Developing an EU Ecosystem Accounting System
Focus on marine ecosystems

Paris, 10 – 11 March 2016

Draft Workshop Report

For feedback by workshop participants by 15 April

Introduction and objectives

The workshop 'Developing an EU Ecosystem Accounting System – Focus on marine ecosystems' took place on the 10 - 11 March 2016 at the French Ministry for the Environment, Paris. The workshop was held as part of the 'KIP-INCA' (Knowledge Innovation Project on Integrated Natural Capital and Ecosystem Services Accounting) and served as a rapid assessment of options for marine ecosystem accounting and the knowledge required to implement them. The workshop outcome presented in this workshop report will support the integration of Europe's marine ecosystems into a proposal for the design of the future EU ecosystem accounting system that is to be developed under an EU knowledge innovation project 'KIP INCA'.

The 'KIP INCA' project is one of the key collaborative projects between DG ENV, Eurostat, DG JRC, DG RTD, DG CLIMA and the EEA at EU level. It has been put together to help develop the knowledge base for monitoring priority objective 1 of the 7th Environmental Action Programme of the EU (on preserving, conserving and enhancing natural capital). By end of April this project needs to develop a concrete technical proposal on the future EU ecosystem accounting system for review and approval by EU Directors General and the EEA executive director.

The workshop focused on the biophysical dimension of ecosystem accounting, i.e. accounts for ecosystem assets and ecosystem services rather than monetary accounts. Hence the data foundation for developing physical marine ecosystem accounts and their design were the main focus for the workshop.

The workshop was guided by the following objectives:

- Provide input to the planned EU integrated ecosystem accounting system
- Presentation of the global and EU framework for ecosystem accounting
- Review current work on ecosystem accounts and ecosystem services for marine systems
- Identify user needs and objectives for the marine part of an EU ecosystem accounting system
- Develop recommendations on research and data investment for integrating marine systems into an EU ecosystem accounting approach

Structure of report

This summary report is structured according to the three sessions of the workshop plus a final concluding section and annex:

- Session 1 – Introduction, policy context and identification of key principles
- Session 2 – Applying ecosystem accounting concepts to marine ecosystems
- Session 3 – Implementing marine ecosystem accounting
- Conclusions and next steps
- Annex – Key questions addressed and workshop programme

Each session explains and presents the main outcomes, as well as open issues which were encountered in the discussions and break out groups.

1. Main outcomes of Session 1 – Introduction, policy context and identification of key principles

1.1 Setting the scene of the workshop - Introduction

In the first section of the workshop the organisers and participants set the focus of the workshop and framed the discussions ahead. Figure 1 was used as an entry point for understanding the workshop focus. Ecosystem accounting aims to describe the stock of ecosystems and the flow of services that we derive from them in a structured approach that enables an observation of trends in ecosystem stocks and associated service flows in a quantified manner. This requires organizing data about ecosystem assets and related flows in relevant spatial and temporal scales. The data foundation for marine ecosystem accounting is shaped by policy reporting requirements (MSFD, WFD, etc.) which provide indicators, methods and data for accounting approaches as well as by general environmental monitoring programmes, e.g. earth observation. To be useful ecosystem accounting should seek to address key policy questions and demands many of which can be derived from current marine, maritime and economic policies at different scales (at Member State, regional seas and EU level). All these factors lead to research and data needs which were explored further in the workshop.

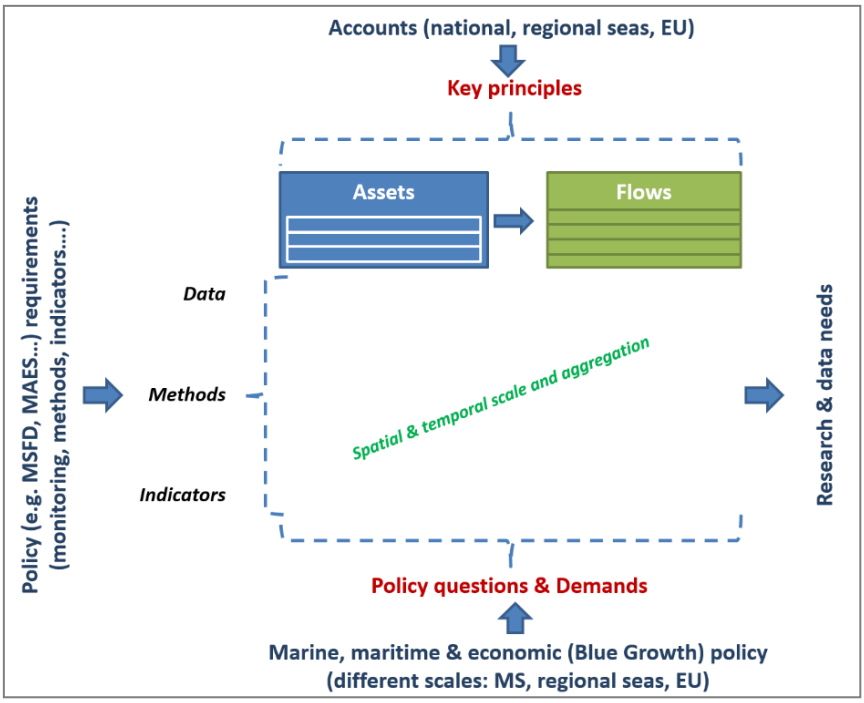

Figure 1: Developing an analytical frame for the workshop
Source: Pierre Strosser, facilitation session

Within the KIP-INCA initiative, ecosystem accounting efforts are guided by the methodological and conceptual frameworks of the System of Environmental Economic Accounting (SEEA) Central Framework (SEEA-CF) and Experimental Ecosystem Accounting (SEEA-EEA). Monetary valuation is an important aspect of the UN system of environmental-economic accounting. However, as set out in the workshop objectives, the main discussion focused on clarifying the bio-physical part of marine accounting as a foundation for subsequent work on valuation methods.

The outcomes of the workshop are one key input to the KIP INCA technical proposal on the future EU ecosystem accounting system, as mentioned in the introduction of the workshop report.

1.2 Setting the scene of the workshop – presentations

This section provides a summary of the presentations held in session 1 of the workshop and depicts the main outcomes of each presentation. The first three presentations focused on general aspects of policy context, economic approaches for measuring sustainability as well as ecosystem accounting, whereas the last presentation focused on marine assessments and accounting.

Policy needs and user expectations - Guenter Hörmandinger, DG ENV

This presentation provided the EU policy context for marine ecosystem accounts, with the Marine Strategy Framework Directive (MSFD) as one of the key policies guiding marine assessments and accounting:

- The system of national accounts gives a biased picture to policy makers regarding sustainability and the wealth and wellbeing of society. There is the strong need to go beyond existing indicators (GDP) to assess the level of sustainable development.

- Communication challenges have to be overcome by bringing together different communities and actors to work in an integrated and interdisciplinary way.

National accounts and capital-based approaches to sustainability: some background elements - Didier Blanchet, INSEE, France

Launched in 2008, the Commission on the Measurement of Economic Performance and Social Progress (also called the "Stiglitz-Sen-Fitoussi commission") was in charge of considering what additional information might be required for the production of more relevant indicators of social progress and economic performance, to assess the feasibility of alternative measurement tools, and to discuss how to present the statistical information in an appropriate way. The presentation reported on key insights of the work of the commission on measuring sustainability:

- On the question of measuring sustainability, the Stiglitz-Sen-Fitoussi commission argued in favour of a separate measure of sustainability that would complement GDP;

- The commission reviewed the existing approaches to measuring sustainability; multiple approaches to build such a measure exist: Composite or hybrid indexes, dashboards, environmental accounting and monetary approaches.

- In its final report the commission argued in favour of a capital-based approach for measuring sustainability, and suggested a dashboard approach as an intermediate proposal in this context, describing separately the dynamics of the main assets that matter for the sustainability of well-being, described in both physical and monetary terms, with monetization only where feasible and reasonable.

Ecosystem accounting – methodological approach and current process at EU level - Jan-Erik Petersen, EEA

Jan-Erik Petersen gave an introduction to the ecosystem accounting approach at EU-level:

- Ecosystem accounting aims to show the links between economy and environment and helps understanding the benefits humans derive from the environment via the use of its assets and ecosystem services
- Ecosystem accounting work is guided by developing global accounting standards: UN SEEA and the handbook on experimental ecosystem accounting (SEEA-EEA)
- Ecosystem accounts, with a focus on terrestrial ecosystems have already been developed or are currently under development: ecosystem land accounts, biodiversity accounts, ecosystem condition accounts, etc.
- However, a substantial amount of work is required to adapt SEEA concepts to marine ecosystems – which is where this workshop comes in
- The improvement of the data foundation is crucial for the development of an integrated ecosystem accounting system

Experience gained from marine assessments at European level - Eva Royo Gelabert, EEA

This presentation reviewed the current status of marine assessments at EU level and gave an outlook on the development of EU marine accounts in the future:

- Marine assessments are anchored in the EU Biodiversity Strategy Target 2/ Action 5
- The conceptual framework for EEA marine assessments is based on principles of the MSFD and Integrated Maritime Policy as well as the MAES conceptual framework and research
- Marine assessments on European level have shown that marine information currently is not spatially explicit, due to lack of data
- There is a substantial lack of knowledge on the status of marine ecosystems, which is illustrated by the fact that Member States assessments report 80 % unknowns for MSFD Marine Biodiversity
- Marine accounts exist so far only on case study level
- Primary information on marine ecosystem condition and functioning available at the EU level - in particular from implementing EU marine and related legislation and policy - is currently:
    - Not all the relevant information (datasets) available at Member State level
    - 'Usable' for qualitative assessments of marine ecosystem service capacity to a certain extent - even if not 'designed' with this aim in mind
    - Not really suitable for the type of accounting applicable to terrestrial ecosystems (also because marine ecosystems are physically, biologically and ecologically quite different)
- EU-level marine ecosystem accounting may require other approaches than those applicable to terrestrial ecosystems, and/or longer time for their implementation

1.3 Towards marine ecosystem accounting - key principles of ecosystem accounting

The concluding discussion of session 1 was based on the introduction and presentations and revolved around the following key issues:

- What is the policy demand that ecosystem accounts aim to address and what are they expected to bring in comparison with what already exists?
- What are the principles of ecosystem accounting that have to be followed?
- What are important marine ecosystem assets and marine ecosystem services?
- What are data requirements for marine ecosystem accounts?

Key principles of marine ecosystem accounting

The review of general principles of ecosystem accounting methodology helped to identify some first key principles that marine ecosystem accounts should build on: Common data standards (spatial reference, etc.) and homogenous set-up of data collection systems are important for ensuring comparability across space and time:

- Directly observed data that link to natural conditions are seen as the starting point for marine accounts, with both in-situ monitoring and earth observation as important tools
- Adaptability to different spatial and temporal scales to fulfil policy needs and to be operational on and across different institutional and spatial levels
- Finally, a pragmatic approach regarding data needs was suggested, especially in the context of the KIP INCA technical proposal

One of the key issues discussed was how to build ecosystem accounts in order to capture key trends in natural capital assets and the sustainability of the use of service flows with the accounts, which would be an important value added compared to the System of National Accounts. In this perspective, it was suggested to consider two levels of ambition: a short-term scenario that could be described as 'improved business as usual' and a long term high ambition level for future data needs.

Specific issues of marine ecosystem accounting

The discussions also highlighted the need to address specific issues:

- Linking marine assets to ecosystem services is essential in order to provide a full picture of the contributions of ecosystems to human well-being
- Marine accounts do not necessarily have to be spatially referenced in the same way as terrestrial accounts as they have different characteristics:
    - Marine ecosystems do not have rigid boundaries as there are interconnections and often a strong exchange of water volumes and biota between different (parts) of the seas
- It is important to build up analytical frameworks based on the assumptions of the availability of better data in the future to construct ecosystem accounts that (potentially) show strong signals in trends of marine assets and services, rather than developing ecosystem accounts limited to the data currently available

- Remote sensing was seen as a great opportunity for fulfilling data needs for certain parameters, in particular for the open sea

- It needs to be further investigated how and to what extent the methodology for accounting for terrestrial ecosystems is applicable to marine ecosystems

2. Main outcomes of Session 2 – Applying ecosystem accounting concepts to marine ecosystems

Session 2 was structured into two sections. The first presented case studies on marine accounting from different Member States and at EU level. The second part reviewed design options for marine ecosystem accounts. The participants were divided into two parallel working groups in which design options for marine ecosystem asset accounts and marine ecosystem services accounts were discussed.

2.1 Case studies at Member State and EU level

The first three presentations introduced experiences with marine ecosystem accounting in different Member States. The last presentation depicted work at the European level. The following paragraphs present the main outcomes of the presentations.

France: Marine ecosystem accounting for the Golfe Norman-Breton – Remi Mongruel, IFREMER

This case study produced an economic assessment of the Saint-Malo Gulf through the development of ecosystem services accounts, based on the SEEA guidelines (as ecosystem satellite account). This approach focuses on assets and current flows of ecosystem services and articulated them with an extended version of the System of National Accounts (extension of production boundary of SNA for household recreational services).

- Modelling was used for filling data gaps and for the calculation of the potential for the provision of ecosystem services

- Both the supply and demand side for selected ecosystem services (provisioning services, regulating services and cultural services) in the Saint-Malo Gulf were assessed through monetary and physical indicators:

    - Physical indicators: production and consumption indicators for activities producing ecological outputs, production indicators for activities using ecological inputs and consumption indicators for products from activities using ecological inputs

    - Monetary indicators: Supply accounting indicators and demand accounting indicators

- The accounting results proved to be of interest for managing different aspects of the Saint-Malo Gulf ecosystem and for conservation policies

- Limits: finding indicators for all services, estimation of cultural services, data collection can be expensive and difficult to be maintained on a regular basis, especially for cultural services

Portugal: A case study of coastal ecosystem services – Rui Mota, NOVA SBE, Lisboa

After an initial focus on monetary valuation of coastal ecosystem services in the case study location in Portugal, the study objective was shifted towards providing information for better management instruments and policies:

- It was chosen to apply CICES to classify ecosystem services, because of the distinction between biotic and abiotic resources. Not assessed were maintenance and regulating services, as there was concern that double counting might occur.

- One of the key outcomes of the study was that monetary valuation of ecosystem services is context dependent and can be difficult, because of interdependencies between different ecosystem services (synergies and trade-offs).

United Kingdom: Using earth observation techniques to support MSFD monitoring and estimating ecosystem service capacity – Shubha Sathyendranath & Eleni Papathanasopoulou, Plymouth Marine Laboratory

This presentation highlighted the analytical value added of earth observation techniques for the assessment and accounting of marine ecosystems and their services:

- Infrastructure exists for monitoring marine ecosystems on a European level and to deliver data streams on a daily basis

- Remote sensing for operational metrics includes: autotrophic biomass, generation of primary production fields, sea surface temperature (SST) and chlorophyll obtainable at the same resolution, construction of time series, inter-annual comparisons

- Role of remote sensing for assessing marine ecosystems: unprecedented time scales over large and distant areas, using consistent methodologies facilitating comparisons, both physical and biological variables can be observed

- Visible Spectral Radiometry (Ocean Colour) produces data on chlorophyll concentrations, but other products are possible as well

- The ecological indicators than can be derived from Remote Sensing give a compact description of the pelagic ecosystem: particulate organic carbon, phytoplankton loss rate, annual phytoplankton production, etc.

- Earth Observation images can also be used as a visualisation tool for ecosystem service capacity and natural capital capacity

Exploration of the ecosystem accounting concept at European level – Gerjan Piet, IMARES

Gerjan Piet presented work on EU level Marine Fish Biomass Accounts (MFBA) which establishes a first pilot supply side account for marine fish production at European level, plus initial ideas for ecosystem extent accounts:

- The current MFBA approach includes only commercially exploited fish stocks assessed, but not all of them, depending on availability of data

- The MFBA is linked to policy through the variable Sustainable Biomass Use (Surplus Production/ landings) and fisheries management targets (sustainable exploitation)

- The development of a Seafloor Integrity Account is in planning for the future, based on SEEA-EEA principles and linked to MSFD reporting. This would be an option for developing marine ecosystem extent accounts (for sea floor habitats) but the development of such an account faces difficulties, due to a lack of data and resources

2.2 Working Group Session on design options for marine ecosystem accounts

In this session the participants were divided into two parallel working groups. One group reviewed design options for marine ecosystem asset accounts, the second group reviewed design options for marine ecosystem services accounts.

Both working groups based their discussions and work on the following key questions:

- What are the data needs for marine ecosystem asset accounts (ecosystem extent and condition) and marine ecosystem services accounts, respectively?
- Can all assets and services be measured through primary data?
- Which data collection and monitoring systems are required to develop a good knowledge base for marine ecosystem asset accounts and marine ecosystem service accounts?
- What about the use of modelled (non-primary) data, including but not limited to data from bio-physical modelling? What are the characteristics of this modelled data and what role can it play in marine ecosystem asset and /or services accounts?

Design options for marine ecosystem asset accounts

The group discussed appropriate analytical units for marine ecosystem accounts ('Ecosystem Accounting Units') and came up with different approaches: units based on a 1 km² grid, division into regional and sub-regional seas as proposed by the MSFD, MAES Marine Ecosystem categories (currently under revision), or photic levels. Figure 2 gives an overview of key conceptual outcomes:

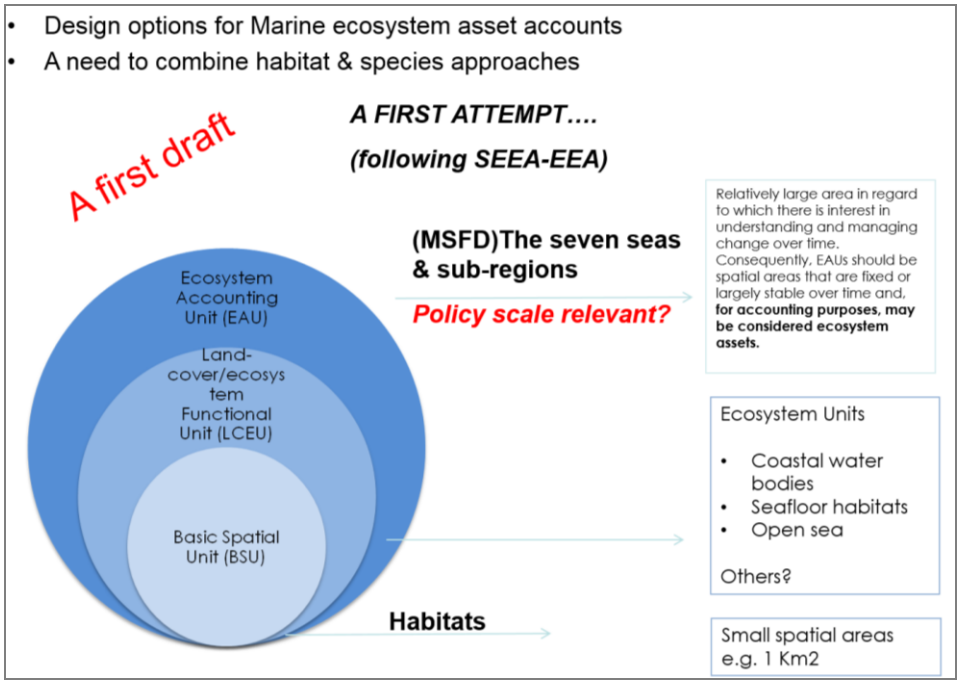

Figure 2 Proposal for Marine Ecosystem Accounting Units

Note: The terminology used in Figure 2 will have to be updated according to the future UN Technical Recommendations for implementing SEEA-EEA (currently in consultation), e.g. 'LCEU' may become 'ESU' (ecosystem units).

As a next step the group discussed how to identify distinct marine assets that could be the basis for asset accounts. Considering our current knowledge of marine ecosystems, habitats and species could represent a relevant functional unit. As (at least some) species can be defined/characterized by their habitat requirements, temperature range etc., species could be an interesting proxy for some ecosystems functions.

The condition of marine assets has been understood as the ecological status of the ecosystem asset and can be assessed directly, or indirectly via pressure indicators. The MSFD has defined 11 descriptors (see for more info: http://jncc.defra.gov.uk/page-5231#GES1) for assessing ecosystem condition, these descriptors could constitute a starting point for measuring marine ecosystem condition, as far as quantified indicators can be derived from them.

Design options for marine ecosystem services accounts

The participants worked on the basis of a sample list of CICES ecosystem services developed from the kick-off presentation by Camino Liquete from DG JRC. The selected ecosystem services were carbon sequestration, biomass supply (fish), coastal protection, water purification, life-cycle maintenance and cultural services. The discussion focused on which indicator would best monitor and assess each of these ecosystem services, and the relevant spatial and temporal scales.

The participants noted that the objectives and perspectives of the accounting system are crucial for how the services are measured. For example when measuring ecosystem services it is possible to focus on potential ecosystem service supply ('capacity'), on the demand for ecosystem services, on the sustainable flow or current accessible flows. Depending on whether the accounting framework intends to account for the sustainable capacity of the ecosystem to deliver a service, the actual contribution of the ecosystem to GDP, or the actual contribution of the ecosystem to well-being, the measurement approach or indicator chosen will differ. Table 1 gives an overview of key outcomes for the potential design of ecosystem service accounts for marine ecosystems.

Table 1 Marine ecosystem services - outcomes of the working group

Revise using existing list (CICES revised…simplified marine relevant)

Session 2 & 3: What & How

A first draft

ES list	…rt description… or warnings	Proposed indicator(s) / proxy	Relevant spatial (accounting) scale(s)	Relevant temporal (accounting) scale(s)
…arbon sequestration	**Be clear about the perspective** • capacity to provide ES, but • ES potential or ES use • Sutainable flow (surplus production) or current flows **Be clear about the benefits** Unpaid ecological costs in a conservation perspective	**Mindful of the many possibilities** **Possibility to use proxies** • Primary production (carbon sequestration, or water purification) • Extent of sea floor integrity	**Distinction accounting, reporting, monitoring, management scale** **Two main options :** 1. An ES specific scale that goes according to the management scales / the policies that are addressed (e.g. local / regional / national sdministrative units for interactions with development / international) 2. An ecosystem - specific scale that allows to assess tradeoffs between ES on a same ecosystem	**Temporal scale requires to consider** • the data • the ecological processes (seasonal fluctuations) • the demand **Forward looking vs. present flows.** Ensure to account for the temporal scale that affects ES (e.g. : fluctuations in surplus production).
Biomass (Fish)				
Coastal protection				
Water purification				
Life cycle maintenance – as support to species not commercial?				
Cultural services				

As direct indicators are not always available proxies could be used as an alternative where necessary. Concerning relevant scales for spatial measurement the participants discussed that scales differ depending on the objectives for the accounting system, e.g. management of ecosystems, national assessment of ecosystem services, or other purposes. Temporal scales depend on existing data, ecological processes, etc.

2.3 Challenges identified

The previous discussion allows drawing some conclusions on the main challenges for building marine ecosystem accounts:

- Develop a shared understanding of ecosystem accounting and clarify the terminology
- Clarify the analytical and policy purpose for the role of ecosystem services accounts in the ecosystem accounting system
- The link between ecosystem assets and ecosystem services is a crucial part of the ecosystem accounting concept and needs to be properly understood
- Build on and integrate already existing data and knowledge but also identify which data sets and monitoring systems need to be developed for a complete ecosystem accounting system
- Ensure that marine aspects are well covered in the ongoing review of CICES as version 4.3 appears not always appropriate for the classification of marine ecosystem services

3. Main outcomes of Session 3 – Implementing marine ecosystem accounting

This session focused on developing an understanding of the data needs for marine ecosystem asset accounts and marine ecosystem services accounts. Section 3.1 on data requirements combines the outcomes of session 1 and session 2 in order to give a comprehensive summary of the overall outcomes of the workshop with regard to data requirements for marine ecosystem accounts. Section 3.2 covers general remarks and outcomes.

3.1 Data requirements

Data requirements for marine assets accounts

Table 2 provides a concise presentation of the outcomes of session 2 and session 3 regarding marine ecosystem assets, their extent and condition (characteristics and data/monitoring). Ecosystem assets were grouped into photic water column habitats, aphotic water column habitats, photic seabed habitats, aphotic seabed habitats, species and seafloor integrity.

Table 2 Outcomes of Session 2 and 3 – A first draft of marine ecosystem account

Assets	Extent	Condition	
	AREA	**Characteristics**	**Data | Monitoring**
Photic Water Column habitats (*phytoplankton, zooplankton, and bacteria embedded in these habitats*)	MSFD marine (sub-) region ['ESU']	**Core account** Physical - pH; oxygen; nutrients; and sea surface temperature Biological – phytoplankton and zooplankton (abundance and distribution); phytoplankton functional types; and condition of specific species from the groups listed in row 5, see * (e.g. via info from habitats directive reporting)	• Phytoplankton condition from remote sensing products • Affected by revision of EC Decision on MSFD good ecological status ('GES') • *Note:* Currently no EU level photic layer and no EU level consistent water/ column mapping
Aphotic Water column habitats (*zooplankton and bacteria embedded in these habitats*)	MSFD marine (sub-) region ['EAU']	**Core account** Physical - pH; oxygen; nutrients-food; and sea surface temperature Biological – zooplankton (abundance and distribution); species composition (tbc); and condition of specific species from the groups listed in row 5, see * (e.g. via info from habitats directive reporting)	• Affected by revision of EC Decision on MSFD GES • *Note:* Currently no EU level photic layer and no EU level consistent water column mapping
Photic Seabed Habitats (*microphyto-benthos, macroalgae, macrophytes, epifauna, infauna and bacteria embedded in these habitats*)	MSFD marine (sub-) region ['EAU'] Broadscale habitat type ['ESU']	**Core account** Physical – as defined in EUSeaMap Biological – Cumulative impact indexes based on cumulative pressures from human activities (HELCOM HOLAS & HARMONY approaches), as well as some classified state information	• Requires national data on human activities - pressures and state • Affected by revision of EC Decision on MSFD GES • *Note:* Currently no EU level photic layer and no EU level datasets/ layers on human activities
Aphotic Seabed Habitats (*epifauna, infauna and bacteria embedded in these habitats*)	MSFD marine (sub-) region ['EAU'] Broadscale habitat type ['ESU']	**Core account** Physical – as defined in EUSeaMap Biological – Cumulative impact indexes based on cumulative pressures from human activities (HELCOM HOLAS & HARMONY approaches), as well as some classified state information	• Requires national data on human activities - pressures and state • Affected by revision of EC Decision on MSFD GES • *Note:* Currently no EU level photic layer and no EU level datasets/ layers on human activities

*** Invertebrates; fish; birds; reptiles; cetaceans; and seals - *to be linked to the above habitats***	MSFD marine (sub-) region ['EAU'] (could be linked to Broadscale habitat type ['ESU'])	**Individual component accounts** • Condition (e.g. species abundance, distribution and composition) of these groups • Asset account for commercial fish species (use [modelled] surplus production as a proxy measure for condition of stock)	• Invertebrates and mammals (separate cetaceans and seals) [would need modification from current MSFD D1 groups] • Affected by revision of EC Decision on MSFD GES
Seafloor integrity	MSFD marine (sub-) region ['EAU'] (could be linked to Broadscale habitat type ['ESU'])	**Different services accounts** – linked to the extent and condition of the seabed/seafloor asset	• Affected by revision of EC Decision on MSFD GES • *Note:* Currently no EU level photic layer and no EU level maps of fishing intensity (based on national VMS data)

Data requirements for marine ecosystem service accounts

It was more challenging to define the data requirements for marine ecosystem services accounts than for marine asset accounts. Nevertheless progress was made.

The DG JRC, as presented by Camino Liquete in the working group on design options for marine ecosystem service accounts, has compared different approaches for accounting for marine ecosystem services: biophysical models, the matrix approach and remote sensing. All these approaches can be used for further work on marine ecosystem accounting.

In this regard the group considered that modelling of certain ecosystem service flows might be useful for developing marine ecosystem services accounts for two reasons. First, this is the only way to get forward-looking information. Second, this will often be required due to the lack of data related to marine ecosystems. Further case studies within this area would be helpful to see what role modelling can play and also to help framing the discussion about the temporal, spatial scales and pressures, condition and capacity.

The group considered that a combination of data would be necessary for developing marine ecosystem services accounts: (fisheries) management data, remote sensing, ground truthing and modelling. Follow-up work (-shops) could review potential approaches for measuring marine ecosystem services for all marine ESS (or at least for most) – this would bring our understanding of the data requirements for marine ecosystem service accounts substantially further.

3.2 General outcomes and remarks

There is existing data which can be used for marine ecosystem accounting, e.g. data from MSFD monitoring, data compiled by EMODnet, etc. On top of this, the participants agreed on the potential of remote sensing data for marine ecosystem accounting.

But the participants also discussed issues of concern with regard to the data sets mentioned above:

- Validation
- Accessibility
- Lack of homogeneity of the data, leading to problems with comparability
- Temporal scales depending on reporting cycles

Further and more precise information on data and research gaps will emerge as an accounting system is developed. The role of modelling data as an option for covering data gaps is acknowledged as an interesting possibility which will have to be investigated further.

Overall, a substantial further effort is required for properly reviewing and documenting the data needs for marine ecosystem accounts, both on the ecosystem asset as well as the ecosystem service side.

4. Conclusions and next steps

Looking back at the objectives of the workshop it can be concluded that the workshop was successful as a starting point for EU level work on marine ecosystem accounting. It brought together experts with different perspectives, provided useful input to technical proposals to be developed under the KIP INCA project, and laid the ground for follow-up research and discussions.

There was general agreement that the SEEA-EEA guidance on ecosystem accounting can be applied to the design of marine ecosystem asset and services accounts even though some adjustments are likely required for adapting the accounting concept to marine systems. For instance, the (seasonal or daily) mobility of species in the water column was mentioned as a problematic feature. Furthermore, the three-dimensional nature of marine ecosystems was discussed as an additional challenge for constructing accounts on 'ecosystem extent' in the water column.

Nevertheless, even in the short term, existing data and knowledge (case studies) appeared sufficient to begin with the development of first marine ecosystem accounts. Case studies were seen as a good option for moving marine ecosystem accounting forward. Starting to build up such pilot accounts would allow identifying data and knowledge gaps and provide feedback in a longer term perspective.

In the medium term perspective, some new possibilities were identified such as the use of remote sensing and modelling for monitoring the condition of ecosystems. As elsewhere, a further investment into collecting ecosystem-related data for marine systems would allow constructing more detailed and convincing marine ecosystem accounts than feasible with current data.

Participants agreed that it is important to clarify the objectives of a marine ecosystem accounting system and to work on the means to involve different communities in the dialogue and the development of marine ecosystem accounts with a shared vision. Such reflexions could also yield a significant contribution to developing further methodological guidance under the experimental ecosystem accounting framework of the UN SEEA process.

Below are some issues that were recognized in the workshop as important to explore in the future:

- How to account for pressures and drivers of change and their impact on ecosystem assets as well as service flows
- The choice of valuation approaches and methods, especially in monetary terms
- Marine ecosystem services:
    - The benefits associated with life cycle maintenance, when understood as an ecosystem service
    - Reviewing the fit of current methods for identifying marine ecosystem services in the context of the SEEA-EEA concept of focusing on final ecosystem services when constructing ecosystem service accounts.

The organisers thanked all participants, rapporteurs and chairs for their interest and useful contributions. The outcomes of the workshop will definitely help to develop technical proposals for the marine part of the future EU ecosystem accounting system.

There is also great interest on all sides to continue the work begun in this first workshop and the organisers will look into options for organising follow-up meetings in the future.

Annex

Please find below the key questions addressed during the workshop and the workshop agenda.

1. Key questions addressed in the workshop

a) Understanding marine systems:

1. What are the special characteristics of marine ecosystems (in comparison to terrestrial ones)? As example: Is it important to take account of the three-dimensional nature of marine systems in developing marine ecosystem accounts?

2. What are the key marine ecosystem stocks (i.e. the bio-physical asset base that delivers services)?

3. Which types of ecosystem services derive from these stocks and how to measure them?

4. At what spatial resolution do we want to capture changes in marine ecosystem stocks and services?

5. Are there key policy questions and policy frameworks that we need to consider in developing marine ecosystem accounts?

b) Developing marine ecosystem accounts:

6. How to develop accounts for marine ecosystem stocks? If feasible – what are the key accounts?

7. How to develop accounts for marine ecosystem services? If feasible – which services to include?

8. What are the data needs for marine ecosystem asset accounts? (ecosystem 'extent and condition')? Can all assets be measured though primary data?

9. What are the data needs for marine ecosystem service accounts? Can all services be measured though primary data?

10. Which data collection and monitoring systems are required to develop a good knowledge base for marine ecosystem asset accounts and marine ecosystem service accounts?

11. What about the use of modelled (non-primary) data, including but not limited to data from bio-physical modelling? What are the characteristics of this modelled data and what role can it play in marine ecosystem asset and/or service accounts?

2. Agenda of the workshop

Session 1 – Introduction, policy context and identification of key principles

(Chair: Xavier Bonnet, Ministère de l'Environnement, de l'Energie et de la Mer, France**)**

10.00 Opening presentation & introduction of all participants

10.15 Policy context and user expectations in the perspective of DG ENV (Günter Hörmandinger, DG ENV, tbc.)

10.35 National accounting systems – Objectives and general principles (Claire Plateau, INSEE, tbc)

11.05 Ecosystem accounting – emerging methodological approach and principles at EU level (J-E Petersen, EEA)

11.25 Experience gained from marine assessments at European level (Eva Royo Gelabert, EEA, tbc)

12.00 Discussion on key principles of ecosystem accounting (facilitation by Pierre Strosser, ACTEON)

13.00 Lunch break

Session 2 – Applying ecosystem accounting concepts to marine ecosystems

(Chair: Jan-Erik Petersen, European Environment Agency)

14.00 Case studies at Member State and European level:

- 14.00-14.30 France, Marine ecosystem accounting on the Golfe Normand-Breton (Rémi Mongruel, IFREMER)
- 14.30-15.00 Portugal, A case study of coastal ecosystem services (Antonieta Cunha-e-Sá, NOVA SBE, Lisboa)
- 15.00-15.30 United Kingdom, Using earth observation techniques to support MSFD monitoring and estimating ecosystem service capacity (Shubha Sathyendranath & Eleni Papathanasopoulou, Plymouth Marine Laboratory)
- 15.30–16.00 Exploratory study on European fish stock accounts (Gerjan Piet, IMARES, The Netherlands)

16.00 Coffee break

16.30: Review of design options for marine ecosystem accounts in coherence with methodological principles

Two parallel working groups:

a) Marine ecosystem asset accounts ('extent and condition' plus..), room TS12A

   Chair: Isabel Pinto, Portugal

   'Kick-off' presentation (10 mins): Jan-Bart Calewaert, EMODNET

b) Marine ecosystem service accounts, room TS13A

   Chair: Pierre Strosser, ACTEON

   'Kick-off' presentation (10 mins): Camino Liquete, JRC (tbc.)

18.00 End of day 1

20.00 Diner at Le Montparnasse 1900, 59, bd du Montparnasse, 75006 Paris (tbc.)

Session 3 – Implementing marine ecosystem accounting

09.00: Feedback from the two working groups followed by discussion on the main options for marine ecosystem accounting (facilitation by Jan-Erik Petersen, EEA)

10.00 **Parallel working groups to develop recommendations for the implementation of marine ecosystem accounts:**

a) Data needs and required monitoring for each option of marine ecosystem asset accounts ('extent and condition' plus..), room TS12A

   Chair: Filipa Saldanha, Gulbenkian Foundation

   Rapporteur: Isabelle Gailhard-Rocher (AAMP, tbc.)

b) Data needs and required monitoring for each option of marine ecosystem service accounts, room TS13B

   Chair: Meriwether Wilson, University of Edinburgh

   Rapporteur: Leonie Robinson, University of Liverpool

11.30 Coffee break

12.00 Feedback from the two working groups followed by discussion on the applicability of the different options for marine ecosystem accounting (facilitation by Ophélie Darses, CGDD)

13.00 Final lunch

Concluding session

14.15 Presentation of the main recommendations arising for each session (i.e. one report each for sessions 1 – 3) (tba) followed by discussion (facilitation by Ophélie Darses, CGDD)

15.30 Coffee break

16.00 Summing up and next steps for work at Member State and EU level (Jan-Erik Petersen, EEA and Xavier Bonnet, CGDD)

16.30 End of workshop