Environmental Policy and Governance
Env. Pol. Gov. **22**, 395–423 (2012)
Published online 19 September 2012 in Wiley Online Library
(wileyonlinelibrary.com) **DOI:** 10.1002/eet.1589

Understanding Policy Coherence: Analytical Framework and Examples of Sector–Environment Policy Interactions in the EU

Måns Nilsson,[1]* Tony Zamparutti,[2] Jan Erik Petersen,[3] Björn Nykvist,[1] Peter Rudberg[1] and Jennifer McGuinn[2]

[1]*Stockholm Environment Institute, Stockholm, Sweden*
[2]*Milieu Ltd, Brussels, Belgium*
[3]*European Environment Agency, Copenhagen, Denmark*

ABSTRACT

This paper presents a framework for analysing policy coherence in a European Union setting through the perspective of policy interaction. Building on a simple policy-analytical approach and theories of institutional interaction, the framework develops a three-step analytical approach, consisting of the inventory of policy objectives, the screening matrix and a more in-depth analysis of key interactions. Central to the analytical framework is the identification of synergy and conflict at three levels: policy objectives, policy instruments and implementation practices, also taking into account as far as possible outcome and impacts. The paper presents illustrative examples from EU renewable energy and cohesion policies in relation to different environmental policy areas such as biodiversity, habitats, resource efficiency and water. It finds that policies are often coherent at the level of objectives, but that associated instruments and in particular implementation practices cause concern for policy conflict in all three examples. Finally, the paper identifies emerging challenges in the application of policy coherence analysis and a need for further development of the analytical approach.

Received 14 October 2011; revised 19 April 2012; accepted 27 April 2012

Keywords: Europe; coherence; waste policy; cohesion policy; energy policy; integration

Introduction

POLICY COHERENCE IS BECOMING AN INCREASINGLY IMPORTANT OBJECTIVE IN GOVERNANCE AND POLICY MAKING IN THE European Union (EU) and its member states (MSs). Demands for more coherent policy making are frequently made with reference to the ever-strengthening interconnections between different economic, social and environmental policy areas, and the need for smarter regulation. Coherence is pursued not only in relation to improving the environmental sustainability of policies, but also to enhance synergies and reduce conflicts between other interacting policy domains such as fiscal, regional development, welfare and public health policies. Attempts at better coherence have been manifested through, for example, the development of national

*Correspondence to: Måns Nilsson, Stockholm Environment Institute, Stockholm, Sweden. E-mail: mans.nilsson@sei.se

sustainable development strategies globally, the impact assessment procedure in the EU, and more recently various 'road maps' (CEC, 2011a, 2011d), the 'better regulation' agenda pursued by both the EU and the OECD (CEC, 2010), and a growing concern amongst policy makers for systems interaction such as between water, energy and land (see, e.g., WEF, 2009). The need for coherent policy is being acknowledged in an increasing number of official EU documents (e.g. CEC, 2011a, 2011b; EEA, 2010).

Although the objective of policy coherence has long been recognized, little research has been undertaken on the concept, what it means and how it can be assessed. This paper aims to address this gap, presenting some conceptual foundations for the study of policy coherence and a preliminary analytical approach tested with three illustrative examples. Our approach does not develop a quantitative analytical tool ready for use. Further work is needed to probe into this direction, in dialogue with policy makers, but the multifaceted and qualitative nature of coherence may very well prove incompatible with a 'tool', although more numerical proxy indicators can be explored.

We define policy coherence as an attribute of policy that systematically reduces conflicts and promotes synergies between and within different policy areas to achieve the outcomes associated with jointly agreed policy objectives. In the following we discuss the conceptual foundations for this definition. Turning first to the academic field, work on policy coherence has identified different types of coherence, such as horizontal, vertical and internal coherence. The most active debate around policy coherence has taken place in EU law and foreign policy. Summarizing this debate, den Hertog and Stross (2011) discuss the legal foundations of policy coherence, in particular relating to external policies. Their definition is well aligned with the approach taken here: 'policy coherence refers to the synergic and systematic support towards the achievement of common objectives within and across individual policies' (p. 4). They emphasize the need for a multilevel understanding of coherence and look at both vertical coherence (between European and MS policies) and horizontal coherence (between policy areas at one level) (Hoebink, 2004; Nuttall, 2005). Outside the field of EU studies, there has been some work on *internal* policy coherence, i.e. coherence of a single policy domain. For instance, May *et al.* (2006) measure factors such as issue concentration (as measured by word counting in bills and hearings), interest group concentration (as measured by participation in hearings) and targeting of groups and entities.

Outside academia, various organizations have addressed the topic. IISD (2007) examined development and environment policy coherence at the international level, using content analysis of policy documents between fields. FAO (2004) discussed coherence between agriculture and trade policies. Like den Hertog and Stross, FAO emphasized the need to tackle both vertical and horizontal coherence. In the field of environment most coherence-related work has been addressed under the banner of environmental policy integration (EPI) (Nilsson and Eckerberg, 2007). From around the mid-1990s, the EU and several of its MSs engaged in strong efforts at enhancing EPI, launching both political initiatives (e.g. the 'Cardiff' process), and introducing procedures such as impact assessments and joint preparations (Jordan and Lenschow, 2008). Since then, although the political attention to EPI has diminished (as policy interest moves on to other topics), many procedures have become institutionalized, e.g. via the European Commission impact assessment on policy proposals.

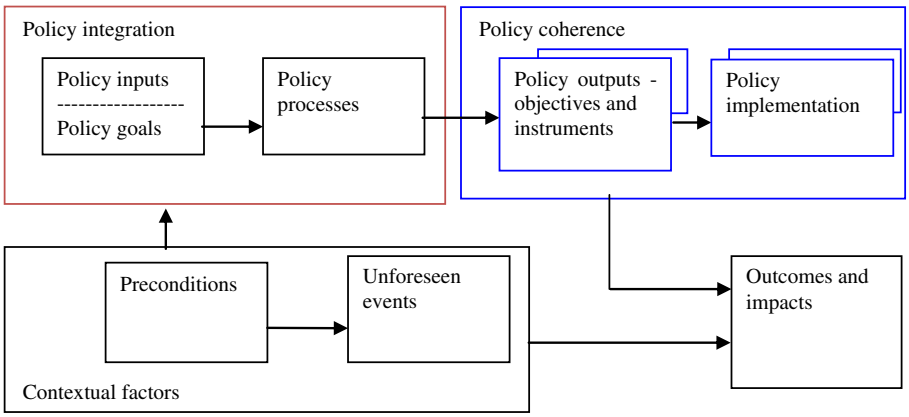
The OECD (2002) published a checklist for improving policy coherence and integration for sustainable development within the context of good governance. OECD's take on policy coherence focuses on the policy-making process and identifies criteria such as stakeholder involvement, knowledge management, and commitment and leadership as criteria for policy coherence. An EU study on development policy reviewed the coherence of 12 policy areas – including trade, environment, agriculture and energy – with development cooperation, aiming 'to build synergies between those policies and development objectives' (CEC, 2009a). The study found awareness of the external impacts of policies and recognition of the importance of coherence but also that policy coherence for development was not adequately institutionalized.

den Hertog and Stross (2011) found a lack of delineation between the terms coherence and consistency. Similarly, a potential source of confusion is arguably the lack of delineation between policy integration and policy coherence. As seen above, many coherence studies have tended to focus on procedural aspects (OECD, 2002; CEC, 2009a; Kivimaa and Mickwitz, 2009). The approach taken in this study to delineate policy coherence analysis is to focus on policy outputs (including objectives and associated implementation arrangements), whereas policy integration analysis is primarily concerned with upstream policy making processes and the associated institutional arrangements. The separation is a heuristic aid – in reality process, outputs and outcomes are of course closely linked (see Figure 1).

DOI: 10.1002/eet

Basic concepts in the figure

- *policy inputs* are the knowledge, resources, actors that feed into policy making;
- *policy processes* are the procedures and institutional arrangements that shape policy making;
- *policy goals* are strategic targets defined by policy actors (at a general level);
- *policy outputs* are the decisions on objectives and instruments that are meant to achieve policy goals;
- *policy implementation* are the arrangements by authorities and other actors for putting policy instruments into action;
- *outcomes* are the behavioural changes and responses of actors in society, such as industry or households;
- *impacts* are the environmental and other effects resulting from the outcomes.



Source: adapted from Dunn (2003) and Nilsson *et al.* (2009).

Figure 1. Policy coherence in a policy-analytical framework

Policy-analytical frameworks such as that in Figure 1 have in the past been predominantly used to evaluate policy effectiveness. However, while policy effectiveness typically refers to a single policy, policy coherence refers to relationships between policies (as indicated by the 'double boxes' in the diagram). A sectoral policy can be effective in achieving its specific objectives without being coherent in relation to the objectives of other policy areas.

Our analysis of policy coherence thus focuses on outputs (including policy objectives as well as policy design and instruments for reaching them) and implementation practices (at different levels). These are linked to integration efforts in policy preparation processes on the one hand, and environmental outcomes and impacts on the other. Thus, strong integration mechanisms in the policy process are expected to help reach more coherent policies, and the degree of coherence between two or more policies will affect outcomes and impacts. Integration analysis, coherence analysis and impact analysis can be seen as part of a wider comprehensive coherence analysis. Following the entire chain from process to impact requires a strong multidisciplinary effort, from political and institutional analysis, through to knowledge and models about the link from policy design and instruments to the behaviour of economic sectors and/or individual actors in the 'real world'. It should be noted that changes in preconditions and unforeseen events can influence outcomes and impacts, requiring a degree of caution in the interpretation of data. It is likely, for instance, that reduced usage of fossil fuels and reduced greenhouse gas emissions in the European Union in recent years have not primarily been the result of an increasingly coherent set of environmental and energy policies, but that in fact a global economic recession and spiralling fossil fuel prices have driven this development independently from policy influence. For example, in 2009, carbon emissions from EU ETS installations fell by 11%, as a result of the recession, actually putting overall emissions below the cap. This is a common problem in policy evaluation methodology, but cannot be avoided as long as a comparison with 'policy-off' cases is not possible. However, close knowledge of specific sectors and analytical tools that aim to identify the impact of different influencing factors can help distinguish the effect of policy measures.

DOI: 10.1002/eet

Policy Coherence as a Problem of Interaction Within and Across Levels

Our definition implies that coherence is about eliminating conflict and promoting synergy. Those concerned with the question of how to deal with conflict and synergy between different policies will inevitably come across the question of how policies interact. A growing literature on the functioning of international environmental regimes has taken an interest in the question of interaction (Oberthür and Gehring, 2006). However, questions about interaction apply at any level of institutional structure and policy making. Institutional interaction relates to a cause–effect relationship between two institutions, and will occur if one institution affects the development or performance of another institution (Breitmeier, 2000). Effects may be beneficial, adverse, or neutral for the target institution. Beneficial effects will create synergy between the two institutions because the policy direction of the target institution is supported by measures originating from the source institution. Adverse effects will result in disruption of target institution policies because measures originating from the source institution undermine the effectiveness of the target institution's own measures (Oberthür and Gehring, 2006, p. 46).

In the context of policy analysis, the equivalent of interactions between institutions can be interactions between policy outputs and implementation practices. Just as improving policy coherence requires addressing integration of the process upstream, dealing with interactions requires processes of deliberation upstream, which has been termed interplay management. Oberthür (2009) identifies four levels of interplay management (i.e. efforts to influence the interactions between institutions): overarching management by a hierarchical body; joint management between institutions; unilateral management; and autonomous management. In our framework, the equivalent of interplay management would thus be integration efforts in the policy making process, such as organizational arrangements and mandates, and administrative procedures, such as impact assessments.

As observed earlier, interactions can be studied within a single policy domain (internal coherence) as well as between different policy domains such as between different environmental or sectoral policies (external coherence). As also observed, the analysis of interactions can be applied both horizontally and vertically. Also here there are links with the analysis of international institutions. For example, Young's work on institutional fit, interplay and scale discussed the concept of horizontal interplay (Young, 2002). This is concerned with the relationship between policies at the same level of governance. One example in the EU would be how transport policy instruments negatively or positively affect different EU-level environmental goals. Vertical interplay, on the other hand, refers to relationships across different (spatial) scales of governance. In vertical interplay, for example, international treaties could be in conflict or synergy with EU or national policy objectives or EU or national policy could be in conflict with local and regional policies. Table 1 displays the two dimensions and the resulting four main types of coherence analysis.

Whereas Oberthür and Gehring (2006) do not venture into the question of the different levels and layers of policy making, our framework allows the consideration of different types of interaction going on at different levels of policy making. Therefore, an analysis of the interaction between two (or more) policies will need to take into ac-

Policy dimension	Administrative dimension	
	Horizontal	Vertical
Internal	e.g. local climate change mitigation policy in relation to local air pollution policy e.g. national transport access for all in relation to the cost efficiency of national transport budgets	e.g. global climate change policy in relation to EU climate policy e.g. EU agricultural policy in relation to national agricultural policy
External	e.g. national transport access policy in relation to national air pollution policy e.g. EU agricultural production policy in relation to EU climate change mitigation policy	e.g. global trade policy (WTO) in relation to EU climate change mitigation policy e.g. EU agricultural policy in relation to national water quality targets

Table 1. Combinations of vertical/horizontal and internal/external interactions

DOI: 10.1002/eet

count these different levels. Taking inspiration from Hall's (1993) work on policy change, which distinguished the analysis of overarching goals, instruments and the calibration of these instruments, the suggested approach here distinguishes between *policy objectives* and *policy instruments* in the 'policy output' box. In addition, it treats *implementation practices* as a third observation unit. Here, several decades of implementation research have highlighted how administrators and bureaucrats filter, interpret and distort formal policy in a number of ways that may result in outcomes that differ significantly from the legislators' intentions (Pressman and Wildavsky, 1973). Furthermore, it is well known in policy making that conflicts are often hidden at the higher levels of abstraction such as overarching goal formulations and strategies, in order to facilitate the adoption of decisions. These conflicts may come to the fore in the selection of instruments and how these instruments are applied 'on the ground'. The layered approach (Figure 2) allows us to juxtapose not only two or more sets of policy objectives, but also instruments and implementation practices, against policy objectives. As far as data allows, the approach also includes estimated resulting changes in economic sectors and associated environmental outcomes.

This 'layered' analysis of coherence, and the horizontal and vertical interactions therein, speaks directly to studies of EU policy implementation and the 'Europeanization' process, which attempt to capture the interaction between EU policy and national level policy (Bache and Flinders, 2004; Jordan and Schout, 2006). The multilevel governance character of the EU to some extent reflects the analytical layers from objectives to instruments to implementation practices, where the overarching objectives and overarching types of instruments are set centrally whereas specific instrument design and implementation is defined at the MS or regional level. However, there are certainly variations. For instance, in the case of renewable energy policy, overarching objectives are established at EU level, whereas the MSs decide on the instruments. In the case of cohesion policy, the EU level establishes the instruments, but the MSs decide which objectives to prioritize and how instruments get implemented.

The Three Steps of Policy Coherence Analysis

Below we present a simple template for analysing policy coherence, with three illustrative examples across different policy domains. Our examples draw in particular on the interaction between sectoral and environmental policy at the EU level, i.e. external and horizontal policy interactions (see Table 1). The case studies focus on the interplay between objectives, instruments and implementation practices of an economic-sector policy (such as energy) and the objectives of a particular environmental policy (such as the Water Framework Directive). It should be noted that, fitting with the aims and scope of this journal, our coherence analysis emanates from an environmental

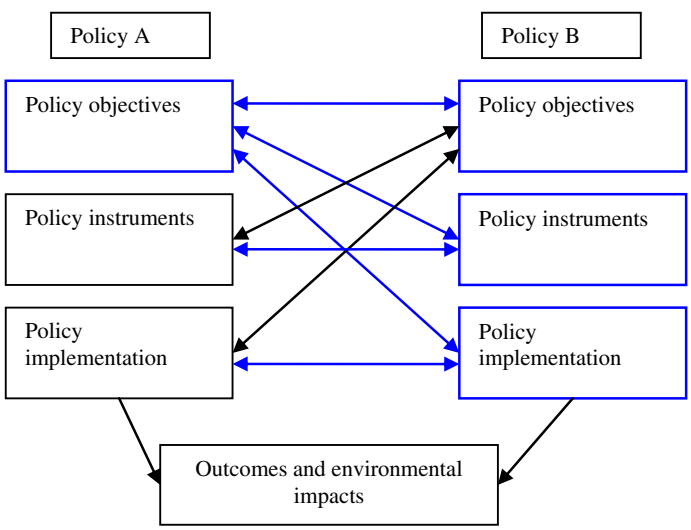


Figure 2. Interacting layers of policy from objectives to implementation

DOI: 10.1002/eet

policy reference framework. The analysis primarily addresses how sectoral policy objectives, instruments and implementation practices interact with environmental policy objectives. Figure 2 shows that interactions in both directions are important: from a sectoral policy perspective, one might consider in detail the increasing influence of environmental policy objectives on those reverse relationships in sectoral policy fields, such as the implementation of biodiversity protection policies and how it affects the attainment of agricultural production objectives.

The three steps leading to an overall assessment of coherence for two policy fields, are first an inventory of policy objectives, second a review of interactions by way of a screening exercise and third a more in-depth mapping of key interactions.

Step 1. Inventory of Policy Objectives

The purpose of the inventory step is to get a comprehensive view of the policy objectives of key environmental and sectoral policies. This is a descriptive analytical task and it is analytically undemanding, but it is not a trivial effort as, the subject is both difficult to delineate and constantly changing. Illustrating this complexity, Appendix Table 1 provides an inventory of the key environmental objectives in four areas (climate change, nature and biodiversity, natural resources and waste, and environment and health), and Appendix Table 2 shows the inventory of energy policy objectives and instruments as per September 2011.

Step 2. The Screening Matrix

The purpose of the screening step is to do a 'quick-map' of the overall interactions between main areas of sectoral policy activity and (in this case) environmental policy objectives. The main tool is a screening matrix which presents environmental objectives on the horizontal axis and sectoral objectives and policies on the vertical axis. The sectors are sub-divided into their main sub-sectors or objectives. In the screening in this study, sectoral policies are tentatively assessed in terms of (a) the strength of the interaction and (b) their overall coherence with EU environmental policy themes of climate change, nature and biodiversity, natural resources and waste, and environment and health (Council of the European Union, 2002). The screening matrices display environmental objectives on the horizontal axis – the latter have been coded due to space constraints (see Table 2).

The screening is performed as a rapid assessment exercise gathering environmental and sectoral experts in a workshop. The screening as performed in the present study builds on a reference framework on sector–environment interactions that is described in an EU-level environmental assessment by the European Environment Agency (EEA, 2010). This reference framework provides an essential analytical context within which expert judgement can

Climate				
C1. Reduction in greenhouse gases	C2. Renewable share of energy	C3. Reduction in energy consumption	C4. Resilience to deal with climate impacts	
Nature and biodiversity				
N1. Well functioning natural systems, habitats, wild flora and fauna	N2. Limiting emissions of eutrophying pollutants	N3. Reverse negative species trends	N4. Keep fishing within safe limits	
Resources and waste				
R1. Consumption of resources within limits	R2. Breaking linkage between economic growth and resource use	R3. Reduction of waste volumes	R4. Waste prevention, reuse, recycle and recover	
Environment and health				
H1. Improving air quality	H2. Good chemical and ecological status of (inland and coastal) waters	H3. Making cities more attractive and healthier places to live	H4. Chemicals used and produced without significant negative impact	H5. Avoid harmful effects of noise

Table 2. Seventeen overarching EU environmental objectives in the screening matrix

DOI: 10.1002/eet

be developed to determine the level of interaction between each main sectoral activity area and environmental objectives. Experts should be assembled across sectoral areas and environmental themes in such a way that in-depth understanding is available for each sector–environment interaction of interest to the analysis foreseen. A combined panel of scientists and expert policy officers is recommended, with an ideal number of four to eight participants depending on the sector and how multifaceted it is in terms of environmental interactions.

In our illustrative exercise (see results below), the strength of interaction was scored as strong (2), weak (1) or neutral/not known (0). The screening does not analyse the nature of interaction but looks at the importance of each interaction between two policies. Thus it identifies important interactions between sector and environmental policies, their overall strength and likely direction (synergy, +, or contradiction, −), as a precursor for selecting cases for further analysis. The screening results in a matrix that maps key interactions and identifies areas for further evaluation of coherence. The interactions identified for further analysis are not necessarily those where there is a strong interaction (i.e. score 2). Rather, the selection of suggested cases is based on the expert group judgment that there is an interesting interaction identified that, for instance, displays a differential pattern depending on assumptions that need to be made. In a full screening, substantial analysis and supporting data sets could be compiled for each box of the matrix, but such detailed documentation was beyond the resources of this pilot exercise.

Illustrative Screening Results for Cohesion Policy

Table 3 presents screening results for cohesion policy. In this domain, specific spending plans are set in the Operational Programmes, many at the regional level. A large share of funding is used for infrastructure investments in roads and rail, but also airports, inland water, multi-modal and short sea shipping, water services, waste management, renewable energy, energy efficiency and grid infrastructure. The area 'Knowledge and innovation for growth' supports business development. Certain measures directly support improvements in resource efficiency, including environmental management schemes in SMEs, and support for businesses working on renewable energy, ecotourism or waste reduction. Co-funding support for environmental infrastructure in the field of waste treatment was identified as particularly interesting, displaying a potentially complex set of interactions, in particular in terms of the EU environmental goal of promoting waste prevention, reuse, recycling and recovery. Several other interactions appear as quite important in terms of their interaction with environmental goals. Cohesion policy support for transport infrastructure was identified as having strong links with both climate change goals and those for improving cities. Co-funding support for knowledge and innovation can have wide-ranging implications for the environment: in this area, it should be noted, the Operational Programmes have great latitude in setting the mechanisms and priorities, creating significant complexity for coherence analysis. A similar analytical problem is seen for cross-border, transnational and interregional cooperation, an area of cohesion policy that funds a great number of programmes across different policy areas.

Illustrative Screening Results for Energy Policy

Table 4 presents screening results for energy policy, including four areas of energy policy: security of supply, internal market, efficiency and renewable energy. Within these, 11 relevant objectives were used in the screening. As regards the pure supply security objectives that relate to fossil sources of energy, there are obvious direct conflicts with climate change objectives. Much of supply security policy relates to pipelines and storage. In contrast, efficiency measures have by their nature highly synergistic interactions with various environmental issues, as they reduce overall energy demand. Biomass, biofuels and hydropower were chosen as more interesting areas to examine as they exhibit both synergy and conflict with resource and environmental protection objectives. Another interesting area is the energy market integration policy, and the relationships implied through the development of electricity transmission and distribution infrastructures.

The scoring in Tables 3 and 4 was developed in an iterative process between experts in the project team. The individual scores for each cross-relationship evaluated here take account of known sector–environment interactions within Europe but do not include potential knock-on effects outside Europe, as the knowledge about such effects is still too uncertain. Similarly, the evaluation of likely impacts considered only first-order effects but not potential second-order consequences, such as the 'rebound effect'. In many instances, there are also different implementation paths for the achievement of individual sector-policy targets, as reflected in the overall score ranges.

DOI: 10.1002/eet

	C1	C2	C3	C4	N1	N2	N3	N4	R1	R2	R3	R4	H1	H2	H3	H4	H5
1. Attractive places in which to invest and work																	
1.1 Expand and improve transport infrastructure	−2/+1	−1	−1	−1/+1	−1	−1/0	−1	0	−2/+1	−2/+1	−1	0	−2/+1	−1	−2/+2	0	−2/−1
1.2 Strengthen synergies between environmental protection and growth	+1	+1	+1/1	+1/+2	+1	+2	+1	+1	+1	+1	+1	+2	+1	+1	+1	+1	0
1.3 Address Europe's intensive use of energy	+2	+2	+2	0/+1	−1/+1	0/+1	−1/+1	0	+2	+2	0/+1	0/+1	+1	0/+1	+1	0	0
2. Knowledge and innovation for growth	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2	−1/+2
3. More and better jobs																	
3.1 Attract and retain more people in employment; modernize social protection	0	0	0	0	0	0	0	−1	0	0	0	+1	0	0	0	0	0
3.2 Adaptability of workers and enterprises; flexibility of labour markets	0	0	0	0/+1	0	0	0	0	0	0	0	0/+1	0	0	0	0	0
3.3 Increase investment in human capital	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1
3.4 Improve capacity of administrations and services	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1	0/+1
3.5 Maintain a healthy labour force	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0/+1	0/+1	0/+1
4. Territorial dimension																	
4.1 Ensure the contribution of cities to growth and jobs	+1	+1	+1	0	0	0	0	0	−1/+1	−1/+1	0	0/+1	0	0	+2	0	0
4.2 Support diversification of rural areas, fisheries, and areas with natural handicaps	−1/+1	−1/+1	−1/+1	−1/+2	−1/+1	+/−1	−1/+1	−1/+1	−/+1	−/+1	0	−/+1	0	−/+1	0	0	0
4.3 Promote cross-border and interregional cooperation	0/+2	0/+2	0/+2	0/+2	−1/+1	0/+2	−1/+1	0/+2	−1/+2	−1/+2	0/+2	0/+2	0/+1	+1/+2	+1/+2	0	0

Table 3. Illustrative screening matrix for cohesion policy

DOI: 10.1002/eet

	C1	C2	C3	C4	N1	N2	N3	N4	R1	R2	R3	R4	H1	H2	H3	H4	H5
1. Supply security																	
1.1 Securing gas supply	−1/+2	0/−2	0/−1	0	0/−1	0	0	0	0	0	0	0	+1/+2	−1/0	+1/+2	0	0
2. Internal market																	
2.1 Grid investments/infrastructure	0/+2	0/+2	0/+1	+1	0/−2	0	0	0	+1/−1	+1/−1	0	0	0/+1	0	−1/+1	0	0
2.2 Common rules	+1/−1	+2	+2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Promoting renewable sources of energy																	
3.1 Biofuels	−2/+2	+1/+2	0	−1/0	0/−2	0/−2	0/−2	0	+1/−1	0	0/+1	0/+2	0/−1	0/−1	0	0	0
3.2 Offshore wind energy	+2	+2	0	0	0/+1	0	0	+1/−1	0/+2	0	0	0	+1	0	0/+1	0	0
3.3 Biomass developed	−1/+2	+2	0	−1/0	+1/−1	0/+1	−1/0	0	+/−1	0	0/+1	+1/+2	0/−1	+1/−1	0	0	0
3.4 Hydroenergy	+1/+2	+2	0	−1/0	−2/0	0/+1	−2/0	0	0/+1	0	0	0	+1	0/−2	0	0	0
3.5 Renewable energy general	+2	+2	0	−1/0	−2/+1	0	−2/0	+1/−1	+1/−1	0	0/+1	0/+2	+1/−1	−2/+1	0/+1	0	0
4. Energy efficiency																	
4.1 Building efficiency	+2	0	+2	+1	0	0	0	0	+2	+1	0	0/+1	+1	0	0/+2	0	0
4.2 Co-generation	+2	0	0/+2	0	0	0	0	0	0/+1	0/+1	0/+1	0/+1	+1	0	0	0	0
4.3 Products and services efficiency	+2	0	+2	0	0	0	0	0	0/+1	+2	0/+1	0/+1	+1	0	0/+2	0	0

Table 4. Illustrative screening matrix for energy policy

DOI: 10.1002/eet

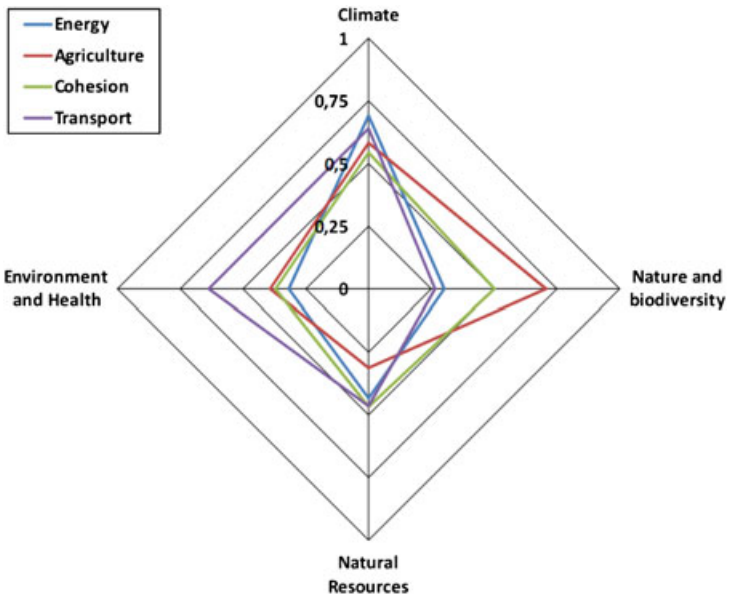


Figure 3. Case selection graph

Optional Case Study Selection through a Simple Data Analysis

On the basis of tentative screening results, and as an additional input into the case study selection, a measure of relative need for further work on coherence can be created. This involves dividing interaction by coherence to identify areas where further work is needed. In order to avoid division by zero when performing the arithmetic operation of dividing the interaction score (I) with the coherence score (C), the original score for I in the interval [0, 2] is rescaled to $\hat{I}$[0, 1], and the original score for C is re-scaled from C[−2, +2] to $C\hat{}$[1, 5]. The resulting measure of relative need for further work is then defined as $\hat{I}/(C\hat{}/5)$. This measure highlights where further analysis is most warranted. The final measure is in the interval [0, 5], with the least interest in further consideration assumed when coherence is high (rescaled $C\hat{} = 5$, original $C = 2$), and the interaction is low ($\hat{I} = 0$, $I = 0$), and the largest interest is presumed when coherence is low ($C\hat{} = 1$, $C = -2$), but the interaction is high ($\hat{I} = 1$, $I = 2$). The data analysis was performed for energy, cohesion, agriculture and transport screening matrices. Figure 3 shows that the greatest interest in further analysis was found for agriculture in relation to nature and biodiversity, transport in relation to environment and health, and energy/transport versus climate.

A Closer Examination of Policy Coherence: Illustrative Examples

Here we examine policy coherence more closely in some of the areas where the screening indicated a high or complex level of interaction. We look at interactions at the level of policy objectives, instruments, implementation and outcomes following an analytical template (Table 5). Due to space constraints, the presentations are collapsed into three categories: policy context and focus, assessment of key synergies and conflicts, and implications and opportunities.

Coherence of Biofuel Promotion in Relation to Land Use Change and its Impacts on Biodiversity

This example discusses the coherence between biofuels promotion in the Renewable Energy (RES) Directive, and the EU objectives and legislation on biodiversity and habitats, in particular with regard to impacts resulting from land use change associated with energy cropping for biofuels. Another important policy debate relates to net GHG effects from promoting biofuels. Due to space constraints this was not tackled in the current paper, although climate change in turn can impact on biodiversity. It remains an important issue to be reviewed in further work.

Policy background	Introductory description of the activity in focus and EU policy frameworks steering this activity, including sectoral and environmental policies
Overall assessment of interactions	**1. What are the main types of interaction?** What components within the policy domains interact? What are the key environmental physical interactions that the policy relates to and what are the main trends? **2. Interactions of the policy objectives, instruments, implementation** Describe the main interactions. Assess (but do not score) level of coherence: strong synergy, weak synergy, neutral, weak conflict or strong conflict (May be several combinations due to objectives, instruments, implementation revealing differential patterns of conflict and synergy) **3. Outcomes and impacts** Supporting data, assessments or modelling results that describe the sector policy's actual outcomes and impacts (Basic data to be collected for the entire EU. When it comes to specific interactions, it is often necessary to go into specific member states as examples or case studies.)
Key synergies and conflicts (drilling down in more specific interactions)	What are the key policy interactions, at the level of objectives, instruments and implementation, where there are synergies or conflicts? What is the nature of these interactions? What is the strength and conditionality of these interactions? What is the level of confidence in the analysis?
Opportunities for synergy enhancement and conflict mitigation	Where are the opportunities for mitigation to reduce policy conflict and develop a more synergetic interaction? Where are the opportunities to enhance, develop and achieve stronger policy coherence?
Issues and implications	Concrete and brief recommendations. Could be for a wide range of stakeholders, and a wide range of issues (research and monitoring needs, institutional reforms, process recommendations to make evidence and systems thinking part of the process, safeguards)

Table 5. Analytical template

Policy Context and Focus

In 2009, the EU committed to increase the use of renewable energy as a key strategy in combating GHG emissions. The RES directive (2009/28/EC) (Council of the European Union, 2009a) states that: 'Each Member State shall ensure that the share of energy from renewable sources in all forms of transport in 2020 is at least 10% of the final consumption of energy in transport in that Member State' (Article 3, § 4). As part of the EU climate and energy package of 2008, the objective is obviously embedded in the context of climate change, but it also interacts with environmental targets *inter alia* related to land use, and impacts on nature and biodiversity (Council of the European Union, 2002). These objectives have been updated: by 2050 the aim is that the '. . .biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored. . .' (Council of the European Union, 2010b). At the timescale coinciding with the shorter term target of 10% renewable energy in the transport sector (until 2020) a headline target is established that aims at '. . .halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss' (Council of the European Union, 2010b). Additionally, the habitats directive (EEC, 1992) and the birds directive (Council of the European Union, 2009b) constitute key pieces of binding EU legislation related to biodiversity. Several other interactions between bioenergy/biofuels and environmental objectives could be investigated, such as water use and soil conservation, but this case focuses on key interactions between bioenergy and nature and biodiversity – related to land use change as a driver that influences nature and biodiversity objectives.

DOI: 10.1002/eet

Key Synergies and Conflicts

The sub-objective of renewable energy for transport in the RES directive is neutral towards type of primary renewable energy (not only biofuels) and concerns all types of transport technology. Thus, at the level of *objectives*, the interaction is weak. However, the RES directive builds on the previous biofuels directive (CEC, 2003) and the intention to promote biofuels in road transportation for the purpose of climate change mitigation is clear, making the interaction stronger in practice. Assuming that an increased share of biofuels will indeed reduce global GHG emissions and considering possible positive impacts from reduced climate change on biodiversity loss, there are synergies with the objective on nature and biodiversity. However, increased used of biofuels will cause direct and indirect effects on land use, and will likely impact negatively on biodiversity. Impacts from production of biofuels, on nature and biodiversity, have to some extent been considered. Sustainability criteria for biofuels are outlined in terms of direct land use change effects and actual mitigated CO_2 emissions (Articles 17–19 and Preamble 65-85). The provision of the sustainability criteria in the RES directive is a first step in defining more environmentally friendly biomass production in agriculture with the aim to prevent potentially negative interactions, and the desire for coherence between the two targets is made explicit in Preamble 44. However, while this suggests policy coherence on the surface, there are limitations to the current criteria, as indirect effects are not addressed by the current policy framework. In reality, the formulation of these criteria is not based on environmental performance only, but reflects political compromises, as more stringent criteria would disfavour e.g. biodiesel produced in Europe.

At the level of *instruments*, few concrete measures are outlined, and instead MSs are given the responsibility for implementation of action plans (Article 4). Therefore, *vertical* coherence patterns between the EU and MSs are relevant to examine, but cannot be covered here. At the level of *implementation practices*, however, biofuels for transport are dominated by first-generation technologies such as liquid ethanol and bio-diesel (UNEP, 2009, pp. 33–34). This translates to increasing use of primarily cereals and sugar cane for ethanol, rapeseed for biodiesel, and imports of palm oil (CEC, 2007). The agriculture sector is thus the primary producer of biomass used in biofuels. Few production plants for second-generation biofuels are currently in commercial operation, and successful commercialization will take another decade (IEA, 2008). Thus, current implementation practices require that more land is used to produce biomass for first generation biofuels. The agricultural sector is in turn the key driver behind land use change with substantial impacts on nature and biodiversity. [1] More extensive use of biomass from the agricultural system is associated with a high risk of increasing pressures on land, and land use change resulting in habitat fragmentation (Tilman *et al.*, 2009; Fisher and Lindenmayer, 2007; EEA, 2006). Further increased production of provisioning ecosystem services is also often in direct conflict with good quality of regulating or supporting ecosystem services (Millennium Ecosystem Assessment, 2005).

The EU biodiversity strategy (see above) as well the EU resource efficiency roadmap (CEC, 2011a) establish qualitative policy targets with regard to habitat protection and associated ecosystem services, and they provide a statement of intent to deal with (global) indirect land-use effects of EU policies and supporting global biodiversity protection. In the Council communication from March 2010 it is 'recognized' that land-use change is the key driver for habitat destruction and fragmentation of landscapes, but no objectives or instruments are outlined (Council of the European Union, 2010a). In the habitats directive that established Natura 2000 the need for coherence with wider land use planning is mentioned (Article 10), but Natura 2000 sites are not primarily concerned with the protection of biodiversity within the broader agricultural landscape (EEC, 1992). The coherence between biofuel promotion and land use and biodiversity can hence only be assessed given overarching objectives to halt biodiversity loss. The final outcomes of policy in terms of global direct and indirect land use change are difficult to assess (UNEP, 2009). There is, however, little doubt that future global increases in agricultural biomass production, partly driven by EU policies on biofuels, are likely to increase current global pressures for conversion of forests and grasslands to arable land (WBGU, 2008).

[1]Concerning net GHG emissions of such increased or converted land use requires careful assessment of indirect land use change, but also the alternative land use ('policy-off option'). The assumption that all bioenergy is carbon neutral is in many ways a flawed assumption (EEA Scientific Committee, 2011), and the actual greenhouse benefits of many forms of bioenergy are highly questionable (for recent reports in the context of EU RES see IEEP, 2011, and IFPRI, 2011).

DOI: 10.1002/eet

Selected Implications and Opportunities for Enhanced Synergy and Conflict Mitigation

Objectives of the EU biofuels policy are ambitious in scope and timeframe. To achieve their GHG reduction goal the global land use implications of the 10% target by 2020 need to be put in the context of global land use change and biofuel targets (Petersen, 2008). Indirect land use effects strongly decrease the GHG reduction and need to be included in relevant accounting systems (EEA Scientific Committee, 2011).

Policy instruments to safeguard sustainability are necessary, as agricultural biomass production is associated with pressures for land use change and intensity. However, the instruments adopted so far focus mainly on preventing damage rather than on encouraging the most environmentally friendly bioenergy production systems, notwithstanding certain provisions in the sustainability criteria of the RES directive. The considerable range of additional policy instruments at both EU and MS levels could be explored (EEA, 2007).

Implementation practices for the production of biofuels so far give rise to concern. Stronger support for the most effective and/or least damaging biomass crops and sources would be helpful but may raise technology neutrality concerns. Dedicated information about, and practical training in, the most environmentally friendly energy crops or other biomass sources could complement. Last, the EU needs to follow the evolving scientific understanding, and develop methods to certify and discriminate between different fuels with different impacts. A part of this would be to conduct science-based impact assessments at regular intervals (as prescribed in related legislation).

Coherence of Cohesion Policy for Environment and Growth in Relation to Waste Treatment

This example discusses the coherence between cohesion policy co-financing for environmental infrastructure and the EU ambition to increase the re-use, recycling and recovery of materials, as set out in the Sixth Environmental Action Programme (6EAP) (Council of the European Union, 2002), the Waste Framework Directive (Council of the European Union, 2008) and the EU Resource Efficiency Roadmap (CEC, 2011a).

Policy Context and Focus

EU cohesion policy, including the European Regional Development Fund (ERDF), the Cohesion Fund and European Social Fund (ESF), represents 35.7 per cent of the total EU budget for the period 2007–2013. EU cohesion policy funds have provided substantial financing for environmental improvements, particularly so through the Cohesion Fund itself, which finances only environment and transport infrastructure. This has been motivated primarily by the desire to assist MSs in complying with the EU environmental *acquis communautaire* in heavy investment areas, including management of waste. The overall objective of cohesion policy, as stated in the Community Strategic Guidelines for 2007–2013, is to support the economic and social cohesion of the EU territory, including the objectives of the renewed Lisbon Agenda, namely maximizing conditions for economic growth and creating more and better jobs (Council of the European Union, 2006). The key environmental objective contained within the Community Strategic Guidelines is 'Strengthen the synergies between environmental protection and growth', meaning that the rationale for supporting environmental infrastructure is expressed in terms of its importance for economic development.

EU environmental objectives for the waste sector are contained in the 6EAP, the Waste Framework Directive and the EU Resource Efficiency Roadmap (CEC, 2011a). All documents express a preference for waste reduction, re-use and recycling over disposal, based on the waste hierarchy. Recovery such as energy recovery via incineration should be a lower priority, and disposal (e.g. land filling) is the last choice in this hierarchy. Several MSs have largely ended their reliance on landfills for waste management – but others continue to rely on them extensively.

Cohesion policy finances investments for the 'management of household and industrial waste'. The cohesion policy funds are programmed by the MSs and regions, based on strategic plans (National Strategic Reference Frameworks) and more specific funding documents (Operational Programmes), which contain the specific measures to be financed. These planning documents are based on national laws (conforming to EU directives) and, for the waste sector, the waste management plans drawn up by the MSs. While cohesion policy objectives and implementation modalities are set at the EU level, the actual types of spending and outcome are mainly determined by the MSs and regions that carry out the funding programmes.

DOI: 10.1002/eet

Assessment of Key Synergies and Conflicts

At the level of *objectives*, there are clear synergies between cohesion policy and the objective to promote the prevention, re-use and recycling of waste, even though they highlight different rationales (economic development versus environmental protection). The Cohesion Policy Community Strategic Guidelines state that 'In order to maximise economic benefits and minimise costs, priority should be given to tackling environmental pollution at its sources. In the waste management sector, this implies focusing on waste prevention, recycling and biodegradation of waste which are cost-effective and help to create jobs' (Council of the European Union, 2006).

At the level of *instruments*, the main instruments used in the two types of policy are quite different: financial instruments for cohesion policy compared with legal instruments for EU waste policy. Nevertheless, under the regulations governing cohesion policy funds, the intent is to finance only investments that are in line with EU policy and legal provisions. The level of coherence is therefore again one of synergy. At the level of *implementation*, the interaction between cohesion policy and the waste legislation becomes more complex. Implementation of cohesion policy is carried out by the MSs and regions and varies considerably from case to case. In theory, to implement cohesion policy, the MSs and/or regions must prepare spending programmes that are in line with EU and national legislation, including other strategic plans such as waste management plans. Indeed, cohesion policy investments have contributed to substantial improvements in waste management that have taken place in recent years (CEC, 2009b). Waste collection services, particularly in rural areas and much of the EU-12, have been expanded and made affordable for citizens. Many unregulated and unsanitary dumpsites have been closed down and remediated, or replaced with new, modern landfills and more sophisticated integrated waste management centres.

However, MSs do not always focus equally at all levels of the waste hierarchy when preparing and implementing cohesion policy spending programmes: particularly not the first three options in the hierarchy – the prevention, re-use and recycling of waste. Part of the reason for this is a desire on the part of the MSs to absorb as much EU funding as quickly as possible through cohesion policy. If funds are not absorbed, it may negatively impact future funding allocations. The result is tremendous pressure on MSs and regions to focus on large investment solutions for tackling their waste management problems, such as the construction of waste incinerators.

In sum, *horizontal coherence* is seen at the highest level, that of objectives. However, conflicts are stronger when it comes to the level of implementation. These conflicts are seen between waste policy goals and cohesion policy implementation, and thus they extend diagonally across both the horizontal and vertical dimensions. At the same time, there is also an *internal conflict* within cohesion policy, between objectives that are in synergy with EU waste policy objectives and implementation at national and regional levels. The conflict cannot be simply ascribed to one between EU goals and MS implementation: the policy instruments designed at EU level also play an important role.

Selected Implications and Opportunities for Enhanced Synergy and Conflict Mitigation

At the level of *objectives*, the drafting of EU, national and regional plans and proposals for the next financial perspectives and the cohesion policy 2014–2020 programmes will provide an opportunity to enhance synergy by strengthening key environmental references and requirements within planning documents. Indeed, the Commission's proposal (CEC, 2011c) for the new period includes a stronger overall framework for cohesion policy objectives, based on the EU 2020 strategy; under this framework, environment and resource efficiency are together identified as one of the 11 thematic objectives, thus highlighting the goals and targets provided by the EU Resource Efficiency Roadmap.

At the level of *policy instruments*, it will be important to look more closely into the design of EU regulations and implementation procedures. One important opportunity is to establish stronger references to the use of environmental assessments. The EU directives on environmental assessment of certain plans and programmes (Council of the European Union, 2001) and Environmental Impact Assessment (EIA) (Council of the European Union, 1985) serve as safeguards against environmental damage from plans, programmes and projects, and seek to maximize the environmental benefit from planning and investment decisions. In this regard, however, the Commission's proposal for the 2014–2020 funding period calls for the use of SEA in the *ex ante* assessment of each Operational Programme 'where appropriate'; the proposal only make this mandatory for transport infrastructure (CEC, 2011c).

Guidance on *implementation practices* could strengthen environmental authorities and stakeholders during the process and assist practitioners to improve results. Moreover, it could be useful to set criteria for funding large-scale

DOI: 10.1002/eet

investments to encourage a stronger emphasis on cost effectiveness and cost recovery for investments that receive support. This may include ceilings for co-financing contributions, revision of minimum project size requirements and other specific parameters. This could remove some of the incentives for MSs to prioritize large-scale infrastructure over alternative solutions with less reliance on disposal.

Coherence of Renewable Electricity Promotion and Inland Water Protection

Policy Context and Focus

The RES directive (Council of the European Union, 2009a) establishes a common framework for the promotion of energy from renewable sources and sets mandatory national targets consistent with a 20 per cent share of energy from renewable sources. The directive is an important part of the package of measures needed to reduce greenhouse gas emissions within the EU and a measure to increase security of supply. The Water Framework Directive (WFD) (Council of the European Union, 2000) concerns the protection of inland surface waters, transitional waters, coastal waters and groundwater, which protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on them. The WFD is a response to trends of deteriorating status of water and increasing scarcity due to pollution and high uptake of freshwater in the EU. The overarching goal is for all water bodies to achieve good chemical and ecological status by 2015, with the possibility of extending the timeframe for reaching these targets until 2027.

Wind power, which represents the main part of *growth* of production capacity of renewable energy since 2001, growing by 47 GW and reaching a total of 65 GW, has limited effect on water quality. The main part of renewable electricity production capacity in the EU, however, comes from hydropower, 143 GW, where the potential for conflict between these policies is substantial (Eurostat, 2011). Hydropower stations and dams lead to fragmentation and deterioration of aquatic habitats, which has a negative effect on aquatic biodiversity and habitats (Rosenberg *et al.*, 1997; Bunn and Arthington, 2002; Abell, 2002). Storage hydropower stations can respond flexibly to peaks in power demand, and with an increasing incorporation of intermittent power sources, such as wind power, the value and importance of such balancing capacity will increase (Holttinen and Hirvonen, 2005; Bélanger and Gagnon, 2002). The potential for further construction of large hydropower stations (which represent about 90% of total production) in the EU is limited. However, there is a potential for around 5 per cent growth from refurbishment of existing facilities (CEC, 2011b).

Assessment of Key Synergies and Conflicts

At the level of *objectives*, there are no immediate conflicts in coherence between RES and WFD since they are both directed at prioritized (and positively linked) environmental objectives such as biodiversity conservation, human environment and health and greenhouse gas reduction. At the level of *instruments*, RES is primarily handled by MSs through feed-in tariffs, certificate schemes and other measures that provide incentives for increasing renewable energy production, such as hydropower, solar and wind. The WFD introduces national monitoring programs in each MS to classify the status of each water body according to a five-class scale (CEC, 2009c). MSs develop river basin water management plans, including programmes of measures, and specify the measures that are needed within each water basin to reach the goals of the WFD. At one level, the interaction between the instruments of the directives is relatively neutral, since there are a number of instruments in the WFD, such as the designation of heavily modified and artificial water bodies with less strict quality requirements, designed to reduce contradictions with other societal needs such as electricity production. There is also the possibility of exemption for specific water bodies if the achievement of the objectives of good water quality would be infeasible or disproportionately expensive (Article 4:5). This allows maintaining or modifying existing hydropower installations. At a second level, however, the WFD requires MSs to work on achieving or maintaining good ecological status. This implies a significant barrier for the installation of new hydropower schemes, even if small, as they generally impact on water flows and morphological structures in flowing waters, which are crucial parameters for achieving good ecological status.

The *implementation practices* in RES and their relation to the WFD show a mixed picture when it comes to vertical coherence, since implementation, to a large extent, is decided by individual MSs with their own legal and administrative systems. Due to space constraints the analysis will however focus on the horizontal coherence of implementation in the EU generally. The RES-E directive, in place since 2001, provides an opportunity to analyse

DOI: 10.1002/eet

implementation practices. The WFD was passed in 2000 but the finalized river basin management plans, including programmes of measures, were only recently released. This limits the amount of information on implementation practices.

The implementation of the WFD will probably differentiate between existing and new hydropower stations. With existing hydropower stations the environmental damage has already been done and the impact of particularly large hydropower stations is usually large enough to lead to the surrounding water to be classified as 'heavily modified'. This entails less strict measures, which should not have significant adverse effects on energy production from hydropower. It is however likely that some quality improving measures will be needed even in heavily modified water, which could result in some loss of energy production (Ecologic, 2009).

Selected Implications and Opportunities for Enhanced Synergy and Conflict Mitigation

At the level of *objectives*, further specifications could be made to identify those renewable energy options and related infrastructure that have the least impact on the aquatic environment. For example, further preferential expansion of sources of renewable energy that do not negatively affect the aquatic environment, such as wind and solar energy, would limit the conflict between the two directives. In addition, alternative ways of balancing the energy system, such as strengthening grid transfer potential and creating smart grids, could decrease the need for balancing power such as storage hydropower as a result of the expansion of wind power.

At the *policy instrument* level, a possibility is to use part of the increased energy producing potential from refurbishment of existing hydropower stations for improvements of the aquatic environment necessary to reach good ecological potential. Capacity enhancement could lead to both increased energy production and improved water quality (Rudberg, 2011). One mechanism could be to develop a jointly managed private–public fund based on fees from hydropower production, from which grants can be provided for investments in enhancing aquatic ecosystems functions during refurbishment.

Implementation practices at the EU level would benefit from sharing examples of good practices in hydropower planning and construction between MSs. Ideally, this would involve stakeholders as well as planning and construction companies. At national and regional levels, to establish platforms for sharing of insights and experiences from water basin management plans with public and private actors in the energy sector would also be a useful tool for minimizing possible conflicts.

Discussion and Conclusions

This paper has presented a novel yet relatively simple policy-analytical approach to assess policy coherence. It demonstrates how policy coherence can be conceptualized as a problem of policy interaction at multiple levels, and how policy coherence analysis entailing three steps can be performed. Based on existing debates, we have established that policy coherence can be analysed vertically and horizontally, as well as externally and internally. In principle, therefore, the analytical approach can be applied between any two interacting policies, such as two sectoral policies or two environmental policies at or across levels of governance. Our examples however have focused on horizontal/external coherence, i.e. interactions between environmental and sectoral policies at the EU level. With this focus, we have analysed coherence at three (related) levels: policy objectives, policy instruments and implementation practices. The consequences of different implementation practices have been considered in the context of a reference framework that enables an estimation of their likely outcomes and impacts on the environment.

The examples found variations in coherence when moving from objectives to instruments and through to implementation practices. The biofuels and land use/biodiversity example showed a neutral to potentially positive interaction in policy objectives and instruments but a conflict in implementation, partly due to the heavy reliance on first-generation biofuels. The cohesion policy and waste example also showed neutral to positive interaction in policy objectives and instruments, but a mixed picture in implementation due to the unwieldy implementation and funding priorities made by MSs. The renewable electricity and water example showed neutral to positive interaction in policy objectives and in policy instruments to reach the objectives but a clear risk of conflict in implementation mainly in relation to hydropower.

DOI: 10.1002/eet

Although three cases will not support claims of representativeness, it is worth noting that the cases were highlights among a larger selection of cases in our study (see Table 6) that could not be accounted for in this paper. However, the wider sample confirms the pattern. In most sectors, there is a relatively limited set of conflictual interactions at the level of objectives. For the most part, policy objectives are formulated in line with overarching EU sustainable development priorities and are held at a general level. Conflicts emerge more clearly in the energy and agriculture policy domain than in transport and cohesion policy, but even in these domains they are limited. Also, most instruments in their general form do not signal that there are many conflicts. However, when it comes to implementation either at the EU or at the MS level, potentially strong conflicts come to the fore. Some of these conflicts can be attributed to instrument design and guidelines and some relate to interpretations by MSs due to national priorities.

The growing interest in improving the process of policy making, through impact assessments and strategic environmental assessments, has been the result of a growing concern for better regulation and more evidence-informed decision making. Policy process analysts (such as those concerned with environmental policy integration) have often posed serious critiques on these processes, including, for example, how ex ante impact assessment has been used and even abused (Nilsson *et al.*, 2008). The present study on the other hand suggests that policy processes that have often been criticized for their weak integration mechanisms appear to have still been able to deliver relatively coherent policy objectives. The apparent lack of conflict can in part be attributed to objectives being sufficiently vague to be able to pass in the legislative process.

This shows how important it is to develop analytical concepts that allow an evaluation of policy coherence down to the level of implementation practices and outcomes. However, it still begs questions on whether policy outputs follows linearly from process, as conventional policy-analytical theory would typically assume, and, following this implication, although somewhat uncomfortable for this group of authors, what role policy integration processes really play in shaping policy outputs. There are however more indirect and long term benefits of policy integration processes such as joint learning and long-term alignment of overarching objectives across sectors (Nilsson, 2005).

In addition to following policies unfolding from objectives to implementation it is necessary to follow how this sequence unfolds across levels of governance from EU to the MS and, where appropriate, local levels. Here, the respective roles of MSs and the EU in instrument design and implementation differ significantly between policy areas. Many EU policy instruments, both environmental and sectoral, are designed to give considerable flexibility to MSs in deciding how to develop regulations and practices at the national level and how to apply the instruments. This is particularly clear in the case of funding instruments within agriculture (rural development pillar) and cohesion policy, but it is similarly applicable to, for example, renewable energy policy, where most instruments and implementation practices still remain a national affair. For cohesion policy, there is a high variability depending on national and regional decisions in implementation. Some instruments are fully designed and implemented at regional or local levels. Thus, whether there is synergy or conflict is often strongly dependent on various choices made, interpretations of how the rules apply at MS and lower levels, and what technologies and mitigation options are applied at the stage of implementation.

Four analytical challenges came to the fore in this first study, and point to further needs for methodology development.

The first concerns the timing of the study and its study objects, and how to address outcomes and impacts in relation to this time frame. Our focus was on current policy objectives, instruments and implementation practices. Still, many EU policies have undergone reform in recent years: for example, the CAP was revised in 2003 and saw further updates in 2008, while debate is now underway on further reform by 2013. Biodiversity policy has also evolved in recent years: in March 2010, the European Council issued ambitious objectives for 2020 and 2050. Coherence analysis can review such changes relatively easily when looking at objectives and also instruments, for example in policy documents and legislation. However, implementation takes time, and depends crucially on interactions between governments and stakeholders; and tracing outcomes and impacts requires an even longer time scale. Thus, one challenge in developing coherence analysis further – in particular at the level of outcomes and impacts – will be to factor in these time lags.

Second is the need to systematically address system boundaries, not only in time but also from a life-cycle perspective. For instance, a full life-cycle approach to technologies promoted will give different results from a more narrow approach. Similarly, the choice of geographical boundaries will affect the pattern of interaction with other

DOI: 10.1002/eet

Case	Objectives	Instruments	Implementation
Bioenergy promotion versus greenhouse gas mitigation and land use change	synergy	neutral or weak synergy	neutral or weak conflict
Biomass promotion versus biodiversity	weak synergy – stated as requirement	neutral or weak synergy – under development	range from weak synergy to strong conflict
Renewable electricity promotion versus water quality	strong synergy	neutral	range from neutral to potential strong conflict
Transport technology innovation versus healthy cities and greenhouse gas mitigation	strong synergy	strong synergy	strong synergy
Transport price signals versus air quality	strong synergy	strong synergy	weak synergy (pricing not sufficient to cover social costs)
Agriculture production subsidies versus biodiversity	neutral	now neutral but conflict from past practice	conflict
Rural development support versus climate adaptation and water scarcity	neutral but probably moving towards weak synergy	weak synergy – white paper notes relevance but measures still under development	data not available
Cohesion policy, environmental protection, growth versus waste prevention, reuse, recycling and recovery	strong synergy	neutral to weak conflict	range from strong synergy to strong conflict
Cohesion policy, innovation, growth versus resource efficiency	synergy	neutral	range from synergy to weak conflict
Cohesion policy versus transport infrastructure and land use	weak synergy	weak synergy	range from strong synergy to weak conflict

Table 6. Summary account of policy coherence cases examined

DOI: 10.1002/eet

policy areas. Upstream activities in for instance energy production (which may occur in countries far away) often result in pollution and resource degradation.

The third challenge is that the estimation of the outcomes on the behaviour of economic actors as well as subsequent environmental impacts requires a reliable reference framework that covers the policy–economy–environment chain. Analytical frameworks such as the DPSIR model help in that endeavour, but they need to be coupled with qualitative and quantitative models that describe and analyse current and future linkages between sectors and the environment. All available tools have shortcomings: with regard to input data, conceptual models employed, the parameters investigated, and particularly with analysing cross-sectoral linkages. Policy coherence analysis needs to build on previously investigated interactions and sometimes work with multiple potential outcomes.

The fourth challenge concerns interactions between multiple policies. This study has looked at the intersections between pairs of policy areas: individual environmental policies and individual non-environmental policies. Several case studies, however, highlighted the importance of interactions between multiple policy areas. For example, the case study on coherence between agricultural and biodiversity policy notes that energy policies that promote biofuels will influence the linkages between agricultural production and biodiversity. Indeed, to determine effects of multiple policies at the level of outcomes has been long recognized as a central challenge in policy analysis more broadly.

It should be noted that the framework applies an admittedly simplistic and instrumental–rationalist view on governance. In reality, efforts towards policy coherence, be it at national, EU or global levels of governance, will be advanced in a political context where multiple actors, with competing interests and ideas, battle to get their views represented in policy decisions. Policy making then becomes not an evidence-based and rationalistic process in pursuit of common goals, which is often implicitly assumed in the integration and coherence tool box, but a political and contested process. From such a perspective, coherence takes on a different complexion – relating to balancing of interest groups and power politics as it is played out between different actors at different levels for political purposes.

The wide embrace of the coherence agenda is of course related to political opportunities as it directly seeks out the possibility of synergies between policy domains which tends to remove or weaken interest conflicts. At the same time, a broader range of governance mechanisms and arrangements to orchestrate the coordination between the public and private spheres are now being called into action to advance coherence and sustainable development, involving a wider set of actors, scales and modes of governance (Paavola *et al.*, 2009). Considering that governance typically denotes not just the policy, but also the polity and the politics, a more comprehensive approach to 'coherence governance' can be elaborated. However, broadening the approach would entail trade-offs in terms of analytical clarity.

Further development of the analytical approach is needed. This will surely identify further challenges and shortcomings that could be used to refine the framework to policy coherence analysis, both towards a more complex representation of policy making and (although probably not at the same time) towards a more concrete and formalized tool. Such developments should be made in a transdisciplinary setting, involving with more depth the policy makers and desk officers as the ultimate users of policy coherence analysis.

References

Abell R. 2002. Conservation biology for the biodiversity crisis: a freshwater follow-up. *Conservation Biology* **16**: 1435–1437.

Bache I, Flinders M. 2004. *Multi-Level Governance and Environmental Policy*. Oxford University Press: Oxford.

Bélanger C, Gagnon L. 2002. Adding wind energy to hydropower. *Energy Policy* **30**: 1279–1284.

Breitmeier H. 2000. 'Complex effectiveness': regime externalities and interaction (Working Group III). In *Proceedings of the 1999 Oslo Workshop of the Concerted Action Network on the Effectiveness of International Environmental Regimes*, Wettestad J (ed.). Fridtjof Nansen Institute: Oslo p 45–48.

Bunn SE, Arthington AH. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* **30**: 492–507.

CEC. 2003. *Directive 2003/30/EC on the Promotion and Use of Biofuels or Other Renewable Fuels for Transport*. European Commission: Brussels.

CEC. 2007. *Impact Assessment of the Renewable Energy Roadmap*, AGRI G-2/WM D (2007). European Commission: Brussels.

CEC. 2009a. *EU 2009 Report on Policy Coherence for Development*, SEC(2009) 1137 final. European Commission: Brussels.

CEC. 2009b. *Ex Post Evaluation of Cohesion Policy Programmes 2000–2006 Co-Financed by the European Fund for Regional Development (Objectives 1 and 2) Work Package 5b: Environment and Climate Change Final Report*, Vol. 1. European Commission: Brussels.

CEC. 2009c. *WISE Monitoring Programmes: Taking the Pulse of Europe's Waters*. European Commission: Brussels.

DOI: 10.1002/eet

CEC. 2010. *Smart Regulation in the European Union*, COM(2010)543. European Commission: Brussels.
CEC. 2011a. *A Resource-Efficient Europe – Flagship Initiative under the Europe 2020 Strategy*, COM (2011) 571 final. European Commission: Brussels.
CEC. 2011b. SETIS *Strategic Energy Technologies Information System/Hydropower: Technology Information Sheet*. European Commission: Brussels.
CEC. 2011c. *Proposal for a Regulation of the European Parliament and of the Council Laying Down Common Provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund Covered by the Common Strategic Framework and Laying Down General Provisions on the European Regional DevelopmentFund, the European Social Fund and the Cohesion Fund and Repealing Council Regulation (EC) No 1083/2006*, COM(2011) 615 final/2. European Commission: Brussels.
CEC. 2011d. *White Paper: Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System*, COM(2011) 144 final. European Commission: Brussels.
Council of the European Union. 1985. Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. *Official Journal of the European Union* **175**: 0040–0048.
Council of the European Union. 2000. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. *Official Journal of the European Union* **327**: 0001–0073.
Council of the European Union. 2001. Directive on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Union* **197**: 0030–0037.
Council of the European Union. 2002. Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme. *Official Journal of the European Union* **242**: 0001–0015.
Council of the European Union. 2006. 2006/702/EC: Council Decision of 6 October 2006 on Community strategic guidelines on cohesion. *Official Journal of the European Union* **291**: 0011–0032.
Council of the European Union. 2008. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste. *Official Journal of the European Union* **312**: 0003–0030.
Council of the European Union. 2009a. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. *Official Journal of the European Union* **140**: 0016–0060.
Council of the European Union. 2009b. Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. *Official Journal of the European Union* **20**: 0007–0025.
Council of the European Union. 2010a. Climate change: follow-up to the Copenhagen Conference (7–19 December 2009) – Council conclusions, Brussels 15 March 2010. *Official Journal of the European Union* CL10-053EN Council: Brussels.
Council of the European Union. 2010b. Council conclusions on biodiversity post-2010 – EU and global vision and targets and international access and burden sharing regime – 3002nd ENVIRONMENT, Council meeting Brussels, 15 March 2010. *Official Journal of the European Union* CL10-050EN, Council: Brussels.
den Hertog L, Stross S. 2011. Policy coherence in the EU system: concepts and legal rooting of an ambiguous term. Paper presented at the conference "The EU as a Global Player", University Institute for European Studies, Madrid, 7–8 April 2011.
Dunn W. 2003. *Public Policy Analysis: an Introduction*. Prentice Hall: Upper Saddle River, New Jersey.
Ecologic. 2009. *Heavily Modified Water Bodies: 'Information Exchange on Designation, Assessment of Ecological Potential, Objective Setting and Measures'*. Ecologic: Berlin.
European Economic Community (EEC). 1992. *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora*. EEC: Brussels.
European Environment Agency (EEA). 2006. *How much Bioenergy can Europe Produce Without Harming the Environment?* EEA: Copenhagen.
European Environment Agency (EEA). 2007. *Estimating the Environmentally Compatible Bioenergy Potential for Agriculture*. EEA: Copenhagen.
European Environment Agency (EEA). 2010. *The European Environment – State and Outlook 2010 – Synthesis*. EEA: Copenhagen.
European Environment Agency (EEA) Scientific Committee. 2011. *Opinion of the EEA Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy*. EEA: Copenhagen. http://www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas [accessed 7 June 2012].
Eurostat. 2011. http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/database > Infrastructure – renewables – annual data (nrg_114a). Eurostat: Luxemburg [accessed 7 June 2012].
Food and Agricultural Organization (FAO). 2004. *Policy Coherence for Agriculture and Development*. FAO: Rome.
Fisher J, Lindenmayer D. 2007. Landscape modification and habitat fragmentation: a synthesis. *Global Ecology and Biogeography* **16**: 265–280.
Hall P. 1993. Policy paradigms, social learning, and the state: the case of economic policymaking in Britain. *Comparative Politics* **25**: 275–296.
Hoebink P. 2004. Evaluating Maastricht's triple C: the C of coherence. In *The Treaty of Maastricht and Europe's Development Co-Operation*, Hoebink P (ed.). Aksant Academic Publishers: Amsterdam 183–218.
Holttinen H, Hirvonen R. 2005. Power system requirements for wind power. In *Wind Power in Power Systems*, Ackermann T (ed.). Wiley: Chichester; 143–167.
IEA. 2008. *From 1st to 2nd-Generation Biofuel Technologies. An Overview of Current Industry and RD&D Activities*. OECD–IEA: Paris.
IEEP. 2011. *Anticipated Indirect Land Use Change Associated with Expanded Use of Biofuels and Bioliquids in the EU – an Analysis of the National Renewable Energy Action Plans*. IEEP: London.
IFPRI. 2011. Assessing the Land Use Change Consequences of European Biofuel Policies. http://www.ifpri.org/sites/default/files/publications/biofuelsreportec2011.pdf [accessed 15 March 2012].
IISD. 2007. *Measuring Policy Coherence among the MEAs and MDGs*. IISD: Winnipeg.
Jordan A, Lenschow A (eds). 2008. *Innovation in Environmental Policy? Integrating the Environment for Sustainability*. Elgar: Cheltenham.

Jordan A, Schout A. 2006. *The Coordination of the European Union*. Oxford University Press: Oxford.
Kivimaa P, Mickwitz P. 2009. *Making the Climate Count: Climate Policy Integration and Coherence in Finland*. Finnish Environment Institute: Helsinki.
May P, Sapotichne J, Workman S. 2006. Policy coherence and policy domains. *Policy Studies Journal* **34**: 381–403.
Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: Synthesis*. Island: Washington, DC.
Nilsson M. 2005. Learning, frames and environmental policy integration: the case of Swedish energy policy. *Environment and Planning C: Government and Policy* **23**: 207–226.
Nilsson M, Eckerberg K (eds). 2007. *Environmental Policy Integration in Practice: Shaping Institutions for Learning*. Earthscan: London.
Nilsson M, Jordan A, Turnpenny J, Hertin J, Nykvist B, Russel D. 2008. The use and non-use of policy appraisal tools in policy making: empirical patterns across three European countries and the European Commission. *Policy Sciences* **4**: 335–355.
Nilsson M, Wiklund H, Finnveden G, Lundberg K, Tyskeng T, Jonsson D, Wallgren O. 2009. Analytical Framework and tool kit for SEA Follow Up. *Environmental Impact Assessment Review* **29**(1): 186–199.
Nuttall D. 2005. Coherence and consistency. In *International Relations and the European Union*, Hill C, Smith M (eds). Oxford University Press: Oxford.
Oberthür S. 2009. Interplay management: enhancing environmental policy integration among international institutions. *International Environmental Agreements* **9**: 371–391.
Oberthür S, Gehring T (eds). 2006. *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*. MIT Press: Cambridge.
OECD. 2002. *Improving Policy Coherence and Integration for Sustainable Development: a Checklist*. OECD: Paris.
Paavola J, Gouldson A, Kluvánková-Oravská T. 2009. Interplay of actors, scales, frameworks and regimes in the governance of biodiversity. *Environmental Policy and Governance* **19**: 148–158.
Petersen J-E. 2008. Energy production with agricultural biomass: environmental implications and analytical challenges. *European Review of Agricultural Economics* **35**(3): 385–408.
Pressman J, Wildavsky A. 1973. *Implementation*. University of California Press: Berkeley, CA.
Rosenberg DM, Berkes F, Bodaly RA, Hecky RE, Kelly CA, Rudd JWM. 1997. Large-scale impacts of hydroelectric development. *Environmental Reviews* **5**: 27–54.
Rudberg P. 2011. *Constant Concessions under Changing Circumstances: the Water and Renewable Energy Directives and Hydropower in Sweden*. Stockholm Environment Institute: Stockholm.
Tilman D, Socolow R, Foley JA, Hill J, Larson E, Lynd L, Pacala S, Reilly J, Searchinger T, Somerville C, Williams R. 2009. Beneficial biofuels – the food, energy, and environment trilemma. *Science*, **32**: 270-271.
United Nations Environment Program (UNEP). 2009. *Towards Sustainable Production and Use of Resources: Assessing Biofuels*. UNEP: Nairobi.
WBGU. 2008. *Future Bioenergy and Sustainable Land Use*. Earthscan: London.
World Economic Forum (WEF). 2009. *Water Security: The Water-Energy-Food-Climate Nexus*. WEF: Geneva.
Young O. 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay, and Scale*. MIT Press: Cambridge.

APPENDIX.

Appendix Table 1. Inventory of environmental policy

Overarching objectives	Objectives	References
Climate change		
'...the long term objective of stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'	The '20–20–20' CARE targets:	*6EAP*: Decision 1600/2002/EC laying down the Sixth Community Environment Action Programme
'...a long term objective of a maximum global temperature increase of 2 °Celsius over pre-industrial levels and a CO_2 concentration below 550 ppm...' (both objectives from 6EAP, Decision 1600/2002/EC, Article 2 § 2)	'A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels' (CARE)	*CARE*: http://ec.europa.eu/environment/climat/climate_action.htm
'...supporting an EU objective to reduce emissions by 80–95% by 2050 compared to 1990 levels...' (Council of the European Union, 2010a)	'20% of EU energy consumption to come from renewable resources'	Decision 406/2009/EC on the effort of MSs to reduce their greenhouse gas emissions to meet the Community's

DOI: 10.1002/eet

Appendix Table 1. (Continued)

Overarching objectives	Objectives	References
		greenhouse gas emission reduction commitments up to 2020
'. . .an EU Framework for Adaptation should be developed in order to improve the EU's resilience to deal with the impacts of climate change; in an initial phase up to 2012. . .' (Council Conclusions on climate change: towards a comprehensive EU adaptation strategy, 2953rd ENVIRONMENT Council meeting, Luxembourg, 2009)	'A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency'	Council of the European Union 7224/1/07 Brussels European Council 8/9 March 2007. § 32
	The binding legislation, and the targets therein:	Decision 406/2009/EC (see above), Article 4, § 1, Action Plan for Energy Efficiency in the objective refer to COM(206)545
	'. . .makes a firm independent commitment to achieve at least a 20 % reduction of greenhouse gas emissions by 2020 compared to 1990.' (Decision 406/209/EC, and preamble 4 Council decision)	Directive 2009/28/EC of 23 April 2009 (Article 3, § 1)
	'. . .a Community objective of a 30 % reduction of greenhouse gas emissions by 2020 compared to 1990 as its contribution to a global and comprehensive agreement for the period after 2012, provided that other developed countries commit themselves to comparable. . .' (preamble 3, Council decision)	
	'. . .objective to reduce energy consumption by 20 % by 2020 compared to projections for 2020 as outlined in the Action Plan for Energy Efficiency which was set out in the Commission Communication of 19 October 2006' (Decision 406/2009/EC)	
	'. . .mandatory national overall targets are consistent with a target of at least a 20 % share of energy from renewable sources in the Community's gross final consumption of energy in 2020' (Directive 2009/28/EC)	COM(2009)147 White Paper: Adapting to climate change: towards a European framework for action
	adaptation: '. . .improve the EU's resilience to deal with the impact of climate change' (COM(2009)147)	
Nature and biodiversity '. . .long-term vision that by 2050 European Union biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity. . .' (Council of the European Union, 2010b)	Establish Natura 2000:	Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Appendix Table 1. (Continued)

Overarching objectives	Objectives	References
'...a headline target of halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss' (Council of the European Union, 2010b)	'A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network... shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range' (Habitats Directive, Council Directive 92/43/EEC)	
	'limit emissions of... eutrophying pollutants... in order to improve the protection in the Community of the environment and human health against risks of adverse effects from... soil eutrophication... and to move towards the long-term objectives of not exceeding critical levels and loads...' (NECD, Directive 2001/81/EC)	Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants. Article 1
	To reverse negative species abundance trends (6EAP-BAP)	BAP (Biodiversity Action Plan): Commission Communication: Halting the loss of biodiversity by 2010 – and beyond. Sustaining ecosystem services for human well-being, COM (2006)216 Final and Annexes to SEC(2006) 621s
	'...halting biodiversity decline with the aim to reach this objective by 2010, including prevention and mitigation of impacts of invasive alien species and genotypes' (6EAP, Article 6 § 1)	
	'...protecting, conserving, restoring and developing the functioning of natural systems, natural habitats, wild flora and fauna with the aim of halting desertification and the loss of biodiversity, including diversity of genetic resources...' (6EAP, Decision 1600/2002/EC, Article 2 § 2)	
	To keep fishing within safe limits, restoring marine trophic levels (6EAP-BAP)	
Natural resources and waste		
'...better resource efficiency and resource and waste management to bring about more sustainable production and consumption patterns...' (6EAP; similar language in the Waste Framework Directive, Art. 1)	'...ensuring that the consumption of resources and their associated impacts do not exceed the carrying capacity of the environment...' (6EAP)	Sixth Environmental Action Programme
	'...breaking the linkages between economic growth and resource use...' (6EAP)	Directive 2008/98/EC on waste and repealing certain Directives (not yet fully in effect)
	Achieve '...a significant overall reduction in the volumes of waste generated...' (6EAP)	
	Encouraging re-use, recycling and recovery (6EAP):	
	Hierarchy of waste management: 'prevention, re-use, recycling, energy and other recovery, disposal' (Waste Framework Directive)	

DOI: 10.1002/eet

Appendix Table 1. (Continued)

Overarching objectives	Objectives	References
Environment and health		
'. . .providing an environment where the level of pollution does not give rise to harmful effects on human health and the environment. . .' (6EAP)	To attain 'levels of air quality that do not give rise to negative health impacts' (6EAP)	Thematic Strategy on air pollution, COM (2005) 446 final; Directive 2008/50/EC on ambient air quality and cleaner air for Europe
Provide the EU with the scientifically grounded information needed to help MSs reduce the adverse health impacts of certain environmental factors and, on the other hand, to step up cooperation between stakeholders in the environment, health and research fields (Environment and Health Action Plan)	To achieve good ecological and chemical status of water bodies (WFD and related legislation)	Communication of 9 June 2004 from the Commission: 'The European Environment & Health Action Plan 2004–2010' (COM(2004) 416 – Official Journal C 49, 28.02.2006)
	'. . .protect the environment from the adverse effects of. . . waste water discharges' (UWWT Directive)	Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants
	'. . .improve the quality of the urban environment by making cities more attractive and healthier places in which to live, work and invest, and by reducing their adverse environmental impact.' (TS Urban Environment)	Directive 2000/60/EC establishing a framework for the Community action in the field of water policy; (related directives, e.g. Nitrates Directive, Bathing Water Directive)
	'..improve indoor air quality' (Environment and Health Action Plan)	Directive 91/271/EEC concerning urban waste water treatment
	'. . .chemicals are only produced and used in ways that do not lead to a significant negative impact on health and the environment. . .' (6EAP)	Thematic Strategy on the Urban Environment, COM(2005) 718 final
	'. . .reduce the impact of pesticides on human health and on the environment consistent with the necessary protection of crops.' (TS Pesticides)	REACH (EC 1907/2006)
	'. . .prevent or, where that is not practicable, to reduce emissions in the air, water and land from. . .' industrial facilities (IPPC Directive)	Thematic Strategy on Pesticides, COM (2006) 372 final; Directives on Plant Protection Products (91/414/EEC) and Biocidal Products (98/8/EC)
	'. . .avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise' (Noise Directive)	Directive 2008/1/EC concerning integrated pollution prevention and control (codified version)
		Directive 2002/49/EC relating to the assessment and management of environmental noise

Appendix Table 2. Inventory of energy policy

Overarching objectives	Objectives	Instruments	References
1. Supply security			
To ensure, for the well-being of its citizens and for the proper functioning of the	1.1 To secure gas supply	A common framework within which MSs can define general security-of-supply policies that are transparent, solidarity-based, non-discriminatory	Directive 2004/67/EC of 26 April 2004 concerning measures to safeguard

Appendix Table 2. (Continued)

Overarching objectives	Objectives	Instruments	References
economy, the uninterrupted physical availability of energy products on the market at an affordable price for all consumers		and consistent with the requirements of a single market in gas *Access to natural gas transmission networks* Rules for natural gas transmission networks, gas storage and liquefied natural gas (LNG) facilities	security of natural gas supply Regulation (EC) No 715/2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005
	1.2 To maintain minimum stocks of crude oil and petroleum products	*Securing oil supply* Rules aimed at making oil supply in the Community more secure based on solidarity amongst MSs; maintaining minimum stocks of crude oil and/or petroleum products; putting in place emergency procedures to be used in the event of a shortage	Directive 2009/119/EC imposing an obligation on MSs to maintain minimum stocks of crude oil and/or petroleum products
	1.3 To secure the supply of electricity	*Obligation to secure electricity supply* to establish obligations to safeguard security of electricity supply and undertake significant investment in electricity networks	Directive 2005/89/EC concerning measures to safeguard security of electricity supply and infrastructure investment
2. Internal market and integration and competitiveness			
To achieve a competitive internal energy market to give European consumers a choice between different companies supplying gas and electricity at reasonable prices, and of making the market accessible for all suppliers, especially the smallest and those investing in renewable forms of energy	2.1 Grid investments and infrastructure	*Guidelines for trans-European energy networks* New guidelines for trans-European energy networks (TEN-E) list and rank, according to the objectives and priorities laid down, projects eligible for Community assistance, and the concept of 'project of European interest'	Decision 1364/2006/EC laying down guidelines for trans-European energy networks and repealing Decision 96/391/EC and Decision 1229/2003/EC
	2.2 Common rules	*Access of third parties to LNG* A directive to lay down the right of third parties to non-discriminatory access to transmission and distribution systems and to liquefied natural gas (LNG) facilities	Directive 2003/55/EC concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC
		Minimum taxation of energy Sets the minimum rates of taxation applicable to energy products, to improve the operation of the internal market by reducing distortions of competition between mineral oils and other energy products	Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity
		Common rules for electricity supply Rules relating to the organization and functioning of the electricity sector, access to the market, the criteria and	Directive 2003/54/EC concerning common rules for the internal

DOI: 10.1002/eet

Appendix Table 2. (Continued)

Overarching objectives	Objectives	Instruments	References
		procedures applicable to calls for tenders and the granting of authorizations and the operation of systems	market in electricity and repealing Directive 96/92/EC
		Cross-border exchange in electricity	
		National regulatory authorities shall send the European Commission notification of decisions concerning the certification of a transmission system operator. National TSOs form the European Network of Transmission System Operators (ENTSO) for electricity	Regulation (EC) No 714/2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003
		Common rules on prospection, exploration and production of hydrocarbons	
		Rules to ensure non-discriminatory access to the activities of prospection, exploration and production of hydrocarbons to help to reinforce the integration of the internal energy market, encourage greater competition within it and improve security of supply	Directive 94/22/EC on the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons
		Increasing transparency in market operations	
		To have transparent and competitive energy markets which contribute to the creation and smooth operation of the internal energy market	Directive 90/377/EEC concerning a Community procedure to improve the transparency of gas and electricity prices charged to industrial end-users [See amending acts
		'Third market package' together with Directives 714 and 715 about networks and exchange mentioned above	Directive 2009/73/EC concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC Directive 2009/72/EC concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC
		Greenhouse gas emission trading scheme	
		A trading scheme for cost-effective reduction of GHG emissions to enable the Community and the MSs to meet the commitments to reduce GHG emissions made in the context of the Kyoto Protocol. Installations operating in the energy sector, iron and steel production and processing, the mineral industry and the paper and board	Directive 2009/29/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC [See amending acts]

Appendix Table 2. (Continued)

Overarching objectives	Objectives	Instruments	References
		industry are subject to the emission trading scheme	
3. Promoting sustainable and renewable sources of energy			
To reach the target of a 20% share of energy rom renewable sources in the overall EU energy mix	3.1 Biofuels	*Promotion and use of energy from renewable sources*	
		A common framework for the use of energy from renewable sources in order to limit GHG emissions and to promote cleaner transport	Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance)
		SET plan	
		A strategic plan to accelerate the development and deployment of cost-effective low carbon technologies, including measures relating to planning, implementation, resources and international cooperation in the field of energy technology	A European strategic energy technology plan (SET plan) – 'Towards a low carbon future' (SEC(2007) 1508) (SEC(2007) 1509) (SEC(2007) 1510) (SEC (2007) 1511)
		Biofuel strategy	
		To further promote biofuels in the EU and in developing countries, to prepare for the large-scale use of biofuels, and to heighten cooperation with developing countries in the sustainable production of biofuels	Commission Communication of 8 February 2006 entitled 'An EU Strategy for Biofuels' (COM(2006) 34 final – Official Journal C 67 of 18 March 2006)
	3.2 Offshore energy	*Promotion of offshore energy*	
		To promote the development of maritime and offshore wind energy in the European Union	'Offshore Wind Energy: Action needed to deliver on the Energy Policy Objectives for 2020 and beyond' (COM(2008) 768 final – not published in the Official Journal)
	3.3 Biomass	*Biomass action plan*	
		Actions aimed at increasing the demand for biomass, improving supply, overcoming technical barriers and developing research	Communication from the Commission of 7 December 2005 – Biomass Action Plan (COM(2005) 628 final – Official Journal C 49 of 28.02.2005)
	3.4 Emissions abatement	*Industrial emissions directive (IED)*	
		IED replaces the IPPC directive, and entails the large combustion facilities, including coal and waste incineration. It has procedural and substantive requirements for industrial facilities,	The draft directive on industrial emissions (second reading as of May 2010)

DOI: 10.1002/eet

Appendix Table 2. (Continued)

Overarching objectives	Objectives	Instruments	References
		including in permitting as well as operations. Best available technology harmonization	
	3.5 Renewable energy general	*Renewable Energy Road Map* The Renewable Energy Road Map aims to enable the EU to meet the twin objectives of increasing security of energy supply and reducing GHG emissions	'Renewable Energy Road Map. Renewable energies in the 21st century: building a more sustainable future' (COM(2006) 848 final – not published in the Official Journal)
		A Competitiveness and Innovation Framework Programme (CIP) 2007–2013 Supports measures to strengthen competitiveness and innovation capacity in the EU. It encourages the use of information technologies, environmental technologies and renewable energy sources	Decision 1639/2006/EC establishing a Competitiveness and Innovation Framework Programme(2007–2013)
4. Energy efficiency To reduce energy consumption, to eliminate energy wastage and to support improving energy efficiency for competitiveness, security of supply and for meeting the commitments on climate change made under the Kyoto Protocol	4.1 Building efficiency and energy consumption	*Energy performance of buildings* Minimum requirements regarding the energy performance of new and existing buildings ensure the certification of their energy performance and require the regular inspection of boilers and air conditioning systems in buildings	Directive 2002/91/EC on the energy performance of buildings. The directive has been recast: Reference: COM (2008)780
		Intelligent Energy Europe EU's tool for funding action to improve these opportunities to save energy and encourage the use of renewable energy sources in Europe	Decision 1230/2003/EC adopting a multiannual programme for action in the field of energy: 'Intelligent Energy – Europe' (2003–20)
		Action plan to reduce energy consumption Aimed at achieving a 20% reduction in energy consumption by 2020. Measures to improve the energy performance of products, buildings and services, to improve the yield of energy production and distribution, to reduce the impact of transport on energy consumption, to facilitate financing and investments in the sector, etc.	Commission Communication on the Action Plan for Energy Efficiency: Realising the Potential (COM(2006) 545 – not published in the Official Journal)
	4.2 Co-generation	*Co-generation* The purpose of this directive is to facilitate the installation and operation of electrical co-generation plants (a technology allowing the	Directive 2004/8/EC on the promotion of co-generation based on a useful heat demand in

DOI: 10.1002/eet

Appendix Table 2. (Continued)

Overarching objectives	Objectives	Instruments	References
		production in one process of heat and electricity) in order to save energy and combat climate change	the internal energy market and amending Directive 92/42/EEC
	4.3 Products and services efficiency	*A framework for energy end-use efficiency and energy services*	
		Framework includes an indicative energy savings target for the MSs, obligations on national public authorities as regards energy savings and efficient procurement and measures to promote efficiency and energy services	Directive 2006/32/EC on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC
		Overarching efficiency target	
		A commitment to reducing consumption of primary energy by 20% by 2020 (i.e.'20–20–20' goal)	Commission Communication – Energy efficiency: delivering the 20% target (COM(2008) 772 – not published in the Official Journal)
		Ecodesign	
		EU-wide rules for improving the environmental performance of energy related products (the use of which has an impact on energy consumption) and include: energy-using products (EUPs), and other energy related products (ERPs)	Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products

DOI: 10.1002/eet