Policy needs and opportunities for operationalising the concept of ecosystem services

IEEP

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List of acronyms

CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CF	Cohesion Fund
CFP	Common Fisheries Policy
CICES	The Common International Classification of Ecosystem Services
COM	Commission Communications
CORINE	Coordination of Information on the Environment programme
CP	Cohesion Policy
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
EEA	European Environment Agency
EFA	Ecological Focus Area
EHS	Environmentally Harmful Subsidies
EIA	Environmental Impact Assessment
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
GDP	Gross Domestic Product
GI	Green Infrastructure
GPP	Green Public Procurement

IA	Impact assessment
LIFE	Financial Instrument for the Environment
LULUCF	Land Use, Land Use Change and Forestry
MMR	Monitoring Mechanism Regulation
MSFD	Marine Strategy Framework Directive
NNL	No Net Loss
OPERAs	Operational Potential of Ecosystem Research Applications
PES	Payment for Ecosystem Services
RBMP	River Basin Management Plan
RDP	Rural Development Programme
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SEA	Strategic Environmental Assessment
SEEA	System for Environmental and Economic Accounts
TEN-T	Trans-European Transport Network
UNEP	United Nations Environment Programme
WAVES	Wealth Accounting and the Valuation of Ecosystem Services
WFD	Water Framework Directive

1. Introduction, aims and objectives

Ecosystem services and natural capital are addressed and/or influenced by a wide set of EU sectoral polices - and related policy instruments - dealing with the use of natural resources. Different policy sectors can be relevant to ecosystem services in two different ways. A range of EU sectors aim at sustainably managing natural resources with direct interdependency on specific ecosystem services (e.g. agriculture, fisheries and water management). Alternatively, a number of policy sectors are known to have negative impacts on biodiversity, ecosystem and related services (e.g. climate, bioenergy and transport).

Several existing EU policy instruments support the conservation and sustainable use of ecosystem services and natural capital. First and foremost, the Birds and Habitats Directives protect the "biodiversity baseline" underlining all ecosystem services. Furthermore, as range of sector specific instruments - such as the common EU policies for agriculture and fisheries (CAP and CFP), policies for the management of inland, coastal and marine areas (Water Framework Directive - WFD, Marine Strategy Framework Directive - MSFD), and polices supporting EU-wide cohesion and regional development – provide measures relevant for maintaining and sustainably utilising ecosystem services.

However, the existing EU policy framework for ecosystem services and natural capital remain far from optimal. The majority of the instruments, such as CAP, CFP and forest policies, are still primarily focused on regulating ecosystems from the point of view of specific natural resource - in other words single ecosystem services such as provisioning of food, fish and timber - rather than addressing the full range of services ecosystems provide. Ecosystem services and natural capital are also poorly integrated into the information and decision-support framework underpinning the development, implementation and assessment of EU policies (data, indicators, assessment procedures, monitoring and accounting etc.).

Consequently, work is needed to develop a comprehensive policy framework for the sustainable management of ecosystem services and natural capital in the EU. Effective integration is needed to minimise the damage to ecosystems caused by sectoral activities and maximise the positive contribution of these activities to conservation. The integration of ecosystem services into sectoral policies can also contribute to achieving wider policy goals and objectives in a sustainable manner. Finally, there is a need to explore the development of policy instruments, including innovative policy instruments such as market-based instruments, which can help to address ecosystem services in an effective manner.

This report presents the results of an EU policy audit that assesses the current level of integration of ecosystem services and natural capital into the current EU policy framework. It also identifies

key gaps, needs and opportunities for further integration, including policy instruments that can either support and/or that are required for integration. The analysis covers the following aspects: current level of and gaps and needs for further integration and uptake within key EU sectoral policies, high level and/or horizontal EU initiatives supporting integration, and identified opportunities for future integration in emerging policy areas. The purpose of this assessment is to provide a comprehensive overview of the current situation and outline the requirements for developing a comprehensive policy framework for the sustainable management of ecosystem services and natural capital in the EU.

D4.1 in the context of OPERAs

The assessment of policy needs and opportunities for operationalising the concepts of ecosystem services and natural capital (D4.1) has been developed under OPERAs work package 4 (WP4).

The deliverable contributes to the following elements of the project:

- WP4 Tasks 4.2 – 4.4: D4.1 provides information on the broader policy and instrument landscape that underpins the development of a range of dedicated tools under WP4. It helps to identify how the instruments and tools developed in the context of OPERAs can contribute to the development and implementation of different (sectoral) policies in the EU. The integration assessment process applied here may also be developing into an OPERAs tool for use in the developing community of practice.
- WP 3 Task 3.3: The insights related to the role of ecosystem service accounting in supporting policy integration will be integrated into the WP3 work on accounting frameworks (D3.2)
- WP3 Task 3.4: D4.1 is an integral part of the research on institutional structure and governance systems for ecosystem services. In particular, it creates the basis for further work on the current level of integration into policies and governance, with further focus on synergies and trade-offs between different policies and their governance (D3.3).
- WP2 Exemplars: D4.1 provides the exemplars a general policy framework within which they can further develop their planned outputs and reflect their final results, with due links to the EU level needs and opportunities. The current assessment is focused at the EU level and the application of a similar approach within national exemplars is being considered, to offer complementary in-depth information at national / regional level.

Ultimately, the conceptual framework outlined in D4.1 is being developed into a common, operational assessment framework aimed at systematically analysing the integration of ecosystem services and natural capital into different sectoral policies. This common framework is foreseen to form a useful tool for furthering the uptake of ecosystem services in policy- and decision-making at different levels of governance, supporting a shift to green economy at local, regional and national level. (See also WP3 Deliverable 3.3)

2. Approach, materials and methods

2.1 Concepts and definitions

Ecosystem services: Ecosystem services are defined as the contributions that ecosystems make to human well-being (EEA 2013 / CICES).

Natural capital: Natural capital is defined as an economic metaphor for the limited stocks of physical and biological resources found on earth (MA 2005). Natural capital stocks provide flows of ecosystem services. It should be noted that purely abiotic natural resources fall outside the scope of the definition used in this assessment.

Green infrastructure: Green infrastructure is defined as a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue in the case of aquatic ecosystems) and other physical features in terrestrial (including coastal) and marine areas. On land, Green Infrastructure is present in rural and urban settings. (COM/2013/249)

Nature-based solutions: concrete approaches for the management of natural resources that build on the understanding of ecosystem services and natural capital, such as conservation and restoration of wetlands for water purification, conservation of ecosystems' carbon storage to mitigate climate change etc.

Conceptual integration: Conceptual integration refers to the integration of ecosystem services and natural capital into the overall premises and objectives of different policy areas. Conceptual integration is assessed based on the key strategic policy documents setting out the scope and objectives for sectoral policies (e.g. EU level strategies).

Operational integration: Operational integration refers to the uptake of ecosystem services and natural capital in practical policy implementation. Operational integration is assessed based on the availability of concrete policy tools and instruments that take up and implement the concepts.

Policy instruments: Three different categories of instruments for policy implementation have been used in the context of this study: information instruments, decision-support instruments and implementation instruments. This categorisation of instruments is based on the overall conceptual framework developed under OPERAs.

2.2 Information sources

The assessment is based on a review of EU policy documents and information available on official EU web pages. In the case of forestry (i.e. an area with limited direct EU competence) a number of relevant international policy and guidance documents have also been considered.

The key types of policy documents reviewed include:

- EU policy strategies, published as Commission Communications (COM)
- EU regulations and directives
- Official and/or Commission endorsed guidance documents for implementing EU policies and legislation
- Official and/or Commission endorsed assessments of EU policy implementation
- Official EU policy discussion documents and proposal for policy action, published as Commission Green and White Papers[1]

2.3 Analytical approach

Identification of policy sectors

In the context of this assessment, the integration of ecosystem services and natural capital into the following EU policy areas was assessed: environmental policies (air, soil and water), policies related to the management of natural resources (agriculture and rural development, fisheries and marine areas and forest), policies with known impacts on nature and natural resources (regional development, climate, bioenergy and transport). These policy sectors were identified based on the official EU policy areas (European Commission 2013a) and selected to be included in the analysis based their high direct relevance to the conservation and sustainable use of biodiversity, ecosystems, ecosystem services and natural capital (e.g. use, interdependency and/or impact).

In addition, a number of high level initiatives have been identified that provide an impetus for mainstreaming the concepts of ecosystem services and natural capital in the EU. These horizontal non-sector specific policy initiatives have been identified based on a review of current EU policy

[1] Green Papers are documents published by the European Commission to stimulate discussion on given topics at European level. Commission White Papers are documents containing proposals for Community action in a specific area.

developments and trends that create opportunities for the integration and uptake of ecosystem services.

In addition to the policy sectors above, it is recognised that a range of other EU policy sectors (e.g. trade policy, external assistance and foreign and security policy) indirectly impact and/or depend on the status of ecosystems, ecosystem services and natural capital. However, policy areas with such indirect influence or interlinkages fall outside the scope of this assessment.

No separate analysis of the EU biodiversity policy has been included in this assessment. This is because the concepts of ecosystem services and natural capital are considered to be an integral part of the current EU biodiversity policy, mainstreamed in the EU Biodiversity Strategy to 2020 (COM/2011/244). The key aspects of the EU biodiversity policy, including the Natura 2000 network, the EU Green Infrastructure Strategy and the EU initiative for no net loss of biodiversity, have been integrated into the assessment as horizontal elements of the sectoral analysis, when identifying the needs, opportunities and instruments of different policy sectors. Finally, it is to be noted that while there are different – and indeed differing - views among researchers and decision-makers with regard to making ecosystem services an integral part of biodiversity policy (e.g. risks related to side-lining conservation for its own right) these consideration fall outside the scope of this assessment.

Categorisation and identification of policy instruments

Three different categories of instruments for policy implementation have been used in the context of this study: information instruments, decision-support instruments and implementation instruments. This categorisation of instruments is based on the conceptual framework being developed in the context of OPERAs. Concrete EU policy instruments considered in the context of this study have been identified based on the assessment of key EU policy documents (See Annex 1). The identified EU instruments have been mapped according to the above categorisation, which has been further defined based on the findings (see Table 3).

The identified instruments are considered as the most relevant (directly or indirectly) with regard to the current or future integration of ecosystem services and natural capital. A number of instruments that aim to prevent the degradation of the environment on a more general level - with possible relevance to ecosystem services and natural capital - fall outside the scope of this assessment (e.g. environmental taxes).

Assessing the level of integration - identifying needs, opportunities and instruments for further integration

Two different levels of integration have been identified in the context of this assessment: conceptual integration and integration into policy implementation (See 2.1). The assessment of conceptual integration is based on the review of most recent EU policy documents, including sectoral strategies and other high level policy documents. The level of conceptual integration has been determined based on how explicitly and to what extent the concepts of ecosystem services and natural capital have been recognised in the premises (objectives, criteria etc.) of a given sectoral policy. Operational integration has been assessed based on the identification and analysis of concrete policy instruments and measures for operationalising the concepts during implementation. The level of operational integration has been determined taking into consideration 1) instruments aimed at preventing harm to biodiversity and ecosystem services and 2) instruments aimed at proactively maintaining and enhancing ecosystem services and natural capital.

A general categorisation regarding the level of conceptual and operational policy integration of different sectors has been using a similar qualitative scale (see Table 1). According to this categorisation the integration of ecosystem services and natural capital within policy sectors can range from explicit to implicit and from direct to indirect.

Based on the assessment of the current level of integration, key needs and opportunities for future integration of ecosystem services and natural capital into different EU policy areas have been identified. Furthermore, a range of policy instruments - existing and new – considered as having a key role in addressing the identified needs and opportunities have been listed. This identification has been carried out by sectoral policy experts, reflecting the following aspects: the policy area's known impacts and/or interdependency on biodiversity, ecosystems and ecosystem services; understanding of the role of ecosystem services in supporting the sustainability and effective implementation of a policy area (e.g. providing cost-effective and nature-based solutions to achieving policy objectives); and synergies between implementing sectoral policy objectives and achieving EU biodiversity goals (e.g. policy area’s foreseen contribution to the 2020 EU Biodiversity Strategy).

Finally, it should be noted that this assessment focuses on reviewing frameworks for sectoral polices only at the EU level. When interpreting the results it is important to keep in mind that - in order to materialise in practice – the identified opportunities for integration of ecosystem services and natural capital need to be taken up by EU Member States at national and regional level. This applies, for example, to the identified opportunities for public investment in ecosystem service related measures by different EU funding instruments. Aspects related to the implementation of different EU policies at national, regional and local level – and consequently the very final “stage”

of operationalising ecosystem services through concrete actions such as permit decisions, planning and investment choices - falls outside the scope of this particular assessment.

Level of integration	Conceptual integration	Operational integration
Comprehensive and explicit	Explicit recognition of all ecosystem services, including the recognition of ecosystem services and natural capital as underpinning elements of human wellbeing	Dedicated instruments exist for addressing ecosystem services and natural capital in a comprehensive manner within a policy area.
Explicit but not comprehensive	Some explicit integration (e.g. some specific ecosystem services), including some recognition of ecosystem services and natural capital as underpinning elements of human wellbeing.	Some instruments exist that proactively address / build on the understanding of ecosystem services and natural capita within the policy area.
Implicit and incomprehensive	Implicit and indirect integration, generally focus on preventing negative impacts of a policy sector on ecosystem services and natural capital	No dedicated instruments exist for directly addressing ecosystem services and natural capital. Some aspects – mainly focusing on avoiding negative impacts on (some) ecosystem services - integrated into sectoral instruments.
No specific integration	No recognition (direct / indirect) of ecosystem services and natural capital	No instruments exist that would in any way address ecosystem services and natural capital.

Table 1 Categorisation of the level of policy integration in the context of this assessment

3. Results

3.1 Current level of integration

This Chapter summarises the current level of integration of ecosystem services and natural capital into different EU policy sectors reviewed in the context of this assessment. The assessment is based on the review of the existing policy documents and instruments outlined in detail in Table 2 and Annex 1.

Conceptual integration

On a conceptual level, ecosystem services and natural capital have been integrated into most of the sectoral policies reviewed in the context of this assessment. The integration of these concepts into EU policies for soil, water, forests, marine and fisheries, and regional development is both explicit and comprehensive. This means that the importance of all ecosystem services and/or natural capital is clearly recognised in the premises of the key documents for these sectoral policies.

While the integration of ecosystem service and natural capital concepts into the EU policies for agriculture and rural development, climate and bioenergy is explicit, it is not considered to be comprehensive. For example, the EU policy framework for agriculture and rural development focusses mainly on the aspects of ecosystem services related to water management and maintenance of soil quality. In the case of bioenergy, opportunities for the integration of ecosystem services are mainly also focused on water management and soil quality and they refer to the sustainable production of biofuels and not extending to the use of solid biomass.

The level of conceptual integration of ecosystem service and natural capital concepts into the EU policies for air quality and transport is considered to be limited. While the EU policy framework for air quality recognises the value of air as natural capital it does not explicitly identify clean air as an ecosystem service produced by well-functioning ecosystems. Consequently, the EU policy framework simply focuses on preventing air contaminants, rather than aiming to protect ecosystems' ability to purify air and maintain air quality. With regard to transport, key EU policy documents do not make specific, direct links to possible negative impacts of transport and related grey infrastructure on ecosystem services and natural capital. Implicit links can be established through the explicit provisions to avoid negative impacts of transport infrastructure on nature and environment (i.e. the impact assessment procedure).

Operational integration

According to the review results, the level of operational integration is more limited than conceptual integration: none of the EU policy sectors currently provide a comprehensive framework for the implementation and uptake of ecosystem services and natural capital.

The level of operational integration is the most comprehensive and concrete in EU policies for water, agriculture and rural development, marine and fisheries, regional development and climate. All these frameworks include policy instruments that - directly or indirectly - integrate some aspects of ecosystem services and can support their maintenance, conservation and/or restoration in practice. For example, none of the existing instruments under the EU framework for water management explicitly recognises the role ecosystem services in maintaining water quality or maintaining ground water sources nor do they explicitly avoid negative impacts on water ecosystem services. However, guidance and work programmes produced under the WFD support ecosystem-based approaches to the implementation of water management measures, this way implicitly building on the understanding of ecosystem services. Similarly, good environmental status of marine areas, as pursued under MSFD, does not explicitly use the term ecosystem services. However, the EU criteria for good environmental status of marine areas under the Directive include several aspects related to the functioning of ecosystems, this way implicitly underpinning ecosystem services.

The operational integration of ecosystems services and natural capital into the EU policy frameworks for air, soil, forest ecosystems, bioenergy and transport is indirect at best, focusing on preventing negative impacts of sectoral activities on ecosystems and in this way circuitously protecting the maintenance of ecosystem services. For example, instruments exist to mitigate negative effects of air pollution on ecosystems but there are no dedicated instruments to protect ecosystems' ability to regulate air quality. Similarly, the EU policies for bioenergy and transport only focus on mitigating possible negative impacts on ecosystems, with very limited direct links to ecosystem services. No dedicated EU policy instruments exist for soil ecosystem services, however some aspects are integrated into different EU instruments, including for example CAP cross-compliance standards for soil cover and the Environmental Liability Directive regarding damage on soil.

Finally, the Treaty on the Functioning of the EU includes no specific provisions for an EU forest policy and therefore the EU has limited competence in adopting dedicated common forest policy instruments at the Union level. Consequently, the most concrete policy instruments related to forest ecosystems can be found under other EU sectoral policies, including for example the EAFRD rural development funding (the primary source of EU funding for the forest sector) and reporting on Land Use, Land Use Change and Forestry (LULUCF) under the EU climate policy.

Table 2 Current level of the integration of ecosystem services and natural capital into EU policy areas

Dark green = comprehensive and explicit, light green = explicit but not comprehensive, light red = implicit and incomprehensive, dark red = no specific integration. See Table 1 for further information on the classification and Annex 1 for a detailed policy analysis.

Policy sector	Conceptual integration	Operational integration	Key references
Environment: Air	The EU's air quality policy (Clean Air Policy Package adopted in 2013) does not explicitly identify clean air as an ecosystem service produced by well-functioning ecosystems. The value of air as natural capital is, however, recognised as the Clean Air Programme for Europe clearly outlines the estimated impacts and costs of air pollution to human health and economy.	Negative effects of air pollution on ecosystems are partly addressed by a range of policies and measures (e.g. use of environmental impact assessments and the Environmental Liability Directive). The positive effects that ecosystems have on air quality or the consequences of air pollution on other ecosystem services are currently not integrated.	Clean Air Programme for Europe (COM/2013/918) SEA Directive (2001/42/EC) EIA Directive (current 2011/92/EU and proposed COM/2012/628) EU Environmental Liability Directive (Directive 2004/35/EC) EC guidance documents on integrating climate change and biodiversity into EIA and SEA (EC 2013b, EC 2013c) EC guidance document on multi-benefit cohesion policy investment in nature and green infrastructure (IEEP and Milieu 2013)
Environment: Soil	Soil ecosystem services are explicitly recognised under the Soil Thematic Strategy. The strategy also explicitly recognises the value of soil natural capital and points out that the impacts of soil degradation on soil ecosystem services or non-use values of soil cannot currently be quantified nor monetised, therefore even the highest estimates of the costs of soil degradation fall short of including the cost of losing these services. Soil as natural capital is also explicitly acknowledged under the EU Roadmap to a Resource Efficient Europe which contains an objective on land and soils that inter alia states that by 2020 soil erosion is reduced and soil organic matter levels increased.	No dedicated policy instruments, some aspects integrated into different EU instruments, including CAP cross-compliance standards for soil cover (to limit erosion and maintain organic matter) and greening requirements for permanent pasture; EAFRD investment on agri-environment-climate and forestry measures; Land Use, Land Use Change and Forestry (LULUCF) reporting under climate policy for soil carbon; and EU environmental liability regarding damage to soil.	EU Soil Thematic Strategy (COM/2012/46) EU Roadmap to a Resource Efficient Europe (COM/2011/571) CAP financing, management and monitoring, including cross-compliance rules (Regulation (EU) No 1306/2013) European Agricultural Fund for Regional Development (EAFRD) (Regulation (EU) No 1305/2013) EU Land Use, Land Use Change and Forestry (LULUCF) accounting rules (Decision (EU) No 529/2013/EU) EU Environmental Liability Directive (Directive 2004/35/EC)

	Soil is also explicitly acknowledged under agriculture and rural development.		
Environment: Water	The EU's current policy framework for water - outlined in the Blueprint to Safeguard Europe's Water Resources recognises and addresses ecosystem services explicitly. It recognises the current threats to water ecosystems and the services they provide and highlights the importance of green infrastructure in cost-effective water management. The Blueprint also recognises water as valuable natural capital and the provider of numerous valuable provisioning ecosystem services, as it highlights the value of water to humans, nature and the economy and proposes to further develop water accounts. It is also stated that there is a need to better include the value of water in pricing and to develop new economic incentives.	Some indirect proactive elements (e.g. restoring fish migration routes under the Water Framework Directive (WFD) and recognising the role of natural flood retention areas under the Flood Directive) and provisions on preventing negative impacts on the functioning of water ecosystems None of the existing instruments explicitly recognise the role of ecosystem services in maintaining water quality or maintaining ground water sources. Nor do they explicitly avoid negative impacts on water ecosystem services. However, indirectly, aiming to secure the good quality of water ecosystems (including their functioning) supports the maintenance of ecosystem services. Likewise, preventing negative impacts on water ecosystems helps to protect water related ecosystem services. Also, different elements of guidance and work programmes produced under the WFD Common Implementation Strategy support ecosystem-based approaches to implementation e.g. develop and promote ecosystem-based approaches for mitigating and adapting to climate change.	Blueprint to Safeguard Europe's Water Resources (COM/2012/673) Water Framework Directive (Directive 2000/60/EC) Floods Directive (Directive 2007/60/EC) Common Implementation Strategy for WFD and Floods Directive - Work Programme 2013-2015 (EC 2013d)
Agriculture and rural development	A certain number of ecosystem services are promoted under both Pillars of the EU Common Agriculture Policy (CAP). All area-based payments are conditional upon cross-compliance, including standards for water, soil and retention of landscape features. Pillar 1 funding: direct payments to farmers (including a greening payment linked to retention of permanent pasture and Ecological Focus Areas); conservation of genetic resources in agriculture; and agricultural surveys.	Some proactive elements (mainly agri-environment-climate, support to Natura 2000 areas, and non-productive investment measures in Member States' RDPs) and preventing negative impacts on ecosystems / ecosystem services (CAP cross-compliance standards for soil, water and landscape, and greening requirements for permanent pasture)	CAP financing, management and monitoring, including cross-compliance rules (Regulation (EU) No 1306/2013) CAP rules for direct payments to farmers (Regulation (EU) No 1307/2013) European Agricultural Fund for Rural Development (EAFRD) (Regulation (EU) No 1305/2013) Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 2009/147/EC) establishing the Natura 2000 network

	EAFRD fund (Pillar 2): allocated by Member States to at least four of six general EU priorities. One priority is 'restoring, preserving and enhancing ecosystems related to agriculture and forestry' with three specific focus areas: biodiversity (including Natura 2000, high nature value farming and "the state of" European landscapes); water management; and soil. Although the agri-environment climate measure is compulsory for all RDPs, the extent to which Member States prioritise these three focus areas will differ. Limited coverage of some ecosystem services, e.g. attractive landscapes, cultural heritage. Pillar 2 also funds provision of advisory services for farmers.		
Forest	Explicit reference to ecosystem services has been included in the current EU Forest Strategy where one key objective for 2020 is 'contributing to balancing various forest functions, meeting demands, and delivering vital ecosystem services'. The Strategy also recognises ecosystem services as natural capital: Member States are asked to develop with the assistance of the Commission a conceptual framework for the valuation of ecosystem services, promoting their integration in accounting systems at EU and national levels by 2020.	No separate / dedicated instruments for forest ecosystem services, some elements integrated into different EU instruments. Although the EU Forest Strategy is a policy document - not a legislative act - it has explicit links to other EU policy instruments and funding, including the EAFRD rural development funds (the primary source of EU funding for the forest sector), Natura 2000 legislation, LIFE+ funding for climate action, Water Framework Directive (WFD); and Land Use, Land Use Change and Forestry (LULUCF) reporting under climate policy. Note: Treaty on the Functioning of the EU includes no specific provisions for an EU forest policy. Consequently, the EU has limited competence in developing common forest policy / adopting dedicated common forest policy instruments for the EU.	EU Forest Strategy (COM/2013/659) European Agricultural Fund for Regional Development (EAFRD) (Regulation (EU) No 1305/2013) EU Land Use, Land Use Change and Forestry (LULUCF) accounting rules (Decision No 529/2013/EU) Habitats Directive (Directive 92/43/EEC) and Birds Directive (Directive 2009/147/EC) establishing the Natura 2000 network Water Framework Directive (Directive 2000/60/EC) LIFE 2014-2020 (Regulation (EC) No 1293/2013)
Marine and coastal (incl. fisheries)	The Marine Strategy Framework Directive (MSFD) forms the environmental pillar of the EU's Integrated Maritime Policy. Ecosystem services (referred to as marine ecological services or marine goods and services) are explicitly integrated into the policy as part of an "ecosystem	Some proactive elements recognising the role of ecosystem services. A number of instruments preventing negative impacts on ecosystems. Good environmental status of marine areas, as pursued	Marine Strategy Framework Directive (EC/2008/56) Maritime Spatial Planning Directive proposal (COM/2013/133) European Marine and Fisheries Find (EMFF) amended proposal (COM/2013/

	approach". As for the EU Common Fisheries Policy (CFP), fisheries are understood to be part of marine ecosystems and the CFP promotes the use an ecosystem-based approach as a key tool for sustainable management of fisheries and limiting negative impacts on marine ecosystems. However, links between fisheries and other ecosystem services are not discussed directly under CFP.	under the MSFD, does not explicitly use the term "ecosystem services". However, the Decision on the criteria for good environmental status of marine areas includes several aspects related to the functioning of ecosystems, thus implicitly underpinning ecosystem services. Indeed some criteria (on fisheries and contamination) are largely focused on the availability and quality of provisioning services (i.e. fish and water) obtained by humans. Assistance for the implementation of the MSFD by the European Marine and Fisheries Fund (EMFF) includes support for participatory actions aimed at maintaining and enhancing biodiversity and ecosystem services, such as the restoration of specific marine and coastal habitats in order support of sustainable fish stocks. The proposed Marine Spatial Planning Directive introduces conservation, restoration and management of coastal ecosystems, ecosystem services and nature, coastal landscapes and islands as minimum criteria for integrated coastal management strategies.	245) Common Fisheries Policy (Regulation (EU) No 1380/2013)
Regional development / cohesion	The EU's current policy framework for cohesion and regional development - building on the Europe 2020 strategy and with a range of possible concrete activities for implementation outlined in the regulations for Cohesion Policy funds (ERDF, ESF and CP) - recognise and address ecosystem services explicitly. Measures aimed at protecting and restoring biodiversity and soil and promoting ecosystem services, including through Natura 2000 and green infrastructure, are eligible for EU financial support. In addition, support is provided for dedicated investment in adaptation to climate change, including ecosystem-based approaches.	Some proactive elements and measures to prevent negative impacts on ecosystems / ecosystem services. Financial support is possible for measures related to ecosystem services and green infrastructure under ERDF and CF (aimed at creating positive win-wins of natural capital and Cohesion Policy implementation). However, it is not obligatory for the Member States to take up these opportunities in the national programmes implementing EU financing, nor is it obligatory to integrate ecosystem services into reporting on the results / outputs of ERDF and CP funding.	Europe 2020 strategy (COM/2010/2020) ERDF European Regional Development Fund (Regulation (EU) No 1301/2013) ESF European Social Fund (Regulation (EU) No 1304/2013) CF Cohesion Fund (Regulation (EU) No 1300/2013) EC guidance document on multi-benefit cohesion policy investment in nature and green infrastructure (IEEP and Milieu 2013)
Climate	Climate change mitigation: ecosystems' ability to sequester carbon is integrated into the calculation of carbon sinks. From July 2013 onwards EU LULUCF (Land Use, Land Use Change and Forestry) accounting rules cover greenhouse	Mitigation: direct but not comprehensive. Only carbon sequestration by soils, trees, plants, biomass and timber are included in the (future) framework for greenhouse gas emissions. Wetlands remain voluntary and marine	EU Land Use, Land Use Change and Forestry (LULUCF) accounting rules (Decision No 529/2013/EU) Monitoring Mechanism Regulation (MMR)

	gas emissions into and removal of carbon from the atmosphere resulting from soils, trees, plants, biomass and timber (ie recognises forest and agricultural ecosystems' carbon storage and sequestration). However, accounting for the draining and rewetting of wetlands will remains voluntary. Also, sequestration and storage by marine ecosystems is not covered. Climate change adaptation: The EU Strategy on Adaptation to Climate Change recognises that ecosystems and the services they provide both suffer from climate change and that green infrastructure and ecosystem-based approaches (building on ecosystem services) can provide cost-effective solutions for adaptation (e.g. help to achieve reduced flood risk, less soil erosion, improved water and air quality and reduced heat island effect).	ecosystems are not included. While relevant to EU, REDD+ (Reducing Emissions from Deforestation and forest Degradation) only supports mitigation of climate change outside the EU. Adaptation: mainly indirect, preventing negative impacts on ecosystems / ecosystem services. Only explicit instrument is support for ecosystem-based approaches to climate change adaptation under EU funds.	for EU climate action framework and Kyoto protocol (Regulation (EU) No 525/2013) EU Strategy on adaptation to climate change (COM/2013/216)
Bioenergy	Ecosystem services are referred to directly in the Renewable Energy Directive in both the preamble (e.g. watershed protection and erosion control) and in relation to sustainability criteria. However, this integration mainly refers to the sustainable production of biofuels and not extending to the use of solid biomass, e.g. there currently exists no sustainability criteria for the latter. In addition to the above, with regard to biofuels, EU bioenergy policy includes reference to existing requirements (e.g. cross-compliance) set out under the CAP direct payment regulation (See dedicated analysis - agriculture). Finally, EU's Energy Efficiency Plan also mentions green infrastructure, which builds direct links to ecosystem services by its definition.	Indirect, preventing negative impacts on ecosystems / ecosystem services For biofuels, the Renewable Energy Directive and Fuel Quality Directive sustainability criteria cover land with high biodiversity value and high carbon stock. There are no EU-level sustainability criteria for solid biomass.	Renewable Energy Directive (Directive 2009/28/EC) Fuel Quality Directive (2009/30/EC) EU Energy Efficiency Plan (COM/2011/109)
Transport	EU guidelines for the development of the trans-European transport network (TEN-T) represent the main piece of legislation on this issue alongside an EU Regulation	Indirect, preventing negative impacts on ecosystems. EU framework for transport builds on the assessment of	Union guidelines for the development of the trans-European transport network (Regulation EU/1315/2013) Funding to support TEN-T implementation

	outlining dedicated funding to support TEN-T implementation. In addition, support for transport and other infrastructure is provided under EU policy for cohesion and regional development (i.e. ERDF and CP). The above key documents do not make specific, direct links to possible negative impacts of transport on ecosystem services and natural capital. Implicit links are created through provisions to avoid negative impacts on nature and the environment (i.e. the impact assessment procedure).	negative impacts on environment. It also foresees the use of SEAs for policies and planning and the use of EIAs for projects to minimise impacts on ecosystems. These processes reduce impacts on the environment and biodiversity and indirectly on ecosystem services. There are currently no specific requirements to cover ecosystem services in the SEA and EIA directives however the official guidance documents supporting the implementation of the directives cover different aspects of ecosystem services.	(Regulation EU/670/2012). SEA Directive (2001/42/EC) EIA Directive (current 2011/92/EU and proposed COM/2012/628)

3.2 Identified needs and opportunities for further integration

This Chapter outlines the identified key gaps and future needs as regards the integration of ecosystem services and natural capital into different EU policy sectors. It also identifies and categorises a range of EU policy instruments – existing and potential – that can play a role in addressing gaps and supporting further integration.

The results are based on the review of the current level of integration and existing instruments summarised in section 3.1 above and outlined in detail in Annex 1. A discussion of the results is provided in Chapter 4, including providing some comparative considerations between different sectors.

Overview - the types of EU policy instruments available to support integration

Based on the policy review, a range of different types of EU instruments can be identified that either already support or, as in most cases, have a potential to support the integration of ecosystem services and natural capital into sectoral policies. These identified instruments are categorised in Table 2 and then outlined in further detail under the dedicated sections on sectoral policies below.

Information instruments: at the EU level, information instruments relevant in the context of ecosystem services and natural capital consist of common indicators for assessing the implementation of EU sectoral policies, EU-level databases and frameworks for monitoring, mapping and accounting, and a range of science-policy assessments supporting EU policy development.

Decision-support instruments: EU decision-support instruments can be further defined into instruments for planning and targeting, reporting, and impact and risk assessment / procedures. Planning and targeting instruments include regional management plans for implementing EU legislation (e.g. river basin and flood risk management plans) and programmes for targeting and implementing EU funding (e.g. RDPs). Furthermore, a range of restrictions affecting plans for sectoral and/or infrastructure developments are outlined in different EU directives. Instruments for reporting consist of different frameworks, procedures and assessments for reviewing the implementation and effectiveness of EU legislation (e.g. reporting for the implementation of EU directives, *ex-post* assessments of EU policy instruments). Finally, there are a number of

dedicated EU instruments aimed at assessing the impacts of policies, plans and projects in the EU, including environmental impacts. All EU policy instruments are underpinned by *ex-ante* impact assessments, and SEA and EIA procedures provide a basis for mitigating negative impacts of plans and (major) projects within the Union.

Implementation instruments: EU implementation instruments can be further defined into legislative instruments, instruments for EU public financing, EU protected areas (i.e. Natura 2000 sites), and market-based instruments supported in the EU context. Legislative instruments include different EU regulations, directives and decisions, including dedicated EU standards set forward by these instruments (e.g. CAP cross-compliance). A range of sector-specific instruments, such as EAFRD, ERDF, EMFF and LIFE, are in place to allocate financing from the EU budget towards policy implementation. In addition to public funding, an increasing number of market-based instruments are being explicitly supported at the EU level. Finally, the Natura 2000 sites form a "standardised" way for establishing protected areas in the EU context.

It is important to note that there are clear interdependencies - and also some overlaps -between the identified instruments and instrument categories. For example, the application of decision-support instruments depends heavily on the availability of information instruments such as indicators. Similarly, EU regulations and directives often form the basis - or set forward the very requirements - for other instruments such as indicators, and monitoring and reporting procedures. For example, requirements for establishing protected areas at the EU level stem from the Habitats and Birds Directives. Furthermore, regulations also form the basis for distributing funding from the EU budget to different sectoral policies.

The analysis of the existing EU policy instruments, as outlined in Annex I and summarised later in this chapter, shows a range of needs and opportunities for further integration. Most of the identified EU information instruments are still either being developed or they require further development in order to address ecosystem services and natural capital in a comprehensive manner. For example, no common framework yet exists to formally monitor and assess ecosystem services at the EU level (e.g. common indicators), though there is ongoing work on MAES (Mapping and Assessment of Ecosystems and their Services) to provide guidance for EU countries in how to map and assess the state of ecosystems and their services[2]. The existing EU level decision-support instruments, supported by dedicated official guidance, already provide a range of opportunities for integrating ecosystem services and natural capital into the decision-making processes. However, further development is required to make the integration more explicit and comprehensive. The existing implementation instruments provide (indirect) opportunities for the uptake of ecosystem services and natural capital in the context of different sectoral policies. However, as with decision-support instruments further development is required to make the integration more explicit and comprehensive.

[2] as required by Action 5 of the EU 2020 Biodiversity Strategy

Instrument category		Identified concrete EU instruments with relevance to ecosystem services and natural capital *See Annex 1 for more details*
Information instruments	Data, indicators, monitoring, mapping, accounting, science-policy assessments	• EU level databases (e.g. CORINE land cover, JRC soils database) • EU level indicators (e.g. EU agri-environment indicators, indicators for good ecological status of surface waters under WFD) • EU level monitoring and mapping frameworks (e.g. EU MAES initiative[3]) • EU level accounting frameworks (e.g. EU LULUCF[4] accounting for carbon sequestration, natural capital accounting (NCA) currently being developed by EEA) and the UN's System for Environmental and Economic Accounts (SEEA) • EU level science-policy assessments and science policy interfaces (SPIs) supporting policy development
Decision-support instruments	Planning and targeting, supported by indicators, monitoring and mapping	• Regional management plans implementing EU legislation (e.g. river basin management plans, flood risk management plans) • Programmes for targeting and implementing EU funding (e.g. rural development programmes, ERDF operational programmes) • Other mechanisms supporting planning and targeting (e.g. restrictions affecting planning of infrastructure developments outlined in EU directives)
	Reporting, supported by indicators, monitoring and mapping	• Reporting and review frameworks for EU legislation (e.g. reporting for the implementation of EU directives) • Ex-post assessments of EU policy instruments and related programmes (e.g. mid-term evaluations of EU funds)
	Impact assessment procedures and risk assessment and analysis	• Impact assessments (IA) underpinning the development of EU policies and legislation (e.g. *ex ante* assessments) • EU Strategic Environmental Assessment (SEA) and related guidance • EU Environmental Impact Assessment (EIA) and related guidance
Implementation instruments	Dedicated legislative acts, regulations & standards	• EU directives and regulations (e.g. WFD, MSFD, Habitats and Birds Directives) • EU criteria and standards for policy sectors (e.g. cross-compliance for direct payments under CAP)
	Protected areas (Natura 2000 network)	• Natura 2000 areas, established based on the EU Habitats and Birds Directives
	Public investment (EU budget)	• European Agricultural Fund for Rural Development (EAFRD) • European Maritime and Fisheries Fund (EMFF) • EU Structural and Cohesion Funds (ERDF, ESF, CP) • EU Fund for the Environment – LIFE
	Market-based instruments and certification	• Payments for ecosystem services (PES) • REDD+ • Offsetting schemes • Green public procurement (GPP)

[3] Mapping and Assessment of Ecosystems and their Services in Europe
[4] Land Use, Land Use Change and Forestry

		• Certification schemes
	Other	• Promoted / endorsed EU-wide practices (e.g. soil conservation practices)

Table 3 Identification and categorisation of the types of EU policy instruments (existing or being currently developed) that can support the integration of ecosystem services and natural capital into different policy sectors.

See Annex 1 for a detailed analysis.

Environment: Air

Key needs and opportunities: In addition to preventing air pollution, the role of well-functioning ecosystems in air quality maintenance should be integrated into the policy framework (both conceptually and operationally).

Key policy instruments to address needs and opportunities:

Information instruments:

- Developing indicators for nature-based air quality maintenance (physical and monetary)
- Developing spatial mapping of areas for air quality maintenance (national / regional level)
- Developing natural capital accounting for air quality maintenance (i.e. showing air quality and correlation to existence and development of natural capital (extent and type)

Decision-support instruments:

- Development of (old or new) instruments and procedures for planning, targeting and reporting on nature-based air quality maintenance
- Systematic integration of nature-based air quality maintenance into EIAs and SEAs

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance nature-based air quality maintenance, especially at urban scale where the problems with air quality are more pronounced. For example, integrating air quality maintenance into green infrastructure investment and developing urban PES schemes.
- Development of urban protected areas with air quality maintenance as one key strategic purpose.
- Developing No Net Loss framework / offsetting schemes for ecosystem services, including air quality maintenance.

Environment: Soil

Key needs and opportunities: There is a need to pursue the development of a comprehensive EU framework for operationalising soil quality maintenance (e.g. Soil Framework Directive). This includes further and more systematic integration of the protection and enhancement of soil ecosystem services (e.g. the protection of soils from erosion) into relevant sectoral policies (agriculture and rural development, water, regional development, climate, bioenergy etc.). There is also a need to support the development of spatial planning mechanisms to reduce and/or minimise soil sealing and urban sprawl. Finally, there is a need to develop effective mechanisms for remediation of contaminated soil and avoidance/minimisation of new soil contamination, with a view to restore soil ecosystem services.

Key policy instruments to address needs and opportunities:

Information instruments:

- Further development of indicators for soil ecosystem services (e.g. soil quality and structure maintenance, and maintenance of soil's ability to maintain water quality)
- Further development of the spatial mapping of areas important for soil ecosystem services (national and regional level)
- Development of means to report and catalogue soil contamination, with links to the related negative impacts on soil ecosystem services
- Developing means to monitor soil sealing rates
- Development of natural capital accounting for soil ecosystem services (notably soil carbon) including via LULUCF

Decision-support instruments:

- Development of (old or new) instruments and procedures for planning, targeting and reporting on the status of soil ecosystem services (e.g. prevention of soil erosion). For example, systematic integration of soil ecosystem services into reporting on CAP cross-compliance and under EAFRD RDPs.
- Systematic integration of soil ecosystem services into EIAs and SEAs
- Supporting the development of spatial planning policies and measures that reduce or minimise the rate of soil sealing and urban sprawl

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance soil ecosystem services, both at rural (e.g. maintenance and enhancement of soil functionality and erosion prevention) and urban (e.g. water permeability and water management) scale. For example: increasing investment in soil ecosystem services under EAFRD, integrating soil

ecosystem services into future PES schemes, and integrating considerations on soil ecosystem services into organic farming practises and certification schemes.

- Integrating objectives for soil ecosystem services into the management plans for rural Natura 2000 sites and other rural protected areas
- Mainstreaming the application of Environmental Liability Directive for protection of soil ecosystem services, as per the provisions already included in the Directive
- Developing a No Net Loss framework / offsetting schemes for soil ecosystem services, including soil quality maintenance

Environment: Water

Key needs and opportunities: In addition to providing standards and obligations for maintaining and restoring good water quality, there is a need to systematically integrate the role of well-functioning ecosystems in maintaining water quality into the policy framework. At operational level this implies that ecosystem-based approaches for managing water quality and quantity should be mainstreamed in the implementation of the Water Framework Directive (WFD) and its river basin management plans (RBMP). Similarly, ecosystem-based approaches for flood protection (i.e. natural retention areas) should be mainstreamed into the implementation of flood risk management plans under the Floods Directive, as foreseen in the Directive. In addition, information on ecosystems' water retention and purification ability should be integrated into the current framework for ground water protection and management.

Key policy instruments to address needs and opportunities:

Information instruments:

- Development of indicators supporting nature-based water management (e.g. indicators of wetlands' water retention and purification capacity)
- Further spatial mapping of areas important for water related ecosystem services (national and regional level)
- Development of natural capital accounting for water related ecosystem services, preferably at river basin or sub-river basin level to maximise utility

Decision-support instruments:

- Integrating ecosystem-based approaches for managing water quality and quantity into RBMPs
- Integrating nature-based flood protection into flood risk management plans
- Integrating information on ecosystems' water retention and purification ability into planning for ground water management
- Systematic integration of ecosystems' ability to capture nutrients and prevent eutrophication in the context of agriculture into agri-environment schemes under EAFRD, thus supporting the allocation of EU financing based on ecosystem services

- Systematic integration of aspects related to nature-based water management into EIAs and SEAs

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance water ecosystem services, both at rural and urban scale. For example, improving the integration of water ecosystem services into investment under ERDF, Cohesion Fund and EAFRD, and integrating water ecosystem services into future PES schemes.
- Integrating objectives for water ecosystem services into the management plans for Natura 2000 sites and other protected areas
- Mainstreaming the application of Environmental Liability Directive for protection of water related ecosystem services, as per the provisions already included in the Directive
- Developing a No Net Loss framework / offsetting schemes for water related ecosystem services, with links to water management
- Mainstreaming the application of the Environmental Liability Directive for the protection of water related ecosystem services, as per the provisions already included in the Directive

Agriculture and rural development

Key needs and opportunities: In addition to mitigating negative impacts on a number of ecosystem services and/or public goods (carbon storage, soil and water quality maintenance etc.), systematically and more explicitly integrating the understanding of well-functioning agricultural ecosystems and related ecosystem services into policy measures for sustainable production and food security. This should especially be the case with regard to the Member States' use of CAP direct payments and EAFRD funds.

Key policy instruments to address needs and opportunities:

Information instruments:

- Further development of indicators for soil and water related ecosystem services on agricultural land
- Developing and utilising indicators for other ecosystem services relevant to agricultural land, such as pollination, pest management etc.
- Further development of spatial mapping of important areas for soil, water, climate etc. ecosystem services (national and regional level). For example, developing ecosystem service mapping that can support the designation of Ecological Focus Areas (EFAs) under future CAP.
- Development of indicators and mapping supporting the development of natural capital accounting for ecosystem services on agricultural land, notably for soil carbon (via LULUCF framework), flood control and water purification.

Decision-support instruments:

- Systematically integrating spatial mapping and other data on ecosystem services into the data sets used for planning, targeting and reporting for agriculture and rural development expenditure under CAP - with explicit links to the maintenance of soil, water, climate, pollination etc. ecosystem services. This should apply to both CAP direct payments (reporting on greening measures and cross-compliance) and funding for rural development under EAFRD.
- Systematic integration of ecosystem service related considerations into EIAs and SEA when these assessments are applied in the context of agricultural land. Further uptake of EIAs at national level, including going beyond the compulsory list of development initiatives on agricultural areas outlined in the Directive.

Implementation instruments:

- Increasing the scale and effectiveness of public investment and/or developing market-based tools that maintain or enhance soil, water and climate etc. ecosystem services on agricultural land. For example, improving the integration of ecosystem services into EAFRD RDPs, integrating soil ecosystem services into future PES schemes, and integrating considerations of ecosystem services (soil quality maintenance, natural pest control etc.) into organic farming practices and certification schemes.
- Integrating objectives for ecosystem services into the management plans for rural Natura 2000 sites and other protected areas, for example with regard to maintaining populations of natural pollinators
- Developing a No Net Loss framework / offsetting schemes for ecosystem services on agricultural land
- Mainstreaming the application of the Environmental Liability Directive for the protection of ecosystem services on agricultural land (soil and water), as per the provisions already included in the Directive

Forest

Key needs and opportunities: The Treaty on the Functioning of the EU includes no specific provisions for an EU forest policy. However, there are ample opportunities for supporting the integration of ecosystem services into national policy frameworks through EU investments in forest ecosystem services under other EU sectoral policies. In addition to mitigating negative impacts on forest ecosystem services, there is also a need to systematically and more explicitly integrate the role of well-functioning forest ecosystems and related services in maintaining a sustainable forestry sector in the EU. This should especially be the case with regard to the Member States' use of EU funds (EAFRD, ERDF etc.).

Key policy instruments to address needs and opportunities:

Information instruments:

- Development of indicators for forest ecosystem services
- Spatial mapping of areas important for forest ecosystem services (national and regional level)
- Developing natural capital accounting for forest ecosystem services, with clear links to climate change mitigation, forest fire mitigation, flood risk management and sustainable forest biomass production

Decision-support instruments:

- Integrating nature-based means for mitigating forest fires and reducing flood risk into the mitigation, adaptation and management plans at EU level
- Integrating aspects of forest ecosystem services into relevant EU (sectoral) planning and decision-support frameworks (e.g. RDPs under EAFRD, RBMPs under WFD and operational programmes under ERDF and CF)
- Systematic integration of aspects related to forest ecosystem services into EIAs and SEA

Implementation instruments:

- Integrating ecosystem services into forest-environment measures under EAFRD
- Investment in nature-based solutions for water management under RBMPs and flood management plans
- Investment in nature-based solutions within forest sector under ERDF and CF (e.g. restoration of forest areas for water and flood management)
- Integrating objectives for ecosystem services into the management plans for forest Natura 2000 sites and other protected areas, including opportunities for climate change mitigation, flood risk management, water management, forest fire prevention and pest regulation

Marine and coastal (incl. fisheries)

Key needs and opportunities: In addition to providing standards and obligations for maintaining and restoring a good quality of marine ecosystems, there is a need to systematically and more explicitly integrate the role of well-functioning ecosystems in maintaining marine ecosystems - including sustainable fisheries - into the policy framework.

Key policy instruments to address needs and opportunities:

Information instruments:

- Developing indicators for marine ecosystem services

- Spatial mapping of areas important for marine ecosystem services (national and regional level)
- Developing natural capital accounting for marine ecosystem services, with links to marine spatial planning

Decision-support instruments:

- Development of (old or new) instruments and procedures for planning, targeting and reporting with explicit links to the maintenance of marine ecosystem services
- Systematic integration of marine ecosystem services into marine strategies under the Marine Strategy Framework Directive (MSFD) and for coastal water RBMPs under the WFD
- Considering opportunities to integrate ecosystem service based measures into the fish stock management and recovery plans in the context of the Common Fisheries Policy (CFP). For example, identifying and protecting important ecosystem services for the purpose of fish stock management (e.g. ecosystem's nursery functions and ability to maintain water quality)
- Systematic integration of marine and coastal ecosystem services into EIAs and SEA, with links to frameworks for marine and coastal spatial planning

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance marine and coastal ecosystem services. For example, improving the integration of marine ecosystem services into operational programmes under EMFF and integrating water related ecosystem services into possible future PES schemes developed for coastal areas.
- Integrating objectives for marine ecosystem services, such as ecosystem services supporting sustainable fisheries, into the management plans for marine Natura 2000 sites and other marine protected areas
- Developing a No Net Loss framework / offsetting schemes for ecosystem services for coastal areas and, depending on the feasibility, possibly also for marine areas
- Mainstreaming the application of the Environmental Liability Directive for the protection of water related ecosystem services for coastal areas, as per the provisions already included in the Directive
- Integration of ecosystem services into the implementation of the upcoming Marine Spatial Planning Directive

Regional development and cohesion

Key needs and opportunities: There is a need to improve the integration of ecosystem services and natural capital - as pro-active elements for sustainable regional development - into the policy framework. This can take place through mainstreaming investment in green infrastructure / nature-based solutions into the priorities for regional development (EU and national level). Furthermore,

there is a need to systematically assess possible negative impacts of EU regional development (Cohesion Policy) investment on ecosystems' function and ecosystem services, primarily by using the existing SEA and EIA procedures. To support this there is a need to develop instruments that can help to systematically mitigate the negative impacts of Cohesion Policy investment, including mapping of and provisions for protecting important areas for ecosystem services, instruments for screening possible negative impacts and - as a last resort - development of possible offsetting schemes for ecosystem services.

Key policy instruments to address needs and opportunities:

Information instruments:

- Development of indicators for all ecosystem services
- Spatial mapping of areas important for ecosystem services (national and regional level)
- Developing natural capital accounting for ecosystem services with links to the regional development, prosperity and employment

Decision-support instruments:

- Development of (old or new) instruments and procedures for planning, targeting and reporting on the impacts on / status of ecosystem services under the Cohesion Policy
- Development of instruments and/or procedures aimed at screening possible negative impacts of Cohesion Policy investment
- Systematic integration of ecosystem services in operational programmes defining the allocation of funding under EU investment in Cohesion Policy (ERDF, ESF and CP)
- Systematic integration of aspects related to ecosystem services into EIAs and SEA carried out in the context of EU investment in regional development

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance ecosystem services supporting regional development. For example, increasing investment in ecosystem services and related nature-based solutions under ERDF and CF.
- Development of PES schemes that support conservation and regional development. Integrating objectives for regionally important ecosystem services into the management plans for protected areas, including opportunities for recreation and tourism
- Developing a No Net Loss framework / offsetting schemes for ecosystem services related to infrastructure development
- Mainstreaming the application of the Environmental Liability Directive for the protection of ecosystem services in the context of infrastructure development, as per the provisions already included in the Directive

Climate

Key needs and opportunities: With regard to mitigation, there is a need to integrate the carbon sequestration and storage of all relevant ecosystems into the greenhouse gas accounting framework, i.e. going beyond the obligatory accounting for forest and agricultural land under the current LULUCF framework and integrating accounting for wetlands and possibly also marine ecosystems, given their importance in carbon storage and sequestration. With regard to adaptation, there is a need for systematic integration of ecosystem-based adaptation strategies into the EU policy framework, including climate change adaptation plans, targets and reporting.

Key policy instruments to address needs and opportunities:

Information instruments:

- Further development of indicators for carbon sequestration and storage (especially for wetlands and marine areas)
- Further development of spatial mapping of areas important for carbon (EU, national and regional level)
- Development of natural capital accounting for carbon sequestration and storage, feasible in both biophysical terms and potentially also monetary terms

Decision-support instruments:

- Integration of ecosystem-based adaptation into climate change adaptation plans, targets and reporting (EU and national level)
- Systematic integration of carbon sequestration and storage and ecosystem-based adaptation into EIAs and SEA

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance carbon sequestration and storage, and ecosystem-based adaptation - both in rural and urban areas. For example, improving the integration of climate and climate change adaptation related ecosystem services into agri-environment investment under EAFRD and investment in regional development under ERDF and CF. Furthermore, integrating climate related ecosystem services into future PES schemes.
- Integrating objectives for climate change mitigation and adaptation – especially objectives related to maintaining or increasing carbon storage - into the management plans for Natura 2000 sites and other protected areas
- Developing a No Net Loss framework / offsetting schemes relevant for mitigating and adapting to climate change, including carbon sequestration and storage and ecosystem services supporting ecosystem-based adaptation

Bioenergy

Key needs and opportunities: With regard to biofuels, there is a need to integrate impacts on ecosystem services more comprehensively into the bioenergy sustainability criteria. This includes taking into consideration 1) direct impacts of biofuel production on ecosystem services other than carbon sequestration and storage and 2) indirect land use impacts caused by biofuel production, including impacts on ecosystem services. With regard to solid biomass, there is a need for the development of dedicated sustainability criteria for biomass production (EU and/or Member States level). The development of such criteria should be done with due links to sustainable forest management practices, integrating impacts on ecosystem services.

Key policy instruments to address needs and opportunities:

Information instruments:

- Development of indicators reflecting the availability and status of ecosystem services that can then support the implementation of sustainability criteria
- Spatial mapping of ecosystem services (both supply and socio-economic importance) with links to direct and indirect land use changes caused by biofuel production

Decision-support instruments:

- Systematic integration of impacts on ecosystem services into decision-making processes (planning, targeting and reporting) related to bioenergy production and sustainability (EU, national, regional level)

Implementation instruments:

- For biofuels, widening the sustainability criteria to cover impacts on ecosystem services and integrating this criteria into voluntary sustainability schemes
- For solid biomass, development of (voluntary) sustainability criteria, with due links to sustainable forest management practises

Transport

Key needs and opportunities: There is a need for comprehensive integration of impacts on ecosystems' function and ecosystem services into impact assessments for transport initiatives and projects. There is also a need for additional policy instruments that help to mitigate – or as a last resort compensate for - negative impacts of infrastructure development on ecosystem services (e.g. screening tools, offsetting schemes).

Key policy instruments to address needs and opportunities:

Information instruments:

- Development of indicators for the availability and status of ecosystem services and spatial mapping of areas important for ecosystem services: this information could then be used in the context of avoiding negative impacts of transport and infrastructure developments

Decision-support instruments:

- Systematic consideration of possible impacts on ecosystem services in the context of EIA, SEA and other decision-making processes (planning, targeting and reporting) related to transport (EU, national and regional level)
- Development of new instruments and/or procedures aimed at screening possible negative impacts of infrastructure investment

Implementation instruments:

- Developing a No Net Loss framework / offsetting schemes for ecosystem services with links to infrastructure development
- Mainstreaming the application of the Environmental Liability Directive for the protection of ecosystem services in the context of infrastructure development, as per the provisions already included in the Directive

3.3 High level or horizontal policy initiatives supporting integration

This chapter outlines a number of high level policy initiatives that create needs and opportunities for the integration of ecosystem services and natural capital. A further discussion of these initiatives is provided in Chapter 4, including providing some considerations regarding their role across different policy sectors.

Green Economy: There is growing recognition among policy-makers (global and the EU) and private sector decision-makers that the current model of economic growth is socially, environmentally and economically unsustainable (ten Brink et al. 2014). This has sparked a renewed focus on the need for the international community to make a committed transition towards a “green” economy. Green economy refers to a shift to an economic model that significantly reduces environmental risks and ecological scarcities while improving human well-being and social equity (UNEP 2011). It is commonly defined by the following criteria: low carbon, resource efficient and socially inclusive.

Integrating the understating of nature's value into national, regional and local economies and into the functioning of different economic sectors is considered to form a critical part of the transition to a green economy, delivering multiple benefits that support economic growth and sustainability (ten Brink et al. 2012). While the transition to a green economy will take different paths for different countries - depending on an area's natural assets, economy and society, and priorities – ecosystem services and natural capital can be a key driver in this transition. The emphasis on green economy and related policy initiatives provides a clear rationale for integrating ecosystem services and natural capital into different policy sectors, both in the EU and globally.

Natural capital initiatives: The full contribution of nature to maintaining economic wellbeing and underpinning the functioning of different economic sectors (i.e. natural capital) is not factored into the national accounting systems that underpin GDP. This poor representation of natural capital is considered to be one of the key limitations of GDP. For example, while timber resources are counted in national accounts the other services of forests, such as carbon sequestration and water retention and purification, are not included.

A range of policy initiatives have been initiated to improve the integration of natural capital into the accounting frameworks, both at global and EU level (see Table 4). Natural capital accounts have the potential to help countries design strategies to improve the contribution of natural capital to country's economic growth while balancing trade-offs and creating synergies between different sectors. The System for Environmental and Economic Accounts Central Framework (SEEA-CF), adopted by the UN Statistical Commission in 2012, provides an internationally-agreed method for asset accounts - which can be in physical and monetary terms - for mineral and energy resources, land, soil resources, timber resources, aquatic resources, other biological resources and water resources (SEEA 2012). Of greater relevance to ecosystem services is the Experimental Ecosystem Accounting (SEEA-EEA) published in 2013. The SEEA-EEA aims to measure the ecosystem conditions - with a particular focus on carbon and biodiversity - and the flows of ecosystem services into economy and other human activities. Experimentation is ongoing to develop accounts that increasingly integrate natural capital (asset stocks) and the flow of ecosystem system services, including the World Bank's WAVES initiative, European Environment Agency's simplified Ecosystem Capital Accounts (ECA) (European Environment Agency 2011) and forthcoming guidance within the MAES initiative.

Reform of environmentally harmful subsidies (EHS): The EU is committed to removing or phasing out EHS in general by 2020 as also has a specific commitment to removing incentives harmful to biodiversity by 2020[5]. Regarding ecosystem services and natural capital, the continued existence of EHS is one of the reasons behind the inefficient use of natural resources that puts pressure on ecosystems and the services they provide. Reforming EHS can help to deliver a range of economic, social and environmental benefits (Oosterhuis and ten Brink 2014). EHS reform can

[5] EU's commitment to the global 2020 biodiversity targets (Aichi Target 3)

help to address the negative impacts of subsidies on ecosystem services and natural capital by avoiding over-extraction of resources (e.g. fisheries) and related negative impacts. EHS reform also offers opportunities to release public funds and/or raise funds for policy objectives such as investment in maintaining and/or restoring ecosystem services and adopting nature-based solutions (ten Brink et al. 2014). Finally, EHS reform can provide incentives for (eco-) innovation and may lead to the development of new markets/niches, including innovations and markets building on ecosystem services. Consequently, EHS reform is generally considered to be an integral part of a transition to green economy, as described above.

EU Resource Efficiency: The flagship initiative for a resource-efficient Europe under the Europe 2020 strategy supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. The implementation of the EU biodiversity strategy for 2020 is considered as an integral part of EU resource efficiency. The initiative recognises that resource efficiency is needed to protect valuable ecological assets and the services they provide. In other words, the initiative recognises that mainstreaming aspects of resource efficiency into sectoral policies can reduce the pressures on ecosystems and their services. Furthermore, the initiative builds on the understanding that interlinkages (increasing synergies and reducing trade-offs) between a range of sectoral policies are required to achieve resource efficiency. This provides a basis for developing nature-based solutions to improve both the resource efficiency and sustainability of a sector.

EU No net loss (NNL) of biodiversity: As one of its objectives, the EU Biodiversity Strategy to 2020 seeks to ensure no net loss of biodiversity and ecosystem services (Target 2, Action 7). The overall objective of the NNL initiative is to support the implementation of Target 2 of the Biodiversity Strategy which states that by 2020 ecosystems and their services should be maintained and enhanced by establishing Green Infrastructure (see below) and by restoring at least 15% of degraded ecosystems. It is possible to interpret the EU objective of ensuring NNL of biodiversity and ecosystem services in the EU in a number of ways, which have considerably different implications for both biodiversity and ecosystem services and any consequent policy requirements. The latest policy assessment by Tucker et al. (2013) for the European Commission concludes that to achieve the EU's headline biodiversity target to halt the loss of biodiversity and ecosystem services by 2020 it seems necessary to take steps to achieve both NNL of biodiversity and NNL of ecosystem services, i.e. having two NNL conditions for the EU.

EU green infrastructure (GI): The EU Biodiversity Strategy to 2020 also seeks to restore and promote the use of green infrastructure (Target 2, Action 6). GI is an EU biodiversity policy initiative defined as a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. In other words, GI aims to create an overall spatial framework for maintaining and enhancing the availability of ecosystem services at the EU level, building on the EU objectives and policies for biodiversity conservation. While protected areas (e.g. the Natura 2000 network) are considered to play an integral role in developing an EU-wide GI network it is also foreseen that enhancing the

maintenance of biodiversity and ecosystem services outside protected areas - through a range of sectoral policies - plays a key role in the GI implementation. Consequently, the integration of ecosystem services into different EU policy sectors is a key for the successful implementation of the EU GI policy. For example, a dedicated EU guidance has been developed to communicate how nature based solutions can support the Cohesion Policy objectives (IEEP and Milieu 2013).

Policy initiative	Description	Reference
Green economy	UNEP defines a green economy as "*one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive*". Integrating understating of nature (e.g. costs and negative wellbeing impacts related to the loss of biodiversity and ecosystem services, opportunities provided by nature-based solutions, "green" jobs and innovations etc.) into economy and the functioning of different economic sectors is considered to form a critical part of the transition to a green economy, delivering multiple benefits that support economic growth and sustainability.	UNEP (2011) ten Brink et al. (2012)
Natural capital initiatives	A key limitation of GDP is the poor representation of natural capital. The UN Statistical Commission adopted the System for Environmental and Economic Accounts (SEEA) Central Framework in 2012 and the SEEA Experimental Ecosystem Accounting (SEEA-EEA) published as a white cover publication in 2013. SEEA-CF provides an internationally-agreed method to create, inter alia, asset account for material natural resources like minerals, timber and fisheries. The SEEA-CF includes accounts of flows in physical terms for energy, water, material flows, air emissions, waste water and solid wastes. The accounts for material flows also include emissions to water. The SEEA-CF also includes environmental activity accounts and related flows for environmental protection expenditures, the environmental goods and services sector, environmental taxes and environmental subsidies. This third category of accounts is not part of natural capital accounts, as it does not measure environmental resources. Finally there are also combined physical and monetary accounts, providing the framework for the derivation of indicators such as resource efficiency and productivity, and linking the physical flows with the monetary flows. The SEEA-EEA goes beyond the SEEA-CF and looks to include wider natural capital and ecosystem services as well as ecosystem condition. The SEEA-EEA offers a synthesis of the current knowledge of ecosystem accounting and serves as a platform for its development at national and sub-national level. It provides a common set of terms, concepts, accounting principles and classifications, and an integrated accounting structure for ecosystem services and characteristics of ecosystem condition, in both physical and monetary terms. It also includes a chapter on the main challenges and methodological options for the monetary valuation of ecosystems and ecosystem services Several initiatives such as Wealth Accounting and the Valuation of Ecosystem Services (WAVES) are taking place to experiment and develop the SEEA-EEA framework, by including a range of regulating ecosystem services and other natural resources that are not traded or marketed.	SEEA (2012) WAVES (2012) Russi, D. and ten Brink P. (2013)
Reform of environmentally harmful subsidies (EHS)	The EU has a long-standing commitment to removing or phasing out EHS. The need to phase out EHS is reiterated in the EU resource efficiency initiative (below) with a milestone for phasing out EHS by 2020. This commitment has also been integrated into the EU 2020 Biodiversity Strategy (Target 6, Action 17). Commitments to reform have also been adopted at the global level, for example in the context of the Convention on Biological Diversity (CBD) and the G20. Commitments have also been adopted at the national, local and regional level. An EHS reform toolkit has been developed in the context of Aichi Target 3 and it is being applied by several countries and regions in the EU (Oosterhuis and ten Brink 2014). This tool focuses on environmental, social and economic benefits of EHS reform.	EU Resource efficiency flagship initiative under the Europe 2020 Strategy (COM/2011/21) EU Biodiversity Strategy (COM/2011/244) Withana et al. (2012) Oosterhuis and ten Brink (2014) and ten Brink et al (2014 therein)
EU Resource efficiency initiative	The flagship initiative for a resource-efficient Europe under the Europe 2020 strategy supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. The flagship initiative creates a framework for policies to	EU Resource efficiency flagship initiative under the Europe 2020

	support the shift towards a resource-efficient and low-carbon economy. As such it provides a long-term framework for actions in many policy areas, including climate change, energy, transport, industry, raw materials, agriculture, fisheries, biodiversity and regional development. Resource efficiency is one of seven flagship initiatives as part of the Europe 2020 strategy aiming to deliver smart, sustainable and inclusive growth in the EU.	Strategy (COM/2011/21)
EU policy objective for No net loss (NNL) of biodiversity	As one of its objectives, EU Biodiversity Strategy to 2020 seeks to ensure no net loss (NNL) of biodiversity and ecosystem services (Target 2, Action 7). This consists of developing a methodology for assessing the impacts of EU funded projects, plans and programmes on biodiversity, and proposing an EU initiative to ensure there is no net loss of ecosystems and their services (e.g. through compensation or offsetting schemes). The overall objective of the NNL initiative is to support Target 2 which states that 'By 2020, ecosystems and their services are maintained and enhanced by establishing Green Infrastructure and restoring at least 15% of degraded ecosystems'.	EC (2014) No Net Loss initiative EU Biodiversity Strategy (COM/2011/244) Tucker et al. (2013)
EU green infrastructure (GI) initiative	As one of its objectives, the EU Biodiversity Strategy to 2020 seeks to restore and promote the use of green infrastructure (Target 2, Action 6). GI is an EU biodiversity policy initiative defined as a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.	Commission Communication on Green Infrastructure (GI) (COM/2013/249)

Table 4 Broad (non-sectoral) EU policy initiatives that can support the integration of ecosystem services and natural capital into (sectoral) policies

4. Discussion and conclusions

4.1 Opportunities across EU policy sectors and policy instruments

The results of the review indicate that no individual EU policy sector and/or policy instrument can ensure adequate outcomes in terms of protecting, maintaining and sustainably using ecosystem services – with foreseen benefits to biodiversity conservation - in the EU. The review rather suggests that further integration of ecosystem services and natural capital is required across a range of relevant EU policy sectors, by using a range of different policy instruments.

In general, there is an apparent lack of information instruments for ecosystem services and natural capital at the EU level, including lack of EU-level data, EU indicators for ecosystem services (general and sector specific), and common frameworks for monitoring, mapping and accounting. While some of these aspects are currently being developed (e.g. EU MAES and EEA natural capital accounting initiatives) there is an urgent need to improve the EU framework of information instruments for ecosystem services that underpin the development and implementation of all EU sectoral policies. While the existing EU decision-support and implementation instruments already provide a range of opportunities for integrating ecosystem services and natural capital into the policy implementation processes, further development is required to make the integration more explicit and comprehensive. Some of these instruments are discussed in more detail below.

The appropriate scope and extent of further integration depends on the policy sector. For example, in the context of bioenergy and transport the most appropriate scope for integration seems to be avoiding negative impacts on ecosystem services and natural capital, whereas other policies such as air and water management, agriculture, fisheries and regional development should aim to both prevent negative impacts and also promote the uptake of ecosystem services and nature-based solutions. Increasing the level of (operational) integration can be done either by improving the integration of ecosystem services and natural capital into the existing policy instruments or by adopting additional instruments. In general, integration is often facilitated by using already existing instruments and processes: there is already a community of practice applying these instruments and focusing on existing policy instruments can avoid perceptions of an additional burden. The use of existing and formally endorsed instruments - such as EU impact assessment procedures and existing EU regulations, standards and funds – is a promising way forward. However, it is also foreseen that some novel instruments are required to secure an appropriately comprehensive integration of ecosystem services into the EU policy framework. This includes the development of novel information instruments (ecosystem service mapping, natural capital accounting etc.) but

also some new market-based instruments, such as PES and offsetting schemes, to support decision-making and policy implementation.

The existing EU framework for planning, targeting and reporting on policy implementation (instruments and processes) seem to provide a solid basis for further integration of ecosystem services across different sectoral policies. The existing regional management plans implementing EU legislation and programmes for targeting and implementing EU funding provide a clear entry point for ecosystem service related considerations (e.g. river basin management plans, flood risk management plans, regional marine strategies, rural development programmes, ERDF operational programmes). These existing instruments can be used to both avoid negative impacts of planned developments and/or resource use on ecosystem services and to encourage proactive uptake of ecosystem services and nature-based solutions. Similarly, a systematic use of EU impact assessment (IA) and environmental assessment (SEA and EIA) procedures to screen negative impacts on ecosystem services should ensure much better operational integration of ecosystem services into policy implementation in the future.

Protected areas are primarily an instrument for implementing biodiversity policy objectives. Integrating ecosystem services into the further development and management of the EU's Natura 2000 network is considered to be a valuable means of attracting support and funding for the network (Kettunen and ten Brink 2013), this way supporting its implementation. Furthermore, protected areas can also play a key role in the implementation of several other policy objectives, including for example sustainable regional development (green jobs, tourism and recreation etc.), water and air (nature-based solutions for water and air purification), and agriculture, fisheries and food security (maintenance of pollinators and fish stocks etc.). Using protected areas as an instrument for ecosystem service integration – while remaining true to the conservation objectives – can therefore also play an integral role in supporting a concrete uptake of ecosystem services across different EU policy areas, supporting both sustainability and resource efficiency.

As regards more novel instruments in the EU policy context, payments for ecosystem services (PES) are commonly considered to be a potentially very important for ecosystem services, helping to create economic incentives for due management and delivery of services. The scope for the use and added value of PES will be context dependent, including reflecting institutional arrangements and stakeholder attitude towards market based instruments. Globally, PES have been used particularly to support water and climate policies, often with links to agricultural land use and forestry. Clean water provision, flood control, and carbon sequestration are the services most often the focus of PES. These policy areas and ecosystem services are considered to be the most promising also in the context of EU. This is a relatively new instrument and it is important to understand where it can offer added value, and where other instruments may be more appropriate, as economic instruments are only one instrument in the toolkit available to policy makers.

Given the EU policy goals for NNL (see below), it is foreseen that the demand for offsetting schemes for biodiversity is likely to increase in the future. The integration of ecosystem services into the offsetting schemes is essential if the EU NNL policy is to respond to the EU 2020 biodiversity target (i.e. halt the loss of biodiversity *and* halt the degradation of ecosystem services) while facilitating synergies and avoiding trade-offs between biodiversity and ecosystem services. The risks, opportunities and added value of an NNL policy (or policies) for biodiversity conservation depend on the how broad or precise the NNL concept is defined and how the related offsetting instruments are operationalised.

4.2 Opportunities created by high level and horizontal policy initiatives

High level and horizontal policy initiatives can create important opportunities for progress on the integration of ecosystem services into EU sectoral policies. As noted above, there are high level and/or horizontal commitments under the transition to Green Economy, improving resource efficiency, proceeding with the EHS reform and supporting investment in green infrastructure and nature-based solutions. All of these initiatives create opportunities – and also needs - for improving the integration of ecosystem services into sectoral policies and creating positive incentives for biodiversity. There are also commitments to natural capital accounting, supporting the development of an appropriate knowledge base for integrating ecosystem services into policies and decision-making processes.

The emphasis on green and resource efficient economy provides a clear policy rationale for integrating ecosystem services and natural capital into a range of different policy sectors, both in the EU and globally. Such integration consists of making the costs related to the loss of biodiversity and ecosystem services an integral part of the functioning of economic systems, including both economic costs and negative impacts to broader wellbeing. Furthermore, it entails pro-actively encouraging the uptake of opportunities provided by nature-based solutions, “green” jobs and innovations in a range of sectoral policies such as air and water management, agriculture, fisheries, forestry, climate and regional development. This further provides a basis for developing green infrastructure for ecosystem services and nature-based solutions, including with a view to improve the resource efficiency and long-term sustainability of different policy sectors. For example, water saving measures and increasing water efficiency are considered a future priority, creating opportunities for ecosystem services based water management. Similarly, protecting the abundance and diversity of natural pollinators is likely to a far more cost-effective way for maintaining pollination and food security than having to replace this service by artificial alternatives. The integration of ecosystem services into different EU policy sectors is key to the successful implementation of the EU green infrastructure policy. In practice this entails, for example, further developing a range of policy instruments for ecosystems services, e.g. identifying

key ecosystems and/or areas for ecosystem services and providing investment in the maintenance or restoration of these important services and areas.

To date there has been little integration of ecosystem services into the EHS reform, including the evidence base and concrete tools supporting the reform (e.g. EHS reform toolkit, see Table 4). However, the situation is changing with the growing evidence base on the ecosystem service impacts from incentives harmful to environment and biodiversity. The integration of ecosystem services and natural capital into the EHS reform is foreseen to improve both the likelihood for reform (i.e. by creating a stronger evidence base) and the potential benefits of the reform to biodiversity, ecosystems and related services. EHS reform is also a key element in a transition to green economy (above), supporting sustainable and resource efficient management of natural resources and making financial support available for green investment.

While the EHS reform offers benefits across the environmental spectrum, direct benefits are particularly expected within EU fisheries policy, where a range of explicit and implicit subsidies adversely affect both the sustainability of fish stocks and the status of biodiversity and marine and coastal ecosystem services. In the context of EU agriculture, subsidies for irrigation have in places led to the use of water intensive crops which have resulted in reducing the amount of water accessible to the ecosystem, with negative impacts on biodiversity and ecosystem services. As for bioenergy, EU subsidies for biofuels have so far failed to integrate the possible negative effects of biofuel production to ecosystem services. Similarly, supporting forestry without due consideration of the wider wellbeing value of forest ecosystems (e.g. carbon storage, cultural services) can *de facto* incentivise unsustainable resource management at the expense of biodiversity and ecosystem services. Integrating the consideration of ecosystem services into EHS assessments and the development of road maps for reform will help inform sustainable sectoral policies and their implementation.

Natural capital accounting for a broad range of ecosystem services could contribute to the sustainability of different sectors by providing a comprehensive framework for an ongoing assessment of the status of ecosystem services and natural capital. The existing high level commitments create an opportunity for integrating natural capital and ecosystem services into the SEEA instrument, which is currently in a formal experimentation and development stage. There are current challenges as regards data for biophysical values of assets and ecosystem service flows and – even more so – as regards monetisation given issues of site-specificity of values. Consequently, there is a window of opportunity for research work on the integration of natural asset stocks and flows of services, through biophysical and monetary indicators, to help to inform and support the SEEA tools development. There is also a need for clarity as regards the limits of natural capital accounting including, for example, the complementary instruments needed to ensure that ecosystem services not covered by the accounting frameworks are also fully integrated into policies and decision-making.

An immediate promising policy area for the integration of natural capital and ecosystem services in the accounting framework is that of the EU climate policy, building on insights on carbon storage and sequestration in soils and vegetation. Given the global value of carbon, not only can biophysical indicators of carbon stock and annual carbon sequestration be used, but also economic values for sequestration (or degradation) can be integrated into the accounts. The EU water policy can also benefit from the development of accounting frameworks: river basin water accounts can help show the relation of water quantity and quality and the state and location of ecosystems performing natural water management, thus supporting river basin management plans and management of water resources (Russi et al. 2013). Building on the above, regional development within the EU could also benefit from accounting, notably where regions have policies of carbon neutrality and data on carbon, and where regional ecosystems are important sources of clean water provision for cities. The EU agricultural policy can also be supported by the development of natural capital and ecosystem services accounts, by linking land management practices to service provision (carbon storage, water purification and flood control). This requires, however that the data is sufficiently precise (i.e. supporting farm level information). Fisheries and forestry, accounting are also valuable to help identify sustainable yields and - where wider services of forest, marine and coastal ecosystems are integrated – support sustainable management practices.

It is to be noted that the development of natural capital accounts provides limited direct benefits to biodiversity. This is because the accounting systems cannot integrate the richness and complexity of biodiversity, only at most – make links to key biodiversity indicators. While direct benefits are less certain, the indirect benefits to biodiversity of integrating natural capital and ecosystem services are more promising. Well-functioning ecosystems that are in ecological status - supported by information on the status and flow of ecosystem services they provide - should generally[6] also help to maintain biodiversity values.

Finally, given the current EU biodiversity policy objectives there is a need to develop NNL policies that also incorporate ecosystem services, supported by mechanisms to offset negative impacts. The availability and importance of ecosystem services is very context dependent: biophysical settings determine the availability of a service whereas its socio-economic importance is determined by its beneficiaries. Furthermore, there are often trade-offs between the maintenance and delivery of different services, both in terms of maintaining their biophysical supply and stakeholders benefiting from different services (e.g. provisioning and regulating services). Therefore, it seems appropriate to identify and set NNL objectives for ecosystem services individually and on a case-by-case basis (Tucker et al. 2013). This could mean, for example, aiming for strict sustainability of the most important and irreplaceable services but allowing appropriate trade-offs for others. Finally, it is considered crucial to ensure that all NNL policies – from EU to regional and local level and the implementation of associated measures - are in

[6] There are clearly exceptions, e.g. where ecosystems perform their key functions but are managed for a specific service (e.g. timber or carbon)

accordance with the principles of mitigation hierarchy[7]. When offsetting of unavoidable negative impacts is to be carried out it should always aim to achieve 'like-for-like-or-better' outcomes. Given that the development of NNL policy in the EU is currently ongoing, it is of high importance to support the appropriate integration of ecosystem services into this policy concept and related instruments.

4.3 Conclusions

The results of this review clearly show that there are a range of gaps – both in terms of needs and opportunities - in the current integration of ecosystem services and natural capital into the EU policy framework. While a number of relevant EU policies have, at least partially, integrated ecosystem services and natural capital into their conceptual basis (i.e. key policy documents outlining the overall scope of a policy) the uptake of these concepts in the context of concrete policy instruments is generally far weaker. There seems to be room for improvement both in terms of preventing possible negative impacts of sectoral policies on ecosystem services and also proactively supporting the uptake of ecosystem services through nature-based solutions that support both biodiversity and sectoral policy objectives.

The identified gaps in the level of integration imply that the EU policy sectors are currently underperforming as regards their contribution to achieving the EU biodiversity targets to halt the loss of biodiversity and degradation of ecosystem services by 2020. Given the increasing knowledge of the importance and value of ecosystem services and natural capital to human wellbeing, the lack of integration also suggests that the EU sectoral policies are not as sustainable as they could – or indeed should – be.

This assessment has focused on reviewing frameworks for sectoral polices only at the EU level. In order to materialise in practice, the identified opportunities for integration of ecosystem services and natural capital need to be taken up by EU Member States at national and regional level. This applies, for example, to the identified opportunities for public investment in ecosystem service related measures by different EU funding instruments. Aspects related to this most concrete "stage" of operationalising ecosystem services (i.e. actual implementation on the ground and responses to non-compliance) are recommended to be looked into in more detail in the future, e.g. in the context of future work under the OPERAs project.

It can be concluded that there is a potential for greater conceptual integration (i.e. explicit acknowledgement of the importance of nature, ecosystem services and natural capital in sectoral

[7] The principles of the mitigation hierarchy state that the implementation of the NNL initiative should focus firstly on measures that primarily avoid or reduce negative impacts on biodiversity. Offsetting of negative impacts should only be used as the last resort and it should not be interpreted as a 'licence to trash nature'.

policy premises and objectives) and operational integration (i.e. use of instruments to ensure that policy objectives are implemented) at the EU level. In addition to integration, monitoring the impacts of policies will be essential, to create concrete evidence base to inform policy development and/or refinement. This requires investment in a science policy interface that can take into account both developments in the knowledge base and policy implementation Furthermore, practical insights from case examples and insights on macro level progress will inform further policy uptake of natural capital and ecosystem services, supporting the progress of integration.

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Annex 1 Mainstreaming ecosystem services and natural capital into EU policies: current status and future opportunities - A policy brief

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With support from OPERAs WP4 team

Ecosystem services: theory and practice

It is almost ten years since the Millennium Ecosystem Assessment planted the concept of ecosystem services - and their value to human well-being - firmly on the global biodiversity policy agenda. In the intervening time, the concept has achieved substantial traction, reflected in the widespread discussions about the value of ecosystems - e.g. their impacts on human health and their role in water provision - and as a means of offering nature-based solutions to local and regional development objectives (see Figure 1). National biodiversity strategies and action plans have been steadily updated to reflect this shift in focus[8] and efforts to incorporate natural capital (see Box A) are afoot in numerous countries, with support from international bodies.[9]

Despite backing for the concept in theory, ecosystems and their services have often not yet been integrated into mainstream political decision-making processes. The translation of the concept into tangible policy outcomes, therefore, has proven to be challenging.

There are a multitude of reasons for this. The site-specific nature of most benefits means that one cannot be sure in advance of the nature and scale of benefits offered by natural capital to the economy and wellbeing. In addition, while many ecosystem services are public goods, decisions are often driven by optimising private interests. Thirdly, benefits of ecosystems flow over long periods of time, decision-making tends to be short-term. Finally, uncertainty remains as to the link between the simultaneous delivery of ecosystem services and biodiversity, with evidence pointing towards highly site-specific interactions that can be difficult to address through generic policies and policy measures.

[8] UNEP-WCMC & IEEP (2013) *Incorporating biodiversity and ecosystem service values into NBSAPs. Guidance to support NBSAP practitioners*. Funded by Defra and in collaboration with the CBD Secretariat.
[9] http://unstats.un.org/unsd/envaccounting/seea.asp

Box A. Glossary of terms

Ecosystem services: the contributions that ecosystems make to human well-being[10] – where an ecosystem is a dynamic complex of plant, animal and micro-organism communities and the non-living environment interacting as a functional unit.

Natural capital: an economic metaphor for the limited stocks of physical and biological resources found on earth. Natural capital stocks provide flows of ecosystem services.[11]

Green infrastructure: Green infrastructure is defined as a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue in the case of aquatic ecosystems) and other physical features in terrestrial (including coastal) and marine areas. On land, Green Infrastructure is present in rural and urban settings.[12]

Nature-based solutions: concrete approaches for the management of natural resources that build on the understanding of ecosystem services and natural capital, such as conservation and restoration of wetlands for water purification, conservation of ecosystems' carbon storage to mitigate climate change etc.

The gaps in understanding have been in part reduced by assessments of the contribution of ecosystems to wellbeing[13] and the economy at large. Nevertheless, opportunities are being missed to integrate these concepts into sectoral policies with a view to creating "win-win" solutions for sectoral development and biodiversity conservation. A vital step, therefore, is the integration or "mainstreaming" of ecosystem service and natural capital concepts into policy.

Mainstreaming ecosystem services and natural capital concepts

"Biodiversity mainstreaming" is a term often used to refer to the integration of biodiversity and ecosystem service considerations into sectoral and cross-sectoral decision-making (see Box B). Experience from environmental mainstreaming efforts demonstrates that it relies upon effective cross-sector collaboration between different policy areas. Mainstreaming is often led by the environmental sector – at times the politically "weakest" sector - while the benefits are experienced across a range of sectors. Therefore, the strengthening of actions between policy sectors and associated public and private institutions plays a key role in biodiversity mainstreaming.

Box B. What is mainstreaming?

Mainstreaming is often used to refer to actions that not only ensure the application of "safeguards" to ensure that

[10] Towards a Common International Classification of Ecosystem Services - CICES Version 4.3, http://cices.eu/ accessed on 4.7.2013

[11] ten Brink P., Mazza L., Badura T., Kettunen M. and Withana S. (2012) Nature and its Role in the Transition to a Green Economy, UNEP TEEB, http://www.teebweb.org/wp-content/uploads/2012/10/Green-Economy-Report.pdf, accessed on 4.7.2013

[12] http://ec.europa.eu/environment/nature/ecosystems/

[13] Kettunen, M. et al (2013) *Socio-economic importance of ecosystem services in the Nordic Countries*. Nordic Council of Ministers, Copenhagen; Russi D. et al (2013), *The Economics of Ecosystems and Biodiversity for Water and Wetlands*, London: IEEP/Gland: Ramsar Secretariat.

development processes do no harm to biodiversity (sometimes referred to as “biodiversity proofing”) but go further to ensure the potential of biodiversity to achieve desirable outcomes is fully factored into decision-making processes.

Mainstreaming is therefore not about creating parallel processes but about integrating biodiversity and ecosystem services into existing sectoral (e.g. agriculture, fisheries, energy etc.) and cross-sectoral (e.g. trade, sustainable development, climate change adaptation and mitigation etc.) policies, structures, processes and systems. It is as much a political issue – requiring institutional change - as a technical one.[1]

Mainstreaming ecosystem services and natural capital into EU policies – insights from OPERAs

OPERAs is a European research project financed by the seventh EU framework program for research and development (FP7). The project seeks to establish whether, how and under what conditions the ecosystem services concepts can move beyond the academic domain towards better informed policy decisions and practical implementation in support of sustainable ecosystem management.

Under Work Package 4, the project has been investigating (a) the *existing integration* of ecosystem services and natural concepts into key EU policy areas and (b) the needs and opportunities for *further integration*.

This policy brief outlines the findings of the above assessment as regards to three current and topical EU policy areas:

a. Water management;
b. Agriculture and rural development; and
c. Regional development & cohesion.

In order to assess the level of integration, two different levels of integration were identified: conceptual integration and operational integration. **Conceptual integration** refers to the extent to which the concepts of ecosystem services and natural capital have been recognised in the *premises* of a given sectoral policy (stated policy objectives and scope etc.). **Operational integration**, on the other hand, refers to the existence of concrete policy instruments to operationalise the concepts (dedicated pieces of legislation and funding instruments etc.). The level of operational integration has been assessed taking into consideration both instruments aimed at preventing harm to biodiversity and ecosystem services and instruments aimed at proactively maintaining and enhancing ecosystem services and natural capital.

To explore the instruments enabling integration, a classification was developed to disaggregate the different types of EU policy instruments. Three different – but interlinked - categories of instruments were identified, based on the conceptual framework being developed in the context of OPERAs. These include:

- **Information instruments** – data, indicators, monitoring, mapping, accounting, science-policy assessments.
- **Decision-support instruments** – planning tools (e.g. River Basin Management Plans), reporting frameworks (e.g. requirements under the Directives), and impact and risk assessment procedures.
- **Implementation instruments** – dedicated legislative acts/regulations/standards, protected areas, public investment, and market-based instruments & certification amongst others.

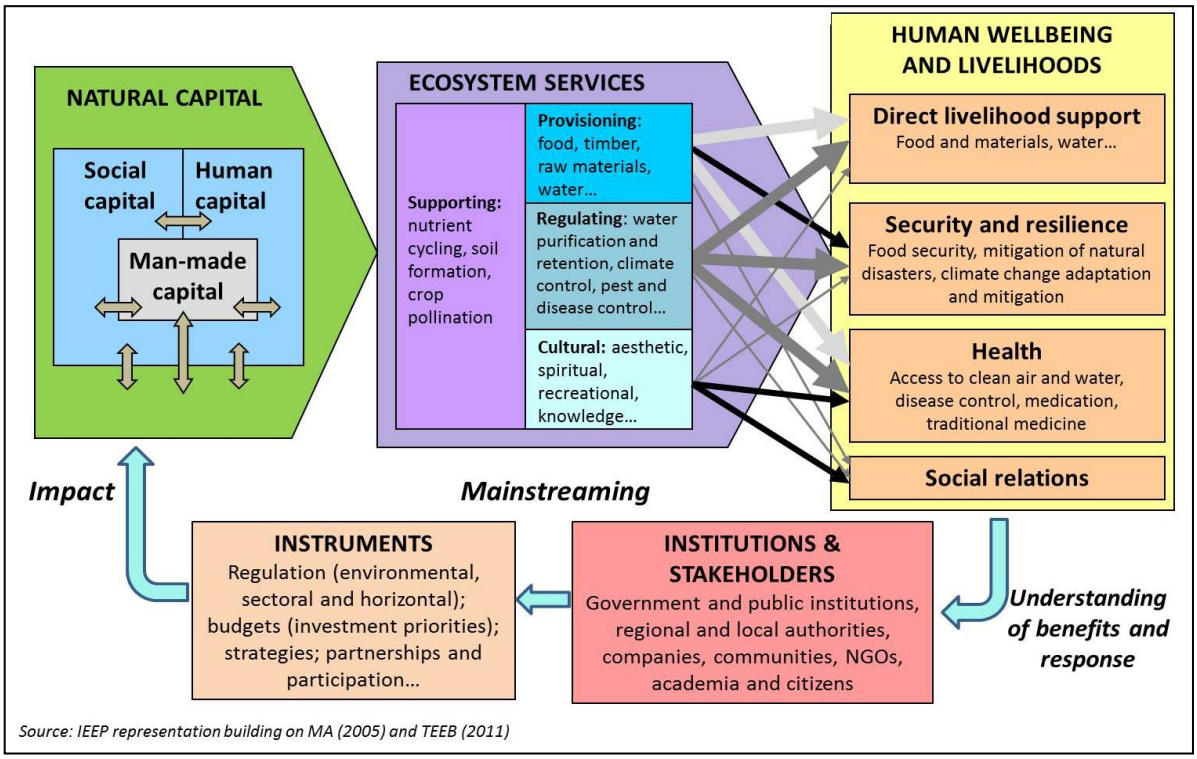

Figure 1. Relationship between natural capital, ecosystem services and wellbeing – and the interaction with policy[4]

ARROW COLOUR: The darker the arrow, the less the opportunities for substitution. **ARROW WIDTH**: Intensity of linkages between ecosystem services and human well-being.

Water management

Existing integration

On a **conceptual basis**, ecosystem services and natural capital are integrated into the policy. The EU's current policy framework for water[14] explicitly addresses ecosystem services, highlighting the importance of green infrastructure in cost-effective water management. It also acknowledges the need to better include the value of water in pricing and to develop new economic incentives.

Operational integration lags somewhat behind. The Water Framework Directive (WFD), for instance, places an emphasis on maintaining and restoring water quality but does not explicitly refer to the role ecosystem services play in maintaining these services. The issue is dealt with indirectly, by aiming to secure the good quality of water ecosystems (including their functioning) which in turn supports the maintenance of ecosystem services. The Floods Directive does include specific requirements to consider natural retention areas in flood management and, therefore, recognises the flood mitigation services these areas provide. However, it is not clear how well such nature based measures are mainstreamed into the implementation of the Directive.

Opportunities for further integration

In addition to providing standards and obligations for maintaining and restoring good water quality, there is a need to systematically integrate the role of well-functioning ecosystems in maintaining water quality into the policy framework. At operational level this implies that ecosystem-based approaches for managing water quality and quantity should be mainstreamed in the implementation of the WFD and its river basin management plans (RBMP). Similarly, ecosystem-based approaches for flood protection (i.e. natural retention areas) should be mainstreamed into the implementation of flood risk management plans under the Floods Directive. In addition, information on ecosystems' water retention and purification ability could be integrated into the current framework for ground water protection and management.

Examples of concrete instruments, identified in the context of the assessment, which could further support integration of ecosystem services and natural capital into the EU water policy are outline below.

Information instruments:

- Development of indicators supporting nature-based water management (e.g. indicators of wetlands' water retention and purification capacity);
- Further spatial mapping of areas important for water related ecosystem services (national and regional level);

[14] Blueprint to Safeguard Europe's Water Resources (COM(2012) 673 final)

- Development of natural capital accounting for water related ecosystem services, preferably at river basin or sub-river basin level to maximise utility.

Decision-support instruments:

- Integrating water related ecosystem services explicitly into WFD RBMPs;
- Integrating nature-based flood protection into flood risk management plans (see Box C);
- Integrating information on ecosystems' water retention and purification ability into planning for ground water management;
- Incorporating ecosystems' ability to capture nutrients and prevent eutrophication into Rural Development Plans under EU Common Agricultural Policy (CAP RDPs);
- Systematic integration of nature-based water management into the implementation of EU Environmental Impact Assessments (EIAs) and Strategic Environmental Assessments (SEAs).

Box C: Slowing the Flow – a nature-based approach to reducing flood risk

In order to reduce the flood risk for Pickering, a high-risk town in northern England, Forest Research are leading an initiative to demonstrate the role of best land management practices in restoring the catchment's natural flood attenuation capacity. This involves a range of measures including creation of riparian and floodplain woodland, targeted woodland creation to protect sensitive soils, restoring woody debris in small streams and targeted blocking of moorland drains to improve wetland quality. It is expected to achieve additional benefits including improved water quality and biodiversity gains.[15]

Implementation instruments for EU water policy could be strengthened by integration of ecosystem service and natural capital concepts, such as:

- Integrating objectives for water ecosystem services and nature based solutions into the management plans for Natura 2000 sites and other protected areas, with due respect to their conservation objectives;
- Developing the EU No Net Loss framework[16] and related offsetting schemes for ecosystem services, including water management;
- Mainstreaming the application of Environmental Liability Directive for protection of water related ecosystem services.

Agriculture and rural development

Existing integration

[15] Forest Research - Slowing the Flow at Pickering: http://www.forestry.gov.uk/fr/INFD-7ZUCL6

[16] EU No Net Loss framework: http://ec.europa.eu/environment/nature/biodiversity/nnl/index_en.htm

On a **conceptual level**, a certain number of ecosystem services – mainly related to water and soil quality - are explicitly promoted under the EU Common Agriculture Policy (CAP), both in terms of CAP support to farmers' incomes (Pillar I) and support provided for the development of rural areas (Pillar II).

Operational integration of ecosystem service and natural capital concepts is mainly focused on preventing negative impacts on ecosystems, with inexplicit links to ecosystem services. For example, all area-based payments are conditional upon cross-compliance, including standards for water, soil and retention of landscape features. The European Agricultural Fund for Rural Development (EAFRD) includes a priority to restoring, preserving and enhancing ecosystems related to agriculture and forestry, including water management and soil. It is, however, up to the Member States to decide how and to what extent they wish to take up this priority, including explicitly promoting the role of nature based solutions in maintaining water and soil quality.

Opportunities for further integration

In addition to mitigating negative impacts on a number of ecosystem services and/or public goods (carbon storage, soil and water quality maintenance etc.), systematically and more explicitly integrating the understanding of well-functioning agricultural ecosystems and related ecosystem services into policy measures for sustainable production and food security. This should especially be the case with regard to the Member States' use of CAP direct payments and EAFRD funds.

Examples of concrete instruments, identified in the context of the assessment, which could further support integration of ecosystem services and natural capital into the EU policy framework for agriculture and rural development are outline below.

Information instruments:

- Further development of indicators for soil and water related ecosystem services on agricultural land;
- Developing and utilising indicators for other ecosystem services than water and soil relevant to agricultural land, such as pollination, pest management etc.;
- Further development of spatial mapping of important areas for soil, water, climate etc. ecosystem services, for example, developing ecosystem service mapping that can support the designation of Ecological Focus Areas (EFAs) under future CAP;
- Development of indicators and mapping supporting the development of natural capital accounting for ecosystem services on agricultural land, notably for soil carbon[17], flood control and water purification.

[17] Via Land Use, Land Use Change and Forestry (LULUCF) framework: http://ec.europa.eu/clima/policies/forests/lulucf/index_en.htm

Decision-support instruments:

- Integrating spatial mapping and other data on ecosystem services into the data sets used for planning, targeting and reporting for agriculture and rural development expenditure under CAP - with explicit links to the maintenance of soil, water, climate, pollination etc. This should apply to both CAP direct payments and funding for rural development under EAFRD;
- Systematically integrating ecosystem service related considerations into EIAs and SEA when these assessments are applied in the context of agricultural land. For example, further uptake of EIAs at national level, including going beyond the compulsory list of development initiatives on agricultural areas outlined in the EU EIA Directive.

Implementation instruments:

- Increasing the scale and effectiveness of investment through public funds and market-based tools, for example combining agri-environment schemes and payments for ecosystem services (PES) schemes to enhance or maintain water ecosystem services (see Box D);
- Where in line with the conservation objectives, integrating objectives for ecosystem services into the management plans for rural Natura 2000 sites and other protected areas, for example with regard to maintaining populations of natural pollinators;
- Developing a No Net Loss framework and related offsetting schemes for ecosystem services on agricultural land;
- Mainstreaming the application of the Environmental Liability Directive for the protection of ecosystem services on agricultural land (soil and water), as per the provisions already included in the Directive.

Box D: Mainstreaming the ecosystem services concept: South West Water's Upstream Thinking initiative

In southwest England a range of environmental authorities are working together with a regional water company, South West Water, to apply the understanding of peatland ecosystem services in practice. A dedicated initiative (so called Upstream Thinking initiative) has been established by South West Water with an aim to improve upstream raw water resources by investing in the maintenance of ecosystems' water retention and purification capacity while at the same time reducing diffuse agricultural pollution. In particular, the aim is to encourage improved land management activities that support the maintenance of good quality ecosystems and related services. In addition water related benefits, the restoration and maintenance of peatlands is foreseen to improve carbon storage and capture.

PES schemes are one of the mechanisms used to distribute funds under the Upstream Thinking initiative to farmers and land managers, with a focus on reducing diffuse agricultural pollution. The payments are commonly based on action by farmers through the provision of improved infrastructure and operations. There has been no payment based on actual raw water quality although opportunities for such payments are under review (in 2012). A part of the funds are generated by a dedicated fee in the consumers' water bill. These PES arrangements allow the costs of maintaining water quality be carried by the beneficiaries (i.e. the water company and end users).[18]

[18] http://www.upstreamthinking.org/index.cfm?articleid=8692 and DEFRA (2013) Payments for Ecosystem Services: A Best Practice Guide – Annex Case Studies, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/200901/pb13932a-pes-bestpractice-annexa-20130522.pdf

Regional development & cohesion

Existing integration

On a **conceptual level**, the EU's current policy framework for cohesion and regional development - building on the Europe 2020 strategy for growth and jobs[19] and with a range of possible concrete activities for implementation outlined in the regulations for EU Cohesion Policy funds - recognises and addresses ecosystem services and natural capital explicitly. Measures aimed at protecting and restoring biodiversity and promoting ecosystem services, including through green infrastructure and nature based solutions, are a legitimate part of the current and future EU regional development.

On an **operational level,** aiming to prevent negative impacts on ecosystems, with inexplicit links to ecosystem services, is a part of the EU policy framework for regional development, for example through the use of EIA and SEA procedures on regional development initiatives. On a more pro-active side, it is possible to implement measures related to ecosystem services and green infrastructure under the EU Cohesion Policy funds[20]. However, it is not obligatory for the Member States to take up these opportunities in the national programmes implementing EU financing.

Opportunities for further integration

There is a need to improve the integration of ecosystem services and natural capital - as pro-active elements for sustainable regional development - into the EU policy framework. This can take place through mainstreaming investment in green infrastructure and nature-based solutions into the priorities for regional development. Furthermore, there is a need to systematically and more explicitly assess possible negative impacts of EU regional development investment on ecosystems' function and ecosystem services, primarily by using the existing SEA and EIA procedures. To support this there is a need to develop instruments that can help to systematically mitigate the negative impacts of Cohesion Policy investment, including mapping of and provisions for protecting important areas for ecosystem services, instruments for screening possible negative impacts and - as a last resort - development of possible offsetting schemes for ecosystem services.

Examples of concrete instruments, identified in the context of the assessment, which could further support integration of ecosystem services and natural capital into the EU policy framework for regional development and cohesion are outline below.

Information instruments:

- Development of indicators for all ecosystem services;
- Spatial mapping of areas important for ecosystem services (national and regional level);

[19] http://ec.europa.eu/europe2020/index_en.htm
[20] IEEP and Milieu (2013) The Guide to Multi-Benefit Cohesion Policy Investments in Nature and Green Infrastructure, a Report for the European Commission, Brussels, http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/guide_multi_benefit_nature.pdf

- Developing natural capital accounting for ecosystem services with links to the regional development, prosperity and employment.

Decision-support instruments:

- Development of (old or new) instruments and procedures for planning, targeting and reporting on the impacts on / status of ecosystem services under the Cohesion Policy;
- Development of instruments and/or procedures aimed at screening possible negative impacts of Cohesion Policy investment;
- Systematic integration of ecosystem services in operational programmes defining the allocation of funding under EU investment in Cohesion Policy;
- Systematic integration of aspects related to ecosystem services into EIAs and SEAs carried out in the context of EU investment in regional development.

Implementation instruments:

- Increasing public investment and/or developing market-based tools that maintain or enhance ecosystem services supporting regional development. For example, increasing investment in ecosystem services and related nature-based solutions under EU funding for regional development (see Box E);
- Where in line with the conservation objectives, integrating objectives for regionally important ecosystem services into the management plans for Natura 2000 sites and other protected areas, including opportunities for recreation and tourism;
- Developing a No Net Loss framework and related offsetting schemes for ecosystem services related to infrastructure development;
- Mainstreaming the application of the Environmental Liability Directive for the protection of ecosystem services in the context of infrastructure development, as per the provisions already included in the Directive.

Box E: Ecological restoration of Comana wetlands (Romania)

The Comana wetland Natural Park, established in 2004, is a 25 000 hectare wetland complex located in the south of Romania. An Cohesion Policy funded project was carried out in 2009-2011 with a view to restore the wetland by restoring the initial high water levels in the Comana area.

The restoration of the Comana wetlands greatly improved biodiversity in the area. Other benefits include cultural ecosystem services. The park administration organises guided visits for school children and other groups, and thematic seminars and workshops with local authorities and interested local stakeholders. Also, an ecological research area was established in cooperation with scientific institutions of Bucharest and other nearby cities.

Future long-term benefits are to be expected from the development of tourism - as the restoration of Comana wetlands is attracting an increasing number of tourists, especially during weekends - and from collaboration with scientific institutions in nearby cities.[20]

Discussion and conclusions

The results of this OPERAs policy review clearly show that there are a range of gaps – both in terms of needs and opportunities - in the current integration of ecosystem services and natural capital into the EU policy frameworks for water, agriculture and rural development, and regional development and cohesion. While these policies have, at least partially, integrated ecosystem services and natural capital into their conceptual basis (i.e. key policy documents outlining the overall scope of a policy) the uptake of these concepts in the context of concrete policy instruments is generally far weaker. There seems to be room for improvement both in terms of preventing possible negative impacts of sectoral policies on ecosystem services and also proactively supporting the uptake of ecosystem services through nature-based solutions that support both biodiversity and sectoral policy objectives.

The identified gaps in the level of integration imply that the EU policies for water, agriculture and rural development, and regional development and cohesion are currently underperforming as regards their contribution to achieving the EU biodiversity targets to halt the loss of biodiversity and degradation of ecosystem services by 2020. Given the increasing knowledge of the importance and value of ecosystem services and natural capital to human wellbeing, the lack of integration also suggests that the EU sectoral policies are not as sustainable as they could – or indeed should – be.

When interpreting the above results, it is important to note that this assessment has focused on reviewing frameworks for sectoral polices only at the EU level. In order to materialise in practice, the identified opportunities for integration of ecosystem services and natural capital need to be taken up by EU Member States at national and regional level. This applies, for example, to the identified opportunities for public investment in ecosystem service related measures by different EU funding instruments. Aspects related to this most concrete “stage” of operationalising ecosystem services (i.e. actual implementation on the ground and responses to non-compliance) are recommended to be looked into in more detail in the future, e.g. in the context of future work under the OPERAs project.

It can be concluded that there is a potential for greater conceptual integration (i.e. explicit acknowledgement of the importance of nature, ecosystem services and natural capital in sectoral policy premises and objectives) and operational integration (i.e. use of instruments to ensure that policy objectives are implemented) at the EU level. In addition to integration, monitoring the impacts of policies will be essential, to create concrete evidence base to inform policy development and/or refinement. This requires investment in a science policy interface that can take into account both developments in the knowledge base and policy implementation Furthermore, practical insights from case examples and insights on macro level progress will inform further policy uptake of natural capital and ecosystem services, supporting the progress of integration.