



Work Package 1: User identification and user involvement

Economic assessment, part 1.

Economic significance of marine sectors in Europe and their need for EDIOS

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Preliminary remarks

This paper presents an assessment of the economic significance of EuroGOOS and potential EDIOS users in Europe in terms of value added and employment. The long term purpose of this exercise is to measure the economic impacts of EDIOS on maritime activities in Europe: but in order to measure such impacts, one has to know what is these activities' production in economic terms. As little information is available on this subject, our findings are based on estimates. This second version is an improvement of the first version released in December 2001. The estimates of the overall European maritime economy have been notably increased herein as compared to those of the first version.

1. Introduction

The main aim of EDIOS is to build a meta-database (computerised Directory) that includes information on all European ocean-observing sites/devices in routine and repeated operation (to be continuously updated) and to use this Directory to define the Initial European Ocean-observing System (for EuroGOOS purposes).

EDIOS will collect the scattered information on ocean-observing sites/devices (metadata only), harmonise it and combine it in a searchable European directory of operational ocean-observing sites/devices currently in use. EDIOS will be placed on the Internet and continuously updated.

This information will include, for example:

- Technical specifications of the data collection methods (instruments, sensors, ships, nets, etc.)
- Geographic co-ordinates
- Specifications of the kind of measurements taken as well as of their spatio-temporal characteristics (but not the observational values). Information on sites sampling biological and biochemical data can be included without the special considerations necessary for the storage of actual records of this kind. Links to databases/archives containing the actual records will be provided.
- Approximate accuracy of measurements
- Present applications of the sampled data including derived products
- Responsible agency/institute for each instrument or sensor
- Links to data-holding agencies and institutes

This Directory of ocean-observing sites/devices will produce for the first time a European scale picture of the engineering components of the ocean observing system and it represents a prerequisite for the full implementation of a co-ordinated European operational oceanographic strategy (EuroGOOS). It will provide the means to detect gaps and, in some cases, duplicate efforts in the current observation systems. It will enable rapid combination and co-ordination of national ocean-observing stations to improve monitoring and modelling around European seas, and to plan investments to develop and refine observations. EDIOS will permit for the first time an analysis of the continuously available data for operational models in Europe, and hence the ability to optimise the deployment of instruments, and the design of sampling strategy. This will lead to a better exploitation of the data generated by operational oceanography as well as of the derived products.

User involvement (Work Package 1) plays an important part in the building of EDIOS to make sure that requirements of all potential users of EDIOS are met regarding the type of information compiled and the design of the user interface. Towards the end of the project, a study will be carried out to assess the actual benefits in terms of efficiency and productivity increase (scientific knowledge, industry goods and services) that different enterprises can have by using EDIOS. This study will help us to derive a solid estimate of the economic value of EDIOS for the European marine sector.

The present paper represents the first step for a choice of cooperating users. It consists in estimating the economic relevance of different marine sectors in Europe and in determining their possible need for the type of Directory that EDIOS will be. Based on this assessment, a list of 20 to 30 European marine agencies, research institutes and SME's from all European regions is elaborated. There are already a number of publications estimating the global economic impact of GOOS (e.g. Flemming 1994, Brown 1996, Sassone & Weiher 1996). It is, however, difficult to assess all GOOS-driven effects on a global scale: therefore, some publications limit the scope of their tentative assessment to the impacts on specific activities, e.g. agriculture (Adams, 1994); whereas others do not go much into detail, e.g. Mannix (1996) who assesses the impacts of specific EuroGOOS products on a large group of European marine economic sectors. Our paper starts by identifying European marine activities and considering their need for the type of information contained in EDIOS. It includes an assessment of the economic significance of different European marine sectors relevant to our project.

2. EuroGOOS products and EDIOS: Who needs what?

Many examples of marine activities that rely on oceanographic information and data have been mentioned in the literature. Shipping, for instance, can decrease operational costs by a more adequate choice of routes or transit timing and planning. Fisheries management benefits from fish stock assessment and fishing activities can profit by decreasing fishing effort (time on sea) if accurate physical and biological information is available. The productivity of fish farming is also sensitive to a number of conditions, i.e. ocean circulation or temperature, climate events (e.g. ENSO: El Niño Southern Oscillations), etc., and precise information on such conditions enables fish farmers to select the most suitable sites for their enterprise. The same applies to offshore activities such as gas and mineral extraction, the running of ports, the environmental protection of the seas, the construction of dikes, and many other marine enterprises. More accurate now- and forecasts are thus an important means to improve marine management and marine economic activities and will benefit societies and economies depending on coasts and seas.

EuroGOOS has the principal aim of facilitating the making of standardised European products from operational oceanography (forecasts, nowcasts, and hindcasts of physical and biogeochemical states of the seas). Such EuroGOOS products will be of great value to large groups of marine applications (Fischer & Flemming, 1999). **EDIOS will be an important tool for the development of EuroGOOS products and therefore serves primarily the needs of European operational oceanography and its beneficiaries.** However, besides the marine sectors that are exclusively or mainly interested in the final EuroGOOS products (EuroGOOS users) a number of marine applications exist that will have an immediate interest in the information contained in the Directory and which are therefore regarded as “direct” users of EDIOS.

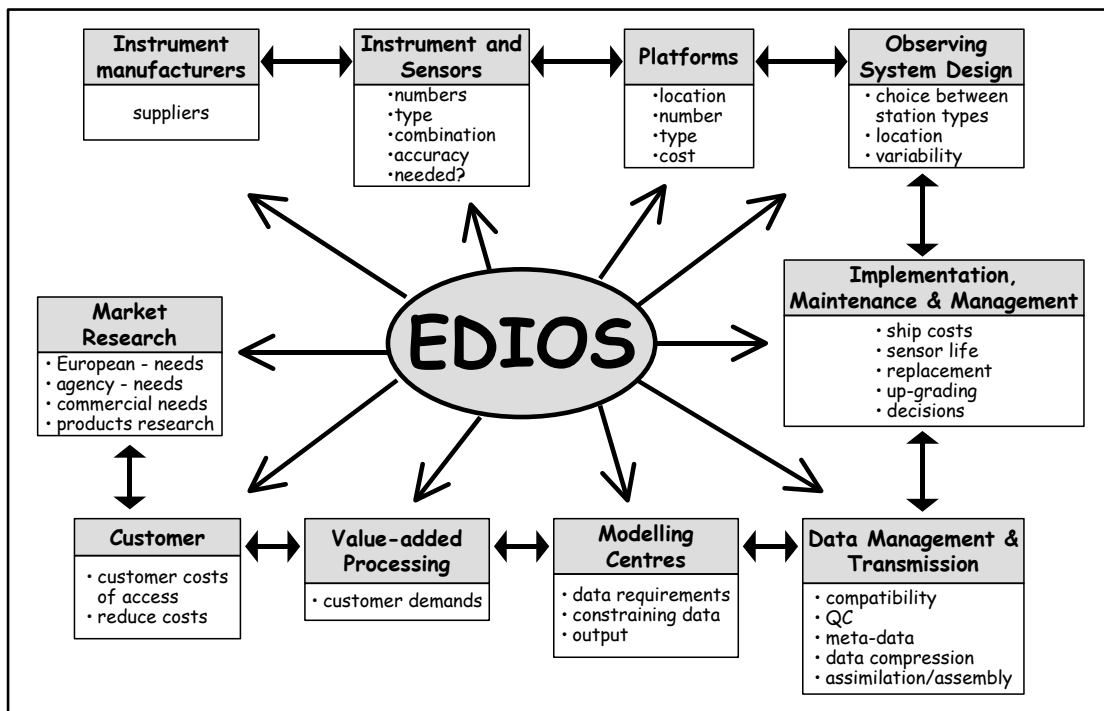


Figure 1. Direct EDIOS users, i.e. components or sectors in Operational Oceanography where information from EDIOS will directly influence decisions, and increase efficiency.

The benefits of EDIOS for European operational oceanography will be obvious in all components that make up the operational system, ranging from instrument manufacturers, design and implementation of the ocean-observing systems, and modelling to value added processing and customer needs (see Figure 1). The Directory will find its own users in addition to international programmes such as IOC/GOOS, EuroGOOS, WMO, etc. These will be scientists and other personnel of oceanographic research institutes and agencies, environmental and resource management agencies, meteorological offices, etc., plus SME’s operating in the marine sector. EDIOS will help marine resource users in general to find the sources generating data relevant to their applications. In addition, a compendium of European ocean-observing sites/devices will facilitate collaborative scientific uses of data generated by operational oceanography and thus reduce redundant or duplicate data sampling. The resulting cost savings might well have the effect of attracting more investigators to study the seas and therefore add to our overall understanding of ocean processes. The classification of measuring systems in EDIOS will set European standards required for a European Ocean-observing System. These standards will deal with the formats, scales, units, geographic distribution, type and detail of information

on ocean-observing sites/devices stored by national and regional institutions. They will most likely incite manufacturers and owners of ocean-observing devices to improve their systems. EDIOS does not yet exist and we cannot tell for sure which marine applications will make use of the Directory, i.e. we rely on assumption and educated guesses when defining the main sectors that will employ EDIOS. We know, however, which marine applications are interested in EuroGOOS products (Fischer & Flemming 1999) and this represent a very good starting point. For our purpose, we subdivide the different sectors of marine applications listed in Fischer & Flemming (1999) into two main groups according to their alleged product/metadata interests or needs (Figure 2). On the basis of this list, a first estimate of the significance of European economic sectors impacted by EDIOS becomes possible.

a) Direct EDIOS users

- Operational Oceanography (EuroGOOS)
- Basic scientific research (all disciplines of oceanography),
- Services (forecasting, consultancy, finance),
- Energy production (offshore exploration, drilling, production, services, offshore energy producing installations),
- Mineral extraction (non-oil & gas material extraction),
- Environmental protection (including control, disposal, cleaning),
- Seafood (including fishing gear production),
- Defence (military construction, engineering and research),
- Building, construction, engineering (including public works, facility construction and services related to the above sectors, as well as military and scientific electronic equipment).

b) Indirect EDIOS users = EuroGOOS end product users:

- Transport and ports (including all shipping operations, all transport facility construction, safety services),
- Energy production (offshore exploration, drilling, production, services, offshore energy producing installations),
- Tourism and recreation
- Hinterland (agriculture, urban and specific zone management, public health).

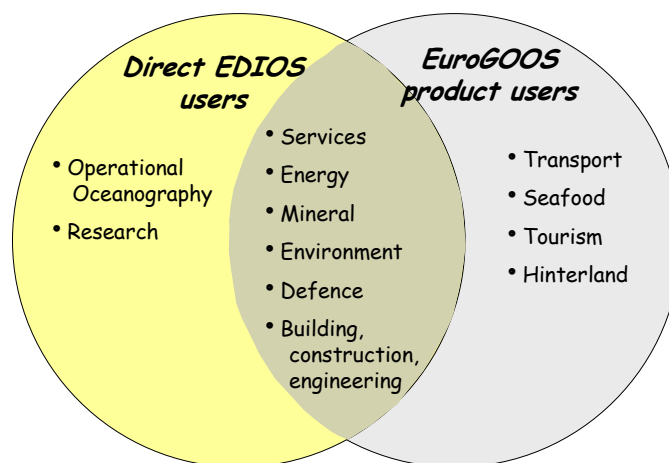


Figure 2. Marine sectors of application that will presumably benefit directly (yellow) or indirectly (grey, EuroGOOS end users) from EDIOS. The overlap indicates those marine sectors that should profit both from EDIOS and final EuroGOOS products.

3. Assessing the size of potential users

3.1. Assessment criteria

3.1.1. Turnover, value added, employment

The basic assessment criteria used to estimate the size of the impacted economy are turnover, value-added, and employment. These are classic criteria that were also applied by other authors, for example, by Pugh and Skinner (1996, 2002) and IFREMER (1997-2001). These criteria were adopted by the recent PRC (Policy Research Corporation) study of maritime industries in Europe (PRC, 2001). Value-added is more relevant than turnover as the latter may lead to double accounts. It is therefore safer to limit the scope to value-added and employment.

3.1.2. Direct and indirect effects

Value-added and employment can accrue from either direct or indirect effects. Typically, maritime industries as such represent direct effects. Indirect effects are created either through material being bought or services being sub-contracted by maritime industries, or through additional consumption by households involved in, and receiving wages from, maritime related activities.

It is critical to start by assessing direct effects. These are more difficult to estimate, and usually serve as a basis to calculate indirect effects: classic models exist for that purpose. We will limit the scope of this paper to direct value-added and employment.

3.1.3. An assessment of some sectors of application

PRC (2001) estimates the significance of the so called European "Maritime Cluster" (including Norway). The cluster in question is defined by a set of industries (or categories, see "Maritime Cluster" in Table 1) which overlaps with the group of EDIOS users as defined above.

In the PRC study, each industry or category of industry is assessed in terms of turnover, value-added and employment for each EU member state and for Norway (unfortunately, the study relies on rather old figures from 1997 and 1993):

- **Direct value-added** of the European activities listed in Table 1 ("Maritime Cluster") is estimated to amount to 70 billion € in 1997 (60 billion in 1993), i.e. around 0.95% of the 1997 GDP of the EU plus Norway.
- **Direct employment** of the European activities listed in Table 1 ("Maritime Cluster") is estimated to amount to 1,545,200 €

Table 1 reflects our effort to estimate the economic significance of EDIOS users on the basis of the PRC assessment of the Maritime Cluster. For two reasons, these two groups do not exactly correspond with each other: a) fields covered and definition of the two sets of industries are not the same; and b) definition of each sub-set of the Maritime Cluster does not perfectly coincide with that of the corresponding EDIOS user category. Therefore, a distinction is made between:

- a) those EDIOS user industries that correspond well with a category of the Maritime Clusters and could therefore be correctly assessed in terms of value-added and employment ;

- b) those EDIOS users that correspond only partly with a category of the Maritime Clusters and where thus estimates of value-added and employment do not perfectly reflect the size of the industries concerned ;
- c) those EDIOS users that were not considered by any of the categories of the Maritime Clusters and which will therefore be assessed using alternative data sources.

EDIOS users	Maritime cluster
Operational Oceanography (EuroGOOS)	R&D and Education
Basic scientific research (all disciplines of oceanography)	
Services (forecasting, consultancy, finance)	Support Services
Energy production (offshore exploration, drilling, production, services, offshore energy producing installations)	Offshore supply
Mineral extraction (non-oil & gas material extraction)	
Environmental protection (including control, disposal, cleaning)	
Seafood (including fishing gear production)	Fishing & Aquaculture Equipment Manufacturing
Defence (military construction, engineering and research)	Naval Shipbuilding
Building, construction, engineering (including public works, facility construction and services related to the above sectors, as well as military and scientific electronic equipment)	Shipbuilding Dredging and maritime works Naval Shipbuilding Equipment and manufacturing Cables and Submarine Telecoms Repair and conversion
Transport and ports (including all shipping operations, all transport facility construction, safety services)	Shipping Ports and related services
Tourism and recreation	Recreational vessels
Hinterland (agriculture, urban and specific zone management, public health)	
	Scrapping Inland Shipping Classification societies Inland Shipping
a) <u>White boxes</u> : industries corresponding well with a Maritime Cluster	a) <u>White boxes</u> : sectors of the of the Maritime Cluster relevant to assess EDIOS users.
b) <u>Grey boxes</u> : industries corresponding only partly with a Maritime Cluster.	b) <u>Grey boxes</u> : sectors of the Maritime Cluster that are only partly relevant for the EDIOS user assessment.
c) <u>Black boxes</u> : industries not considered by any of the Maritime Clusters. (no assessment here)	c) <u>Black boxes</u> : sectors of the Maritime Cluster irrelevant to the assessment of EDIOS users

Table 1. Comparison of potential EDIOS user groups and the closest corresponding Maritime Clusters from the PRC (2001) study.

Table 2 represents an estimate of value-added and employment for EDIOS users which is based on the PRC figures of the relevant Maritime Clusters. As for seaside tourism, PRC data have been supplemented by estimates based on Eurostat's data and those of the French Ministry for Tourism.

EDIOS users	VA (m €)	Employment ('000)
Operational Oceanography (EuroGOOS)	1,332	27.1
Basic scientific research (all disciplines of oceanography)	o	o
Services (forecasting, consultancy, finance)	4,319	73.6
Energy production (offshore exploration, drilling, production, services, offshore energy producing installations)	6,519	137.8
Mineral extraction (non-oil & gas material extraction)		
Environmental protection (including control, disposal, cleaning)		
Seafood only (excluding fishing gear)	6,697	295.0
Defence (military construction, engineering and research)	1,291 u	35.3 u
Building, construction, engineering (including public works, facility construction and services related to the above sectors, as well as military and scientific electronic equipment + fishing gear production)	13,481 ?	349.5 ?
Transport and ports (including all shipping operations, all transport facility construction, safety services)	30,915	519.2
Seaside tourism and recreation	52,640 u	1,316.0 u
Hinterland (agriculture, urban and specific zone management, public health)	65,570	1,470.8
Total	182,764	4,224.3

Table 2. Estimate of the economic value of different sectors of potential EDIOS users.

o: overestimate; u: underestimate; ?: uncertain.

Source: Policy Research Corporation NV & ISL (2001)

Owing to the lack of figures for several activities, especially hinterland (coastal agriculture and various services), our findings on value-added and employment are likely to underestimate the economic significance of EDIOS users. With regard to seaside tourism, an improvement has been achieved as compared to the first version of Dec. 2001: an order of magnitude has been arrived at, based on reliable estimates of overall seaside tourism expenditures in France as measured by yearly surveys; such methodology has served to obtain average daily expenditure ratios which have been used together with Eurostat's estimates of the numbers of daily stays per European country. However, seaside tourism remains underestimated as some EU countries, especially Greece, are missing in Eurostat data sets. Finally, it is also important to point out that our estimation of the economic value of potential EDIOS users is based on the assessment of

large groups or industrial sectors regardless of the fact that not every single enterprise in these user sectors will actually make use of EDIOS. Our findings still need to be improved on the basis of more relevant data sources.

4. References

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