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Socio-economic studies in the field of the Integrated Maritime Policy for the European Union

Marine Data Infrastructure

Executive summary

European Commission
Maritime Affairs
and Fisheries

‘Socio-economic studies in the field of the Integrated Maritime Policy for the European Union’

- The role of Maritime Clusters to enhance the strength and development in European maritime sectors – Executive summary
- Legal aspects of maritime monitoring & surveillance data – Summary report
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Marine Data Infrastructure

Executive summary

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1 Introduction

The purpose of this Study is to support measures towards the establishment of the European Marine Observation and Data Network (EMODNET), which was proposed in the Blue Book on an integrated maritime policy for the European Union[1]. The Blue Book was accompanied by an Action Plan[2] in which the European Commission proposed the preparation by 2009 of an EU action plan to make progress in this area. The Commission has been invited to come forward with the initiatives on the proposals contained in the Action Plan.

Large quantities of data relating to the marine environment are collected and stored all over Europe for a wide variety of purposes and by a variety of public and private entities. Such data, which record a wide range of natural and human-activity in and around the oceans, are a key pre-requisite for effective strategic decision-making on maritime policy. At the same time, these data, and the research they relate to have a major role in promoting the development of economic activities relating to the maritime sector and the creation of new industrial products and services.

The one-year consultation process that followed the release of the Green Paper on a Future Maritime Policy for the European Union[3], revealed stakeholder concerns that the present poor access to marine environmental data was a brake on the economy, a handicap to government decision making and a barrier to scientific understanding.

An earlier Study[4], prepared under the same Service Framework Contract as the present Study, examined the existing legal restrictions on improved flows of marine environmental data. In outline, that Study found that notwithstanding the adoption of a number of instruments at Community level, intended to promote both access to marine environmental data and the re-use of public sector data at a fundamental level the existing legal frameworks leave question of data use and re-use to be determined on the basis of the data policies of individual data holders in accordance with the intellectual property rights that they hold over such data, primarily copyright.

Building on the earlier Study, the present Study seeks to assess the economic benefits of moving towards a regime for the sharing and multiple use of marine data and to evaluate the legal options of such a regime.

More specifically the Terms of Reference (ToR) for the present Study specified that four separate tasks were to be undertaken. These are: (a) Task One, an analysis of present marine data collection infrastructure; (b) Task Two, an assessment of how much time and money is spent by various public and private data user organisation on different types of marine data; (c) Task Three, an evaluation of the benefit of reducing uncertainty (in other words the opportunity cost of uncertainty) in connection with sea-level rise; and (d) Task Four, an analysis of the legal instruments that the EU could deploy for the establishment of EMODNET.

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[1] European Commission (2007) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - An Integrated Maritime Policy for the European Union (COM (2007) 575).

[2] European Commission (2007) Commission staff working document - Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - An Integrated Maritime Policy for the European Union (SEC (2007) 1278).

[3] European Commission (2006) Communication from the Commission to the Council, the European Parliament, the European Economic and Social committee and the Committee of the Regions - Towards a future Maritime Policy for the Union: A European Vision for the Oceans and Seas (COM (2006) 275).

[4] MRAG Ltd et al (2008). Legal Aspects of Marine Environmental Data Framework Service Contract, No. FISH/2006/09 – LOT2 Final Report.

2 Tasks one and two: Marine data costs

Information, including marine data, is an economic good and/or a service for which there is demand by many different end users in EU economies. The starting point for economic analysis is the observation that information such as marine data has economic value because it allows individuals to make choices that yield higher expected payoffs or expected utility than they would obtain from choices made in the absence of information. The wider availability of marine data also brings other direct benefits such as the time savings in acquiring such data. Such time savings also bring financial and economic benefits. Marine data is an important component in the financial and economic analysis of coastal development and offshore projects.

A further basic issue associated with the use of marine data is whether they should be treated as a free public good available to users at no cost or whether such data should be sold on a commercial basis in order to recover all or part of their collection, analysis, storage and dissemination costs. In the United States, the treatment of marine data as a public good is seen as contributing to overall economic development and value added. In the EU, many public sector agencies seek to recover all or a proportion of the costs of collecting, analysing and disseminating marine data both to other public agencies (sometimes at preferential discounted prices) and private sector users. Large scale coordinated collection and dissemination of marine data may lead to economies of scale. Cost recovery for marine data is variable between different EU countries and between different public sources of data. In practice, marine data is provided by a combination of public and private goods providers.

Following the literature review, draft outlines of the two questionnaires were presented in the Inception Report and subsequently refined following close discussion with the Commission. Copies of the final English language versions of the questionnaires are attached as Annex C. The questionnaires were also translated into French and Spanish, and were all distributed electronically to identified parties. Results were compiled into a database for analysis.

Tasks One and Two are, broadly speaking, both concerned with the costs of marine data management and use.

Task One requires an assessment and evaluation of the present data collection infrastructure. Three specific questions are raised: (a) under what legal basis and for what purpose is marine data collected by public bodies? (b) How much is being spent annually by public bodies on collecting, processing, maintaining and distributing marine data the amounts spent annually by public bodies on the collection, processing, storage, maintenance and distribution of marine data; and (c) How much income is raised from sales of raw marine data and from products derived from marine data? More specifically data is required to be gathered at two separate levels: (a) on the basis of available literature for all EU coastal countries; and (b) on the basis of more detailed analysis for five particular Member States, namely France, the Netherlands, Spain, Sweden and the United Kingdom (the ‘five coastal States’) based on a questionnaire and follow-up interviews. In terms of identifying the Public Sector Data Holders in the five coastal States in connection with Task One, a preliminary list was prepared using data from the earlier Study as well as the European Directory of Marine Data (EDMED) and the Marine Observation and Data Expert Group (MODEG). In order to maximise the likelihood of a response and to facilitate follow up, as far as possible the questionnaires were sent to named individuals at each Public Sector Data Holder. As regards private sector Data Users, the questionnaire was distributed where possible through European trade associations. The ToR also calls for the responses to be broken down according to the type of data under six headings: (1) bathymetry,

(2) geology – sediments, strata etc, (3) physics – tides, ice, temperature, salinity, opacity etc, chemistry – pollutants etc, (4) chemistry (5) biology (except fish) abundance and diversity etc (6) fisheries, (7) human activity – shipping intensity etc. These headings were also used in the earlier Study. The public bodies holding marine data that are the subject of Task One are described in this report as 'Public Sector Data Holders'.

Task Two required an assessment as to the time and money spent collecting, processing, maintaining and distributing by a range of users of marine data, described as 'Data Users' in the Report, in the acquisition of such data. These are specified in the ToR to be (a) private organisations involved in port expansion, wind farm siting, pipeline or cable laying and fisheries management and (b) public authorities that regulate them

2.1 Marine Data Collection by Public Bodies and their Costs

Organisations were asked to provide the purpose for which each type of marine data is collected. The responses received for each purpose and type are summarised in Figure 1. The findings show that most often cited purposes for data collection were to understand the behaviour of the planet and to provide advice for marine management. The most commonly collected categories of data collected are biological and physical. The least common reasons are for coastal defence, national defence and sea navigation whilst least prevalent data categories are fisheries and human activity (Fig 1).

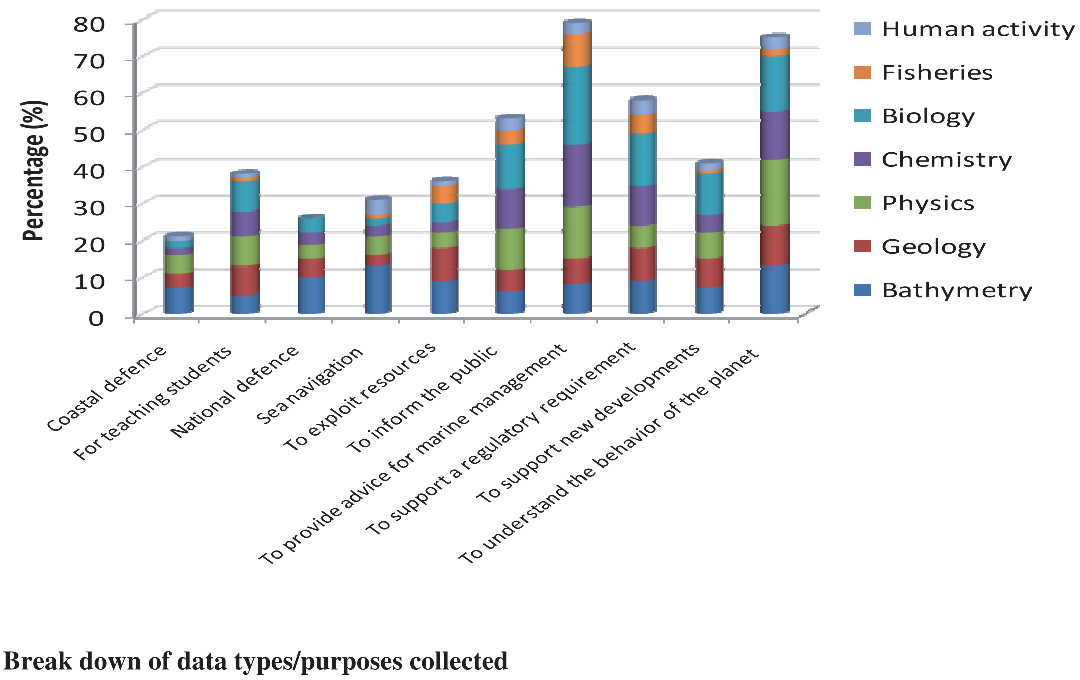

Figure 1 Break down of data types/purposes collected

The annual spend by public bodies on collecting, processing and distributing marine data is summarised in Table 1, compiled from both the results from the initial questionnaires and from the later follow up interviews. Where answers to both existed, those from the interviews were used as most respondents indicated that responses to the interviews were more accurate because it was clearer to them exactly what information was needed and in what format. The spend on data collection is compared to the total turnover of the collecting institution.

Table 1 Total turnover and entire data spend by institution for case studies

Member State	Institution	Total Turnover (€)	Total Expenditure (€)	Average Expenditure (€)	% Expenditure to Turnover
Spain	CEDEX	55.7	2.78		5
Spain	CSIC UTM	n/a	n/a		n/a
Spain	IRTA	8.1	n/a		n/a
Spain	Puertos de Estado	n/a	n/a		n/a
Spain	CEMMA	0.2	0.02		10
Spain	Instituto de Ecología Litoral	0.6	0.4		67.7
Spain	IEO	68	21		30.9
Spain	*Total*	*76.9*	*24.2*	*7.14*	*28%*
France	SHOM	75 mil	24.8 mil		33.1
France	INSU CNRS	n/a	n/a		n/a
France	IRD	219 mil	6 mil		2.7
France	IPEV	23 mil	20.7 mil		90
France	CNES	1423 mil	15 mil		1.1
France	CLS	24.54 mil	n/a		n/a
France	IFREMER	230 mil	70 mil		30.4
France	E-SURFMAR	0.82 mil	0.13 mil		15.9
France	CETMEF	0.335 mil	0.134 mil		40
France	Institut de Physique du Globe de Paris	34 mil	7.69 mil		22.6
France	SOMLIT	n/a	1.3 mil		n/a
France	CNRS University de Perpignan	0.3mil	n/a		n/a
France	Université de la Rochelle, CRMM	n/a	n/a		n/a
France	Bureau Gravimetrique Int'l	0.15 mil	0.1125 mil		75
France	*Total*	*2030.1*	*145.9*	*14.6*	*7.2%*
Netherlands	Hydrographic Services, Royal Navy	5.3 mil	5.3 mil		100
Netherlands	NIOZ	20 mil	0.25 mil		1.25
Netherlands	Rijkswaterstaat	3500 mil	26 mil		0.75
Netherlands	Port of Rotterdam	450 mil	n/a		n/a
Netherlands	*Total*	*3975 mil*	*31.6 mil*	*€10.5 mil*	*0.8%*
Sweden	Swedish Environment Protection Agency	330.5 mil	4 mil		1.2
Sweden	SMHI	53.5 mil	2.4 mil		4.5
Sweden	Swedish Maritime Administration, Hydrographic Office	192.6 mil	13.5 mil		7
Sweden	Swedish Board of Fisheries	27.9 mil	3.63 mil		13
Sweden	Geological Survey, Sweden	22.8 mil	2.16 mil		9.5
Sweden	Sven Loven Centre for Marine Sciences	5.15 mil	0.15 mil		2.8
Sweden	Umea Marine Sciences	2.5 mil	1 mil		50
Sweden	*Total*	*635 mil*	*26.8 mil*	*3.8 mil*	*4.2%*
UK	Marine Scotland	29.4 mil	10.9 mil		37
UK	UKHO	109 mil	5.45 mil		5
UK	CEFAS	62.74 mil	35.12 mil		56
UK	Maritime & Coastguard Agency	130 mil	6 mil		4.6
UK	British Oceanography Data Centre	1.5 mil	1.5 mil		100
UK	NERC	n/a	40.1 mil		n/a
UK	British Atmospheric Data Centre	2.2 mil	1.5 mil		68
UK	Seafish	8.8 mil	3.3 mil		38
UK	*Total*	*343.6 mil*	*103.8 mil*	*9.1 mil*	*18.5%*
	TOTAL	*3480.6 mil*	*332.3mil*	*57.9mil*	*8.3%*

The total expenditure by data collecting bodies in the five case studies is €289 million annually amongst which the highest expenditure is by France at 149.5 million followed by the UK at €63.9 million, the Netherlands at €31.65 million, Sweden at €26.8 million and Spain with €21.4 million. The €289 million figure is a minimum total value for the five coastal States, as many organisations contacted did not provide data. For the Netherlands there is some ambiguity concerning the Rijkswaterstaat

(RWS). The total budget for this organisation is €3.5 billion within which that of the Waterdienst department which has major data collection responsibilities is €36.9. There may, however, be other data collection departments within the Rijkswaterstaat therefore it was not possible to 'normalise' the figures for the Netherlands in the relative proportions of expenditure by data type (Table 2). The relative breakdown by field of data is summarised in Table 2, which gives some indication of the relative priorities of the different Member States.

Table 2 Proportion of turnover and data spend for Public sector data Holders by Member State

Member State	Bathymetry	Geology	Physics	Chemistry	Biology	Fisheries	Human activity	Other
Spain	6.3%	4%	17.4%	32.5%	14.1%	5.9%	16%	2.7%
France	15.2%	13.4%	24.7%	11.43%	20%	10%	0.7%	3%
Sweden	50.6%	7.6%	2.8%	9.5%	15.6%	13.8%	-	-
UK	19.1%	7.1%	11.4%	16.1%	16.5%	19.1%	7.3%	-

The values in Table 3 show that, as a proportion of the survey total, the majority of the total data management costs are incurred in collecting (64.2%) and then processing the data (11.3%). Much smaller proportions are spent on maintaining (5.8%), distributing (3.9%), and on other tasks (14.7%).

Table 3 The split of total data spend on data management between collecting, processing, maintenance and distribution

MS	Organisation	Collecting (EUR)	Processing (EUR)	Maintaining (EUR)	Distributing (EUR)	'Other' (EUR)
Spain	CEDEX	0.74 mil	1.3 mil	0.22 mil	0.42 mil	0.1 mil
Spain	CEMMA	0.014 mil	0.003 mil	0.001 mil	0.002 mil	_
Spain	CSIC UTM	n/a	n/a	n/a	n/a	n/a
Spain	IRTA	1.62 mil	0.2025 mil	0.10125 mil	0.081 mil	-
Spain	Puertos de Estado	n/a	n/a	n/a	n/a	n/a
Spain	Instituto de Ecologia Litoral	0.16 mil	0.16 mil	0.04 mil	0.04 mil	-
Spain	IEO	n/a	0.653 mil	n/a	n/a	0.469 mil
Spain	*Total*	*2.53 mil**	*2.32 mil**	*0.36 mil**	*0.54 mil**	*0.57 mil**
France	SHOM	>20 million	-	-	-	-
France	IFREMER	n/a	n/a	n/a	n/a	n/a
France	IRD	-	-	-	-	-
France	E-SURFMAR	0.033 mil	0.033 mil	0.033 mil	0.033 mil	-
France	CETMEF	0.134 mil	-	-	-	0.134 mil
France	Institut de Physique du Globe de Paris	6.9 mil	0.77 mil	-	-	7.69 mil
France	SOMLIT	0.65 mil	0.39 mil	0.13 mil	0.13 mil	-
France	CNRS University de Perpignan	n/a	n/a	n/a	n/a	n/a
France	Univ de Rochelle CRMM	0.0495 mil	0.0495 mil	0.033 mil	0.0165 mil	0.0165 mil
France	Bureau Gravimetrique International	-	-	-	-	0.1125 mil
France	*Total*	*27.77 mil**	*1.24 mil**	*0.196 mil**	*0.18 mil**	*7.95 mil**
Netherlands	Hydrographic Services of RN	1.59 mil	2.12 mil	1.59 mil	-	-
Netherlands	NIOZ	0.13 mil	0.05 mil	0.025 mil	0.01 mil	-
Netherlands	Rijkswaterstaat	24 mil	-	-	-	12.9 mil
Netherlands	Port of Rotterdam	n/a	n/a	n/a	n/a	n/a
Netherlands	*Total**	*25.72 mil**	*2.17 mil**	*1.615 mil**	*0.01 mil**	*12.9 mil**

MS	Organisation	Collecting (EUR)	Processing (EUR)	Maintaining (EUR)	Distributing (EUR)	'Other' (EUR)
Sweden	SMHI	1.9 mil	0.25 mil	0.25mil	-	-
Sweden	SEPA	1.7 mil	1.7 mil	0.3 mil	0.3 mil	-
Sweden	SMA, HO	7.39 mil	1.16 mil	2.15mil	1.66 mil	1.17 mil
Sweden	Swedish Fisheries Board	2.59 mil	1.01 mil	-	-	-
Sweden	SGU	1.55 mil	0.43 mil	0.05 mil	0.01 mil	0.12 mil
Sweden	Sven Loven Centre for Marine Sciences	0.11 mil	0.003 mil	0.0075 mil	0.0045 mil	0.02 mil
Sweden	Umea Marine Sciences Centre	0.3 mil	0.4 mil	0.25 mil	0.05 mil	-
Sweden	***Total***	***15.54 mil***	***4.95 mil***	***3.01 mil***	***2.02 mil***	***1.31mil***
UK	Marine Scotland	8.8 mil	1.43 mil	550,000	220,000	-
UK	CEFAS	19.36 mil	7 mil	3.52 mil	3.52 mil	1.76 mil
UK	MCA	5.468 mil	200,000	332,000	-	-
UK	BODC	1.53 mil	180,000	18,000	36,000	36,000
UK	***Total***	***35.158 mil***	***8.81 mil***	***4.42 mil***	***3.776 mil***	***1.796 mil***
Total		**106.72 mil***	**18.84 mil***	**9.6 mil***	**6.5 mil***	**24.5 mil***
% of TOTAL		**64.2**	**11.3**	**5.8**	**3.9**	**14.7**

There were some particular cases such as the UK's British Oceanographic Data Centre (BODC) which does not itself spend any money on the collection of data. These costs are borne by all BODC's data contributors such as National Environments Research Council (NERC), Fisheries Research Services (FRS), CEFAS, the Environment Agency amongst others. The BODC spends funds on providing the infrastructure (software and hardware) to store and distribute data and smaller amounts on collecting and processing the data. Therefore in responding to the question on how much is spent on different categories of marine data, their response only refer to the time spent preparing the data and metadata for use.

2.1.1 Annual expenditure by public bodies on research vessels

A major component of the cost of marine data collection is that spent on vessels. Information from different sources, including research conducted as part of this study, the minimum number of research vessels in Europe was estimated to be over 112 from the returns from this survey. The Eurocean website indicates that it is 233 in total, of which 107 are major vessels, similar to the present returns. The five coastal States have 71 of these major vessels, around 65% of EU fleet, which area expensive assets. The total annual cost of running this fleet plus a much smaller contribution from the small vessels exceeds EUR 209 million for the five countries which is some 72% of the total spend on collecting marine data of EUR 289.4 million (Table 1).

Research institutes often share time on vessels in their national fleet or on other European fleets. For instance, the French Research Institute for Exploitation of the Sea (IFREMER) occasionally also uses other vessels such as the German research vessel R/V *Meteor* and the *Polastern*. German and other European research institutes also use time on French vessels. IFREMER holds open tenders every year for the use of their boats. There have also been joint collaborations for building research vessels. For instance, the IEO contributed to financing the construction of the ship *Thalassa* (75 meters) for marine research and fisheries, in cooperation with IFREMER. This vessel is operated by IFREMER and IEO. The 'Pourquoi Pas?' was also built as a joint collaboration between Service Hydrographique et Océanographique de la Marine (SHOM) and IFREMER.

Table 4 Fleet Operations and Expenditure

MS	Organisation	Total no. vessels	No. major vessels	No. days at sea	No. minor vessels	No. sea days	Ave. cost per day	Annual spend
	IHM/Armada	4	4	1,320	0	0	19,333	25,520,000
	CEMMA	1	1	30	0	0	1,666	50,000
	Universidad de Oviedo	1	1	24	0	0	0	0
	IRTA	1	1	150	0		1,233	185,000
	IEO	7	7	1,540	0	0	4,440	5,860,360
	Other vessels	3	3	267	0	0	9,300	1,810,000
	CSIC	2	2	440	0	0	7,500	3,300,000
ES		**19**	**19**	**3,771**	**0**	**0**	**9,739**	**36,725,360**
	SHOM	12	5	900	7	1,540	29,000	26,250,000
	IRD	2	2	504	0	0	8,762	4,415,796
	IPEV	3	3	n/a	0	0	18,500	8,640,000
	INSU CNRS	12	4	1,227	8	1,695	1,102	3,890,665
	average others	2	2	310	0	0	_	990,000
	IFREMER	7	7	1,477	0	0	15,333	18,665,000
FR		**38**	**23**	**4,418**	**15**	**3,235**	**8,212**	62,851,461
	Rijkswaterstaat	25	10	2,220	15	3,300	12,380	68,090,000
	Hydrographic Services of the RN	3	3	765	0	0	14,705	11,250,000
	NIOZ	2	2	440	0	0	6,818	3,000,000
NL		**28**	**13**	**3,425**	**15**	**3,300**	**12,623**	**82,340,000**
	Sven Loven Centre for Marine Science	3	3	175	3	n/a	4,937	863,975
	Geological Society Sweden	1	1	100	0	0	8,000	800,000
	Swedish Coast Guard	1	1	220	0	0	15,000	3,300,000
	Maritime Authority, Hydrographic Office	2	2	290	2	n/a	14,724	4,269,960
	SMHI	2	2	78	1	n/a	14,916	1,163,448
	Swedish Fisheries Board	1	1	200	1	n/a	7,458	1,491,600
SE		**10**	**10**	**1,063**	**0**	**0**	**11,1843**	**11,888,983**
	Marine Scotland	2	2	600	0	0	23,529	6,000,000
	CEFAS	1	1	250	0	0	10,000	4,500,000
	NERC	3	3	900	0	0	9281	8,352,900
	Maritime & Coastguard Agency	3	3	570	0	0	10,000	6,000,000
	UKHO/Royal Navy	2	2	250	0	0	20,000	5,000,000
UK		**6**	**6**	**1,670**	**0**	**0**	**9,281**	**23,852,900**
TOTAL		**101**	**71**	**14,347**	**30**	**6,535**	**11,887**	**217.71mill**

The hydrographic offices are important data centres for bathymetry and oceanography data although not all of them have their own research fleets for collecting data. Academic institutes such as universities often use time on vessels free of charge, usually through long term agreements involving the main public marine research institute. Amongst Member States generally, France, Spain, the Netherlands and the UK spend a significant amount on their research fleet (Table 4). The costs of vessels varied significantly between countries and between different institutes (Table 4).

The average national daily rate for deploying research vessels across the community seems relatively consistent at some €8-13,000 per day with a mean of 11,000 (Table 4). Clearly the precise rate will depend upon size and nature of the vessel. Within these national averages there is a good deal of individual variation. The cost per day for IFREMER includes both larger and smaller vessels but since the budget contribution to the smaller vessels is not given separately it has been assumed they are half the cost thus giving a major vessel equivalent. These provide some comparative parameters for future planning estimates. There are, of course, variations especially for the larger vessels. The Rijkswatersaat estimate its ocean going vessels cost around €26,000 per day, whilst the largest of the IFREMER vessels, the 107 m 'Pourquoi Pas?' cost around €40,000per day. The naval minesweepers occasionally providing data to the UKHO are thought to cost €90,000 per day because of their large crews and complexity. In IEO, however, they estimated their largest vessels cost €15,000 per day. More details on the fleet characteristics and costs are presented in the body of the report.

There are also a number of data acquisition relationships with sources that have responsibility for doing other tasks apart from collecting environmental data. It can be extremely difficult to disentangle such costs. For example, the UKHO does not collect data but relies on supply from sources such as port and harbour authorities, other government bodies in the UK, other national hydrographic offices around the world and the commercial sector. Most of these relationships are governed by bilateral arrangements relating to the supply and use of the data. The Hydrographic Services of the Royal Navy (NL) as a department does not directly collect marine data. It receives data from naval vessels whose budget is under a different department. They also receive data from other public organisations and trust funds from within them. These organisations are all publically funded bodies of the government. Two naval survey vessels are used. SHOM (FR) also acquires data from other sources such as foreign hydrographic offices or marine institutions, as does the Swedish Maritime Administration however in their instance it is only a small percentage, they collect >90% themselves. Agreements are established to fix a protocol of data exchange.

2.1.2 Annual expenditure by public bodies satellite imaging

Spending on satellite measurements of seas and oceans are shown in Table 5. They include development, launch and operation of satellites by the European Space Agency (ESA), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and national bodies (CNES, French Space Agency). Each sensor can monitor both land and ocean. The costs were attributed to marine use depending on the use to which the data were put and only the marine component is included in this table. This attribution introduces an error margin of ± 25% (Source European Space Agency; Private Communication). More details on the operation, costs and uses of such data and the organizations are presented in the report.

Some of the key satellites involved in marine observation and oceanographic data collection are Jason, Envisat, SMOS, CloudSat. Some costs for these have been obtained such that: Envisat cost €2 billion includes 10 instruments with 30% marine and, Jason cost €182 million.

There are other elements in the availability of satellite data. *MyOcean* is a network of about 60 European partner organisations with 12 clusters, seven of which work on modelling (6 focused on regional basins and 1 global), five of which operate thematically. Its aim is the implementation (definition, design, development and validation) of an integrated European capacity for monitoring, analysis and prediction of the oceans, bringing together existing national level resources. It uses satellite and in-situ data. It contributes to the marine component of the Global Monitoring for Environment and

Security (GMES) programme. The funding is €20 million per year with €11 million from the EU and €9 from the 60 partner organisations. The budget can be broken down as follows: 75% is spent on monitoring and forecasting, with the modelling centres receiving 50% and the thematic assembly centres receiving 25%. The remaining part of the budget (25%) is spent on innovation, research, communication, organisation and logistical costs associated with the coordination of this network. The data is free.

Table 5 Satellite data spend on marine data

		Estimated Spend (Million €)						
Organisation	**Measurements provided**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
ESA	SST, sea level, ocean colour, ocean currents, sea surface salinity, surface waves, oil pollution, sea ice, icebergs, coastal change, ocean surface winds	200	200	350	350	350	450	350
Eumetsat	SST, sea ice concentration, ocean surface winds	36	30	30	30	30	30	
National (CNES)	sea level	35	35	35	35	35		
	TOTAL	***271***	***265***	***415***	***415***	***415***	***480***	***350***

2.1.3 Income gained from sales of raw marine data and from products derived from the marine data

From five coastal States, the hydrographic offices gain income to varying degrees from the sale of data and data products. **SHOM** receives about €4 million per year revenue from the sale of data products which mostly consist of navigation maps and navigation instruction books. **The Swedish Maritime Agency Hydrographic Office** sells some data to re-invest in the collecting process. About €2.4million is received for data and data products (92% from data products such as charts and maps). One purchaser of the data is the Swedish Defence department, who pay about €0.4 million for data. In addition, about €0.3 million is received for data used within the Swedish Maritime Agency by other branches. **The UKHO** licence the use of value added services under the appropriate UK and EU regulations (e.g. EIR, ROPSI, OPSI IFTS) and sell physical analogue and digital products data. The UKHO have a global turnover of approximately €109 million.

Most public research institutes surveyed during the course of this study however do not gain significant income from selling data. For instance, RWS do not make any money from selling their data and have to make it available free of charge by law to any requesting parties, whether the organisation is commercial or academic. However, these other companies do often use it to generate revenues.

In many cases, when income is received it is considered to be cost-recovery. In Spain, the revenue from sales of data and data products by the IEO were €3500 over two years (2008 and 2009). In Sweden, the SMHI Core Services Department sell some data, as a cost-recovery process. Annual income from data is about 70,000SEK (€6,800) per year and from data products about 200,000SEK being sold on to end users. The price put on data from the core services depends on the type of data as well as the purpose it will be used for. Researchers using data for non-commercial purposes get data for free (or might be charged for delivery), whereas commercial users are charged. The BODC identified that possibly €10,900 out of the €1.64 million would be associated with sales of data. The centre does not produce 'value-added products' as their data is received free from other organisations and it would not be viewed favourably for them to do so. The situation is summarised in Table 6. Some other public research institutes do gain higher amounts of income but it was not always transparent how much was made

Some Public Sector Data Holders such as IFREMER gain income from chartering vessels to other research institutes. Others, such as the IEO or IPEV loan time on their boats to researchers free of charge or at a small charge. The IEO gains approximately €200,000 per year from this activity. In other cases, charges are made for commercial uses of research vessels, for instance TOTAL S.A chartering an IRD vessel. The total from the five coastal States exceeds EUR 3.47 million.

Table 6 Income from data sales from selected Public Sector Data Holders

MS	Organisation	Turnover	Income from Data Sales	% income from data sales to turnover
Spain	IEO		3500/2 years	
Sweden	SMHI	53,500,000	26,200	0.049 %
Sweden	SMA, HO	192,600,000	2,430,000	1.26%
UK	BODC		10,900	

2.1.4 Scaling-up data costs across the Community

A view is provided of the economic basis for comparing data as a public or private good whilst identifying those economic sectors where improved marine data availability is likely to have significant impacts. To address the question as to how much marine data is currently costing across the EU it was necessary scale up the costs to the public sector from the five case studies. Five scaling factors were assessed, GDP, per capita, EEZ or by coastline length. The lowest variance around the mean and ranking against costs was shown by relating spend to GDP which suggests this is probably the best scaling factor. In addition, the use of EEZ presents a number of difficulties since, for example, the Mediterranean countries do not have EEZ as such but only national waters whilst for certain other Member States there is the question of whether to include those entities outside EU home waters. The most extreme example is perhaps France where the EEZ of France (metropole) is 349,000km^2 whilst with France (outre-mer) it becomes 9,877,000km^2. As a multiplier this clearly has an immense, and probably unrealistic, effect on total costs. Other Member States have a similar issue such as Portugal, Denmark and Spain. No doubt the metropolitan state will incur a cost in monitoring these external waters but whether it is at the same unit cost as for home waters, remains to be seen.

A further complication arises with the possibility of using coastline as the scaling factor. Where states have large archipelagos, such as Sweden, Finland or Greece, using coastline as the scaling factor for total costs will introduce considerable distortions.

All of these points contribute to the case that the correlation of rankings of expenditure and GDP are the closest, which is consequently why GDP should be taken the **best estimate of EU-22** public expenditure of **EUR 928.5 million per annum**. This figure must ultimately be seen in relation to the scale of benefits that improved data availability might provide.

Given that the five case studies, which are the basis of this estimate, represent a sample of costs the scaled up total may be something of an underestimate. Equally, however, it is also true that the five coastal States have a disproportionate number of the major vessels (see above) so that, given that these assets contribute a high proportion to the total data collection costs (72%), the case study states may also present a high baseline for the scaling up process.

The fact remains, however, that the important thing as far as EMODNET is concerned is the relative scale of the costs of the various components of the marine data system. These are explored a little further below.

2.2 Costs of Data Users

It was not possible to collect systematic on the private sector since businesses were often quite prepared to discuss their business but not to give figures. However, it is possible to give a qualitative view on the issues.

A selection of public bodies using data for regulatory purposes did respond to the questionnaire and gave estimates of their relative spend on data in terms of searching, procuring and processing. On average such bodies spent around 15% of their turnover on data although this ranged from almost 50% in the case of DRAM a regulatory fisheries body in France to 5% from the South Wales Sea Fisheries Committee in UK. Of the total spent on data by for the largest part, around 61% was spent directly on purchasing and collecting data compared to 22% for searching and 16% for processing.

From a range of private sector institutions including consultancies, IT and oil companies with an aggregate turnover of €513billion, on average they spent 20% of their turnover on data. The highest proportion was Fugro, a data and IT company, at 47% whilst the lowest was Shell oil and gas at less than 0.01%. It was possible to summarise the role of data use in some sectors.

An aggregates company indicated that all of their data is collected by third parties since they don't own their own survey vessels and have little in-house processing capacity. The data is used primarily for development projects, EIAs and prospecting applications.

Consultancy companies do collect data but largely on a project by project basis. Data as such is not sold but is essential for the reports/products they sell. They may collect some of their own data but rarely own survey vessels, which are chartered as needed. The costs of data collection are built into the cost of the project to the client. Whilst a lot of data is free online, the consensus is that a central store for marine data would be very useful. Fisheries groups have most recourse to ICES or GMFC where the data is free.

Port authorities gather data for navigational safety and for dredging purposes to maintain navigable channels. For port expansion terrestrial data is also needed. Some monitoring may be undertaken and data is often stored over time to provide useful repositories.

Wind farms require mainly geological and geotechnical information which is regarded as one of the most expensive types. The data is mainly collected and processed by consultants and the requirements may vary widely from year to year depending upon the project development cycle.

The oil and gas industries also have a great need for geophysical and met-ocean data, also on a variable scale depending upon development plans. Generally, however, it is a small proportion of their turnover. Some environmental and fisheries data can be required for impact assessments and compensation assessments. Much of the data collection and processing is contracted out with only Shell having a dedicated unit. As well as development some monitoring takes place particularly around oil platforms. There is a common industry standard via the Petroleum Data Management Association and data is often exchanged or given free between companies rather than being sold.

A type of company emerged in this study which did not really fit any of the categories specified in the ToR where the main business is data itself. Pre-eminent in this group is the Netherlands Company FUGRO whose aim is 'the provision of advice related to the earth's surface, the seabed and the soil and the rocks beneath'. Fugro are a private company with revenues in 2008 reaching €2.15 billion. Fugro are not a data 'user'; they collect data for others to use. Some 80% of their work is for oil and gas companies. In addition to marine data, they conduct terrestrial survey work; the split between terrestrial and marine data work is approximately 40:60 but ***95***% of the company's work is data collection related. Most of Fugro's data is collected as a requirement for companies who have hired their services including governments. Data is stored on behalf of the companies. Fugro are not the data owners but can be described as the data collectors and managers. To collect raw data Fugro own approximately 55 vessels, 8 autonomous underwater vehicles (AUVs), 125 remote operating vehicles (ROVs), 50 aircraft and 25 jack-up platforms. A further service that Fugro offers is to clear out warehouses and storage facilities of bulky raw datasets. They have the capacity to clean the data sets and make them available again in usable formats and typically through intranet facilities. They work in an advice capacity about whether datasets are worth keeping and cleaning up, and of its potential and actual value. Fugro keep a vast amount of raw data and datasets in warehouses. Fugro have a meta-database with most of the data that they held recorded within it. On occasions they contact companies to advise them that they are holding maybe 4-5 years worth of data for them and ask them what they would like them to do with it now. Often this data will then be discarded at the request of the owner of the data. The role of this company as a source of data is considerable. There are other companies which have a similar data business such as Gardline and, from a more specialised viewpoint, the satellite based company, SPOT, but Fugro is probably preeminent here since it is an expensive market to break into.

Of Fugro's revenue, some EUR 1.5 billion will be from Marine data-related business which, in effect, is largely related to the costs of data use to the oil, gas and other marine infrastructure industries. Taking into account that 5-6 % of the work of SPOT images concerns the marine environment their revenue in this area amounts to about €5,653,380 for marine related products. There are other players in the commercial sector but this indicates that the annual cost to commercial data users clearly exceeds EUR 2 billion per year whilst also representing the revenue of the data gatherers. Since this is based on revenue, this effectively represents the cost to the private sector data users. Assuming a generous margin to the data collector, such as Fugro, which might amount to 20% then the costs of data collection by these private sector organisations could be around EUR 1.6 billion. Vessels are one of the greatest costs. The average cost of private sector vessels, for example, is around EUR 27,700 per day, rather more than those in the public sector.

There are a number of common factors in the way the private sector use marine data. Firstly, most outsource collection and often processing, frequently to specialist companies such as Fugro or consultancy groups. Secondly, most data collection and use is project related and, at the end of the project, it remains in reports, design specifications or impact assessments. It may often effectively be lost. Most of the data is one-off with longer term monitoring exercises being less common so time series data is rare. It is difficult to categorise companies as collectors or users since many effectively do both and some major players are, in effect, data brokers. Such companies can be competitors, contributors or users of EMODNET data. Most had views on the relative value of EMODNET.

2.3 Overview of Costs

Ultimately it is possible to provide an overall picture of the estimated costs of data collection and data use in the public and private sectors (Fig 2). Most of the estimates in Fig 2 are minima but the diagram does give the relative scale of the operations and the relative cost of the public good of data from government institutions and the relative needs of the commercial sector.

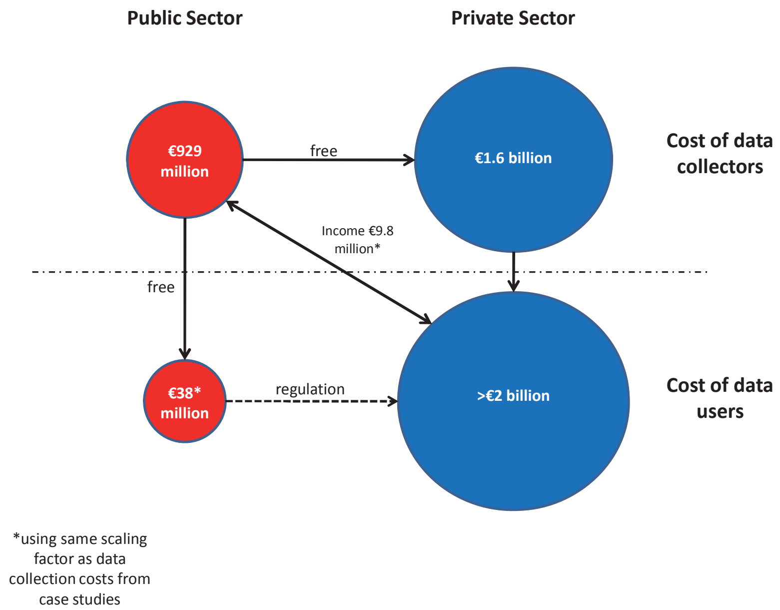

Figure 2 Diagram of relative annual costs and data flows for data collection and usage in public and private sectors

3 The Benefits of Reducing Uncertainty

The reduction in uncertainty, to the greatest extent possible, is obviously a highly desirable improvement. With reduced uncertainty, prudent strategies could be reduced in their extent, with consequent savings in costs. The relation between uncertainty and cost are clear: if uncertainty can be reduced, costs can be brought down. The increased application of data is one way of achieving this – but on what scale?

This study is focused on a case within Global Climate Change. The driving variable is the predicted sea level rise (SLR) in the North Sea. The policy relevance is that some defences must be built, lest the low-lying coastal communities risk being drowned. Yet because of the uncertainty in the scale of the threat, there is great uncertainty in the scale and design of the appropriate response.

The projects whereby adaption to SLR will take place are engineering rather than scientific projects. These will be exceptionally large in scope, long in duration, complex in execution, and beset by unprecedented uncertainties. In its management of uncertainties, engineering shows its difference from science. The leading criterion for success in civil engineering is to be robust rather than precise; and this applies to uncertainty as to other aspects of design and performance. With regard to estimating the cost of adapting to climate change two main approaches have been adopted. These are based on the best scientific data, e.g. Richards and Nicholls (2009) and the more pragmatic estimates based on present and planned engineering costs, e.g. Policy Research Corporation (2009)[5].

It has been estimated that close to 85% of all expenditure on coastal protection between 1998-2015 is or will be spent by 5 Member States, the Netherlands, UK, Germany, Spain and Italy. It is intended to draw case studies from these countries, focussing particularly upon the Netherlands and UK which have conducted careful studies regarding adaptation.

These national projects as can be represented as ‘engineering in uncertainty’, with their characteristic styles of management of uncertainty within the engineering approach. A further view on locations of special risk is provided by a look at Italy and Venice in particular. In terms of specific benefits from engineering uncertainty the question is raised as to how much funding would be saved if the difference between maximum and minimum level of sea-level rise by 2040 assumed in sea-level defence calculations could be reduced by 50%, 40%, 30%, 20% or 10%?

The costs of adaptation to climate change have been estimated under a maximum and minimum scenario, i.e. where SLR is 50.8cm or 22.6cm, by Richards and Nichols (2009) during the PESETA study. A simplifying conceptual model was developed based on the key assumption that zero reduction in uncertainty corresponds to the upper limit of SLR (i.e. the ‘worst case’ requiring total precaution in design and investment) while 100% reduction in uncertainty corresponds to the adaptation cost of the lower limit of SLR. For mathematical simplicity it is also assumed that the saving is proportional to the reduction in uncertainty brought about through improved application of data. This model was applied to the UK and Netherlands cases based on the estimated annual costs for their adaptation. This is shown for the Netherlands in Figure 3.

The quid pro quo is that it costs more to obtain the data to achieve decreased uncertainty but that this results in the magnitude of savings demonstrated by the model. To estimate the order of magnitude of savings that can be obtained across the Community, the cost of adaptation across the Community is given as €488.3 mill per ann. at lowest SLR and 853.9 mill per ann. at highest estimate (Richards and Nichols 2009). Applying the above logic provides an estimated annual savings of:

- € 92 mill at 25% reduction in uncertainty;
- € 183 mill at 50% reduction;
- € 275 mill at 75% reduction;
- € 366 mill savings at near complete reduction.

[5] Policy Research Corporation (in association with MRAG) (2009), the economics of climate change adaptation in coastal areas, for the attention of European Commission, Directorate-General for Maritime Affairs and Fisheries.

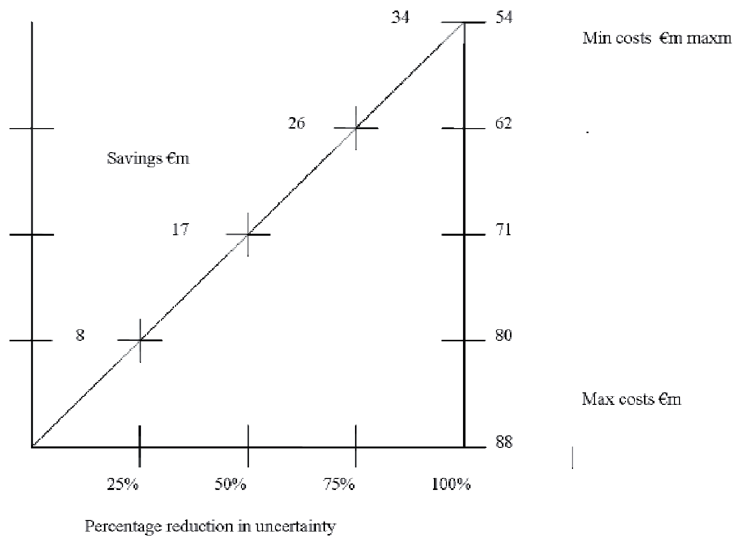

Figure 3 Benefits of Reducing Uncertainty in Sea Level Rise under max: Annual Savings- The Netherlands. Estimated maximum and minimum costs of adaptation at 50.6 and 22cm SLR are shown on the right-hand axis.

A further feature is that assuming proportionality with the highest annual cost of adaptation being for the UK, followed by France, Germany, the Netherlands and Denmark these are the places where savings could be the greatest. It is also the case that the costs estimated by Richards and Nichols (2009) were only based on some infrastructure aspects of coastal protection such as beach nourishment and dyke heights.

The total saving across the community on the limited adaptation measures assumed in the estimates would be €365.6 million against a total maximum possible spend of €853.9 million per annum that is the total savings of eliminating uncertainty could be 43% of a major infrastructure programme. It is, however, unlikely that uncertainty can be completely eliminated but if it could be reduced by half then savings on infrastructure programmes could be of the order of 20%. It is this relative savings from the reduction of uncertainty that indicates the real value-added of improved data availability.

4 Legal aspects of EMODNET

An analysis of the appropriate legal basis for EMODNET, in terms of the Treaty of Rome (as amended) as well as the Treaty of Lisbon, which will enter into force on 1 December 2009, is called for because unlike certain other policy sectors, such as agriculture and transport, the EU's Maritime Policy has no explicit legal basis in the Treaty. Consequently the implementation of different elements EMODNET may require reliance on specific Treaty provisions that most closely relate to the proposed policy initiative.

The purpose of EMODNET is to improve and streamline the access to high quality marine data, as well as to improve the usefulness of marine observations and the resulting marine data collected and held by European public and private bodies to European users for scientific, regulatory and commercial purposes, regardless of where that data has been collected from. EMODNET should ensure that data is compiled in a comprehensive and harmonized system, and made accessible as a support tool for better governance, expansion of value-added services and sustainable maritime development.

The specific policy background and principles for EMODNET, including the EMODNET Roadmap, suggest that EMODNET should be seen as both: (a) a tool for improving interoperability and better access to marine data; and (b) a source of both raw and processed marine data that can serve multiple purposes and benefit to multiple actors. As such, it will gradually replace the current fragmented data collection infrastructure by building on the existing infrastructure of national marine data centres.

EMODNET closely interacts (or partly overlaps) with a number of other initiatives involving the collection, sharing and use of marine data. For some of these initiatives, legislative action has meanwhile been undertaken by the Community; other initiatives are still under construction.

The most relevant include: **Global Monitoring for Environment and Security (GMES)** which seeks to provide services in support of the EU environment and security policies as well as meeting the needs of other users including national authorities and agencies, researchers, private companies and citizens and in respect of which a draft regulation has been prepared; **Shared Environmental Information System (SEIS)** which is a collaborative initiative of the Commission and the European Environment Agency to establish, together with the Member States, an integrated and shared EU-wide environmental information system in respect of which EMODNET will be seen as a thematic contribution; the **Marine Strategy Framework Directive (MSFD)** which is seen as the 'environmental pillar' of the EU's integrated maritime policy and which requires the Member States to develop strategies for their marine waters in order to achieve '*good environmental status*' of these waters by 2021; **Infrastructure for Spatial Information in the European Community (INSPIRE)** which is based on similar principles to SEIS) and obliges Member States to adopt measures for the sharing of spatial data sets and services between its public authorities and, to a certain extent, with the public; the **Environmental Information Directive** the objective of which is to guarantee the right of access to environmental information (including marine data) held by or for public authorities and to set out the basic terms and conditions of, and practical arrangements for, the exercise of this right of access; the **European Environment Information and Observation Network (EIONET)** which is a data network that aims to provide timely and quality-assured data, for the purpose of assessing the state of the environment in Europe and the pressures acting upon it; the **European Research Area (ERA)** which encompasses three inter-related aspects: (i) a European internal market for research, where researchers, technology and knowledge can freely circulate, (ii) effective European-level coordination of national and regional research activities, programmes and policies, and (iii) initiatives implemented and funded at European level; the **Common Fisheries Policy Data Collection Regulation** with establishes a number of data collection obligations relating to the Common Fisheries Policy that *inter alia* permit an assessment of fisheries impacts on marine ecosystems; and the **IDABC Project** which aims at the development and establishment of pan-European Government Services and the underlying interoperable telematic networks supporting the Member States and the Community in the implementation of Community policies and activities, achieving substantial benefits for public administrations, businesses and citizens.

The legal right of the Community to act with regard the establishment of EMODNET will depend on the scope of the powers conferred upon it by the Treaty. The relevant Treaty provision will define the scope of the institution's material competence, the instrument adequate to exercise the competence and the relevant decision-making procedure.

According to settled case-law, the choice of legal basis for a measure must be based on objective factors which are amenable to judicial review. These include in particular the aim and the content of the measure. The legal basis for an act must be determined having regard to its own aim and content and not to the legal basis used for the adoption of other Community measures which might, in certain cases, display similar characteristics. Further, the wording of the title of a measure cannot by itself determine its legal basis but rather according to its aim and content as they appear from its actual wording.

While measures can have a dual legal basis, the threshold for deeming a measure to have a dual legal basis is quite high. The fact that a certain measure will produce benefits to a Community objective is not sufficient to establish the relevance of that objective as a legal basis Nevertheless, it is settled case-law that when a measure simultaneously pursues a number of objectives or has several components that are indissociably linked, without one being secondary and indirect in relation to the other, such an act will have to be founded on the various corresponding legal bases.

An error as to the legal basis will not affect the validity of the act in question where the Member State or Community institution affected enjoyed all of the procedural guarantees which may have been applicable and the error did not have an effect on their legal position.

The exercise of Community powers must be based on a number of important principles. These include: (a) Subsidiarity, meaning that the Community should act only if the proposed objective cannot be sufficiently achieved by the Member States and can be better achieved by the Community; (b) Proportionality, which restricts the authorities in the exercise of their powers by requiring a balance to be struck between the means used and the intended aim (or result reached) and (c) the Approximation of laws, whereby measures are to be adopted with the aim of progressively establishing the internal market.

Moreover, the Community is also charged with implementing certain policies outlined in Article 3 of the EC Treaty which include the creation of Trans-European Networks (Articles 154-156 EC Treaty); fostering EU Industry (Article 157 EC Treaty); promoting Research and Technological Development (Articles 163-166 EC Treaty); and protecting the Environment (Articles 174-176 EC Treaty). Finally, Article 308 of the EC Treaty provides that 'if action by the Community should prove necessary to attain, in the course of the operation of the common market, one of the objectives of the Community, and this Treaty has not provided the necessary powers, the Council shall, acting unanimously on a proposal from the Commission and after consulting the European Parliament, take the appropriate measures'. This provision concerns the powers not explicitly (or implicitly) granted to the Community. Consequently, Community competence is not divided according to subject-matter, but 'functionally' limited to what is required by the objectives and tasks of the Community.

Article 249 of the EC Treaty specifies the instruments that Community institutions can deploy in order to carry out their tasks. The type of instrument selected will depend *inter alia* on whether or not it is intended to establish binding or mandatory rules. They include: (a) **Regulations** which are of general application, and which are binding in their entirety and directly applicable in all Member States; (b) **Directives** which are addressed to the Member States and are binding as to the result to be achieved while leaving to the national authorities the choice of form and methods; (c) **Decisions,** which are binding in their entirety upon those to whom they are addressed; (d) '***Sui Generis'* decisions** which are far more general and are often adopted by institutions which intend to adopt a binding act; and finally (e) **Recommendations** and **Opinions** which have no binding force and are generally adopted by the institutions of the Community when they do not have the power under the Treaty to adopt binding measures or when such measures are not considered appropriate.

As already noted, the EU's Integrated Maritime Policy has, as such, no explicit legal basis in the Treaty, but at the same time covers many different policy areas where the Community has received explicit powers to act (fisheries, environment, transport, research and technological development, enterprise and industry, etc.).

EMODNET has an 'operational' objective as well as a 'policy' objective. The 'operational' objective could be described as the establishment of a 'network', i.e. an integrated marine data infrastructure which allows a pan-European analysis of different types of marine data and meta-data from various (currently fragmented) sources and which contributes to the improvement of systematic observation, interoperability, access to and dissemination of marine data (based on robust, open and generic ICT solutions).

The 'policy' objective of EMODNET lies in the fact that the 'network' is to be seen as a tool for better governance, policy-making, expansion of value-added services, scientific research in the marine and maritime area and attaining good environmental status and sustainable maritime development.

In terms of existing policy areas, while EMODNET will contribute to the **Common Fisheries Policy** (CFP) it seems questionable that the CFP could provide for an appropriate legal basis for EMODNET as the EMODNET initiative is, as such, not aimed at attaining the CFP's objectives and its primary focus is not on the collection or processing of fisheries data as such, but on marine environmental data. While one of the 'general objectives' of EMODNET is to support the common **transport** policy, it seems questionable that Article 80 (2) of the EC Treaty could provide an appropriate legal basis for EMODNET as the EMODNET initiative is, as such, not specifically aimed at attaining the objectives of the common transport policy, as laid down in Title V of the EC Treaty. Similarly, while EMODNET intends to provide a marine knowledge infrastructure that can contribute to the development of value-added products and services and help private industry to compete in a global economy, its objective is broader than serving **industry** and in any event 157 (3) of the EC Treaty only grants powers to the Community to take industry-related measures 'in support of action taken in the Member States'.

As regards the Community's **environment policy**, regulated by Article 3 (1) of the EC Treaty, while EMODNET is explicitly seen as a thematic contribution to SEIS and as closely interacting with the MSFD the purpose and mission of EMODNET is not solely environmental, and it does not fall squarely into the definition of the Community objectives as set out in Article 174 (1) of the EC Treaty. It is as such not an environmental protection, conservation or restoration measure. While the promotion of **research and technological development (RTD)** is laid down by Article 3 (1) of the EC Treaty as one of the activities of the Community, although EMODNET is explicitly incorporated in the Strategy for Marine and Maritime Research as a tool to support marine scientific research, and it is clear that the scientific research community will be able to benefit from EMODNET, EMODNET is as such not an RTD project, and it does not specifically serve the objectives of the Community policy on RTD laid down in the Treaty.

Finally, Article 154 of the EC Treaty calls on the Community to contribute to the establishment and development of **Trans-European networks (TENs)** in the areas of transport, telecommunications and energy infrastructures. Article 155 goes on to require the Community to (1) establish a series of guidelines concerning the objectives, priorities and broad lines of measures envisaged in the sphere of TENs; (2) to implement any measures that may prove necessary to ensure the interoperability of the networks, in particular in the field of technical standardization; and (3) to support projects of common interest supported by Member States.

Article 156 of the EC Treaty can therefore serve as a legal basis for measures implementing TENs, in accordance with the co-decision procedure referred to in Article 251 of the EC Treaty. There is direct precedent for the fact that, where the aim of the measure has been to ensure the interoperability of national networks by means of operational measures of a technical nature, Article 156 of the EC Treaty was an appropriate legal basis.

Arguments that Article 155 of the EC Treaty requires that guidelines be established prior to the implementation of any measure have been rejected by the European Court of Justice meaning that second indent of Article 155 of the EC Treaty can be seen as a stand-alone legal basis for measures that are 'necessary to ensure the interoperability of the networks'.

On the basis that EMODNET will be designed as a 'network' (i.e. a distributed telematic network underpinning marine data services), and will in essence be a tool to facilitate the interconnection and interoperability of national networks (and the services which make use of them) across Europe, the Treaty provisions on TENs may seem an appropriate legal basis for the establishment of EMODNET. However, it should be noted that EMODNET's objectives go beyond the purely 'technical' or 'operational' aspect of setting up an interoperable data transmission network or connecting existing communication networks. EMODNET clearly has a number of specific 'policy' objectives. Further, EMODNET aims to provide continuous availability of and access to marine data, and in its capacity as a data warehouse, could be seen to go beyond the establishment of the network as such.

In conclusion, with regard to the choice of legal instrument for the establishment of EMODNET, it is to be taken into consideration that Regulations and '*Sui Generis*' Decisions are instruments of general application that are binding and directly applicable in all Member States. As the EMODNET legal act may need to define the roles and responsibilities of the Member States in the network, such type of instrument may be suitable to achieve the desired objectives of EMODNET.

A Directive may be a useful instrument in so far as the Community's action on EMODNET would require national rules to be amended or added to in order to achieve the intended result.

A Recommendation on EMODNET would have no binding force. It could be envisaged if the Community would consider it not appropriate to adopt mandatory rules in relation to this particular component of the EU's maritime policy.

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