Towards a framework for assessing current level of and future opportunities for ES/NC integration at different levels of governance

D3.3

Kettunen, M. and ten Brink, P. (IEEP)

Ecosystem Science for Policy & Practice

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393.

Prepared under contract from the European Commission

Project reference: 308393

Collaborative project

FP7 Environment

Project acronym: **OPERAs**

Project full title: **Operational Potential of Ecosystem Research Applications**

Start of the project: 1 December 2012

Duration: 60 months

Project coordinator: The University of Edinburgh

Project website: operas-project.eu

Deliverable title: Existing and potential governance modes for various ES/NC (original title from DoW)

Deliverable number: 3.3

Nature of the deliverable: Report

Work package responsible: WP3

Partner responsible: IEEP

Other partners involved: ULUND, ETHZ, WP4 partners

Due date of deliverable: Month 24

Actual submission date: Month 26

Deliverable status: Draft final

Version	Status	Date	Authors
2	Draft final	Jan 2015	M. Kettunen and P. ten Brink (IEEP) With support from ULUND, ETHZ and WP4 partners

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Contents

1. Introduction, aims and objectives

D3.3 in the context of OPERAs

This deliverable discusses the development of a common framework for assessing the current level of and future opportunities for the integration of ecosystem services and natural capital at different levels of governance. It is part of the OPERAs work package 3 (WP3). It has been developed in close cooperation with the work package 4 (WP4) as it aims to support the operationalisation of the conceptual framework developed in the context of WP4 Deliverable "Policy needs and opportunities for operationalising the concept of ecosystem services" (D4.1).

Parts of this Deliverable will be published in ten Brink, P. and Kettunen, M. (2015): 'A policy perspective to ecosystem services' in Potschin, M., Haines-Young, R., Fish, R. and Turner, R.K. (eds) Routledge Handbook of Ecosystem Services. Routledge, London and New York.

D3.3 contributes to the following elements of the project:

- WP3 Task 3.4.2 and 3.4.4: D3.3 will contribute to the development of other sub-tasks under WP3 by providing information on the underlying policy framework relevant for ecosystem services and natural capital, forming a 'policy backdrop' for more detailed ecosystem service governance related analysis under the work package.
- WP4 Tasks 4.1 – 4.4: D3.3 provides the conceptual premises for the planned development of a concrete and applicable assessment instrument that can be used to operationalise the concept of ecosystem services at different levels of governance. The applicability of the conceptual framework is also being explored in the context of the bottom-up work under Task 4.2.1.
- WP2 Exemplars: the common assessment framework explored in D3.3 is foreseen to be further developed and tested in the context of some of the exemplars. Cooperation has already been established with the Scottish exemplar where the framework is being adopted to assess the integration of ecosystem services and natural capital into the policy framework at national level.

A policy framework for ecosystem services

The status of ecosystems and availability of ecosystem services are affected by a number of drivers such as land-use practises, extraction of natural resources and infrastructure development. These drivers are governed by a range of different EU and national policies related to, for example, agriculture, forestry, climate and energy, and regional development. Consequently, utilising the concept of ecosystem services as a means to try to increase the overall sustainability and biodiversity- friendliness of policies requires an uptake of the concept by different sectoral policies – on a conceptual level, in terms practical implementation and at different levels of governance.

Figure 1 below provides an illustration of the links between drivers, pressures, ecosystem functions and services and impacts whereas Figure 2 outlines the institutional and instrumental response to appreciation of the multiple values of nature.

Figure 1 Illustration of the links between drivers, pressures, ecosystem functions and services and impacts

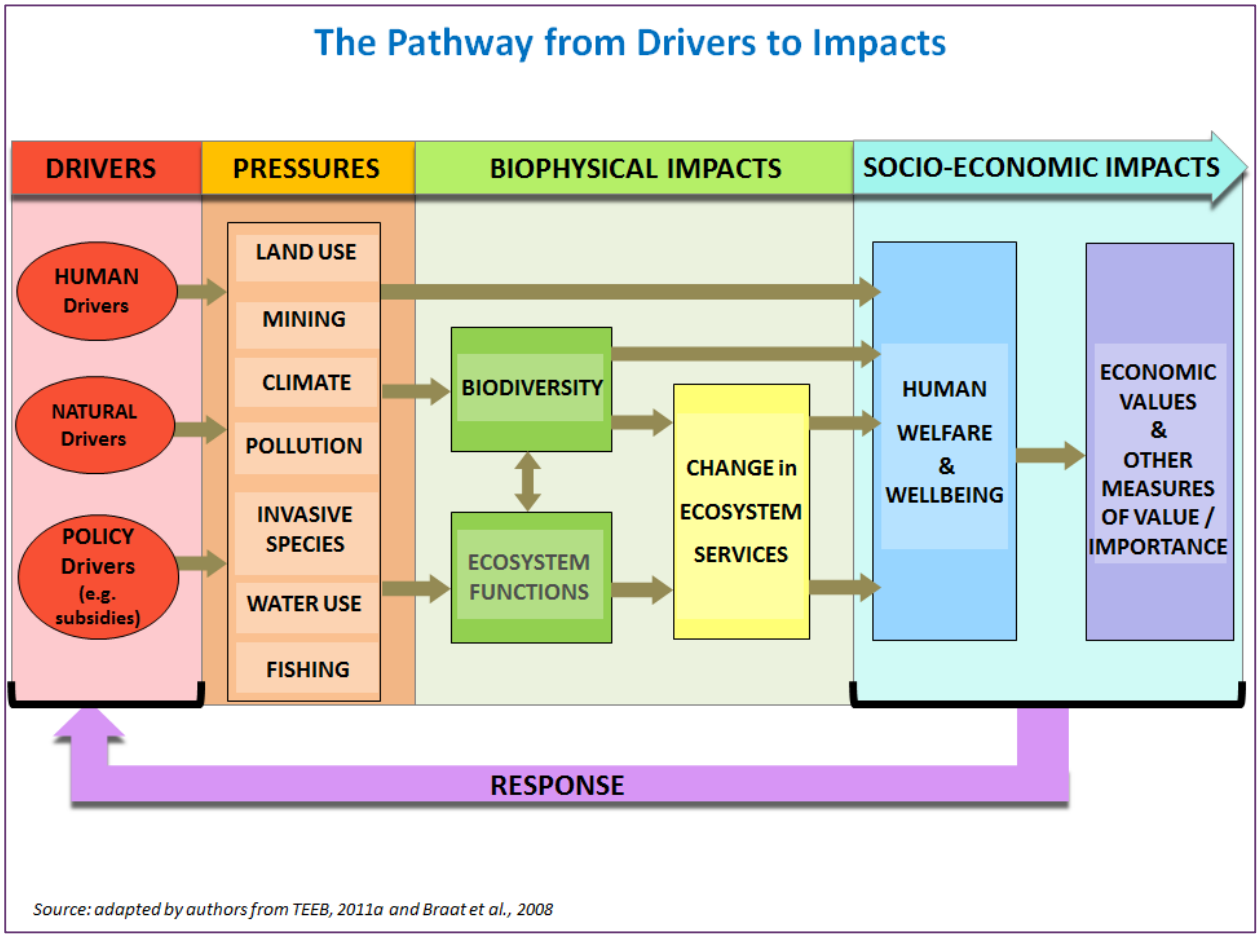
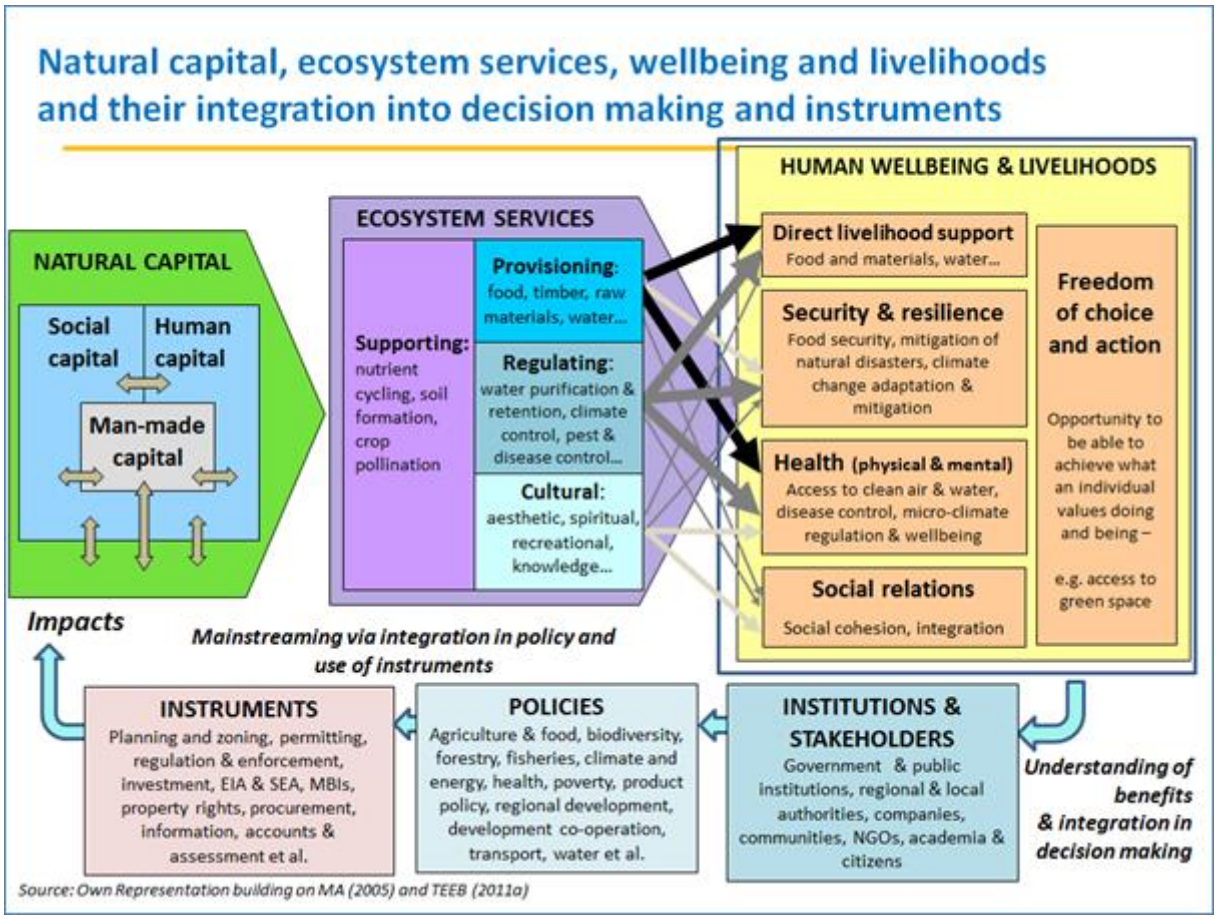


Figure 2 Institutional and instrumental responses to appreciation of the multiple values of nature. Source: ten Brink, own presentation



The integration of ecosystem service related aspects into sectoral policies is needed for two reasons. Firstly, it minimises the damage to ecosystems and their services caused by sectoral activities and maximise the positive contribution of these activities to conservation (ten Brink and Kettunen 2015). The integration of ecosystem services into sectoral policies can also contribute to achieving sectoral and other wider policy objectives in a sustainable manner, increasing policy effectiveness and create win-win solutions between delivering different policy objectives. For example, there are cost-effective nature based solutions (i.e. measures building on the understating of ecosystem services) for the water and energy sectors through using wetland restoration as a means for water purification or using natural shading of rivers to support cooling water for power stations (TEEB 2011, Russi et al. 2013).

Current and future progress with the mainstreaming of ecosystem services in sectoral policies varies across policy areas and governance levels (global, national, regional and local as well as private sector policies). According to the conceptual approach developed by Kettunen et al. (2014) mainstreaming and integration needs to take place in three different levels – conceptual integration (where policy documents explicitly or implicitly take ecosystem services into account), operational integration (where specific measures or instruments are identified and committed to that address

ecosystem services related objectives) and, finally, integration through implementation (where measures achieve integration on the ground in concrete decisions, such as creating investment). Across these three levels of integration, mainstreaming the ecosystem service concept into policy development and implementation needs a good evidence base, a range of tools and instruments (e.g. impact assessments and strategies), engagement by different stakeholders and mobilisation of resources to facilitate the uptake.

The recent assessment by Kettunen et al (2014) showed that within the EU there has been a range of policy developments and reforms that have provided opportunities for taking up the ecosystem service concept across different sectoral policies, potentially directly affecting Union's 28 member countries. However, while there is good conceptual integration for a range of EU policy areas there is generally weaker operational integration. Consequently, the existing EU policy framework for ecosystem services remains far from optimal. This is particularly true when considering the integration of ecosystem services into different sectoral policy instruments. The majority of the existing policy instruments are still primarily focused on regulating ecosystems from the point of view of specific natural resource - in other words addressing single ecosystem services such as provisioning of food, fish and timber - rather than addressing the full range of services ecosystems provide. This risks leading to inappropriate trade-offs between ecosystem services - and also between ecosystem services and biodiversity conservation. For example, the use of certain pesticides and the loss of natural areas to improve food production can have negative effects on wild pollinators and thus loss of biodiversity, pollinating services, and subsequently reduced farm output (Vanbergen et al. 2013). Further to the above, ecosystem services are also poorly integrated into the information and decision-support framework underpinning the development and implementation of policies and policy instruments.

Consequently, it seems clear that EU policy sectors are currently underperforming as regards their contribution to achieving the global and European targets for conserving biodiversity and ecosystem services, therefore further efforts are needed to develop a more comprehensive policy framework for the sustainable management of ecosystem services in the EU. While no overall crosscutting assessment yet exists on existing policy frameworks for ecosystem services in different EU Member States, it is likely that the national and regional situation reflects the situation at the EU level.

Role of green economy

High level and horizontal[1] policy initiatives can create important opportunities for progress on the integration of ecosystem services into sectoral policies. The current policy paradigm for green economy is one of such opportunities. Green economy refers to a shift to an economic model that

[1] Horizontal policies refer to policy frameworks that aim to address cross-cutting issues across different sectoral policies. They include, for example, policy frameworks for impact assessments.

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. The notion of green economy originates from the growing recognition among policy-makers - global and the EU alike - and private sector decision-makers that the current model of economic growth is socially, environmentally and economically unsustainable (ten Brink et al. 2012).

The emphasis on green 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. There is a growing recognition of the links between nature and the green economy, culminating in a range of recent policy commitments. Such commitments include reforming environmentally harmful subsidies under the Strategic Plan for Biodiversity 2011-2020 and in the G20, and integrating the value of ecosystem services into natural capital and integrated environmental and economy accounts (SEEA) (CBD 2010, UNEP 2011, ten Brink et al 2012). Building on the existing knowledge it seems clear that integrating the understating of nature's value into national, regional and local economies and into the functioning of different economic sectors should be considered a critical part of the transition to a green economy, delivering multiple benefits that support economic growth and sustainability (ten Brink et al. 2012).

Green economy is not a stringently defined policy framework. Rather it is foreseen that the transition to a green economy will proceed on different development paths for different countries, depending on an area's natural assets, economy and society, and priorities (See Chapter 2). Regardless of the path taken ecosystem services and natural capital can be a key driver in this transition starting with making the costs related to the loss of biodiversity and ecosystem services an integral part of the functioning of economic systems and pro-actively encouraging the uptake of opportunities provided by nature-based solutions and "green" jobs and innovations. This further provides a basis for improving the resource efficiency and long-term sustainability of different policy sectors. For example, ecosystem service based water management water can provide a cost-effective means for water saving measures and increasing water efficiency. Similarly, protecting the abundance and diversity of natural pollinators is likely to a far more cost-effective way for maintaining food security than having to replace natural pollination by artificial alternatives.

Aims and objectives

This report focuses on exploring how the sectoral integration of ecosystem services and natural capital can play a key role in the transition to a truly 'green' green economy within different policy sectors. In particular, the report considers opportunities for the development of a common, operational assessment framework aimed at systematically analysing the integration of ecosystem services and natural capital into different sectoral policies. Such a common framework can form a useful tool for furthering the uptake of ecosystem services in policy- and decision-making at different levels of governance.

Key concepts and definitions

Green economy: Green economy is defined as an economy 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 (UNEP 2011).

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 focus of this assessment.

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.

Different levels of integration of ecosystem services and natural capital into green economy are considered to include the following (see D4.1 by Kettunen et al. 2014):

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.

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.

Implementation integration: Implementation integration refers to the final stage of the integration process, i.e. where concrete measures achieve integration on the ground in actual policy- and decision-making situations (e.g. using a range of instruments and measures to protect or investment in ecosystem services).

Ecosystem service governance: The governance of ecosystem services can be defined as the interaction of laws and other norms, institutions, and processes through which a society exercises powers and responsibilities to make and implement decisions affecting ecosystem services (Greiber and Schiele 2011).

2. Assessing the level of and needs for sectoral integration

Assessing the level of sectoral integration

In the context of the OPERAs project, Kettunen et al. (2014) have developed a conceptual framework for assessing the level of sectoral integration of ecosystem services in the EU policy framework. This framework currently consists of two different levels of integration: conceptual integration and integration into policy implementation. Furthermore, a general categorisation of the level of integration in different sectoral policies was developed, 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.

In addition to the conceptual framework, a range of different types of concrete policy instruments have been 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 they include:

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

Decision-support instruments: decision-support instruments include instruments for planning and targeting, reporting, and impact and risk assessment / procedures. Planning and targeting instruments include regional management plans for implementing EU and national legislation (e.g. river basin and flood risk management plans) and programmes for targeting and implementing EU and national funding. Furthermore, a range of restrictions affecting plans for sectoral and/or infrastructure developments are outlined in different pieces of EU and national legislation. Finally, instruments for reporting consist of different frameworks, procedures and assessments for

reviewing the implementation and effectiveness of legislation (e.g. reporting for the implementation of legislation, ex-post assessments of policy instruments).

Implementation instruments: implementation instruments include legislative instruments, instruments for public financing, protected areas (both Natura 2000 sites and nationally designated sites), and market-based instruments supported either in the EU and national context. Legislative instruments include different EU and national regulations and decisions (e.g. EU directives), including dedicated standards set forward by these instruments (e.g. CAP cross-compliance). A range of sector-specific instruments are in place to allocate financing from the EU and national budgets towards policy implementation. In addition to public funding, an increasing number of market-based instruments are being explicitly supported at the EU and national level. Finally, national protected area designations and the Natura 2000 sites form a "standardised" way for establishing protected areas in the EU context.

It is to be noted that there are clear interdependencies and also some overlaps between the identified instruments and instrument categories. These are further discussed in the context of operationalising the framework in practice (Chapter 3).

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 by Kettunen et al. 2014

Instrument category		Identified concrete instruments with relevance to ecosystem services and natural capital
Information instruments	Data, indicators, monitoring, mapping, accounting, science-policy assessments	• Databases • Indicators and indices • Monitoring and mapping frameworks • Accounting frameworks (e.g. SEEA) • 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 • Programmes for targeting and implementing funding (EU and national) • Other mechanisms supporting planning and targeting (e.g. restrictions in regulations affecting planning of infrastructure developments)
	Reporting, supported by indicators, monitoring and mapping	• Reporting and review frameworks for legislation (e.g. reporting for the implementation of EU directives) • Ex-post assessments of policy instruments and related programmes (e.g. mid-term evaluations of funds)
	Impact assessment procedures and risk assessment and analysis	• Impact assessments (IA) underpinning the development of policies and legislation (e.g. *ex ante* assessments) • Strategic Environmental Assessment (SEA) and related guidance • Environmental Impact Assessment (EIA) and related guidance • Product life cycle assessments • Project selection and evaluation criteria
Implementation instruments	Dedicated legislative acts, regulations & standards	• EU directives and regulations • National and regional legislation • Criteria and standards for policy sectors
	Protected areas (Natura 2000 network)	• Natura 2000 areas, established based on the EU Habitats and Birds Directives • National protected areas, established based on national legislation
	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 • National and regional funds
	Market-based instruments and certification	• Payments for ecosystem services (PES) • REDD+ • Offsetting schemes • Green public procurement (GPP) • Certification schemes (e.g. for labels of sustainable production)
	Other	• Promoted / endorsed EU or nation-wide practices (e.g. soil conservation practices)

Table 2 Identification and categorisation of the types of policy instruments (existing or being currently developed) that can support the integration of ecosystem services and natural capital into different policy sectors, modified from Kettunen et al. 2014

The assessment and framework by Kettunen et al. (2014) 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. Consequently, in addition to the conceptual and operational integration Kettunen et al. (2014) foresaw a third level of integration - namely implementation integration – to be required to be included in the conceptual framework to make it comprehensive and operational. This third level of integration of foreseen to cover the final stage of the integration process, i.e. where concrete measures achieve integration on the ground in actual policy- and decision-making situations (e.g. creating investment in ecosystem services).

Integration in terms of concrete implementation builds directly on operational integration (i.e. the existence of concrete policy instruments for ecosystem services) which in turn relies on support at the contextual level. The integration of the ecosystem service concept into concrete implementation activities within policy sectors needs a good evidence base supported by a range of tools and instruments (e.g. on-site impact assessments and strategies), mobilisation of resources to facilitate the uptake and good ecosystem service governance. Given its focus on concrete outcomes, implementation integration is foreseen to take place at national to local level of ecosystem service governance.

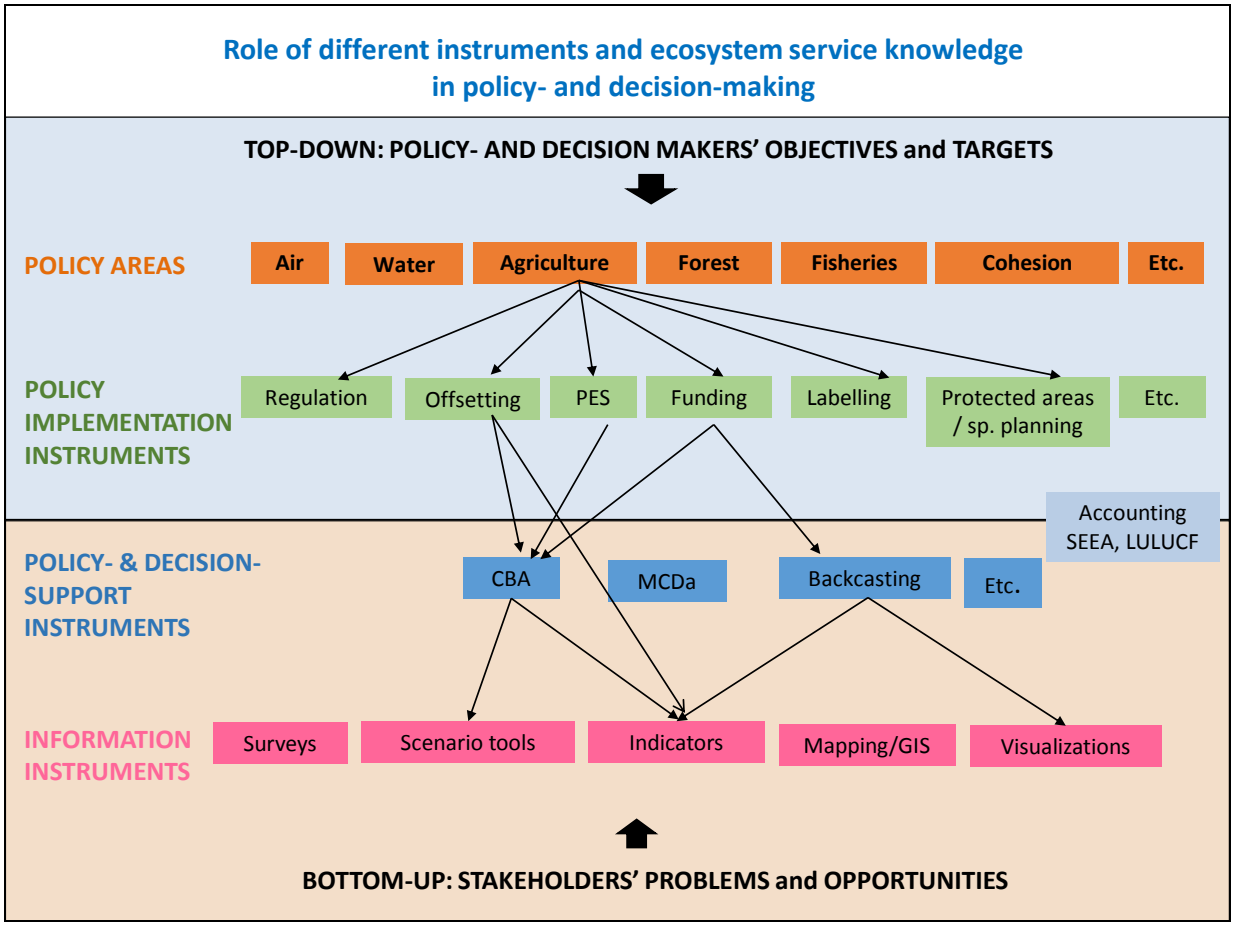
From concepts to practical operationalisation: governance of ecosystem service instruments and knowledge in the context of integration

As the assessment by Kettunen et al. (2014) indicates, the uptake and integration of the ecosystem service concept into different policy areas can take place through a range of processes, requiring a range of institutional roles and tools. It also shows 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, regulations and directives often form the basis - or set forward the very requirements - for other instruments such as indicators, and monitoring and reporting procedures.

Figure 3 below provides a conceptual illustration of the hierarchy and role of different ecosystem service instruments (i.e. implementation, decision-support and information) required for successful integration of ecosystem services into policy- and decision-making. The illustration shows that the integration of ecosystem service and natural capital concepts can be driven both top-down or

bottom-up, i.e. from the perspective of setting policy goals and targets or from the perspective of stakeholders' needs and opportunities on the ground. In either of these cases establishing a full picture on the interlinkages between policy sectors and instruments and the related opportunities plays an integral role for ensuring operationalising integration at the level of implementation.

Figure 3 Illustration of the hierarchy and role of different instruments (implementation, decision-support and information) required for successful integration of ecosystem services into policy- and decision-making. Source: OPERAs WP4 own illustration, adapted by M. Kettunen

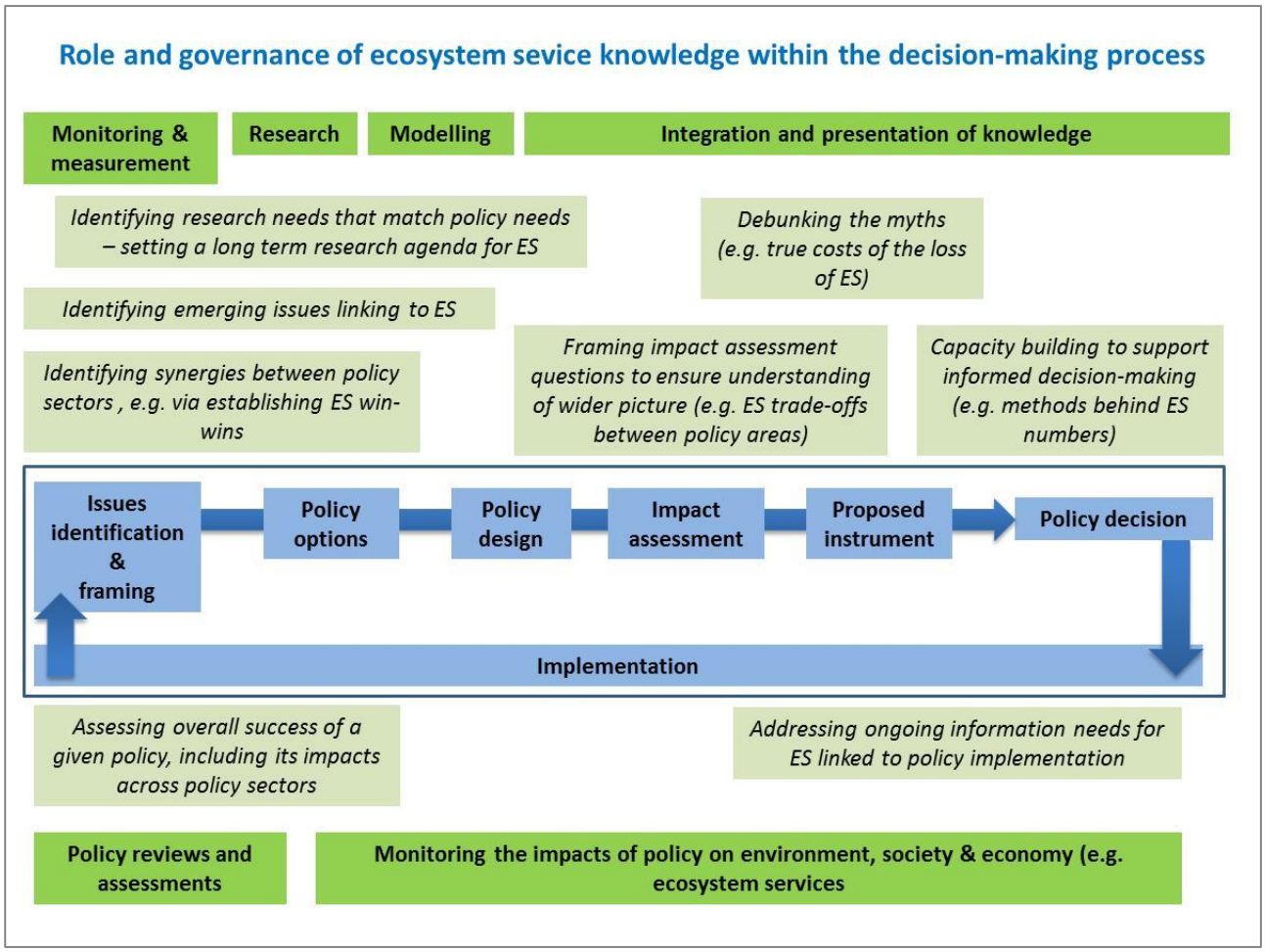


Building on and beyond the illustration in Figure 3, it is evident that information and policy- and decision support instruments form the basis for successful integration of ecosystem services into concrete decision-making. In this context, it is important that the integration of scientific knowledge on multiple benefits of ecosystem services in decision-making takes place throughout the ecosystem service governance cycle, from policy / decision framing, to formulation, negotiation, implementation and review (Figure 4). Different environmental impact assessment tools play an important part in integrating ecosystem service knowledge into concrete decision-making at the stage of implementation, especially if applied early enough, thoroughly enough and if the results are taken into account. Strategies and action plans can also be useful processes for coherence and good governance – e.g. the national biodiversity strategies and action plans, green economy

strategies (see Chapter 3) and national development plans each have the potential to act support the integration of ecosystem services and nature based solutions. Furthermore, capacity building and ongoing assessment of both outcomes and emerging information needs is required.

Consequently, understanding the hierarchy of different policies and policy instruments and the engagement by institutions and stakeholders responsible for their implementation, i.e. good ecosystem service governance, is essential for integration of the ecosystem service concept in practice. While understating the governance of ecosystem service instruments and the role of knowledge forms an important crosscutting element for all levels of sectoral integration, it can be argued that it is particularly crucial at the final stage when implementing the concept in concrete terms at national, regional and local level.

Figure 4 Illustration of the role of ecosystem service knowledge in the context of policy and/or decision-making process. Source: M. Kettunen, adapted from illustration by ten Brink in Neßhöver et al. (2014)



3. Assessing interdependencies with and opportunities for the transition to green economy

In recent publications ten Brink et al. (2012 & 2014) created a framework for the transition to green economy. This framework consists of a mix of policy measures ranging from traditional business-as-usual approaches to more active approaches building on nature-based solutions and holistic measures pursuing environmental sustainability. ten Brink at al. (2012 & 2014) systematised these possible measures into a six interconnected meta-approaches outlined below and presented in Figure 5.

A – Avoiding unsustainable trade-offs: The bottom-line for a transition to a green economy is formed by policy approaches that are aimed at minimising losses and avoiding inappropriate trade-offs between ecosystem services. This can be done through understanding the whole picture of winners and losers of a given decision (e.g. mapping the beneficiaries of ecosystem services) and the associated environmental, economic and social impacts over time and in a given location, including international impacts (e.g. associated with traded goods).

B – Environmental compliance and infrastructure: Furthermore to step A above, investing in environmental infrastructure to comply with legislation and regulation can be considered to form a basis for green economy transition. These measures include, for example, water supply and waste water infrastructure to meet water quality standards, and waste infrastructure and air pollution control measures to meet emission and air quality standards. These approaches have been frequently taken by the private sector (e.g. utilities), public sector (e.g. municipalities) and international organisations (e.g. World Bank).

C – Active risk management: Moving beyond steps A and B above, proactive approaches to risk management, which build on a wider appreciation and understanding of risks, form the next step in the transition. Such approaches include, for example, flood control based on risk mapping that understands the wider river basin dynamics and control of invasive alien species building on detailed taxonomy research of the species.

D – Proactive investment in natural capital: Supporting step C, investment in natural capital via restoration, conservation and improved management practices provides another proactive avenue for a transition to green economy. This includes, for example, the development of networks of protected areas, restoration of peatlands for carbon storage and other co-benefits, restoration of flood plains or afforestation for flood control.

E – Eco-efficiency: Measures and policies supporting eco-efficiency and wider resource efficiency across policy sectors are seen as one of the most comprehensive means to support the transition. This includes, for example, adjusting water or other resource pricing to reflect the true costs to the environment (e.g. ecosystem services) and wider environmental fiscal reform to incentivise efficient resource use via products, process and ambient standards, labelling and consumer information and positive incentives (e.g. payments for ecosystem services, public payments for public goods).

F – Decoupling: Finally, decoupling the economy from resource use and its negative impacts through more radical innovation and changes in demand is the ultimate step toward green economy. This can include new clean products and processes building on biodiversity and ecosystem services such as genetic resources (e.g. pharmaceutical sector and plant based cancer treatment) and biomimicry (e.g. floor tiles and waste, architecture and natural cooling). Decoupling also builds on the many of the five approaches discussed above.

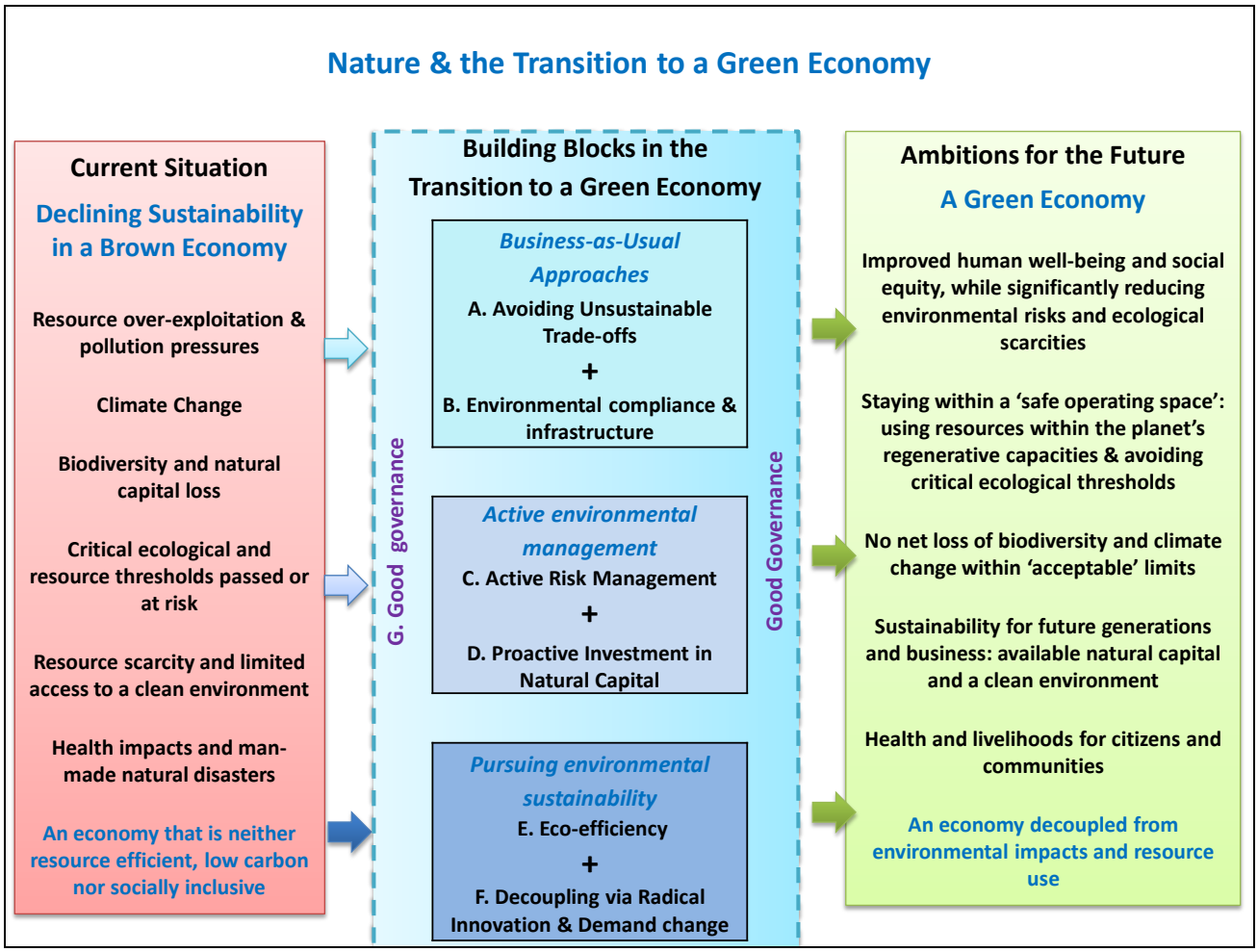
In addition to the six groups of approaches above, ten Brink et al. also recognise the role of good governance as key means supporting the transition to a green economy and of resource mobilisation/financing to help ensure that investments are made (Kettunen et al. 2013). The identified components of good governance inter alia include: institutions and their roles; processes and participation; transparency and disclosure; and monitoring and enforcement.

While different countries may opt for transition paths towards a green economy tailored to their national circumstances (see Chapter 1), adopting a wide range of coherent and coordinated measures and combining a range of approaches is foreseen to be the most likely – and indeed the most feasible and beneficial – way towards successful transitions. The mix and emphasis of the measures and approaches will differ from one country to another. In most cases, a balanced overall approach will include both supply and demand measures, thereby greening the economy with production and consumption-focused measures.

As outlined in Chapter 1, national or regional approaches should build on the knowledge and appreciation of the value and role of nature which will provide a core foundation for the development of a future green economy. The instruments for the sectoral integration of ecosystem services (as identified in Table 2 above) are essential to facilitating and enabling this, playing an central part in different transition measures and approaches. For example, knowledge and information on ecosystem services and natural capital can be integrated into the transition process via information and decision-support instruments such as impact assessments, product life cycle assessments, project selection and evaluation criteria. Furthermore, the approaches also need to build on understanding resource use and associated resource scarcity and ecosystem risks by developing ecosystem capital accounts and integrated environmental economic accounts that present the interactions of the economy and the environment. Finally, the improved evidence base

should lead to the take up of a range of implementation instruments that provide concrete means for a shift to a green economy.

Figure 5 A conceptual framework and six interconnected meta-approaches for the transition to green economy, building on natural capital. Source: ten Brink et al. (2012)



As ten Brink et al. (2012 & 2014) show, the links between ecosystems services and green economy are evident. Building on this understanding Antikainen et al. (2015)[2] have developed a conceptual framework for a systematic identification of the role of ecosystem services in the context of green economy, using different economic sectors as a lynchpin between the concrete and its uptake in practice. According to Antikainen et al. (2015) key economic sectors for transition to a green economy share two characteristics: they are strongly dependent on ecosystem services and / or they also have significant effects to them. Consequently, these economic sectors play a key role in operationalising the concept of ecosystem services and natural capital, supporting the achievement of a range of benefits associated with green economy (Figure 6).

[2] The framework further builds on the work by ten Brink and Kettunen (2007) to demonstrate the interlinkages between biodiversity and the economy.

As a concrete means for assessing the role of ecosystem services in 'greening' the economic sectors, Antikainen et al. developed a dedicated illustrative assessment framework for assessing the dependency and impacts of a sector on ecosystem services (Figure 7). The purpose of this framework is to enable a systematic and sufficiently detailed conceptualisation and visualisation of the role of individual ecosystem services – or groups of services - within different key green economy sectors. In particular, the framework provides a means to identify and assess what kind of positive and negative interactions and interdependencies there are between ecosystem services and the foreseen sectors of green economy (e.g. forest sector, water supply and management, and tourism).

Figure 7 below provides an example of the application of this framework in the context of forest sector in Finland, demonstrating the interlinkages and interdependencies between ecosystem services, forestry sector and green economy. This assessment shows that the most substantial ecosystem services – especially from the economic perspective - by the forest ecosystems are provisioning materials from plants (wood) and bioenergy. In addition, however, forests maintain also other ecosystem services that – directly or indirectly - benefit forest industries by affecting the growth of forests. These regulating services include maintenance of hydrological cycles and flood protection, pest and disease control and soil formation and composition. If these ecosystem services would not exist, the material production for the industry would be halted or significantly reduced. While the forest industries are strongly dependent on and benefit from ecosystem services, they also have a great impact on practically all forest ecosystems services.

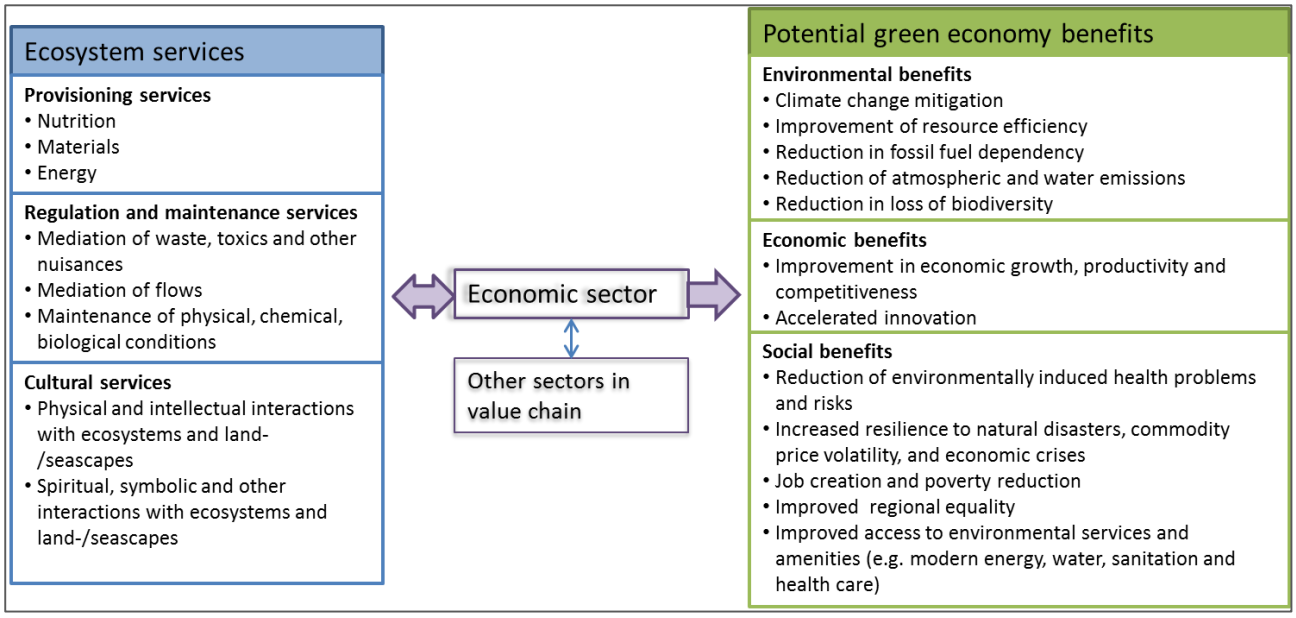


Figure 6 Schematic presentation of the conceptual framework to systematically assess the connections between ecosystem services, economic sectors and green economy. For ecosystem services, the Common International Classification of Ecosystem Services (CICES, version 4.3) was used. For green economy, no agreement exists yet on an analytical framework or a set of indicators to monitor green growth or green economy, therefore green economy benefits were compiled from green economy related

publications of different organizations (UNEP, OECD, World Bank and Global Green Growth Initiative) Source: Antikainen et al. (2015b)

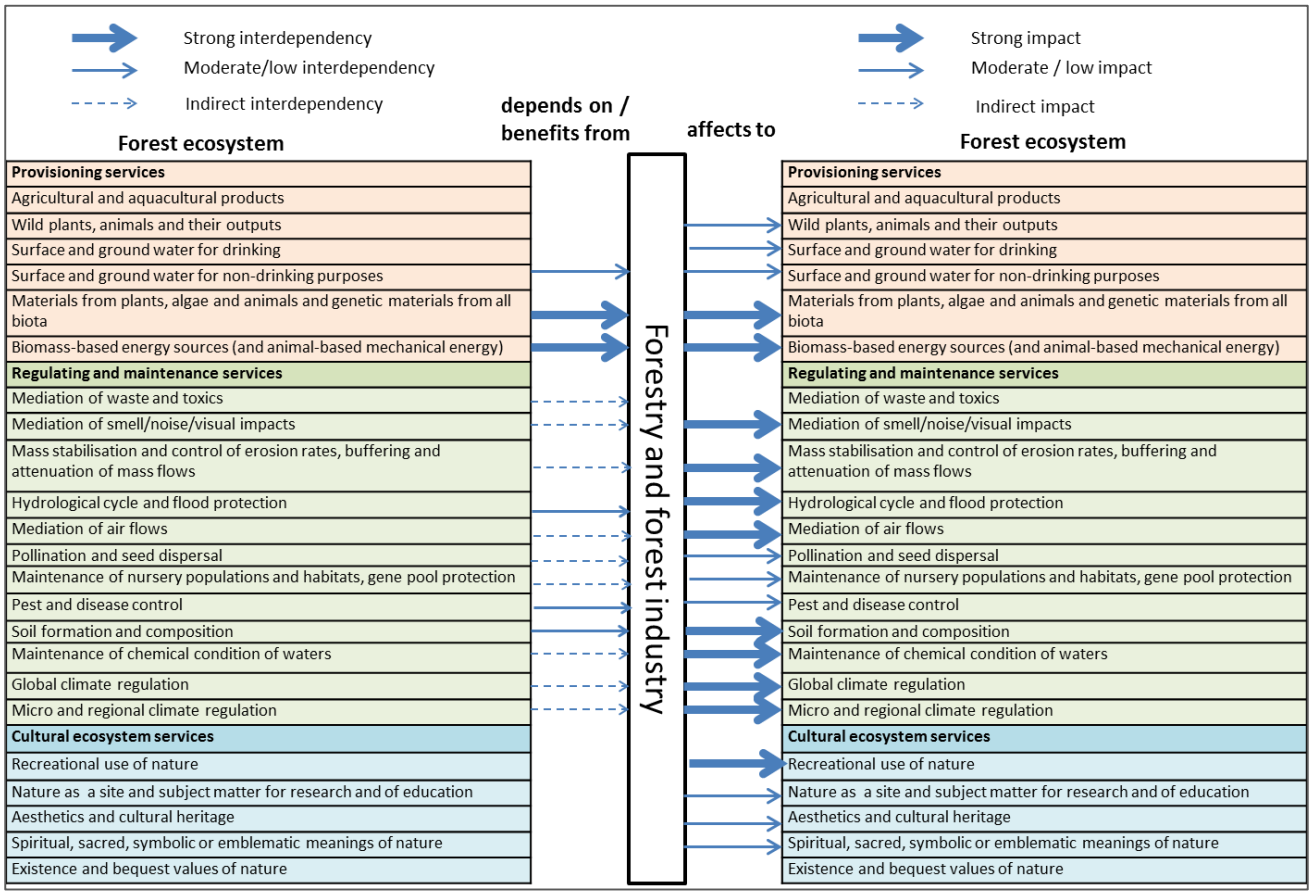


Figure 7 Example of a systematic assessment and illustration of interlinkages between the forestry sector and ecosystem services in Finland: interlinkages between ecosystem services and the forestry and forest industry. For ecosystem services, we used the Common International Classification of Ecosystem Services (CICES) (version 4.3). Source: Antikainen et al. (2015)

The frameworks by ten Brink et al. and Antikainen et al. complement one another and together provide a good conceptual basis for the identification of interdependencies between ecosystem services and green economy, allowing moving on to the assessment of concrete opportunities for further integration and uptake. In other words, these frameworks can be taken up and used strategically to operationalise the concept of ES in practice in the context of broader green economy. For example, in the context of the Finnish forestry sector the policy oriented conclusion drawn by Antikainen et al. (2015a) imply that - given the interdependency and possible impacts on ecosystem services – the nationally promoted concept of bioeconomy (i.e. economy in which renewable natural resources are used to provide food, energy, products and services) should be seen as a part – not synonyms – to green economy. This is because, based on the assessment, a key question in the transition to bioeconomy is that how the degradation of ecosystems due to forestry is combated and ecosystem services provided by forests to both forestry and other sectors are safeguarded. Therefore, the transition to green economy in Finland should not be perceived as

transition to bioeconomy only but it should comprise of a broader set of greening approaches (as defined by ten Brink et al. 2012 and 2014). Following this broader green economy path, sustainable forestry and forest industry with pro-active integration of ecosystem services into the sector could produce many green economy environmental benefits, including climate change mitigation, reduction in fossil fuel dependency, as well as socio-economic benefits such as potential improvements in economic growth, productivity and competitiveness, accelerated innovation, and thus job creation and poverty reduction.

4. Developing a standard conceptual framework for assessing ecosystem service integration to support green economy

Given the underpinning role of ecosystem services and natural capital in green economy, a systematic and comprehensive assessment of the integration of ecosystem services across relevant policy sectors seems to offer a logical starting point for the transition to a green economy, this way also paving the way for further sectoral integration of these concepts into concrete policy- and decision-making. In addition to providing information on the current level of integration, such an assessment can help to identify the needs for policy coherence between sectors and identify 'win-win' opportunities between different policy objectives underpinning green economy (e.g. sustainable use of bioresources and cost-effective nature based solutions). Finally, looking at the foreseen future developments under different sectoral policies, it can also help to identify windows of opportunity and possible bottlenecks for the transition. As such the framework would provide a concrete means for operationalising the rather ambiguous concept of green economy, facilitating the transition.

As explained in the context of green economy, which policy areas have real potential and windows of opportunity for progress and which policy instruments will prove helpful, depends on the country, region or locality. In general, the main opportunities for green economy do lie with national level sectoral policies and decision making processes, supported or encouraged by global and EU agreements, conventions, protocols and law. Furthermore, in certain countries, regional (i.e. state) and local level policies can also play a crucial role in the uptake through planning processes, investment and other instruments. A systematic assessment of ecosystem service integration can help to identify the most promising policy areas for integration across different governance levels: a) sectoral integration of ecosystem service can also help to avoid inappropriate trade-offs between ecosystem services - and between ecosystem services and biodiversity conservation - across policies and b) is also needed to help identify opportunities where the appreciation and understanding of ecosystem services can create win-win solutions between delivering different policy objectives. The integration of ecosystem into sectoral policies will improve policy coherence

and added value of individual policies. Examples of integration across policy areas are illustrated below.

Green economy and ecosystem service: identifying concrete opportunities and needs for sectoral integration

One area of major potential for enhancing policy coherence is that of climate change. Nature-based solutions, i.e. policy and management responses that build on the maintenance or restoration of nature's functioning and processes, can be used to support the achievement of climate related policy goals. These solutions build on the understanding of how ecosystem services can contribute to such things as the cost effective climate change mitigation (e.g. peatland protection and restoration, protection of old growth forests), adaptation to the adverse impacts of climate change and natural hazards management (e.g. forests reducing risk of flooding, avalanches or mudslides).

On climate mitigation, key policy processes include the global United Nations Framework Convention on Climate Change (UNFCCC) and related national and local climate strategies implementing the global commitments. Improving the recognition of nature-based means for mitigation within these processes, for example through the REDD+ instrument, can support both climate and biodiversity objectives.

On climate adaptation and disaster mitigation, improving the links between the different relevant pieces of legislation and associated implementation of commitments would be important, helping climate mitigation and adaptation while simultaneously addressing land desertification, degradation and biodiversity conservation.

Climate policy is, however, also a potential source of policy dissonance, where it runs counter other policy objectives. For example, monoculture carbon plantation forests can be low in biodiversity and also lead to a smaller set of ecosystem service provision to the detriment of others (e.g. cultural services) and attention is needed in designing REDD+ schemes and carbon plantations more generally to ensure that the potential multiple ecosystem services benefits (or losses) are not overlooked (ten Brink et al. 2011).

Another fundamental sector is water supply and management, i.e. water security and the provision of clean water. Both can benefit from nature's role in water retention, water and waste regulation and water provision (Russi et al. 2013). Here integration can be facilitated by making nature-based solutions for water management an integral part of implementing national, regional and local water security measures. Multi-country river basin management processes are also venues for integrating ecosystem services and potentially support international diplomacy where water is a source of international conflict. A dialogue around the evidence for ecosystem-based management

approaches in multi-country river basins could potentially contribute to diplomacy initiatives, conflict resolution and solution identification. Where ecosystems are fundamental to the provision of clean water and/or water use decisions (e.g. dam construction, over-abstraction) risk undermining biodiversity, ecosystem functions, services, and benefits to society, there are particular merits in taking account of the roles of nature in discussions, decisions and cooperation. While there are synergies between biodiversity and water security over the short to long term as biodiversity often is fundamentally important for clean water provision, there can also be competition as both people, industry and nature 'compete' for water. Where short term water security objectives lead to over-extraction such that less is available for ecosystems to function (i.e. if the water tables falls), then this can lead to ecosystem tipping points with loss of biodiversity and in cases ecosystem changes – i.e. from woodland to grassland, leading to often quite different ecosystem service provision.

The long term viability of livelihoods and food security at all governance levels can be improved through ecosystem-based management of fisheries, helping ensure that viable fish stock are maintained by, for example, protecting the nursery functions of coastal ecosystems. On land, sustainable agricultural management practices can help avoid soil erosion, this way maintaining agro-ecosystem's natural ability to maintain both soil fertility and carbon stocks. Similarly, the investment in protecting genetic diversity of crops can help crop resilience while the protection of wild pollinators and natural predators can support food production and lead to cost savings from avoided pollination costs, avoided losses from reduced yields and lesser costs of pesticides and herbicides (Hajjar et al., 2007). At the same time, agricultural policies and practice can lead to policy conflict as policies and incentives focusing on short term outputs may lead to a loss of soil fertility, carbon storage and water retention potential from soils. Furthermore, the conversion of biodiverse areas to agricultural land can involve important trade-offs between biodiversity, ecosystem services and food provisioning (TEEB 2011). The use of certain pesticides and the loss of natural areas can have negative effects on wild pollinators and thus loss of biodiversity, pollinating services, and subsequently reduced farm output (Vanbergen et al. 2013).

For the energy and transport sectors, the conflict with biodiversity is well known: habitat fragmentation through infrastructure, pollution and water abstraction each affect biodiversity and ecosystem services provision. Large hydroelectric dams can lead to major inundation upstream and falling water tables downstream, which can lead to ecosystem tipping points, biodiversity losses as well as social impacts where upstream relocation of human settlements was necessary (Koenig, 2002). This provides a fundamental challenge and constant source of policy conflict. Environmental impact assessments (EIA) and other assessment tools can be useful tools to inform decision making and minimise trade-offs, but have often proved weak tools in the face of calls for economic development. Evidence of the values of ecosystem service losses could help strengthen policy makers resolve to make better use of EIAs. As regards synergies, there are cost-effective nature based solutions for the energy sector that merit more attention, for example through providing shading of rivers that can reduce possible constraints on use of cooling waters for power stations and through reduced soil erosion which could lead to losses of output of hydropower plants (TEEB 2011, Russi et al. 2013).

The potential contribution of nature to poverty alleviation, regional development and the wider transition to a green economy is also being understood and emphasised (ten Brink et al. 2012, IEEP and Milieu 2013). On global poverty alleviation there are opportunities for policy synergies through development cooperation and national poverty alleviation programmes that recognise the social benefits of ecosystems and integrate them in investment decisions. Similarly, the Rio +20 process and associated millennium and sustainable development goals offer to be important policy processes to integrate ecosystem services for poverty alleviation. As regards national and regional development, national plans and regional strategies can be used to encourage win-wins through building on national and local nature-related branded products, creating cost-savings from the provision of clean water, increasing opportunities for recreation and (nature-based) tourism, and attracting investment as a result of better environmental quality. Again it is important to understand the risks of trade-offs (e.g. tourism activities on the environment), and put in place measures to safeguard the assets and avoid unsustainable losses. Finally, innovations for green economy can usefully build in benefits created by bio-innovations such as biomimicry and pharmaceuticals. Improving access and sharing of benefits under the CBD Access and Benefit Sharing regimes could prove a key driver both for innovation in pharmaceuticals, and also for innovation and eco-efficiency more widely. Green economy strategies, national development plans and NBSAPs could also each be used as tools to help take account of and enable potential win-wins and hence be a source of policy coherence.

Ecosystem services can also support health objectives through, for example, benefits from improved air quality and from mitigated heat island effects in cities, access to green areas, and the range of medicines linked to genetic materials and traditional knowledge (ten Brink et al. 2012). National health strategies are useful governance tools here, as are municipal climate and health policies, plans and investments.

Towards a standard operational framework for opportunities and needs for future integration

As highlighted in the introduction, there is a need for an operational framework (e.g. a dedicated policy assessment tool) for assessing the opportunities and needs for sectoral integration of ecosystem services into policy implementation in practice. The conceptual frameworks introduced in Chapter 2 and 3 are considered to form central elements for developing such a framework. The recommended steps - as identified in the context of this assessment - are outlined below.

Step 1: assessment of the current level of policy integration. Understanding the state of play forms a crucial starting point for any future assessment. Building on the conceptual premises set by Kettunen et al. (2014), the state-of-play assessment should comprise of the assessment of all three levels of integration: conceptual, operational and implementation, with the focus in particular

on the successes and failures of the latter. This assessment should take stock of the current level of integration at different relevant sectoral governance levels, starting from understanding the situation at the EU and/or national level and then moving onto regional and/or local level. This is because for several policy and/or economic sectors the overall premises are set at the EU level.

Step 2: identification of key policy and sectoral opportunities and needs for future integration. The assessment of the current level of integration allows for a systematic approach to the identification of key opportunities and/or problem areas for ecosystem service integration to be taken. This assessment will include aspects related to possible future policies and policy instruments but also assessment of the needs and opportunities for boarder ecosystem service governance and science-policy interphase. It requires the development of criteria for how to plan and prioritise policy action for further integration and uptake of ecosystem services and natural capital in the context of different policies. This includes criteria for identifying key win-wins and avoiding trade-offs between policy sectors, assessing any possible bottlenecks for development (e.g. conflicting stakeholder interests or sectoral / geographical mandates), identifying concrete windows of opportunity (e.g. upcoming policy reforms) and linking these to possible sources to finance uptake.

As an outcome, this step is foreseen to include a hierarchical mapping of policy instruments across identified key sectors (as per Figure 4) and identification of needs and opportunities for ecosystem service knowledge for key sectors (as per Figure 5). In addition, this stage should include the mapping of key institutions and stakeholders responsible for affecting and implementing the decision.

Step 3: using the green economy framework as a strategic and holistic platform for planning take up and further implementation in practice. In order to use the sectoral policy assessment to support the broader national, regional or local shift to a green economy, the outcome of the assessment need to be strategically mapped against the different possible pathways for green economy as outlined in Chapter 3. This will provide a useful framework for planning and communicating the opportunities for ecosystem service integration and it will also help to develop a short and long term plan for a shift to green economy building on natural capital (Figure 8).

One of the foreseen outcomes of this assessment would be the identification of key economic sectors within the area for green economy and carrying out a detailed assessment of interdependencies of and impacts on these sectors on ecosystem services (as per Figure 7).

Step 4: (planning for) assessing and monitoring policy impacts. The final success of integrating the concept of ecosystem service in to sectoral policies is determined by the impacts of policies and related policy instruments on, on the one hand, the status of biodiversity, ecosystem services and related benefits in practice and, on the other hand, the developments of economic

sectors under the green economy umbrella. This stage would make use of a range of information instruments (indicators, maps, values, accounts, ex-post policy assessments), summing up win-wins and trade-offs across policy sectors. The final step of the assessment framework is foreseen to take place over the years following policy implementation, however in order to ensure that the impacts of ecosystem service integration are picked up appropriately it will be useful to plan for this step already in the context of the state-of-play assessment and consequent future strategic planning.

The above steps are developed into a wireframe for a foreseen assessment tool and guidance for practitioners in Annex 1 (see Milestone 3.7 for further information).

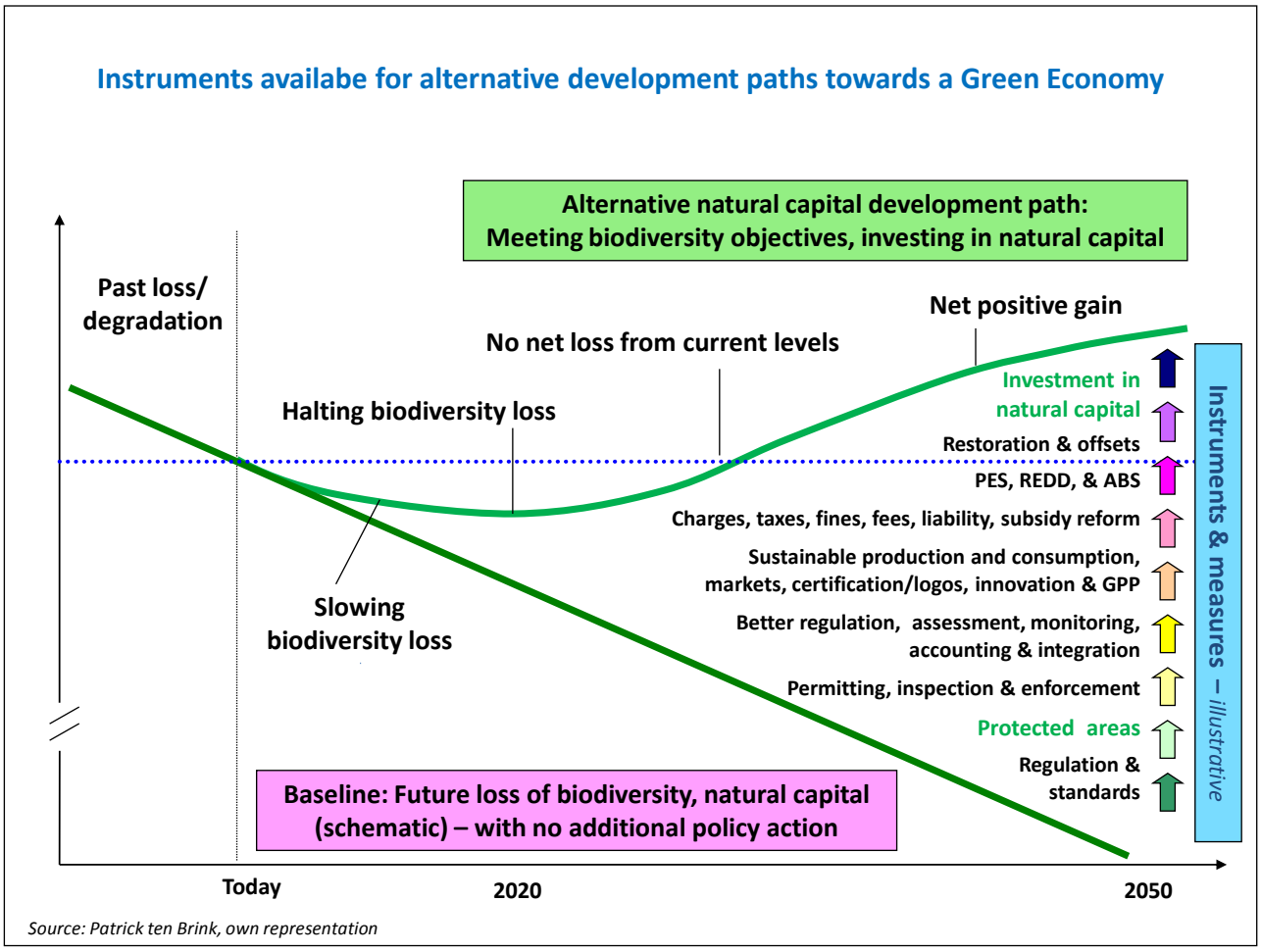
Developing and operationalising a standard approach to the assessment of sectoral integration should be used to pinpoint a range of opportunities - and also challenges - for further integration in the context of green economy. For example, the ecosystem boundaries and political structures often do not match (Young 2002). Ecosystems and their functions and services often span over geographical areas that fall into different political and administrative boundaries and jurisdictions. Such issues need to be picked up in the assessment of implementation integration. Similarly, the mobilisation of resources is essential to the concrete implementation of ecosystem service related initiatives. Demonstrating nature based solutions to different national, regional and local development goals and objectives play an important role in this. The reform of national incentives harmful to biodiversity (and wider reform of Environmentally Harmful Subsidies, EHS) can also potentially reduce pressures on the environment while liberating funds (Oosterhuis and ten Brink 2014) which can help meet policy objectives more efficiently.

In terms of institutions and stakeholders, strengthening the implementation of the Polluter Pays Principle (PPP) via regulation and economic incentives could be essential to halt biodiversity loss, protect the flow of ecosystem services, and encourage investment in natural capital. Strengthening the beneficiary (or user) pays principle and beneficiary-provider gets paid principles (i.e. by having more Payments For Ecosystem Services (PES) or other incentives such as tax relief or reverse auctions), can also help, though there are limits to how much PES can fund due to resource availability and due to ethical and cultural resistance to the ideas of payments for services, where this is seen simply as 'responsible behaviour' (ten Brink et al. 2011). There is a further challenge of implementation at practical levels such as permitting (e.g. land-use change permits, which can impact ecosystem services), inspection and non-compliance enforcement, which require a range of other stakeholders (permitting agents, inspectors, judges), institutions (e.g. courts and the rule of law), governance processes and tools (e.g. fees, fines and criminal sentences). This requires institution building, capacity building, political will and individuals to champion change.

As the discussion on policy synergies above shows, there is promise for improved policy coherence and reduced policy dissonance for ecosystem services, however there also remain major challenges – political will, vested interests, institutional roles, time, geography and

economics itself. Decisions are taken within certain jurisdictions (e.g. by institutional and geographic reach), representing certain interests (e.g. sectoral, geographic), and usually short term in nature. Impacts abroad, impacts in the medium to long term, and impacts on groups that are under-represented or not represented at all are often given less attention in decision making. Similarly decisions often favour the economic, arguably biasing decision making by not fully factoring in other values. Given the global, long term and public goods nature of the biodiversity and ecosystem services this would suggest that that decision makers need to broaden their horizons – becoming 'ombudsmen' for future generations and more responsible statesmen and stateswomen in a world run by national self-interest, where short term private gain is more important than (longer term) public goods. An improved and transparent assessment of and evidence base on ecosystem services and their sectoral integration is foreseen as a key tool for progress.

Figure 8 Illustration of instruments available for different development paths towards green economy. Source: ten Brink, own illustration



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Annex 1 Wireframe for an operational assessment tool

Table A1 Wireframe for an operational toolkit for assessing the integration of ecosystem services across sectoral polices in the context of green economy

No	Chapter	Short description of the content	Comments
1	Introduction		
1.1	Ecosystem services and natural capital: introductory remarks	Introduction to ecosystem services and natural capital, how integrating these concepts / aspects into sectoral policies can help sustainability	
1.2	Toolkit: structure and content	Brief outline of the toolkit structure and content	
1.3	What is the toolkit for?	Description of overall objectives of the toolkit and the foreseen situations / stakeholder motivation for applying it.	Important to focus on both synergies from mainstreaming ecosystem services and natural capital and reduced trade-offs
1.4	Who is the toolkit for?	Description of the target audience	Identify the type and level of a stakeholder - as the toolkit can be applied at EU, Member State, regional and even city level.
1.5	Application of the toolkit	Description of how the toolkit should be applied	See Tables 1 and 2
2	Step 1: assessment of the current level of policy integration		

2.1	Setting the scene – objectives, policy areas and governance	Setting the overall objectives for the assessment and, based on the objectives, identifying key policy areas to be assessed, also providing guidance for assessing different levels and aspects of ecosystem service governance.	Work through a hierarchy of documents - e.g. treaties, legislation, conventions, strategy documents, communications, white papers etc.
2.2	Assessing the current level of integration	Assessment of all three levels of integration: conceptual, operational and implementation, with the focus in particular on the successes and failures of the latter. This assessment should take stock of the current level of integration at different relevant sectoral governance levels, starting from understanding the situation at the EU and/or national level and then moving onto regional and/or local level.	Covering both the opportunities for win-wins and reduced trade-offs. Windows of opportunity will differ at different governance levels (EU, Member State, region, city)
3	Step 2: identification of key policy and sectoral opportunities and needs for future integration.	The assessment of the current level of integration allows for a systematic approach to the identification of key opportunities and/or problem areas for ecosystem service integration to be taken. This assessment will include aspects related to possible future policies and policy instruments but also assessment of the needs and opportunities for boarder ecosystem service governance and science-policy interphase.	
3.1	Developing criteria for identifying opportunities and needs	Development of criteria for how to plan and prioritise policy action for further integration	

		and uptake of ecosystem services and natural capital in the context of different policies. This includes criteria for identifying key win-wins and avoiding trade-offs between policy sectors, assessing any possible bottlenecks for development (e.g. conflicting stakeholder interests or sectoral / geographical mandates), identifying concrete windows of opportunity (e.g. upcoming policy reforms) and linking these to possible sources to finance uptake.	
3.2	Identification - key policy areas and instruments	Identification and mapping of key policy areas and instruments for ecosystem service integration	See Figure 3
3.3	Identification - ecosystem service knowledge	Identification of needs and opportunities for ecosystem service knowledge for key sectors	See Figure 4
3.4	Identification - institutions and stakeholders	Mapping of key institutions and stakeholders responsible for affecting and implementing the decision	Depends on specific aspect of ecosystem services / natural capital and ideally cover both vertical links (i.e. from top down institutions to bottom up actors) and horizontal links (between stakeholders at the same level – e.g. different ministries)
4	Step 3: using the green economy framework	In order to use the sectoral policy	Refer to resource

	as a strategic and holistic platform for planning take up and further implementation in practice	assessment to support the broader national, regional or local shift to a green economy, the outcome of the assessment need to be strategically mapped against the different possible pathways for green economy.	efficiency, circular economy and bio-economy as well as sustainable development where relevant.
4.1	Identification of an appropriate strategic approach for a shift towards green economy	Outcome of the assessment under Chapter 3 is to be strategically "mapped" against the different possible pathways for green economy, this will form the basis for a strategic national / regional / local approach towards green economy	See Figure 5
4.2	Key economic sectors for a shift to green economy	Identification of key economic sectors within the area for green economy and carrying out a detailed assessment of interdependencies of and impacts on these sectors on ecosystem services	See Figure 6
5	Developing a plan for a shift towards green economy based on natural capital	Building on the insights above (Chapters 3-4) developing a strategic plan for the shift towards green economy and also a plan for communicating the opportunities to stakeholders, envisaged for a short and long term plan to be developed.	Ideally this would cover: issues, sectors, actors, actions, timelines.
6	**Step 4: (planning for) assessing and monitoring policy impacts**	Guidance on how to plan for measuring and assessing the impacts of ecosystem service integration in the future, this way verifying the actual impacts on biodiversity, ecosystems and related services.	Will require a range of existing data, tools and metrics, as well as likely new sources of information.
	References		
	Annexes		Include data sources for

			different types of documents for the assessment