agriculture sector) this is viewed by a number of our interviewees as a separate endeavour to use of

CBA at project level and other policy support functions. Thus the EA, while very experienced with CBAs, are not closely engaged in the debate on greening of national and sectoral accounts and have developed their own agricultural accounts focused on decision making requirements (EA, 2007). The Office for National Statistics (ONS) compile environmental accounts but these are based on conventional standards which include environmental protection expenditure, environmental taxes and revenues but not valuation of externalities.

In document review and interviews for this case study we did not find close connection of UK Government departments with EU level initiatives in green accounting or other EU level valuation related work. There has been some use of ExternE data (for example on air quality discussed above) and the Environmental Agency has connection to some EU level valuation projects and data[23]. However, the types of policy related research detailed above is on the whole funded from UK sources rather than EU or international sources. Nonetheless, the influence of EU level legislation and initiatives in developing the policy use of monetary valuation in instrumental, conceptual and political ways should not be ignored. EU Directives, by setting agendas and influencing policy priorities, can provide a key driver for demand for this type of research. Indeed the Bureau & Glachant (2006) study found a consensus of interviewees citing EU Directives as an important promoting factor for such research in the UK.

3.3 Energy Policy Use of Externality Valuation Research

This section focuses on use of externality valuation in the energy policy of the UK. The key environmental issues relevant to energy sector and the EU context of energy policy are described elsewhere in this report and not repeated in detail here. An outline of the nature of externalities in the energy sector, external cost research programmes and energy policies at EU level are given in the German case study (Chapter 4). An overview of EU level strategies that have been informed by valuation of externalities and examples of externality cost estimates for energy at European level are also given in the Italian case study (Chapter 5).

Energy Policy Scope

The scope of energy policy given in the UK energy review (DTI, 2007a) includes the production and distribution of electricity, transport fuel usage, and means of heating. Taking a wide view of the external costs of energy, such as used in the ExternE impact pathway approach, these would include such costs across: (i) energy production/conversion for a range of fuels and technologies principally fossil fuels, nuclear and renewables, (ii) transportation and (iii) use in industry, agriculture and transport. The external costs would include health and environmental effects. Thus the main effect categories included in ExternE are human health effects (mortality and morbidity), effects on crops (e.g. yield changes) and building materials (e.g. through acid deposition), amenity losses (noise) and land use change. Additionally, effects of climate change through increases in greenhouse gases are a key category. The Stern Report

[23] Examples given during interviews were: (1) involvement in Com Coast project reviewing valuation of flood management schemes across EU and (2) use of habitat valuation benefit transfer data from EEA.

(2006) uses a definition of the sources of GHG emissions from energy emissions that includes power, industry, transport and building, while land use agriculture and waste are defined as non energy emission sources.

UK Energy and Climate Change Policy Framework

The key document setting out UK energy policy is the Energy White Paper of May 2007 (DTI, 2007a). Four main policy goals are (i) to set path to cut carbon dioxide emissions by 60 per cent by about 2050, with real progress by 2020; (ii) to maintain reliable energy supplies (energy security); (iii) to promote competitive markets in the UK and beyond; and (iv) to ensure adequate and affordable household heating.

There exists a raft of environment related energy policies focused on energy supply (e.g. the Renewables Obligation and Renewable Transport Fuel Obligation), and use (e.g. the Climate Change Levy and Carbon Reduction Commitment and Enhanced Capital Allowances (ECAs) scheme). Much of the current policy framework is focused on fulfilment of EU level legislation. For example, the Climate Change Levy, a charge on energy use by the business sector aimed at encouraging the development and use of energy efficient technologies, is one means by which the UK fulfils Article 1 of Council Directive 2003/96/EC 'restructuring the Community framework for the taxation of energy products and electricity'.

The importance of the climate change agenda within energy policy is evidenced by the formation in 2008 of the Department of Energy and Climate Change which combines energy policy (previously under the Department for Business, Enterprise and Regulatory Reform), and climate change mitigation policy (previously under the Department for Environment, Food and Rural Affairs).The policy framework to meet carbon dioxide emissions targets is set by the following recent developments:

- The Climate Change Act 2008 introduces a framework to achieve mandatory 80 per cent cuts in carbon emissions by 2050 and gives Ministers powers to introduce the necessary measures for achieving targets.
- Under the Act the Committee on Climate Change[24] was established to provide advice to the Government on these targets and related policy measures.
- The UK Low Carbon Transition Plan (2009)[25], outlines the actions needed to achieve mandated carbon emissions cuts by 2020.

It is also of note that the UK introduced a voluntary pilot Emissions Trading Scheme (ETS) prior to the EU ETS scheme (see chapter 4). This ran between 2002 and 2006 and helped UK participants gain experience at trading before the introduction of the EU scheme.

[24] The CCC's first report "Building a low-carbon economy - the UK's contribution to tackling climate change" (CCC, 2008) gives recommendations on the 2050 emissions reduction target and advises on the levels of carbon budgets for 2008-2022.

[25] Available from: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

Externality Valuation Research in Energy Policy

A body of research papers exists for valuation of externalities in the energy sector. Stated preference methods are in particular undertaken in this policy context, for example, the study by Longo et al (2008) examined willingness to pay for electricity to internalize the external costs related to energy security, climate change and air pollution. One focus for such research is renewable energy preferences. For example, the paper by Bergmann et al (2006) estimated the magnitude of external costs and benefits (in terms of landscape quality, wildlife and air quality) for renewable energy technologies in Scotland, and Scarpa & Willis (2009) investigated households' WTP for a number of renewable energy technologies in the UK. A study by Bergmann et al (2008) analysed preferences over environmental and employment impacts that may result from the deployment of renewable energy projects in rural areas of Scotland.

The study by Menegaki (2008) reviews the global academic literature on the valuation/evaluation of renewable energy projects and summarizes the methods used in them. It found a number of studies using stated preference methods (a few of these for the UK) while those using revealed preference methods were rarer. It concluded that there is a shortage of such studies in the area of renewable energy compared to studies in other areas of environmental and energy economics.

At EU level, much research into the analysis of environmental damage costs for the energy sector has been sponsored by the European Commission in the last two decades. Much of this work builds on existing studies by researchers in the field in order to develop methodological frameworks, rather than undertaking specific primary research. In particular, the "ExternE" (External Costs of Energy) European Research Network has developed methodologies and estimates for energy externalities. A number of ExternE projects and projects using ExternE methodology have taken place since 1996 (including the EXIOPOL, NEEDS, CASES, METHODEX projects among others).

At international level the Environmental Valuation Reference Inventory (EVRI) database is intended as a tool to assist policy analysts in accessing valuation estimates for external environmental and health costs, in particular for use in the benefits transfer approach. It is intended for use across sectors and is not specifically directed at energy projects. The EVRI database was a Canadian initiative but is now part funded by DEFRA and therefore it has a strong representation of UK case studies. Other projects focus on particular aspects of valuation, for example, the Natural Capital Project[26] provides tools for assessing economic value of natural capital in policy evaluation.

Policy Use of Externality Valuation Research

The influence of energy externality valuation research and the engagement of academic and consultancy environmental economists at policy level with the UK Government are clearly evident in policy papers and other funded studies. These quote from a range of valuation studies used including ExternE[27]. Policy use has occurred in the UK both for project appraisal and at strategic level as outlined below. However, the Bureau &

[26] http://www.naturalcapitalproject.org/toolbox.html#Database

[27] The European Commission report on external cost research (EC, 2003) identifies the policy use of ExternE in the regulatory appraisal of air quality objectives for DEFRA (as outlined above) and a Study into Lorry Track and Environmental Costs informing the UK Government review of Vehicle Excise Duty for goods vehicles.

Glachant (2006) study found that such use for energy policy was less advanced than in some other policy areas and this can be partly explained by the particular complexities and uncertainties of using these approaches in energy policy. Research for this case studies largely agrees with the conclusion of the Bureau & Glachant study that the key efforts to bring externality valuation to the energy policy arena at strategic level has been in the context of social cost of carbon (an examination of carbon valuation in UK climate change and energy policy is given at the end of this section) and air quality valuation (outlined above).

Use of cost benefit analysis by UK government to evaluate project and policy options has occurred since the 1960s with first applications for road and rail transport options. Increasingly, energy policy related CBAs have included health and environmental benefits quantified in monetary units to the extent considered feasible.

For use of the valuation approach in project appraisal, an interesting example is the Severn Tidal Power Feasibility Study, for which initial assessment has focused on the regional economic impact rather than environmental impacts (e.g. the value of non-market impacts such as the loss of the Severn Bore and noise pollution)(DTZ, 2009). However, it is proposed to undertake a further study on the value of ecosystems, biodiversity, flood protection, recreational use and heritage assets for the policy options (DECC, 2009b). Other ad hoc studies include the Environment Agency commissioned report on costs and benefits of the Sea Empress oil spill in 1996 that included estimates of conservation/non-use costs[28].

At policy level, an example of use of valuation methods is the CBA of the Large Combustion Plant Directive for DEFRA (ENTEC, 2003) which included quantified and where possible monetised benefits human health and environmental benefits where "sufficiently robust to be considered within a cost benefit analysis".

A number of policy level CBAs were conducted as part of the UK Government Energy Review in 2007. These included those for improved household electricity and gas billing, energy efficient products, cap and trade scheme (Energy Performance Commitment), reforming the Renewables Obligation, nuclear power generation, carbon capture and storage and the Renewable Transport Fuels Obligation. The analysis was undertaken consistent with guidance in the HM Green Book and for Regulatory Impact Assessment such that "to the extent possible a monetary value was given to all key benefits" (DTI, 2007c). For assessment of the benefits of security of supply a Value of Lost Load (VoLL) was used "where appropriate".

In the case of the nuclear power CBA the Energy Review analysis includes valuation of environmental benefits (with the main focus on carbon emissions) and security of supply benefits. However, it did not monetise all health and environmental costs and benefits, for example, a monetary value was not estimated for potential accidents (DTI, 2007b).

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[28] For Environment Agency Summary see: http://publications.environment-agency.gov.uk/pdf/STS-PS133-e-e.pdf

While monetary estimates of energy externalities have informed the development of UK energy and climate change policy (as illustrated in the discussion on the social cost of carbon below) there are not examples of direct use in the design of economic instruments. For example, these estimates were not used to inform the setting of the level of the Climate Change Levy introduced in 2001, nor in setting levels of premium payments for renewable-generated electricity under the Renewables Obligation. Similarly, the NEEDS study (Bureau & Glachant, 2006) found that while estimates of externalities of fuel consumption have been used in the policy debate on transport taxation (for example, a study of Lorry Track and Environmental Costs[29] was commissioned to inform the UK Government review of Vehicle Excise Duty for goods vehicles) they have not been used to set fuel taxes. Designing taxes on transport to internalise external costs accurately is complicated due to the range of externalities of from pollution emissions, to noise, accidents and congestion. However, among these different types of environmental impact the external costs from CO2 emissions could be reasonably well captured in fuel taxes. A summary of a range of estimates for marginal external costs of road travel (quoted in Leicester, 2006) indicates that, on average, the current charging regime in the UK is only covering up to 50 per cent of marginal social costs.

Social Cost of Carbon

Recent developments in carbon valuation in UK climate change and energy policy provides a significant example of the changing position of the use of valuation of non market impacts in policy making, which is interesting to track in some detail. Specifically this concerns the use of studies of the lifetime damage costs of greenhouse gas emissions (the Social Cost of Carbon or SCC) in policy decision making, as opposed to the use of abatement costs incurred to meet specific emissions reduction targets. SCC values are potentially useful in a number of decision making contexts, from project appraisal to regulatory impact assessment in energy, climate change and transport policy (Watkiss et al, 2005).

In 2002 the Government Economic Service review of literature on estimating the social cost of carbon (Clarkson & Deyes, 2002) suggested a value of £70/tC (within a range of £35 to £140/tC) as an "illustrative" estimate for global damage cost of carbon emissions, along with an increase in real terms of £1/tC per year. The value of £70/tC was taken from the "most sophisticated of the published studies reviewed", the ExternE project (which used the FUND and the Open Framework models). This figure therefore includes the available valuation of non market impacts but excludes socially contingent impacts (such as those associated with hunger, migration and conflict) of climate change.

These SCC values were subsequently referred to in the Energy White Paper of 2003. This acknowledges the need for "a coherent approach to carbon valuation and energy use, so that environmental costs can be internalised as efficiently as possible" and states that "most of the carbon savings in the Energy White Paper ….can, we believe, be delivered at costs lower than, or in line with, the illustrative range for [SCC] damage costs". (DTI, 2003)

A review process of these figures followed with a Defra sponsored International Seminar on the Social Cost of Carbon in July 2003 and the establishment of an Inter-departmental Group on the Social Cost of Carbon (IGSCC) in October 2003. Two studies

[29] Commissioned from NERA Economic Consulting, AEA Technology Environment and TRL Ltd. Completed in 2000 but unpubished.

were commissioned by the group to examine application in policy assessment (Watkiss et al, 2005) and improving SCC estimates (Downing et al, 2005).

The policy assessment outlined the relevance of SCC in terms of policies and projects directed at greenhouse gas mitigation or adaptation, and other policies directed at, for example, improvements to air quality, energy and transport policy but which also have an impact on greenhouse gas emissions. It also set out four specific policy areas where the SCC values could be used: (i) Project appraisal (project cost-benefit analysis), (ii) Regulatory Impact Assessment (policy cost-benefit analysis), (iii) setting of economic instrument (taxes, charges, or subsidies) and (iv) long-term objectives or targets.

Examples of where SCC has been used in UK policy were found for the first three policy areas given above. In the case of Regulatory Impact Assessments of greenhouse gas mitigation policy uses included (i) cost-benefit analysis of the former UK Emissions Trading Scheme; and (ii) proposed regulation for emission abatement in fluorinated gases. RIAs using SCC in other policies include: (i) air quality policy appraisal in Defra, (ii) transport policy appraisal in DfT's National Transport Model and marginal social cost pricing models, and (iii) energy policy. Examples given of current and potential use of SCC values in economic instruments included: (i) DfT assessments for road user charging, vehicle excise duty and fuel duty levels (ii) costing of carbon emissions for standards in energy performance of Building Regulations. However, these appear to be rather isolated examples and not standard in the design of economic instruments in UK energy and transport policy.

Clear examples were not found for impact of SCC values on long-term objectives or targets, which are driven more by scientific evidence, political negotiations, and wider economic considerations.

The list of policy uses of SCC in the UK given in Watkiss et al (2005) and Watkiss & Downing (2008) show a spread of Government organisations involved (Defra, DfT, DTI, EA, Ofgem and the Office of the Deputy Prime Minister*)*. However, the full list of policies is not extensive in the context of possible uses. Indeed, it is noted that there were:

> "... a number of relevant policy appraisals or policy areas across Government organisations where the SCC was not used at all, even though the policies involved changes in greenhouse gas emissions. This issue was also highlighted in the stakeholder consultation and raises a broader issue of consistency in policy applications in relation to the use of the SCC" (Watkiss et al 2005, p.9).

Interestingly, the study also undertook stakeholder consultation of experts and users (over 20 interviews). It found that there was general acceptance of the need for (i) a shadow price of carbon for project appraisal and RIAs, (ii) consistency with long term policy objectives and (iii) consistency of application across different types of policy use. However, there were differences in view about whether shadow prices should be based on estimates of marginal abatement costs to meet emissions reduction targets or on estimates of marginal damage costs (as used in SCC). It is noted that these differences in

views reflected different methodological viewpoints and attitudes towards the role of CBA in long term climate change policy

A revised approach to the 2002 guidelines for the valuation of greenhouse gas emissions in project and policy appraisal was published in December 2007 (DEFRA, 2007b) This included more recent evidence from the Stern Review (2006) and set a value for emissions costs in 2007 of £25.5/ tCO2e (increasing at 2 per cent per annum in real terms). While this revision continued to use the social cost of carbon approach to valuation, the paper also announced a review of this approach.

The result of the review of carbon valuation approaches by senior Government economists was issued as new guidance by DECC in July 2009. This departed from a valuation based on the social cost of carbon and focused on the cost of mitigating emissions by a valuation of carbon at a level consistent with short and long-term targets. The key reason for the change is given as the "considerable uncertainty that exists surrounding estimates of the SCC" (DECC, 2009a). The Stern Review itself had noted that estimated of damage costs were: "indicative only and interpreted with great caution" and regarded them as "rather conservative estimates of costs, relative to the ability of these models to produce reliable guidance" (Stern Review, 2006). Also in the review period the Committee on Climate Change's first report (CCC, 2008) distances itself from placing monetary values on non-market health and environmental impact due to the levels of uncertainties involved[30].

Unease with the level of uncertainty involved in SCC estimates is also reflected in most of the expert consultations supporting the decision[31] (as was evident in the stakeholder consultation by Watkiss et al (2005) outlined above). Indeed, some of these contributions outline quite fundamental methodological misgivings with the use of estimates of a monetary value of long-term damages of greenhouse gas emissions.

It is also noted in the DECC announcement that the change in approach helps to ensure that "the policies the UK Government develops are consistent with the emissions reductions targets that the UK has adopted through carbon budgets and also at an EU and UN level" (DECC, 2009a). It is interesting to note that the use of SCC estimates in policy applications in other EU and non EU countries is unusual while use of marginal abatement cost estimates of carbon emissions in project and policy appraisal is the common approach. Thus, the Watkiss review of 2005 concluded that "the UK government appears unique in its widespread adoption and implementation of a SCC estimate in policy assessment". As well as methodological and uncertainty issues, we suggest that the reason for change in direction is also motivated by the desire for consistency in EU and international approach.

Although the DECC states that formal modelling evidence, including evidence on the Social Cost of Carbon will continue to be an important input to setting emissions reductions targets and global

[30] This position is given in the technical appendix notes of CCC (2008) when outlining the Integrated Assessment Modelling to be used.

[31]For expert consultations on the switch to use of cost of mitigation by DECC see: http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

stabilisation goals, it acknowledges that "in practice ... these will be supplemented by political judgement and the outcomes of international negotiations". Therefore, the 2009 statement by DECC represents a significant downgrading of the importance of using the Social Cost of Carbon approach in UK policy appraisal. Moreover, to the extent that valuation of non market impacts is an element of the Social Cost of Carbon approach and one of sources of uncertainty (though not the only one), it also represents a reduction of future policy influence of externality valuation techniques in this area of policy.

3.4 Waste Policy Use of Externality Valuation Research

The direct use of research on monetary estimate of externalities in the design of policy instruments for environmental objectives is quite rare in UK and internationally. There are, however, two such cases in UK waste management policy: the landfill tax and the aggregates levy. This section tracks how these estimates have been used in the two cases and briefly outlines UK Government involvement in continuing research in this field.

Landfill Tax

The Landfill Tax was one of the first initiatives by the UK Government to shift taxation away from labour and towards pollution and resource use, and sought to internalise some of the externalities associated with the disposal of waste to landfill. The proposal to introduce a new tax on waste disposed to landfill was announced in the Budget of November 1994. In March 1995 detailed proposals for the landfill tax were announced and a consultation paper released. The consultation included discussion of whether the tax should be ad valorem or weight based. By August 1995 it was announced that the *ad valorem* landfill tax had been dropped in favour of a weight based tax. It is interesting to note that in interviews for this study it was stated that no rigorous impact assessment was undertaken for the tax at this time. The tax was introduced by the UK Government in 1996, with the objective of reducing the level of waste going to landfill and promoting reuse and recycling of materials. The UK has a particularly poor record in waste management among European countries, with about 65 per cent of waste sent to landfill in 2005 compared to less than 5 per cent in the Netherlands, Sweden and Switzerland.

The original landfill tax rates reflected estimates of the marginal external cost of landfill and were influenced by a study by CSERGE (1993), which calculated mean externalities from a number of landfill scenarios of about minus £3 per tonne and from waste incineration scenarios of about plus £4 per tonne. An initial tax of £7 per tonne (and £2 per tonne for inactive waste) therefore seems to be based on the difference between these two mean externality estimates. Indeed, from our review of literature and interview responses it is generally understood that the CSERGE figures represented a starting point for setting the original tax rates. It was accepted at the time that the rate was too low to significantly reduce waste and expand recycling but the exclusion of disamenity values in the research meant that there was scope for an increase in tax based on development of the methodology (Powell & Craighill, 1996).

Despite methodological developments in waste management externality estimates, subsequent increases in the tax rate since 1999 have moved away from using these estimates and have been more influenced by the need to meet targets of the 1999 European Landfill Directive. A Strategy Unit review in 2002 acknowledged that the original rate of tax was too low to change consumer behaviour and put forward an increase which came into force in 2005.

The divergence between basing taxes on externality valuation and on EU targets is expressed at this time in a HM Treasury paper on tax and the environment:

> "It is not always clear that targets set by EU environmental legislation are commensurate with the environmental costs imposed by particular sources of pollution within the UK. For example, it could be argued that the Landfill Directive targets will require much greater reductions in the quantity of waste landfilled than might be implied by the initial estimates of the external costs of landfill in the UK..... At EU level, as in the UK, progress against targets should be kept under review and, as far as possible, the targets adjusted (up or down) if the costs and benefits turn out to be different from those originally expected. However, where the UK has firm international commitments, the Government will plan to meet them using the instrument or package of measures that does so in the most efficient way." (HM Treasury , 2002, p,21)

Further increases in the Landfill Tax were announced in 2007 with the standard rate set from £21 to £24 per tonne; and more increases in the standard rate of £8 a year were announced from April 2008 until at least 2010-11. However, the rate of Landfill Tax in the UK is still well below some other EU countries, for example the current rate in the Netherlands of €85 (£58) per tonne.

While the UK Landfill Tax can be seen here to have departed from the original approach of tax rate setting based on the externalities associated with landfill, it has been argued that the higher rate better reflects the difference between the negative externalities of landfill, and the positive ones of recycling, rather than incineration as originally used (Eunomia, 2008).

Aggregates Levy

The Aggregates Levy came into effect in 2002 and was charged on commercial exploitation of aggregates at an initial rate of £1.60 per tonne of sand, gravel and stone. A report by London Economics (1999) for DETR aimed to provide information on the non-market costs of aggregates extraction and suggested that the total external costs of aggregates extraction in the UK were about £380 million per year. These external costs included transport emissions, noise, dust, groundwater pollution and loss of habitat. Estimates from contingent valuation studies for the London Economics report gave an average external cost of about £0.35 per tonne for crushed rock extracted, £2 per tonne for sand and gravel extracted and £10 per tonne for aggregates extracted from National Parks. While the optimal rate of the levy varies between the type of material and location of extraction, a uniform rate was set to avoid administrative and enforcement difficulties. Part of the aggregates levy was hypothecated into the Aggregates Levy Sustainability Fund, which supports environmental enhancement projects in the locality to the aggregate extractions.

In 2008 the rate of the levy was increased for the first time to £1.95 per tonne to take into account inflation. This suggests that, unlike the Landfill Tax, the use of external cost estimates to set the rate is in principle still in place in this case.

Policy Related Research

During and since the introduction of the Landfill Tax and Aggregates Levy DETR (and subsequently DEFRA) and the Environment Agency have sponsored continuing research to improve the valuation

of externalities in the context of waste management (see for example: CSERGE & Eftec , 1998, ERM & Eftec ,1999, DEFRA, 2003 and Enviros,2004). UK academics and consultancies have also contributed to this research at EU level (Coopers & Lybrand, & CSERGE, 1997) and research in the academic literature (for example, the primary stated preference survey on landfill impacts by *Garrod & Willis 1998).*

Despite these more comprehensive valuations of environmental impacts of waste management options, the impact assessment for policies in the Waste Strategy for England 2007 (Defra, 2007d) includes climate change impacts of the scenarios as a proxy for total environmental impact. The carbon savings of policy scenarios were monetised using the social cost of carbon methodology but for social and disamenity impacts it was concluded that valuation is *not possible at this time* and these impacts were subject to qualitative assessment.

3.5 Policy Impact Findings: Summary of Interviews

As well as a review of literature this analysis of policy impacts of externality valuation research also draws from semi-structured interviews with a number of key experts in this field from government, academia and consultancies. The interviews covered the diversity of such impacts in UK policy, not only focusing on the energy and waste sector analysed above, since most experts interviewed were involved in application for a range of sectors. Table 1 lists details of interviewees for this case study, although in the following summary of findings we do not assign individual views and statements given in interviews. The objective here was to explore the explanatory factors for the level of use of externality valuation research and gain insight and recommendations in this context. The conclusions from the interviews are given below grouped according to the general discussion topics used in the interviews. The focus in this section is on UK policy but consultations with EU level officials are also used to inform overall conclusions given in Chapter 11.

Table 2: List of Interviews Undertaken

Institution	Interviewees	Position/Division
UK Level		
Department for Environment Food and Rural Affairs	Helen Dunn	Environmental Protection Economics Division
Environment Agency	Jonathon Fisher	Economics Policy Manager
London School of Economics	Giles Atkinson	Senior Lecturer in Environmental Policy
University of Bath	Anil Markandya	Professor of Economics
University of Bath	Alistair Hunt	Researcher in Environmental Economics
University of Stirling	Nick Hanley	Professor of Environmental Economics
EFTEC (environmental economics	Ece Ozdemiroglu	Founding director of

consultancy)		Eftec
Eunomia (Waste management consultancy)	Adam Baddeley	Principal Consultant
EU Level		
DG Environment	Stephen White	Sustainable Development and Economic Analysis Unit
DG Environment	Oliver Zwirner	Sustainable Development and Economic Analysis
DG Research	Nicholas Christoforides	Coordination and International Cooperation
DG Research	Daniel Deybe	Development Unit of the Directorate-General for Research
European Environment Agency	Jean-Louis Weber	Senior Adviser Environmental Accounting

Level of Knowledge and Experience of Externality Valuation Research

This question focused on the level of knowledge and understanding of externality valuation research by different UK government departments and agencies.

- Among government departments it was generally accepted that **DEFRA** have the most advanced knowledge in this area. This is principally the Environmental Protection Economics Division but also includes other divisions for specific issues. The department is active at strategic level in the valuation agenda for issues including: ecosystems, flood, wildlife, landscape, marine, rural, air and noise/health (see above for further details of their activity across environmental issues). DEFRA are active in commissioning valuation research from outside experts and in coordinating with other government departments and agencies where they have shared agendas (e.g. DfT and Environment Agency).

- The picture for **other departments** is more mixed. There is good knowledge in DfT in specific subjects (value of noise, safety and time as part of guidance appraisal process). Other departments have less expertise, with the examples of BERR (Now BIS), DECC and the Treasury given in some interviews. Regional government was also said by one interviewee to have in general a greater understand of physical impacts (such as tonnes of carbon) rather than monetised impacts.

- The **Environment Agency** was recognised to have strong knowledge of the practical application of valuation techniques, focusing on improving the evidence base, especially through CBA at project appraisal level. It much less involved in high level corporate strategy applications than DEFRA.

- In terms of **knowledge of specific issues**, the use of carbon valuation was understood by a broader cross section of central government than other valuations. Understandably, knowledge of other applications of valuation varies by relevance to the department.

- One consultee put forward the view that **differences in knowledge within organisations** are an important issue to recognise as well as differences between organisations. Higher ranking economists generally understand the subject (but may have higher expectations than can be delivered), while understanding by policy officers varies quite widely.

- An further issue raised was that, due to the small number of officials in specialist departments that have expert knowledge of this subject, there is a risk of **loss of institutional memory** when specialist move on.

- Comparing between countries, one interviewee gave the view that the UK Government was in general terms more advanced on use of environmental economics than most other national governments. This conclusion is to some extent consistent with the findings of the comparative analysis (Chapter 10).

Perception and Level of Contention About the Use/role of Externality Valuation Data

While the concept of externalities is widely used in the policy debate, the process of quantifying these in monetary terms has more resistance even though there is general acceptance of the usefulness of setting quantified standards and targets. This question aimed to gain views on existing perceptions and resistance to monetary valuation methods.

- Expression of **political and philosophical objections** to the use of monetary valuation of environmental impacts had reduced in Government circles in recent years, in the view of interviewees that addressed this point. There exists some criticism on these grounds though this was not said to be specific to particular departments.

- Expressed criticisms encountered b y respondents tended to focus on **conceptual and technical issues** (as outlined in the introduction chapter) rather than philosophical issues. Barriers to policy use caused by conceptual and technical issues are discussed further below under the question on availability and quality of data. It is noted here that more resistance was said to be encountered for stated preference methods than revealed preference methods.

- Even where there are misgiving and uncertainties about values, **cost benefit analysis** was said to be widely accepted as flagging up the nature of environmental costs and benefits in project and policy appraisal. Compared to specific project CBAs, high level CBAs, such as those by the Environment Agency for the PRO4 exercise for the water sector, face more challenges based on the different priorities of participant organisations.
- Several interviewees pointed to the distinct **groups of experts and officials** which support varying approaches to policy appraisal and a tendency for lack of engagement between these groups (this issue is also raised in the EU context).
- An interesting point made by one valuation study specialist was that these studies may be viewed differently from other scientific evidence as people feel

"entitled" to criticise valuation results on the basis of their own WTP being different from the study results. This is not the case with scientific findings which are not based on individual perceptions.

- **Differences between government departments and agencies.** A report for DETR (1997) concluded that departments remained adverse to valuation techniques and they were rarely used. The current position has shifted from that time in that monetary valuation methods have been used increasingly in UK Government. A key observation from interviews was that acceptance of valuation of externalities was usual in some departments and divisions (such as in DEFRA) and for some policy issues (such as, carbon valuation), although this was not the case in some other areas of government and other policy issues. This observation is consistent with the Bureau & Glachant (2006) study with found that opinions varied substantially between departments. In interviews, it was suggested that among departments with a more cautious view were HM Treasury, Department of Health, the DTI[32] and the Home Office. The environment agency was also mentioned in one interview as having some mistrust. There is some divergence on this point among interviewees, although this conclusion is consistent with the Bureau & Glachant (2006) observation that the Environment Agency is cautious about environmental valuation due to the uncertainties of this approach. This underlines the point made above that there can be significant differences in acceptance and knowledge within organisations as well as between them. One respondent stated that the level of acceptance of research findings by a given department could vary according to whether these findings coincided with the wider aims of a department (i.e. political use of research findings).

Capacity of Policy Makers to Use and Understand Valuation Data

This question is connected to the question above on knowledge and experience, but focuses on the capacity of non specialists in Government departments and agencies to understand and usefully apply externality valuation studies.

- **Communication of findings** was a key issue raised. In particular, this concerns how to appropriately present the meaning and applicability of valuation of research to policy makers and reduce the risks that studies are not understood and are, therefore, used out of context or disregarded. Differences in values produced by different studies can lead to confusion and thus need to be explained clearly to non specialists.

- **Role of guidance.** A number of respondents addressed the issue of the appropriate technical level of guidance documents needed for different audiences. In fact, the DETR (1997) study pointed to available guidelines at that time being too technical for the non specialist but not detailed enough for the specialist involved in appraisal. On this point, some interviewees argued for more detailed issue specific official guidance for use by specialists, not only generic guidance. One the other hand, it was argued that guidance aimed at policy makers needs to be understandable and therefore peer reviewed by non economists.

- Capacity in Government institutions has been aided by **outreach of academics**, and exchange between academic and policy professional posts. With the

[32] From 2007 the DTI became the Department for Business, Enterprise and Regulatory Reform and the Department for Innovation, Universities and Skills

development of the subject over recent years there has been a corresponding greater employment of environmental economists in government departments and agencies.

- This question also led to more general discussion of the **diversity of monetary valuation techniques** and their effective application in policy making. To what extent is standardisation in application of techniques necessary and appropriate for different types of policy use (the process of developing standards in the context of environmental accounting is covered in Annex 3).

- The point was made by two interviewed experts that **expectations by policy makers** of valuation research can be unrealistic (or there can be overuse and overselling of this research). In particular, expectations should be managed so that it is clear at the start of valuation studies what the research will and will not deliver in terms of aiding policy decisions. Connected to this point, the risk of damaged perceptions in the policy community if resources are spent on studies that do not provide definite conclusions was also raised. Indeed the cost of studies is stated as a hindering factor to the use of monetary valuation in the Bureau & Glachant (2006) UK case study.

Availability and Quality of Policy Relevant Externality Values

Barriers to policy use related to conceptual and technical issues were addressed under this question. It is stressed that this case study does not attempt to enter the methodological debate on monetary valuation techniques but instead to report those issues which are seen by interviewees to have most influenced the take up of research results in policy decisions.

Methodological and data availability issues were seen by most interviewees to be more important barriers to policy use than other objections to valuation techniques. We outline below various aspects of uncertainty/robustness of findings and gaps in/availability of evidence that were raised in the consultations.

- The use of **Benefit Transfer** was a recurring issue in consultations on barriers to policy use. While valuation practitioners see this as a useful way to estimate the order of magnitude of externalities where there is a lack of primary research (and it has been frequently used in this way in the UK), it is an often criticised technique. Where results are heavily contested on this basis their perceived legitimacy can be undermined for use at policy level.

- A wide range or **variation in monetary** valuations within or between studies can cause credibility problems if these are used to support criticisms of environmental economics techniques such as stated preference techniques. Valuations will be particularly difficult for policy makers to interpret if sensitivity analysis changes overall findings significantly. An interesting example of uncertainty caused by variation in results is the case of the social cost of carbon. The distribution of estimates of the social cost of carbon (derived from different discount rates and equity weightings used) and the selection of the estimate in the Stern Review (2006), as analysed by Tol (2007), was the source of some debate. Some interviewees felt that this debate had influenced the confidence of policy makers in such damage costs. However, it was also stated that this effect was not as significant as may have been expected and, in the context of the Stern review,

economists were now listened to more due to the prevailing agenda and linkage with science on climate change.

- The issue of the link between **science and economics was also raised.** End points at scientific level may not be easily applied for valuation, i.e. what science provides may not be useful for economists and vice versa.

- Doubts over **comparison of non market figures with other figures** were raised as a continuing area of debate. This is an issue of relevance to the use of external costs in national accounting frameworks outlined in **Annex 3**

- Economic approaches to the monetisation of the **value of a human life**, including through contingent ***valuation*** approaches, were mentioned as a continuing issue of debate. However, this issue was not raised by many interviewees in the context of barriers to policy use.

- The **issue of timing** was raised by several interviewees. The time required to produce primary research results does not match the short timeframe for answers that is often required in policy making. Thus, a decision may be already effectively made when research findings are available and serve a mainly political function. Moreover, it was suggested that for a CBA or other study to be available in time to inform decision making may require second guessing of specific issues to be addressed and the technical requirements. It was also suggested that the need for quick answers by decision makers may have contributed to greater use of benefit transfer, although we have no quoted examples of this.

Recommendations

Interviewees were asked for general recommendations for improving use of externality valuation research in policy making. The most common recommendations concerned various aspects of the **promotion of good practice**. This included:

- Further **development of guidelines** in valuation techniques, in particular, for the appropriate use of benefit transfer such as the manual being developed by DEFRA. However, the discussion above on the appropriate technical level of guidance documents is relevant here. The need for manuals of excepted approaches was questioned by one interviewee, while on the other hand it was argued that following official guidelines could provide a useful official "stamp of approval" for studies.

- In the development of standards it is important to **work with other specialists** (for example, in the case of ecosystems valuation there is a need for economists to work with ecologists for standard agreed methodologies).

- The use of **policy appraisal** methods where valuation data is clearly presented as a value added to the overall appraisal (see for example, the pyramid of valuing ecosystems given in the TEEB report (EC, 2008)).

- The usefulness of a **major coordinated research exercise** at an early stage in valuation research development for a particular policy area e.g. ExternE for energy policy. This can set the agenda and aid use/acceptability for policy making. However, if development of research is not well coordinated and focused at the

start the application for policy can be hampered. The example of valuation of ecosystem services was given.

- The need for **external peer review** from the beginning of commissioned studies. Related to this was a recommendation for a mechanism from the start of a (commissioned) study to guide its **policy relevance and the presentation of results** in an user friendly format.

For **data gaps** the recommendations were for:

- An **improved database** of existing data. A database such as EVRI needed better database management in order to identify research gaps in primary valuation. And strategic approach was needed to fill gaps rather than the existing ad hoc approach.
- It was argued by one interviewee that **more repetition** in application was needed to increase the number of studies on particular policy issues (i.e. specialists may prefer to push forward in new areas rather than consolidate).

Other recommendations were:

- The need for **better communication** between specialists and policy makers/data users was referred to by a number of respondents. This concerned the need for better identification of what research will be needed for policy makers. While there is often good contact between the two sides (such as through the DEFRA academic panel) this tends to be on a project by project basis rather than on a strategic level where overall needs are discussed. Thus these forums could be expanded to provide a better "alignment of expectations" between specialists and policy non specialists.

- The need to address **the timing** issues (as outlined above) but without specific practical recommendations.

- It was suggested that there should be more impetus in use of valuation methodology at **local level**. The example was given of the lack of valuation of environmental impacts in the WRATE (Waste and Resources Assessment Tool for the Environment) software that compares the environmental impacts of different municipal waste management systems.

3.6 Conclusions

The findings from interviews and document review indicate that the capacity and knowledge of environmental economics techniques in some UK government departments and agencies has increased greatly in recent years, in particular in DEFRA. The situation in other departments is more mixed. Thus, the use of carbon valuation is understood by a broader cross section of central government than other areas of valuations and knowledge of other applications of valuation varies by relevance to the department.

The examples given in this case study indicate increasing policy use of research on externality valuation across a broad range of sectors and environmental issues in the UK. This coincides with finding of the Bureau & Glachant (2006) UK case study that monetary valuation methods and CBA

were being used in UK policy increasingly by different stakeholders over the last decade, although while reference is made to valuation results, "they are rarely used as the main supportive evidence to justify final political decisions". The extent of direct policy use varies but in some areas this has been significant, in particular for water policy. The examples also show a range of types of policy uses from CBAs for project appraisal, to ad hoc support for specific policy measures and sector wide strategic assessments. There are some examples of engagement by UK Government Departments with development of environmental accounts but we did not find close connection of UK Government departments with EU level initiatives in green accounting. There has been some use of ExternE data in UK policy documents but, on the whole, policy related research using externality valuation data is funded from UK sources rather than EU sources. Thus the EU level influence on the policy use of such valuation in the UK is more from EU legislation which, by setting agendas and influencing policy priorities, can provide a key driver for demand for this research along with other types of research.

The analysis of energy policy found that direct policy use of externality valuation has occurred in the UK both for project appraisal and at strategic level. Key areas of policy use at the strategic level have been in the context of social cost of carbon and air quality valuation. However, the recent statement by DECC indicates a shift away from official use of the social cost of carbon approach for carbon valuation in UK policy towards use of the cost of mitigating emissions. The key reason for the change is given as the uncertainty connected to estimates of the SCC and that the new approach helps to ensure that "the policies the UK Government develops are consistent with the emissions reductions targets".

For waste policy two cases of direct use of externality valuation data in the design of policy instruments are highlighted, the Landfill Tax and the Aggregates Levy. However, the Landfill Tax has moved away from using these estimates and tax rates have been more influenced by the need to meet targets of the 1999 European Landfill Directive.

It is interesting to note, therefore, that in two prominent examples of the use of externality valuation research in policy, the cases of the social cost of carbon and the Landfill Tax, the need to ensure that target commitments are met has resulted in a subsequent shift away from their direct use.

Key findings from the semi structured interviews undertaken in this case study were:

- Externality valuation methods have been used increasingly in UK Government and acceptance of such approaches was usual in some departments and divisions (such as in DEFRA) and for some policy issues (such as, carbon valuation), although this was not the case in some other areas of government and other policy issues.

- Expressed criticisms encountered in the policy arena tended to focus on conceptual and technical issues rather than philosophical issues.

- Communication of findings was a key issue raised. In particular, this concerns how to appropriately present the meaning and applicability of valuation of research to policy makers

- Methodological and data availability issues were seen by most interviewees to be more important barriers to policy use than other objections to valuation techniques. These issues included use of benefit transfer and uncertainties caused by the variation in monetary valuations between studies.

- The issue of timing was raised by several interviewers. The timeframe required to produce primary research results may not match the shorter timeframe for answers that is often required in policy making.

- The most common recommendations concerned: (i) the promotion of good practice (including through guidelines pitched at the appropriate level for specialist and non specialists) , (ii) addressing data gaps and (iii) communication between specialists and policy makers/data users

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4 Case Study of the German Energy Sector

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Introduction

This sector study provides a qualitative analysis of how research on external effects has influenced policy making in the energy sector in Germany. Since a large share of Germany's energy demand is still covered by fossil fuels, it is crucial to analyze how policy decisions help to overcome negative externalities. In order to examine this issue, it is important to begin by defining what external effects are in general and explain the different theoretical policy instruments for an internalization of these effects which is done in Section 2. Section 3 provides an overview of potential externality types in the energy sector and presents key research programmes that valuate external costs. Section 4 points out how different policy instruments are implemented in European and German policy making. Section 5 analyses policy impacts of external cost studies by examining results of interviews with policy makers. Section 6 concludes.

4.1 Policy Context

Externalities in General

In general one can say that externalities exist, if the utility function of a market participant contains at least one parameter that is not completely influenced by him- or herself but by another party, i.e. an economic action has an impact on individuals that are not directly involved in that action. In a perfect market, all parties have to pay the costs induced by their actions. On the other hand, every party should be compensated with an appropriate reward if an advantage for a third party is generated by the action of that party. If these conditions are not fulfilled, the costs or benefits in the production or consumption of a product or service are not reflected by their prices. External effects form the basis for market failure.

From the perspective of individuals who are affected, these (technological) external effects may be negative or positive. A positive impact is called an external benefit while negative externalities are called external costs or external diseconomies. Externalities can be found in all sectors of the economy. Regarding to environmental problems, especially external costs in the energy and transport sectors play a significant role.

Policy Instruments for the Internalization of External Costs

In theory there are a lot of economic instruments that help internalize external costs in the energy sector which will be presented in this section.

The *Coase theorem* states that under the assumption of clearly defined property rights and the absence of transaction costs, bargaining will lead to a Pareto-optimal outcome without governmental intervention. Furthermore, it says that those conditions result in an efficient level of environmental quality regardless of the initial allocation of the property rights[33]. On the one hand, if the polluter has the right to pollute, the injured party has an incentive to compensate the polluter for a reduction of emissions to a certain level. On the other hand, if the polluter does not have the right to pollute, he has the opportunity to buy these rights and compensate the injured party for polluting. Without transaction costs, in both cases the resulting level of emissions is the same.[34] In practice, however, transaction costs cannot be neglected and complete information of all participating actors does not exist. Therefore, the initial allocation of property rights often plays an important role. Hence, this theoretically efficient method of bargaining is prevented in the majority of the cases by the existence of transaction costs and poorly defined property rights.

A different approach to environmental issues is to rely on *liability laws* that make polluters legally responsible for the damages they cause. The purpose is to avoid external costs by making the "would-be polluter" take into account the costs for the compensation of the injured party.[35] Whether this approach is efficient depends on the definition of the law. Two liability approaches are conceivable, i..e. tortious liability and absolute liability. Absolute liability means that the polluter is liable for all damages resulting from his action regardless of his own default. In contrast, a tortious liability means that the polluter only has to pay for intended and negligent damages.

With absolute liability the polluter does not only have an incentive to reduce expected damages but also high incentives to search for better opportunities of minimizing them due to the high risk of financial losses.[36] Hence, an absolute liability seems to be an efficient instrument for internalization. In contrast, due to the lower risk, a tortious liability is less efficient as with this approach the economic incentive of searching for new opportunities of avoidance is much lower.[37]

Particularly in relation to environmental problems, there were many attempts to influence the preferences and the targets of economic subjects by appealing to their moral values. There are objections, however, that can be raised concerning the use of *moral suasion* as a primary policy approach.[38] In imposing the burden to the part of the population that is morally more sensitive, moral suasion is often considered

[33] Cf. Blankart (2003), p.524.

[34] Cf. Fritsch/Wein/Evers (2007), p.134 ff.

[35] Cf. Field (1994), p.190 f.

[36] Cf. Fritsch/Wein/Evers (2007), p.146 ff.

[37] ibd. p.147.

[38] Cf. Romans (1966), p.1221.

inequitable.[39] Experience indicates only a minor effectiveness of this instrument so that it cannot be used as a substitution for compulsory instruments.

These compulsory instruments such as *taxes* for the causer of external costs, the establishment of a system for *tradable discharge permits*, e.g. for greenhouse gas emissions, *prohibitions*, *conditions*, *standards* or similar regulatory approaches such as *pollution permits* which allow to emit a specific quantity of emissions may be solutions to the problems stated above.[40]

There are different possibilities to internalize negative technological externalities by means of taxes. A *Pigouvian tax* burdens the polluter in a way that private and social marginal costs coincide exactly at the optimal aggregate output. Pigouvian taxes require a detailed assessment and attribution of external costs and a continuously adjusted rate of taxation. As the state's information costs for the determination of this optimal tax rate are too high in practice, Pigouvian taxation is only approximately feasible.[41] On the contrary, the *standard price approach* operates without the effort of assessing the optimal aggregate output. According to this approach, policy makers set a goal for a maximum of emissions and polluters have to pay a tax for every emission unit they cause. Pigouvian taxes as well as the standard price approach are efficient instruments to internalize external costs, but both are afflicted with the problem of determining the right tax rate.

In Germany like in many other European countries eco-taxes for electricity and fuels serve as an example for a fiscal environmental policy instrument to internalize external costs.

Regulatory instruments like pollution permits and standards are very simple instruments to avoid or regulate external effects. The usual permit is a property right to emit a maximum quantity of pollutants. Such approaches have been widely used in environmental policy, for instance they are pursued by the German *Bundesimmissionsschutzgesetz* (*Federal Immission Protection Act*).

However, the popularity of these instruments is rather explainable with their political feasibility than with quality and effectiveness. Inefficiencies arise as policy makers are not able to assess the optimal quantity of pollution permits. Moreover, they are not capable of taking into account particular differences between emitters of a specific pollutant.[42]

The internalization of external costs by *tradable discharge permits* embodies elements of the Coase theorem as well as the standard price approach.[43] Similar to the Coase theorem the role of the state is confined to the definition of the legal framework. The total quantity of tolerable emissions is limited by the state through a political process.

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[39] Cf. Field (1994), p.201.

[40] Cf. Siebert (2008), p.132.

[41] Cf. Fritsch/Wein/Evers (2007), p.122 ff.

[42] Cf. Siebert (2008), p.133.

[43] Cf. Fritsch/Wein/Evers (2007), pp.140 ff.

As the total volume of emissions is defined by the cap, emissions trading permits lead to a concrete level of pollution avoidance. Hence, this mechanism ensures that the emissions target is reached. The licenses are either sold or distributed to the polluters. Only the owners of pollution licenses are allowed to emit a limited quantity of emissions per period. If public authorities purpose a successive reduction of the total quantity of emissions it is possible to distribute fewer permits in the following periods. Due to the transferability of the licenses a price for pollution rights is established and the allocation of the emission rights is set via the price mechanism. Hence, systems based on tradable discharge permits can be considered to be an effective instrument of internalizing external effects.[44] European policy makers follow this approach with the European Union Greenhouse Gas Emissions Trading Scheme (EU ETS).

4.2 External Costs in the German Energy Sector

First and foremost, the most important type of external costs in the energy sector arises from greenhouse gas emissions caused by the combustion of fossil fuels. On the one hand, these emissions are the reason for changes in climate. This applies in particular to carbon dioxide (CO_2) emissions but also to the emissions of other greenhouse gases such as methane (CH_4) and nitrous oxides (NO_x). On the other hand emissions can be harmful to the health of residents living in the surrounding area of electricity power plants, but also power supply lines may injure the health of people who live in their direct environment. Due to the lack of imputability of the long-term costs these consequences are not taken into account by the polluter.[45]

Furthermore, power plants which do not use fossil fuels may have negative external effects as well. The case of nuclear electricity generation shows that the latent hazard of an accident in nuclear plants can be considered as such an effect. It is conceivable that even renewable energy sources cause external effects. For instance, the construction of equipment for wind power as well as the construction of solar PV equipment might influence biodiversity in the respective areas. Wind and biomass installations might cause externalities on residents as to noise pollution or odour nuisance. However, our sector case study will not concentrate on these types of externalities since their extent as well as the real policy effect is difficult to measure. Instead, the following components will be examined in greater detail:

- Externalities caused by greenhouse gas (GHG) emissions that accelerate anthropogenic climate change
- Externalities caused by hazards due to nuclear power plants

The objectives of the study are thus to assess the impacts of these negative external effects on policy-making.

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[44] Cf. Antes/Hansjürgens/Letmathe (2008), p.23

[45] Cf. Coase (1960), p.42.

Up to now, the main research programme to valuate external costs in the energy sector was ExternE (Externalities of Energy), cf. Bickel & Friedrich (2005). This project was conducted by the European Commission, Directorate-General for Research. The principal aim was to transform externality impacts into monetary values. The methodology behind these estimations (Impact Pathway Approach - IPA) consists of four principal steps. First, the emission is defined by specifying the relevant technologies and pollutants. In the second step (dispersion), the increased pollutant concentrations are calculated. The next step encompasses the computation of the impact in physical units whereas in the fourth stage these physical values are transformed into monetary values by estimating follow-up costs of the damages. The project covered various subjects, e.g. morbidity and mortality caused by different pollutants and noise, impacts on agriculture and construction materials, global warming, accidents and impacts on the ecosystem and biodiversity. Another research programme which is widely regarded by German policy makers was *Identifizierung und Internalisierung externer Kosten der Energieversorgung* (*Identification and Internalization of External Costs in Energy Supply*), cf. Prognos (1992). It was conducted by the German Federal Ministry of Economics and Technology (BMWi) in the early 1990s and quantified and monetized impacts arising from external effects. Other research projects whose subject is to valuate external costs in the energy sector include New Ext (New Elements for the Assessment of External Costs from Energy Technologies) commissioned by the European Commission, DG Research and CASES (Cost Assessment for Sustainable Energy Systems), an FP5 project of the European Commission.

In previous projects ZEW performed research dealing with evaluation of external costs and policy impacts in the energy sector, respectively. The project "Social Costs of Energy" which was part of the ExternE project series developed a methodology for the evaluation of external costs and its implementation for selected EU member states, also cf. Rennings & Koschel (1995) for a qualitative survey on external costs and policy instruments on their internalization. Against this background, ZEW worked on the following issues:

- Assessment of social costs and benefits of climate change (methodological improvements of the assessment strategy concerning the issue of inter- and intragenerational equity in particular).

- Assessment of non-environmental externalities (integration of nuclear proliferation under consideration of associated problems).

- Assessment of social costs and benefits of rational energy consumption (use of case studies for the approximation of external costs (savings) due to the use of various ´smart energy´ strategies).

Another project that dealt with policy decisions regarding the energy sector computed the economic effects of the nuclear phase-out in Germany, cf. Böhringer et al. (2000), Böhringer and Vögele (1999). Apart from looking at the legal framework for abandoning nuclear energy, the possible economic and emission-related effects were examined that a decision to stop exploiting nuclear power could have. A dynamic economic model backed up by energy technology was used for a quantitative study of opting-out scenarios.

Finally, on a qualitative scale a list of criteria was produced with which the role of nuclear power in a medium- to long-term energy concept was critically examined.

4.3 Environmental Policies in Europe and in Germany

In this section, the most important European and German policy decisions concerning the externalities outlined above are specified and analyzed regarding their economic efficiency and their environmental effectiveness. Furthermore it is analyzed whether economic research results are implemented in these decisions.

4.3.1 Energy and Climate Package

On the EU climate summit in March 2007 the European member states agreed upon binding climate targets, the so called 20/20/20 by 2020 aims. The agreement sets three key targets: [46]

- A reduction of at least 20 percent in greenhouse gas (GHG) emissions by 2020 - rising to 30 percent if there is an international agreement committing other developed countries to comparable emission reductions,
- A 20 percent share of renewable energies in EU energy consumption by 2020,
- A reduction of the EU's energy consumption by 20 percent below the expected level of 2020 by improving energy efficiency.

With the "Energy and Climate Package" adopted on December 17th, 2008, the EU translates these and further climate targets into norms. The package contains six norms:[47]

- A directive that sets legally binding targets for the share of renewable energy,
- A directive for a more ambitious Emissions Trading System from 2013,
- A decision that sets targets for a reduction of emissions not covered by the EU ETS e.g. for small-scale emitters in such sectors as transport, buildings, agriculture and waste, which represent approximately 60% of total GHG emissions in the EU,
- A directive that provides a legal framework on geological storage of CO_2,
- A regulation that sets binding targets to ensure that emissions from the new car fleet are reduced,
- The fuel quality directive that places an obligation on suppliers to reduce GHG from the entire fuel production.

[46] Council of the EU (2007), pp.11 ff.

[47] European Parliament (2009) pp.1 ff.

These norms that pertain to several fields of the European environmental policy are explained in detail in the respective subsection.

4.3.2 Emissions Trading

With the European Union Emissions Trading Scheme (EU ETS) European policy makers put the theoretical instrument of tradable discharge permits into practice. The scheme aims to achieve the goals defined in the Kyoto Protocol in 1997 "through an efficient European market in greenhouse gas emission allowances, with the least possible diminution of economic development and employment."[48] In European law it was implemented in 2003 with *Directive 2003/87/EC* and came into effect on January 1st, 2005. Under the EU ETS large CO_2 emitters are obliged to monitor and report their emissions. For this purpose, with the decisions *2004/156/EC* and *2007/589/EC* the European Commission established guidelines for the monitoring and reporting of GHG emissions.[49]

Furthermore, for each period each member state has to develop a *National Allocation Plan* (NAP) stating the total quantity of allowances it intends to allocate[50]. In Germany this directive is transposed into national law by the *Treibhausgas-Emissionshandelsgesetz* (*Greenhouse Gas Emissions Trade Act*) (2004), which sets the legal basis for emissions trading in Germany. As in every other European state, two NAPs were implemented, the first (NAP I) for the emission period from 2005 to 2007 and the second (NAP II) for the period from 2008 to 2012. Furthermore, the *Zuteilungsgesetz* (*Allocation Act*) (2004 and 2007) regulates national aims for the emissions of CO_2 and the distribution of discharge permits.

In the German NAP I annual emissions for energy and industries were fixed at 503 million tonnes of CO_2 for the period from 2005 to 2007.[51] As this allowed the industries to emit more CO_2 than actually needed, the price for CO_2 nearly fell to zero in the beginning of 2007. In the current period up to 2012 the annually permitted emissions are limited to 495 million tonnes.[52] For the third phase starting in 2013 more stringent caps are planned.

Besides the absolute amount of permitted emissions it is of great interest how the allocation of the permits is organized. In the first phase the NAP I stated the grandfathering principle as the general method of allocating permits.[53] The allocation of emission allowances by grandfathering is free-of-charge and based on past emissions.

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[48] European Comission (2003a), p.32

[49] Cf. European Comission (2004) and European Comission (2007).

[50] Cf. European Comission (2003a), pp.35 f.

[51] Cf. Antes/Hansjürgens/Letmathe (2008), p.27

[52] Cf. Antes/Hansjürgens/Letmathe (2008), p.27

[53] Cf. BMU (2004a), p.32.

Firms that polluted more in the past are allowed to emit more CO_2.[54] According to Antes et al. (2008), the design of the first German NAP significantly differs from its economic ideal as it may limit the effectiveness and efficiency of emissions trading.[55] In the second period from 2008 to 2012 grandfathering still is a basic principle of allocation but for the energy sector also benchmarking between factories is possible[56], i.e. the allocation of certificates follows a benchmark for CO_2 emissions of comparable industries. In practice, this means that a factory that produces more emissions than a comparable one and therefore needs more certificates for the production of the same output suffers economical disadvantage.[57] Compared with grandfathering this allocation rule provides more incentives for developing cleaner production technologies.

Moreover, with the possibility of auctioning 10 percent of the permits, NAP II allows a third procedure of allocating emission rights.[58] Unlike with grandfathering and benchmarking, with auctioning firms have to pay for their emission permits. In the first and the second period of emissions trading in Germany the low acceptance of the firms affected averted a more extensive implementation of this method. Nevertheless, from an economic point of view this third method of allocation has some advantages: Auctioning the permits results in a higher dynamic efficiency and lower transaction costs than an allocation at no charge.[59] Besides the fiscal argument, these economic advantages are reasons that in the ETS periods after 2012 more of the allowances are auctioned in Germany.[60, 61]

The Commission estimates that in 2010 46 percent of the European CO_2 emissions are covered by the emissions trading system.[62] The first ETS directive covered four main sectors: first, the energy sector with activities like combustion installations or mineral oil refineries, second, production and procession of ferrous metals, third, mineral industries like the production of cement clinker, and fourth, other activities such as production of pulp and paper.[63] In 2008, *Directive 2008/101/EC* that includes aviation activities in the scheme for emission allowance was enacted.[64] With the Energy and Climate Package of 2008 further sectors were added to this list. Particularly, the chemical industry and the emissions related to capture, transport and geological storage of greenhouse gases were added. Furthermore, other greenhouse gases like nitrous oxides (NO_x) are worth mentioning.[65] In addition, the climate package contains a decision for the emissions not

[54] Cf. Lucht/Spangardt (2005), p.21.

[55] Cf. Antes/Hansjürgens/Lethmathe (2008), p.31.

[56] Cf. BMU (2007), p.30f.

[57] Cf. Lucht/Spangardt (2005), p.21

[58] Cf. BMU (2007), p.10.

[59] Cf. Diekmann/Schleich (2006), p.260.

[60] Cf. Diekmann/Schleich (2006), p.259.

[61] Cf. Kemfert/Diekmann (2009), p.171.

[62] Cf. Lucht/Sprangart (2005), p.68.

[63] Cf. European Comission (2003a), p.42.

[64] Cf. European Comission (2008a).

[65] Cf. European Parliament (2009), p.121.

covered by the EU ETS. In these sectors, in particular transport and service industries, small industry plants and agriculture emissions are to be reduced by 10 percent on average in Europe as a whole and by 14 percent in Germany until 2020 based on the emissions of 2005.[66]

4.3.3 Ecological Tax Reform

In 2003 EU *Directive 2003/96/EC* was enacted to restructure the community framework for the taxation of energy products and electricity.[67] It was transposed into German law in 2006 with the displacement of the *Mineralölsteuergesetz* (*Oil Tax Act*) by the *Energiesteuergesetz* (*Energy Tax Act*), which covers the regulation of several sorts of fossil fuels, natural gas, coal and lubricants. Except for some relevant changes like the implementation of taxes for biofuels and coal that is used for heating, the importance of the EU directive for Germany was rather small as extensive eco-taxes had already been implemented since the *Gesetz zum Einstieg in die Ökologische Steuerreform* (*Act Concerning the Entrance into the Ecological Tax Reform*) of March 1999.[68]

With this act an eco-tax was levied on electricity, except for electricity based on renewable sources, and the tax for petrol, diesel, natural gas and light fuel oil was increased.[69] Thus the act followed the recommendations of the Commission and the OECD to implement ecological taxes.[70] Concerning this act, the policy impact of externality research is apparent as the aim of internalizing external costs of pollution is clearly mentioned by the German government.[71] However, although economists basically appreciated the implementation of eco-taxes as a market-based internalization strategy, the realization was highly controversial. Based on the results of interviews which are outlined in more detail in Section 5 it is not clear to what extent external cost valuations had a direct influence on the design and the level of the tax. Those estimations seem to have served as argumentation assistance rather than being directly transformed into the implemented design.

The ecological tax reform attempts to combine elements of environmental policy and employment policy.[72] Economists criticized this combination of aims as counterproductive and were in doubt about the effectiveness of the tax. [73,74,75]

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[66] Cf. European Parliament (2009), p.145.

[67] Cf. European Commission (2003b)

[68] Cf. BMU (2004b), p.4.

[69] Cf. Gesetz zum Einstieg in die ökologische Steuerreform (1999).

[70] Cf. BMU (2004b), p.4.

[71] ibd..

[72] Cf. RWI (1999), p.14.

[73] ibd.

[74] Cf. Böhringer/Schwager (2002), p.11.

[75] Cf. Blankart (2003), p.533.

With the *Gesetz zur Fortführung der ökologischen Steuerreform* (*Act Concerning the Continuation of the Ecological Tax Reform*) in December 1999 a successive increase of the taxes was determined and heavy fuel oil was added to the list of taxed energy products.[76] Additionally, for large parts of the industry as well as for agriculture and forestry a reduced tax rate by the amount of 20 percent of the standard tax rate was implemented in order to avoid competitive disadvantages for these sectors. Further abatements were granted for local public transport and cogeneration plants for heat and power.[77] These exclusionary rules were sharply criticized by economists as they expected negative impacts on the incentives to reduce emissions.[78]

From an overall economic point of view a uniform taxation of energy sources would be much more efficient as emissions were avoided at minimal costs.[79] Therefore, the *Gesetz zur Fortentwicklung der ökologischen Steuerreform* (*Act Concerning the Further Development of the Ecological Tax Reform*) of 2002 contains measures that improved environmental taxation in Germany. Among other rearrangements, environmentally harmful and inefficient tax abatements for the industrial sector were reduced significantly.[80]

With the introduction of a tax for coal and reductions of tax allowances in the *Energiesteuergesetz* (*Energy Tax Act*) further measures for a consistent taxation of energy sources have been introduced.[81]

Despite these modifications, there are still many exceptions for some sectors that prevent a significant impact on externalities. Therefore from an economic point of view the evaluation of the German eco-tax is ambivalent. The impact on climate protection was rather small in the first ten years of this measure. In contrast, from the fiscal point of view the measure was a success as it meant high additional tax yields amounting to 0.7 percent of the German GDP.[82]

4.3.4 Measures Concerning Energy Efficiency

Improving energy efficiency is often mentioned to be one of the most promising ways to reduce greenhouse gas emissions. This paragraph shows and discusses European and German policy actions that have been implemented to achieve this aim. First activities to improve energy efficiency on a European level were already made in 1992 with Council *Directive 92/75/EEC* on the indication by labelling and product information of energy consumption by household appliances and again in 1993 with the SAVE directive. The purpose of the SAVE directive was the limitation of CO_2 emissions, particularly by

[76] Cf. Gesetz zur Fortführung der ökologischen Steuerreform

[77] Cf. BMU (2004), p.4.

[78] Cf. Böhringer/Schwager (2002), pp. 7 f.

[79] Cf. Böhringer/Schwager (2002), p. 12.

[80] Cf. BMU (2004), p. 7

[81] Cf. Truger (2006), p.172 ff.

[82] Bach (2009), p.218

improving energy efficiency of buildings and by billing of energy costs on the basis of actual consumption. Further acts were enacted concerning energy efficiency, particularly in the fields of energy performance of buildings (*Directive 2002/91/EC*), office equipment (*Regulation EC No. 2422/2001*), and energy-using products (Eco-design *Directive 2005/32/EC*). The Energy Performance of Buildings Directive forms the statutory framework for setting minimum standards of energy efficiency. The German *Energieeinspargesetz (2005)* and the *Energieeinsparungsverordnung (2001)* (acts regulating energy saving) transpose most parts of this directive into national law. The Eco-design directive does not introduce directly binding requirements for specific products, but defines conditions and criteria for setting standards regarding environmentally relevant product characteristics. The regulation for the prohibition of electric bulbs is only one of the actions taken on the basis of this norm. The directive is transposed into national law by the *Energiebetriebene-Produkte-Gesetz* (*Energy-Using Products Act*) in 2008.

A further EU-wide supported measure is subsidizing cogeneration plants for heat and power. As these plants also use waste heat of electricity production they are much more efficient than standard thermal power plants. To boost this technology, in 2004 the EU enacted *Directive 2004/8/EC*. In Germany there had already been a norm to support this technology since the introduction of the *Kraft-Wärme-Kopplungsgesetz* (*Act Concerning Cogeneration of Heat and Electricity*) in 2002. Furthermore in *Directive 2006/32/EC* the Commission set concrete requirements concerning energy end-use efficiency and energy services.[83] Between 2006 and 2015 member states shall adopt and aim to achieve an overall national indicative energy savings target of 9 percent to be reached by means of energy services and other energy efficiency improvement measures.[84]

Most of these norms set the framework for standards. In the politician's view these standards have the advantage that emissions can be reduced (apparently) without monetary costs.[85] From an economic point of view this regulatory approach is less preferable than a market based solution like taxes or emissions trading. This has several reasons: Emissions can be avoided at minimal costs, if the marginal abatement costs are equal for all emitters. However, with standards this adjustment is not reached as with this approach the costs of compliance with the standards are not taken into account.[86] Hence, as market-based approaches generate less social costs, these instruments should be preferred. A further and often neglected aspect is that standards can also impose negative distributional effects, particularly for low-income households, as they force the consumer to buy products which meet the standards and are hence more expensive. Low-income households often cannot afford these products.[87, 88]

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[83] Mennel/Sturm (2008), p.11.

[84] European Commission (2006), p.69.

[85] Mennel/Sturm (2008), p.57.

[86] ibd. p.56.

[87] ibd.

[88] That this argument especially applies to low-income households is up to the fact, that these households generally have a higher rate of discount.

The intensive use of these standards shows that although the German government and the EU claim to act on the basis of economic research by decreasing its "exposure to external factors by giving the right incentives to the EU's internal energy market to consume less energy through improved energy efficiency"[89], this was not completely accomplished in many instruments concerning energy efficiency.

4.3.5 Measures Concerning Renewable Energy

With the Energy and Climate Package of 2008 the EU established a target of a 20 percent renewables share in the total energy consumption and a 10 percent target for biofuels in transport by 2020. Furthermore *Directive 2009/28/EC* that belongs to this package, promotes renewable energy types.[90] In the Annex to the Climate Package, use of externality research is apparent. The problem of external cost is emphasized as a "specific problem driver related to renewable energy sources"[91] This accentuation of externalities and the also mentioned wide support of their internalization[92] is evidence for an impact of externality research on policy making.

In Germany, renewable energies are boosted since the enactment of the *Erneuerbare-Energien-Gesetz (EEG)* (*Renewable Energies Act*) in 2000. This act guarantees fixed feed-in tariffs for electricity generated with the help of wind energy, solar energy, biomass, geothermal energy or pit gas.[93]

In 2001 the Commission enacted *Directive 2001/77/EC* with the main objective of increasing the share of electricity produced from renewable energy sources in the international electricity market. The Annex to this directive contains specific renewable energy aims for the European Countries.[94] Germany is obliged to increase its share of renewable energy in electricity from 4.5 percent in 1997 to 12.5 percent in 2010. Thereupon in Germany two amendments to the EEG were enacted to transpose this directive into national law. The second amendment of 2008 sets the goal of a 20 percent share of renewable energy in electricity until 2020.[95] This objective is to be achieved by increased support for offshore wind power and a better integration of renewable energy plants into the electricity network.[96] The elementary conception of fixed feed-in tariffs is kept.

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[89] European Commission (2008b), p.12.

[90] European Parliament (2009), p.2.

[91] European Commission (2008b), p.12.

[92] Cf. European Commission (2008b), p.9.

[93] Cf. Erneuerbare Energien Gesetz.

[94] Cf. European Commission (2001), p.39.

[95] Cf. Erneuerbare-Energien-Gesetz (2008)

[96] ibd.

Furthermore in 2006 the *Biokraftstoffquotengesetz* (*Act Concerning Bio Fuel Quotas*) was enacted which transposes *Directive 2003/30/EC* into law. This directive promotes the use of biofuels or other renewable fuels for transport. The *Biokraftstoffquotengesetz* obliges the petroleum industry to introduce a defined and successive growing minimum share of biofuels.[97]

Thus, German policy makers use two main instruments concerning renewable energies: feed-in tariffs and minimum shares. Feed-in tariffs for energy minimise financials risks of independent electricity producers by fixing the compensation for their electricity products. Due to their high effectiveness at low transaction costs feed-in tariffs are statically efficient instruments. As in the German EEG the amount of the tariffs depend on the technological improvements, the German implementation of this instrument also provides incentives for innovation and therefore is dynamically efficient. In contrast, minimum shares (e.g. for biofuels) are less dynamically efficient as they are generally not combined with such incentives.[98]

However, also feed-in tariffs have disadvantages, particularly if the fees for renewable sources are different. In the long run this leads to an inefficient support of technologies that produce energy at higher costs than alternative ones.[99] Therefore feed-in tariffs as well as minimum shares should only be considered an initial funding for promising technologies.[100] In the long run the aims for renewable energies can only be achieved if the technologies used for their production become competitive without these instruments.[101]

Nevertheless, some economists totally refuse specific support of renewable energies. Especially in its present form and the combination with emissions trading they do not only consider this support ineffective but also harmful.[102, 103] Their argument is that fixed feed-in tariffs reduce the demand for emission permits. If now the total amount of emission permits is kept constant, this leads to a decline of their prices and to a shift of permits to other sectors or countries.[104] As these arguments cannot be dismissed, the right coordination of both policy instruments is important. With a right coordination, e.g. with a linking of the expected CO_2 reduction by renewable energies to the cap that is set for emissions trading, negative interdependencies between these two instruments can be avoided.[105]

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[97] Biokraftstoffquotengesetz (2006).

[98] Cf. Ragwitz (2005), pp.2 ff.

[99] Cf. EWI (2004), p.130.

[100] ibd.

[101] ibd., p. 129.

[102] DIW (2009), p.169.

[103] e.g. Blankart et al.: Die Energie-Lüge. In: Cicero 12/2008, 94–95.

[104] DIW (2009), p.171.

[105] DIW (2009), p.174.

4.3.6 Nuclear Power Phase-Out

Most of the policy instruments mentioned in chapter 4.1 to 4.5 attend to internalize external costs caused by the emission of greenhouse gases or particulate matter emissions. Nevertheless, also hazards of an accident in nuclear plants can be considered as external costs which are however difficult to measure as interviews with policy makers suggest (see Section 5).

In Germany the use of nuclear power is regulated in the *Atomgesetz* (*Atomic Energy Act*) which was enacted in 1959. It sets the framework for the peaceful use of nuclear energy and the protection against their hazards. It also contains measures for the internalization of externalities caused by these risks, e.g. with extensive regulations for inspections.[106]

In 2002 an amendment changed the main focus of the *Atomgesetz* and set the framework for a regulated retirement of nuclear power in Germany.[107] With this amendment a convention of 2000 between the German government and the power supply industry was transformed into law.[108] However, it is not clear whether externality research had a direct impact on this decision. The law is justified with common reasons and experiences but not with security concerns.[109] Also the convention between the government and the industry does not directly name reasons for the phase-out.

If the law is kept, the German nuclear power phase-out will most probably be achieved in 2021. However, even after the decision of 2002 the phase-out is discussed controversially in Germany. The German Christian Democratic parties pursue an exit from the phase-out in order to use nuclear power to bridge the energy gap until renewable energies are further improved. The Social Democrats stick to the decision made in 2002. Until the election in September 2009 the phase-out is fixed in the coalition agreement of 2005.[110] However, after this election which has led to a partial change of the ruling parties, an extension of the running time of nuclear power plants is possible. Nevertheless, currently – as of early October 2009 – this cannot be confirmed since the negotiations for the new government have not been finished yet.

4.4 Policy Impacts

In order to find out how research on externalities and external cost valuations influence policy making, different representatives from the German Federal Ministry of Economics and Technology and from the German Federal Environmental Agency

[106] Cf. Atomgesetz, Section 2.

[107] Cf. Atomgesetz, Section 1, § 2, Abs.1.

[108] Cf. Atomkonsens (2000).

[109] Posser/Schmans/Müller-Dehn (2002), p.15.

[110] CDU/CSU/SPD (2005), p.50.

(*Umweltbundesamt*) were interviewed. The results of these interviews show that policy makers in the energy field know what external effects are and that they are aware about the existence of some studies on external costs. However, the application of these studies is limited. This is, in the view of interview partners, due to uncertainties about the definition of externalities, in general, about the estimation results, and about the possibility to quantify these types of costs. External cost data are for example used for the calculation of costs and benefits of specific actions and for the impact assessment of policy actions. This however depends on the subject, i.e. if appropriate studies for a specific issue are existent, they are used. A particular problem is, for instance, nuclear energy since external effects in this area are difficult to monetise and environmental and security concerns might contradict each other. Nevertheless, although the results of external cost valuations are rarely transformed completely into policy actions, they frequently serve as background and argumentation assistance in political discussions. Furthermore, another comment given by interviewees was that the empirics behind external cost estimations are not clearly transparent. As different studies often have diverging results, the uncertainty about the scope of these results might cause additional confusion among policy makers since they are not aware about what specific data of the entire scope should be applied in a particular policy context. Hence, often data at the lower bound of the scope are used.

The main field where external cost studies are applied are issues related to climate protection. Questions for concrete examples to what extent these studies had an impact on policy making showed, for instance, that in particular for supporting the development of renewable energy carriers studies are used as background in order to determine costs and benefits of specific laws. In addition, interview partners remarked that for the development of policy instruments such as eco-taxes estimations on external costs were gathered although nothing could be confirmed about the extent of their impacts on developing the specific design of these actions. The application of such studies however might be influenced by value judgements of policy makers.

Another wide area in which at least qualitative studies are used is policy consulting. The sources of such estimates are studies by all kinds of economic research institutes. In particular, outcomes of EU projects are used. Concrete examples of external cost studies the interviewees could name are the ExternE project series, New Ext and HeatCo (Developing Harmonised Approaches for Transport Costing and Project Assessment) – all these projects were conducted by the European Commission – and furthermore, the research programme *Identifizierung und Internalisierung externer Kosten der Energieversorgung* (*Identification and Internalization of External Costs of Energy Supply*) commissioned by the German Federal Ministry of Economics and Technology. Moreover, interviewees in general pay attention to OECD studies and studies on the willingness to pay.

According to the interview partners, the general perception of policy makers about external cost studies is relatively high depending on their professional background. Interviewees suggested that economists have in general higher background knowledge about these issues whereas non-economists seem to be more sceptical, e.g. about the methodology of surveys used for the calculation of external costs. Nevertheless, many of the policy makers consider external cost valuations not clearly quantified. One recommendation regarding these studies is that more transparency could make them easier to comprehend. In addition, various analyses show notable differences in their

results which makes the understanding of their background more difficult. Hence, a meta-analysis covering all important studies was suggested in order to obtain a comprehensive overview of the subject.

4.5 Conclusions and Recommendations

This study provides a survey of central policy instruments and actions that influenced the German energy sector and the impact that externality research had on policy making in this field. Furthermore, for several policy measures it is discussed if research on environmental externalities actually had an impact or if the norms were enacted for other reasons.

Two important measures, the EU ETS and the ecological tax reform are clearly based on research on external effects. However, in practice these measures might have lost much of their theoretical potential due to significant influence of other factors such as the interests of specific industries. Also the measures supporting renewable energy (feed-in tariffs) rely on externality research. Nevertheless, their effectiveness could be higher if they were coordinated in a more efficient way with emissions trading. Although these instruments evidently take externality research into account, it becomes clear that arguments of economists are often not completely appreciated.

In the future, efficient instruments like the EU ETS and eco-taxes should be improved and widened. So far, these instruments have not completely exhausted their full potential. The EU ETS should be linked to trading schemes beyond Europe in order to achieve the climate policy aims more efficiently.[111] Furthermore it is important to coordinate EU ETS with feed-in tariffs for renewable energy sources to solve the present conflict between both instruments. The fact that these measures are supported by recent norms like the decisions and directives of the Climate- and Energy Package shows the impact of economic research on policy making in energy and climate issues.

Nonetheless, in order to increase policy makers' understanding of studies on external costs, there is still room for improvements in future projects on external cost valuation according to recommendations given by interview partners. First, there should be more transparency how external cost values are estimated so that policy makers can better understand the background of these estimates. Furthermore, a meta-analysis of existing studies would make policy makers able to recognise differences between various analyses and comprehend the causes of these differences. Another possible extension of external cost studies might be to show more interest in the contrast between technological and pecuniary externalities. Finally, future studies should point out more deeply how the simultaneous application of different policy instruments affects the internalization of externalities.

[111] Alexeeva-Talebi, Anger (2007), p.1.

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5 Italian Energy Sector Case Study

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FEEM

5.1 Impact of externality research in the Italian energy sector

5.1.1 Externalities in the Energy Sector and environmental issues of relevance

An external economy (diseconomy) is an event which confers an appreciable benefit (inflicts an appreciable damage) on some person or persons who were not fully consenting parties in reaching the decision or decisions which led indirectly or indirectly to the event in question. (James Edward Meade, 1973)

Following this definition, each of the different types of energy production industries, based on limited resources (Coal, Gas, Oil, Nuclear) or on renewables (water, wind, solar, biomass, thermal) will create different types of externalities, depending on the combustible and/or on the technology used. Besides the type of energy production, externalities will be generated during all the phases of a generic energy production process: from extraction, processing, and power generation, till the waste management.
All of these phases are potentially harmful to the environment in very different ways: from the liquid, gaseous, or solid emissions into air, water, or soil, impacting thus human health, passing from the consumption of resources, the change of land use, till the visual intrusion of different types of onshore and offshore plants (wind energy converters, extraction of natural gas and oil).

5.1.2 Key relevant strategies and policies in place

At the EU level, a number of directives have been drafted thanks to the valuation of externalities. We present below the main energy strategies and policies in place at the EU level inspired by these principles.

EU level

- 1999/30/EC Relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
COUNCIL DIRECTIVE 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0030:EN:NOT

- The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone
The Executive Body adopted the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone in Gothenburg (Sweden) on 30 November 1999. The Protocol sets emission ceilings for 2010 for four pollutants: sulphur, NOx, VOCs

and ammonia. These ceilings were negotiated on the basis of scientific assessments of pollution effects and abatement options. Once the Protocol is fully implemented, Europe's sulphur emissions should be cut by at least 63%, its NOx emissions by 41%, its VOC emissions by 40% and its ammonia emissions by 17% compared to 1990.

- Air Quality Strategy - The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 17 July 2007 (Cmd paper No 7169).
Defra and the devolved administrations published 'An Evaluation of the Air Quality Strategy'13 in January 2005. It evaluated selected air quality policies in the road transport and electricity generation sectors to assess their effectiveness in achieving air quality improvements. The report looked at policies between 1990-2001. However, due to the fact that the benefits of these policies extend far beyond this period, the analysis was also extended over a projected period between 2002-2010.

- 2007 Revision of the National Emission Ceilings Directive
The revision of the National Emission Ceilings Directive 2001/81/EC (NECD) is part of the implementation of the Thematic Strategy on Air Pollution. The proposal to amend the NECD is still under preparation and should set emission ceilings to be respected by 2020 for the four already regulated substances and for the primary emissions of PM2.5 as well. The revision builds upon the evaluation and review of the National Programmes 2002 and 2006, the work performed under the Clean Air for Europe Programme, the Thematic Strategy on Air Pollution, and new scientific and technical work.
http://ec.europa.eu/environment/air/pollutants/cba.htm

- 2008/1/EC Integrated pollution prevention and control
Directive 2008/1/EC of 15 January 2008 concerning integrated pollution prevention and control
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0001:EN:NOT

- 2001/80/EC Emissions from Large Combustion Plants
Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from Large Combustion Plants
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0080:EN:NOT

- 1999/32/EC Sulphur content of liquid fuels
Directive 1999/32/EC on reduction of sulphur content of certain liquid fuels
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0032:EN:HTML

- Communication to the Council and the European Parliament on a Community Strategy to Combat Acidification
http://ec.europa.eu/environment/docum/9788sm.htm

- European Pollutant Emission Register Guidelines
EPER is the European Pollutant Emission Register, the first European-wide register of industrial emissions into air and water, which was established by a

Commission Decision of 17 July 2000. According to the EPER Decision, Member States have to produce a triennial report, which covers the emissions of 50 pollutants to be included if the threshold values indicated in Annex A1 of the EPER Decision are exceeded.
http://eper.eea.europa.eu/eper/default.asp

- 94/63/EC VOC emissions from petrol storage and distribution

Directive 94/63/EC of the European Parliament and of the Council on the control of VOC emissions resulting from the storage of petrol and its distribution from terminals to service stations
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0063:EN:HTML

- 2004/42/CE VOC emissions from organic solvents

Directive 2004/42/CE of the European Parliament and of the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC.
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0042:EN:NOT

- 2006/21/EC waste from extractive Industries

Directive 2006/21/EC of 15 March 2006 of the European Parliament and of the Council on the management of waste from extractive Industries and amending directive 2004/35/ec
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0021:EN:NOT

- 2008/98/EC Hazardous waste new directive

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives (text with EEA relevance)
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF

2004/35/CE prevention and remedying of environmental damage
Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0035:EN:HTML

National level

Besides the transposition of the above mentioned directives into the Italian normative system, at the National level, no policy today in place have been drafted taking into account existing valuation of externalities. Thus, the policy style of the country in the energy sector is strongly focused on regulation instruments.

In Italy, no guidelines directly suggests the use of economics instruments in the energy sector. There are, however, a number of environmental economic policy

units within academic institutions, theoretically supporting the national administration, also when it comes to decision making.

Above all, ENEA (Italian National Agency for New Technologies, Energy and the Environment) has historically several economic and policy units, but this public institution is now (September 2009) undergoing a strong re-assessment of its organisation and its future asset and role is not yet clearly defined.

5.1.3 Background to External Cost Research in the Case Study

Externalities in the Energy sector

One common point to almost all energy industries is the huge use of water, of which a great part is sea water, mainly for cooling purposes through heat exchangers: this poses the threat of thermal pollution when water is discharged. Other types of externalities are typically depending on the technology adopted for power generation.

Coal

Coal is the largest source of fuel for the generation of electricity worldwide, as well as the largest worldwide source of carbon dioxide emissions, the major contributor to the increase in global average temperature and related climate changes.

Another important source of pollution generated by this technology is the emission of nitrogen oxides and sulfur dioxide into the air, which in turn acidifies precipitation. This then leads to the acidification of soils and freshwater bodies, damages plants and aquatic habitats, and corrodes building materials.

Coal combustion also emits particulates that have a serious impact on public health, such as coal fly ash, but also secondary sulfate and nitrate comprise a major portion of the particulate matter from coal-fired plants.

Oil and Gas

During Exploration & Production (E&P), water is used in great quantities both in onshore and offshore plants to be injected in the wells to guarantee an adequate pressure level to then emerge coupled with oil or gas. Also thanks to important quantities of water, the refining industry purifies, or refines crude petroleum into various products such as gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants thanks to various processes such as fractionation, distillation, and cracking, thus generating important quantities of contaminated effluents. Lastly, the transportation of fuels is mainly achieved trough pipelines and shipping, where the risk to threat water can happen during oil spills.

The atmospheric emissions of energy companies are mainly caused by combustion, therefore by the choice of fuels in the technologies adopted. The use of pipeline transportation technology limiting fugitive emissions is also important. In the E&P sector, the main gaseous emissions are related with greenhouse gases (GHG) emissions, coming especially from flaring and venting operations, while NOx and SOx emissions come from combustion activities, especially flaring and significant NMVOC fugitive emissions are mainly due to

venting activities. Then, main GHG emissions are due to fuel consumption in the power plants, while natural gas emissions originate mainly from pipelines during transport and distribution activities. SOx and NOx emissions can be limited due to the preferential use of natural gas as a fuel, with a very low sulphur content. In the Refinery sector the main GHG and NOx and SOx emissions are related with fuel consumption in the refineries, while significant NMVOC fugitive emissions originate from logistics and distribution network. In addition, emissions of particulate are considered, which originate mainly from fuel oil combustion in the process furnaces and in the boilers.

Severe impacts on soils are generated during the E&P phases, trough the generation of cutting drills and fluids on site. These lands needs to be remediated after the exploitation phase has ended, generating important quantities of liquid and solid wastes which then need to be disposed. More in details, during perforation of the earth's crust to reach the oil or gas field, drilling cuts are brought on the surface thanks to a fluid with particular chemical and physical characteristics. Drilling cuts and fluids together are then separated in liquid and solid phase to allow the re-use of the fluid; the remaining solid part is called cutting and represents the dangerous solid wastes generated during this phase of the process. Moreover, the most important source of solid wastes is solid sulphur (S8), generated to pull down the sulphur concentration in the gas associated with extracted oil, before its transport in pipelines. Then, during the refinery phase, the main solid wastes are oily and biological muds coming respectively from the cleaning of tanks and pipes or from water treatment plants.

Others

Like all forms of power generation using steam turbines, Nuclear power plants use large amounts of water for cooling, thus generating large quantities of waste heat. The safe storage and disposal of nuclear waste is the main challenge of this technology and is yet an unresolved problem. The most important waste stream from nuclear power plants is nevertheless spent fuel: a large nuclear reactor produces about 25 to 30 tons of spent fuel each year. It is primarily composed of unconverted uranium as well as significant quantities of transuranic actinides (plutonium and curium, mostly). In addition, about 3% of it is made of fission products. The actinides (uranium, plutonium, and curium) are responsible for the bulk of the long term radioactivity, whereas the fission products are responsible for the bulk of the short term radioactivity.

Hydroelectricity, Wind power, Solar Power, Geothermal power, Biomass, are all based on renewable resources and thus do not produced the usual type of externalities related to extraction and waste management for instance. Nevertheless, these technologies do generate some impacts on the surrounding environment which can be assimilated to externalities. These externalities (such as visual intrusion, land-use-change, alteration of river flows, etc..) are often very difficult to evaluate in monetary terms, but they should as well be part of decision making processes leading to the promulgation of policies in the energy sector

External costs estimates in the Energy sector

Although it has been recognized since the 30s that the generation of energy for human activities generates externalities which should be taken into account when formulating policies for the sector, it is only since the 90s that robust estimates of the magnitude of these externalities are available.

The assessment of the several different types of externalities in physical terms can now be done on a routine basis but when it comes to attribute monetary values to externalities, things can get more difficult as external costs include a number of items that are very difficult to evaluate in such terms: for instance external value of land use change, acidification of the aquatic environment, visual intrusion, and the cost of damages by climate change. Several techniques are available to evaluate items not commonly exchanged on the market, but they are not straightforward, and may have a lower level of acceptance from the interested actors.

Nevertheless, important progresses have been achieved in recent years with regard to providing clear and shared framework for the valuation of externalities, particularly in the energy sector. For instance, the externE project, which began in 1990 as a collaborative study between European and American experts, provided a methodology following the "impact pathway" approach, where emissions from a source are traced in each sphere of the environment they are producing impacts. The EC when promulgating important directives for the sector, as well as every EU member state, has used this framework to estimate external costs of different sources of electric power and for other types of energy.

The perception of processes generating externalities lead the decision-makers to promulgate policies which take into account these market failures by foreseeing a number of different policy instruments. The desired instruments should create no distortions on the market, and able to minimize costs and uncertainty and have low administration costs . The instruments commonly applied in such policies include both command and control measures and economic instruments with several possible design options: feed-in tariff, fixed premium, tendering system, tradable certificates, investment subsidies, taxations... etc

In this context, the results from the ExternE studies had and have important policy implications: for the design of Economic instruments, for the evaluation of environmental regulations, and for green accounting. In the next chapters, we will presented a review of the main existing energy policies which took into account externalities estimates during their iter of study and/or promulgation.

The NEEDS project analyses the role and existence of Cost Benefit Analyses for the valuations of externalities in the Energy policy making process in three countries: France, UK, and USA. The authors firstly conclude that the pattern is different in different countries: this follows mainly the official requirements to carry on costs and benefits analyses of proposed regulations and or guidelines. In USA these exercises are far more common than they are in the UK, and even more than in France. This is also ruled by the existing relationship between economic researchers and policy makers in the different countries. A common feature is represented by the fact that these analyses, if performed, are often

done at late stage of the policy making process, and rather less usual than in other areas (e.g. transport, policy).

Climate change

Although consistent literature exist in this field, climate change impacts (externalities) are difficult to assess as they concern many sectors of the society (e.g. health and safety, economic production and consumption, recreation, and environmental and natural assets). When monetary estimates of the damages caused by climate change are made, these are often too uncertain and ranges still too wide. Nevertheless, considering that likely damages of climate change could be very high, important policy efforts lead the international community to follow a precautionary approach, for the adoption of an international agreement to tackle human induced climate change. From this agreement came the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 that called for a stabilization of worldwide emissions of greenhouse gases (GHG) at 1990 levels by the year 2000. Over the next five years, the world community met numerous times to negotiate a binding agreement for meeting the UNFCCC's goal. In December 1997, such an agreement was reached in Kyoto, Japan. The Kyoto Protocol included a commitment to reduce average global GHG emissions by 5.2% between 2008 and 2012. It also outlined a number of mechanisms that could be used by countries to meet their targets. Details of the rules that would govern use of the various mechanisms were left for future Conferences of the Parties (CoP).

In this context, the European Union took a pro-active approach by setting ambitious targets for its member's countries. In January 2007, as part of an integrated climate change and energy policy, the European Commission set out an ambitious global agreement in its Communication "Limiting Global Climate Change to 2 degrees Celsius: The way ahead for 2020 and beyond". In March 2007, EU leaders committed to cut their greenhouse gas emissions by 30% of 1990 levels by 2020, provided other developed countries commit to making comparable reductions under a global agreement. Nevertheless, independently of what other countries decide to do, they committed to cut emissions by at least 20%, thus starting to transform Europe into a highly energy-efficient, low-carbon economy. More in details, the EU set three key targets to be met by 2020: a 20% reduction in energy consumption compared with projected trends; an increase to 20% in renewable energies' share of total energy consumption; and an increase to 10% in the share of petrol and diesel consumption from biofuels. On January 2008 the European Commission put forward a far-reaching package of proposals that will deliver on the European Union's ambitious commitments to fight climate change and promote renewable energy up to 2020 and beyond. Central to the strategy is a strengthening and expansion of the Emissions Trading System (EU ETS), the EU's key tool for cutting emissions cost-effectively. Emissions from the sectors covered by the system will be cut by 21% by 2020 compared with levels in 2005. A single EU-wide cap on ETS emissions will be set, and free allocation of emission allowances will be progressively replaced by auctioning of allowances by 2020. On January 2009, the European Commission set out its proposals to be discussed in Copenhagen for a comprehensive and ambitious new global agreement to tackle climate change and how it could be financed.

This example shows how estimation of externalities, even if highly uncertain, are taken into account by the policy-making sphere.

Other impacts

For what concerns other types of impacts, many EC directives and guidelines have been driven by the need to reduce environmental impacts of electricity generation. In most cases, the Commission has undertaken a cost-benefit analysis of the proposed measures and has often used externE results during the selection and approval process, sometimes modifying the proposal in the light of the results of the analysis.

Sample of relevant external cost estimates for Energy at European level

- **Air pollution - Environmental economics**
- Estimates of marginal external costs of air pollution in Europe (2002)
- Economic Evaluation of Air Quality Targets for Heavy Metals (2001)
- Economic Evaluation of Air Quality Targets for PAHs (2001)
- Study on the economic, legal, environmental and practical implications of a European Union System to reduce ship emissions of SO2 and Nox (2000)
- Economic Evaluation of a Directive on National Emissions Ceilings for Certain Atmospheric Pollutants (1999)
- Economic Evaluation of Air Quality Targets for CO and Benzene (1999)
- Economic evaluation of air quality targets for tropospheric ozone (1999)

http://ec.europa.eu/environment/enveco/air/index.htm#1#1

- **Climate Change – Environmental Economics**
  - The Costs and Benefits of Lowering the Sulphur Content of petrol and diesel to less that 10 ppm (pdf ~140K) (2001)
  - Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change (2001)
  - Economic analysis of EU-wide emissions trading in CO2 (2000)
  - Economic Evaluation of Quantitative Objectives for Climate Change (1999)
  - Reduction of the emissions of HFC's, PFC's and SF6 in the European Union (1999)
  - Options to Reduce Methane Emissions (1998)
  - Options to Reduce Nitrous Oxide Emissions (1998)

http://ec.europa.eu/environment/enveco/climate_change/index.htm

- **EC Research – Publications on EU and Energy Research**

http://ec.europa.eu/research/energy/gp/gp_pu/article_1100_en.htm

- **Socio-Economic Impacts of the Identification of Priority Hazardous Substances under the Water Framework Directive**

Socio-Economic Impacts of the Identification of Priority Hazardous Substances under the Water Framework Directive Following recent adoption of the Water Framework Directive, the European Commission is required to identify, from a list of 32 priority substances, the priority hazardous substances (PHSs) that are of particular concern for the aquatic environment. Consideration of the socio-economic implications is part of the proposed procedure for the identification of PHSs. This study is a first survey of existing information on the potential socio-economic costs of the possible identification of substances as PHSs. It contains a short methodological discussion and a summary of findings in the main report. The individual substances are discussed in specific annexes.

http://ec.europa.eu/environment/enveco/chemicals/pdf/exec_summary_haz_sub_report.pdf

http://ec.europa.eu/environment/enveco/chemicals/pdf/haz_sub_report.pdf

5.2 The Italian energy sector questionnaire

The energy sector questionnaire is intended to investigate, in the Italian context, to what extent the results of research valuing the monetary value of the externalities generated by this sector - and in particular EU-funded research results - have actually been used to support policy makers in the decision making process. Below, we provide a description of the questionnaire and discuss the results of the survey.

The questionnaire was administered by phone in September 2009 to a selected sample of decision makers belonging to six institutions, both private and public, active in the Italian energy sector (see Table 3). The questionnaire is described in the reminder of this Section, while results are discussed in Section 3.

Table 3: Description of the sample.

Institution	Expertise
ENEA	Renewables
FEEM	Energy: Research and policy
World Energy Council Italy	Energy lobbying: oil downstream
Assoelettrica	Energy lobbying
University of Siena	Energy: Research and policy
Politecnico di Torino	Energy: Research and policy

5.2.1 Structure of the questionnaire

The structure of the questionnaire is articulated in the follows three parts:

- Part 1: Introductory questions
- Part 2: Policy impact of research results
- Part 3: Dissemination of research results

Introductory questions

Part 1 introduces the topic of the questionnaire, with a brief presentation of FEEM and a description of the EXIOPOL project. It then explores if, and how much, interviewees are concerned about the concept of externality in general, and in particular in the energy sector. The questions presented to the sample are presented in the box below.

Box 1: Presentation of the questionnaire and Introductory questions

Dear *X,*

Fondazione Eni Enrico Mattei and several partner research organisations are currently carrying out the large-scale EU-funded FP-7 research project: "A new Environmental Accounting Framework for Policy Analysis – EXIOPOL".
In this regard, we would like to know your expert opinion about the impact of past research about the ***external costs and benefits resulting from the energy sector*** *on the Italian and EU policy-making.*

Part 1

1. *According to your opinion, what are the main environmental externality due to the energy sector?*
2. *According to your opinion, is it useful to monetize the energy sector environmental externalities? If yes, why?*
3. *According to your opinion, are Italian decision makers familiar to the concept of environmental externality?*

Question on Policy Impacts of Research

Part 2 explores to what extent and how have valuation concepts and economic studies impacted on policy. The role of research to support the energy policy making is investigated. See Box 2 and Table 4 for the full list of questions.

Box 2: Role of research data in the private and public decision making process in the Italian energy sector.

Part 2 - Let us discuss the public [private] decision making process related to the Italian energy sector.

4. *Based on your experience, what type of information and know-how are usually considered to support the public decision making process? Please select one or more of the option below:*
   - *market data*
   - *internal consultation*
   - *external consultants*
   - *ad hoc research*
   - *other:_____*

Comments:_____

Now we would like you to focus on the results of international - and EU-funded in particular - research on the energy sector.

5. *What sort of knowledge does exist?*
6. *Is the current research knowledge sufficient?*
7. *Is the existing knowledge used in public [private]policy-making?*
8. *Are you informed about any research (national or international) whose results have been used to support public [private] policy making?*
   - *Which models have been applied in these cases?*
   - *Why have these modelling results/data been used?*
9. *As for the results of research on the external cost of the energy sector, are you informed about any research (national or international) whose results have been*

used to support public [private] policy making?

Please fill in the table below:

Table 4

EXAMPLE	Decision taken	Research results employed	Relevance of results to support the decision making process	Type of impact
(exemple1) **Involved stakeholders** **Year:** **Place:**			**Weak** ❑ **Strong** ❑	❑ **Direct use**: Direct impact on policy – initiation of actions, decision influenced, identification of policy instruments (at legislative design and policy paper level). ❑ **Conceptual use**: Awareness raising, formation of opinions, identification of policy instruments (at conceptual level). ❑ **Political use**: justification of decisions already taken and existing policies. Tactical use to postpone decision-making by referring to an on-going study. ❑ **Symbolic use**: Research used to give rationale for decisions but results not inherent in actual decisions.
(exemple1) **Involved stakeholders** **Year:** **Place:**			**Weak** ❑ **Strong** ❑	**Direct use**: Direct impact on policy – initiation of actions, decision influenced, identification of policy instruments (at legislative design and policy paper level). ❑ **Conceptual use**: Awareness raising, formation of opinions, identification of policy instruments (at conceptual level). ❑ **Political use**: justification of decisions already taken and existing policies. Tactical use to postpone decision-making by referring to an on-going study. ❑ **Symbolic use**: Research used to give rationale for decisions but results not inherent in actual decisions.

Question on dissemination of research results

Part 3 explores the role of dissemination to enhance the policy impact of research.

Box 3: Dissemination of research results

Part 3
10. What can be done to make EU research results usable?
11. What are the most promising research areas?
12. How should results be presented to ensure their use in policy-making?
13. In order to improve the policy impact of research results, hat should the ideal target of research dissemination be?

5.2.2 Results

Results of the energy survey

In the reminder of this section, we discuss the key lessons learned from the Italian energy sector questionnaire. Notwithstanding the rather small sample involved it the survey, the information gathered during the personal interviews are very coherent across interviewees, thus enabling us to depict a rather consistent image on the policy impact of research results in the Italian energy sector.

Main results are presented below:

Part 1 - Introductory section

- Irrespectively of their educational and professional background, all interviewees believe that the monetization of the external costs of the energy sector is important in order to define efficient policies, and to support the transition toward renewable energies. However, interviewees are concerned about the uncertainty that still affect the available monetary estimates. In particular, the use of benefit transfer is perceived as a limitation, as well as the uncertainties that still affect mortality and morbidity data. Besides, some interviewees recall the well-known argument that the monetary perspective should not be the sole decision making criteria.
- According to all interviewees, Italian public decision makers are scarcely familiar with the concept of externalities and with the issue of their monetization. If they are, the concept and studies is often delegated to the national specialised research institutions.
- Decision makers in the private sector are perceived to be more informed, but the level of concern is very much dependent on their educational and professional background. Concern comes, into the Italian decision making circle, only when regulations and policies come into force. In this concern, the role of EU directives is crucial in Italy.

- As for the availability of research knowledge on the external impacts of the energy sector, overall this is considered to be sufficient, particularly for what concerns the quantitative analysis of classical air pollutants such as SO2, NOx, CH4, NH3, VOC, O3 and CO2. In details, few issues have been highlighted by interviewees:
  - Few knowledge areas are still lacking: health effects and their related costs; remediation costs; monetary estimates of external costs.
  - The EU-funded EXTERN-E, NEW EXTERN-E, NEEDS and CASES projects are well-known by the interviewees.
  - Available knowledge does not effectively reach both the private and public actors.

Part 2 - Policy impact of research

- From the policy viewpoint – a part from specific valuation procedures, such as Environmental Impact Assessment, which includes (mostly qualitatively) valuation issues inspired by the research sphere – overall, the available quantitative research knowledge is not employed at the Italian policy level (neither national nor local). The policy impact of research results is purely political and symbolic, if any. Examples refer to:
  - promotion of "green" behaviours at the local level, such as reduced use of motorized vehicle to reduce urban pollution;
  - promotion of "green" policies and plans at the local level, such as the introduction of vehicle entry tolls in big urban areas (e.g. Milan); and incentives for micro-hydroelectric plants in mountain areas;
  - promotion of energy strategies at the national level, such as the re-introduction of nuclear power plants in Italy
- Interviewees are not able to provide specific examples of EU-funded research results that directly impacted on the Italian private or public policy decision making, neither economic nor technological research data
- Only two isolated recent examples of research (not EU-funded) integrated into the Italian policy framework have been quoted by the interviewees. Research outcomes have been used in the preparation of the following recent strategic plans: "The National Plan for Energy Efficiency" and "Industria 2015".
- Interviewees are more confident about the impact of research results at the European decision making level. In particular, the cited examples are:
  - CAFE energy bill (use of monetary valuation data. NEEDS and EXTERN-E projects are mentioned)
  - EU energy strategy 20/20/20 (use of PRIMES and GEM3 models)

Part 3 - Dissemination of research results

- The most attractive areas for future research mentioned during the interviews are rather varied. These are:
  - Climate change effects from the energy sector
  - Renewable energies and the related consumers' willingness-to-pay

- Environmental accounting
- Dissemination of research results
- Comparison of impacts across industrial sectors, with special focus to those sectors which are still scarcely regulated

– As for how to improve the impact of research, dissemination appear to be pivotal. In particular, we asked interviewees how improve the visibility of research results. The following points have been highlighted:
  - Dissemination should be performed at three different levels:
    - at the consumers level;
    - at the technical level, with special attention to experts from both the public and private sectors joining international energy associations and meetings;

    - and at the government level (both national and local), with special emphasis to the key technical assistants of policy makers such those advising transport and energy managers, ministries of Environment, Infrastructures, etc.

- Dissemination strategies should be considered and designed within a strategic plan.
- The interaction between Institutions financing research and research end-users should significantly be enhanced.
- Dissemination strategies should be varied in order to cover the whole range of stakeholders: brief notes for lay people and policy makers, seminars, full reports for experts and policy makers, etc.
- Impact of research results would be enhanced by introducing mandatory ex ante valuation procedures (such as cost-benefit analysis, LCA, etc.) to support the design of energy and transportation policies, programmes and plans.

5.2.3 Recommendations

The energy sector questionnaire shows that the policy impact of research results on the external effects of this sector is still rather weak in Italy. Economic and technical research results and data on the negative externalities of the energy sectors are indeed only marginally integrated into the decision making process.

Few available examples of research results influencing the policy circle refer to purely political and symbolic impacts. This applies both to national, EU-funded and international research.

Private and public institutions, are concerned about energy externalities, to a give extent, but not fully prepared to employ the up-to-date knowledge to design their short-term or long term strategies, policies, programmes and plans.

The main obstacle seems to consist in the lack of an explicit strategy aimed at systematically informing key policy makers and managers about recent research results. Scientific knowledge reaches Italian policy makers and manager, mainly via informal channels, out of any institutional setting.

In this concern, the role of dissemination appears to be pivotal. Few recommendations can be offered below.

- The interaction between Institutions financing research and research end-users should be enhanced. Key potential end-users should be reached in order to identify actual knowledge needs.
- Dissemination strategies should be considered and designed within a strategic plan, able to detect and reach all key relevant stakeholders at the consumer (e.g. lobbies), technical and government level (e.g. technical and scientist assistants of key policy makers and managers).
- Dissemination strategies should be varied in order to cover the whole range of stakeholders and dissemination channels: brief notes for lay people and policy makers, seminars, full reports for experts and policy makers, etc.
- Dissemination channels should be as much formal and institutionalized as possible

6 Finnish Forestry Case Study

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6.1 Forestry in Finland

Finland has more forests in relation to its area than any other European country: three quarters, or about 23 million hectares of the land is covered by forests.[112] The objective of the forest management in Finland is to secure the production of high quality timber, and to preserve the biological diversity of forests and the preconditions for the multiple use of forests. The stated objective for the forest legislation is sustainable management of forests.[113]

At the second Ministerial Conference on the Protection of Forests in Europe, held in Helsinki in 1993, the European countries and the European Union agreed to promote the implementation, on both the national and the international level, of the forest principles adopted by the UN Conference on Environmental and Sustainable development in Rio de Janeiro (UNCED 1992). The criteria and indicators for sustainable forest management were drafted in the Helsinki Conference. The work continued in Lisbon 1998.

Cultural heritage, landscapes and the associated values are recognised extensively in Finnish legislation as functions that need to be taken into consideration.

Forest strategies and programmes and policy relevant research on externalities

Forest strategies or programmes are extensively used in Finland to guide the implementation of the forest legislation. The overall goal of the forest strategies in Finland is to maintain the globally recognised status and know-how of Finland in the development of the assessment and monitoring of sustainable forest management. The first national forest programme after the Act of 1996 was prepared in 1999.[114] The

[112] MoA, Publications 5a/2000

[113] The Forest Act (1093/1996) Section 1: "The purpose of the Act is to foster economically, ecologically and socially sustainable management and use in such a way that forests provide a good sustainable production while at the same time their biodiversity is maintained" (unofficial translation).

[114] Finland's National Forest Programme 2010

second was published ten years later in 2008.[115] Vision papers have been published in 2000[116] 2006[117] and 2007[118].

The purpose of this overview is to identify topics and research which have been related to forest externalities and which have influenced forest policy and decision making in Finland. The analysis is based on selected policy reports, investigation of relevant studies and research. About twenty valuation studies written by Finnish forest scientists and experts are synthesized. Research related to forest conservation and forest biodiversity in Finland has been directly linked to policy development.

6.2 Externalities in forestry

In addition to traditional market commodities based on timber, forests and related environments, such as bogs, produce non-wood products (berries, mushrooms; game, reindeer; lichen and herbs), maintain biodiversity, provide cultural and landscape values as well as recreational opportunities and possibilities for ecotourism.

Externalities are commonly defined as those costs or benefits arising from production or consumption of goods and services which are not reflected in market prices. Thus negative externalities arise when traditional forest (timber) production reduces production of the other goods and services that forest can provide, whereas positive externalities are reflected in any increased value of some non-timber goods or services.

In the public debate arguments based on externalities have been presented concerning, for example:

- The consequences of excessive and misguided draining of wetlands for forest production;
- The adverse effects of forestry on water quality
- The loss of berry and mushroom yields due to forestry operation
- The loss, but also gains, of game production in forestry areas
- The loss of reindeer pastures and reindeer production
- The loss of possibilities for tourism

Research related to externalities in forestry have usually focused on identifying the non-wood part of the forest production and valuing these. One could, however, in theory take any of the products and services of forest as a focal point and then examine its

[115] Finland's National Forest Programme 2015

[116] The State of Forestry in Finland 2000

[117] Future Review for the Forest Sector – Outline of the Forest

Council concerning focuses and aims for the forest sector

[118] State of Finland's Forests 2007 - Based on the criteria and indicators of sustainable forest management.

externalities. It turns out that while timber production is by far the most dominant use of forests in Finland, estimations of external costs of timber production are rare. Instead there is a large body of literature looking upon conservation of biodiversity as the product, leading to estimates of its external effect on timber production.

The State of Finland´s Forests (2007) identifies 6 basic criteria for sustainable use with 12 qualitative and 35 quantitative indicators, but none of them provides direct information on negative or positive externalities in economic terms. There are indicators, such as impacts of forest management on waters that provide hints of externalities, but no economic effects have been derived from these.

6.3 Specific studies related to valuation of forestry externalities

This summary examines key traits in the part of Finnish forestry research 2000-2006 that has dealt with externalities related to forests and forestry. Special focus has been devoted to economic impacts related to the protection of biodiversity and the protection of forest land. Also non-wood forest products are shortly discussed. A key area is the valuation of forest ecosystem services, particularly in the valuation of forest conservation and biodiversity. Valuation research is a key to the determination of economic externalities, and especially the valuation of non-market goods has received considerable attention.

6.3.1 Policy connections

In Finland the focus of the policy discussions concerning forestry have focused on the tensions between different uses. The dominance of the forest industry has meant that a key issue is to what extent the forest industry can forego forest land for other uses.

The national forestry programmes have tried to resolve this allocation issue at a general level. A large part of the economic research emerging from these programmes has emphasized the economic consequences of the use of forests for other purposes than maximal wood production. Few attempts have been made to examine the economic consequences of forestry on other sectors, except in terms of positive effect on local employment and business.

The importance of the studies on willingness to pay for conservation should be seen against this background and they have played a role in research projects connected to the creation of the Finnish Natura Network (Pouta et al. 2000; Rekola et al. 2000; Li et al. 2004) and in the implementation of the so called METSO –programme, which is a specific programme for improving the state of biodiversity conservation in forests in southern Finland (Pouta et al. 2000). Part of the research (Lehtonen et al. 2003 b); Rekola et al. 2003) has been directly connected to the preparation of the Finnish

National Forest Programme 2010 or, more generally, to forest planning and decision-making (Lehtonen et al. a); Pouta et al. 2003; Haltia et al. 2006)).

Studies that have examined externalities in terms of their ecological effects, for example, effects on biodiversity, reindeer herding, berry production and nutrient run off have been studied, but these have not been translated into economic consequences. Thus it has been found that nationally forestry is contributing only a small proportion of the total nutrient loads to watercourses, especially in Eastern and Northern Finland it is a significant source of nutrient loads. In two projects of Metla[119] nutrient loads to water courses resulting from tools have been developed to manage the nutrient loads from forestry operations.[120] The economic aspects, have, however, not been a focus of the studies.

It has also been observed that forestry activities have negative effects on berries and mushrooms and these effects may be aggravated by climate change. If the use of timber for, for example, biofuels, increases the harvests of timber, the adverse impacts on berry yields may increase. Blueberry twigs do not bear intense sunshine on clear forest cuttings, nor drying of soil. In addition, extreme climate conditions expose blueberries during flowering time to frosts. No attempts have been made to evaluate these potential changes in economic terms.

According to the Metla project (3429)[121] the moose population in Finland has increased. Different moose – related interest groups have conflicting targets with respect to ideal moose density (Nature Reserve Malla)[122]. To avoid conflicts of interest and to safeguard the moose ecosystem, information is required to support decision making concerning moose management at the local level (Metla project presentation). Although economic estimates exist on the value of moose production economic evaluations of different scenarios have not been made.

Reindeer herders have a long tradition of entrepreneurship located in the Northern Finland. It is a traditional livelihood that supports a unique cultural continuity of both Sami and Finnish populations. Although reindeer management in Finland has in many cases been a success story of self employment (Hukkinen et al.) this kind of entrepreneurship has to have had great ability to adapt to the changing social, cultural and ecological circumstances. Economic valuations of different conditions created by forestry development have not been made.

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[119] Metla Project 3485. Hydrological nutrient losses and methods of water quality protection on peatlands drained for forestry purposes. Duration 2008 -2011; Metla Project 3477. The effects of stem wood and whole tree harvesting in drained peatlads on leaching of nutrients and heavy metals to water courses and nutrient sufficiency for sustainable tree production. Duration 2007 – 2011.

[120] Metla Project 7217. Tools for Water protection in forestry. Project duration 2006 – 2009.

[121] Regional aspects of the societal and forestry effects of cervids in Finland

[122] The effects of reindeer husbandry and nature conservation on the Strict Nature Reserve Malla. NARP: Nordic Arctic Research Programme.

6.3.2 Nature resource valuation

Commercially the most important use of forests has been the production of timber. Other market goods include game, lichens, mushrooms, berries and, in northern Finland, the use of forest as pastures for reindeer. In addition several non-market goods and services have been associated with forest in the context of biodiversity conservation. These include maintenance of biological diversity and recreational use, which is also partially commercialized and important in certain regions.

As noted above one of the key issues in Finnish forestry policy has been the tension between the use of forests for commercial forestry and nature conservation, which is largely based on non-market values. This has produced a large body of research based on contingent valuation methods (CVM). Contingent valuation methods have been applied in numerous studies. The method can be applied by assessing the target group's willingness to pay (WTP) for conservation of a forest or a part of it, or for preserving biodiversity. Contingent valuation method has been applied and willingness to pay found out in NATURA assessments (Rekola et al. 2000; Pouta et al. 2002; Li et al. 2004). Also when preparing the Finnish National Forest Programme estimates of interviewees' willingness to pay (WTP) for increased forest conservation was made. Lehtonen et al. (2003) found out that the willingness to pay for conservation varied from 60 to 223 € per person and year.

6.3.3 Development of CVM-methods

Much has been discussed of validity and reliability of valuation studies. On the bases of empirical WTP studies conclusion as been drawn that results of interviews or questionnaires does not necessarily, on an aggregate level, give reliable bases on decision- making: the respondents may easily give their willingness to pay higher than it were in reality. Instead of the well known Logit model Lehtonen at al. (2003) applied a so called Spike model in order to correct the 'fat-tail' problem of a conventional regression analysis in their research of forest conservation on Southern Finland (Kristöm 1997; Kniivilä et al. 2002; Haltia et al. 2006). One of the advantages in applying a Spike model is that a respondent's willingness to pay can be zero or even negative.

The reliability of contingent valuation studies with their willingness to pay estimates has somewhat increased by using approaches applied in sociology ((Theory of Planned Behaviour,e.g., Pouta et al. 2003). Rekola et al. (2000 a) ja b); 2004) have made research of incommensurable preferences in contingent valuation and uncertainty in connection with WTP –responses. Further, Rekola et al. (2003) have also tried to classify the WTP – responses more carefully by using lexicographic preferences.

6.3.4 Valuation of non-wood forest products

In Finland, ecological and social sustainability of forest use is stipulated in forest legislation. The purpose of the Forest Act is to promote economically, ecologically and socially sustainable management and utilization of forests (1 §). Tools for promoting social sustainability provided by the Act are national and regional forest programmes and the Forest Biodiversity Programme for Southern Finland (METSO), supported by a research programme MOSSE. These programmes have guided and reflected forestry development in Finland. Important from the point of view of externality discussions are the emphasis put on multiple use of forests and including non-wood forest products (NWFP) into the forest strategies. These principles concern state forests and also private forests as well.

The multiple use of forests means coordinating the timber production ('business as usual') with the traditional forms of forest uses such as hunting, reindeer husbandry; picking of berries, mushrooms and other products of nature; cultural environments; outdoor recreation and ecotourism. The basic idea is that a combination of different small scale forest uses with commercial forestry would promote social and economic well-being in rural communities. The public right of access (everyman's right) is important aspect in promoting multi purpose objectives of forestry.

In the following some indicative estimates concerning economic value of non-wood forest products in Finland are presented. Because of lack of studies the examination is limited to reindeer husbandry, picking of forest berries and mushrooms and nature tourism. Indicative evaluations of the importance of these activities on local and national level will be given.

Reindeer husbandry and game

Reindeer husbandry is a significant rural business in northern Finland, also in terms in tourism and food processing. The production of reindeer meat has remained relatively stable between 2004 - 2008. In 2004, the total production was about 2.5 million kilos, and in 2007 about 2.7 million kilos a year (FGFRI Studies 6/2009). The reindeer meat processing is concentrated, and the bigger share of reindeer meat is processed in a few large companies. It is evident that the global economic instability which has been growing since the beginning of 2009, may affect the demand of expensive reindeer meat products.

Much have been discussed, in the field of policy sciences (Hukkinen et al. 2006) as well as in reindeer husbandry sector (FGFRI)[123] that land right conflicts exist between forest cutting and reindeer management. The legal status of reindeer herding is, however, strong (www.mmm.fi). Reindeer management is also important livelihood adjusted to the extreme conditions in the northern Finland.

Assuming that reindeer meat is produced 2.7 – 3.15 million kilos on annual basis with a price of 4,8 €/kg (Metla Statistics), the economic value of production is 13 - 15 M€ per

[123] Finnish Game and Fisheries Research

year. Most of the reindeer herders in the northernmost Finland are indigenous Sami people. Thus in addition to generate income, reindeer husbandry assists in preserving the original cultural values of Lapland.

Berries and mushrooms

In a good year, the biological yield of wild berries in forests and peatlands in Finland is about 1000 million kg (FAO 1998) and in a poor year about 500 million kg. Collectable yield is estimated to be about 30 per cent of the biological yield. In the recent years, however, only about 5 to 10 percent of the biological yield of wild berries has been collected.[124] In many parts of the country, picking for sale is an important economic activity.

One of the indicators of sustainable forest management is the volume of support of berries and mushrooms. Among wild berries in the Finnish forests, blueberry, lingonberry and cloudberry are the most common, and among mushrooms, Lacteous agarics, Boletuses and Chanterelles. In Table 1, sales value in 2008 of wild berries and mushrooms is presented.

Table 1. Sales value in 2008 of the most common wild berries and mushrooms in Finland.

Forest berries	**kg**	**€**	**€/kg**
Blueberry	1 746 553	3 224 225	1.85
Lingoberry	4 041 278	4 202 311	1.04
Cloudberry	169 930	1 285 528	7.57
Total	**5 986 000**	**8 768 000**	
Mushrooms	**kg**	**€**	**€/kg**
Lacteous agarics	49 459	138 826	2.81
Boletuses	356 906	1 653 629	4.53
Chantarelle	9 820	57 783	5.88
Total	**416 925**	**1 850 238**	

Source: Metla Statistics 2007

In Table 2, the economic significance of non-wood forest products in Finland in 2007 is estimated by relating the production value of non-wood forest products to the delivery value of timber harvested in 2007.[125]

Table 2. Economic significance of non-wood forest products (NWFP) 2007 in Finland.

[124] In 2007, even less than that.

[125] Calculations are based on Metla (Viialainen 2009).

NWFPs	Units,Mkg	€/kg	Total sales value	Timber value on national level, M€	Total sales value/timber value on national level, %
Reindeer husbandry	3.15	4.8	15.1	1900	0.8
Berries and mushrooms	6.3	1.70	10.7	1900	0.6
Game	11	5	55	1900	2.9
Other NWFPs[126]			5[127]	1900	0.3
			85.8	1 900	4.5

Source: Metla Statistics 2007.

Table 2 shows that the economic significance of non-wood forest products in Finland was approximately 4-5 % of the delivery value of timber harvested in 2007. However, this information does not as such provide information on the externalities of forestry, it merely explains why, in the present situation, the economic analyses have focused on timber. The market based externalities are, as it were, already included in the figures. Thus it is known that some game animals, in particular the elk, has benefited from current forestry practices with extensive areas of young tree stands, including deciduous trees, whereas others, such as the capercaille, have suffered.

The relative importance of non-wood forest products differs with regions. Thus timber is relatively less important in the northern parts of the country (Table 3). The implication is that also the markets based externalities of forestry activities are more important in Lapland than in other parts of the country. One should also note that (nature) tourism is not included in these figures. Large scale timber production affects tourism negatively, in particular in Lapland, where the regeneration times are long and one of the key motives for tourists is the possibility to experience "pristine" nature.

Table 3. Economic significance of non-wood forest products (NWFP) 2007 in Lapland..

NWFPs	Units,Mkg	€/kg	Total sales value	Timber value in Lapland, M€	Total sales value/timber value in Lapland, %
Reindeer husbandry	3.15	4.8	15.1	137	11.0

[126] Herbs etc.

[127] An expert estimate.

Berries and mushrooms	4.3	3.5	15.0	137	10.9
Game	2.2	5	11	137	8.03
Other NWFPs[128]			1[129]	137	0,7
			42.1	137	30.7

Source: Metla Statistics 2007.

The economic importance of non-wood forest products were for the first time estimated as early as 1980 in Finland. This makes it possible to produce an indicative 'time series' (Table 4).

Table 4. Economic significance of NWFPs 1980s – 2007.

Finland, a	**Finland %**
1980	8
1990-1993	7
1994	9
2007	4.5
Lapland, a	**Lapland, %**
1980	16
1994	28
2007	30.6

Source: 1980 -> 1994 Saastamoinen[130].

2007 information bases mainly on Metla Statistics.

Although indicative, Table 4 shows a decreasing value of non-wood forest products on a national level whereas the trend in Lapland seems to be slightly increasing. The estimates include uncertainties, for example concerning how much of the collected berries and mushrooms are for household consumption or the value of less well known products like herbs. The relation between the annual value of non-wood forest products and of timber values varies not only because of the large variation in the yields of non-wood forest products, but also because of changes in annual cutting volumes and stumpage prices for wood.[131] The valuation of non-wood forest products has a long

[128] Herbs etc.

[129] An expert estimate.

[130] Non-wood forest products: utilization and income generation in Czech Republic, Finland and Lithuania. FAO corporate document repository.

[131] See also Saastamoinen 2003.

tradition in Finland as in other northern countries. Although minor on national level, their significance may be considerable on local or regional level.

Nature tourism

Nature tourism is based on the idea that the destination and purpose of travel is nature itself. Specialized form of nature tourism focuses on specific groups of plants and animals, impressions and views. The customers of nature tourism are very often nature enthusiasts who have an interest in forest flora and fauna and hiking.

In Finland the relative importance of recreation and tourism has increased (Tyrväinen 2004): about 40 % of adult population take nature trips. Nature has also been the main reason mentioned by foreign visitors for choosing Finland as their travel destination (Finnish Tourism Board 2004). In 2004 the number of foreign visitors was about 4.9 million, 25 % of which take part in outdoor activities. Among nature tourism, there is in Finland a strong regional interest for creating new employment opportunities for rural and peripheral areas.

Finnish Tourist Board estimated that added value from nature tourism in 2002 was 562 M€. Tyrväinen (2004) concludes that this is approximately 20 % of the added value of forestry in Finland. In northern Finland the economic significance of tourism is clearly greater. In some municipalities, tourism and related activities can account for more than 50 % of the employment, whereas forestry provides less than 10 % (Lapin liitto 2008).

6.3.5 Regional forestry planning

Finland has a long tradition in forestry planning at the regional level. It has been developed particularly by the national forest and park service (Metsähallitus), which owns approximately 60 000 km2 of forest land in Finland.[132] The planning has developed into a series of regional plans – resource management plans – that cover the areas managed by Metsähallitus. In the northern and eastern part of the country Metsähallitus manages a high proportion of the land, in the southern and western parts Metsähallitus plays a lesser role in the management of the land.

The objective of the regional resource plans is to develop a "balanced use of the [regional] natural resources" (Hiltunen and Väisänen 2004). The plans take a broad view of the use of the forests managed by Metsähallitus, as Metsähallitus is simultaneously a manager of commercial forests, national parks and nature reserves, as well as a manager of other land resources and water resources. The plans, which typically cover about 10 years, are based on an analysis of alternatives that are compared using a set of criteria that have been developed in participatory processes.

The criteria include economic variables such as the turn-over of Metsähallitus in the region, the net economic benefit of the land owner, i.e. the state, and the number of

[132] Forests and Forestry in Finland by the Ministry of Agriculture and Forestry.

person years of employment provided by Metsähallitus. Criteria related to externalities include the extent of forest suitable for recreation, which are defined as forests with stands generally older than 80 years.

The alternatives emphasize some combination of the criteria, for example one stresses maximal commercial use of forests for timber production, another a significant increase of the protected areas. The economic effects of increasing or decreasing the amount of protected areas can clearly be seen in the net economic gain for the state as land owner, but no attempt has been made to provide economic estimates of the consequences for other sectors such as tourism, recreation or berry picking of an increased intensity of timber exploitation. Instead, a multi-criteria comparison has been made, justifying a compromise solution. Thus no optimization is attempted at.

6.4 Concluding remarks

In Finland forest externalities have been approached using methods that involve both subjective preferences and market based valuation. Contingent valuation (CV) with willingness to pay (WTP) measurements has been widely used to gather individual preferences related to forest externalities. Indicative examples concerning NWFP valuation based on market prices are also available to some extent.

As Kristöm (1997) states, valuation of forests is useful if it helps society to make decisions about forest environments and forest resources. Carefully structured valuation studies based on accepted economic theory are available for this purpose, although the regional forest plans also show that planning can take externalities into account with expressing them explicitly in economic terms. It is nevertheless of interest to know that conserving forests has a value, but only so far as we are able to compare this use of a forest to another use, especially in regions such as Lapland where the economic values of the different sectors partly competing for the use of forests are comparable. Making a proper economic analysis of externalities may show that the traditional use of timber is not the best option from an economic point of view, despite the fact that its market value is easy to verify.

As was seen in the previous sections increasing the validity of externality valuation biological and ecological expertise is necessary in order to come up with meaningful results. According to Hiedanpää (2004) forest-related development and environment planning is not improved by making it more rational or more abstract and formally rule based. Instead, input from psychologists and sociologists will be needed in order to better understand human behaviour, especially in the context of measuring individual preferences and valuations; planning and assessment practices need to be more reasonable and discursive; more engaging, ethically sensitive and scientifically plural.

In Finland, it was especially in the early 2000's that forest externality valuation studies were prepared, in co-operation of forest research institutes and universities. One of the reasons for this was the relatively close connection between preparation of forest programmes and valuation research. Later on 2007 - 2011, larger monitoring

programmes concerning externalities have been started especially in the Finnish Forest Research Institute (Metla)[133].

In Finland non-wood forest products valuation has so far been mainly carried out on ad hoc basis with a focus on products that are relatively easy to quantify in economic terms. There is no consistent and reliable data base for non-wood forest products values that could easily be used to deduce the economic externalities of forestry activities. Recently the role of private sector has increased its contribution especially in the field of valuing nature tourism and forest recreation.

Overall the analysis has shown that data on certain forest externalities exist. Except for the analysis of different scenarios of nature conservation, few systematic analyses exist that would provide estimates of the economic externalities under different policy options and forestry practices. For example, the regional data show that non-wood values are particularly important in Lapland, but there are virtually no studies that would systematically explore how the externalities of the forestry activities affect the possibilities for developing the activities affected by the forestry.

Useful information to analyze the impacts of forest externalities, and forestry as well, more thoroughly may be given for example by the follow up reports to the METSO program (MoF 2003). Another instrument might be a further development of the regional planning system, which can integrate the objectives of nature conservation and recreation with the economic conditions on forestry and other livelihood like reindeer husbandry.

6.5 Recommendations

1. The analysis has shown that information on forestry externalities is available, but it has been translated into economic terms only to a limited extent. It would be of interest to *produce a coherent view of the economic externalities* of forestry activities. Such an analysis also has to take into account regional differences.

At a national level such information could be useful in debates considering alternative approaches to forestry practices in relation to a wide interpretation of ecosystem services. At a regional level systematic analyses of externalities serve a discussion on alternative management strategies, which so far have relied heavily on the economic value of timber production. Resources for carrying out economic analyses are available, but a systematic analysis of externalities will require a partial refocusing of the work and resources.

[133] Metla Project 3462. Natura-based recreation monitoring and assessment (2007 – 2011). Metla Project 3472. Environmental and recreational services of forests: economic impacts, valuation and business opportunities (2007-2010).

2. *A systematic treatment of externalities in economic terms would guide and improve the development of criteria and indicators of sustainable forest management.* Such an analysis would improve the debates on and allocation of state resources for forestry development. However, it is evident that analyses of externalities will suffer from the non-market nature of many externalities. Although methods and skills exist for the valuation of non-market externalities, they will always be subject to public debate and different interpretations.

The advantage of forestry relative to many other sectors is the long time scale of forestry planning. Forestry develops in a series of incremental decisions and thus there are possibilities to revisit and reconsider the policies that guide detailed decisions.

3. Multi-criteria approaches can deal with combinations of non-economic and economic valuations of forests and forestry activities, but the findings indicate that the burden of proof has been heavily on those emphasizing also other uses than timber exploitation. Simple reversing the situation is, however, not likely to remove the tensions between different uses of forests. There will always be elements of subjective value judgments involved. The analysis of externalities should be connected with a broader social learning process that is open to all societal actors with an interest in forests. Developing these processes and the supporting institutions is likely to be a necessary condition for meaningful uses of externality estimates.

6.6 Forest externalities in Finland: Summary of interviews

Background information

1) In which connections do you have acquainted yourselves with economic evaluation of forest externalities?

All the interviewees had acquainted themselves with forest externalities in connection of preparation on the National Forest Programmes of Finland[134] and the METSO – policy programme[135], in particular when it comes to the consideration of alternatives and targets. The Biodiversity policy for forest outlined by f the Ministry of Environment was also considered to be important by some of the interviewees.[136]

The economy of the multiple use of forests were studied in specific studies in METLA (Finnish Forest Research Institute) in which the economy of forest externalities was evaluated, too. A willingness to pay study, on the basis of which an increase of forest protection was recommended, was a part of this research. Also regional forest programmes were mentioned which, in connection with the National Forest Programme of Finland, form an interactive planning system.

[134] 2010 and 2015

[135] A policy programme to enchance conservation of forest biodiversity.

[136] "Protecting biodiversity of the Finnish forests", PM3/1994, Ministry of Environment

The Finnish Forest and Park Service (Metsähallitus) has an accounting system for assessing and following up, in connection of the 5 –year planning, economic value of 'social responsibilities' in related to forests (preserving forest biodiversity; ;forest recreation; management of employment; interests of reindeer husbandry etc.).

2) Are the forest policy makers well aware of externality economics?

According to the interviews, forest policy makers seem to be reasonably well aware of the need of economic research of forest externalities. Competence of the forest policy experts was considered to be relatively good in this respect even if enough knowledge or data of forest externalities is not necessarily available in every case.

In Finland it is possible to order economic research or studies for example from METLA or other research institutes. These may, in certain cases, remain on a too theoretical level to be fully utilized in forest planning. METLA's review 'Well- being of Finnish Forestry 2015' (METLA Working Papers 26) which was prepared to support the preparation of the National Forestry Programme was considered to be very good. In this publication, two forest strategies were compared with each other: the 'business as usual' and the strategy of active adjustment. Also calculations by METLA in 2007 concerning the objectives of the National Forest Programme of Finland were illuminating. Six action programme alternatives with their impacts were compared with each other. In the preparation of the calculations it was noted that not all impacts can be quantified and thus qualitative assessments have to be accepted.

3) Do you know examples of economic assessments of externalities that have influenced forest policy? In what way?

Quite a thorough economic analysis was made when preparing the legislation forsustainable forest subsidies and for fertilizer products. Indicative economic analysis were made, and it also influenced considerations of impacts of forestry on water quality; on reindeer husbandry in the northern parts of Finland; on scenery values and forest biodiversity, even though it has not been possible, in all these cases, to utilize adequate economic valuations.

In the National Forest Programme of Finland analyses were made of alternative levels for timber cuttings, forest protection, recreation and the energy use of timber.The alternatives were assessed using economic, ecological and social criteria. The economic analyses included, among other things, production values of forest industry, stumpage income of forest owners, and level of employment; in the ecological analysis, carbon sinks, impacts on waters and impacts on forest biodiversity were taken into account. For example changes in sales value of timber affect forest owners, which is why economic analyses of timber cuttings and forest externalities were considered to be important.

According to the interviewees, economic analyses of forest externalities were one of the factors that increased the social acceptability of the METSO – policy programme, which

aims at enhancing the state of biodiversity protection in forests in the southern half of the country.

4) **In which phase of the forest policy did economic analysis prove to be necessary: in connection of developing forest taxes or assessing costs and benefits of forestry alternatives? In other connections?**

It has proved to be necessary to assess forestry externalities in national and regional forest policy programming and also in connection with planning of specific actions such as the exploitation of peat bogs, peat lands, acid sulphate soils and in planning of water sheds.

In the METSO –programme, a willingness to pay study and a larger research of forest economy were made: analysis of forest expenses and revenues on a regional level were carried out; sales revenues and market based expenses; the need for imported timber assuming that the demand of timber goods and the price of wood increases; impacts of forest protection on nature tourism, forest recreation values; forest biodiversity. The assessment of recreation values of forests gave significant results.

It has been necessary to estimate economic values of forest externalities also in connection of development of forest taxation, systems of economic subsidies and the nature value trade.[137]

The costs of general social obligations that are based on legislation and the Governments guidelines of forest owner policy, as well as the National Forest Programme and the METSO –programme are included in the annual budget and the 5 – years plans of Metsähallitus (the Finnish Forest and Park Service).

5) **On what political level have economic analysis of forest externalities been utilized? In developing forest legislation? In strategic forest programs or other forest policy discussions?**

In connection with developing forest legislation; when drafting the new Finnish forest legislation 1996-1997 economic analysis were carried out; in connection with forestry subsidy systems and later also the system of nature value trade. As pointed out previously, economic analysis was in some extent a part of the National Forest Programme in Finland and the METSO – policy programme. Economic analysis is needed also for, i.e., strategic visions to be used to support the preparation of future government programmes.

Some critics have questioned the reliability of the economic analyses of forest externalities.

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[137] A voluntary policy instrument utilized developed for Finnish forestry aiming at increasing biodiversity conservation through the creation of special markets for nature values

6) **Do you see that you could utilize quantitative economic analyses of forest externalities in you work?**

All interviewees unanimously agreed that economic analysis of forest externalities is needed. Non-market goods like biodiversity, beautiful scenery and possibilities for forest recreation should be included in the BNP and in studies concerning regional ecosystem services; these should also be taken into account when examining the economy of an individual forest owner. In addition to the development of qualitative indicators the development of quantitative economic indicators is needed, too.

In addition to the cost estimates it would be extremely important in forest policy to estimate also the economic benefits of forestry externalities; benefit calculations offer a good ground for preserving and enhancing forest protection areas. Because the economy gets tighter and tighter, cost – effectiveness and cost efficiency –studies gain importance also in forest policy.

Exploring perceptions

7) **According to your opinion, what are the attitudes of the experts in the environmental/ forest sector towards the economic analysis of forest externalities?**

Many of the interviewees saw that economic analyses of forest externalities belong to the basic skills of professional authorities and researches; they also emphasized that the significance of these skills increases all the time. As was mentioned earlier, economic analyses are needed on national as well as on local level. Timber production techniques are becoming more effective and more complicated all the time and economic data is needed of their effects; economic assessment helps stakeholders to evaluate timber production measures and to compare these with each other.

8) **What is your opinion of the usefulness of economic analysis of forest externalities?**

In case the administrations own expertise in forest economy is not considered to be satisfactory, economic assessments of forest externalities are commissioned from research institutes or individual researchers. The reliability of these studies has in general been quite good and it has been possible to utilize them.

In this connection some of the interviewers brought up a communication problem which may even be very significant. Solving the communication problem may require an interpretation procedure between the users of economic information and its producers. Examples mentioned were communication program of nature biodiversity; dialogue concerning ecosystem services; communicative co-operation in connection with the Stern report.

9) In which contexts would economic assessments of forest externalities be needed? When developing forest taxation? Assessing costs and benefits of forest policy? In other connections?

According to the interviewees, economic analyses of forest externalities are needed in all phases of the development of forest policy. One has to be aware of the existing alternatives, and be able to at least indicatively assess economic impacts of the alternatives.

As was mentioned earlier, economic assessment is needed in connection of the development of forest legislation: revising forest taxation and exploring existing forest subsidies; developing and maintaining the system of nature value trade. Economic assessment is a crucial part of the forest planning on national, regional and local level. It is very important to develop the assessment of benefits to get motives for example to preserve nature protection areas.

10) - 11) Which obstacles hinder the production and use of economic assessments? Which factors would make it easier to utilize these?

There are in forest planning and policy making no obstacles at the level of attitudes when it comes to using economic analyses and economic information. Instead, the question is whether enough resources have been reserved and whether there exists enough reliable economic data for forest planning and decision making.

The basic economic factors in timber production like competitiveness, profitability, financing and strategies of the forest industry have traditionally been a focus on researchers' interests and, for a long time, one of the focal points of the national follow-up. At the moment it seems like that the focal point should be moved to some extent from the core business to the development of economic analysis of forest externalities. A prerequisite for this is to reserve enough resources for this purpose. Of crucial importance is also a well functioning co-operation between the key parties and the most important stakeholders. An interesting opportunity in this connection is the nature reserve consortium built by the central research institutes in the field of natural resources. The importance of distinct and adequate information distributed in real time can not be emphasized enough in this development work.

12) Do you have any recommendations or comments in your mind concerning the assessment of forestry externalities?

It would be good, in the prevailing economic conditions, to make acquaintance with the visions concerning the future of the Finnish forests 2015 mentioned before in the text.

Forest policy programming and impact assessment have to be carried out systematically and in a properly organized way. In this kind of long –term activity of the timing of research or assessment is crucial. Impact assessment is a condition for making conscious

decisions. The need for economic calculations is especially important in the participatory planning process in the forest sector; public participation deepens the stakeholders' knowledge of the forest plan strengthening at the same time their involvement in planning and decision making.

On a national level, a thorough but easy to apply handbook of assessment of forestry externalities should be available.

13) General conclusions

- Decision makers in the forest sector in Finland are well aware of the need of economic research and development of forest externalities. Especially the valuation of benefits of preserving forest land for recreational use was emphasized. One of the problems at the moment is the lack of reliable economic indicators or other assessment methods.

- Economic assessment is important from the point of view of large forest policies and programmes. To some extent it has been utilized also in connection with the development of forest policy instruments like forest taxation; economic subsidies; nature value trade.

- Assessing cost-effectiveness- and cost-efficiency of the 'core business' and of preserving forest externalities is especially important in the prevailing economic circumstances. In participatory planning processes economic analysis makes it easier for stakeholders to evaluate different alternatives.

- The assessment of economic externalities may be relatively easy in sectors where economic analysis has traditionally been a part of the impact analysis. The value of non-market externalities may, however, in some cases exceed the total production value of the sector. In such cases utilization of non-market economic assessments together with basic economic analyses is a challenge for decision making, both conceptually and in practice. Difficulties arise when the externality assessment switches from being an additional piece of information to the main piece of information. This challenges traditional thinking and firm beliefs and will therefore not be immediately accepted. Finnish forest policy provides several examples of this inertia.

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Appendix

Table 1. Summary of selected Finnish valuation research.

Reference	Methodology applied	Objectives/content of the study	Policy implications/connecti-ons to plan or programme
Haltia et al. 2006	Willingness to pay (WTP) Dichotomous choice Contingent valuation (CV)	Examines the problems for solving 'the fat tail problem.' Introduces a pinched spike model.	Forest conservation
Pouta et al. 2003	Contingent valuation (CV) Theory of planned behaviour (TPB)	The study produces empirical estimates of WTP for nature conservation areas.	Nature conservation and forest programs. Level of biodiversity. Estimates essential in order to evaluate forest policy in an environmental direction.
Pouta et al. 2000	Choice experiment (CE)	Voluntary mechanisms have advantages like -cost-effectiveness -fair cost distribution -social welfare gains -social acceptability.	METSO -programme
Li et al. 2004	Coice experiment WTP WTA (willingness to accept)	Finnish households' valuations of different preservation levels.	The NATURA 2000 Network Biological considerations

Lehtonen et al. 2003	Dichotomous choice Contingent valuation (CV) - data Mail & internet surveys WTP Spike model instead of a common logit model	Monetary welfare estimates for policy planning. Comparison of the two data collection methods.	Forest conservation in southern Finland
Lehtonen et al. 2003	Contingent valuation (CV) survey Choise experiment (CE)	74 % prepared to pay for increased conservation, 16 % supported it but not willing to pay; 5% indifferent; 5 % supported a decrease in forest conservation. Monetary WTP- > 60-223 € per household for increased biodiversity conservation.[138]	Finnish citizens´ valuations for forest conservation programmes for southern Finland; Finland's National Forest Programme;
Kallio et al. 2006	Partial equilibrium approach	Scenarios with 3 % or 5 % of productive forest stock in western Europe set aside for conservation are compared to a baseline case.	Increase forest conservation supports biodiversity; Has impacts on forest sector: increased conservation -> decreased forestry investments?
Kniivilä et al. 2002	Cost-Benefit analysis	Nationwide vs. local interests.	Timber production vis-à-vis nature conservation.

138 Depending on methods.

	Compensation variation Spike models		Local/ regional costs/ benefits. Unlike most discrete choice CV studies also zero WTP is allowed.
Siikamäki et al. 2006	The study investigates the convergent validity of discrete choice contingent valuation (CV) and contingent rating/ranking (CR) methods. Stated preferences Nonmarket valuation Data pooling	Use of econometric models. Separate contingent valuation and contingent ranking models.	A methodological study ->CV and CR can produce consistent data (achieved convergent validity) when respondents' preferred choices and the same changes in environmental quality are considered.
Rekola et al. 2003	WTP WTA L* –ordering is elaborated further in order to study the structure and the existence of inverse demand functions.	There is a correlation between broadly defined goods. High share of CV responses really lexicographic preferences.	National nature conservation programs
Pouta et al. 2002.	CV survey 1997 Effect of the scope of the conservation programme on WTP is analyzed with 3, 6 and 9 % increase in conservation. An effect of the institutional context of policy planning on valuation was explored.	Choice behavior was explained by logit regression model (age; sex; income level; urban – rural; planning system).	NATURA 2000; The study was a part of the impact assessment of the program.

Rekola et al. 2000	CV VTP Logit models Incommensu-rability modeled with lexicographic preferences, in particular the model of L* – ordering.	In the present study, respondents' commitments to the guaranteeing of private property rights and to absolute nature rights were explored. Respondents' commitment to right-based environmental ethics and complexity of the choice task: reasons for the incommensurable preferences in contingent valuation?	NATURA 2000 Network in Finland The study concludes that individual's preferences may include several incommensurable attributes and that it is possible to measure them in contingent valuation survey.
Rekola 2000	Examines two empirical methods: pair comparisons and statements that have been used to measure lexicographic preferences in contingent valuation. L* -ordering model has been proposed. The content validity of the methods was analyzed theoretically.	From the point of view of the total number of respondents with LP, the validity of paired comparisons is superior to that of statements. The reason is that paired comparisons operate directly with respondents' choices. Statements can be used to find reasons for lexicographic preferences. It is important not only to determine the exact number of respondents	Theoretical study. When measuring statements with Likert scales one need to decide on the scale the value where interpretation of preferences switches from ordinary to lexicographic. When using paired comparisons one needs to decide the number of comparisons and the magnitudes of the good as well.

		with lexicographic preferences but why they responded as they did.	
Rekola et al. 2002	CV survey WTP for a hypothetical land use policy regulating private regeneration cuttings in a particular forest area.	The survey investigated the general public's WTP for a hypothetical land use policy regulating private regeneration cuttings in a particular forest area.	Respondents WTP for a proposed land use policy was higher when future cuttings were remained uncertain (13.30 €) compared to the second sub sample (9.30 €) where cuttings were described without uncertainty. Respondents were risk-averse and believed they would be better off if information on forest management plans were available.
Rekola 2004	CV WTP	Incommensura-bility; uncertainty	Forest and nature conservation. The main contribution of the study is its ability to provide a better understanding of the role of incommensurability in CV and in nonmarket valuation in general.

7 Canadian Forestry Case Study

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Introduction

This case study presents an assessment of forest strategies and policy application in Canada. It concludes with a summary discussion on similarities and differences between forestry in Finland and Canada and the role of information on economic externalities.

7.1 Canadian Forest Strategies and Policy Relevant Research on Externalities

Canada has approximately one-tenth of the world's forests. Utilization of forest resources are regulated by legislation, forest plans and programs, including economic instruments. In Canada, forest resources are considered to be common heritage, which has contributed to the development of public participation procedures in connection with preparation of forest plans and programs.

The purpose of this analysis is to identify related topics and research that have been related to externalities in the field of forestry and that have received attention in Canadian forest policy. The aim is to find the links between policy discussions and research on externalities in the context of forests and forestry. Our theoretical frame for examining the use of research in policy development is taken the methodological analysis given in Chapter 1. It has been supplemented by findings from research on the use of evaluation, which recognizes four broad categories of use.

Direct/instrumental *use is supposed to bring rationality to policymaking and directly improve policies. In Gerdes et al.'s (2008) terminology this is initiation of action and influencing decisions, and to some extent the identification of appropriate instruments.* Conceptual *use or* 'enlightenment' *has been defined as "the percolation of new information, ideas and perspectives into the arenas in which decisions are made" (Weiss, 1999, p. 471). This represents awareness raising, forming of opinions, and the identification of policy instruments.* Political use *is foremost about* legitimisation*, in which research is a rationalistic ritual aimed at justifying decisions that have already been taken or policies that are already in place (Weiss, 1999, p. 477). Political use can also be* tactical*, as when research is initiated to postpone decision-making by referring to an ongoing study (Vedung 2001, 141.). The fourth category is* 'symbolic' *use, in which research is initiated or maintained to give the impression of a rational organisation although decisions are motivated by, for example, short term economic interests or political bargains without any real connection to the research or its results.*

The basic sources of information have been the Canadian forest policy strategies 1992 – 2008 and other related policy papers. Also www –pages of the forest administration (Natural Resources Canada; www.nrcan.gc.ca) have been extensively used. Articles and other literature published on the www –pages of the Canadian forest administration, and scientific or professional periodicals or journals in the forest sector have been examined. A complete review of forest externality literature is, however, beyond the scope of this study. It should also be noted that in Canada the actual implementation of forest policies take place at the provincial level. The policy documents at the federal level provide certain guidance, but do not determine the implementation.

7.2 Forest externalities in Canada – topics of interest and the research themes

Forestry related externalities can be both positive and negative. In what follows we will focus on externalities related to public goods such as pleasant landscapes, recreational amenities and the conservation of biodiversity. These can be enhanced or threatened through forestry practices, depending on the type and intensity of the forestry activities.

The evolution of topics

The Canadian Forest Strategies beginning from the Strategy 1992 – 1998 and ending with the 'Vision for Canada's forests 2008 and Beyond' have identified several different issues related to externalities, and one can also identify a certain evolution in the topics (Table 1).

Table 1. Canadian Forest Strategies: externality related topics and their evolution.

Topic	National Forest Strategies			A Vision for Canada's Forests 2008 and Beyond
	1992 – 1998	1998 - 2003	2003 – 2008	
Overall management approach	Management of multiple benefits	Management of multiple values	Ecosystem-based forest management	Rational use for maximal societal benefit
Forests as ecosystems	Recognition of biodiversity	Maintaining of the productivity and resilience of ecosystem	Non-timber values, multiple benefits conserving biodiversity	Non-timber forest as a new business opportunity
Governance	'Sound Stewardship'	'Practicing stewardship'	'Responsible stewardship'	Stakeholder's responses to the Discussion Paper: - forest related information & knowledge - forest sector

				competitiveness & bio-economy - climate change impacts & adaptation
Monitoring	Sustainable Forest Management SFM Indicators	Criteria and indicators of sustainable forest management	Sustainability	
Specific instruments supporting overall approach and governance		Canadian based certification system	Forest certification	
Challenges of climate change		Framework convention on Climate Change Actions to fulfil Canada's forest carbon commitment	Carbon pooling	Mitigating and adapting to Climate Change

The justification for Canadian forestry policies has, since the first examined strategy, been management for broad social benefits. The governance of Canadian forests is thus being developed with reference to sustainable forest management. The aim is to meet society's increasing demands for forest products and other benefits, while respecting the values that society confers on its forests and preserving forest health and diversity (http://canadianforests.nrcan.gc.ca/articletopic/45).

This suggests that externalities have been recognised on a general level and that research on externalities have contributed to conceptual development and legitimisation. The more specific topics can provide information on the use of particular aspects of environmental economics research.

Forests are recognised as ecosystems and not only a resource base. The conservation of biodiversity has been identified as an important ecological concern in forest management in Canada (www.nrcan.gc.ca). Threats to Canada's forest biodiversity include habitat loss, alien species, pollution and climate change. Forest conservation can be carried out by protective measures or sustainable forest management practices. An important instrument in conserving biodiversity is the Canadian Biodiversity Strategy. The economic aspects of biodiversity have not been strongly emphasised, although the Vision for 2008 and beyond aims at identifying new and novel business opportunities. Thereby some previous externalities may in fact become internalised. This suggests that environmental economics research has been utilized for conceptual development and also political justification. There are signs that research has been initiated with more instrumental use in mind, as revealed by ongoing research.

Natural Resources Canada carries out research concerning non-timber values in two research themes. One deals with the valuation of non-timber goods and services provided by forests, especially recreation. Essential is also the development and evaluation of non-market valuation methods for assigning an economic value to timber goods and services.

The other theme involves a social psychological approach to examining forest values. This them includes the identification of values, and the development of methods to measure values, examining values across geographic regions and among stakeholder groups and assessing the relationships among cognitions, behaviour and social and cultural influences.

Natural Resources Canada has identified significant knowledge gaps with respect non-timber forest products. Some of the information that needs to be provided is how to integrate timber and non-timber systems for maximum benefit.

The development of governance is not only about decision making but also innovative technologies, approaches and tools are considered to be the key to the sustainable development of the forests (www.nrcan.gc.ca). Specific research areas include the identification of social and economic indicators of sustainable development and exploring the means to measure and monitor them; analyzing statistics and indicators of community sustainability; examining policies that influence the use of forests and how these policies contribute to the sustainability of communities. A specific forest ecosystem research network of sites (FERNS; (http://cfs.nrcan.gc.ca/subsite/ferns) promotes forest research based on ecosystems and sustainable forest management and provides a forum for information and data sharing. Environmental economics research on these sites is still rudimentary [check!!]. Overall one can identify clear conceptual use in the context of governance development. Some of this use and the research it is based on may in the future create the basis for instrumental use of the monitoring of external effects. So far, however, no specific goals or threshold values have been specified with reference to research on externalities.

One topic of particular interest in the Canadian forest administration is forest certification. For an independent third party forest certification is a useful tool in ensuring that paper and wood products purchased and used come from forests that are well managed and legally harvested (www.nrcan.ga.ca). The certification system in Canada promotes by the Certification Coalition, the goal of which is

> *"to promote the use and acceptance of internationally recognized sustainable forest management certification standards in Canada in order for Canadian producers to continually move towards sustainable forest management, secure a sustainable supply of raw material, and to ensure marketplace acceptance of Canadian forest products."*

Here one can also identify conceptual and political use of externality research, perhaps also symbolic use. The specific rules of the certification have not, however, been developed based on systematic externality research, but are instead the result of bargaining and weighting of different interests. Systematic analyses have been used in the debates, but not as a specific basis for the decisions.

Climate change has open up new views on the issue of externalities. Natural Resource Canada has three research themes concerning economics of climate change (www.nrcan.gc.ca). The first one is to find out forest ecosystem changes as a result of climate change. Methodologically this requires integrated and interdisciplinary approaches. The second theme focuses on implications of climate change on local forest management, and the third theme deals with potential effects of climate change on outdoor recreation. The implicit assumption is that it is essential to be able to predict long-term effects of climate change and forecast forest outputs, and especially the associated economic benefits.

Public involvement in Canadian forest policy

A specific arena for the use of externality research is the public debate. In Canada, most of the forests (94%), is publicly owned (http://canadaforests.nrcan.gc.ca/articletopic/48) and citizens have opportunities to participate in forest planning. Public involvement in Canada can be traced to the UNCED Conference in Rio 1992. Today, there is broad consultation with non-governmental organizations, industry, aboriginal and local communities, academics and others before major forest decisions are made.

Participation and collaboration starts at the top, at the ministerial level. At the national level, public involvement has had great influence on uncountable forest policies and programs, just to mention the National Forest Strategy, the Canadian Biodiversity Strategy and the Criteria and Indicators for Sustainable Forest Management.

Essential in an analysis of the influence of public involvement on the use of research is to investigate, or at least to be aware of, different kind of externality networks or partnerships. One of the long term goals of the Natural Resources Canada is to create a network of people who have an interest and expertise in various aspects of non-timber forests products. Beckley & Smith (ref) have investigated possibilities to build partnerships for sustainable management of non-timber forest products (http://cfs.necan.gc.ca/foresresearch/subjects/socioeconomics). This suggests that externality research can gain increasing use through public debate. In this case the use will be conceptual, political and symbolic, but rarely instrumental. However, one can argue that all the other uses are a prerequisite for instrumental use of environmental economics research.

7.3 Specific studies related to externalities in the Canadian forestry

A number of studies related to the specific topics of externalities of the Canadian forestry strategies can be identified (Table 2). All of the topics are dealt with in both Canadian literature and in a broader international literature (Table 2). When it comes to conceptual or political use it is difficult and partly meaningless to distinguish between Canadian and non-Canadian literature, although one can argue that policy relevance is enhanced by dealing with national cases. Research that is closely linked to the Canadian context is easier to use in awareness raising and conceptual development for policies level. Thus Canadian research may act as a gate-keeper for also the conceptual use of international research in Canadian forestry policy.

Instrumental use, and somewhat paradoxically also symbolic use, requires context specific detailed studies. Studies, which would actually have been used instrumentally, appear to be very rare in Canadian forestry. Thus there is no specific economic monitoring of externalities although there is detailed economic monitoring of the main output of Canadian forestry. The closest one comes to externality monitoring is the monitoring of the value of non-timber products, but it is mainly treated in production terms, not in relation to externalities or environmental effects.

Table 2. Forest externality topics and related research

Forest externality related topic	Research/Study: references
Ecosystem based forest management Management of multiple forest values	www.canadaforests.nrcan.gc.ca/articletopic/60: Integrated landscape management. Article date 2007-09-01 Points of view: Boreal forest. Article date 2005-09-01 Is Canada, as a country, managing its forests sustainably? Article date 2001-09-01 Canadian literature: Kant, S. 2007. Economic perspectives and analyses of multiple forest values and sustainable forest management. Forest Policy and Economics Vol 9, Issue 7, April 2007. Other literature Zhang,Y. 2005. Multiple-use forestry vs. forestland-use specialization revisited. Forest Policy and Economics. Vol 7, Issue 2, February.
Biodiversity and conservation	www.canadaforests.nrcan.gc.ca/articletopic/60: Ecosystem services: the total value of forest. Article date 2008-04-21 Integrated landscape management. Article date 2007-09-01 Spirit bears rainforest: integrated landscape management at work. Article date 2007-10-17. Benefits of the boreal forest. Part 1. Article date 2005-09-01. www.nrcan.gc.ca State-of-art of practices to mitigate the threats to biodiversity Canadian literature Adamowitcz, W and Veeman, T 1998. Forest Policy and the Environment: Changing Paradigms. Canadian Public Policy, Vol 24 (1998), pp S51 – S61.

	Other literature: Fisher, J. 2008. Challenges for applying cost-benefit analysis and valuation of environmental benefits to aid environmental decision making in practice. Environmental Agency of England and Wales. Paper presented in EAERE/Gothenburg. [EVRI]: Horne, P & Karppinen, H & Ylinen, E 2004. Citizens opinions on protecting forest biodiversity. In publication Horne, P & Koskela, T & Ovaskainen, V. (ed) Metsänomistajien ja kansalaisten näkemykset metsäluonnon monimuotoisuuden turvaamisesta. Abstract: Safeguarding forest biodiversity in Finland – citizens and non-industrial private forest owners view. Finnish Forest Research Institute. Research Papers 933. Turpie, J & Heydenrych, B & Lamberth, S 2003. Economic value of terrestrial and marine biodiversity in the Cape Floristic region. Implications for defining effective and socially optimal conservation strategies. Biological Conservation 112(2003).
Non-timber forest products: • Valuation of non-timber forest benefits; • Environmental values of forests; • Recreational use of forests;	Smith, R & Cameron, S & Beckley, T. The forest is much more than trees. (http://cfs.nrcan.gc.ca/foresresearch/subjects/socioeconomics) Canadian literature Kant, S.2003.Extending the boundaries of forest economics. Forest Policy and Economics. Vol 5. Kant, S & Shahi, C. 2008. The enchaged green golden rule. University of Toronto, Faculty of Forest. Paper presented in EAERE/Gothenburg. Other literature Navrud, S. & Brouwer, R. 2007. Good practice guidelines in benefit transfer of forest externalities. Draft Nov 28th 2007. Cost Action E45. European Forest Externalities. EUROFOREX. [EVRI]: Lindhjelm, H 2007. "20 years of stated preference valuation of non-timber benefits from Fennoscandian forests: a meta-anlysis. Journal of Forest economics 2007, Vol 12, Issue 4, pp 251 – 277. Tobias, D. & Mendelsohn, R 1991. Valuing ecotourism in a tropical rain forest reserve. New South Wales Government, Department of Environmental and Climate Change (www.environment.nsw.gov.au/envalue/studydetail.asp). Amigues, J & Boutaloff, B & Desaigues, C & Gauthier, C & Keith, J 2002. The benefits and costs of riparian analysis habitat preservation: a willingness to accept/willingness to pay contingent valuation approach. Ecological Economics. Vol 23, Number 1, Nov 2002, pp 17 – 31(15).
Climate change	Global trends: growing demands. Article date 2000-09-01.

• Forest ecosystem changes • Deforestation	www.canadaforests.nrcan.gc.ca/articletopic/60 Canadian literature [EVRI]: Reinsborough, M. 2003. A Ricardian Model of Climate Change in Canada. Canadian Journal of Economics. Vol 36, Number 1, March 2003, pp 21 – 40. Other literature An introduction to environment accounting as a business management tool: Key concepts and terms. EPA 742-R-95-001. June 1995. Haneman, M. 2008. The economics of climate change revisited. University of Berkley. California. Paper presented in EAERE/Gothenburg. Heal, G. 2008. Climate change economics: a meta review and some suggestions. Columbia University. Paper presented in EAERE/Gothenburg. Felgenhauer, T. 2008. Optimal paths of climate change mitigation and adaptation under certainty and uncertainty. University of North Carolina, Dept. of Public Policy. Paper presented in EAERE/Gothenburg. Pingoud, K & Soimakallio, S. 2004. Greenhouse gas balances of harvested wood products and bioenergy (PUUNIELU2). VTT Working Papers 1459 – 7683.
Sustainable forest management • Identification of social and economic indicators of sustainable development • Exploring the means to measure and monitor them	Canadian Council of Forest Ministers (CCFM).2003.Defining sustainable forest management in Canada. Criteria and indicators 2003. Canadian Council of Forest Ministers (CCFM) 2005. Criteria and indicators of sustainable forest management in Canada. Key trends and conditions 2005. Canadian literature Adamowitz, W. 2003. Economic indicators of sustainable forest management: Theory versus practice. Journal of Forest Economics 9(27): 27-40. Other literature Colin, P. Sustainable forest management, pecuniary externalities and invisible stakeholders. Forest Policy and Economics. Vol 9, Issue 7, April 2007, pp 751 – 762. Kilgore, M & Blinn, C. 2004. Policy tools to encourage the application of sustainable timber harvesting practices in the United States and Canada. Forest Policy and Economics 6 (2004), pp 111-127.

Forest certification	Forest certification. Article date 2001-09-01 Canada´s forests in the new millennium. Article date 2000-09-01 Global trends: growing demands. Article date 2000-09-01. www.canadaforests.nrcan.gc.ca/articletopic/60 Other literature: Managed forests in climate change policy: program design elements. A study paper of Dec 2007 by Sampson, N & Ruddell, S & Smith, M and Society of American Forests, to identify and research consensus on the inclusion of forests and forestry activities in public policies on climate change (http://www.safnet.org/managedforests_final_12-14-07.pdf).

Canadian National Forest Strategies
A forest Sector Strategy for Canada: Discussion paper 1981 – 1987
A national forest Sector Strategy for Canada 1987 – 1992
National Forest Sector Strategy for Canada 1987 – 1992
National forest Strategy 1992 – 1998.Sustainable Forest, a Canadian Commitment
National Forest Strategy 1998 – 2003. Sustainable Forest: a Canadian Commitment
National forest Strategy 2003 – 2008.
A Vision for Canada's Forests 2008 and Beyond

7.4 Summary discussion – similarities and differences between forestry in Finland and Canada – the role of information on economic externalities.

The aim of the section was to outline forest policy in Canada and in Finland, and to identify similarities and differences in policy style between the two countries, especially in relation to the treatment of externalities. Forest strategies and other related policy papers in the two countries have been used as important sources of information. Also www –pages of the forest administration have been extensively used as well as articles and other related material, including expert interviews. An extensive literature study concerning economic assessment of forest externalities in international peer review articles was also carried out.

In this summary forest policy framework and selected policy instruments in Finland and Canada are shortly discussed.

The context

Canada and Finland are countries dominated by forests, but the scale is different. Canada's forests and other wooded lands cover 402.09 million hectares[139] against Finland's 26.3 million hectares[140] of forestry land, which includes forest land, scrub land, waste land and other forestry land. Of the area about 23 million hectares are considered available for wood production. The differences in production are clearly smaller than those indicated by the area. Between 2006 and 2008 Canada produced some 80 million cubic meter of lumber, 20 – 23 million tons of pulp, and some 11 million tons of paper for newsprint, printing and writing.[141] Comparable figures for Finland in 2007 were 12.5 million cubic meters of lumber, 13 million tones of pulp and 14 million tons of paper and paperboard.[142] In Canada the share of GDP has been around two percent[143] in 2006-2008 whereas in Finland the forest sector's share in 2007 was around six percent.[144]

The differences in economic importance is likely to be reflected in the policy style, but from a policy point of view an even more important difference lies in the ownership structure. Of Canada's forest and other wooded lands 77 % are owned by the provinces, 17 % is Federal land and only 7 % is private. In Finland about 60 % of the forestry land available for wood production is privately owned, 26 % by the state, 9 % by companies and the remaining 5 % by municipalities, parishes and communities. Communities consist of co-operatives, jointly owned forests, limited partnerships, housing companies, and foundations. Canada's forests are thus mainly public whereas forests in Finland are dominated by private actors.

Forest policy style

From government to governance

During the last decade, forest policy makers in Finland has been undergoing a shift from formal, hierarchical policy making to more open and inclusive modes of governance involving actors within the state, economy and civil society. This development from government to governance is consistent with a general trend in public policy making where policies are defined and implemented within different kind of networks rather than within public hierarchies or markets alone (Kleinschmit, D., Böcher, M. and Giessen, L. 2009; Saglie 2006; Saarikoski, Åkerman, Primmer manuscript draft Sept 2009). According to Dalai-Clayton and Bass (2002), the challenge of governanace is about

[139] http://canadaforests.nrcan.gc.ca/statsprofile/resources/ca [Nov 15 2009]

[140] http://www.metla.fi/metinfo/tilasto/julkaisut/vsk/2008/vsk08_01.pdf [Nov 15 2009]

[141] http://canadaforests.nrcan.gc.ca/statsprofile/production [Nov 15 2009]

[142] http://www.metla.fi/metinfo/tilasto/julkaisut/vsk/2008/vsk08_10.pdf [Nov 15 2009]

[143] http://canadaforests.nrcan.gc.ca/statsprofile/economicimpact/ca [Nov 15 2009]

[144] http://www.metla.fi/metinfo/tilasto/julkaisut/vsk/2008/vsk08_12.pdf [Nov 15 2009]

'achieving collective action in the realm of public affairs, in conditions where it is not possible to rest on resource to the authority of the state'.

In the forest sector, a major challenge in promoting collective action relates to the need to balance traditional orientation towards maximizing volumes of timber production with newly arising demands for multi functionality of forests (Gossum et al. 2005; Wolf and Primmer 2006). Alongside economic goals of income and employment generation, forestry authorities designing and implementing forest policy now need to take into account also conservation and recreational considerations which fall partly under the jurisdiction of environmental authorities, and in which environmental and recreational interest groups as well as local people and absentee forest owners take a keen interest (Horne et al. 2004).

In Finland the shift from government to governance in forestry is natural in the sense that a general shifts in society emphasizing the role of private actors reduces the possibilities of strong regulatory intervention as long as the activities remain within the general boundaries specified as sustainable forestry. In Canada the transition to governance means above all an opening of the forest sector to other actors than those who have had an immediate economic interest in traditional exploitation. The change can be accomplished through a shift in the public ownership policy.

The differences in ownership can become reflected in different uses of externality information. When land is publicly owned information on externalities can be used directly with the purpose of developing comprehensive policy and planning that takes into account "all" aspects and interests related to the forest. Such development has been observed also in Finland within Metsähallitus, which is the manager of practically all state owned forest land. When forest land is mainly privately owned the policy instruments and their implementation differ. Externality research can be used to highlight issues and as justification for changes in regulation that guides the exploitation of forests, but it cannot be used directly and instrumentally to achieve "optimal" management.

Forest sustainability

One of the main objectives of forest policy in Finland (www.mmm.fi) and Canada (http://www.ec.gc.ca/soer-ree/English/default.cfm) is the sustainable well-being of diverse forests. The forest policy aims to safeguard the well-being based on the use of forests and forest biodiversity. Forest policy tools include legislation, public funding and information control. Sustainable forestry has several dimensions: economic, ecological, social and cultural sustainability. Their coordination is a challenge that forest policy must respond to assess the success of sustainable forest management criteria and indicators.

The National Forest Programme (NFP) of Finland is the cornerstone and strategic base of the Finnish forest policy. The NFP aims to ensure forest-based work and livelihoods, biodiversity and vitality of forests, and opportunities for recreation for all citizens. The programme was prepared as an open process between all stakeholders in forest issues.

The cooperation continues in the implementation, follow-up and development of the programme (http://www.mmm.fi/en/index/frontpage/forests/nfp.html). Forest policy management objectives on regional level are included in regional forest programmes.

Canada published its first truly national forest strategy in 1987, in which the approach was principally one of maximizing timber yields (http://dsp-psd.pwgsc.gc.ca/Collection-R/LoPBdP/PRB-e/PRB0513-e.pdf). Spurred by the Brundtland Report[145], Canada then implemented a new, much more consultative, multi disciplinary, and in-depth approach to forest strategy development. The results of this approach were presented in 1992[146]. However, as noted above, most forest in Canada are owned by the provinces and thus there can be considerable variation in the interpretation of what sustainable forest means within Canada.

Success in sustainability in forest management can be evaluated through the criteria and indicators for sustainable forestry. However, there are indices in both countries that defining and assessing sustainable forest management at the national level remains the real challenge.

Ecosystem services

Ecosystem based management is one of the eight strategic directions in national forest policies in both of the countries. Ecosystem based management also considers non-timber and timber benefits along with other social and economic benefits. The goal is to manage the natural forest using an ecosystem based approach that maintain forest health and biodiversity and includes to implementing integrated land-use planning.

In Canada, the strategy attempts to maintain carbon reservoirs and manage the forest to be a net carbon sink. Thus the Canadian forest statistics documents carbon sinks and sources and estimations of the carbon sequestration.[147] These numbers can, with the emergence of a carbon markets fairly easily be converted to monetary value although it remains a theoretical exercise as long as it is not part of a formal international agreement on mitigation of climate change.

Policy instruments

Forest legislation

[145] United Nations World Comission on Environment and Development, Our Common Future, Oxford University Press, Oxford, 1987

[146] The First Canada Forest Accord with a new National Forest Strategy, Sustainable Forest Management: A Canadian Commitment. The Accord and the Strategy have been signed by numerous enterprises, industry associations, landowner groups, forestry associations and environmental groups

[147] http://canadaforests.nrcan.gc.ca/statsprofile/forest/ca [Nov 15 2009]

Forest legislation is the most powerful means of forest policy for ensuring sustainable forestry (http://www.mmm.fi/en/index/frontpage/forests/forest_policy/legislation.html.

In Finland the Forest Act lays down provisions on the restrictions and preconditions for the use of forests. The Act of the Financing of Sustainable Forestry promotes forest improvement and environmental management in private forests and the use of wood for energy. In Finland, there is also legislation on the prevention of forest damage, trade in forest reproductive material, timber measurement, jointly owned forests and organizations in the forestry sector.

Environmental regulation in Canada falls under federal, provincial and in some cases, municipal jurisdiction. Environmental Canada is the federal department that works to enhance the quality of the natural environment, conserve Canada´s natural resources, coordinate policies and programmes and address climate change and waste management issues.

The forest legislation in Canada has undergone several stages with respect to the main objectives, from unregulated exploitation to sustainable management (Ross 1997).

The gradual shift from mere forest exploitation to forest management has occurred throughout Canada. During the current decade, a concern for ensuring the sustainability of forest ecosystems rather than merely a continuous supply of timber resources has emerged. At the provincial level this has led to the setting up of new bodies for the governance, for example in British Columbia, which is one of the main forest provinces, The Private Managed Forest Land Council is an independent agency established under the Private Managed Forest Land Act with tasks related to the encouragement of forest management practices on private Managed Forest land, taking into account the social, environmental and economic benefits of those practices.[148]

Forest taxation and subsidies

Forest taxation in Finland is complex. From the beginning of the 1920s it was based on the assessed average value of the annual increment (so-called area-based forest taxation system). Over the years several changes were made to the details of the system but the main principles have, however, remained in accordance with the original aim.[149]

From the beginning of the year 2006, all forest owners are taxed according to their stumpage revenues.[150] Ensuring the supply of raw material to the forest industries has been the central goal of Finnish forest policy since 1960s. The prevailing forest income taxation system based on actual stumpage revenues does not nullify this aim although modern forest policy does focus more on the non – economic values of forests.

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[148] http://www.pmflc.ca/council.html#who [Nov 15 2009]

[149] Salakari 2006.

[150] Salakari 2006.

In the late 1950´s and early 1960´s, the government launched a programme for improving forests.[151] The Act on the Financing of Sustainable Forestry was enacted in 1996. Its main objective is to ensure the sustainability of timber production, to protect the biodiversity and to promote forest ecosystem management.[152] According to the Act, financing from the annual state budget in the form of aid and loan shall be allocated for the measures like ensuring the sustainability of timber production; maintaining the biodiversity of forests; promoting forest ecosystem management.

In Canada an important difference to the mainly privately owned forests in Finland lies in the revenues collected through rents paid by holders of agreements or licenses for forestry practices on provincial land. For example, British Columbia has a complex set of regulations for different forestry activities, including the payments that permit or license holders have to pay.[153]

The differences in system for revenue collection lead to different possibilities to use externality assessments. In Finland the focus of taxation is on actual incomes generated, and the general tax policy is towards harmonization of different incomes. Exemptions from taxes can be justified by the production of public goods and for this purpose positive externalities can be considered. This leads to a general interest in the level of externalities, but does not translate into specific values. In Canadian provinces which collect revenues from payments one can at least in theory consider the possibility of setting the payments at a level which lead to a compensation also of negative externalities that may arise.

Regulation of biodiversity conservation

The protection of biodiversity has increasingly attracted regulators' attention since the adoption of the Convention on Biological Diversity 1992. The parties are politically committed to reduce significantly the loss of biodiversity by 2010[154] and the EU Heads of State or Government have agreed, for their part, to 'halt the decline of biodiversity by 2010, and to 'restore habitats and natural systems'.

These commitments are proving hard to meet. For example in Finland, the measures of the national biodiversity programme appear insufficient even to slow down the decline of biodiversity by the target year (Fromond, Similä and Suvantola 2009)[155].

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[151] One on the objectives of the forest taxation in Canada is to bring fairness to the property tax system by valuing forest lands according to their current use and to increase landowner's awareness about forest stewardship.

[152] http://www.finlex.fi/en/laki/kaannokset/1996/en19961094.pdf

[153] http://www.for.gov.bc.ca/tasb/legsregs/forest/foract/contfa.htm [Nov 15 2009]

[154] Convention of Biological Diversity, COP 6 Decision VI/26

[155] http://jel.oxfordjournals.org/cgi/content/abstract/eqn033

The loss of biodiversity is an obvious negative externality related to forestry practices, but in Finland it has proven hard to translate into effective regulatory action. The reason is that conservation is felt to cause negative economic externalities and so far the balance has been on the traditional forestry practices, minimizing the costs that biodiversity conservation may cause. In such a context the role of externality studies have been to highlight positive externalities of conservation.

In Canada the federal government's mandate concerning forests includes managing the forests on its own lands, managing international trade and relations, enforcing environmental regulation (e.g., Species at Risk Act), coordinating responsibility for healthy forests, increasing Aboriginal participation, and reporting under national and international obligations. The provinces and territories manage their own natural resources, including forests, except on federal lands, such as First Nations lands and national parks. Each province and territory sets the policies, legislation and other regulatory matters for its own resources.[156] This varying level of responsibilities creates variation in the role of externality studies. Those provinces which have a major forest industry will see limitations and economic externalities of biodiversity regulation, whereas provinces with little economic forestry activities can focus on the positive externalities of biodiversity conservation. At the provincial level, forest practices codes and guidelines for timber harvesting have been developed to promote conservation of wildlife habitat, natural regeneration and retention of natural landscape patterns. Some provincial governments are moving to protect valued ecosystems, including old growth.[157]

Natural values trading

Temporary conservation in the form of natural values trading[158]contracts have been piloted within the Forest Biodiversity Programme for Southern Finland (METSO) (Fromond, Similä and Suvantola 2009)[159].They were initiated by the landowner and concluded between the landowner and the regional forestry or environmental authority for 10 or 20 years. The landowner agreed to protect or promote natural values in a forest area fulfilling predefined ecological criteria. In return to their commitment, landowners were entitled to a subsidy, which was calculated on the basis of the timber and natural values of the area and was paid as a lump sum at the beginning of the contract period. This generates an interest in the valuation of positive externalities related to the conservation of forest biodiversity, although in practice the prices have been set on the basis of negotiations.

There is no directly analogous policy instrument in the Canadian forestry, which is explained by the fundamental difference in land ownership between Finland and Canada. In Canada the main trading concerns the rights to exploit forests and thus the

[156] http://canadaforests.nrcan.gc.ca/article/policy-legislation [Nov 15 2009]

[157] http://www.ec.gc.ca/soer-ree/English/Indicators/Issues/For_Bio/Bulletin/fb_iss_e.cfm [Nov 15 2009]

[158] Pilot project carried out in 2003 – 2007.

[159] http://jel.oxfordjournals.org/cgi/content/abstract/eqn033

interest in externalities focus on the potential adverse consequences of the trading of forest exploitation rights. For example, in British Columbia the Forest Practices Board see itself as British Columbia's independent forestry watchdog. On behalf of the public, it monitors and oversees forest and range practices on public land, as well as government's enforcement of the Forest and Range Practices Act.[160] The Audits cover issues related to externalities but do not aim at economic evaluations as they focus on compliance and enforcement of the relevant legislation.[161]

Auctions

Auctions to invite proposals for permanent or temporary nature conservation is a kind of soft regulation among forestry. Auctions aim at cost –effective use of public and private forest resources. In the METSO- programme in Finland, the regional environmental authorities requested landowners' tenders through competitive bidding for temporary (max 20 years) or permanent nature conservation areas on private land.[162] The bids included a description of the natural values to be protected and the requested amount of funding, and they were assessed against ecological criteria. In Finland the idea of the auction would be to identify the cheapest way of expanding protected sites thus minimizing the economic externalities of conservation while at the same time reducing the negative biodiversity externalities of forestry.

In the Canadian context some debate has been going on concerning auctions of the rights to exploit forests. Thus May (2005) has remarked that "It's very simplistic to put it this way, but if you're going to be producing violins and guitars, you're going to get more jobs and more value than if you're producing toilet paper," she says. "Basically, the same trees can do both, but you really want to find the highest economic value for every tree that's logged…"It's breaking down now," she points out. "There are some auction opportunities happening." To the extent that such auction practices develop they will also contribute to new information of the level of externalities of forestry practices.

Forest certification

Forest certification is a guarantee given by a third independent party which shows that a product or process complies with the predefined ecological, economical and socially acceptable standards of sustainable forest management. Its objective is to promote sustainable forestry. The most unique feature of this instrument is that the Finnish certification system adopted an approach called regional group certification (Fromond, Similä and Suvantola 2009)[163]. This differs from other countries where the certification

[160] http://www.fpb.gov.bc.ca/content.aspx?id=238 [Nov 15 2009]

[161] Audit Reference manuals for compliance and enforcement. http://www.fpb.gov.bc.ca/content.aspx?id=264 [Nov 15 2009]

[162] Pilot project carried out in 2004 – 2005.

[163] http://jel.oxfordjournals.org/cgi/content/abstract/eqn033

is granted individually. Group certification means that all the forests in certain area will be certified at the same time.

The Finnish forest certification system has proved to be cost-effective without jeopardizing the reliability of the results[164]. At the national level, voluntary forest certification system is potentially good sustainable forest management instrument, although Finnish forestry was largely sustainable even before certification was introduced (1998).

At the international level, Finland has adopted the forest certification system to adjust to the international framework on certification of sustainable forest management. Also in Canada, forest management certification systems are in use[165] to demonstrate the forest company's responsibility by having their forest management planning and practices independently certified against a sustainable forest management standard.

The certification systems increase the visibility of forestry externalities, but do not as such, lead to estimates of the externalities in monetary terms. The cost of the demands by the certification systems indicate the willingness of the forestry industry to pay for increase social legitimacy but are not related to the monetary value of the externalities. Studies of externalities may, however, contribute to a debate on the appropriate level of the demands included in the certification systems, which so far have been relatively modest compared with the standard non-certified practices of forestry.

Conclusion

Information on economic externalities are of interest in Canada and Finland as this information may affect the evolution of forestry policies and legislation. From the point of view of using information on externalities in the implementation of forestry regulation there are fundamental differences between Finland and Canada that can be explained by differences in ownership structure.

In Finland an important issue is the use of externality information to guide the development of regulation in such a way that forestry practices of private land owners do not cause unacceptable externalities. For this a macro perspective is essential. In Canada a major concern is the introduction of proper pricing at the level of permits and licenses so that externalities are properly taken into account in the pricing. This leads to a micro perspective as a complement to the macro perspective that guides the overall evolution of forestry policies and legislation.

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[164] Similä 2007.

[165] http://www.certificationcanada.org/

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8 Fishery and Marine Resource Management Case Study

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Executive summary

The present study has been developed for the EXIOPOL Project (WP IV.a and WP IV.b), which aims to analyze the impact of research on externalities in the field of marine resource management.

In the first part, the different types of externalities in the marine environment are investigated. Fishing exerts the most serious pressures on marine ecosystems, in terms of the overexploitation of targeted stocks, degradation of seabed habitats, by-catch, and alteration of trophic interactions. In addition, we show that several others human activities (i.e. recreational fishery, aquaculture, extraction of raw materials, navigation, recreational activities, land development, climate change, spread of invasive species) pose negative threats on marine ecosystems, i.e. pressure on marine populations, release of nutrient and non-nutrient contaminants, conversion and degradation of habitats, which can result in food web disruption, alteration of community structure and consequent loss of biodiversity.

In the second part, we briefly describe the efficacy and applicability of different management approaches that have been devised to overcome these negative effects: 1) traditional fishery management strategies (total allowable catch, regulatory methods, limiting entry schemes), 2) voluntary approaches (co-management, market-based standards and labels), 3) ecosystem-based management, 4) use of marine protected areas. In addition, we list the most important legislative acts that ensure the enforcement of such instruments at the European level.

In the third section, we describe the methods used to quantify the environmental damages and the benefits of conservation in economic term and illustrate how these economic estimates can be applied in the field of legislation and policy-making. We show the main finding of a review of the scientific literature providing quantitative appraisals of the economic costs and benefits associated with both environmental damages and conservation measures. In addition, we present the results of a series of interviews to marine biologists, scientists and politicians carried out to assess the level of knowledge and familiarity of the use of externality data in policy making.

In the last part, we provide recommendation to policy makers, especially at European level, about the actions to be undertaken to avoid the occurrence of negative externalities in the marine environment.

8.1 The externalities in the marine environment

Externality can be broadly defined as any indirect negative or positive effect of an economic activity on a party that does not receive direct compensation for the damages that receives or does not directly contribute to the production of the gains it benefits from.

Traditionally, the concept of 'externality' in the sector of marine resource management has been related to the 'tragedy of the commons' affecting the fisheries worldwide. While from the society's perspective the optimal solution would be that of a sole owner (i.e. maximize the net present value of the fishery resource, that is, maximize the long-term consumptive yield of the fish stock (*Clark 1990*)), at a global scale the lack of property rights has lead to a widespread excess of fishing effort with consequent depletion of the stocks and dissipation of resource rents. Stock externalities, defined as the costs imposed on other fishers by reducing the fish stock - including increased unit harvest cost and decreased productivity- are unavoidable in an open access fishery (*Clark 1990, Holland 2004*). Beside the lack of property rights, which is the fundamental source of externalities in the fishery, there are other types of diseconomies that can arise in this sector. Congestion, or crowding, externalities result from the interference of the fishermen among each other and the consequent reduction in catch and increase in costs (*Agnello and Donnelley 1976*). Mesh externalities occur when a suboptimal choice of the mesh size causes an excessive mortality of juveniles and consequently reduces the long-term productivity of the fish stock (*Smith 1969, Agnello and Donnelley 1976, Holland 2004*). In addition, Boyce (1992) showed that 'in-season stock externalities' are likely to arise when individual fishermen tend to concentrate effort in the most productive period. These types of externalities are all internal to the fishery sector: the focus here is to analyze the interference among fishermen and the resulting effects on the economic profitability. Basically, every exploitation scenario that is suboptimal (with reference to the rents potentially gained by a sole owner) generates an externality. These externalities, summarized in table 1, can be quantified as the differences in rents potentially gained by a sole owner (assessed through a bioeconomic model) and the actual rents generated in a given fishery.

Table 1. Summary of the externalities occurring *within* the fishery sector

Externality	Description
Stock externality	Costs imposed on other fishers by reducing the fish stock in an open-access fishery (*Agnello & Donnelley 1976; Clark 1980*)
'In-season' stock externality	Costs imposed on other fishers by exerting excessive pressure on the fish stock in the most productive season (*Boyce 1992*)
Crowding externality	Interference of fishermen among each other and consequent reduction in catch and increase in costs

	(*Agnello & Donnelley 1976*)
Mesh externality	A suboptimal choice of the mesh size causes an excessive mortality of juveniles reducing the reproductive output of the stock (*Smith 1969, Agnello & Donnelley 1976, Holland 2004*)

However, these types of externalities occurring in the fishery sector (and supported by the *only* fishery sector) are only a small part of the external costs generated by human activities in the marine environments. Besides fishing, many other human activities (i.e. land development, aquaculture, dredging, tourism, recreational activities, sport fishery, commercial fishery) benefit of the ecosystem services provided by marine habitats. This human use is altering the oceans through direct and indirect means and is the major cause of degradation of ecosystems and consequent loss of biodiversity. The main drivers insisting on marine environments and their main ecological impacts are shown in table 2. We individuate 9 human activities (commercial fishery, recreational fishery, aquaculture, extraction of raw materials, navigation, recreational activities, land development, climate change, spread of invasive species) that exert both direct and indirect negative pressures on the marine ecological systems. The major direct impacts are the pressure on marine populations, the release of nutrient and non-nutrient contaminants and the conversion and degradation of habitats, which can result in food web disruption, alteration of the community structure and consequent loss of biodiversity. Overall, the anthropogenic impacts undermine the essential provision of ecosystem services and negatively affect the profitability of others economic activities and the social welfare, and hence are a canonical example of negative externality. The overall impacts generated by unregulated human activities can results in high social costs and in long-term economic losses. These negative trends now besetting fisheries can be turned around, and their ecosystem rebuilt, at least partly, if a range of political actions is undertaken by governments to balance social equity and environmental concerns. Managers should rely on information about the potential benefits and losses derived from the economic activity, in order to guide the decision making process toward a sustainable use of marine resources.

Table 2. Human-driven ecological impacts insisting on marine environments

Activity	Direct & Indirect Ecological Impacts	References
Commercial fishery	Stock depletion	Jackson et al. 2001; Myers & Worm 2003; Ward & Myers 2005; Worm et al. 2006.
	Fishing induced selection & genetic changes	Hauser et al. 2002
	Habitat degradation	Thrush et al. 1998; Jennings et al. 2001; Wells et al. 2008
	Bycatch	Pitcher et al. 2002; Pikitch et al. 2004
	Food web disruption; alteration of	Yodzis1998; Sheffer et al. 2005;

	community structure	Mumby et al. 2006;
Recreational fishery	Stock depletion	Coleman et al. 2004
	Fishing induced selection & genetic changes	Reviewed by Cooke & Cowx 2006
	Bycatch	Reviewed by Cooke & Cowx 2006
	Habitat degradation	Reviewed by Cooke & Cowx 2006
Aquaculture	Habitat conversion	Reviewed by Naylor et al. 2000
	Nutrient & non-nutrient pollution (pharmaceuticals, hormones)	Reviewed by Naylor et al. 2000
	Inbreeding & competition with wild populations	Naylor et al. 2005
	Spread of disease	Krkosek et al. 2007
Extractive activities	Habitat degradation	Erftmeijer & Lewis 2006
	Sediment loading	Bolam et al. 2006
Navigation & Shipping	Impacts on marine mammals	Hovelsrud et al. 2008
	Spread of invasive species	Dunstan & Bax 2008; Molnar et al. 2008
	Release of garbage	Derraick 2002
	Oil spill events	Wiens 2007
Recreational activities	Pollution & garbage	Ivar do Sul & Costa 2007
	Habitat degradation	Buerger et al. 2000
	Disturbance	Bejder et al. 2006
Land development (urban development, industrial and agricultural activities)	Habitat conversion	Halpern et al. 2008
	Nutrient & non-nutrient pollution (sediments, pesticides, heavy metals, organic contaminants)	Smith & Schindler 2009
	Release of garbage	Derraick 2002
Climate change	Local extinction	Portner & Knust 2007
	Habitat loss	Hoegh-Guldberg et al. 2006
	Distributional shifts	Perry et al. 2005
	Food web disruption	Edwards & Richardson 2004
Invasive species	Local extinction	Gurevitch & Padilla 2004; Molnar et al. 2008
Cumulative impacts	Loss of biodiversity	Worm et al. 2006; Halpern 2008

8.2 Political approaches to face the externalities in the management of marine resources

The concept of externality in the sector of marine resource management can be interpreted in two ways: a first one refers to the open access nature of marine resource and consequent economic and biological inefficiency of exploitation patterns; the second is more wide and include all the potential impacts of human activities that lead to loss of ecosystem services upon which human enterprises depend. The message is relatively straightforward: the overexploitation and degradation of marine habitats do not make sense nor from the narrow economic point of view, provided that the benefits and conservation and the costs of environmental damaged are recognized.

A first important impact that this concept can exert in the decision-making process is the *raising of awareness* among politicians of the urgency of avoiding negative impacts of economic activities on ecosystems. Politicians can be encouraged to undertake mitigation strategies when they anticipate the potential economic losses of an unsustainable use of marine resources. Several are the methods that can be applied to avoid the occurrence of negative externalities in the marine environment.

Traditional fishery management tools include the definition of Total Allowable Catches, regulatory methods and limiting entry schemes. The Total Allowable Catch (TAC) is a catch limit set for a particular fishery, generally for a year or a fishing season, and it is actually defined in many countries on single-species assessment. A large set of other methods of regulation (e.g. gear restriction, size limits, trip limits, closures) can be implemented to regulate and limit fishing effort and to minimize the damage resulting from fishing activity. A common approach is also limiting entry to marine fisheries, attempting to overcome the problem of external costs through the creation and enforcement of property rights where they have not evolved naturally (*Waters 1991*). It can been shown that limiting entry is a fundamental way to solve the so called 'Tragedy of the Commons', because it overcomes the problem of open-access resources (*Becker and Choresh 2006, Clark 2006*); however, the method of limiting entry should be accompanied by regulations and restriction in order to avoid other harmful consequences on marine ecosystem. Besides the more traditional instruments, the **ecosystem-based management** (EBM) represents a more holistic approach to marine resource management as it explicitly recognizes the importance of ecological and ecosystem processes in determining the response to human exploitation. The overall objective of EBM is to sustain healthy marine ecosystem and the fishery they support, generating knowledge of ecosystem processes sufficient to understand the likely consequences of human activity (*Pikitch et al. 2004*). The main goals of EBM are to restore and maintain an ecosystem in a healthy, productive, and resilient condition in order to guarantee the providing of ecosystem services and to evaluate cumulative impacts across sectors, resolving trade-offs among sectors or activities. An ecosystem-based management should support the scientific research, and when dealing with uncertainty, rely on the precautionary principle and on the adaptive management. In the context of the ecosystem-based management, **Marine Protected Areas (MPAs)** are key instruments in the spatial planning of sea uses. They aim at the protection of biodiversity protection, at a sustainable fishery management, and at the development of non-extractive uses of the ecosystem (recreational activities, ecotourism) (*Alban et al. 2006*). A set of voluntary approaches can be also implemented to achieve a more sustainable use of marine resources. **Co-management strategies** are suitable instruments to reduce the negative impacts of extractive use of marine resources, promoting the involvement of greater stakeholders in the decision-making processes in a collaborative manner. The co-

management approach can be facilitated by the adoption of codes of practice. Other alternative approach includes the adoption of accredited environmental management systems, implemented through the promotion of environmental performance certification.

In the following table 3, the different management briefly cited above are classified regarding their capacity to overcome the different types of externality occurring in the fishery. In particular, sign (+) is assigned when the management instrument is capable to diminish the given externality, sign (-) when it make the situation worse, and ( ) when the management instrument has no action toward the given externality. Of the traditional tools focused on fishery management, the establishment of property rights (in particular output or catch rights) can effectively overcome some of the externalities occurring within the fishery sector. However, when considering the complexity of ecosystem's functioning and the coexistence of others human activities besides fishing, the ecosystem-based management coupled with MPAs establishment can significantly contribute to reduce the incidence of negative externalities and also contribute to the occurrence of positive externalities.

Table 3. Efficacy of different management strategies in avoiding negative externalities.

Strategy / *Externality*	TAC	Closed season	Area closures	Gear restrictions	Access rights	Input (effort) rights	Output (catch) rights	EBM	Voluntary approaches	MPAs
Excessive number of fishermen	-				+	+	+		+	
Overcapitalization	-	-	-			-	+			
Decline in stock abundance	+	+	+	+			+	+	+	+
Reduction in average age, size at age, and genetic diversity	+						+	+	+	+
Threaten of extinction								+	+	+
Decline in trophic level of landings								+	+	+
Bycatch		+	+	+				+		+

Habitat damage			+	+				+	+	+
Disruption in food chain		+	+	+				+	+	+
Pollution								**+**		+

8.3 Instruments to internalize externalities at the European Level

Thanks to the adoption of a Common Fisheries Policy, the European Union has gained the role of 'lighthouse' for Member States for what concerns the management of fisheries and marine resources. At the European level, in fact, mainly all of the above-cited instruments to internalize the externalities occurring in the marine environment are currently adopted. In the following table, 4 the related legislative acts are reported. The regulatory framework of marine resources is constantly updating and adjusting to the new challenges that continuously arise, thanks to the support of scientific research and to virtuous examples of some Member States. European Union is now laying the foundations to address the problem of open-access condition of marine resources that constitutes the most concerning externality in the field.

Table 4. Application of different management strategies in avoiding negative externalities at the European Level

The fishery management in the European Union	
Regulation No 2371/2002	On the conservation and sustainable exploitation of fisheries resources under the common fisheries policy.
Regulation No 1281/2005	On the management of fishing licenses and the minimal information to be contained therein.
Regulation No 1438/2003	Laying down implementing rules on the Community Fleet Policy.
Regulation No 861/2006	Establishing Community financial measures for the implementation of the common fisheries policy and in the area of the Law of the Sea.
Regulation No 1198/2006	On the European Fisheries Fund.
The TAC system in the European Union	
Regulation No 2371/2002	Restates the TAC system practice
Regulation No 871/1997	Definition of analytical TACs and precautionary TACs.
Regulatory methods in Europe	
Regulation No 850/1998	North Sea (including Kattegat and Skagerrak) and Atlantic Sea.
Regulation No 600/2004	Antarctic Sea

Regulation No 2187/2005	Baltic Sea
Regulation No 1967/2006	Mediterranean Sea
Regulation No 520/2007	Highly migratory fish
Limited entry schemes in Europe	
Regulation 2371/2002	All Community fishing vessels shall be required to have a fishing license
Regulation No 1281/2005	Lays down rules for the management of fishing licenses and for the minimum information to be contained therein
Regulation No 1438/2003	Fixed the reference level of fishing fleet at which each Member State should attain.
Communication 2007/247	On rights-based management tools in fisheries
Market labels and co-management experiences in Europe	
Communication 2005/275	Launching a debate on a Community approach towards eco-labeling schemes for fisheries products
A network of MPAs in Europe	
Directive 79/409/EEC	Special Protected Areas (SPAs
Directive 92/43/EEC	Special Areas of Conservation (SACs)
Europe toward an ecosystem based fishery management	
Directive 2008/56/CE	Marine Strategy Directive on the EU's integrated Maritime Policy

8.4 Externality data in the sector of marine resources

8.4.1 Estimation and use of externality data

Quantitative estimates of externalities can have several applications in the field of resource management and legislation. Economic evaluations could be used in Benefit Cost Analysis to identify the advantages and disadvantages of different development alternatives on the several stakeholders involved in the project. Benefit Cost Analysis is typically used by governments to evaluate the desirability of a given intervention, with the aim to gauge the efficiency of the intervention relative to the status quo. The process involves monetary value of initial and ongoing expenses vs. expected return, and hence strongly relies on correct economic valuations. Estimates of economic losses due to environmental damages are also used in the determination of optimal tax especially to

disincentive emission of pollutants and contaminants. In the fishery sector, taxes are not commonly applied to restrict fishing effort (*Clark 1990*); however, source or non-source pollution from terrestrial activities cause several damages to marine ecosystems and taxes applied to disincentive pollution should rely on economic estimates of the damages. Economic estimates are also useful in the field of civil and criminal law, as they can be used to determine monetary compensation after environmental damage, or to estimate the correct fines to limit the incentive of illegal activities. Economic evaluations of benefit proceeding from conservation program can be used to determine user fees for recreational users and hence promoting the financial self-sustainability of conservation programs. Also when economic evaluations are not directly converted in monetary gains or losses (because no market instrument has been devised to capture that value or because the benefit and cost are only potential) they could be a strong incentive for managers and convincing tools of the convenience of protecting nature. The identification and estimation of economic losses from marine degradation (and economic gains from conservation) can hence help justify protection measures and limit the cumulative pressure on marine ecosystems.

Several approaches can be used to estimate positive and negative externalities in economic terms. Theoretically, changes in the quality or quantity of the ecosystem services should be measured by the change in the associated economic welfare, which consists of the sum of the producer and consumer surplus (also indicated as total economic value, *Costanza et al. 1997*). A diverse range of valuation methods can be applied to estimate the indirect changes in economic welfare (table 5). The production function, the net factor income, the market price and replacement cost methods can be used to evaluate marketable goods and services. The production function approach captures the change in consumer and producer surplus resulting from a variation in quantity or quality of environmental service. The net factor income (or net rent) method estimates only changes in producer surplus by subtracting the costs of other inputs in production from total revenue, and ascribes the remaining surplus as the value of the environmental input. This approximation is valid when the demand is perfectly elastic and the price of the output is unaffected by the environmental change. Also the market price method (price times quantity) can be used as a proxy for economic value of the change, although it tends to overestimate the producer surplus and to neglect the consumer surplus (*Brander et al. 2006*). The replacement cost estimated the value of the change basing on the cheapest alternative way to obtain that service (*Woodward & Wui 2001*). Non-market values can be measured using the travel cost, the contingent valuation or the hedonic pricing methods, which all estimate the change in consumer surplus.

Table 5. Main ecosystem services provided by marine ecosystems and common methods to estimate their value (NFI, Net Factor Income, TC, Travel Cost, CV, Contingent Valuation, RC, Replacement Cost, HP, Hedonic Pricing).

	Function	Ecosystem good or service	Common valuation technique
Use value	*Direct use value:*		
	Provisioning or production services	Production of valuable food and fiber for harvest	NFI, PF, MP
		Pharmaceuticals	NFI, MP

		Raw materials	NFI, MP
	Cultural services	Recreational opportunities	NFI, TC, CV
		Education and scientific knowledge	CV
	Indirect use value:		
	Regulating services	Water quality control	NFI, RC, CV
		Waste treatment	NFI, RC
		Flood control and storm buffering	NFI, RC
		Biological regulation	
		Human disease control	NFI
	Supporting services	Climate regulation	RC
		Nutrient cycling	RC
	Option value:		
	Option value	Future benefit for direct and indirect uses	CV
Non use value	Existence value	Intrinsic value of species, habitat, biodiversity	CV, HP

8.4.2 Externality data in the scientific literature

Despite the many potential application of externality data and the noticeable efforts made to devise methodologies to estimate them, the analysis of scientific literature shows that quantitative appraisals of externalities in the sector of marine resources are quite scarce. In fact, while a large number of publications provide evidences of anthropogenic injuries to marine ecosystems, very few add a quantitative estimate of the associated economic damages. We used ISI Web of Knowledge as search engine to estimate the huge gap between the number of evidences of ecological damages and the number of associated economic evaluations, as shown in figure 1.

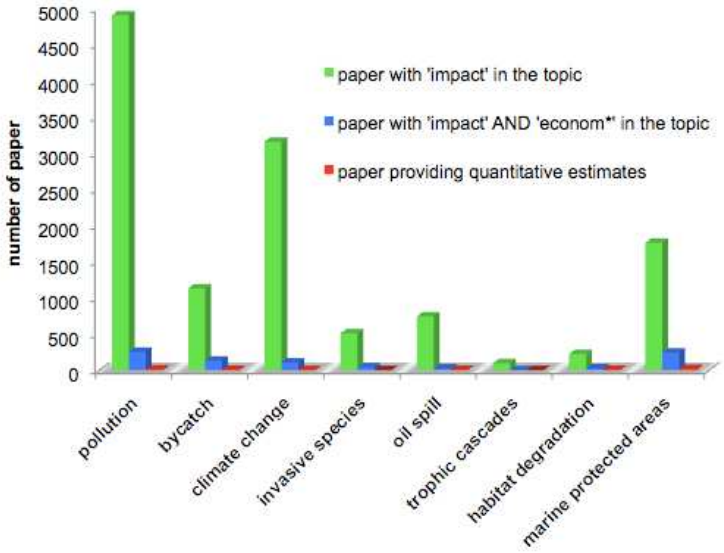

Fig 1. Number of studies providing quantitative economic estimates of environmental impact in marine ecosystems (red), relative to studies reporting evidence of the ecological impact (green) and to studies referring to the economic consequences of the impact (blue).

We found only 94 studies published on journals with IF providing estimates of benefits and costs of human activities (including conservation programs, environmental quality improvements, environmental damages, impact mitigation strategies). Of these, 3 were review papers and 4 metanalysis. Overall, roughly half (44%) of the studies were published in economic journals, with a high number of studies published on Ecological Economics (14) and Marine & Resource Economics (10). Of the 94 studies, the most focused on the economic benefits and costs of habitat conservation (30), on the economic inefficiency of unsustainable fishing practices (29) and on the economic consequences of pollution events (20). In most cases the external costs and benefits of different anthropogenic impacts were evaluated as changes in the profitability of the fishery sector (54%). This can reflect both the major availability of economic data in the fishery sector with respect to other economic areas, both the relative importance of the fishery groups in the decision-making process. A substantial part of the studies also focused on the economic benefits and costs supported by recreational activities (20%) and tourism (7%). Other potential sector (management cost, human health, sea defense, loss of amenity value) roughly obtained the same number of valuations (3-5%) (fig. 2).

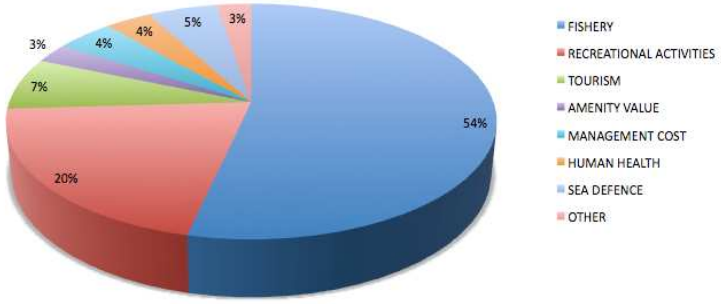

Fig. 2. Number of studies by sector supporting the benefits or the costs

Among these 94 studies, several provided evidence that implementation of property rights in the management of fish stock results in an increase in the profitability of the fishery sector. Evaluations of monetary gains after introduction of property right demonstrate that economic efficiency cannot apart from biological sustainability, and constitute a convincing proof of the suitability of property-right based tools in managing fishery resources. With respect to bycatch problem, fishermen generally do not have any economic incentive to reduce the accidental catch of commercially unimportant species. Rather, scientific papers show that mitigation strategies to preserve species always impose additional costs on fishermen. In addition, benefits of safeguarding impacted species such as dolphins, albatross, sharks, etc are rarely evaluated in economic terms, although potential economic loss can proceed when tourism and recreational activities depend on the presence of charismatic animals, or when removals of such predators cause community-wide effects. Regarding the use of destructive fishing gears, economic estimated of associated damages suggest that such practices are not sustainable in the long term for a wide range of economic activities, including the fishery itself. Establishment of property right constitutes a partial incentive to limit the extent of damages; however, more appropriate cap-and-trade systems (such as individual habitat quotas) could be introduced to avert the use of destructive fishing practices.

Several studies analyze the costs of unregulated coastal development, such as habitat destruction and water pollution. The economic analyses suggest that conversion of habitats is not more convenient when negative externalities and loss of ecosystem services are taken into account. In the marine planning, these negative costs should be analyzed through benefits cost or multi-criteria analysis to devise the optimal development scenario that maximizes social benefits. Regarding pollution events, they impose severe costs especially on the fishery and tourism sector, and also raise both health and management costs. Economic appraisals of the magnitude of these costs can be used to grant compensatory measures or to devise pollution taxes.

Global warming and spread of invasive species also impose serious costs on society. Valuations of associated economic losses provided by scientific papers could be a strong incentive for managers to undertake mitigation strategies.

Regarding the economic feasibility of conservation programs, it is important to devise appropriate market instruments (also as simple as user fees) to monetize the benefits proceeding from preservation of important ecosystem services in order to outcompete the opportunity costs of foregone development chances.

8.4.3 Use of externality data: results from interviews

A series of interviews has been carried out to assess the level of knowledge and familiarity of different stakeholders toward the use of externality data in policy making. We indentified 20 actors among MPA directors, marine biologists, economists and politicians in Italy and USA. The structure of interviews was quite elastic and allowed the actors to freely communicate their knowledge and experience with externality data; nevertheless, for each interviews these main themes were analyzed:

- the level of familiarity of each actor with the concept of externality;
- the knowledge of applied case studies where externality data were used;
- the general propensity of the actor toward the use of externality data in policy making.

From the interviews it emerges that all interviewed persons have familiarity with the concept of externality, although differences exist in the jargon used. The word 'externality' is more familiar to academic professor and researchers, while MPA directors more commonly refer to 'external cost and benefits'.

While the concept of externality is well known (intended as secondary or negative effect of human activities with an associated economic loss), the use of quantitative estimates of externalities is much more limited among stakeholders.

However, from the interviews it was possible to highlight two fundamental fields where externality data were of more interest: the estimate of damages from pollution events and the estimate of socioeconomic impacts of Marine Protected Areas.

Regarding the consequences of water pollution, economic estimates of associated damages exist at local level, with fishery, aquaculture and tourism the most impacted sectors. Generally, economic estimates of pollution-related damages can help undertake mitigation strategies. Monetary compensations are instead problematic because they often do not rely on quantitative estimates, more on political decision. Especially for the fishery sector, the habit to grant subsides can bias the estimates and the subsequent compensation.

Regarding the use of externality data in management of Marine Protected Areas, it emerges that effective MPA enforcement is the prerequisite for positive externalities to occur. Positive externalities could be also monetized (i.e. revenues from tourism, diving) and help the self-sustainment of MPAs. However, quantitative analyses are useful more as support, and decision-making process is often independent from cost-benefit analysis. In particular, economic estimates are not able to capture some values and are not good proxies when the aim is conserving nature.

8.5 Recommendations

8.5.1 Strengthening the impact of the concept of externality: property-right based systems, ecosystem-based management and the problem of subsides

In the sector of marine resource management, the concept of externality can be interpreted in two ways: a first one refers to the open access nature of marine resource and consequent economic and biological inefficiency of exploitation patterns; the second is more wide and include all the potential impacts of human activities that lead to loss of ecosystem services upon which life depends. These aspects of externalities have received substantial attention among economists and scientists, and the message is relatively straightforward: the overexploitation and degradation of marine habitats do not make

sense nor from the narrow economic point of view, provided that the benefits and conservation and the costs of environmental damaged are recognized. However, a gap still exists between the optimal solutions provided by scientific research and the political actions undertaken by governments. Stronger and more conscious awareness of the urgency of avoiding negative impacts of human activities on ecosystems should arise among politicians.

When possible, **property rights** should be implemented to internalize the externalities within the fishery sector. The scientific community is unanimous in considering the introduction of individual catch quotas as the most efficient tool to internalize the externalities within the fishery sector. Indeed, implementation of property rights-such as ITQs- has shown to halt, and even reverse, the global trend toward widespread fisheries collapse. In addition, several empirical studies show that the implementation of such methods results in an increase in the profitability of the fishery sector. Definitions of catch rights on a more precise spatial and temporal scale can overcome other problems concerning the fishery ('in-season' and crowding externalities) and constitute a first step toward a more comprehensive spatial planning of marine resource use. Regarding the European level, ITQs are currently implemented in Iceland, Holland, Norway and Portugal. Most countries still hesitate in correctly facing the problem of open access condition of the fishery sector. Fortunately, European Union is now laying the foundations to address the problem of open-access condition of marine resources that constitutes the most concerning externality in the field. System of ITQs could be implemented for stocks that are now managed through Total Allowable Catches. Current TAC system, in fact, is not a good system in avoiding the problem of excess fishing capacity and effort, as it cannot prevent the overcapitalization of the fishing fleets. It is worth noting that some problems also exist in implementing ITQ systems, especially in the Mediterranean countries where the fleet is made up mainly of small-scale fisheries distributed along the coasts. In such communities it is often difficult to implement system if individual quotas. One solution could be the implementation of co-management experiences as a hybrid-form of property rights. This 'small-scale management' could be facilitated by the adoption of codes of practices and by the creation of marine protected areas with definition of exclusive fishing areas for local fishermen. In Italy, for example, the implementation of Marine Protected Areas basically implies a form of limited access within a spatial zoning of marine areas, favoring the adoption of more sustainable fishing practices.

Unfortunately, property rights systems are not the panacea for all problems insisting on marine environments. Bycatch, habitat degradation and food web disruptions are alarming impacts recorded all over the world. Establishment of property right constitutes a partial incentive to limit the extent of damages; however, more appropriate cap-and-trade systems (such as individual habitat quotas) could be introduced to avert the use of destructive fishing practices. In addition, when considering the complexity of ecosystem's functioning and the coexistence of others human activities besides fishing, the **ecosystem-based management** coupled with MPAs establishment is a necessary approach to reduce the incidence of negative externalities and also contribute to the occurrence of positive externalities. At European Level, the Marine Strategy Directive (Dir 2008/56/CE) (jointly with Birds Directive (79/409/EEC) and Habitats Directive (92/43/EEC)) represents a successful initiative toward ecosystem-based management. Clearly, the challenge is the dedication by which the Member States will recipe it.

Another crucial aspect of fishery management is the grant of **subsides**. Although the open-access nature of fisheries remains the ultimate cause of overfishing, the problem of overcapitalization, or overcapacity, is seriously aggravated by government subsides to fisheries. From an economic point of view, in fact, subsides decrease the cost of fishing, so that the bioeconomic equilibrium established at higher values of effort. When the majority of stocks were largely underexploited, as in the 1950s and 1960s, subsidies granted by governments reflected in increasing catches and thus in higher profits. Nowadays, however, the resource base is now too small for all fishing boats to make a profit, with too many stocks being fully or overexploited. Actually, overcapitalized fisheries can continue to operate after they have depleted their resource thanks to government subsidies, and currently the global fishing fleet is more than twice the size that the oceans can sustainably support. Thus, subsidies, far from having the effect they had earlier, now contribute to overfishing. Another important reason for governments subsidizing fisheries is the belief that without subsidies, the fishing industry and fishing communities will suffer in the short term. Finally, governments- especially those of rich countries- are also motivated to provide subsidies in order to ensure trade competitiveness in fisheries products. As highlighted by Pauly (2003), the future for fishery depends upon which major driver (markets, security, policy or sustainability) will influence the actions undertaken by governments. Among these different future scenarios, the gradual elimination of subsides is a priority in order to reduce the rate of overexploitation of marine resources. Among the economic and financial interventions which provide powerful instruments to regulate the use of ecosystem goods and services, the elimination of subsidies that promote excessive use of ecosystem services has been indicate as a priority also by the Millennium Ecosystem Assessment. However, removal of subsidies is not a simple issue because unilateral actions have trade implications, and may not work because fish and fishing vessels do not respect national exclusive economic zones. Hence, the only effective approach to the problem of overfishing subsidies is through multilateral action, with all fishing nations ending or reducing these subsidies under similar rules. Sumaila et al. (2007) indicates the WTO as the only institution that can overcome the global problem of overfishing subsidies. This 151-country entity in fact determines the rules of international trade.

Buyback subsidies have been widely employed to reduce fishing capacity, but these 'decommissioning programs' throughout the world have generally failed. In fact, buying vessels out of the fishery can be extremely costly: most fishermen will wish to remain in the fishery if they anticipate that it will be profitable. High payments will be needed to convince the fishermen to withdraw. Furthermore, the incentive for a renew increase in capacity persist after the buy-backs are completed. Other rounds of overcapacity and further buy-back programs are then almost inevitable. European Union is actually using buyback subsides to order to reduce the fishing capacity, and each Member State should provide a description of the way to achieve an adequate fishing fleet. The subsides program will continue until 2013; the recommendation here is that this buyback program would be suspended, and that EU would promote multilateral actions at international scale to gradually eliminate subsides.

8.5.2 Using externality data: a methodological, political and ethical issue

Despite the potential usefulness of externality data, the actual use of quantitative estimates of externalities is much more limited in the decision-making process. Several barriers contribute to limit the use of externality data in the policy-making process.

Methodological barriers include the difficulty of estimating in quantitative manner the external benefits and costs of human actions. Substantial data and information are needed to correctly valuate positive or negative externality, but often they are not available. In addition, some methods have inherent weakness that makes the estimates hardly objective. For example, the results of CBA depend often by the purposes and expectation by which the analysis are conducted and can too often be biased. Methodological barriers could be worsened when economic analyses such as CBA are not placed in any legislative framework.

Political barriers arise when quantitative analyses are used as support but decision-making process is independent from quantitative economic appraisals. For example, compensatory measures of environmental damages are much more determined on political base rather than on econometric analyses. Especially for compensatory measures destined to fishermen, the habit of asking for subsides can lead to an unrealistic appraisal of the actual costs supported by fishermen and to a consequent biased grant of these funds.

Ethical barriers exist because often it is neither necessary nor possible to quantify the beauty of nature in economic terms. Does it make sense try to monetize the scent of rosemary? Or put a price-tag on a grouper? Economic estimates are not able to capture some values and are not good proxies when the aim is conserving nature. Do we really need to put a price on dolphins to protect them from a foolish killing? Are economic justifications really stronger than ethical ones?

8.5.3 Integrating externalities data in the national accounts

Taking into account the impacts of externalities data implies not only their correct valuation, but also the adoption of suitable instruments in which benefits and costs of human activities became available and useful for policy makers.

At the national level, the current System of National Accounts (SNA) represents a fundamental instrument in influencing political decisions. In the current national accounts, economic progress and human wellbeing are often represented by indicators such as Net National Product (NNP), resting on the assumption that wellbeing is proportionate to consumption of produced goods. In the SNA compilation, the several negative effects related to production of good and service are usually not considered, although pollution or habitat destruction can translate in remarkable reduce output or directly affect the human wellbeing. With regard to fisheries, for example, until recently, the SNA recorded only the income from capture fishing, but not changes in fish stocks. This can be misleading when a fish stock is being overexploited: income from overexploitation would be recorded, but not the corresponding depletion of fish stock neither the costs associated to environmental degradation.

The Green National Accounting is an alternative indicator of economic progress and wellbeing, based on the idea that the costs associated to environmental externalities and to depletion of natural capital should be reflected in the national accounts, in order to

provide a most reliable index of human welfare. A key player in developments of Green Accounting is the United Nations Statistical Department, which has overseen the development of the System of Environmental-Economic Accounting (SEEA), a satellite system of the System of National Accounts (SNA). This is stated as providing "a transparent information system for strategic planning and policy analysis which can be used to identify more sustainable paths of development" (UNSC, 2007a). The most important publication in the field of the environmental economic accounting applied to fishery is the "Handbook of National Accounting: Integrated Environmental and Economic Accounting for Fisheries (SEEAF)", issued jointly by United Nation Statistical Department and the FAO Fisheries Department in 2004. This handbook provides methodological and practical guidelines to implement the SEEA in the UN countries, with specific regard to the fishery sector.

The motivation for environmental accounts has been the adoption by many countries of the notion of sustainable development. The design and implementation of strategies for sustainable development relies on information about the interactions between the environment and the economy. Information is needed to monitor progress toward meeting environmental goals. Information is also needed to assess alternative development strategies, and to design environmental policy instruments to achieve sustainable development. The SEEAF is designed to provide this information for fisheries resources.

Like the traditional country's system of national account, the SEEAF include two main categories: capital assets and flows assets.

Capital asset includes both produced assets (capital used for fishing and manufacturing of fish products, e.g. boats, fishing gears, and cultivated fisheries) and non produced asset (which include wild fish stock, a portion of which is exploited).

The environmental, or physical, asset includes all aquatic resources (cultivated fishes for harvest and breeding and non cultivated fishes) and marine habitats supporting fisheries. This natural capital could be compiled both in physical and monetary terms. Compilation of the physical asset account requires the registration of the fish stocks at the beginning and end of the accounting period and changes therein, divided into changes that result from economic activity (changes in inventory, net growth of stock, catches) and changes due to other factors (for example, catastrophic losses due to environmental events or diseases). As fisheries are dependent on ecosystem health, it is useful to construct accounts for those components of ecosystem that provide fish habitat. Stock accounts can be constructed for habitats such as mangroves, sea grass beds, coral reefs, lagoons, and others including water itself as well as for terrestrial ecosystem resources that affect fish habitat, such as forests.

The monetary asset account has the same structure as the physical asset accounts with a revaluation recording the economic value of gains or losses. The value of any asset is the sum of the discounted stream of resource rent that it is expected to generate during its lifetime. For fisheries that are managed under a system of freely tradable individual fishing rights, like Individual Transferable Quotas (ITQs), the asset value of a fishery can be reflected by the trading prices for ITQs. The monetary asset account is capable to register the depletion and degradation of the natural capital, which is defined as the

decline in the value of the stock as a result of human harvesting activities. The monetary depletion is hence a measure of the reduced ability of the fish stock to generate resource rent in the future. An indicative monetary valuation of habitats such as mangroves, coral reefs, sea grass beds, etc. could be found in studies like Costanza (2007). When the monetary valuation of habitats and ecosystems result too difficult, these assets should be included in the physical accounts and, where appropriate, supplemented by suitable indicators of abundance and sustainability.

Flow accounts related to fisheries include: all economic activities related to fisheries; environmental impacts generated by fishing and related industries; resource management and environmental protection expenditures; taxes, subsides and other levies related to resource management. Economic activities related to fisheries include not only the fishing activity itself but also the range of forward linkages (processing, marketing and distribution) and backward linkages (production of inputs, especially vessels and gear), that support economic activities and employment in other, related industries. Environmental impacts include damage to fish habitat or to other aquatic species, emissions by fishing vessels, water quality degradation and detrimental changes in land use by aquaculture activities. Expenditures for protection of fish habitats and resource managements accounts can be particular useful for policy analysis. The reason to establish accounts for environmental protection and resource management is to identify and measure society's response to environmental concerns through the supply and demand for environment goods and services, through the adoption of production and consumption behavior aimed at preventing environmental degradation of ecosystems and by managing fishery resources in a sustainable way. Taxes, subsides and levies, including the broadly used buyback subsides, are also registered as flow accounts.

The System of Environmental-Economic Accounting for Fisheries has been implemented in several countries, including Norway, Namibia, Iceland and United States.

The Norwegian case study focuses on methods to estimate resource rent from national accounts and survey data when a large share of the operations is undertaken by owner-operators. It also compares the actual value of cod stock under current management to the potential value of cod under more economically efficient management. The Namibian case study focuses on the success of the government in recovering resource rent through a system of quota levies, and the extent to which quota levies and other fees cover government's cost of managing fisheries. It also includes some observations on the potential problems that can arise from a strong foreign presence in the fishing industry of a developing country. The Icelandic case study focuses on different approaches to valuation of fish stocks, assessing three alternative methods of valuing fish stocks. The case study of the Atlantic sea scallop fishery in the United States of America provides an example of an age-structured asset valuation approach, based on a well defined fisheries management plan to increase the fishable biomass and the future sustainable harvest. The value of the fisheries asset under the new plan is compared to the value under current management.

These case studies mostly focuses on the status of the main fishing stocks as source of current and future rents, following a "single-species" approach that is common in fishery management. No case study explicitly refers to environmental expenditures, nor to the value of the ecosystem services, or provides valuation of pollution or discarding costs.

However, such systems of accounting represent a useful framework that could be next implemented and completed, in the direction of a more 'ecosystem-based' approach.

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9 Hungarian Agriculture Case Study

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9.1 Introduction

This chapter focuses on the case of agriculture in Hungary. Firstly, we very briefly outline historical developments of agricultural policies in the EU and introduce the definition of the concept of externality. Next we give a brief assessment of the main documents in Hungary where references to environmental externalities in agriculture may arise. Finally, we provide a summary of the interviews with some key stakeholders on environmental externalities in agriculture.

9.1.1 Brief introduction to agricultural policy developments in the European Union

According to Warren, Lawson and Belcher (2008) by 1980 the European Union managed to produce goods in different areas in a self-sufficient way (for instance butter, sugar, beef-production and commodities). Agricultural policy had reached its goals: production increased significantly, quantity (agricultural goods) was not an issue any longer in Europe. Since then the aim was not to increase the quantity produced as overproduction and excess supply became a problem that had to be solved. In order to reduce overproduction a new system was introduced in 1988; the 'set aside' system, where ceasing production temporarily on the land was subsidized by the European Union. However the latter mentioned subsidy system turned out to be not a proper solution for the problem of overproduction. It became obvious that production has to be separated from the subsidies of the Common Agricultural Policy (CAP). In 1992 'MacSharry reforms' were introduced: the subsidy system shifted from a product based subsidy system (a guarantee for high-prices) to a producer focused subsidy system (direct compensation payments). As Warren, Lawson and Belcher (2008) states, there were mainly two reasons for 'greening' the CAP: it could handle the problem of excess supply and on the other hand it could control the expenses of the subsidy system. Later, based on Bignal and Baldock (2002) put forward an idea, that the agri-environmental programs were only by-products of agricultural policies.

The roots of the progress that made the agriculture more environment friendly were set in the conferences of the United Nations, which were held in Rio de Janeiro and Stockholm, as Csete and Láng (2005) states (1972, and 1992, Agenda-21). In the European agricultural policies, tackling environmental damages became significant after the reforms in 1992. The political rationale behind reforms were rather political and not environmental (Baylis et al., 2008, p.755). Up until the 1990's, the agricultural externalities played a minor role comparing to the importance of such aims as incomes, prices and trade (Shortle and Abler, 1999). Agri-environmental protection policies introduced in the 1980's served rather as a compensation for decreasing price supports.

Theoretically agri-environmental programs were developed because of market failures. The market is unable to tackle some of the environmental damages, for instance increasing amount of nitrates in groundwater or decrease in biodiversity; but on the

other hand, it is not guaranteed by the market alone that positive impacts, such as maintenance of landscape will be carried on. As a consequence of market imperfections, government intervenes.

Ángyán (2001, p.63) analysed the fundamentals of multifunctional agriculture. In his interpretation "the countryside is not only a location of agricultural production it also serves as biological and social habitat. In the introduction, based on Csete and Láng (2005), we already touched on some elements of multifunctional agriculture, we are now based on Ángyán (2001, p.63) listing the most important ones:

- the production of healthy and safe goods, without chemical residues while still rich in inner content,
- the sober use of non-renewable resources and energy,
- decrease or, if possible, avoidance of the pollution of soil, atmosphere and water,
- sustaining biodiversity and cultural landscape,
- preserving rural cultural and agricultural values,
- providing employment and ensuring an acceptable level of income for as many people as possible.

Based on Romstad et al. (2000) multifunctional output of agricultural production encompasses biodiversity, cultural heritage, openness, borders-mosaics, active landscape, recreation access, food security, food safety, food quality, rural settlement, scientific-educational value, and negative external effects. Naturally, environmental externalities[166] are not related to all the above, as the question of food safety and food-quality might be resolved via labelling the products, hence it can be solved by the market (see Randall, 2002, p.294).

Multifunctional agriculture differs from the one dimensional conceptions of agriculture that the latter focuses not only on the production of food, it also broadens its scope to functions that are socially deemed adequate (see environmental, cultural and regional aspects). A working-definition of multifunctional agriculture used by OECD (2001, p.13) has two key elements. Firstly, agriculture jointly produces multiple commodity and non-commodity outputs, while secondly, some of the non-commodity outputs exhibit the characteristics of externalities, i.e. public goods with an inappropriate market value. Ángyán (2007, p.29) likewise categorises the tasks of multifunctional agriculture into two subdivisions: firstly, production functions that are controlled by the market (e.g. food, renewable resources, energy sources etc.), secondly, environmental, social and cultural functions related to environmental conditions, landscape, soil (non-commodity outputs, public goods). Ángyán (2007, p.29) also points it out that CAP subsidy system reforms are based on these two pillars of multifunctional agriculture described above, where the first pillar focuses on the productivity of farming, while the second pillar focuses on the 'eco-social performance of agriculture'.

Warren, Lawson and Belcher (2008, p.191) argued tellingly that environmental goods and services were, in the past, the by-product of agricultural activity and 'with agri-environmental schemes they have become the product while food has become the by-product' (see also Huylenbroeck et al., 2007).

9.1.2 The definition of the concept of externality

[166] Environmental externalities will be discussed later.

Externalities, i.e. the concept of external costs and benefits were introduced a hundred years ago by Alfred Marshall. In Kerekes' (2007, p.117) interpretation Marshall used the term, externality for such events, when a financially independent unit (e.g. corporation) directly influences another financially independent unit (a corporation, or a consumer), without getting into direct contact on the market. Mishan (1971) defines external economic impact as an unintended economic impact of an actor on the level of economic welfare of another actor. Thus, externality is a fundamental manifestation of market failure. In the presence of externalities, markets do not reflect full social benefits or costs. As Baumol and Oates (1988, p.17) states 'externality is present whenever a person's utility or production relationships include real variables, whose values are chosen by others without particular attention to the effects on the person's welfare'. In addition, an essential feature of an external effect is non-deliberateness. 'The effect produced is not a deliberate creation, but an unintended or incidental by-product of some otherwise legitimate activity' (Mishan, 1971, p.2). The reason behind the existence of externalities can be found in the absence of well-defined ownership. According to Verhoef (1999), the quality of the environment is typically a good, where property rights are not defined, thus the market is non-existent. The ExternE project[167], which aimed to quantify externalities, defines externalities as the following: an external cost, also known as an externality, arises when the social or economic activities of one group of persons have an impact on another group and when that impact is not fully accounted, or compensated for by the first group (EC, 1999). However, Vatn and Bromley (1997, p.135-137) state that disputes about definitions and consistencies prevent the development of externality debate. From their point of view, it is not accurate to label externalities as a type of market failure, because if market exist, the presence of externalities may be interpreted as a rational consequence, thus it is not appropriate to label it as failure of market. From their perspective difficulties arise when we attempt to determine the appropriate level of efficient intervention mechanisms; because the time gap between the emission and the awareness of external impacts may be long. Thus 'fundamental questions about rights and duties must be determined ex post'.

In conclusion, the main characteristics of externalities can be defined as perceived changes in welfare of a third person (other than consumer and producer), there is no compensation and the impact caused is unintended.

Environmental economics is specifically to deal with negative externalities. The negative external costs are typically in relation with public goods. However, in the field of agriculture, positive externalities related to the environment are significant as well. Maintenance of biodiversity and landscape is a positive externality, and a relatively few attempts has so far been made at incorporating them in valuation exercises.

Warren, Lawson and Belcher (2008, p.68-69) examine the question of excludability and rivalry in relation to public goods. They argue that, for instance, it is difficult to exclude others from the beneficial effects of biodiversity. Benefits enjoyed by a person normally do not reduce the quality and quantity of biodiversity available for others. As a result, the "producers" of biodiversity can hardly obtain economic rewards; and that results in external benefits.

During the assessment of broadly interpreted agricultural performance Randall (2002) underscores, that usually not only public goods are considered, rather local public goods serve as a subject of assessment.

Hodge (1991, p.181) raises an interesting point about the fact that it is not always unambiguous, if it is an external benefit or cost. Furthermore he states that 'if a farmer refrains from destroying an area of valuable habitat, does this constitute the provision of an external benefit or, rather, would its destruction constitute an external cost'? The

[167] ExtenE project begun in 1991, with the aim of evaluation of external costs of different fuel cycles. Methodology was updated in 1998.

provision of agricultural subsidies assumes that from a social point of view, the production of a good or service is a valuable thing, and as there is no market, it is to be supported financially. But it is possible to get subsidy for the reduction of nitrates pollution, which action would otherwise result in an external damage. According to Hodge assessment will depend on the rights of the farmers. If they have the right to pollute, but the farmers waive their privilege to pollute, that can be regarded as producing an external benefit. We would like to note, that in the case of biodiversity this dilemma is clearly existent. Part of agricultural subsidies aim for an increase in the biodiversity. The farmer is subsidised in order to reduce pollution, and that serves as compensation of the external benefit. That way, the producer has the right to pollute, though another system could also be considered, where the producer would not have the right to pollute, so his action would appear as an external damage instead.

9.2 Assessment of main strategic agriculture-relevant documents in Hungary in light of externalities

In this section we provide a very brief assessment of the main documents in Hungary, where references to environmental externalities in agriculture may arise. The focus of the review assessment is to underscore references in the documents, which may relate to environmental externalities. Relevant parts of the documents are referred below.

Rural Development Plan

The document builds on the European Agricultural Guidance and Guarantee Fund's (EAGGF) measures and its main goal is to sum up and standardize the implementing system of rural development measurements. The RDP tackles agricultural and rural development subsidies.

An important element of RDP is Agri-environmental farming. This is the element that draws the most attention to externalities in the agricultural sector. The specific and operational goals in RDP are not linked to the externalities.

Goals in RDP that have links to externalities:

- General goals: Reduction of environmental pressures caused by agriculture.
- Specific goals: The preservation and improvement of the physical, chemical, micro-biological status of soils.
- Operational goals: Includes programmes that emphasize the motivation of farmers. Goal: environmentally friendly farming, use of integrated farming methods (optimal use of pesticides). These goals are mainly justified by inappropriate farming practices, intensive pesticide and fertiliser use, inappropriate plant protection, increase in soil degradation, abandonment of crop-rotation and the negative externalities of extensive agricultural production.

National Environmental Protection Programme

It is a general environmental protection document of Hungary and some parts are dedicated to agriculture. In relation to underground water protection the NEPP's aim is

to reduce the rate of waterworks' wells that contain an amount of 50mg/l nitrate. In relation to soil protection the NEPP's aim is to reduce pesticide residues below threshold limits. Pesticide reduction is mentioned in connection to the reduction of risks from chemicals.

The following three Action Plans mention the reduction of externalities regarding agriculture:

- Climate change action plan: reduction of emissions from intensive agricultural production, agricultural plant production for energy use (energy crops).
- Environmental health and food safety action plan: pesticide reduction.

  Rural environmental quality land use action plan: citing the Agri-environmental Programme's goals.

New Hungary Development Plan

The NHDP is the major strategic development document in Hungary, aiming to foster 'New Hungary'. Although the Plan is inclusive of the Environment and Energy Operational Programme and the Environment and Infrastructure Operational Programme, no reference to aims to reducing agricultural externalities can be found.

National Development Plan (2004-2006)

The NDP contains Agro and Rural Development Operative Programme. The NDP does not contain explicit aims to reducing agricultural externalities. By providing subsidies the main goal is to improve the efficiency of agricultural production, modernization of agricultural technologies for environmental protection. Although no explicit mention of externalities, it states that no proposed development may result in an increase in environmental pressures. References to externalities can be found in the status reports in Agro and Rural Development Operative Programme. Both in the NDP and in the ARDOP a description on the types of externalities is provided. Possible damages due to externalities are e.g. deflation, erosion, acidification of soil and soil compaction.

National Agri-environmental Programme

The NAEP contains horizontal and zonal aims of environmentally friendly agricultural production. The NAEP's goals are in line with the National Development Plan's goals. The NAEP is introduced by a status report on the quality of the environment, where externalities are described.

In conclusion, all action plans reviewed mention (mainly the status report parts) the effects and consequences of externalities. Specific goals, aims concerning a possible level or quantity of externality in the future are not included in the action plans. They mainly focus on technological development, modernization, and with such measures they aim to reduce the environmental impacts of agriculture.

As a general conclusion, few references to externalities can be found in the documents. Moreover, these references are not specific, they are rather general.

References to externality data in main policy documents

Acronym of document	Document type	Containing the concept of externality in qualitative terms?	Containing externalities in quantitative terms?	What is the purpose behind the reference to externalities (if any)?
RDP	Rural development plan	Externalities mentioned qualitatively both in status reports and in several measures.	No quantitative reference	In the status report it is the justification of the Agri-Environmental Protection Act.
II. NEEP	national environmental programme	Externalities mentioned qualitatively in action plans	No quantitative reference	When assessing the quality of environment in Hungary, the necessity of the Programme is underscored and justified by the externalities discussed.
NHDP	national economic strategy	No reference	No quantitative reference	N/A
NDP, ARDOP	development plan, and its action plan	Externalities covered qualitatively in ARDOP action plan. The action plan gives a broad picture of agricultural externalities.	No quantitative reference	Comprehensive assessment of the state of the environment in Hungary. The main goal is the reduction of externalities, hence providing basis for the action plan's measures.
NAEP	agro environmental programme	Qualitative references to externalities throughout the document.	No quantitative reference	The main goal is the reduction of externalities, hence providing basis for the action plan's measures.

The above findings may be a consequence of the fact that, to the best of our knowledge, no thorough research on externalities in agriculture in Hungary has been carried out so far. The relevant publications or sectoral externality data are found to be scarce.

9.3 Summary of interviews with some key stakeholders

The semi structured interviews with five targeted policy stakeholders took place in Hungary, between June and September 2009. It turned out to be quite difficult to find interviewees possessing basic knowledge, information and relevant competence in the field of environmental externalities in agriculture. Therefore the selection of interviewees did not conform to the Exiopol Wp.IV.1 Semi-structured Interview Guidelines as we identified only few actors (stakeholders) to choose from. The deviation from the selection process, however, does not prevent us from outlining a general picture.

Three interviews were conducted with heads of relevant departments in the Ministry of Agriculture and Rural Development, one with the head of a relevant department the Ministry of Environment and Water and one with head of research in an agricultural research institute.

Answers by interviewees to the semi-structured questions were found to have much in common, and no divergent opinions concerning the main lines of the questions were gathered. In the following the main findings of the interviews are presented using the format of the semi-structured questions.

Background Information:

- *What is your level of knowledge and experience of externality data?*

  The general level of knowledge and experience of externality data was found to be rather low. Interviewees from the Ministries rarely could cite examples of externality researches. One interviewee referred to the term externality as subsidy policy. One interviewee, after seeing the interview questions prior to the interview, had searched the internet for them to be prepared for the interview. The research institute carried out researches touching on positive externalities in agriculture.

  A telling description is cited: 'In the agricultural sector we mainly talk about and come across positive externalities. Policy makers don't understand the word externality, because instead in their everyday lives they use the term environmental impact.' The interviewee couldn't find any helpful studies.

- *How is the use of externality data relevant for your professional role and responsibilities?*

  In theory externality data would be relevant, but it just isn't. Externality data is perceived to be needed as to make one's point, however in practice, this is not the case. No heads of departments interviewed deal with these data, curiously though all hypothesised that in other departments externality data should be relevant.

- *What is the level of knowledge about externality data of policy makers in your area of interest?*

  There appears to be not much of an interest among policy makers in Hungary. Knowledge is perceived to be rather low. Supposedly, in Brussels, at EU institutions the knowledge must be more widespread.

- *To your knowledge are there examples of the use of externality data in policy development in your professional field or sector?*

  No examples (papers, studies, specific data sets, etc.) were cited, interviewees from Ministry were not aware of examples. The interviewed research institute was never contracted to carry out such analysis. A notable exception may be the regulation and monitoring of Environmentally Sensitive Areas and its related subsidy policy.

  Referring to externality research one interviewee claimed that 'many know the slogans and catchy phrases, but the content behind them is missing'.

- *If so, what type of policy development was externality data used for, e.g. environmental taxes, cost benefit analysis of existing policy measure?*

  N/A.

- *If so, what level of policy development was externality data used for, e.g. legislation, green paper, policy consultation?*

  N/A.

- *If so, what are the sources of this data? For example, national level estimates of external costs, sector based studies or ad hoc studies.*

  According to a concerted opinion of interviewees the vast majority of policy decision-makers do not consult externality studies.

Exploring Perceptions:

- *What is the general perception of policy makers about the use/role of externality data in your area of interest?*

  According to all interviewees decision-makers base their decision unrelated to externality data. Some have heard of externality researches, but decisions on subsidy policy or legislation in general are not based on them. Other concerns (e.g. profitability of farmers) dominate.

- *What is the capacity of the relevant Governmental agencies in your area of interest to use and understand valuation data?*

  Capacity is not of primary concern. There would need to be more motivation, social pressure, coercion, etc. for externality data to be used. According to interviewees the short cycles of politics (4 year terms) do not match the long time horizons of externalities. Also national agricultural policy making has recently lost some of its relevance due to dominance of EU policy harmonisation.

- *What is your general perception about the use/role of externality data in policy development in your area of interest?*

  A somewhat paradox opinion emerged here as most interviewees wished research should be considered and used in decision making and it would be important to use externality data. This notion may be due to the fact that head of departments are not the ultimate decision makers, decisions are made in upper political circles.

- *What is your view of the validity of currently available externality values in your area of interest?*

Apart from the fact that the level of knowledge and experience of externality data of most interviewees were considered rather low, in one case the reliability of researches were criticised ('Estimations need to be treated as estimations').

- *What is the potential for further development of policy relevant sources of valuation data in your area of interest? For example, national level estimates of external costs, sector based studies or ad hoc studies.*

  An interesting aspect popped up during the interviews; the general focus is mainly on negative externality data. According to interviewees externality needs to be looked at more detachedly. Both positive and negative externalities need to be taken into account. Especially it is the case in the field of agriculture, where positive environmental externalities are claimed to be significant (e.g. grazing). Analysis in general needs to be quantitative and measurable and also average and general values, not specific ones, could be of use.

  The research institute lamented that in Hungary only one doctoral thesis thus far is related to agricultural externalities.

- *What type of policy measure in your area of interest has the most potential to benefit from the use of externality data? For example, environmental taxes, cost benefit analysis of existing policy measure?*

  In the agricultural sector subsidy system is prevalent. Therefore the prime focus of externality research, according to interviewees, should be subsidy relevant. Agricultural subsidy policy may partially be based on externality data. Positive externalities emphasised again.

- *What are the barriers to use of valuation data in your sector?*

  The usual national agricultural policy in practice rarely provides room for long term solutions. Solving acute problems in the agriculture sector use most of the available resources (financial, human), and these measures are rarely conditional of performance (i.e. environmental impacts).

  Lack of monitoring was many times cited as a constraining factor. Monitoring is missing from the process. Little information are available on the baseline conditions, so often 'there is nothing to compare the results to'.

- *What are the enablers to use of valuation data in your sector?*

  The EU's Common Agricultural Policy bear high priority, national policies have declined in importance, therefore, according to interviewees, the role Hungarian agricultural policy may play is limited. If externality data is to be more often used in the CAP, national agricultural policies will need to conform.

- *Do you have any recommendations or comments on the future use of valuation data in your sector?*

  The need for a closer cooperation between researchers and policy stakeholders appeared several times during interviews. Researches would need to be more focused on the actual and particular needs of policy, therefore a stronger cooperation between the two sides is encouraged ('The ministry needs to be involved from the beginning, even the goals of research needs to be decided together').

  Awareness raising among farmers and the general public at large could foster the adoption of externality research findings.

The main conclusions of the interviews may briefly be summarised as on the one hand political top decision makers are to a large extent uninterested in externality researches, and on the other hand visibility of externality research is rather low in Hungary. The reasons behind the perceived disinterest of top political decision makers in externality researches are, according to interviewees, economic considerations. Economic aspects dominate decision making processes and as environmental externalities in the agricultural sector are hardly expressed in monetary terms, externalities are often ignored.

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10 Comparative Analysis: policy impact of external cost research across countries and sectors

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Introduction

This chapter reviews the analysis and conclusions given in the preceding sector and country case study chapters to provide some insight into variations and commonalities in the policy impact between countries and sectors. The comparative analysis informs the general conclusions and recommendations for this report. In this chapter we follow the general format of the case study chapters by focusing on policy context, external cost research, policy impacts of this research and the analysis of policy impact findings.

10.1 Policy Context

The sectors analysed in the case studies vary as to the nature, scope and complexity of externalities. Thus differences in externality cost assessments would at least to some extent reflect differences in the characteristics of the externality profiles of the sectors. This section briefly summarises the general environmental issues associated with each sector, i.e negative and positive externalities, and compares the sectors with regards to the scope and complexity across sectors and, when relevant, countries.

Key environmental issues

The agricultural sector(see chapters 2 and 9)

Agricultural production produces a wide range of environmental externalities, primarily but not exclusively negative ones. Agriculture emits polluting substances related to the use of fertilisers and pesticides both to water, air and soil, thus causing externality effects such as eutrophication, acidification and climate change which lead to deterioration of natural habitats and organisms. Agricultural practices furthermore may impact on soil quality and fertility and reduce biodiversity. In southern Europe water extraction may also be so considerable that it causes environmental externalities.

But agriculture may also produce positive externalities. Carbon-sequestration, recyling of nutrients, flood prevention and support of wildlife dwelling all represent positive externalities from agricultural production. Food production is not included in the list, as an externality is commonly defined as an incidental by-product of an activity (see chapter 2 of this report).

The balance between positive and negative externalities depends on the specific form of production with negative externalities typically being more likely in highly intensive mass production (see chapter 2).

Generally, then, the scope of externalities from agriculture is wide, interactions among these factors are fairly complex, and agricultural pollution is diffuse, in that it stems from many small sources and diffuses over a wide area, which inhibits monitoring and therefore also precise externality valuation. Time lag between emission and effects further compounds these issues. All of these factors combine to make externality valuation in the agricultural sector quite challenging.

The energy sector(see chapters 3, 4 and 5)

Environmental externalities from energy production vary depending on the type of energy source used and the production technology, and externalities arise in all phases of energy production, use and waste management (see chapter 5). Air pollution stemming from the burning of oil, coal and other fossil fuels impact on human health, increasing mortality and morbidity, and therefore reducing the expected value of human life as well as causing increased health care expenses. Air pollution also affects soil and water acidity, negatively impacting on the productive capacity and the natural habitats. Finally, air pollution damages buildings, eroding their surfaces.

Perhaps the most important externalities from energy production and use arise from the emission of greenhouse gases caused by the burning of fossil fuels. These externalities have far reaching and complex impacts on climate change which results in extreme weather events and natural disasters, including draughts, melting glaciers and changes in natural habitats, all of which affect the conditions for human life and production.

Other sources of energy also cause externalities. Nuclear power embodies a risk which may be considered an externality (see chapter 2); furthermore nuclear power requires large amounts of water for cooling and storage and disposal of waste represent further externalities. Energy production based on renewable resources may also include negative externalities such as noise and reflections in the case of windpower as well as disturbance of wildlife and nature for both windpower and solar energy.

Externality cost assessments thus vary depending on the specific production form and energy source. Clearly, assessing the externalities from the burning of fossil fuels represents by far the most comprehensive task as it involves point source (e.g. coal plants) as well as diffuse pollution (e.g. transport), impacts locally and regionally with air and water pollution as well as globally due to the contribution to climate change. Furthermore, specific effects particularly with regards to climate change can only be assessed with great uncertainty as the causal mechanisms interact in complex ways and are not necessarily well understood,

just as there is considerable time lag between energy production and impact; this leads also to questions about the intergenerational distribution of costs and benefits.

The UK study on energy outlines energy externalities across production of energy, transportation and use phases, while the case study of energy in Germany focuses on externalities from greenhouse gases and externalities caused by hazards stemming from nuclear plants. The Italian case includes externalities from energy production based on renewables.

The forestry sector(see chapters 6 and 7)

Forests give rise to a number of marketable products, i.e. direct use values including timber as well as non-wood such as berries and reindeer as well as services such as recreational opportunities and tourism. Furthermore, they produce indirect use values in the form of biodiversity and carbon dequestration and watershed protection, and finally non-use values such as existence of pristine forests and preservation of landscape and cultural values – all of these, except timber production may be considered positive externalities.

Negative environmental externalities stem primarily from timber production which may reduce non-wood products and services, i.e. reduce the positive externalities. Environmental externalities from forestry include draining of wetlands to raise forests; adverse effects on water quality, loss of non-wood products of loss of recreational opportunies and tourism.

Thus, the externalities from forestry are more limited in scope and perhaps also more often limited in location to the local or regional level compared with energy production and perhaps, agriculture; the polluting agents can be defined and the effects largely assessed at the aggregate level of the forest or by unit of production. Generally, then forestry should lend itself to externality cost assessment although determining the value of non-use and indirect use values offers methodological challenges and uses methods which are often distrusted outside the economic community (see section 5 of this chapter).

The study of the Finnish case study focuses on nature resources and non-wood forestry products, while the Canadian study focuses on public goods such as landscape values, recreational services and conservation of biodiversity.

The fisheries sector(see chapter 8)

Finally, the externalities within the fisheries sector primarily concern the negative impacts on stock due to overfishing, in-season crowding and particular fishing technologies such as wrong mesh. This affects stock directly in the near-term but also affects indirectly and longer term through selection and genetic changes in stock, bycatch and habitat degradation.

Aquaculture resembles agriculture in that externalities stem from nutrients and in the effect on habitats and biodiversity. As such, the externalities from the fisheries sector proper are more limited in scope than the other sectors included in this study while they resemble diffuse pollution with a large spatial coverage.

Comparison across sectors concerning externalities

Agriculture and energy production are similar in the sense that they emit polluting substances and these spread, having effects at the local or regional level and the global level due to their impact on climate change. In both cases there is a time lag as well, and this may be greater for the energy sector although pesticide pollution sometimes does not show up in the drinking water until decades after its use.

Forestry and fisheries impact more specifically on natural resources as well as biodiversity and landscape. This is also the case for agriculture. But the actual pollution from fisheries and forestry is more limited than for agriculture and energy.

Logically it would be more challenging to do environmental valuation in sectors with a wide range of externalities and with great time and spatial lag as well as uncertainty. This would apply to the energy sector in particularly, but as the analysis will show more studies have actually been carried out in this sector than in the other sectors suggesting that factors other than the character of the externality is at least as important for determining the extent of external cost research studies.

10.2 Key relevant strategies in place at EU and national level

Agriculture

Agriculture is a main focus of EU policy and while it began as price support and production subsidies successive reforms have moved EU agricultural policy towards integration of environmental objectives. The EU Common Agricultural Policy consists of two pillars: one pillar contains market and income support measures, but with the latest reform of 2003 this support has been linked to compliance with environmental regulation. The other pillar targets rural development, and improving environment and countryside is one of three areas of focus in the Rural Development Pillar. The funds holds a number of financing instruments with environmental and other public goods objectives. The strategy at the EU level thus consists of economic subsidies either coupled with rules and standards (first pillar) or subsidies targeting environmental and other objectives.

The extensive EU regulation and funding in this sector spills over into national policies. Much agricultural policy at the national level consists of implementation of EU directives, although the country specific elaboration of rural development occurs at the national level.

Thus both Germany and Hungary largely tackle environmental externalities from agricultural production through the use of subsidies and regulations. Germany's implementation of agri-environmental measures have included programmes for extensification and landscape maintenance as well as contracts for nature protection; however, due to insufficient funding none of the programmes have taken hold (see chapter 2). Hungary has aimed to get farmers to employ integrated farming methods with fewer pesticides and fertilisers, using programmes to motivate farmers.

The energy sector

EU has several strategies aiming to curb the externalities from energy production and use. Since 2005 an EU-wide Emissions Trading Scheme is in place for CO2. Furthermore, in 2008 an "Energy and Climate" package includes a set of six directives and regulations which include binding targets for the share of renewable energy, a tightening of the ETS, targets for a reduction of emissions not covered by the ETS, binding emission standards for emissions from new cars and an obligation to reduce GHG from fuel production. The EU furthermore has required taxation of energy products and electricity.

EU climate policies also include efforts to improve energy efficiency. This is done mostly through standards for the energy performance of buildings and labelling schemes for household appliances. Most recently an outright ban of the electric lightbulb has been implemented. Finally, EU offers subsidies for cogeneration plants for heat and power.

As for air pollution, not specifically related to climate change, EU relies primarily on emission ceilings and similar target approaches (see discussion of CAFE programme in Chapter 11).

At the national level, each country must implement the ETS through National Allocation Plans. In the German case, in addition to the national allocation plan, an Energy Tax Law was put in place in 2006, implementing the EU energy taxation directive. The ecotax forms part of an overall ecological tax reform aiming to reduce tax on income in order to switch to environmental taxation. As for energy savings, Germany has generally implemented EU regulations. On renewable energy Germany uses primarily two instruments: guaranteed fixed feed-in tariffs for electricity generated with renewables and minimum shares of, for instance, use of biofuels in the petrol industry. Finally, German energy production has established a phase-out strategy for nuclear power, but the credibility of this political goal is unclear.

In the UK the policy framework to meet carbon dioxide emissions targets is set by the Climate Change Act 2008 and the Low Carbon Transition Plan (2009) outlines the actions needed to achieve mandated carbon emissions cuts by 2020. Current policy includes Climate Change Levy, a charge on energy use by the business sector, which is one means by which the UK fulfils Article 1 of Council

Directive 2003/96/EC on taxation of energy products and electricity. The UK also introduced a voluntary pilot Emissions Trading Scheme (ETS) prior to the EU ETS scheme.

Strategies targetting the energy sector significantly rely on economic instruments which aim to internalise the externality effects of energy production into production and consumption decisions, particularly the Emissions Trading System and energy taxation. This applies to the EU level as well as to the national level. But strategies also include standards, e.g. for energy efficiency and labelling schemes. And finally, renewable energy sources are being supported through minimum feed-in tariffs and requirements to have minimum shares. The energy sector uses a broad spectrum of strategies and much of it derives from the EU, although Germany and the UK have in some cases been ahead of the EU.

Forestry

In 2006 the European Commission set in motion a Forest Action Plan covering the period 2007-2011 and aiming among other objectives to improve the competitiveness and to protect the environment. As for environmental protection the plan specifies no EU-wide regulatory measures. Yet, the EU and its member states have made a commitment to reduce significantly the loss of biodiversity by 2010 and to restore habitats and natural systems – commitments which concern Council Directive 79/409/EEC also to forestry. This objective is regulated through the Birds Directive (Council Directive 79/409/EEC) and the Habitat Directive (Council Directive 92/43/EEC).

As for Finland and Canada, the case studies show that both countries have in place rather elaborate forest policies and programmes, employing a wide range of strategies to address externalities from forestry (see Chapters 6 and 7).

Firstly, they have in place regulations to ensure sustainable forestry. In Finland, the Forest Act lays down provisions for the use of forests, the majority of which are privately owned. There is also legislation on the prevention of forest damage, trade in forest reproductive material, timber measurement, jointly owned forests and organizations in the forestry sector. In Canada, environmental regulation falls under federal, provincial and in some cases, municipal jurisdiction. Generally, forest legislation in Canada where most of the forests are publicly owned has evolved from forest exploitation to forest management with sustainability objectives.

Secondly, both countries use economic instruments. In the case of Finland, forestry is taxed according to stumpage revenues, while economic subsidies in the form of aid and loans are granted to measures aiming to promote sustainable timber production and biodiversity conservation. In Canada, forestry is priced through rents paid for licenses of forestry on provincial land. The Finnish tax is not designed with the purpose of setting an accurate price on externalities, while

the Canadian licensing system conceivably could set a price that included the cost of negative externalities.

Finland has also undertaken a pilot programme for natural values trading[168]contracts (Fromond, Similä and Suvantola 2009)[169]. Under the contract scheme a landowner agreed to protect or promote natural values in a forest area in return for a subsidy calculated on the basis of the timber and natural values of the area. This generates an interest in the valuation of positive externalities related to the conservation of forest biodiversity. Finland has also undertaken auctions to invite proposals for permanent or temporary nature conservation in order to identify the cheapest way to expand protected sites. The regional environmental authorities requested landowners' tenders through competitive bidding for temporary (max 20 years) or permanent nature conservation areas on private land.[170] The bids included a description of the natural values to be protected and the requested amount of funding, and they were assessed against ecological criteria.

Finally, both countries use forest certification systems to promote sustainable forestry practices. These represent independent assurance that a product or process comply with predefined ecologically, economically and socially acceptable standards. Certification increases the visibility of forestry externalities but does not explicitly monetise the external cost of forestry.

Fisheries

The EU applies a range of strategies to regulate the environmental externalities of fisheries. This includes fishery management, such as the Common Fisheries Policy which regulates the overall level of fisheries as well as rules regulating fishing fleets and licences. The Union has in place a Total Allowable Catch (TAC) system, ie. established quotas for fish. Through the European Fisheries Fund, the EU also uses economic instruments to promote economically and environmentally sustainable fisheries (European Commission 2009). Thus, EU has in place a wide range of policy instruments to prevent or abate over-fishing and the externalities resulting from this.

Policy styles

A cross-country comparison is difficult to undertake, given the limited coverage on national policies for some sectors. An analysis across the case studies indicates that the EU sets the standard for much national policy, particularly in the agricultural, energy and fisheries sectors. This suggests that national policy styles are becoming less important, at least in regulatory areas where the EU is very active.

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[168] Pilot project carried out in 2003 – 2007.

[169] http://jel.oxfordjournals.org/cgi/content/abstract/eqn033

[170] Pilot project carried out in 2004 – 2005.

However, in the forestry sector national policy measures appear to dominate and vary somewhat by the policy context. Hence, while Finland and Canada employ similar strategies to address externalities in the forestry sector, the actual implementation varies somewhat due to the different ownership structures of the forestry sectors as well as the government structures. Hence, while in Finland more than half of the forests are privately owned, in Canada as much as 94 percent is publicly owned, and most of this by the provinces. Hence, in Finland externality studies serve to guide regulatory designs that limit the negative externalities from forestry. In Canada, externality information may serve to set proper prices for permits and licenses, i.e. prices that accurately reflect externalities.

Comparing across sectors clearer differences and trends emerge. Firstly, externalities from agriculture and fisheries are regulated through rules and standards laid out in environmental and sectoral regulation combined with economic subsidies for sustainable practices. For agriculture, regulatory measures are reinforced through the cross-compliance mechanism which makes the single payment scheme, also a subsidy, available to farmers conditional upon complicance with environmental regulation.

In the energy sector policy relies to a greater extent on market-based instruments such as taxes and emission trading which affect behaviour through the price mechanism. But, reflecting the complexity of the energy sector, energy externalities are addressed through a wide range of policy instruments which also include energy performance standards, rules and positive economic incentives through guaranteed buy-in tariffs for renewables. Generally, however, regulation of the energy sector appears to have gone the farthest in terms of using economic policy instruments. There are signs then in the case study countries of sector-specific policy styles rather than country-specific ones.Even within each sector the strategy depends on the sub-sector, for instance in the regulation of production and use of energy.

Requirements for the use of environmental economic techniques and existence of environmental economic policy units

The case reports offer only few examples of EU or national requirements or guidance for the use of environental economics techniques in policy formulation. However, the EU does require that ex ante impact assessments are carried out for all policy initiatives (see chapter 2). This includes an overview of positive and negative economic, social and environmental impacts and criteria for comparing policy options include both effectiveness and efficiency in achieving policy objectives (European Commission 2009b). The guideline calls for a full cost-benefit analysis "when the most significant part of both costs and benefits can be quantified and monetized and when there is a certain degree of choice as regards the extent to which objectives should be met" (2009b: 44). When a policy entails a fixed objective, the guideline calls for a cost-effectiveness analysis. This requirement cuts across all sectors. In the UK use of such techniques are recommended by govenrment in policy impact assessment where feasible and guidance documents have been produced to support this.

The case studies indicate that research units for environmental economic techniques exist. Natural Resources Canada, the government unit under which forestry belongs, has undertaken valuation studies, and the case study concludes that the existence of this unit has led to a greater use of externality costing and environmental economics in Canadian forestry policy. Also in the forestry sector, the Finish case suggests that an academic environmental economics unit or environment exists, as there are quite a few references to Finish externality and valuation studies.

In other sectors the case reports mainly conclude that there are no environmental economics units, the case of Germany, or they include no information about such units. However, in the UK such a unit exists in the Department for Environment Food and Rural Affairs and has been active in developing valuation of environmental impacts in a number of contexts (see Chapter 3). As for the EU level, DG research has fostered some research in the area of envionmental economics and agriculture. However, in general the European Commission does not itself undertake primary research on externality valuation but is more focued on the macro level.

In the US federal agencies must prepare economic reviews of the cost, benefits and effects of all major regulation proposals. The requirement follows both from Executive Order 12866 and by the Unfunded Mandates Reform Act of 1995, which lists effects on health and environmental among the variables to be included in cost-benefit analyses (Bureau & Glachant, 2006: 74) Monetization of costs and benefits are not required but recommended. According to interview data, the US Environmental Protection Agency is the centre of expertise in environmental economics and conducts and supervises research on economic analytic methods. The Office of Management and Budget also issues guidelines on how to conduct regulatory impact assessments (ibid).

Comparison across cases – summary

As could be expected the case studies reveal differences across countries, but more importantly across sectors as to the character of environmental externalities and subsequently as to the preferred policy instruments. National differences in regulations may have been reduced due to the strong role of EU regulation in sectors such as agriculture, fisheries and energy policy. The case studies suggest that agricultural and fisheries policies are still somewhat bound by past approaches of subsidies and regulations, while energy policy relies to a greater extent on economic policy instruments but also simply uses a wider array of policy instruments. Except for EU impact assessments, EU or national requirements and guidelines for externality valuation are sparse and research or policy units rare.

10.3 Background to external cost research in the case studies

This section gives a brief overview of the use of externality valuation and availability of economic estimates of externalities, citing differences and commonalities across the sectors.

The case studies indicate that EU has given impetus to externality valuation, firstly by setting out a requirement for policy impact assessments across all sectors and for requiring that either cost-benefit analysis, cost-effectiveness analysis or multi-criteria analysis be undertaken as part of the assessment. Secondly, in the energy sector, the EU funded the ExternE project which contributed to the development of methodologies and specific externality estimates and has led the way for large-scale externality assessments. Likewise EU funded New Ext, a study to assess external costs from energy technologies. At the national level, the UK have actively used environmental economics, such as in waste management legislation (see Chapter 3).

Comparing across sectors, the impact assessments would ensure widespread use of externality assessments, but as stated in chapter 2 the externalities are generally inadequately assessed and rarely monetized.

In agricultural studies economic valuation does not seem widespread. The German case offers only a few examples which vary in approach, namely a study assessing the external costs of pesticide use and a comparative study of conventional and organic farming with respect to pig fattening. Hungary on the other hand has produced a quantified and monetized study of agricultural products. But generally, studies are fairly scarce in the agricultural sector.

The energy sector has applied externality valuation to a much greater extent, with much of this application at EU and national level stemming from the ExternE project. At the national level Germany has undertaken several studies of external costs related to energy supply. These studies do aim to quantify and monetize the external costs.

Finally, externality studies appear common and well-developed in the forestry sector, covering both Canada and Finland. Both government agencies and academics are involved, and they pursue valuation of both non-wood products and less tangible values such as conservation and biodiversity. Likewise, a range of methods are used in the sector, including willingness to pay and other contingent valuation methods. However, in the case of Finland much focus has been on valuation of competitive activities, such as tourism or reindeer, on the value of wood production whereas few studies have examined the externality effects of wood production on other potential uses of the forest, including conservation. Nonetheless benefit estimates are available at the national level and, perhaps more importantly, a relevant policy environment exists which can produce externality estimates.

While the EU appears to have been instrumental in developing externality valuation in the energy sector; when it comes to the forestry sector the case studies indicate that national governments have been instrumental.

10.4 Policy impacts of research

This section reviews examples and trends across case studies with regards to the extent and nature of the impact of externality cost research on policy. The review is based on interviews with stakeholders, policy documents as well as other documents. As outlined in Chapter 1 impacts can be categorised into the following types: Direct/instrumental use, Conceptual use, Political use, Symbolic use.

In general, the case studies offer only a very few examples of direct links between a study or set of externality cost data and use in the policy process, whether instrumental, political or symbolic. More often the case appears to be that the notion of externality costs and valuation has been used more broadly to inform or justify environmental policy priorities and the choice of policy instruments. If 'instrumental use' is considered more broadly, as the impact of externality cost ideas reflected in choice of policy instruments, the case studies yield more examples of **direct use**, although still within the single-digit numbers and primarily in the energy sector.

Thus, European and German energy policies to a considerable extent build on economic theory about internalisation of external costs through pricing mechanisms. This applies to the Emission Trading System implemented at European and German level (Chapter 4), while it is not mentioned in the Italian case study. Likewise, the energy taxation schemes implemented in Germany through the laws on Ecological Tax Reform of 1999 and its revision in 2002 as well as the 2006 Energy Tax Law were justified with reference to the aim of internalising externalities, and estimates on external costs were gathered in preparation of this policy. The revisions were generally undertaken to bring the policies more in line with environmental economic principles of doing away with exceptions to allow the most effective use of price signals.While Germany implemented ecological tax reforms rather early on, the EU has also promoted application of externality cost principles and the energy tax law of 2006 follows a 2003 EU directive. Interview data indicated that the German research programme "Identification and internalisation of external costs in energy supply" contributed to development of policy, but did not specify how. The same applies to the EU-commissioned Extern-E projects. Finally, the German renewable energy policy uses an economic policy instrument in the form of fixed feed-in tariffs which may serve to overcome market failure with regards to the development of renewable energy sources. Fixed feed-in tariffs minimise the financial risks of energy producers by guaranteeing a price for their electricity products although such tariffs also risk reducing the creation of long-term efficient markets. Hence the renewable energy policy also applies externality cost principles, but again is not justified with reference to a particular study (Chapter 4).

In the UK case studies key efforts to bring externality valuation to the energy policy arena at strategic level have been in the context of social cost of carbon and air quality valuation, for which the government has been active in sponsoring research papers. CBAs incorporating environmental externality valuations have also been used in project appraisal and at policy level, for example of use of valuation methods was used in the CBA of the Large Combustion Plant Directive for DEFRA. Furthermore, a number of policy level CBAs including were conducted as part of the UK Government Energy Review in 2007. Estimates of externalities of fuel consumption have also been used in the policy debate on transport taxation (for example, a study of Lorry Track and Environmental Costs was commissioned to inform the UK Government review of Vehicle Excise Duty for goods vehicles).

Externality valuations are rarely used in economic instrument design. However, examples of where such data has had a direct effect on setting the Landfill Tax and the Aggregates Levy in the UK are outlined in Chapter 3.

At the EU level, however, monetary valuation data generated by the EU funded NEEDS and Extern-E projects did provide direct input into Clean Air for Europe (CAFE) strategy (see Box 1 in Chapter 11 for discussion of this).

In contrast, externality cost principles appear to have been applied more ***symbolically*** in policies promoting energy efficiency. Hence, EU policies make references to incentives and markets (European Commission 2008), but the actual policy instruments that have been chosen rely on standards and norms rather than prices and incentives (Chapter 4). The same holds for the German case with regards to policy on energy efficiency.

Symbolic or perhaps political use of externality policies are also evident in the Italian case on energy policy. This is the case in examples such as the introduction of a vehicle entry toll in metropolitan areas and national energy strategies. These do not incorporate externality cost studies, neither do they directly reflect such principles (Chapter 5).

Overall, however, externality cost principles have been applied directly to significant parts of energy policies in the EU, Germany and the UK even if they do not directly incorporate externality studies. At the very least the Emissions Trading System and ecological tax reform of Germany reflect significant conceptual use of the externality cost notions, while the Italian case does not provide much evidence of such use. Moreover, the externality costs have been used symbolically or politically to justify policy actions, as in the case of energy efficiency policy.

The forestry sector, which like the agricultural and fisheries sectors is characterised by concentrated producer interests, provides more of a mixed picture, while the agriculture and fisheries sectors produce no or very weak links between valuation studies or concepts and policy making. The Finnish and

Canadian case studies on the forestry sector indicate that externality cost thinking affected the development of sustainable forest strategies in both countries. Thus in the Finnish case, interview data show that economic analyses were included in the preparation of legislation on sustainable forest subsidies and that the analysis considered the impact of forestry on water policy and forest biodiversity among others. Arguably, this represents an instance of direct use of policy studies. To some extent economic assessments were also employed in the development of policy instruments such as taxation and economic subsidies. In the Canadian forestry sector the use of externality cost ideas has been largely conceptual. Research on externalities has contributed to the "conceptual development and legitimisation" of sustainable forest policies as well as biodiversity policies. Like-wise, in Finland, externality research was used conceptually to increase acceptability of a policy programme to enhance biodiversity protection in forests . Finally, the Canadian forest certification policy reveals both conceptual and political use of externality concepts.

As for agriculture, the German case study produced one example of direct use of externality research in the development of a legislative initiative on greenhouse gas emissions from agriculture. It is not clear how the study impacted on the legislation. Furthermore, a model on material flows, RAUMIS, is used to develop nitrate mitigation strategies, according to the case study. Monetary assessments of agricultural externalities have also been used conceptually to raise awareness in the German case. But interview data also indicate frequent **political use** of externality studies from which data is used to confirm decisions already made (Chapter 2).

The case studies offer no specific evidence of either direct or conceptual use of externality cost research in the Italian cases on the energy or fisheries sectors.

Comparison across case studies

As is clear from this review, externality studies have not yet contributed very directly to policy development. Only the forestry sectors, the UK landfill tax and aggregates levy examples and the German ecotax case exhibit direct use of actual externality studies in the policy-making process, although there is also an unspecific reference to the impact of a study in the German agricultural policy process. The Clean Air For Europe programme (CAFE) also uses data from the EXTERN-E study

Generally, however, policy in the energy sector in the studied countries and at EU level does reflect to a considerable degree the externality concept and the idea of putting a price on pollution; this is true in the Emissions Trading System and in the energy taxes as well as perhaps the renewable energy policies. In these cases, arguably there is an intertwining of direct use and conceptual use of externality studies and the impetus to a considerable degree stems from EU policy and EU-funded research such as Extern-E. There appears to be a relatively high awareness in the energy policy sector about the use of externality concepts, and externality principles are included in policy papers and reflected in

the choice of policy instruments, although policies have typically not been based on concrete studies.

On the other hand, the use of economic analyses and assessments of externalities appears to be more direct in the forestry sector where studies have been used in the development of sustainable foresty policies as well as more concretely in implementation programmes and plans particularly in Finland.

In the agricultural case evidence is rather scarce. EU does not appear to have been as forceful in promoting the externality concepts in agricultural policy as in the energy sector , although the Water Framework Directive, which is cross sectoral but significantly involves agriculture, calls for cost-effectiveness appraisals of policy proposals. This might inspire further interest in externality valuation in this sector. Thus, in the German case conceptual and political use of externality studies appear to dominate. It should be noted however that use of valuation studies in the UK in the context of the Water Framework Directive has been quite significant.

Comparing across countries, the case studies show that the externality concepts are used more frequently in Germany, the UK and Finland than in Italy and Hungary. Thus, while externality concepts appear more influential in the energy sector, the German agricultural case also does produce evidence of externality concepts whereas the Italian case studies on energy and fisheries suggest that externality concepts have not been used for policy making in either sector in that country. This would indicate that differences in policy use of the externality concepts reflect at least to some degree differences in national policy styles rather than sectoral differences. But generally the case studies do not support a strong conclusion in this regard.

Comparing EU countries with non-EU countries is limited by the fact that Canada and the US represent the only non-EU countries covered in the case study reports. The Canadian case indicates that at least in the forestry sector Canada was quick to incorporate externality concepts in the policy process as forestry policies since the early 1990s were managed within a sustainable management framework. But the use of externalities has remained largely conceptual, whereas in the EU-country Finland there are a few examples of instrumental use of external cost assessments in the policy preparation. In general, the case studies do not suggest major differences in the role of externality studies between EU and non-EU countries.

In the case of the energy sector, the Bureau & Glachant (2006) study concludes that, in general, policy use is less advanced in the UK and EU than in the US, and this is partly explained different official requirements to use environmental economics studies, externality estimates and CBA in decision making.

10.5 Analysis of policy impact findings

This section presents a comparative analysis of factors influencing policy use of externality valuation. It is based on responses in the semi structured interviews undertaken as part of the case studies. The interview process is outlined in Chapter 1.

Level of knowledge and capacity of policy makers to use and understand

The level of knowledge among policy makers varies both across and within sectors and countries. Thus, interviews generally indicate that policy makers are familiar with the concept of externalities. This goes for the energy sector in Germany and the UK, for the forestry sector decision makers in Finland, for fisheries in Italy and the US and for agriculture in Germany. Yet, the level of knowledge varies in the sense that decision makers in some sectors know about the natural science aspects of exter-nalities, while they remain unfamiliar with economic valuations of these externalities (fisheries sector; agricultural sector in Germany). In some cases externalities are referrred to as environmental damage.

On the other hand, interviews indicate a low level of knowledge about and interest in externalities among decision makers in the Italian energy sector and the Hungarian agricultural sector. In Italy, supposedly private sector decision makers are better informed but their interest depends on their professional background.

Perception regarding use

Across the interviewees in the energy, forestry and fisheries sector there is a perception that externality studies and approaches are useful and necessary, although actual policy decisions are often taken without direct use of CBA and other valuation instruments. In the German agricultural sector study the interviews indicate a common perception that externality studies are commissioned for political purposes and therefore do not have much credibility.

Despite the generally positive perception of externality approaches, the interviews also reveal that some questions regarding the methodologies are widely shared across the sectors and countries. These include:

- Uncertainty about estimates or about definitions of externalities
- Uncertainty and thus lack of confidence in empirical evidence about some externalities, for instance about mortality and morbidity data related to energy production and consumption
- Lack of confidence in benefit transfers
- The difficulty of quantifying many types of cost
- Contradictory evidence
- A caution against granting privilege to monetary perspectives as monetary estimations do not adequately reflect all types of values

On the other hand across the sectors there is a perception that more estimates of the benefits of environmental and resource management policy would be useful and that studies would gain support and credibility if they also include positive externalities.

The agricultural sector case studies reflect the most negative perceptions of the use of externality studies or in the Hungarian case simply a lack of interest. For the German case, in addition to the perception that externality studies are biased or politically commissioned there is furthermore criticism of the methodologies for not adequately incorporating multifunctionality aspects of agriculture and for inadequate understanding of details.

In some cases, such as interviews representing the energy sector in Italy, responses were uniform across policy analysts, researchers and interest groups. In others, most notably the German agriculture case study, responses varied by respondent background. Thus researchers from the agricultural research institutes emphasized that externality assessments are hampered by an inadequate comprehension of the details of the processes that create environmental effects, while academic researchers from agricultural and economic universities emphasized that non-point pollution is well understood but more research is needed on the multifunctionality of agriculture. The latter were also more concerned about the lack of monetization of benefits as it detracts from the overall credibility of externality assessments.

Perhaps following from this, the agricultural researchers and policy makers perceive externality assessment as a good approach, but have little confidence in the actual numbers it can produce. On a slightly more positive note, academic researchers perceive externality assessments as promising although they agree that methodologies must still be developed. Interest groups and environmental ministry representatives, but also a representative for the agricultural ministry at Länder level expect that externality assessments will play a role in the revision of the Common Agricultural Policy.

Availability and quality of externality data

Availability of data varies across sectors and countries. As discussed also in the previous sections, externality data are more readily available in the energy and forestry sectors, less so in fisheries and agriculture. EU-funded data from Extern-E, New Extern-E, NEEDS,Cases and other related projects are well known. In the energy sector, data are good for pollutant emissions while there is a need for better data on health effects and related costs. In the forestry sector, data on non-wood products are requested.

In general, however, the interviews indicate that the issue of data quality, cf. above, is a more poignant problem than of lack of data. The case studies indicate a need for continued development of methodologies so that they are both more precise, less uncertain and, not least, more transparent.

Barriers and enablers

Across those sectors in which externality approaches are perceived positively the main hindrances relate to data quality and the methodological shortcomings of externality studies. Furthermore, the lack of communication between those research environments that produce externality numbers and the policy and producer communities that may use them presents another barrier. This goes back to the issue of transparency.

In the agricultural sector, the main barrier to the spread of externality studies in agricultural policy appears to be the continued dominance of producer interests in the policy making communities and the tradition for seeing agricultural policy as production support. The latter, however, is slowly changing with recent reforms of the EU Common Agricultural Policy which have set in motion a process of decoupling subsidies from production and linking to a larger degree subsidies to environmental services (see for instance Nielsen et al. 2009).

Thus, identification of these barriers also point to some factors that might enable or facilitate further use of externality estimates in policy making. Improved transparency about methodologies and proper presentation of uncertainties are pointed out as factors that might improve the legitimacy and credibility of externality data.

Furthermore, improving methodologies to produce more precise and comprehensive estimates and to reduce uncertainty is pointed out as important for the uptake of such estimates in policy making.

It is also pointed out that the more studies are produced the more it will become standard to commission externality studies and to include them in policy decisions. In this regard, the EU appears to play a very important role as the driver of developing the notion and the standard for including externality studies in policy processes. This is particularly clear in the energy sector where EU directives and EU funded studies appears to have contributed to a more widespread knowledge of, interest in and actual use of externality studies.

The EU is also seen as the prime enabler of overcoming the barriers to the use of externalities in the agricultural sector. The ongoing revision of the Common Agricultural Policy is seen as a potential vehicle in this direction. Likewise, in the Hungarian case it is pointed out that externality considerations need to be tied to the agricultural subsidy system to gain acceptance and interest.

Summing up then there is a general knowledge of and acceptance of the contribution that externalities can make to policy making. The main barrier at this point, however, appears to be the perceptions that methodologies are still inadequate resulting in uncertain and incomplete estimates and therefore in a lack of confidence in these estimates. The case studies also show the key role of the EU in developing and preparing the ground for the use of externality studies

in policy making and in the continued need for the EU to play this role. At the same time interview studies caution that policy makers do not want economic estimates to take primacy but merely to contribute to the decision processes.

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11 Conclusions

General conclusions on use of externality valuation in policy are presented here based on the sector case studies and the comparative analysis. This draws out some of the differences and similarities of the case study contexts and discusses some general findings from the interviews with experts and policy makers undertaken as part of this project. We also consider overall recommendations on enhancing policy use of externality research.

Policy Context

Both sectoral and country policy contexts can have a bearing on the potential type of policy use of externality research. The comparative analysis of case studies outlines differences in overall policy style by sector. Agriculture and fisheries are more generally regulated through rules and standards in environmental and sectoral regulation and have economic subsidies for sustainable practices. The energy sector policy relies to a greater extent on market-based instruments such as taxes and emission trading, although other instruments such as energy performance standards and guaranteed buy-in tariffs for renewable also apply. Thus the opportunities for the type of policy application of externality valuation will vary between these sectors.

The comparison of forestry policy in Finland and Canada (Chapter 7) suggests that different ownership structures of forestry sectors provide different opportunities. In Finland, where there is greater private ownership, externality studies serve to guide regulatory designs that limit the negative externalities. In Canada, where there is greater public ownership, externality information may serve to set prices for permits and licenses that accurately reflect externalities.

While the case studies give a few examples of official requirements and guidance for the use of environmental economics techniques in policy formulation, including for impact assessment at EU level and in the UK, this appears to be an underdeveloped area at national level. Interview responses referred to impact assessment at EU level as being a key developing area for valuation studies with a stress given to valuation by the Impact Assessment Board. Guidelines for Impact Assessments (EC 2009a) for Commission staff states that the IA should assess economic, social and environmental impacts "in qualitative, quantitative and monetary terms or explain in the IA why quantification is not possible or proportionate" and Annexes give guidance on monetisation of non-market impacts. However, a survey of Commission officials regarding the Impact Assessment System (TEP, 2007) indicated a desire for appropriate tools and methodologies to monetise environmental benefits to be further developed.

In the case of the United States, the existence requirements for federal agencies to prepare economic reviews of the cost, benefits and effects of all major regulation proposals, recommends monetization of costs and benefits. This requirement was found to be a crucial factor in explaining different levels in use

of monetary valuation of environmental externalities in national energy policy in the study by Bureau & Glachant (2006).

Research in Externality Valuation

The availability of economic estimates of externalities was found in the comparative analyse to vary considerable across the studied sectors. Studies are fairly scarce in the agricultural sector and these can vary in their approach.

Research into externality valuation for the energy sector is much further developed, with much of this development at EU and national level stemming from the ExternE project and related projects. Interview response suggested that such a major coordinated research exercise at an early stage in valuation research development for a particular sector is useful for setting the research agenda and aiding use/acceptability for policy making.

Externality studies appear common and well-developed in the forestry sector, covering both Canada and Finland case studies and national governments have been instrumental. The UK case study also found that across a number of sectors the national government had been active in developing research for policy purposes.

The fishery and management of marine resources case study undertook an international literature search. While this is a developing area of study this subject is less well researched than in other sectors in this report. For example, it found that no explicit valuation of externalities data related to fisheries have been carried out in Italy.

The case studies also indicate that impetus to externality valuation at EU level has come from requirements for policy impact assessments across all sectors, including through use of cost-benefit analysis. However, at present the use of such monetized valuation in policy impact assessment at national level is patchily used, with potential for much greater use.

Policy Impacts

The comparative analysis notes that, in general, the case studies give only a few examples of direct links between a study or set of externality cost data and use in the policy process. More often than direct links to policy decisions, the notion of externality costs and valuation has been used more broadly to inform or justify environmental policy priorities and the choice of policy instruments.

Examples of ***direct use*** in the case studies come mainly from the energy sector. This has been given impetus from EU policy and EU-funded research such as Extern-E. While there is relatively high awareness in the sector of the use of externality concepts, and externality principles are included in policy papers and

reflected in the choice of policy instruments, policies have typically not been based on concrete studies.

Considering the potential types of direct policy uses (given in Chapter 1) for externality values, some key examples are given in the UK energy case study in the context of project appraisal (principally cost-benefit analysis) and policy appraisal (e.g. higher level cost-benefit analysis such as in the context of impact assessment). At EU level the CBA for the Clean Air for Europe (CAFE) programme of the European Commission is cited as a key example of policy appraisal use of valuation (outlined in Box 1).

There is also evidence of direct use of economic analyses and assessments of externalities in the forestry sector where studies have been used in the development of sustainable forestry policies and in implementation programmes and plans, particularly in Finland.

In the case of the agricultural sector there is a mixed picture. In the UK use of valuation methods by government agencies (especially in the context of the Water Framework Directive) is quite significant while in the German agriculture case conceptual and political use of externality studies seems to dominate. The conclusions of the Hungarian agriculture case study were that decision makers are to a large extent uninterested in externality researches, and visibility of externality research is rather low. This may reflect the more general position of externality research in the country rather than being sector specific.

Externality valuations are rarely used in economic instrument design. However, examples of where such data has had a direct impact on setting the Landfill Tax and the Aggregates Levy in the UK are outlined in Chapter 3. It is interesting to note in the example of the Landfill Tax that the need to ensure that target commitments are met contributed to a shift away from direct use of environmental externality values.

In the case of green/environmental accounting frameworks that include valuation of non-market impacts (outlined in Annex 3) specific policy impacts are not easy to track. Respondents to interviews on this issue pointed to these frameworks working at the level of contributing to awareness raising and agenda setting, and regarded them as a separate endeavour to other policy uses of valuation data.

Symbolic use of externality cost principles has been applied, for example, in policies promoting energy efficiency. While EU policies make references to incentives and markets (European Commission 2008), the actual policy instruments that have been chosen rely on standards and norms rather than prices and incentives (see Chapter 4). The German and Italian energy policy case studies also refer to such symbolic references.

Conceptual use is also evident in the Finnish and Canadian forestry case studies where externality cost concepts influenced the development of sustainable forest strategies in both countries. The Canadian forest certification policy reveals both conceptual and political use of externality concepts. Monetary assessments of agricultural externalities were also used conceptually to raise awareness in the German case. The German case interviews also indicated frequent ***political use*** of externality studies from which data is used to confirm decisions already made.

The comparative analysis concludes from the case studies that externality concepts are used more frequently in Germany, the UK and Finland than in Italy and Hungary. This is supported by the greater evidence of policy use of externality concepts in the energy sector in the UK and German case studies than in the Italian energy case study, and greater evidence in German agriculture and Finnish forestry case studies than the Italian Marine Resources and Hungarian agriculture studies. This would indicate that differences in policy use of externality concepts reflect at least to some degree differences in national policy styles rather than sectoral differences. But generally the case studies do not support a strong conclusion for this proposal.

Box 1: Policy Use of CBA in CAFE Programme

A key example of use of CBA in policy development cited by interviewees is the Clean Air for Europe (CAFE) programme of the European Commission. The objective of CAFE is to develop an EU thematic strategy on air pollution through setting environmental and health targets, revising air quality directives and the National Emission Ceilings Directive (NECD). It therefore supports the development of air quality legislation for the period 2010-20 based on national emissions ceilings and air quality standards.

Within the CAFE modelling framework CBA has fed into scenario development and target setting. The approach has been to quantify emissions, control costs and impacts for health, crops, materials and ecosystems (monetized where possible) for "business as usual" and "all known abatement technologies applied and used" scenarios and apply CBA and CEA to assess the desired scenario between these two bounds (Watkiss, Pye & Holland, 2005). Thus recommendations for national emissions ceilings for EU Member States could be made as an input to policy decision making in thematic strategy on air pollution. This is acknowledged in the Air Pollution Thematic Strategy communication which states: "The Strategy also builds on economic-environmental models and tools developed using Community RTD funds" and cites health valuation from ExternE and NewExt projects (EC, 2005).

It should be noted, however, that the CBA methodology was a source of contention with some stakeholders. Following release of the CAFE CBA methodology concerns were expressed by industry groups (e.g. UNICE and CONCAWE) relating to the methodology for health impact assessment. These centred on the morbidity assessment and use of the VSL (Value of Statistical Life) approach rather than the VOLY (Value of One Life Year) approach. The response by the CAFE CBA team concluded that the methodology as peer reviewed and then revised was an appropriate and robust methodology[1]. However, the need for greater consensus on the approach to mortality and morbidity valuation using non-market valuation techniques, evidenced by such lobbying, was to result in the omission of some contested non market values in supporting sensitivity analyses. While in this

Analysis of Impacts

The following section summarises conclusions from the semi structured interviews undertaken as part of the case studies focusing on factors influencing policy use of externality valuation.

The ***level of knowledge*** among policy makers on externality concepts was found to vary both across and within sectors and countries. Thus, interviews generally indicate that policy makers are familiar with the concept of externalities although there is much variation in understanding of monetary valuations.

Unsurprisingly, this reflects to some extent the level of policy uses by sector and country.

On the question of perceptions about externality valuation, interviewees tended to focus on conceptual and technical issues rather than philosophical issues. Several interviewees in the UK and EU levels pointed to the distinct groups of experts and officials which support varying approaches to policy decision making and a tendency for lack of engagement between these groups. However, in some cases, such as the energy sector in Italy, responses were uniform across policy analysts, researchers and interest groups. Acceptance of valuation approaches can also vary between government policy departments and divisions. This observation is consistent with the Bureau & Glachant (2006) study with found that opinions varied substantially between departments. An example of this is the different views on use of externality valuation data in accounting frameworks between some national accountants and valuation specialists[171] that were stated in number of interviews.

Across sectors, the agricultural case studies found the most negative perceptions of the use of externality studies or in the Hungarian case simply a lack of interest.

Availability and quality of externality data: In general interview data indicate that the issue of data quality is a more important than lack of valuation data. However, there were calls for improved databases of existing data with better database management in order to identify research gaps in primary valuation. A number data quality and methodological questions raised in interviews are evident across sectors and countries studied. These include:

- Uncertainty about estimates or about definitions of externalities
- Uncertainty and thus lack of confidence in empirical evidence about some externalities, for instance about mortality and morbidity data related to energy production and consumption
- Lack of confidence in benefit transfers
- The difficulty of quantifying many types of cost
- Contradictory evidence. A wide distribution or variation in monetary valuations within or between studies can cause credibility problems.
- A caution against granting privilege to monetary perspectives as monetary estimations do not adequately reflect all types of values

Recommendations

A number of common themes for improving the policy use of externality valuation research that emerged in the case study recommendations are presented below. While these are informative for the general way forward, the

[171] The differences in acceptance of valuation data between national accounts statisticians and valuation specialists is identified in the Stiglitz Commission Report (Stiglitz, Sen & Fitoussi, 2009).

case study chapters should also be consulted for more focused sector specific recommendations.

Technical Recommendations

- An important requirement arising from interviews was the need to further develop consensus on methodology and accepted good practice standards for research in order to improve understanding, legitimacy and confidence in results at the policy making level[172].

- Development of accepted good practice includes the production of standard guidelines and manuals. The need for further development of guidelines appropriate to the user was mentioned in a number of interviews.

- The usefulness of a major coordinated research exercise at an early stage in valuation research development for a particular policy area (the key example being ExternE for energy policy), is highlighted. This can set the agenda and aid use/acceptability for policy making.

- In order to address data gaps in a more strategic way better database management of existing databases, such as EVRI, was also recommended.

Institutional Recommendations

- The need to develop further communication structures between the valuation research community and the policy communities was a recurring theme in interviews. On one hand, this concerns the need for enhanced identification and communication of the research needs of policy makers on a strategic level as well as policy specific level. On the other hand, this requires better communication by the research community of the role and appropriate uses of externality valuation research in the policy process.

- The communication of results to policy makers should be at an appropriate level of clarity and should consider its policy relevance. Thus, dissemination results of studies should be targeted for the given audience, from full reports for experts to briefing notes for policy makers.

- Improved transparency about methodologies, assumptions and uncertainties of externality valuation data were pointed out frequently as factors that might improve clarity of the meaning of results and their credibility among non specialists.

The role of the EU in supporting the development of externality valuation methodology and in its introduction to the policy arena is clearly evident in the case studies undertaken for this report. This influence is particularly clear in the case of the energy sector where EU Directives and EU funded studies have contributed to a more widespread knowledge of, interest in and actual use of

[172] Indeed, the need for establishing internationally accepted methods is stated in the "GDP and Beyond" proposals (EC, 2009b) in the context of valuation of ecosystem goods and services in "Integrated environmental-economic accounting".

externality studies in policy at EU and Member State level. The contribution of such research to the policy arena is at a less developed stage in other sectors studied here and key challenges remain across all sectors in terms of methodological development, and understanding and perception at policy making level. The EU can continue to play an important role in addressing these challenges and driving the concept and the standards for appropriate use of externality studies as an input to policy processes.

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Annex 1: Guideline Framework for Sector Case Study Reports

Nick Dale (University of Bath) and Helle Ørsted Nielsen (NERI)

This guidance note gives a suggested summary report framework for sector case studies in both WP IV 1a (EU focused) and WP IV 1b (non EU focused) to be included as chapters in the final report based on the work each partner has carried out. Following the framework, to the extent appropriate given the differences of focus between case studies, will allow for some level of comparative analysis (cross sectoral and cross country) between case studies in final reporting conclusions. Following this framework are some notes on comparative analysis which will be undertaken by UBath and NERI in consultation with other partners.

In line with the DoW for the work the general approach should be qualitative and a narrative (with the possible exception of the use by some partners of the methodology for assessing the policy impacts of research developed by Ecologic).

As discussed at the Milan meeting on 2 July 08, the specific topics that partners chose to focus on within their chosen sector will have depended on where the most fruitful avenues of research exist. Therefore, in some case studies there may be clear examples of where externality studies have impacted on the design of policies while in others the impact may be more at the conceptual level. In case studies where policy impacts are at a low level the focus of the research conclusions should be on the explanatory factors for this and on where the greatest potential exists for future impact on policy.

The suggested framework is as follows:

1. Introduction

Outline of the focus of the study, methodology and structure of report.

2. Policy Context

- Brief outline of general environmental issues of relevance to the case study sector and particular topics within these general issues that are to be focused on
- Key relevant strategies and policies in place at EU (for WP IV.1.a) and national level.

- Policy style of country and sector – is there a dominant of preferred approach to regulation, e.g. regulation, economic instruments, subsidies, voluntary approaches or mixes?
- Any official/legislative requirements or guidance documents for use of environmental economics techniques for in policy. This could be at EU, national or sector level.
- Existence of environmental economic policy units within the national administration, within academic institutions and elsewhere.

3. Background to External Cost Research in the Case Study

- Explanation of what is meant by externality in the case study sector and "state of the art" in the sector.
- Availability of external cost estimates for sector at country, regional or international. Outline key research programmes and studies undertaken related to the external cost valuation issues in focus and any development of methodological frameworks, working groups (Governmental and academic), expert groups, etc. of relevance to the case study. The role of EC funded research is highlighted in the DoW but we should also include other key research programmes.
- Differences in approaches. Although this study is not intended to be an examination of methodological issues of valuations studies, where the strengths and weaknesses of differences in approaches feed into an understanding of the policy impacts these issues could be noted here.

4. Policy Impacts of Research

Based on stakeholder consultations, policy documents and other document analysis to what extent and how have valuation concepts and studies impacted on policy? This could include the following (and is summarised in Table 1 below):

- Nature of policy impact[173].

(v) Direct/instrumental use: Direct impact on policy – initiation of actions, decision influenced, identification of policy instruments (at legislative design and policy paper level).
(vi) Conceptual use: Awareness raising, formation of opinions, identification of policy instruments (at conceptual level).
(vii) Political use: justification of decisions already taken and existing policies. Tactical use to postpone decision-making by referring to an on-going study.
(viii) Symbolic use: Research used to give rationale for decisions but results not inherent in actual decisions.

[173] Based on the categorisation of the functions of externality research in Gerdes et al (2008) and the draft review paper of research on the use of valuation by SYPE.

In cases of direct use, political and symbolic use it should be possible to identify a direct link to specific studies, research data and policy statements. In the case of conceptual use the link would not necessarily be as clear cut and the assessment may be based more on interviews and qualitative research sources.

- Detail of policy impact where there are clear examples of *direct use*. This could include:

  (i) Identification of where external cost approach was used in policy cycle (agenda setting/prioritisation, policy formulation, policy adoption, policy implementation, and ex post policy evaluation),
  (ii) Context of use, e.g. CBA of policies or projects, pricing policy, design of environmental taxes, emissions trading schemes…
  (iii) Particular data used (e.g. choice of data sources, use of benefit transfer data). **This would be of particular interest if it is a Commission funded source as the role of EC research is highlighted in the DoW.**
  (iv) Extent of policy impact. Could be descriptive only or use the Ecologic methodology for measuring policy impact (each partner to decide on its suitability for their case study).
  (v) Administrative level of policy impact (EU, national, local).
  (vi) Policy impacts of national level estimates of external costs (for those partners reviewing these for a given country).

  For more *indirect uses* this could be descriptive of the policy use scenarios, context administrative level and extent of impact.

- In case studies where there are no specific examples, the discussion could focus on the types of policy measures where valuation studies could potentially have the most impact.
- Where possible also note negative results (i.e. where research has contributed to a decision not to implement a certain measure).

5. Analysis of Policy Impact Findings

Given the above investigation of the actual and potential policy impact of valuation data, what are explanatory factors of the key findings? This might include conclusions from interviews and document review on any of the following:

- Level of knowledge and experience of externality data by different groups (policy makers, academics and other experts).
- Perception/level of contention of policy makers and other actors about the use/role of externality data. This may include methodological and philosophical objections to valuation techniques as found for some stakeholders in the NEEDS study (Bureau & Glachant, 2006).
- Capacity of policy makers and agencies to use and understand valuation data? E.g. gaps between developing concepts in environmental research and standard concepts used in policy documents (the example of ecosystem services was given by Mikael Hilden in the Milan meeting)

- Availability and quality of policy relevant externality values. For example, this may refer to uncertainty of results or the timing of research results input to the policy process.
- Other barriers to use of valuation data.
- Enablers to use of valuation data.
- Other conclusions coming from the interviews and document review?

6. Recommendations

Recommendations flowing from the above analysis. For example, these could refer to:

- Better use of existing externality research in policy making.
- Development of externality research better to meet the needs of policy makers.
- Research community communications with policy makers about uses of valuation studies, and policy makers communications to research community about their information needs for decision making.
- Development of better awareness among policy makers about availability of valuation studies.
- Lessons to be learnt for the EU from international experience in use of externality research in policy making (from WP IV.1.b).
- Other recommendations from the analysis?

Table 1: Policy Impact Framework

Policy Use Category	Function of Research	Where in Policy Cycle	Context of Policy Use	Studies/Data Used	Administrative Level of Impact	Possible Evidence
Direct/Instrumental	Initiation of actions, decisions influenced, identification of policy instruments	Possible at all parts of the cycle?	CBA of policies or projects, pricing policy, design of environmental taxes, emissions trading schemes	Sources and funding of data used (esp if from Commission)	EU/National/Local	Legislation, policy papers, policy statements. Research studies Interviews
Conceptual	Awareness raising, formation of opinions, identification of policy instruments?	Agenda setting Prioritisation Formulation				Interviews Qualitative research studies
Political	Justification of existing decisions, Tactical use to postpone decision-	Possible at all parts of the cycle?				Policy statements. Interviews

	making.					
Symbolic	Justification of existing decisions	Evaluation				Policy statements. Interviews

Comparative Analysis

The comparative analysis should provide at least tentative answers as to when, how and why external costs research impact on policy formulation.

Previous studies indicate that the presence of official guidelines and national requirements to consider costs and benefits explain some of the differences among countries' use of monetary valuations. However, it is conceivable that higher-order explanations such as policy style (e.g. preferred approach to regulation might lie behind the existence of these guidelines and requirements). Thus, it would be helpful if case studies would include a brief section on the national policy style of the case country.

Likewise, studies indicate that the presence in the policy environment of environmental economic think tanks may contribute to an explanation. Thus, it would also be useful if the case study indicates whether an environmental economic policy environment exists within the national administrative units, within academic institutions as well as outside of these in influential think tanks.

Thus, the cross country comparison will focus on these cross-country differences:

- national guidelines or requirements
- policy style: is there a dominant approach to regulation, either using economic instruments, command and control regulation, voluntary instruments or other
- does a policy research environment on academic environment exist

However, there may also be sector-specific factors that affect the use of externality cost estimates in policy and thus in order to analyse properly the cross-country differences, we should at least to consider or try to control for factors specific to the sector rather than the country. For instance, the availability and quality of cost estimates may be explained in part by differences in complexity and uncertainty of the case sector.

Thus, the analysis will also study differences among sectors, focusing on

- externalities: complexity, range of externalities and degree of interaction among them
- external cost calculations: degree of uncertainty (e.g. climate change externality estimates would typically be more uncertain than point source emissions of one or a few substances)

Given the above investigation of the actual and potential policy impact of valuation data, what are explanatory factors of the key findings? This might include conclusions from interviews and document review on any of the following:

From the stakeholder interviews and drawing on other studies, the comparative analysis would also look at differences between sectors and countries in: (i) level of knowledge and experience of externality data by different groups (policy makers, academics and other experts), (ii) perception of policy makers and other actors about the use/role of

externality data, (iii) capacity of policy makers and agencies to use and understand valuation data, and (iv) other barriers and enablers to use of external cost research.

7. References

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Annex 2: Semi-structured Interview Guidelines

Nick Dale (University of Bath) and Jacopo Crimi (FEEM)

1 Introduction

This document provides guidelines for semi structured interviews to take place with stakeholders in Workpackages IV.1a & 1b. According to the DoW for these Workpackages semi structured interviews should take place with a small number of targeted policy stakeholders including key decision-makers, policy advisors and experts. In this report we set out a simple explanation of the key features of this research tool followed by a guide to the main steps from selection of interviewees to planning and conducting the interview, and analysis of findings.

The main practical guidance given here is based on a number of sources presenting tools and methods for research including semi structured interviews[174].

2 Key features

Semi structured interviews are common in qualitative research in a number of social science and policy contexts. They are a method of gathering information and views from individuals or small groups where broad questions are asked, which do not restrict the scope of the interview as much as structured surveys, and allow new questions to arise from the discussion. In this sense they are sometimes described as guided conversations as it is a relatively informal discussion based on a predetermined structure of questions. Their particular uses and advantages include:

1. Providing in-depth information on different elements of a given subject to produce a more exhaustive study than facilitated by structured interviews.
2. Gathering and verifying factual information on the subject of the interview.
3. Understanding the basic mind set, values and perceptions of the interviewee on the subject and allowing comparisons between the perspectives of different stakeholders.

[174] These main sources are: the MSP Resource Portal, FAO (1990), World Bank (Tools and Methods for Social Analysis), Evalsed (European Commission, DG Regional Policy) and the RECOUP research consortium. For further discussion in the academic literature on methodological issues of semi structured interviews, see for example Bryman (2001).

The selection of interviewee approach proposed here is based on the methodological framework developed by FEEM: Network Analysis - Creative System Modeling - Decision Support (NetSyMoD) (Giupponi et al, 2006) and on the guidelines for Actors' identification developed for the Brahmatwinn *(2006)* project.

4. Generating suggestions and recommendations from stakeholders on a specific issue or subject.
5. Providing a relevant technique when the key stakeholders are too small in number to be the subject of a statistically representative survey.
6. Individual interviews can provide a greater level of detail than focus group methods.
7. Interviewers have a chance pose follow-up questions and clarifications on answers given, compared to more structured methods.

The disadvantages of the ***semi-structured interview*** are that:

1. The open ended question format can make it more difficult to synthesise responses for clear results. Accurate and clear note-taking and/or recording is therefore particularly important to aid interpretation.
2. The flexible and individualised structure complicates comparison between responses in different interviews for a given topic and therefore makes it more difficult to draw general conclusions for the sample.
3. There is more potential for interviewer bias to be introduced.
4. There is greater risk of a lack of consistency between interview approach than in structured interviews
5. Interviews more likely to reveal confidential information not for wider circulation (not necessarily a disadvantage but an extra issue to be addressed)

3 Main Steps

Selection of interviewees

This section outlines a suggested approach to identifying interviewees for sector case studies and study of impact of national level estimates of external costs on policy. It is based on the FEEM step-by-step guide to actors' selection (Crimi & Travisi, 2008) with the steps given here focused on the needs and resources of this Workpackage.

Starting from an extended preliminary list of potential actors to be interviewed, in this phase the research team will then select a few actors to effectively participate in the survey.

The most important part of this step shall be undertaken through **team working** on the selection of interviewees. The whole process can be lead by only one - preferably senior – researcher which will involve (e.g. via email) other colleagues/experts of externalities issues and/or of the sector case study within his research team.

The team leader will **prepare a list of bounding criteria** for the selection of actors to be interviewed, based on the list suggested below (focusing in each criteria on the relevant sector and geographical location of the case study) and extending the list as relevant to the sector case study. The list of criteria below can also be adapted to focus on identification of experts in national level estimates of external costs:

a) List any known actors who have papers published in academic journals on the impact of estimates of external costs on policy, in the last five years.
b) List all the known actors who have participated in research projects providing estimates of external costs of economic activities, in the last five years.
c) List all the known actors who worked as consultants in the field of environmental policy applications for estimates of external costs, in the last five years.
d) List all the known actors who have published in academic journals more than five papers on environmental economics relevant to the sector of concern.
e) List of know actors, who work in public and private institutions with an interest in the sector of concern and use of estimates of external costs.
f) List of principal know actors, who are policy makers in the sector of concern at different administrative levels (national, regional, local) and who may have used or potentially could use estimates of external costs.
g) Add other criteria relevant to each sector case study

Team members should provide feedback of criteria in order to cover all the relevant aspects to be evaluated. Once an agreement has been reached, team members can identify potential actors to be involved in the interviews.

Team members provide a draft list of actors to be eventually interviewed. The list is presented using an 'actor profile form' that contains the following information (see Table 1):

- Contact details (name, position, organization, address, city, phone/fax, e-mail)
- Interests (description of the actor interest and relevant expertise)
- Status (position of the actor in the scientific national or international panorama; position of the decision maker in the policy circle)
- Qualitative assessment of the performance of the actor with respect to each criterion as agreed for each case study.

Table 5: Actor profile form

	Actor 1			
Contact details:	*name, position, organization, address, city, phone/fax, e-mail*			
Interests:	*description of the actor interest and relevant expertise*			
Status:	*position of the actor in the scientific national or international panorama; position of the decision maker in the policy circle*			
	Performances	W	G	P
Criteria a	*Qualitative description*	X		
Criteria b	*Qualitative description*		X	
Criteria c	*Qualitative description*		X	
Criteria d	*Qualitative description*			X
Criteria e	*Qualitative description*		X	
Criteria f	*Qualitative description*			X

	Total	1	3	2

A simple assessment of performances can be as follows, where the numbers given are the score of the given actor for each of the criteria:

1. Weak
2. Good
3. Perfect

At the end of the process, the leader should then **hold a list of actors**, completed with the **relative performance of each actor with respect to each bounding criteria**. The final ranking of actors can be done by counting the number of fulfilled criteria under *Weak, Good*, and *Perfect* (respectively scoring 1, 2 and 3), then using a mean[175] for each actor. Considering the template above, the performance for this particular actor would be:

Mean = [(1x1)+(3x2)+(2x3)]/6 = 1.67

This will allow you to rank the potential actors and **start contacting them**, from the most preferable one to the least preferable - to check their availability for being interviewed.

Conducting interviews is a time consuming exercise: you should thus start contacting actors well ahead, to ensure you are able to fix a suitable date for the interview. It is good practice to prepare a standard text for the phone-calls or mails such as the following:

> *Good morning, my name is……*
>
> *I would like to talk to Mr/Mrs/Dr. XYZ.*
>
> *We are conducting some interviews in the context of a EU funded project on **, which has the main objective of **. I would therefore like to enquire whether you would be available for an interview of about 40 minutes, which will focus on the experience of your institution and other institutions working on **. We will also explore the position of your organization with respect to the following issues**. Would you be available on provide alternative suitable dates? If yes, fix venue and time. If no, do you know of anyone else in your organization whom we may talk to? Thank you, we will forward to you the Questionnaire which will form the basis for the interview, so that you can have a clear picture of the topics of our meeting next XYZ.*

Planning the Interview

After semi structured interviews have been arranged it may be helpful to provide the interviewee with a guide to the issues that are to be covered to provide an opportunity for them to gather any necessary

[175] A weighted mean can be used if weights are assigned to criteria.

factual information prior to the meeting. At least prior to the interview the interviewee should be informed of the purpose of the interview, how long it will last (no longer than an hour), the level of confidentiality (that responses will not be attributed to individuals in project reports) and the use to be made of findings. It is also useful prior to interview to know the role of the interviewee (which should already have been established during the selection stage) and to anticipate the questions on the checklist that are likely to be main focus of the interview.

Conducting the Interviews

Typically the interviewer will first present the context of the study, its objectives and the purpose of the interview. The interview is then guided by a short checklist of questions starting with general topics to be covered and then focusing on more specific issues (a rule of thumb is that no more than about 5 key issues should be covered in an hour). The checklist of questions should be pre tested in a small number of interviews to revise as needed.

The first questions gather background information on the interviewee's knowledge, experience and professional role in the subject to give some context for the interviewer (although in this WP this may already have been established to some extent at the actor identification and analysis stages). This would be followed by more specific information questions on the subject and questions exploring perceptions, views and attitudes. These latter questions in particular are open ended allowing interviewees the opportunity to expand on points they see as important, express opinions and introduce issues which they think are relevant and which may be unforeseen. Supplementary questions not given in the interview guide may be necessary to allow respondents to clarify and expand on points raised. For interviewers to ask such non scripted follow-up questions, prior background knowledge of the research issues under discussion is more important than in structured interviews where there is no deviation from set survey questions.

Some key advice from the literature on interviewer practice in semi structured interviews is as follows:

Note Taking

- Brief notes should be taken during each interview or a recording should be made to ensure that points are not distorted and the most important points are included in the report.
- If a recording is to be made agreement with the interviewee should be sought first. This should not be treated as the complete record of the interview and interpretation is needed in the transcription of recorded interviews. Good practice is for interviewers to elaborate on their notes immediately following each interview.
- The interview report should be shared with the interviewees and it may be useful at this stage to follow up any unresolved questions. Permission to use material from the interview should be formally granted by the interviewee and overall results of the Workpackage should be fed back to the interviewee when available.

Interview Technique

- The interviewer must be **careful not to influence the interviewee** by approving or orienting answers. Clearly interviewers should not be drawn into expressing an opinion.
- If interviewees use generalities, use probes such as "Can you give me an example of that?"
- Try to **avoid long or multiple questions.**
- It is not **necessary to always maintain the order of questions** given in the guidance checklist (below). For example, it may be appropriate to ask a question earlier than it appears on the checklist because it flows from an answer given by the interviewee.
- It is also **possible to miss questions given on the checklist** where these are not relevant to a specific case study or to discontinue a line of questioning if it is clear that these are not relevant to the area of knowledge, interest or responsibility of the interviewee.
- It is **possible that the questions will move away from the checklist** if points raised are particularly pertinent to the research questions. These unprompted diversions may be the most valuable.
- In following up points made by interviewees, **supplementary questions should be neutral** as to intended outcome avoiding leading or biased questions. E.g. If the interviewee states that a Ministry is not interested in valuation data, rather than ask "Does a failure of human capacity in the Ministry account for lack of interest in valuation data?", ask "What is the reason why Ministry X has not shown an interest in using valuation data?"

Suggested Checklist of Issues and Questions

Background Information:

- What is your level of knowledge and experience of externality data?
- How is the use of externality data relevant for your professional role and responsibilities?
- What is the level of knowledge about externality data of policy makers in your area of interest?
- To your knowledge are there examples of the use of externality data in policy development in your professional field or sector?
- If so, what type of policy development was externality data used for, e.g. environmental taxes, cost benefit analysis of existing policy measure?
- If so, what level of policy development was externality data used for, e.g. legislation, green paper, policy consultation?
- If so, what are the sources of this data? For example, national level estimates of external costs, sector based studies or ad hoc studies.

Exploring Perceptions:

- What is the general perception of policy makers about the use/role of externality data in your area of interest?
- What is the capacity of the relevant Governmental agencies in your area of interest to use and understand valuation data?

- What is your general perception about the use/role of externality data in policy development in your area of interest?
- What is your view of the validity of currently available externality values in your area of interest?
- What is the potential for further development of policy relevant sources of valuation data in your area of interest? For example, national level estimates of external costs, sector based studies or ad hoc studies.
- What type of policy measure in your area of interest has the most potential to benefit from the use of externality data? For example, environmental taxes, cost benefit analysis of existing policy measure?
- What are the barriers to use of valuation data in your sector?
- What are the enablers to use of valuation data in your sector?
- Do you have any recommendations or comments on the future use of valuation data in your sector?
- Any other comments?

Analysis of interview data

As an introduction to the analysis of interview data a simple quantitative assessment can be made (similar to that of the actors' profile form above) based on answers to the first questions on the checklist concerning background information, to allow a possible cross-comparison between different interviews and case studies.

Table 2: Background information

Actor 1			
Performance	W	G	P
Actor's level of knowledge and experience of externality data?			
Relevance of externality data to actor's professional role and responsibilities?			
Level of knowledge about externality data of policy makers in actor's area of interest?			
Actual use of externality data in policy development in actor's professional field or sector?			

The following part of the analysis of interview data is qualitative and consists of comparing information and perceptions given in answers by interviewees and finding common and divergent themes and trends. Discussion on the different types of qualitative data analysis can be found in the literature (see for example Thomas, 2003). Most quoted applications relate to health and social research however, these methods are also applicable to analysis of qualitative data in the policy context of this Workpackage.

Textual or narrative data such as that derived from open ended questions during individual interviews, focus groups and in questionnaires are typically analysed and interpreted using content analysis. Taylor-Powell & Renner (2003) provides a simple guide to content analysis which outlines stages of analysis as: getting to know the data, focusing the analysis of responses by question or topic, categorizing (coding) information, identifying patterns and connections, and interpretation. Pope et al (2002) have developed a related approach specifically for applied or policy relevant qualitative research in which the objectives of the study have been set in advance and are defined by the information requirements of the funding body (as is the case for the key research questions set out in the DoW for WP IV 1a and 1b). Five stages of analysis in this framework are: Familiarisation, identifying a thematic framework, indexing, charting, mapping and interpretation. Other sources of guidance on qualitative data analysis which give practical advice on the stages of context analysis include the Online QDA resource.

It should be noted that there is not specific blueprint or rigid procedures for analysing qualitative data of the type that will be gathered during the semi structured interviews and document reviews in this Workpackage. Therefore, no rigid approach is prescribed here since sector case studies will differ to some extent in their characteristics and requirements. However, for analysis of interview results in this workpackage we recommend a content analysis approach such as that set out in the guidance in Taylor-Powell & Renner (2003) and Pope et al (2002). Although software for qualitative data analysis is available, the small number of interviews foreseen in this project mean that its use is likely to be unnecessary for our purposes as it is primarily intended as a aid to surveys with large datasets.

Websites

Evalsed: Resource for the Evaluation of Socio Economic Development, Sourcebook of methods and techniques in the evaluation of socio economic development: European Commission, DG Regional Policy.

http://ec.europa.eu/regional_policy/sources/docgener/evaluation/evalsed/sourcebooks/method_techniques/obtaining_data/stakeholders/index_en.htm

MSP Resource Portal: Multi stakeholder processes resource developed by Wageningen International, part of Wageningen University and Research Centre (Wageningen UR), Netherlands.

http://portals.wi.wur.nl/msp/

NetSyMoD: Network Analysis - Creative System Modeling - Decision Support, developed by FEEM.

http://www.netsymod.eu/default.aspx

Online QDA: Training materials for Qualitative Data Analysis as part of the Research Methods Programme of the UK Economic & Social Research Council (ESRC). http://onlineqda.hud.ac.uk/Intro_QDA/what_is_qda.php

RECOUP: Research Consortium on Educational Outcomes and Poverty. A collaborative website for researchers interested in qualitative research methods. http://manual.recoup.educ.cam.ac.uk/wiki/index.php/Semi-structured_interviews

West Lothian Council: Research guidelines on conducting semi structured interviews.

http://www.westlothian.gov.uk/media/educationdocs/researchsemiinterviewdoc

World Bank: Tools and Methods for Social Analysis, Qualitative Research.

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http://learningstore.uwex.edu/pdf/G3658-12.pdf

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http://www.fmhs.auckland.ac.nz/soph/centres/hrmas/_docs/Inductive2003.pdf

Annex 3: Guidance Note on National Level Estimates of External Costs

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The DoW for WP IV 1a and b includes “An investigation of the impact of national level estimates of external costs on policy through questions in the interviews above and also separate interviews with national accounts experts”. This section expands on the requirements of this element of the WP.

Developments in national environmental or "green" accounting in recent years have focused on the need to address the drawbacks of the standard system of national accounts (SNA), in particular the use of GDP as a key indicator of economic performance. Two distinct approaches to developing green national accounts are (i) the adjustment of existing national accounts to incorporate environmental effects and (ii) compiling satellite accounts complimentary to the existing SNA. Both these approaches involve the use of economic valuation data for environmental damages and the depletion of natural resources.

The task here would therefore be to:

1. Identify the key national level initiatives developing such environmental accounting systems for a specific country and establish their sources and use of external cost data. This could also include any existing alternative approaches to the key initiatives on national environmental accounting.
2. Investigate through document review and interviews the intended, actual and potential impacts on policy of these initiatives. Where appropriate this would mean including questions about national level externality estimates, their use in environmental accounts and their policy impacts to interviewees in the sector case studies.

With respect to point 1 above, there may be some crossover between the sources of external cost data relevant to sector case studies and external cost data used to compile national level estimates used in environmental accounting systems. The distinction is that in the case of sector case studies this data may be used in a number of different ways to support specific sectoral policies while in the case of national level estimates the focus may be more at the overview policy level, for example in informing decisions about environmental priorities between sectors. However, there may be some blurring of this distinction in the real task of the WP in that research and interviews in sector case studies could include consideration of national level estimates for that sector (See outline below of the Global Assessment of Environmental-Economic Accounting by the UNSC which also addresses the “module” level).

System of Environmental-Economic Accounting

A key player in developments at the national level is the United Nations Statistical Department which has overseen the development of the System of Environmental-Economic Accounting (SEEA), a satellite system of the SNA. This is stated as providing "a transparent information system for strategic planning and policy analysis which can be used to identify more sustainable paths of development" (UNSC, 2007a).

Following the publication of the "interim" Handbook of National Accounting: Integrated Environmental and Economic Accounting (SEEA) in 1993, the London Group on Resource Accounting was established by the UN Statistical Commission to lead the development of international best practices in environmental accounting within the framework of the SNA.

The London Group collaborated with UNSD for the revised Handbook (SEEA-2003) which was issued jointly with the United Nations, the European Commission, the IMF, OECD and World Bank.

A future strategic direction of the London Group is: "to assist in promoting the implementation of SEEA-2003 in countries and the use of environmental accounts to inform policy debates at the national and international levels" (UNSC, 2004). To this end a working group on policy uses of environment-economic accounts (to be moderated by Statistics Sweden and the European Environment Agency) was among a number of sub-groups set up in 2003. The objectives of this group were to:

(a) Identify policy needs in relation to environmental accounting;

(b) Identify means to communicate with the user community so as to promote the usefulness of environmental accounts in the policy process;

(c) Identify current applications of environmental accounts in the policy process.

A United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) was established by the UNSC in 2005 as a means of mainstreaming environmental-economic accounting and promoting implementation of the SEEA. For more information on the work of the UNCEEA and other developments on the subject see UNSC 2007b and 2008.

A Global Assessment of Environment Statistics, Environmental-Economic Accounting and related statistics has been undertaken by the UNSC under the auspices of the UNCEEA (UNSC, 2007c). This assessment is a useful starting point for information on national level developments since it covers general information on the programmes of environmental economic accounting for a range of countries. A key finding was that about half of the countries that responded to the assessment have an environmental economic accounting

programme of some kind. The assessment also analyses the environmental-economic accounting data compiled by countries according to "modules" that we may approximate to sectors (for example it includes: energy, forest, waste and fisheries). Therefore, it may also be a source of background information on national level programmes relevant for sector case studies.

A number of sector/media focused initiatives are underway in the overall development of the SEEA. Sub groups on Water Accounting, and Mineral and Energy Accounts have been set up and in 2005, the Handbook of National Accounting: Integrated Environmental and Economic

Accounting for Fisheries (SEEAF) was issued jointly by UNSD and the FAO Fisheries Department. The System of Environmental-Economic Accounting for Water Resources (SEEAW) was prepared for submission to the UNSC in 2007.

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