



Diving into the functioning of the ocean market economy



Assessment framework for investigating the organization of key segments of the ocean economy

Report presenting the framework for analyzing the organization of the ocean economy

WP2, Detailed Structure Deliverable D2.1, February 2016





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Introduction

By diving into the functioning of the ocean market economy, we aim to identify different actors of the ocean economy whose behavioral change is a key to enhancing ocean health and seizing opportunities provided by the ocean. The aim is to focus on key segments of the economy that are closely linked to the sea, be it a source of pressure or a benefit (present or future). The purpose is not to present an exhaustive view of these segments, but rather to focus on the interrelationships among and between segments through the scope of an environmental issue and show these via several case studies. These interrelationships can be expressed and characterized in terms of ecosystems services. However, in order to analyse these interrelationships from the viewpoint of value-chains and different segments of ocean economy the existing DPSIR and EGS framework need to be adapted/linked with the framework developed in the WP1.

In order to start working on the framework, main concepts and definitions need to be clearly understood and shared, as these may have different meanings and representations.

Thus, the first issue to be addressed is the concept of ‘*ocean economy*’. A review of definitions and implementations in different countries and regions shows difference in understandings and applications. Linked to this first issue is the question of measurement: how to deliver economic information, norms, and indicators for different economic segments (in particular in ocean economy).

The second issue is related to the organization of segments of the economy and the Value-Chain as a way of representing, organizing and informing segments of the economy, value chain actors and their ability to change behavior.

The third and core issue of the framework is the integration and use of the Value Chain approach in the DPSIR framework. The proposed adaptation and integration will form the basis for analyzing the key stories (developed in the WP1). The issue of scales, both spatial and temporal will be also discussed as these issues can have an effect on the implementation of the proposed framework.

This deliverable presents an initial analysis of concepts and issues for developing a framework for investigating the organization of key segments of the ocean economy. As it stands now, it identifies the issues and is providing a structure for identifying main issues to be addressed by the value chain framework. This deliverable will serve as a basis for the WP2 workshop, organized in Paris 10-11.03.2016, where the core groups of WP2 and leads of WP 1 and 3 will develop further the framework for ocean economy segments to make it coherent and linked with the frameworks developed in WP1 and WP3. In the final report of WP2 (Deliverable 2.2) the updated framework will be presented and illustrated via case studies for selected key storylines.

1. How economics monitors and provides measure of ocean related economy

If the ocean economy is often perceived in a common way – the economy linked to the sea or ocean based activities – the way to address and formulate it remains challenging. The object itself refers either to "ocean related economy", "ocean economy", "Blue Economy", "Blue Growth", "segments of the economy that are key to ocean"... They can relate to different meanings and perceptions, some being solely based on development through extraction of natural resources from coast and ocean, others integrating the environmental dimension. They can then be split into two main families: Ocean based economy and Blue Economy.

1.1 Ocean based economy and Blue Economy

Ocean based economy

Ocean based economy can be defined as ocean related activities, i.e. primary sectors of economic activity that derives all or part of its inputs from the ocean and/or coasts. These economic activities are grouped into sectors and their component industries to delineate the Ocean Economy. Information attached to these sectors or activities can be understood as market based data for the ocean and coastal Economy (NOEP 2016). The ocean sector and industry definitions are addressed hereafter in the metrics section.

Blue Economy

Blue Economy derives from Green Economy concept by expanding the Blue aspect of the Green Economy. This last one is based on sustainable development and poverty eradication. But aside the Green Economy approach, many coastal countries (especially the small island development states or SIDS) questioned the focus of the Green Economy and its applicability to them. The Blue Economy is then rather a developing world initiative pioneered by SIDS (UN 2014). Blue Economy is going beyond of ocean-based economies, perceiving ocean as area of development integrating conservation and sustainable use. Blue Economy approach is founded upon the assessment and incorporation of the real value of the natural (blue) capital into all aspects of economic activity (UN 2014). Compared to Ocean based economy, Blue Economy is a broader concept addressing sustainability issue and could be defined as *sustainable ocean industries*.

Blue Economy issues are : Sustainable use of biodiversity, Food security, Unsustainable Fisheries, Climate change and managing carbon budgets (Acidification and Blue Carbon), Marine and coastal tourism, Pollution and marine litters, Governance and international cooperation. This will encompass the key stories identified in ResponSEable.

To be completed with BG concept and issues; BG that doesn't question the rationality of objective at the light of environmental issues (e.g. stagnating fisheries and continuing growth demand for seafood products are calling for aquaculture in a disconnected manner to aquaculture potential and bottlenecks).



Other approaches aim at integrating the blue economy in the traditional System of National Accounts (SNA). Short brief about Blue I/O based on ES, CGEM and other dynamics representations of the ocean economy.

1.2 Economics metrics for ocean economy

The introduction of the environmental dimension, through externalities produced by economic activities and responses to these impacts, leads to difficulties in apprehending the blue economy which is more related to the concept rather than to the implementation. But the solely consideration of the ocean based economy already underlines some heterogeneity in the way to deliver a metrics.

An important constraint for ResponSEABLE is also to rely on existing, public and free access data. Purpose is not develop new or additional methods to gather and produce new or missing data, but to implement a proposed framework based on existing data to support the replicability of the approach from an environmental issue to another.

1.2.1 Review of ocean based economy approaches, metrics and information sources

Metrics will allow for quantifying a sector, an industry or a segment of the economy. Expressing sectors in terms of volume and value allows for comparison and gives a first estimates of sectors according to each other, be it part of the ocean economy or not. But before being characterized, related sectors have to be identified.

Include the review of ocean based economies and metrics for ocean based economy. Complexity attached to the way how coast and ocean are defined. No two nations measured the ocean economy in the same way, but many common sectors. Illustrations from different areas and nations. Static view of extractive or supported activities.

Indicators, ways of calculation, aggregation...

World Bank, OECD, UN (FAO, UNDP...), EC Atlas of the SEA, Eurostat and EEA, Nations, Association, Industries...

Country	Main Substance
U.S.	The economic activity, which is (a) an industry whose definition explicitly ties the activity to the ocean, or (b) which is partially related to the ocean and is located in a shore-adjacent zip code.
U.K.	Those activities which involve working on or in the sea. Also those activities that are involved in the production of goods or the provision of services that will directly contribute to activities on or in the sea.
Australia	Ocean-based activity ("Is the ocean resource the main input? Is access to the ocean a significant factor in the activity?").
Ireland	Economic activity which directly or indirectly uses the sea as an input.
China	The sum of all kinds of activities associated with the development, utilization and protection of the marine.
Canada	Those industries that are based in Canada's maritime zones and coastal communities adjoining these zones, or are dependent on activities in these areas for their income.
New Zealand	The economic activity that takes place in, or uses the marine environment, or produces goods and services necessary for those activities, or makes a direct contribution to the national economy.
Japan	Industry exclusively responsible for the development, use and conservation of the ocean.
South Korea	The economic activity that takes place in the ocean, which also includes the economic activity, which puts the goods and services into ocean activity and uses the ocean resources as an input.

Park et al. 2014

1.2.2 Lesson learnt from the review

Ocean based economy sectors

Include the illustrations from the review underlining the diversity of approaches and common sectors.

Information and database

Main lessons from the review of available information are linked to three main issues: availability of relevant economic activities information in the field of coastal and marine economy, lack of environmental consideration in producing related socioeconomic information and aggregation scale.

Inherited from land based activities, databases are not really concerned with marine and coastal dimension for the most detailed ones. Solely natural resources are detailed and carefully monitored due to international regulations and obligations in the fields of natural resources management. But Beyond of physical units, it is often difficult to get detailed economic information such as labor and added value.

The review of activities and databases leads to a sort of "Fish and Ships" syndrome. From an economic point of view, oceans and coasts are too often translated into a fish and ships tank in databases. This is also translated into the lack of environmental dimension associated with coastal and marine activities at all scales.

1.2.3 Ocean economy in the ResponSEABLE context

In a sustainability vision, the functioning of the ocean market economy has also to deal with impacting activities such as agriculture for instance (eutrophication issue, water quality). But land based activities are excluded from the ocean based economy. According to responSEABLE's



objectives, segments of the economy to be considered are those "closely linked to the sea", be it as source of pressure and not only benefiting from.

As a consequence, those key segments of the ocean economy to be addressed are somewhere in-between the ocean based economy and the Blue Economy. Environmental issues are considered alongside economic sectors, but not fully integrated in the economic representation of the ocean economy (Green and Blue I/O, CGEM...).

To be developed and illustrated

1.3 Ontology for segments of the economy

Major sectors of the Ocean Economy as defined by the NOEP.

The Statistical Classification of Economic Activities in the European Community (NACE) provides a sector-based breakdown of the maritime activities without double accounts, and enables to make international benchmarking among countries.

NUTS scales

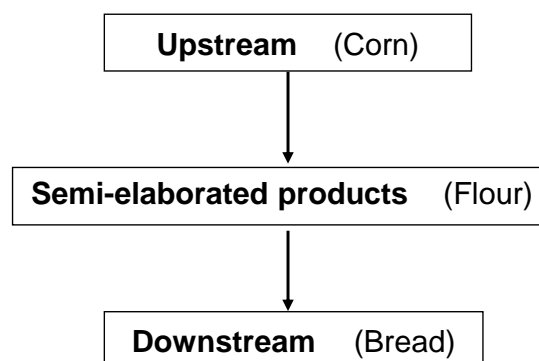
The sector-related indicators provided.

2. The organization of segments of the economy - the Value Chain approach

Having a metrics about the ocean economy doesn't tell much about the organization of this economy. The Value Chain is a way to inform and represent this organization and the relationships between segments of an industry, including actors from others segments having an impact over the industry, as well as supporting and regulatory segments (governance, institution, R&D...).

2.1 Value Chain approach (the value chain concept and representation)

The Value Chain also called Products chain allows to have a global and synthetic view of an activity or industry. Value Chain is an approach required by the existence of interactions between the economic actors of an industry. It's an attractive notion because explicit: it's a picture of succession, processes and progress. The idea is a cascade of intermediate statements followed by a product. It is a vertical and then linear representation according to three levels: Upstream, Semi-intermediate products and Downstream (Figure). The upstream level is characterized by the mobilization of initial production factors – inputs - required to implement a production - output- (for instance a natural resource in the case of extractive activities, together with Capital and Labor). The downstream level is the final product delivered to the market by the industry when Semi-intermediate levels represent successive production processes to achieve the final product.



Defined under that way it is said that the Value Chain is a technological area, a commercial relationships area and an area of strategies.

Relevance of the Value Chain approach may be useful to ocean literacy through its following properties. Value Chain is:

- a technical description tool underlining how the technique of one level can influence the technique of another level;
- an economic description Instrument characterizing the relationships between all the components of the chain (technologies, products and markets);



- a way of statistical distribution of the productive system by quantifying the flows between the different actors, based on official statistics or surveys;
- an analysis method of the components' strategies: internalization, integration of several activities (upstream or downstream) in order to reduce uncertainty or to get more profitability (based on transaction costs and production costs);
- an instrument of industrial policy: to elaborate an industrial policy, public authorities can decide to favor some strategic segments (called the nodes) of the value chain having a ripple effect over the rest of the economy; the purpose is to act quickly and efficiently by knowing who controls the chain, identifying the nodes, etc. For instance when there is a good representation/picture of the Value Chain, public authorities can support a non-profitable but essential activity in the existence of the sector (e.g. hatcheries for some species in aquaculture). It can also contribute to avoid waste by having a better idea of the industry organization.

In the frame of ocean literacy, the present property of the Value Chain can then contribute to identify nodes (e.g. key segments) where to act as lever and to change behavior or increase awareness to modify the impact over marine and coastal ecosystems.

To be completed with illustrations of marine based Value Chain, organization among actors and quantification and qualification of relationships. Similar to system approach, the quality of relationships between actors/components/segments is much more important than the actors/components/segments themselves.

2.2 Limitations of the Value Chain approach

The Value Chain approach is facing a number of critics. Amongst the most important is the static dimension of the approach opposed to the dynamics of systems approaches. It provides a picture of an industry, a sector, but for a given period. It doesn't tell much how the Value Chain could evolve over time. In addition, when all related activities and components have to be included it becomes more and more difficult to be read.

But from an ocean literacy point of view, such weakness shouldn't be limiting factors and compared to more dynamics tool such as modeling it is far less costly and could be more communicable to stakeholders.

Static approach, non-transversal, introduction to systems theory and mind mapping facing complex systems such as marine and coastal socioecosystems.

2.3 Greening the Value Chain approach

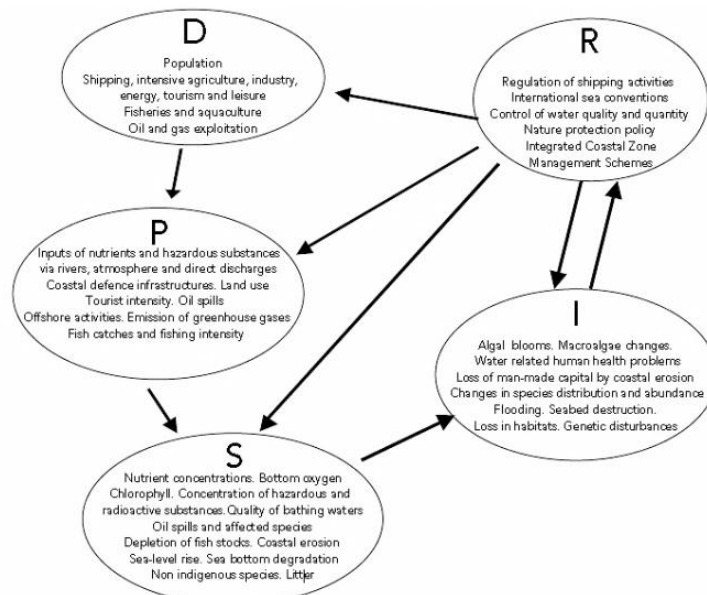
Explain the environmental value chain approach as it stands by now and how it could contribute to ResponSEABLE.

3. Sectors and economics activities organization and DPSIR framework

3.1 What place for economic activities or key segments of the industry within the DPSIR and ES frameworks?

The DPSIR framework is a well-established framework to analyze environmental change processes based on cause-effect relationships between interacting components of social, economic and environmental systems (WP1; Knudsen et al. 2010; Atkins et al. 2011). The framework provides a chain of causal links starting with Driving forces, through Pressures to States and Impacts on ecosystems, human wealth and functions leading to political Responses (Brochier et al. 2012). Figure illustrates the DPSIR framework proposed by the European Environmental Agency (EEA) for coastal and marine areas.

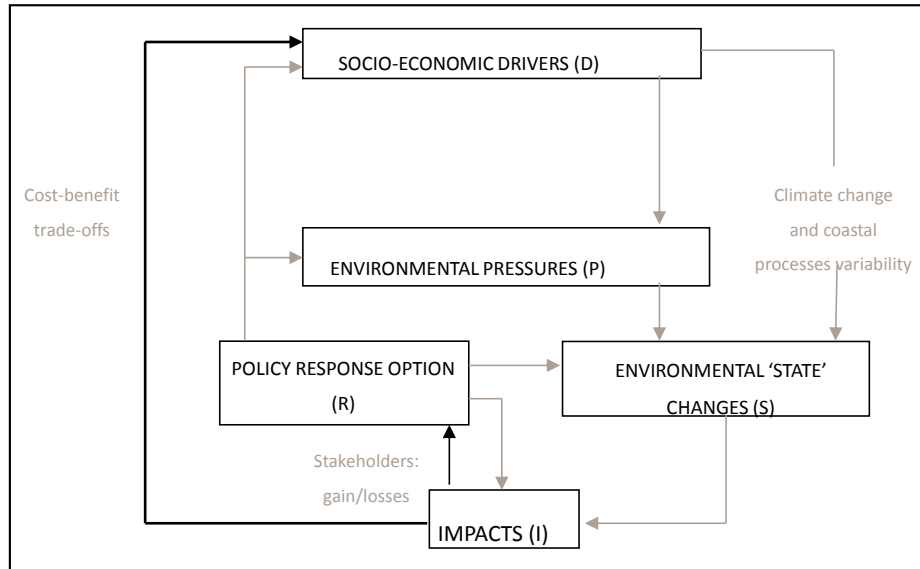
Introduce the EEA's marine and coastal DPSIR



EEA

Activities, or economic activities, in the proposed DPSIR framework are seen as the causal relationships between drivers (demands that society places over the environment: energy supply, food security, transport, recreation...) and pressures resulting from these drivers (fisheries, shipping, coastal tourism and waste generation). Drivers are then rather socio-economics when pressures are environmental, activities being the implementation mean and exerting pressures. The State of the environment will then change (plastics on seabed, chemical contamination...) and will result in an Impact calling for a Response. To that point of view, DPSIR is a useful framework to elicitate the role that socioeconomic drivers play in inducing pressures over the environment (Turner et al. 2010).

DPSIR Framework as understood by economists (Turner, 2010)



The Impact may be of different nature according to natural scientists and social scientists. The injury of an organism is then acknowledged as an impact when it implies a loss of an ecosystem service for economists (GSAMP 2014). This translation in terms of loss of ecosystem services (ES) is made through the concept of welfare: a loss of ES will result in a welfare impact. Through the FP7 Knowseas project¹, an attempt was made to clarify these two perceptions by switching from DPSImpactR to DPSWelfareR framework (Cooper 2013). But it was rather a way to proceed to an economic valuation in terms of monetary value through the introduction of the welfare concept and proceed to cost and benefits trade-offs analyses. If the benefits side was achieved, the costs side was considered as too complex to be implemented over scales such as regional seas.

Objective of the present assessment framework is not to deliver an aggregated value as a measure of the whole economic pressure through the monetary valuation of goods and ecosystem services but to identify the adaptation potential of economic actors by qualifying the relationships between economic segments.

Considering "Activities" as the exerting pressure mechanism can also be limiting. Activities can be spread all along the DPSIR framework taking into account not only "pressuring" activities but also impacted activities. Some of these activities could be both impacting and impacted through the dynamics and health of ecosystems (e.g. aquaculture in some cases). Other activities can also have a positive impact on the provision of ES. But in the frame of ResponSEable and ocean literacy the positive effects of such segments will not be taken into account (*to be discussed*).

This is one of the main limiting factors of the DPSIR framework: it can be perceived as an inappropriate analytical tool as it ignores the multiple dimensions of causality inherent in complex environmental and socio-economic systems (Sundblad et al., 2014). Another limit is expressed through the needs to be better embedded in the institutional context.

Additional: Introduction of Life Cycle (+ contexts and regulations) through the Response step

¹ www.knowseas.com and www.msfd.eu

3.2 Designing a new framework based on lessons learnt from Value Chain, DPSIR and ES

3.2.1 Pressures as a co-production of the Value Chain

Despite critics over the DPSIR framework and integration of economic activities, DPSIR framework provides a conceptual model of causalities resulting in a cumulative environmental pressure. Aside this causal model, the Value Chain approach results in a successive embedded activities or key segment of the economy, linked by some dependence relationships from the upstream to downstream. The downstream is the delivery of the final product to the market. This production is going along with a coproduction in terms of environmental pressure for those segments of the economy that are closely linked to the sea and being a source of pressure over marine and coastal ecosystems, resulting in a loss of ecosystem services.

Pressures can then be assessed as a coproduction, as an additional output of the Value Chain. Similarly to the classic approach of the Value Chain (vertical economy), the final product will result in a cumulative pressure from impacting activities, part of the key segment of the ocean economy. To identify these key segments, the purpose is then to reverse the Vertical Chain approach by swimming upstream from downstream.

3.2.2 Swimming upstream the Value Chain - Building from the causalities diagram

WP1 is building the causalities diagram of relationships between anthropic and bio-physical system. This Human-Ocean relationships system will be the inception point to derive the key ocean related segments of the economy, based on value chain framework. This Human-Ocean relationships system is the inception point to derive the key ocean related segments of the economy, based on value chain framework.

To be completed with a step by step approach guidelines and conceptual graph underlining the approach. Implementation through participatory workshops with stakeholders and experts.

3.2.3 Identifying the area of changes

Area of changes: areas of potential change in terms of practices (producers), behavior (consumers, citizens) and regulation (institutional innovation, policy makers).

To be developed

3.3 Information to be produced within the framework

Following i) the review of metrics and approaches to define ocean economy, iii) according to the need for taking into account environmental pressures over marine and coastal ecosystems originated

from segment of the economy, the following indicators have been identified as relevant to the approach and as proxy of environmental pressures exerted through a size effect. Indicators are:

- Turnover
- Added-value
- Employment level
- Number and demography of enterprises

To be defined, explained and illustrated under a value chain approach.

Quantitative information produced will not allow for quantifying the importance or the contribution to Pressure from each sector or identified key segment (an input from natural scientists). Nevertheless it could be possible to hierarchize the contribution from a sector compared to another based on experts knowledge and through the participative implementation process.

Illustrations to be given about the level of information that will be provided and related importance of sectors regarding pressures.

3.4 Key stories formulation under the proposed framework

Key stories to be considered have to be formulated according to a couple based approach. For instance, if fisheries can be addressed through the Value Chain approach, on its own it can't be used through the causal diagram to draw and identify the key segments of the ocean economy. To make sense at the framework level crossing organization of the ocean economy and pressures' issues, Fisheries has to be considered as Fisheries and overexploitation. Similarly the cosmetics-microplastics couple makes sense opposed to the solely microplastics. This can be again expressed for agriculture-eutrophication vs. agriculture.

How WP2 understood and use key stories. Illustration based on a tentative application to one or two key-stories.

4. Scale mismatches

Some of ecosystem loss and degradation problems can be confined more or less to local scale opening room for local management actions over Drivers and Pressures. In the case of eutrophication, problems have to be viewed at the river catchment scale. But Drivers and pressures (intensification/expansion) are often located beyond the coastal zone. Drivers of change are then distantly located from the ecological impacts and consequent socio-economic cost effects.

Working at the scale of the issue (policy or environmental issue) which is the water catchment or river basin scale, defined here as an ecosystemic scale and potential management unit compared to traditional management scales based on administrative scales.

Issue of scaling down/up the blue economy at ecosystem scales (Regional Seas...). The LMEs approach from NOAA, Application over the Mediterranean and Black Sea, Ben Halpern...



Issue of scale: time and space. Space obvious one when dealing with administrative/regulatory and ecosystems scales (watershed, coastal system, regional seas...). The scale to be considered is the scale of the issue, i.e. the one where the issue makes sense or where it talks to stakeholders. There's no real difference for the framework to operate at different spatial scale. Process remains the same as it is thought in terms of access to data gathered and monitored regularly and of public access. Purpose is not to propose an implementation process depending on data to be produced through this process.

Complete with legacy effects (temporal scale; historical legacy from past activities (contaminants from industrial development)) and working at ecosystemic scale; Non linearity, memory and choke effects.

5. Beyond of the framework, outputs to ocean literacy

Knowledge sharing platform crossing Key-stories, ES and Pressures. Illustration based on Seagrass conservation issue and anthropic pressures in the Bay of Morbihan.



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WP1 Methodological Note