Knowledge innovation project (KIP) on Accounting for natural capital and ecosystem services - scoping paper
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Abstract

Establishing a sound method of natural capital accounting with a strong focus on ecosystems and their services is a key objective of the 7th Environment Action Programme (EAP) and of the EU Biodiversity Strategy. It will help understand better how job creation, economic growth and well-being rely on natural capital and will support a number of key strategic EU policies, such as the Europe 2020 strategy.

This KIP aims to design and implement an integrated accounting system for ecosystems and their services in the EU by connecting relevant existing projects and data collection exercises to build up a shared platform of geo-referenced information on ecosystems and their services. This system would be used to derive indicators and assess the economic importance and value of ecosystems and their services, in a manner that is consistent with UN standards on environmental accounting. An innovative outcome of the project is that bio-physical and economic data related to the extent and condition of ecosystems can be integrated in a systematic way, so that they can be aggregated and disaggregated at the required scale, including at national level, to complement figures of economic performance.

The project will be structured in 2 main phases, a feasibility and design phase and a follow-up implementation phase, running from 2015 – 2020. The project focuses on establishing an accounting system for the EU level, primarily using EU-wide data sources, thereby contributing the EU layer to the MAES initiative. Member States will be able to link into this system. Main project partners will be Eurostat, the EEA, DG ENV, DG JRC and DG RTD. Other interested DGs will also be involved (e.g. DG AGRI, DG GROW).

A) Topic

Accounting for natural capital and ecosystem services

Acronym:
INCA - Integrated system for Natural Capital and ecosystem services Accounting

B) Objectives and approach

Measuring and accounting for natural capital is essential for ensuring smart, sustainable and inclusive growth. Understanding better how job creation, economic growth and well-being rely on natural capital contributes to resource efficiency and the promotion of a circular economy. This improved understanding also contributes towards a more cost-effective achievement of the objectives set out in the key EU strategic policies that have links with natural capital, such as strategic investments, energy union, industrial, common agricultural, fisheries and cohesion policy. Establishing a sound method of natural capital accounting with a strong focus on ecosystems and their services is a key objective of the 7th Environment Action Programme (EAP) and of the EU Biodiversity Strategy to 2020. This key objective can only be achieved if workable concepts and adequate access to valid data are available.

An integrated accounting system for ecosystems and their services is particularly suitable to fulfil the mentioned objectives, because it would integrate bio-physical and economic data in a systematic way, so that they can be aggregated and disaggregated at the required scale. It further underpins and supports the development of indicators that complement and go beyond GDP, as requested *inter alia* by the 7th EAP.

The integrated accounting system is a shared platform of linked data sets and tools for covering geo-referenced information on ecosystems and their services, allowing to assess their economic importance and value, and which can be linked to the standard national accounts. It includes layers of data based on (1) earth observation (e.g. on land cover), (2) statistical collections including physical data about human activities (e.g. land use, industrial use), biomass production, water use and availability, (3) environmental monitoring data including data reported under relevant legislation and (4) models which quantify ecosystem services such as water, air and soil regulation, pollination, carbon release and sequestration, etc. The shared platform will seek to integrate monetary and non-monetary valuation of ecosystems and their services.

At international level, the System of Environmental-Economic Accounting - Experimental Ecosystem Accounting (SEEA EEA) handbook provides a framework for testing ecosystem accounting at different levels. This KIP aims to design and implement an integrated accounting system for ecosystems and their services in the EU, and thereby provides an EU contribution to testing the SEEA EEA and could feed into international initiatives, such as the Sustainable Development Goals. It will also contribute to the EU layer of the Mapping and Assessment of Ecosystems and their Services (MAES) under the EU Biodiversity Strategy. The project would include an EU layer of main accounts, and the institutional capacity to maintain these EU accounts. Member States and research institutes could then tap into this system to add extra detail or extra analytical layers.

The KIP would connect relevant existing projects (such as Horizon 2020's ESMERALDA) and data collection exercises (such as LUCAS) to make them contribute more information about the ecosystem components of natural capital. Where necessary it would also propose revision of existing data collection systems, to generate synergies and thus ensure coverage of data gaps as far as possible. In the short term, data gaps would be filled with model results. Durability of underlying data collections will be an important consideration.

The ecosystem accounting system will provide maps, tables and accounts and will be designed to support and inform policy development and implementation in the EU and will be established on the basis of MAES, the SEEA EEA and other relevant methodological guidance. The system would be designed so that its data layers and other information outcomes would be fit for purpose for policy-makers, analysts and researchers as they prepare various policy evaluations and decisions. It would also contribute to better planning and implementation, as well as monitoring of progress towards achieving objectives and meeting communication goals. Examples range from UK work on forest spatially disaggregated accounts, which helped support forest management decisions, to the publication of national natural wealth figures in Canada and Australia to complement economic performance figures. By focussing on ecosystems and their services, this KIP addresses an important gap in terms of knowledge, data and tools, for national accounting and related indicators.

Due to the institutionalisation of the integrated accounting system, regularity in data provision and monitoring would be ensured, as it already has been the case in two successfully institutionalized research projects around environmental input-output models - EXIOPOL and Desire - now leading to attempts by international organisations to establish a regular production of multi-regional input-output tables for environmental and other modelling.

This is a substantial endeavour, foreseen to run from 2015 to 2020. A stepwise implementation is proposed as it would not be feasible to fully cover all types of natural capital and all types of ecosystem services from the beginning. This is particularly relevant for the inclusion of marine ecosystems in the work of the KIP which is proposed to be reviewed during the feasibility and design phase.

The KIP would have two main phases:

1. An initial feasibility and design phase of about 12 months, using mainly existing resources and knowledge from EKC partners and in consultation with stakeholders and users. This would lead to a proposal and prototype for an integrated accounting system for ecosystems and their services.

2. A follow-up implementation phase, bringing the proposed accounting system into production. This would take an estimated 4-5 years to complete and would entail careful project and budget

planning. Implementation will be done in a step-wise approach, the aim being to gather full stakeholder engagement at each successive step.

A detailed budget proposal will be set out, once phase 1 (feasibility and design) is sufficiently advanced.

Expected main steps and final outcomes:

The core of the project is to combine existing geo-spatial data layers related to ecosystems and to generate initial (primarily bio-physical) indicators and accounts on a regular basis and which could then be used to derive estimates of the value of ecosystems and their services.

Feasibility and design phase:
  i.   Review of existing and planned international and EU level data collection instruments
  ii. A plan for an integrated accounting system for ecosystems and their services at EU level, with engagement of all relevant stakeholders

Implementation phase:
  i.   A step-wise implementation of the system, starting with natural capital components identified as high priority
  ii. Publication of first EU accounting results as a test case, with associated analyses and demonstration of their environmental and policy implications
  iii. Implementation of revised survey design for priority data collection instruments (e.g. for LUCAS and Copernicus)
  iv. Gradual building up of individual accounting layers, leading to a fully-functional and integrated accounting system for ecosystems and their services, being in place by 2020.

Final outcomes:
  i.   Analytical framework integrating physical and economic data, with a view to linking to national accounts
  ii. Asset accounts describing the extent and condition of ecosystems, and ecosystem services accounts
  iii. Methodology for estimation of economic flows associated to ecosystems, including valuation of ecosystem services
  iv. First set of macro-indicators resulting from the system

C) Description

1. Context and motivation – deficits in knowledge base and consequences for policy making

The first priority of the 7th EAP is to protect, conserve and enhance its natural capital, "i.e. its biodiversity, including ecosystems that provide essential goods and services, from fertile soil and multi-functional forests to productive land and seas, from good quality fresh water and clean air to pollination and climate regulation and protection against natural disasters" (§17). This contributes e.g. to the Treaty objective of sustainable development, the implementation of the EU's Rio+20 commitments and the soon to be adopted Sustainable Development Goals (post-2015 agenda).

One of the actions set out is the integration of the economic value of ecosystem services into accounting and reporting systems at Union and national level by 2020, thereby recalling the MAES initiative under the EU Biodiversity Strategy. It is foreseen that work to implement a system of environmental accounts, including physical and monetary accounts for natural capital and ecosystem services, should be stepped up. This contributes towards the aim of "developing indicators that complement and go beyond GDP to monitor the sustainability of progress", and "to integrate economic

indicators with environmental and social indicators, including by means of Natural Capital Accounting (NCA)" (§84 vii).

The existing environmental and related statistical data is not sufficiently geared towards monitoring and accounting for ecosystems and their services. As a result their importance and impact on economic prosperity and human well-being is not taken into account. Various types of data about the extent and condition of different ecosystems and their services which are regularly updated are in principle available from different sources. However, while lots of data exist, information is not available in a comparable, timely and integrated way, and EU-wide applications do not exist. The on-going data revolution will further sharpen this dilemma, with vast amounts of 'noisy' data, preventing efficient access to what is actually needed, unless the required data are identified and channelled towards a specific knowledge producing machinery.

There are, however, several data collection exercises, such as CORINE Land Cover (now being updated under Copernicus) and the LUCAS survey, that provide geo-referenced data suitable for tracking certain trends in ecosystems and their services. Also the data collected by Member States under different environmental legislation such as the Habitats Directive and the Water Framework Directive have a spatial dimension. There are also substantial sets of statistics (e.g. on agriculture or forestry), environmental monitoring data and data reports that can provide important complementary information if they are suitably geo-referenced. There is also important modelling and research work undertaken by all partners. If all these instruments could be combined efficiently and remaining gaps filled it would be possible to develop an EU system for the integrated accounting of ecosystems and their services.

A fully functioning integrated accounting system would provide a good information basis for a better management of ecosystems and their services. Thus it would directly support a range of EU policy objectives, includes in particular the 7th EAP as well as the EU Biodiversity Strategy, the Europe 2020 Strategy for smart, sustainable and inclusive growth and its resource efficiency flagship, the Water Framework Directive, the Marine Strategic Framework Directive, the EU Forest Strategy, the Climate Adaptation Strategy, the Soil Thematic Strategy, air quality legislation, the circular economy, the common agricultural policy, the common fisheries policy and cohesion policy, industrial policies and other policies which have ecosystem impacts and depend on healthy ecosystems. It would further support the trans-European transport networks, the energy union, trade and the urban agenda. Such a foundation will enhance the possibilities for evaluating the achievements of the objectives of these policy documents.

2. Current work and tools of EKC partners

Several of the EKC partners already manage and develop substantial statistical and environmental monitoring exercises and have significant conceptual knowledge. These can be summarised as follows:

Eurostat: As the EU statistical office Eurostat manages important sets of regional (e.g. population) and sectoral statistics (e.g. on agriculture or forestry) that can provide important land use information if suitably geo-referenced. It also runs every third year a Land Use and Cover Area frame Survey (LUCAS), the latest one in 2015. LUCAS gathers harmonised data on land use/cover collected through direct observation in the field and can become a key source of in-situ data on ecosystem characteristics. Eurostat compiles environmental accounts which analyse the interactions between the environment and the economy for a range of areas, in physical and monetary terms. These accounts are expanding but at this stage do not include geographical information and the range of natural resources does not encompass ecosystems.

Eurostat further hosts the EU data centres on waste and on natural resources and is involved in a UN initiative on the integration of statistical and geospatial information with the ambition to create integrated information systems, the UN-GGIM: Europe. This initiative provides a forum to bring together producers of geospatial information useful for ecosystem descriptions and accounting. UN-GGIM: Europe could be used as a platform for making progress in particular at the national and regional level.

European Environment Agency: The principal role of the EEA is to provide information on the state of the environment in Europe to policy makers and the public. To do that it has developed assessment approaches and information systems. The EEA also manages a number of EU data streams, including those relating to biodiversity.

The EEA has already worked for several years on developing ecosystem capital accounting approaches, including land accounts and the CICES classification of ecosystem services, and can thus contribute substantial expertise in this field. In support to the MAES process, EEA has worked on developing an ecosystem assessment methodology and is developing an initial ecosystem map for the EU which can be an important source of input data on ecosystems and their services.

The EEA is managing the CORINE land cover data set and has recently been assigned responsibility for managing the in-situ component of the EU Copernicus programme - which will be an important data source for the foreseen ecosystem accounting system. In addition, the EEA hosts the EU data centres on water, land and biodiversity and air. The data streams arising from that responsibility and the investment in building information systems on water and biodiversity (WISE and BISE) are expected to be very relevant contributions to the work of the KIP.

DG ENV: to provide overall policy direction for environmental and sustainable development issues is one of the responsibilities of DG ENV. With the MAES initiative, DG ENV, with DG JRC, EEA and input from other Commission services, supports Member States in implementing action 5 of the EU Biodiversity Strategy. Whilst the first phase of MAES concentrated on biophysical mapping of ecosystems and their services, the second phase will also look at valuing ecosystem services and integrating them into accounting and reporting frameworks.

DG ENV is also running a project on MAES marine which aims at further refining the MAES marine methodology and linking it up with the implementation of the Marine Strategy Framework Directive. A reference document on natural capital/ecosystem accounting is being drafted as part of a pilot led by EEA and Bulgaria. DG ENV is also engaged in Natural Capital Accounting (NCA) initiatives in the private sector, via the EU Business and Biodiversity platform, and internationally, via the steering committee of Wealth Accounting and the Valuation of Ecosystem Services (WAVES), The Economics of Ecosystems and Biodiversity (TEEB) and a new Partnership Instrument project on NCA and valuation in emerging economies. DG ENV assures the integration of relevant elements into the range of relevant policies managed by the Commission, both in Europe and internationally.

DG ENV is also engaged with DG JRC and the EEA in defining indicators and policy scenarios on land use efficiency and land degradation, in support of various policy processes such as Circular Economy and Sustainable Development Goals. Potentially useful data sets related to the condition of ecosystems are collected under the Birds and Habitats Directives, the Water Framework Directive, and the Marine Strategy Framework Directive.

DG JRC: As in-house provider of scientific knowledge to different services of the Commission, the Joint Research Centre maintains 158 scientific tools and databases, several of which are relevant for ecosystem accounting. In particular, the data centres on forest (EFDAC) and soil (ESDAC) as well as the different information systems on agriculture (e.g. agri4cast, CAPRI), biodiversity (DOPA, eHabitat and EASIN) and water (water portal) are essential sources for assessing changes in ecosystems and their services

Of particular relevance is the DG JRC's Ecosystem Services Mapping Tool (ESTIMAP), which builds on land cover and land use maps to which it adds other spatial information with the objective to map and quantify various ecosystem services at EU scale. Linked to LUISA (the land use-based integrated assessment platform) it provides annual updates of ecosystem services and importantly, it can be used for scenario based projections relative to an EU baseline scenario up till 2050. The model was initially developed to provide support to the MAES process but following the coupling to the LUISA platform it can be used to assess impacts of other policies as well with a clear focus on cohesion policy.

DG RTD's research programme on biodiversity and ecosystem services (FP6, FP7) produced relevant knowledge and tools. Available resources on the project websites (e.g. FP7 SCALES; HighArcs; etc.) are usually maintained only sometime after the closure of the grant agreement, with notable exceptions

(e.g. FP7 BIOFRESH and its BIOFRESH Portal; OPERAs and OpenNESS and their OPPLA platform, which cover global freshwater biodiversity, Ecosystem Science for Policy and Practice and operationalisation of natural capital and ecosystem services). The most relevant available tools are: (i) SCALETOOL - designed to help a wide range of users with understanding and exploring scaling issues in biodiversity research and conservation, (ii) WRAP toolkit - the Wetland Resources Action Planning is a toolkit of research methods and better management practices, (iii) BIOFRESH Atlas - the Global Freshwater Biodiversity Atlas is a collection of published and open access freshwater biodiversity maps in addition to a gateway for geographical information and spatial data at different scales.

DG RTD has been traditionally very active in supporting the creation of EU-wide and international communities of researchers and stakeholders, in different fields. This is for example the case of the EU-mechanism for biodiversity and ecosystem services. Currently, DG RTD focuses its policy on delivering solutions, more than on knowledge creation. It finances, for instance, large-scale demonstration actions (e.g. nature-based solutions, re-naturing cities). The monitoring of these actions can be a valuable source for the exploitation of natural capital and ecosystem services accounts. They provide dynamic information about solutions and policies that work.

Together the KIP partners manage a wide range of data sets and tools that could form a data foundation for an integrated ecosystem accounting system for Europe. This should be complemented by input from private organisations and individuals that build relevant environmental data sets such as citizen observatories, provided sufficient quality assurance can be obtained. The same applies to international initiatives that build relevant data platforms, such as Group on Earth Observations/Global Earth Observation System of Systems (GEO/GEOSS) or work by UN organisations, such as UNEP-live. Compatibility between the various applications used will be an issue to be overcome over the medium-term, i.e. as systems are revised and renewed, inter-system compatibility can be addressed without undue extra cost.

3.   Innovative approach or methods to knowledge co-creation

The proposed KIP is an experiment involving an innovative institutional approach. It aims to provide a system of ecosystem accounting that meets the needs of the various institutional and other users and to institutionalise ecosystem accounting. The KIP would support knowledge innovation under three broad themes:

1. Bringing an ecosystem accounting perspective into EU statistical and environmental monitoring programmes. The KIP would look at the concept and components of natural capital as described in the 7th EAP and other key policy documents as well as the ongoing work at international level, in Europe and in the business sector. Based on this assessment critical information needs for monitoring trends in ecosystems and their services and for analysing their social, economic, environmental and well-being implications would be derived. To do this, the KIP will aim to provide a comprehensive overview of the data foundation available to monitor the status of ecosystems.

2. The KIP would for the first time integrate different data sources and models (satellite images, LUCAS surveys, statistics, models, data bases about specific ecosystems such as Natura 2000 areas or coastlines), as well as the range of data available from EU MS sources, into one information system within the frame of the international accounting standards of SEEA. Next to the basic geo-referenced data sets – maps – the KIP would explore innovative ways to turn this spatially explicit information into tabular accounts and indicators that can be aggregated to fit the needs of various policy makers, designers and analysts. In particular the interfaces with economic analysis and modelling and the System of National Accounts would be explored. This means that different types of data sources would be reviewed and consolidated from an integration perspective (including statistical data, satellite data, environmental reporting and citizen science). The integrated accounting system will allow derivation of summary (or macro) indicators.

3. The successful implementation of the KIP would require close cooperation among key EU information producers and users and an integrated approach to analysing the basic data systems. This knowledge innovation project would therefore be developed in close exchange with relevant

stakeholders across Europe, e.g. policymakers, potential users, producers of statistics with experience in ecosystem accounting, ecologists, economic research institutes and modellers, companies potentially involved, etc. This means it would aim to employ a 'knowledge co-creation' approach whereby the final proposal for an integrated EU ecosystem accounting system would be developed in an iterative process with bottom-up input rather than via a top-down solution.

4. Supported policies - how policies and their societal impacts would be improved

As stated in the 7th EAP and elsewhere a healthy natural capital is a critical resource for human prosperity and well-being. Hence it is very important to ensure that it is well managed across a wide range of policies. This is only possible with an adequate and targeted knowledge, of what needs to be done.

The different elements of natural capital and ecosystem services set out in the 7th EAP (including inter alia transitional, coastal and fresh waters, marine waters, land and soil ecosystems, forests) represent critical environmental variables that need to be tracked in order to be able to evaluate the success and/or impact of most environmental, economic and sectoral policies.

The integrated accounting system for ecosystems and their services and associated data sets would provide a multi-purpose tool that could be used for a range of policies, also at different stages of the policy cycle, which national authorities and research centres could also access.

A good data foundation on the extent, condition and trends in ecosystems and their services, organised in a structured accounting system, will provide substantial value-added in a range of policy contexts.

This includes in particular the 7th EAP as well as the EU Biodiversity Strategy, the Europe 2020 Strategy for smart, sustainable and inclusive growth and its resource efficiency flagship, the Water Framework Directive, the Marine Strategic Framework Directive, the EU Forest Strategy, the Climate Adaptation Strategy, the Soil Thematic Strategy, air quality legislation, the circular economy, the common agricultural policy, the common fisheries policy and cohesion policy, industrial policies and other policies which have ecosystem impacts and depend on healthy ecosystems. It would further support the trans-European transport networks, the energy union, trade and the urban agenda.

Furthermore, the overall outcome could include developing indicators that complement and go beyond GDP, as outlined in the 7EAP, adding to Europe 2020 and potentially feeding into the development of SDG indicators. These options would need to be further discussed both within the Commission and with the relevant external stakeholders, such as the OECD, FAO and others.