



Policy analysis of key regulatory frameworks within
Europe

Deliverable 2.1 / WP2

Final Version

08 March 2015

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From concepts to real-world applications
www.openness-project.eu

Prepared under contract from the European Commission
 Contract n° 308428
 Collaborative project
 FP7 Environment

Project acronym: OpenNESS
 Project full title: Operationalisation of natural capital and ecosystem services: from concepts to real-world applications
 Start of the project: 01 December 2012
 Duration: 54 months
 Project coordinator: Finnish Environment Institute (SYKE)
 Project website: <http://www.openness-project.eu>

Deliverable title: Paper on the Policy Analysis
 Deliverable n°: D2.1
 Nature of the deliverable: Report
 Dissemination level: Public

WP responsible: WP2
 Lead beneficiary: Helmholtz-Zentrum für Umweltforschung GmbH - UFZ

Citation: EU FP7 OpenNESS Project Deliverable 2.1, Schleyer, C., I. M. Bouwma, E. Primmer, G. Bela, P. Berry, A. Smith, J. Hauck, K.J. Winkler, C. Deerenberg, J. Young, E. Carmen, P. Bezák, J. Špulerová, Z. Barankova, H.-L. Kangas, E. Preda, A. Vadineanu, and C. Görg. *Paper on the Policy Analysis*. European Commission FP7, 2015.

Due date of deliverable: Month 27
 Actual submission date: Month 28

Deliverable status:

Version	Status	Date	Reviewed by	Author(s)
3.0	Final to SYKE	08 March 2015	Name	Schleyer, C., I.M. Bouwma, E. Primmer, G. Bela, P. Berry, A. Smith, J. Hauck, K.J. Winkler, C. Deerenberg, J. Young, E. Carmen, P. Bezák, J. Špulerová, Z. Barankova, H.-L. Kangas, E. Preda, A. Vadineanu, C. Görg
			Organization	UFZ, Alterra, SYKE, ESSRG, UOXF.AF, IMARES, CEH, ILE SAS, UB-DSES

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Executive Summary

Task 2.1 was commissioned to explore, investigate, and analyse opportunities and challenges for mainstreaming ecosystem services (ES). In this Deliverable, it was assessed how existing EU regulatory frameworks (= policies) address ES explicitly or implicitly. In order to identify those policies most relevant for the operationalisation of the ES concept, a three-step selection process was applied (see WP2-MS3 report): A literature and document review resulted in an initial list of 53 EU policies that were further prioritised according to their relevance for the OpenNESS case studies, and with the help of EU policy makers that identified key policies at a focus group in Brussels. The eleven thus selected EU policies that were analysed in this Deliverable cover policy fields ranging from biodiversity (Green Infrastructure Strategy, Habitats Directive, Biodiversity Strategy), forest (Forest Strategy), and water policies (Water Framework Directive) to climate policies (Renewable Energy Directive, Climate Change Adaptation Strategy) and policies for rural and urban areas (Common Agricultural Policy, Thematic Strategy on the Urban Environment) as well as a mobility and infrastructure-related policy (Trans-European Network – Transport). The concept of coherence was used to measure the extent to which the different policies at the level of definitions, objectives, and implementation (the latter including policy type and mode of steering as well as reporting, monitoring, evaluation, and financing mechanisms) are able and ready to incorporate the ES concept to ‘produce’ a meaningful and integrated policy. The results show that the ES concept has hardly been introduced yet, remaining confined to the policy arena that addresses natural ecosystems, forestry, or agriculture. While five EU policies – Biodiversity Strategy, Green Infrastructure Strategy, Forest Strategy, Common Agricultural Policy, and Marine Strategy Framework Directive – refer to ES explicitly, only the first three reflect the ES concept also in the design of measures. Other more recent policies (e.g., Climate Change Adaptation Strategy), however, do not take up the ES concept at all. Policies that explicitly mention ES usually refer to all three ES categories and biodiversity. In all policies, regulating ES are mentioned in much greater detail than the other ES categories. Those policies, however, that only mention ES indirectly tend to refer just to a small selection of regulating ES, such as carbon storage or water quality. The relatively few references to cultural ES often focus on tourism and recreation. There is a broad and diverse range of drivers from the natural and the social sphere mentioned in the policies, ranging from overexploitation of natural resources and climate change to changes in lifestyle, education, and demographic change. Most direct drivers relate to the main objectives pursued, such as maintenance of biodiversity (Biodiversity Strategy) or improvement of water quality (Water Framework Directive), reflecting the sectoral nature of most policies. All three policies in which the ES concept is fully embedded are strategies featuring an advisory mode of steering, reflecting the novelty of the ES approach and the reluctance of Member States (MS) to sign up to strict regulation across different ES categories. Very few policies require MS to report on the stock/flow of a particular ES. Also, accounting for the environmental impacts is not standard for all policies, or it focuses only on very specific ecosystems (e.g., Water Framework Directive). While for most policies there are various EU funds available to finance measures, there is, however, a small set of EU funds that feature prominently, including the EU Cohesion fund, the Life/Life+ programme, and the EU Agricultural Fund for the Rural Development. In conclusion, there is considerable scope to improve the mainstreaming of the ES concept through, for example, common methods for monitoring and evaluation of ES, developing dedicated financing mechanisms, and better tools to help policy makers exploit synergies and manage trade-offs between ES. In a next step, detailed policy recommendations will be developed in particular in collaboration with WP6.

Introduction

OpenNESS aims to translate the concepts of Natural Capital and Ecosystem Services (ES)¹ into operational frameworks that provide tested, practical, and tailored solutions for integrating ES into land, water, and urban management and decision-making. It examines how the concepts link to and support wider EU economic, social and environmental policy initiatives, and analyses the potential and limitations of the concepts to be mainstreamed into various policy fields.

An important issue for the operationalisation of ES is the way in which – and the extent to which – regulatory frameworks or policies enable or impede the mainstreaming process. However, ‘mainstreaming’ itself has different meanings, and is connected to several expectations and challenges. Indeed, there is a broad range of interpretations among policymakers and other concerned stakeholders as to what ‘mainstreaming’ actually means, or what it should mean. These interpretations range from pure ‘window-dressing’ to its comprehensive and compulsory incorporation or application. ‘Window-dressing’ in this context might simply mean adding ES references or ES terminology to preambles or general parts of existing or emerging regulatory frameworks, with only indirect, non-binding implications for the recipients and/or implementers of the regulatory frameworks. At the other end of this continuum, a concrete, comprehensive, and compulsory incorporation or application of the ES concept could encompass all relevant and available tools and methods for the assessment and valuation of ES at all stages of the policy implementation process.

The concept of ES is based on the idea that human well-being is dependent on healthy and functioning ecosystems, which deliver a range of services which provide benefits for society. From our perspective, mainstreaming the ES concept in EU regulatory frameworks allows, in principle, the adoption of a systematic and integrative perspective on linkages between ecosystems and society. The ES concept explores the way humans and societies depend on functioning ecosystems and the services they provide, accounts for the effects human activities have on the processes in and functions of various ecosystems, and addresses the implications of the changes induced by certain regulatory frameworks for the ability of ecosystems to provide specific ES for human society. However, in the policy context, the concept of ES is seen as a process through which scientific evidence about the causes of ecosystem change and their consequences for human well-being is identified, so that appropriate management and policy options can be developed to support the needs of decision-makers (MEA, 2005; Jordan & Russell, 2014). From a policy perspective, the ES concept enables policy makers to exploit synergies and manage trade-offs between different categories of ES (i.e., provisioning, regulatory, and cultural ES) and between individual ES within these categories (see, for example, Maes et al., 2013, Hauck et al., 2013 a/b, Schleyer et al., 2015, and Matzdorf & Meyer, 2014). Thus, effective mainstreaming of the ES concept in EU policymaking, i.e., introducing it in a variety of policy fields, would go well beyond introducing some ES-related terminology and/or assessment or evaluation tools. For example, mainstreaming ES could help to expand the

¹ While we acknowledge the conceptual differences between Natural Capital and Ecosystem Services – the first concept accounting for the ‘stock’ (of ecosystems), the second describing the respective ‘flows’ – for the purpose of this Deliverable we integrate NC in the ES concept for easier reading and because it does not change our results and arguments.

assessment of environmental impacts in a systematic way, thus providing a way to improve coherence between different policy fields (Hauck et al., 2014).

Within OpenNESS, Task 2.1 was commissioned to explore, investigate, and analyse opportunities and challenges for mainstreaming ES. More precisely, Task 2.1 assesses how existing and forthcoming EU and national regulatory frameworks address ES explicitly or implicitly. This analysis forms the basis for developing recommendations on how regulatory frameworks might be enhanced to better incorporate the concept of ES and its operationalisation. The process and the results of this analysis of EU regulatory frameworks are presented in this Deliverable.

In this Deliverable, we use the terms 'regulatory frameworks' and 'policies' interchangeably. For us, both are encompassing terms to denote different policy measures applied at EU and member state (MS) level, such as directives, communications, and strategies. These policy measures differ in terms of their binding character and their obligations; in the following, these characteristics will be analysed in detail. Moreover, they vary also in terms of their impacts on the multi-level governance: to what extent measures at the EU level influence or control those at lower levels. This again is an important issue for our analysis and for further analysis in selected OpenNESS case studies, as it highlights the relevance EU regulatory frameworks have 'on the ground' in policy implementation.

The structure of this Deliverable is as follows. First, we introduce the method used to select the key EU regulatory frameworks that we analysed in-depth. Second, we present the analytical framework we developed and used. Subsequently, we present the results of the policy analysis structured according to this analytic framework. Finally, we discuss the results and draw conclusions.

Identifying and selecting key regulatory frameworks

In order to identify those regulatory frameworks most relevant for the operationalisation of the concepts of ES, a three-step identification and selection process was applied. As a first step, the selection process started with an extensive review of a wide range of legal and policy documents, scientific articles and studies, evaluation reports, 'white and green papers'², press releases, and position papers, which resulted in an inclusive list of 53 relevant EU regulatory frameworks. At this step, all regulatory frameworks were selected that explicitly referred to ES, as well as those that were likely to substantially impact – directly or indirectly – ecosystems and/or ES in EU Member States and beyond. Here, we found it crucial to not only look at regulatory frameworks designed to explicitly improve the functioning of ecosystems (i.e., environmental policies), but also to consider other policies that often unknowingly depend or unintentionally impact on ES (e.g., agricultural, urban and regional development, infrastructure, and trade policies). This list included EU regulatory frameworks that had already been implemented, as well as others for which the implementation process had just started (e.g., the Green Infrastructure Strategy) or which are still in the development phase, such as the EU Soil Framework Directive.

² While 'white papers' usually present the policy opinions of the EU-Council and the Member States to prepare the introduction of a new legislation, 'green papers' are strategy documents prepared by the European Commission – usually by a certain Directorate General (DG) – which might result in a 'white paper' at a later stage in the policy process after consultation with the Member States and other DGs. In other words, 'green papers' may give rise to legislative developments that are then outlined in 'white papers'.

As a second step, we asked all OpenNESS WP5 case studies to indicate those EU regulatory frameworks most important for their work at the respective national or regional level. Here, we used primarily questionnaires and discussions at the first OpenNESS cross work package meeting (WS1) in Loch Leven (Scotland) in October 2013 to capture the case studies' perspectives and priorities. In a third step, we asked EU policymakers at a stakeholder workshop in Brussels in January 2014 to identify key EU regulatory frameworks that (will) have the most substantial direct or indirect impacts on ecosystems, ES and/or NC in the EU Member States. More detailed information on the selection process including the inclusive list of 53 regulatory frameworks can be found in the Milestone 3 report on 'Selection of the key regulatory frameworks for an in-depth analysis'.³

The following EU regulatory frameworks, covering policy fields ranging from biodiversity, forest, and water policies to climate policies and policies for rural and urban areas, as well as a mobility and infrastructure-related policy were selected and are discussed in this Deliverable.⁴

Table 1: Selected EU regulatory frameworks

Policy Field	Regulatory Framework (Short form/acronym used in Deliverable; year of publication)
Biodiversity Policies	Green Infrastructure Strategy (<i>GI Strategy</i> ; 2013)
	Habitats Directive (<i>HD</i> ; 1992)
	Biodiversity Strategy to 2020 (<i>Biodiversity Strategy</i> ; 2012)
Water Policies	Water Framework Directive (<i>WFD</i> ; 2000)
	Marine Strategy Framework Directive (<i>MSFD</i> ; 2008)
Forest Policy	<i>Forest Strategy</i> (2013)
Policies for rural and urban areas	Common Agricultural Policy (<i>CAP</i> , 2013) incl. Rural Development Regulation (<i>RDR</i>)
	Thematic Strategy on the Urban Environment (<i>Urban Strategy</i> ; 2006)
Climate Policies	Renewable Energy Directive (<i>RED</i> ; 2009)
	Climate Change Adaptation Strategy (<i>Adaptation Strategy</i> ; 2013)
Mobility and Infrastructure-related Policy	Trans-European Network – Transport (<i>TEN-T</i> ; 2014)

³ [https://vyvi-some.vy-verkko.fi/vyvityotila/openness/WP2/Deliverables/OpenNESS_MS3_Selection of the regulatory frameworks_WP2.pdf](https://vyvi-some.vy-verkko.fi/vyvityotila/openness/WP2/Deliverables/OpenNESS_MS3_Selection%20of%20the%20regulatory%20frameworks_WP2.pdf)

⁴ With the exception of the EU Nitrate Directive which was dropped due to lack of capacities within the Task 2.1 team.

Developing an analytical framework

The aim of Task 2.1 was to examine how existing and forthcoming EU and national regulatory frameworks address the concept of ES, either explicitly, i.e. actually using ES-related terminology, or implicitly, i.e. by referring to particular services or by containing terms referring to ecosystems as complex systems or ecosystem functions. We used the concept of *coherence* to assess the degree of policy integration achieved within and by different frameworks. Coherence is considered as the degree to which policy goals and associated instruments of different laws or policies are in line with one another or form a meaningful ensemble (May et al., 2006; Mickwitz, 2003). Coherence can be measured at the level of definitions, objectives, instruments, or implementation practices (Deloitte Consulting, 2011; Nilsson et al., 2012). *Internal coherence* relates to the logic between goals, objectives, instruments, and the implementation processes within a particular policy field. In our case, this also relates to the coherence between the ES concept and a respective regulatory framework within this policy field. *External coherence* relates to the overlap or alignment of definitions, objectives, instruments, or implementation processes between different policy fields. In this analysis, the term coherence is used to measure the extent to which the different regulatory frameworks at the level of definitions, objectives, and (financing/monitoring/sanctioning) instruments are able and ready to incorporate the ES concept to ‘produce’ a meaningful and integrated policy. In other words, what is the level of ‘fit’ or ‘internal coherence’ between the ES concept and the various dimensions of a particular regulatory framework? Following up on this descriptive assessment, a more analytical aim is to derive more generic conclusions as to the extent to which existing regulatory frameworks and upcoming ones might assist or hinder the operationalisation of the ES concept in everyday practice.

The following dimensions of coherence between the EU regulatory frameworks and the ES concept were covered in the analysis.⁵

- 1) **Coherence at the level of definitions.** Concepts – usually encompassing a group of ideas – develop and change over time and often become embedded in policymaking and politics (Schmidt, 2008). This can be seen in the way legal frameworks, strategies, and other policies reflect new ideas and concepts, and in the extent to which they have incorporated them. The concept of ES was developed in scientific circles since the beginning of the 1990s (de Groot, 1992; Daily, 1997; Costanza et al., 1997) and the number of scientific publications addressing this issue have substantially increased since then (e.g., Potschin & Haines-Young, 2011; Figure 1). In the political domain, the ES concept gained momentum after the publication of the Millennium Ecosystem Assessment (MEA) in 2005 and the TEEB reports (The Economics of Ecosystem Services and Biodiversity) (TEEB, 2008).

We expected that, regardless of the sector or policy field to which a regulatory framework belongs, the more recent it is, the higher the chance that it explicitly uses ES terminology or addresses the ES

⁵ Although providing one single analytic framework many different people carried out the review. The benefit was that this allowed us to draw on the in-depth knowledge on particular frameworks. The challenge was that people with different disciplinary backgrounds with perhaps different interpretations of some of the categories of the analytic framework and different takes on ES and the ES concept carried out the analysis of the regulatory frameworks. In order to reduce the latter effect, the analytic categories were calibrated face-to-face in two meetings and over email.

concept in some way. However, the extent and way it implicitly refers to the ES concept is also assumed to depend on when it was drafted. In the analysis, attention was paid to the date of coming into force of the respective regulatory framework and of possible revisions that were made since then. Based on this review a timeline (1992-2014) was compiled of the different regulatory frameworks and of the extent to which they took the ES concept into account (*'a historic timeline'*) (Figure 1). Furthermore, we expected that EU regulatory frameworks covering 'classic' environmental policy domains, such as biodiversity, and/or that were crafted (mainly) by DG Environment, would be more likely to feature ES and the ES concept prominently.

- 2) **Coherence of aims or objectives**⁶. In the analysis we carried out, another important issue beyond the explicit use, or not, of the term 'Ecosystem Services' was the degree with which the policy objectives were in principle compatible with the 'spirit' of the ES concept. In this respect, we particularly focussed on the aims and objectives and how far the regulatory frameworks distinguished between particular categories of ES (provisioning, regulating & maintenance, or cultural services); with or without mentioning these terms explicitly. We assume that even if a regulatory framework does not use the ecosystem services terminology explicitly, it might be designed to safeguard various ES if the aims and objectives are not contradictory. We further expect that in regulatory frameworks in which ES are explicitly mentioned, usually all ES categories are referred to, as well as biodiversity. However, different situations can be distinguished. Based on the extent to which the ES concept is reflected in definitions, objectives or instruments, the regulatory frameworks were assessed using a scoring mechanism that was adapted from a characterisation of impact assessments published in Helming et al., 2013:

Table 2: Typology of regulatory frameworks with respect to references to the environment and/or (the) ES (concept) based on Helming et al., 2013

Type	Description
Type 0	No ecological or environmental issues mentioned or referred to
Type 1	Environment mentioned but neither a prominent objective nor relevant for/mirrored in policy measure design or monitoring
Type 2	Environment mentioned and/or relevant for/mirrored in policy measure design or evaluation
Type 3	Strong environmental framing and evaluation, but ecosystems or ES not explicitly mentioned
Type 4	Contains framing around ES or use of terminology but is hardly relevant for/mirrored in policy measure design or evaluation
Type 5	ES fully embedded throughout the regulatory framework, including objectives and policy measure design and monitoring

⁶ For the purpose of this Deliverable, we do not differentiate between aims and objectives, not the least because most policy documents consulted are not explicit about it. Further, we address the coherence between a regulatory framework's aims or objectives and the ES concept, not between different aims or objectives of this particular regulatory framework.

Closely related to the aims and objectives of a regulatory framework are the drivers, i.e. developments or trends at global to regional scale, that the respective regulatory frameworks set out to tackle. In fact, these often determine the type and range of objectives of regulatory frameworks and usually have substantial repercussions for the choice of measures and instruments suggested or introduced, and for the actor groups targeted by a regulatory framework. For example, tackling the loss of biodiversity resulting from deforestation might bring different policy measures to the fore rather than, for example, tackling the loss of biodiversity resulting from pollution of rivers. In line with the Millennium Ecosystem Assessment (MEA) (2005), we distinguish between *direct* and *indirect* drivers. *Direct* drivers are physical or biological drivers influencing ecosystem processes including changes in climate or land use. *Indirect* drivers, in turn, operate more diffusely by altering one or more direct drivers and include demographic, economic, socio-political, science and technology, and cultural drivers. We assume that the broader the range of direct drivers – and thus, arguably, the number of (changes in) ES addressed in a regulatory framework, the more valuable it is to use the ES concept, because this allows for exploiting synergies and managing trade-offs between ES.

3) Coherence at the level of implementation (degrees of freedom)

Another aspect we considered in the analysis was the degree of freedom of EU Member States when implementing regulatory frameworks. Regulatory frameworks can be considered rather static, which draws attention to implementation as a top-down process, even if attention is paid to processes taking place at different governance processes in a non-hierarchic fashion (Hooghe & Marks, 2001; Wurzel et al., 2013). In these kinds of approaches interest lies in the dominance of goals, ambitions, and instruments formulated by the government and how they are designed, as well as the 'coherence' of policies and policy instruments across policy fields. Another approach argues that the meaning of policies is constantly reframed in various debates at all levels of implementation (i.e. EU, national, regional, or local level) (e.g., Hajer & Wagenaar, 2003). This reframing can lead to situations in which the original policy intent deviates considerably from what is happening 'on the ground'. The attention is on implementation practices and the degree of freedom inherent in the design of a particular regulatory framework: how policies are (and can be) interpreted and modified at the various implementation levels, how they play out in real life, and how this varies in different settings.

Analysing high-level, i.e. EU, regulatory frameworks, we adopted both these approaches by paying attention to the high-level obligations or expectations and the established systems of reporting and monitoring on the one hand, and by recognising the practical implications and room for local interpretation on the other. However, we did not have the resources to identify and analyse such reframing processes (i.e. interpretation and modification processes) at the national or regional level empirically. Rather, we analyse the regulatory frameworks' *inherent* degrees of freedom for implementing policies provided to Member States and local stakeholders, since this has considerable bearing on the implementation practices they can develop. This defines the flexibility they have to address issues that are of particular importance at the national or regional level and to incorporate new emerging ideas and concepts. Indeed, EU regulatory frameworks show a notable variety in their degree of freedom; from just stating the overall objectives and aims, via specifying the dominant mode of

steering (e.g., command-and-control, advisory or economic)⁷, to providing detailed instructions of the type of policy instruments or measures to be used, such as agri-environment schemes, and even explicitly stating the required outcomes of the policy at a given time (e.g., detailed specifications of the level of pesticide applications allowed) (Wurzel et al., 2013; Primmer et al., 2014; Primmer et al., in review). Further, regulatory frameworks provide varying degrees of flexibility to Member States with respect to reporting, monitoring, and evaluation duties, and might also be explicit about which (usually EU-funded) financing mechanisms can be used, or not.

Thus, in the analysis presented here, particular attention was paid to these dimensions of freedom and how they are reflected in the distribution of related rights and duties between the EU, Member States, and stakeholders or public administrations at national and regional level. In general, depending on the respective degrees of freedom, implementation practices may develop at national, regional or local level that do incorporate elements of the ES concept – or in principle allow for it – which are not addressed by or reflected in the regulatory framework per se. Nevertheless, higher degrees of freedom in one or more of those dimensions do not necessarily lead to a better integration of the ES concept in the policies implemented.

In particular, we looked at the following dimensions of coherence that are relevant for implementation:

- a) **Policy type / mode of steering.** With respect to the type of regulatory framework, we distinguish between strategies, framework directives, directives, and other policies. Here, we expect that it is more likely to see the ES concept explicitly referred to in strategies or framework directives. The reason is that these ‘framework policies’ delegate measures to foster and/or assess particular ES to Member State or regional levels. From a policy perspective, this means that the decision about which ES to foster, or not, and how to decide on trade-offs between the services, is delegated to lower political and administrative levels. Further, for simplicity, we differentiate only between command-and-control (regulatory), economic, and advisory modes of steering. Here, we assume that uptake of the ES concept is most likely in economic and advisory policies.
- b) **Reporting, monitoring, and evaluation.** Much attention has been focused, by scientists and policy makers alike, on reporting, monitoring, and evaluation of policies (Nagel, 2001; Fischer & Miller, 2006; Vedung, 2008). In (environmental) policy evaluations, a distinction is made between the policy *output* (number of management plans, subsidies, or permits), the *outcome* (change in behaviour of actors), and the *environmental impact* (Kütting, 2000; Crabbé et al., 2006; Mickwitz, 2003). EU regulatory frameworks contain different types of reporting, monitoring, and evaluation obligations. Some require Member States to report back on the policy output (e.g., CAP); for other regulatory frameworks regular reports need to be compiled on the environmental impact(s) of the policy or specific instruments or measures. Here, we assume that if regulatory frameworks are required to assess environmental impacts, the extent to which ES are taken into account is automatically higher, even if unintentionally. However, reporting on the environmental or ecosystem/habitat status does not automatically provide specific information on the level of ES

⁷ Please note that the dominant mode of steering inherent in the EU regulatory framework itself might differ from the regulatory frameworks’ recommendations regarding the modes of steering to be used at lower levels for implementing measures.

provided. Furthermore, detailed requirements for monitoring and reporting on the outcome of measures of a regulatory framework, for example, the size of areas with changed land-use practices, might provide useful proxies for estimating changes in ES provision, again making an integration of the ES concept at some point an easier task.

Financing mechanisms: The range and origin of EU funds and other financing mechanisms are important for assessing the degree of freedom for implementation. We assume that if national or regional funds are involved, Member States are freer to use the money for whatever purpose, which supports the mainstreaming of ES. However, such national environmental funds are increasingly limited depending on the budget situation in general. We also expect that EU funding mechanisms are often complex regulatory frameworks, and are not necessarily coherent with the ES concept. They might also have very particular ways of reporting and monitoring – which, again, might not necessarily be coherent with the provisions of the ES concept.

The results from this Deliverable are expected to yield relevant insights to the OpenNESS case studies including the general importance of EU regulatory frameworks in defining regional or local operational context and activity, as well as the mechanisms through which those regulatory frameworks generate weight. The analytical framework used can be found in Annex 1.

Results

Coherence at the level of definitions, aims and objectives

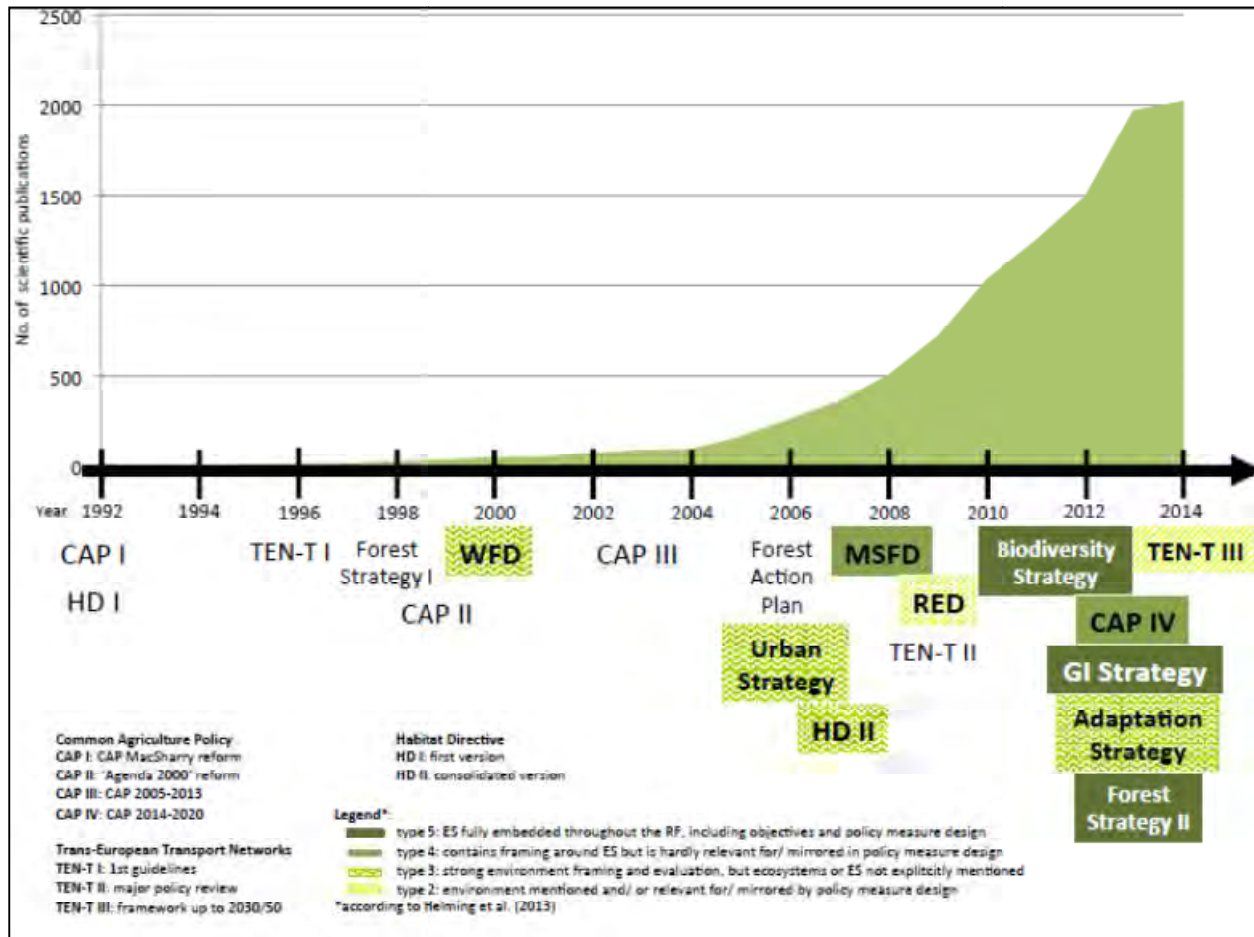
In the first part of the analysis, employing the typology developed by Helming et al., 2013 (Table 2), we assessed the extent to which the terminology of ES, the ES concept, and the ‘environment in general’ could be found in definitions, objectives or instruments suggested by the regulatory frameworks under scrutiny (Table 3). If applicable, we accounted for revisions or updates of existing regulatory frameworks since 1992.

Table 3: Extent of reference to ES, the ES concept, and ‘environment in general’ of investigated regulatory frameworks (according to Helming et al., 2013; see Table 2)

Regulatory Framework	Type
GI Strategy	5
Biodiversity Strategy	5
Forest Strategy	5
MSFD	4
CAP/ RDR	4
HD	3
WFD	3
Urban Strategy	3
Adaptation Strategy	3
RED	2
TEN-T	2

Only five regulatory frameworks actually relate explicitly to either ES or the ES concept, scoring 4 or 5 on the Helming et al. scale (Table 2, Figure 1). These are the MSFD, the Biodiversity Strategy (e.g., ‘measures to halt the loss of biodiversity and degradation of ES and the restoration as far as feasible’), the Forest Strategy, the GI Strategy, and the most recent revision of the CAP.

Figure 1: Timeline of regulatory frameworks under scrutiny and extent of reference to ES, the ES concept, and ‘environment in general’ and use of term ‘ecosystem services’ in scientific publications (1992-2014)



Note: The figure shows the investigated regulatory frameworks (cf. Table 1) arranged on a timeline; the different shades of green reflect the scoring according to Helming et al., 2013. It is important to note that we applied the typology – and thus the green-shading – only to those versions of the regulatory frameworks that we analysed in-depth in this Deliverable. Thus, earlier versions such as HD I and CAP I (incl. RDR), both introduced in 1992, might as well be classified as type 3 or type 2, respectively, yet, we did not cover them in our analysis. It also contains a graph showing the increasing number of scientific publications containing the term ‘ecosystem services’ (own search carried out on 6 January 2015 using Scopus database).

As hypothesised, the more recently a regulatory framework has been implemented or updated, the more likely it is that the ES concept is addressed explicitly. The first regulatory framework to feature the ES concept was the MSFD, coordinated by DG Environment, which was introduced in 2008. Before this, ES terminology was absent for environment-oriented regulatory frameworks like the HD II (consolidated

version of 2007) as well as the WFD (2000), the CAP of 2004, and the Urban Strategy (2006). Thus, despite the fact that the ES concept had already been used by researchers from the 1990s onwards, it seems that it was not before the publication of the MEA in 2005 and the publication of the first results of the TEEB initiative in 2008/2010 that the concept found its way into the political domain and, further, to actual regulatory frameworks. Since then, however, it has started to feature prominently even in some revisions of policies that are beyond the responsibility of DG ENV, such as the latest CAP reform, and, as expected, in all new or revised environment-oriented policies. However, at the same time no mainstreaming can be observed for other regulatory frameworks outside the environment-domain such as TEN-T or the Adaptation Strategy.

In Table 4, we compile information on which categories or detailed accounts of ES and biodiversity are mentioned in the regulatory framework. As expected, in regulatory frameworks in which ES are explicitly mentioned, usually all ES categories as well as biodiversity are referred to. Yet, there are a few policies that address biodiversity without any reference to ES, including the HD and TEN-T. Further, there are some policies, such as the Adaptation Strategy and the Urban Strategy that mention ES indirectly, i.e., they contain terms like soil function or climate regulation that can be regarded as regulating ES, but there is no reference in the text that these are ‘ecosystem services’.

Although ES are often not mentioned explicitly, Table 4 shows that if we consider the coherence of the regulatory frameworks at the level of aims and objectives, the extent to which ES categories and individual ES are included varies. Only six of the reviewed regulatory frameworks consider all three main categories of ES (i.e., provisioning, regulating, and cultural). Apart from those five regulatory frameworks that explicitly use ES terminology (GI Strategy, Biodiversity Strategy, MSFD, CAP, and Forest Strategy), the Adaptation Strategy also refers to all three categories.

It appears that regulating ES are exemplified – directly or indirectly – in much greater detail and are much more differentiated than all other categories of ES. Their importance is often highlighted in a sense that these ES are essential ES to maintain the required levels of provisioning services. What is more, there are quite a few specific regulating services that either deal with climate change (e.g., climate regulation, flood prevention) or are related to health issues (e.g., clean air and water, low noise levels). Thus, the frequent mentioning of ES related to climate change and health might reflect the high the societal importance attached to these issues. To some extent, however, this might also be due to the fact that for some of these regulatory services, for example, carbon sequestration and water quality and quantity, there are fairly accurate proxies available to assess ES delivery.

Cultural ES, in turn, are only specified if ES or the ES concept is mentioned explicitly; if the ES concept is not directly used, cultural ES are not considered, perhaps because the policies at hand have a strong focus on the physical environment or ‘the planet’, and not, or less so, on its potential non-material use. They are also considered in much less detail, and the focus is usually on tourism and recreation, perhaps because these services are empirically and conceptually easier to identify and measure than, for example, spiritual services. However, some of the regulatory frameworks, such as the GI Strategy and the Forest Strategy, address local lifestyles and rural communities, which can be considered to (in)directly address people’s cultural dependence on the ecosystems addressed by these regulatory frameworks.

Table 4: Detailed information on categories of ES and biodiversity considered in the regulatory frameworks

Regulatory Framework	Provisioning ES	Regulating & Maintenance ES	Cultural ES	Biodiversity
GI Strategy	<ul style="list-style-type: none"> • food • materials • water • fish stocks 	<ul style="list-style-type: none"> • cleaning air & water • climate regulation/ sequestration • ensuring water flows/ quality • water levels/ quantity • flood prevention • pollination • pest control • keeping soil function • urban temperatures 	<ul style="list-style-type: none"> • recreation • cultural heritage • local identity • education benefits • aesthetics/ attractiveness 	
HD				
Biodiversity Strategy	<ul style="list-style-type: none"> • food • shelter • medicine • fresh water 	<ul style="list-style-type: none"> • cleaning air & water • mitigation of natural disasters • pest control • disease control • climate regulation 		
WFD				
MSFD	<ul style="list-style-type: none"> • marine activities/ fishing • marine goods 	<ul style="list-style-type: none"> • ecological function. • sea water quality 	<ul style="list-style-type: none"> • tourism • recreation 	
Forest Strategy	<ul style="list-style-type: none"> • wood (for products and energy) 	<ul style="list-style-type: none"> • climate regulation • conserving genetic resources • controlling forest health risks 	supporting rural and urban communities	
CAP/ RDR	<ul style="list-style-type: none"> • biomass and other renewable energy sources 	<ul style="list-style-type: none"> • keeping soil function • climate regulation • cleaning water 	<ul style="list-style-type: none"> • tourism • recreation • cultural heritage 	
Urban Strategy		<ul style="list-style-type: none"> • flood prevention • climate regulation/ sequestration 		
RED	<ul style="list-style-type: none"> • biofuels • bioliquids 	<ul style="list-style-type: none"> • watershed protection • erosion control 		*
Adaptation Strategy	<ul style="list-style-type: none"> • food • wood • water 	<ul style="list-style-type: none"> • flood prevention • soil function • cleaning air & water 		
TEN-T		<ul style="list-style-type: none"> • soil function • cleaning air & water • noise mitigation • climate regulation/ sequestration • habitat provisioning 		

Note: dark green boxes: direct mentioning of ES/ biodiversity; light green boxes: indirect mentioning of ES/ biodiversity; * “Land with high biodiversity value” (primary forest, protected areas, highly biodiverse grassland) is *not* allowed to be used for raw materials for biofuels or bioliquids”

What is interesting to note is that the HD seems to be the only regulatory framework that neither uses the ES concept nor mentions particular ES explicitly or implicitly. Thus, at the level of aims and objectives, in this regulatory framework, no explicit or implicit link is being made between biodiversity protection and fostering ES.⁸ The relatively early date of putting the HD into practice, 1992, might explain this omission.

With respect to direct and indirect drivers mentioned in the regulatory frameworks under scrutiny (Table 5), we identified a broad and very diverse range of drivers from the natural and the social sphere, ranging from overexploitation of natural resources, hazardous substances, and climate change to changes in lifestyle, education/ knowledge, and demographic change.

Table 5: Direct and indirect drivers tackled by regulatory frameworks

Regulatory Framework	Direct drivers	Indirect drivers
GI Strategy	unsustainable use of natural resources → loss of natural capital	<ul style="list-style-type: none"> • over reliance on built (grey) infrastructure • benefits from nature not fully appreciated by society leading to a degradation of NC
HD	human use of species (capturing, killing, collecting), or their habitats (destruction, disturbance)	
Biodiversity Strategy	<ul style="list-style-type: none"> • land-use change • overexploitation of biodiversity and its components • spread of invasive alien species • pollution • climate change 	<ul style="list-style-type: none"> • demographic change • lifestyle change • institutional drivers (market failures) • economic structure: size, growth, trade
WFD	<ul style="list-style-type: none"> • discharges • emissions and loss of priority substances • pollution of groundwater 	
MSFD	<ul style="list-style-type: none"> • pressure on natural marine resources • high demand for marine ecological services leading to unsustainable use 	
Forest Strategy	<ul style="list-style-type: none"> • climate change (carbon balance, weather change, and forest health risks) • forest area change (direct and indirect) and forest use (harvest rate) 	<ul style="list-style-type: none"> • market demand for new and existing forest products • demand for energy

⁸ Since then several studies have shown a high correlation between high biodiversity values and, in particular, the provision of regulating and cultural ES (Cimon-Morin et al., 2013), yet caution is advised in the use of biodiversity as a proxy for ecosystem service delivery. Strategies focussing on protecting particular attributes of biodiversity (e.g., species richness, specific species, functional traits) might not automatically result in safeguarding all desired ES; and also the opposite is argued, i.e. safeguarding particular ecosystem services might not deliver the desired biodiversity (Vira & Adams, 2009).

Regulatory Framework	Direct drivers	Indirect drivers
CAP/ RDR	<ul style="list-style-type: none"> climate change: adaptation & mitigation overexploitation of soils and water 	<ul style="list-style-type: none"> social drivers (young farmers, education) small farms mountain areas rural development supply chains competitiveness poverty of women in rural areas
Urban Strategy	<ul style="list-style-type: none"> high level of traffic and congestion derelict land greenhouse gas emissions urban sprawl waste and waste-water 	<ul style="list-style-type: none"> high levels of noise poor-quality built environment lifestyle change demographic change
RED	<ul style="list-style-type: none"> climate change land-use change 	
Adaptation Strategy	climate change	
TEN-T	<ul style="list-style-type: none"> landscape fragmentation soil degradation air and water pollution 	<ul style="list-style-type: none"> high levels of noise

As one might expect, most direct drivers are rather specific to the respective regulatory frameworks: for example, overexploitation of ecosystems (Biodiversity Strategy), pressure on marine resources (MSFD), climate change (Adaptation Strategy, RED), and urban sprawl (Urban Strategy). There are also some direct and indirect drivers that feature prominently in several regulatory frameworks, including the unsustainable use of ecosystems (HD, CAP, Biodiversity Strategy, MSFD), climate change (Adaptation Strategy, Forest Strategy, RED), insufficient quality of air and water (MSFD, Urban Strategy, WFD, TEN-T), and too much noise (Urban Strategy, TEN-T). Whereas some regulatory frameworks point at rather concrete direct drivers such as soil degradation, others refer only to broader categories like degradation of ecosystems and their services. By and large, however, most direct drivers reflect the sectoral nature of most of the investigated regulatory frameworks. They mainly consider drivers related to the main objectives pursued, such as maintenance of biodiversity (Biodiversity Strategy) or improvement of water quality (WFD). It is interesting to note, however, that even some environment-focussed regulatory frameworks (GI Strategy, Biodiversity Strategy) explicitly mention socio-economic drivers, such as changes in lifestyle and consumption patterns, as well as demographic change. Other regulatory frameworks such as the CAP also refer to competitiveness, rural development, young farmers, and poverty of women in rural areas.

Policy type / mode of steering

The policy type and the mode of steering seem to play some important role in the extent to which ES and the ES concept are reflected in a regulatory framework (Table 6). As hypothesised, all three regulatory frameworks in which ES and the ES concept are fully embedded are strategies (Biodiversity Strategy, GI Strategy, Forest Strategy) featuring an advisory mode of steering. However, there are also strategies such as the Urban Strategy and the Adaptation Strategy focussing on environmental issues and the linkages between ecosystems and humans in which ES and the ES concept are not explicitly mentioned, though these cover rather non-traditional environmental policy fields. As we assumed above, it appeared to be

more likely that the ES concept has been integrated in a policy type for which the specific design of measures and related ways of monitoring and – if applicable – sanctioning has been delegated to the Member States or even sub-national levels. A prominent example is the Biodiversity Strategy where mapping, assessment, and valuation are to be undertaken by the Member States, albeit with support from the EU. This way, it is not necessary to organise consensus at the EU level about the selection of ES targeted, ways of mapping, assessment, and approaches to (economically) value these services; thus, a detailed operationalisation – a challenge in the context of the ES concept – is not necessary at EU level.

Table 6: Type of policy and mode(s) of steering

Regulatory Framework	Policy type	Mode(s) of steering
GI Strategy	Strategy (supposed to get an 'enabling framework')	Advisory
Biodiversity Strategy	Strategy	Advisory
Forest Strategy	Strategy	Advisory
Urban Strategy	Strategy	Advisory
Adaptation Strategy	Strategy	Advisory; yet reporting implies a level of control
WFD	Framework Directive	Command-and-control (e.g., River Basin Management Plans), yet considerable leeway for Member States to employ other modes of steering
MSFD	Framework Directive	Command-and-control (e.g., spatial protection measures contributing to Marine Protected Areas); yet types of measures decided by Member States
HD	Directive	Command-and-control; choice of instruments up to Member States
RED	Directive	Decentralized decision-making at member state level
CAP/ RDR	Policy	Command-and-control; economic
TEN-T	Regulation on EU guidelines	Consulted and coordinated planned action

Reporting, monitoring, and evaluation

Only a few exceptional cases of regulatory frameworks (e.g., MSFD and Biodiversity Strategy), require Member States to report on the stock and/or flow of a particular ES delivered (Table 7). The same is mostly true for environmental impacts: hardly any regulatory frameworks feature comprehensive monitoring systems for measuring environmental impacts; and even if they do, as in the case of the WFD demanding frequent assessments of the ecological status of surface and ground water bodies, they are strongly focussed on the core ecosystems targeted by the respective regulatory frameworks. This relative absence of pronounced and compulsory systems of measuring environmental impacts might be due to the fact that such a systematic (environmental) monitoring is often technically difficult and time consuming, thus, resulting in very high – perhaps too high – demands in terms of knowledge and personnel for those administrative units responsible. In some cases, for example in the CAP/ RDR, environmental impacts are not directly measured, but assessments are made based on proxies that signal the change in a (negative) driver such as observed reduced use of pesticides. Interestingly enough, these kind of proxies are often required for assessing the outcomes of measures (co-)financed by EU funding schemes, such as agri-environmental schemes, where the proper use of public money needs to be documented (Table 8).

Table 7: Reporting and monitoring requirements of the regulatory frameworks

Regulatory Framework	Output	Outcome	Measuring Environmental impacts	Measuring ES provision
GI Strategy (proposed output/ anticipated outcome)	<ul style="list-style-type: none"> GI strategy – taking the form of an enabling framework. The commission and the EIB are looking at a number of options to establish a financing facility to support biodiversity-related investments, including GI projects (by 2014) Study to assess the opportunities for developing an EU TEN-G initiative. This will assess the costs and the economic, social and environmental benefits of such an initiative. By 2017 the Commission will review progress on developing GI and publish a report on the lessons learnt together with recommendations for future action. 	<p>Measures which deliver multiple benefits (yet trade-offs are likely). Measures that are cost effective (compared to traditional grey infrastructure measures) Measures that can be integrated into regional and local planning processes/ spatial development policies. Measures that are applicable across scales (transboundary to local)</p> <p>Measures for urban development: <i>Health in cities</i> (e.g., clean air, better water quality) <i>Social cohesion in cities</i> (e.g. greater sense of community). <i>Aesthetic value of cities</i> (connecting urban and rural to provide appealing places to live and work). <i>Address disconnect between production and consumption of food</i> (urban food production and community gardens). <i>Job creation.</i> Measures with advantages for the following social groups; <i>Individuals and communities in cities</i> <i>School children</i> (efficient tools to educate school children) <i>Young people</i> (engage their interests) <i>Vulnerable groups, such as those who are chronically ill or elderly</i> (mitigate urban heat island effect)</p> <p>For climate change and disaster management: <i>Carbon mitigation</i> (reduce footprints in cities by green transport corridors, green construction techniques), <i>Increase resilience</i> (e.g. functional floodplains,) For natural capital: <i>Land and soil</i> (help reduce the loss of ES associated with future land take and improve and restore soil function) <i>Water</i> (e.g. water quality). For nature conservation: <i>Ecological network</i> (reduce fragmentation and increase connectivity in Natura 2000)</p>	Data consistency and coordination (from other policies, such as Biodiversity) needs improving.	<p><i>Knowledge gaps;</i> About the extent and condition of ecosystems, the services they provide and the value of these services to correctly value and price if appropriate. Links between biodiversity (species and habitats) and condition of ecosystems and capacity to deliver ES. Valuation of ES (particularly for social, health and security/ resilience benefits)</p> <p>Trans-boundary activities - Need to improve spatial data and information sharing.</p>
HD	<ul style="list-style-type: none"> Number/ surface of sites designated Number of derogations Measures taken under art. 6.1 (management plans/ subsidies etc.) 		Conservation status of species & habitat types	
Biodiversity Strategy	<ul style="list-style-type: none"> Valuation of Natural Assets Integrated framework for monitoring, assessing and reporting on progress EU Business & Biodiversity Platform Mid-term review in 2014 	<ul style="list-style-type: none"> Measures to halt the loss of biodiversity and degradation of ecosystem services and the restoration as far as feasible Measures to ensure more sustainable agriculture, forestry & fishery 	<ul style="list-style-type: none"> By 2020, 100% more habitat & 50% more species assessment under HD & 50% more species assessment under Bird Directive By 2020, identified pathways of invasive alien species are controlled, managed, or eradicated 	By 2020, ecosystems & ES are maintained & enhanced, incl. restoration of min. 15% of degraded ecosystems

Regulatory Framework	Output	Outcome	Measuring Environmental impacts	Measuring ES provision
WFD	<ul style="list-style-type: none"> • Surface water monitoring network • River Basin Management Plans, including maps of monitoring networks, water status, and groundwater bodies • Programmes of measure (art. 11, WFD) • Report on implementation of WFD (every 6th year) • Common Implementation Strategy (every 2nd year) 	<ul style="list-style-type: none"> • Measures to promote efficient and sustainable water use • Measures to safeguard water quality (e.g., restrictions of use of mineral fertilizers → induced increase in hectares of extensive grassland farming; afforestation → induced increase in hectares afforested) • Controls over the abstraction and recharge of fresh surface water & groundwater (e.g., number of/working hours of water consultants advising farmers) • Measures to ensure/improve hydromorphological conditions (e.g., kilometres / meters of copse development to improve river bank habitats) • Measures to improve longitudinal continuity (e.g., number of induced construction of fish passes) 	<p>Change of the ecological, chemical and morphological status of water bodies</p> <p><u>Surface waters:</u></p> <p>- <i>ecological status</i> (high, good, moderate, poor, bad): criteria for the classification include biological indicators (e.g. composition of fish fauna), hydromorphological indicators (e.g., morphological conditions), chemical and physico-chemical indicators (e.g., specific synthetic pollutants), general indicators (e.g., salinity), specific pollutants</p> <p>- <i>chemical status</i> (e.g., standards of pollutants like arsenic, listed in Annex VIII, WFD)</p> <p><u>Groundwater:</u></p> <p>- <i>quantitative status</i>: e.g., groundwater level</p> <p>- <i>chemical status</i>: general (e.g. oxygen content), conductivity, concentration of pollutants, Annex V</p>	Not mentioned
MSFD	<ul style="list-style-type: none"> • Develop a marine strategy encompassing: initial assessment, determination of good environmental status, environmental targets and associated indicators, monitoring programme • Programme of measures 	<ul style="list-style-type: none"> • Contributions to Marine Protected Areas (MPAs) • Achieve or maintain good environmental status of marine waters 	<p>Analysis of predominant pressures and impacts, incl. human activity, on the environmental status of the marine waters</p> <p><i>good ecological status</i> (biological diversity, non-indigenous species not harmful, exploited fish and shellfish within safe biological limits, intact marine food web, minimal eutrophication, seafloor integrity, alteration of hydrographical condition without negative effects, limited concentrations of contaminants in water and in biota, marine litter not harmful, energy and noise not harmful)</p>	Not mentioned
Forest Strategy	<ul style="list-style-type: none"> • Forest management plans and their integration of biodiversity considerations • Criteria and indicators for sustainable forest management • Forest information Systems 	<p>No explicit changes in behaviour.</p> <p>General goals include behavioural assumptions on:</p> <ul style="list-style-type: none"> • Managing forests sustainably • Balancing forest functions • Meeting demands • Delivering ES 	<p>No specific impacts stated as targets of monitoring. Attention is paid to:</p> <ul style="list-style-type: none"> • Forest health • Biodiversity 	All ES monitoring is done through cross-referencing EU Biodiversity Strategy
CAP/ RDR	<ul style="list-style-type: none"> • Rural Development Programmes • Implementation Reports • Regulation on financing, management and monitoring of the CAP (art. 110) 	<p>Measures to allow viable food production, sustainable management of natural resources, balanced territorial development</p> <p>Rural Development Programmes:</p> <p>Measures address, among others:</p> <ul style="list-style-type: none"> - <i>Small farms</i> (e.g., .g., financial business start-up aid → number of supported farmers/funds provided in Euro) - <i>Mountain areas</i> (e.g., improvement of infrastructure like broadband → number of villages covered, payments for land area → funds provided in Euro/hectares receiving payments) - <i>Short supply chains</i> (e.g., setting-up producer groups with jointly 	<p>"[A] monitoring and evaluation system should be set up jointly by the Commission and the Member States with the purpose of demonstrating the progress and assessing the impact and efficiency of rural development policy implementation." (RDP)</p> <p>CAP Regulation on financing, management & monitoring</p> <p>standards for good agricultural and environmental condition of land:</p> <p>Most environmental effects are measured indirectly,</p>	No specific category for reporting/ monitoring

Regulatory Framework	Output	Outcome	Measuring Environmental impacts	Measuring ES provision
		placing of goods → numbers of groups set up; co-operations of various actors → number of co-operations fostered, develop new products → funds provided for fostering development in €) - <i>Climate change mitigation and adaptation and biodiversity</i> (e.g., fostering agroforestry systems → induced increase in hectares used for agroforestry; investments in the resilience of forest ecosystems → respective funds provided; agri-environment-climate payments/ payments for organic farming/ payments for land under WFD or HD protection → induced increase in hectares where respective measures are applied, payments provided in Euro, number of farmers receiving respective payments, etc.)	i.e. by using proxies, for example: - <i>water</i> (e.g., hectares of established of buffer strips) - <i>soil and carbon stock</i> (e.g., hectares with minimum of soil cover) - <i>Biodiversity</i> (e.g., area covered by Habitats Directive; kilometres of planted/maintained hedgerows) Yet, partly/for some plots also elaborate assessment methods applied, like vegetation monitoring, soil monitoring, ground/surface water monitoring with respect to nitrate content, etc.	
Urban Strategy	<ul style="list-style-type: none"> Technical guidance on integrated environmental management Sustainable Urban Transport Plans European Urban Knowledge Network Funding via existing mechanisms: LIFE+, Cohesion Funds, etc. 	No evaluation, but general aim is to help local authorities to adopt a more integrated approach to urban management, mainly through changes to man-made infrastructure (buildings, transport systems, energy generation, planning).	No specific indicators measured, but aims “to improve the quality of the urban environment, making cities more attractive and healthier places to live, work and invest in, and reduce the adverse environmental impact of cities on the wider environment, for instance as regards climate change.” Other aims include reducing air and water pollution and habitat loss.	Not mentioned
RED	<ul style="list-style-type: none"> National targets for share of energy from renewable sources National renewable energy action plans Promote and encourage energy efficiency and energy saving Measures to ensure that targets will be achieved Report on RED implementation progress by MS (every two years until 2021) Renewable Energy Roadmap for the post-2020 period (2018) 	<ul style="list-style-type: none"> Measures for the use of energy from renewable sources Measures of cooperation between MS and third countries for achieving the overall national targets Define sustainability criteria for biofuels and bioliquids Verify compliance with the sustainability criteria for biofuels and bioliquids Information and training for relevant actors related to benefits and practicalities of developing and using energy from renewable sources Provision of guarantees of origin for electricity, heating and cooling produced from renewable sources 	No specific indicators measured. Some restrictions are mentioned as pre-conditions for renewable energy production (e.g., land with high biodiversity value, such as primary forests, protected areas, and highly biodiverse grasslands, as well as land with high carbon stock, such as wetlands, forested areas, and peatlands are not allowed to provide raw materials for biofuels and bioliquids in order to avoid an increased impact on environment	Not mentioned
Adaptation Strategy	No explicit ones	<ul style="list-style-type: none"> Principles and recommendations for integration into other Strategies and programmes, for example, RDPs. Mainstreaming of adaptation measures into EU policies and programmes and legislative proposals Facilitation of the climate-proofing of CAP, the Cohesion Policy and the Common Fisheries Policy (CFP) 	<ul style="list-style-type: none"> Adaptation could promote resilience and sustainability Reduced flood risk, less soil erosion, improved water and air quality; reduced social impacts: improved health and well-being 	Not mentioned
TEN-T	<ul style="list-style-type: none"> Corridor work plan Corridor Progress Reports (every 2nd year) 		<ul style="list-style-type: none"> Environmental Impact Assessment for infrastructure projects 	Not mentioned

Financing mechanisms/ Funding regulatory frameworks

The policy analysis revealed that EU funding schemes are an important means for implementing regulatory frameworks and concrete measures in Member States (Table 8). More specifically, the analysis showed that for most regulatory frameworks, there are various EU funds available to finance measures. However, there is a small set of EU funds that feature prominently, including the EU Cohesion fund, the Life/Life+ programme, and the EU Agricultural Fund for the Rural Development (EAFRD). This reliance on a restricted set of EU-funded and designed financing tools with their own internal logic and rules might in practice jeopardize the degree to which a regulatory framework can address ES. For example, financing multiple – or bundles of – ES at the same time (to reduce trade-offs between ES and to account for the joint production of ES) is usually impossible with EU financing schemes such as EAFRD (Plieninger et al., 2012).

Table 8: EU funds/programmes and other funds used for financing regulatory frameworks

Regulatory Framework	Cohesion Fund	EU Regional Development Fund (ERDF)	Horizon 2020/other Research Framework Programmes	Connecting Europe Facility	EU Marine and Fisheries Fund	LIFE/ LIFE+ Programme	EU Agricultural Fund for the Rural Development (EAFRD)	EU Social Fund	Multi-annual Financial Framework MFF) 2014- 2020	Other
GI Strategy										*
HD ⁹										**
Biodiversity Strategy										
WFD										***
MSFD										
Forest Strategy										
CAP / RDR										****
Urban Strategy										
RED										#
Adaptation Strategy										##
TEN-T										###

Note: dark green boxes indicate financial instruments/funding sources explicitly mentioned in the regulatory framework as well as those actually used to finance measures

* Financing facility set up by European Investment Bank (EIB) and EU Commission (2014)

** Major part of funding by Member States

*** Mainly funding by Member States

**** Partly national/regional (co-)funding

Funds from the European Investment Bank; Global Energy Efficiency and Renewable Energy Fund

Mainly funding by Member States

Funds from the European Investment Bank plus national funds

⁹ In the HD itself, reference is only made to 'relevant Community instruments'. So, for the information in Table 8, we also used available implementation reports of Member States and guidance documents on the financing of measures published by the European Commission related to the HD. This give a more accurate picture of the relevant Community instruments actually used.

The example of financing biofuel production shows that schemes fostering single ES are (still) dominant. Similarly, it might be necessary to support collective activities – for example, planting hedgerows across farms – for fostering ES. However, EU funds usually do not allow for non-individual payments. In some cases, these EU funds are complemented by national and regional financing mechanisms also incorporating private sector funding. It is interesting to note, however, that there is no regulatory framework connected with EU or other funds exclusively dedicated to finance measures only within this particular regulatory framework. For example, there is no ‘Green Infrastructure Fund’ at EU level for implementing measures in the context of the GI Strategy – at least not yet.

Discussion

In this Deliverable, we have analysed the extent to which eleven key EU regulatory frameworks have incorporated the ES concept. In this Section, we assess the coherence of the regulatory frameworks at the level of definitions, aims or objectives, and also at the level of implementation (degrees of freedom for Member States), with the latter category focussing on policy type and dominant mode of steering, reporting, monitoring, evaluation, and financing mechanisms. We then consider how the ES concept could be strengthened within current and future regulatory frameworks in order to produce meaningful and integrated policies.

Coherence at the level of definitions and aims or objectives

ES and the ES concept have not been mainstreamed across all policy sectors but rather they are confined to the policy arenas with a traditional ecosystem focus, addressing natural ecosystems or other large areas with vegetation cover (agriculture, forestry). In particular, the ES concept is not yet represented in regulatory frameworks addressing the connection and interaction of humans and nature, such as the Urban Strategy and the Adaptation Strategy; though this is where the ES concept, with its focus on the human-environment relationship, could contribute most.

The assumption that this might be due to the timing of the creation and implementation of a regulatory framework proves to be only partly true. Quite a few of the more recent regulatory frameworks, such as the Biodiversity Strategy, the GI Strategy, and the latest CAP reform, clearly show a rather high level of coherence of definitions and objectives with the ES concept, reflecting the timing of the introduction and increasing ‘popularity’ of the ES concept and ES terminology (see for similar findings, for example, Maes et al., 2014 and Matzdorf & Meyer, 2014). At the same time, however, some of the more recent frameworks, for example, the Adaptation Strategy as well as the latest reforms of TEN-T and even the HD, do not (explicitly) take up the ES concept at all (see for similar findings, for example, Maes et al., 2013). Some of the goals of these regulatory frameworks actually appear to be in partial conflict with a balanced and sustainable provision of different ES, largely as a legacy of the past. For example, RED calls for fostering biofuels and bioliquids, resulting perhaps in landscapes with relatively low biodiversity and aesthetic or recreational value.

When the ES concept is used in a regulatory framework, the emphasis is on regulating services; climate and human health issues in particular. But there are also some regulating services, such as pollination, that are only addressed by very few regulatory frameworks, although more frameworks, for example the CAP, the RED, and the Urban Strategy, would be able to target those ES. The relevance and even the importance of regulating services are particularly recognised when they are expected to have an impact on provisioning services, for example, conserving genetic diversity in the Forest Strategy. The focus on regulatory services is

rather surprising since literature often suggests that preferences for provisioning services are stronger (e.g., Rodriguez et al., 2006; cf. Seppelt et al., 2011). However, the apparent lack of attention paid to provisioning services could also be because – in some cases – these ES are implicitly the main focus of the entire regulatory framework in some cases (e.g., food provisioning for the CAP, timber provision for the Forest Strategy, and water provision for the WFD). It could also be the case that the regulatory frameworks are attempting to redress an existing imbalance between provisioning services, where there is generally a commercial incentive to exploit the service (i.e. the market value of food, timber, or water) and regulating services, which are often at risk because they have no explicit market value. Further, findings in focus groups carried out in OpenNESS Task 2.2 indicate that there is more 'knowledge' available on provisioning services; and satisfying knowledge needs should focus on rather valuing cultural and regulating services.

Many cultural ES, such as aesthetic or spiritual services of an ecosystem, are absent, signalling that they are either not 'demanded' politically, or that they are simply ignored. When cultural ES are mentioned, they often focus on consumer- and citizen-oriented aspects, such as tourism and recreation¹⁰ (e.g., MSFD), as well as aspects related to rural communities and livelihoods (e.g., CAP). The GI Strategy, the Forest Strategy, and to some extent the CAP are the only regulatory framework that include a broader range cultural ES.

Most of the analysed regulatory frameworks mention loss of biodiversity and/or climate change as important issues that need to be addressed. These topics have gained importance to the extent that they are mentioned and targeted across sectoral policies beyond environmental regulatory frameworks. For example, five of the investigated regulatory frameworks target specifically climate regulation/sequestration, and six regulatory frameworks explicitly address the maintenance or even improvement of biodiversity. One could argue that biodiversity maintenance and climate regulation have successfully been integrated as cross-cutting issues in EU regulatory frameworks, being gradually introduced at different governance levels and across different policy mechanisms (Urwin & Jordan, 2008; Primmer, 2011). The lessons from these integration processes should be used in the mainstreaming of the ES concept (Primmer et al., in review). We suspect, however, that in particular the increasing integration of climate regulation and biodiversity maintenance might pose challenges to mainstreaming the ES concept, as it might be difficult to argue for the uptake of yet another concept with partly overlapping foci. However, the ES concept provides added value with its core idea of connecting environment and humans in a systematically integrated fashion, addressing the complex human-nature-relationship.

Degrees of freedom and ES concept operationalisation

Our assumption that regulatory frameworks with higher degrees of freedom facilitate the incorporation of the ES concept in the implementation process proves partly correct. A high degree of freedom for Member States allows in principle for implementation practices to develop at national, regional, or local level that do incorporate elements of the ES concept, regardless of whether it is addressed by or reflected in the regulatory framework itself. Our results show that the ES concept is integrated predominantly in those regulatory frameworks for which the specific design of measures and related ways of monitoring and – if applicable – sanctioning rests with Member States and/or lower levels. This way it is not necessary to organise consensus at the EU level about the selection of ES to be targeted, ways of assessment, and perhaps approaches to valuation of these services. In other words, it has been easier to include the new ES

¹⁰ This reluctance to include cultural ES other than tourism and recreation might also be exacerbated by the fact that they are relatively difficult to identify or even assess.

concept in regulatory frameworks, such as the GI Strategy, where a detailed operationalisation is not necessary at EU level. Moreover, this opens up room for flexibility in operationalising the ES concept and the selection of ES due to the characteristics of certain regions.

However, there are also advantages in encouraging a common approach to ES assessment at the EU level. This approach is adopted by the Biodiversity Strategy - the most direct and comprehensive operationalisation of the ES concept observed in this review - which requires Member States to assess and value their ecosystems and the associated ES. To ensure a common understanding of ES, a Working Group on Mapping and Assessment of Ecosystems and their Services (MAES) has been established to develop guidelines. Some Member States have already completed national ecosystem assessments, whereas other countries are only beginning (e.g., in Germany a feasibility study was conducted, see Albert et al., 2014) or have not started yet. This supporting process is the main framework for operationalising ES in the EU taking place at different governance levels. This has facilitated using multiple knowledge sources and national approaches to identify and measure the new ES concept, which crosses traditional sector and knowledge management boundaries (Primmer & Furman, 2012). Here, EU level coordination, rather guidance, has iteratively made use of an increasing number of national, regional, and local knowledge sources (Maes et al., 2013). As the monitoring and assessment capacities grow and familiarity with the ES concept increases, regulatory frameworks might become more detailed, and requirements for assessing and valuing the effects of regulatory frameworks on ES might increase. However, while producing common assessment methods might help to satisfy the knowledge needs regarding the provision levels and values of different types of ES at national or EU-level, it appears that comparing or negotiating 'trade-offs' between different ES at all levels will remain difficult (see, for example, the OpenNESS Task 2.2 report on 'knowledge needs' discussed by focus group in Brussels).

As mentioned earlier, one reason for the low coherence between existing monitoring systems and the ES concept is surely the difficulties encountered in trying to assess them appropriately. Prior to the MAES process, in many cases both methods and data were lacking. Although major progress has been made, this is often still the case (see, for example, OpenNESS Task 2.2 report on 'knowledge needs' discussed by focus group in Brussels). Another approach to close these gaps is the recently started EU Horizon 2020 coordination and support action ESMERALDA (Enhancing ecoSystem sERVICES mApping for poLicy and Decision mAking). Apart from these methodological difficulties, the administrative 'burden' or costs associated with the various monitoring schemes in place are another challenge. Many Member States already face difficulties in complying with the existing monitoring requirements.

Financing mechanisms and policy implementation

The coherence at the level of financing mechanisms proved to be intricate. Our analysis showed that there have been only a handful of different financial mechanisms at the EU level that help to fund the various regulatory frameworks analysed in this Deliverable. The need for the existing financing schemes to address the many requirements originating from different regulatory frameworks makes them complex and potentially even incoherent. On the one hand, the ES concept might help to provide an overarching framework to balance the different services requested. On the other hand, reliance on a restricted set of EU-funded and designed financing tools with their own internal logic and rules might jeopardize the degree to which a regulatory framework can address ES. For example, financing multiple – or bundles of – ES at the same time (to reduce trade-offs between ES and to account for the joint production of ES) is usually

impossible with EU funding schemes such as the EU Agricultural Fund for the Rural Development (EAFRD) (Plieninger et al., 2012).

Sometimes, supporting collective activities might be necessary for fostering ES – for example, planting hedgerows across farms. Yet EU funds usually do not allow for non-individual payments. Making use of national and regional finance mechanisms – partly complementary to the EU-funds – as well as incorporating private sector funding might be an option to overcome the limits of EU funding mechanisms. However, even national funding schemes are restricted by EU regulations; for example, the EU State Aid Regulation has constrained the development of ES payments because they can be discriminatory (Raitanen et al., 2013). This kind of indirect impact of EU regulations on ES that takes place by constraining national regulations is hard to evaluate but should be of interest for the EU.

The dominating influence of existing EU financing schemes might offer a backdoor to mainstream the ES concept in regulatory frameworks, if it could be integrated in the design of the financing schemes, which often have very concrete and sophisticated rules as to how to measure socio-economic impacts. Yet, for technical and feasibility reasons, only proxies of ecosystem degradation, such as land-use changes, are usually assessed for these schemes. Drivers or outcomes, such as land-use changes or land-user activities, (e.g., restoration measures) are easier to evaluate than changes in ecosystem status, ES, or even human well-being (Ferraro & Kiss, 2002; Pascual et al., 2010). The new Natural Capital Financing Facility (NCFF)¹¹, run by the European Investment Bank and drawing on funds from the LIFE budget, might help to address these problems by considering costs and benefits more broadly. The NCFF aims to support revenue-generating or cost-saving projects that promote the conservation, restoration, management, and enhancement of natural capital for biodiversity, ES, and climate adaptation, including ecosystem-based solutions to challenges related to land, soil, forestry, agriculture, water, and waste, with the pilot phase running over 2015-2017.

Implications for strengthening the uptake of the ES concept

It is clear from the review that even though the ES concept gained popularity in academic circles, uptake by policy makers has been relatively slow and it has only been fully integrated into a small number of regulatory frameworks to date – mostly those in the environmental policy domain. It is not possible to fully understand the reasons for this slow uptake from the results of this document analysis. However, a number of issues could be relevant.

On the one hand, the attitude of different stakeholder groups to the concept of ES may play a part. For example, nature conservation policy makers are often at odds with the anthropocentric – and often utilitarian – approach introduced by the ES concept. On the other hand, supporters of market-based governance instruments may welcome the ES concept as it favours non-regulatory modes of steering.

Furthermore, attempts to mainstream the ES concept challenge the established relations between the environmental policy sector and other sectors, such as agriculture, forestry, regional, and urban development. This can create tensions within and between policy sectors in terms of wording (including the definition of basic concepts), competencies (to regulate certain issues), and resources (including budgetary issues).

¹¹ <http://ec.europa.eu/environment/biodiversity/business/assets/pdf/ncff.pdf>

What does this mean in terms of improving mainstreaming attempts of the ES concept? First, more detailed research is needed to assess why some regulatory frameworks included the ES concept, and others did not, possibly including semi-structured interviews with stakeholders in the relevant policy domains in the European Commission. This should include a detailed analysis of the communication obstacles to introducing the ES concept or ES terminology, but also potential motivations or barriers that affect uptake of the ES concept. The complex relationships and tensions between policy sectors must also be analysed in more detail. For example, moving from competition towards cooperation in planning and implementation of policies may raise questions of responsibility and liability, but also issues of power.

Our analysis shows that little attention is given to the ES concept in non-environmental policy arenas. One of the first priorities is therefore to ensure that the ES concept is included in new regulatory frameworks, perhaps as part of the process of impact assessment (under the 'environment' section). However, mainstreaming the ES concept in existing regulatory frameworks is difficult, partly because they are rarely open to revision (for example, the HD has not been substantially reviewed since 1992). Currently, a 'fitness check' is being carried out by the EU Commission on some regulatory frameworks, for example, on the WFD, which may provide opportunities to incorporate the ES concept.

Mainstreaming can be done at different levels: definitions, aims or objectives, monitoring, reporting, and evaluation systems, and financing schemes. Although the regulatory frameworks investigated show a large variation in how far these issues are legally embedded, in general it may be easier to modify individual components of a regulatory framework, especially the financing mechanisms or the systems for monitoring, reporting, and evaluation. In particular, our analysis shows that financing mechanisms are essential in integrating the ES concept, and new sources of finance dedicated to promoting an ES approach, such as the NCCF, might solve the problem of multiple demands on the same budget from different regulatory frameworks (in short: mainstreaming through the money).

Similarly, there is scope to advance the ES concept through a common approach to monitoring and evaluation. The MAES process is a great step in advancing both methodology and knowledge of ES delivery. There is scope to extend this through developing improved methods of valuation, particularly for those ES that are hard to measure, including many cultural services. It should be noted, however, that monetary methods might not be appropriate for some of these services (see, for example, the OpenNESS Task 2.2 report on 'knowledge needs' discussed by focus group in Brussels).

Another barrier to the uptake of the ES concept is presented by the political choices Member States would need to make on ES delivery, and the challenges they face in terms of balancing supply and demand for the provision of specific ES. A next step in this process might be to ask decision makers at Member State and local levels what tools and information they would need to inform these decisions: the OpenNESS case studies are already helping to address decision-makers needs in this respect.

Conclusions

This in-depth analysis of regulatory frameworks covering ecosystem-related policy fields (biodiversity, forests, water, climate adaptation, rural and urban development, transport and infrastructure) has identified a broad range of direct and indirect drivers that pose problems for the well-being of society, including over-exploitation of ecosystems, climate change, pollution, demographic change, and increasing consumption. These drivers threaten the future integrity of ecosystems that provide vital services to

humans. It is important that policies across all sectors recognise the importance of protecting natural capital and ecosystem services.

However, the results of this policy analysis clearly show that the ES concept has hardly been introduced yet. The concept has not yet been mainstreamed across policy sectors, but remains confined to the policy arena that addresses natural ecosystems, forestry or agriculture. Only three of the regulatory frameworks that were investigated in depth, i.e. the Biodiversity Strategy and the GI Strategy, both led by DG Environment, and the Forest Strategy, refer to both ES and the ES concept explicitly and – at least to some extent – reflect the ES concept in the design of measures. Other regulatory frameworks mention ES indirectly via terms such as ‘soil function’ or ‘carbon storage’ that correspond to individual regulating ES, which signals that integration or mainstreaming takes place also from within the sector-specific approaches. However, although the uptake of the ES concept is increasing over time, it has not been mainstreamed for most regulatory frameworks outside the environment-domain; even some of the more recent regulatory frameworks, such as TEN-T or the Adaptation Strategy, do not address ES explicitly. This is significant because the ES concept, with its focus on human-environment interactions, has great potential to improve policy outcomes in these sectors.

There is considerable variation in the range of ES covered. Although the regulatory frameworks that explicitly mention ES usually refer to all three ES categories (provisioning, regulating, and cultural) as well as biodiversity, those that only mention ES indirectly tend to refer just to a small selection of regulating ES, such as carbon storage or water quality. In all of the regulatory frameworks, regulating ES are mentioned in much greater detail than the other ES categories, and there are relatively few references to cultural ES. This could indicate a lack of balance between the different ES categories, though the apparent lack of attention paid to provisioning services could also be because these services are implicitly the focus of the entire regulatory framework in some cases (e.g., food provisioning for CAP; timber provision for the Forest Directive; water provision for the WFD), or because the regulatory frameworks are deliberately attempting to redress an existing policy imbalance between provisioning and regulating services.

All three regulatory frameworks in which the ES concept is fully embedded are strategies featuring an advisory mode of steering, perhaps reflecting the novelty of the ES approach and the reluctance of Member States to sign up to strict regulation across different ES categories, on the one hand, or reflecting trends in governance more widely, on the other hand. Similarly, very few regulatory frameworks require Member States to report on particular ES. Also, accounting for the environmental impacts of the policy is not standard for all policies, or it focuses only on very specific ecosystems (e.g., WFD). In some cases, environmental impacts are measured indirectly by using proxies such as observed land-use changes.

There is considerable scope to improve the mainstreaming of the ES concept, in order to achieve coherence between the aims of different policy sectors. It is clear that measures should be taken to actively promote uptake of the ES concept in new regulatory frameworks as well as in revisions of existing ones. However, this will require a deeper understanding of the factors affecting uptake, including communication barriers, stakeholder attitudes to the ES concept, and tensions between policy sectors. Further research should be undertaken to address these issues, including interviews with stakeholders in the relevant policy domains in the European Commission, and to facilitate communication across policy boundaries. There is also scope to improve uptake of the ES concept through dedicated financing mechanisms, common methods for monitoring and evaluation of ES (especially cultural ES), and better tools to help policy makers exploit

synergies and manage trade-offs between ES (see, for example, OpenNESS Task 2.2 report on 'knowledge needs' discussed by focus group in Brussels).

Finally, while mainstreaming the ES concept might indeed help to systematically expand the assessment of environmental impacts of regulatory frameworks, and, thus, to improve coherence between different policy fields, we need to analyse and address the challenges of mainstreaming the ES concept carefully to achieve this potential. The ES concept is no silver bullet, but it can improve sectoral and cross-sectoral policy making significantly if applied properly.

As a next step following the submission of this Deliverable, policy recommendations will be developed in collaboration with other WPs, in particular with WP 6 in the context of D6.4 – D6.6 (Clearinghouse for operationalisation of the concepts of ES and NC). Here, the discussion process will be started at the Annual Meeting Barcelona in April 2015.

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