Towards Better Governance of the Channel Ecosystem

ENGLISH **Edition 2014**

Promoting Effective Governance of the Channel Ecosystem

Promouvoir une gouvernance efficace de l'écosystème de la Manche

france (manche channel) england interreg

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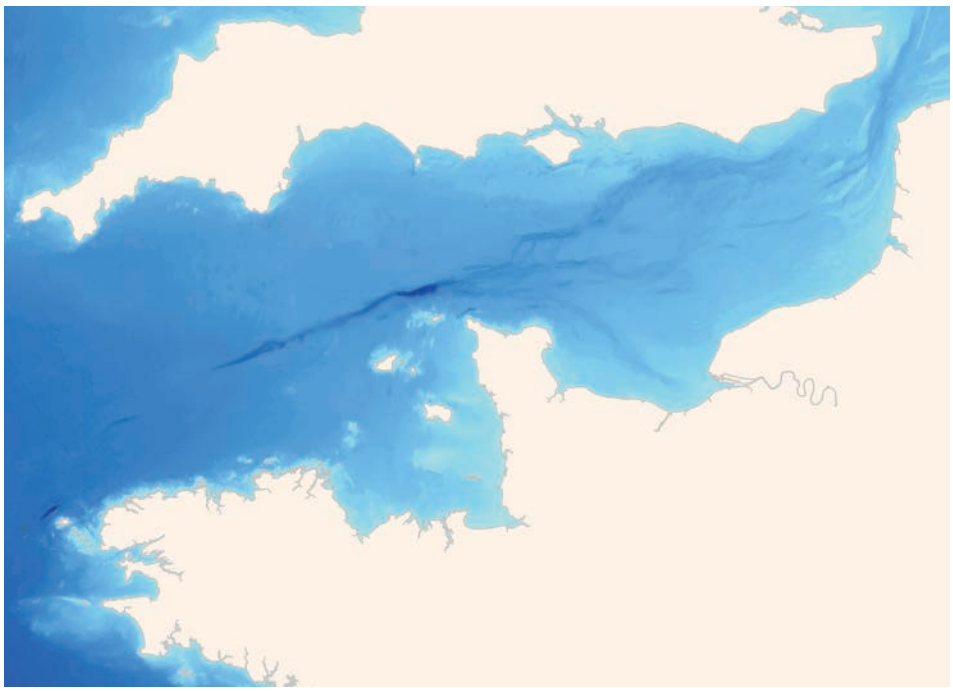


Sources : IFREMER – GEBCO – SHOM – IGN – EEA – AAMP

CHANNEL REGION CONTEXT

The Channel is an area requiring complex management due to the diversity of marine ecosystems and the human activities that occur within it. It is one of the most intensively used maritime basins in the world. Some of the activities taking place in the region include transport, marine renewable energies, fisheries, aggregate extraction and tourism, many of which depend on the economic, ecological and social resources available in the Channel region. Forecasts[1] suggest this use will increase due to the growth in existing activities and development of new uses; putting further pressure on the region, its environment and ecosystems.

The governance of the Channel region is complex since it has to take into account local, European and international policies and agreements. A range of new maritime and coastal policies and legislation have been introduced over the last 20 years in order to address the challenges facing the marine environment, and maximise opportunities. In this developing landscape, the fundamental role of cross-sector working and integrated approaches are key to successful marine management.

Supporting governance and cooperation at the scale of the Channel is therefore necessary to meet the specific needs of this region. The Channel area is a 'connector' linking two major seas and connecting communities and land uses. This leads to two reasons for cooperation: the implementation of joint actions at the Channel scale, whereby the Channel is recognised as a single region; and also to exchange experiences of communities within the Channel region impacted by similar opportunities or threats. The Interreg IVA France (Channel) - England cross-border cooperation programme demonstrated the value of cooperation between both sides of the Channel Sea. Over a hundred Franco-British projects were supported by the programme enhancing cooperation across a wide range of sectors and activities including fish stock assessments, marine renewable energies, marine protected areas and technological developments.

1 CAMIS (2013). Integrated Maritime Strategy for the Channel Region: A Plan for Action. Available at: https://camis.arcmanche.eu/stock/files/user4/13_247_Camis_doc_strategie_maritime_UK_BD_1.pdf

THE PEGASEAS PROJECT - Promoting Effective Governance of the Channel Ecosystem

The PEGASEAS project is funded through the Interreg IV A programme (France (Manche) - England) and aims to promote the effective governance of the Channel marine ecosystem through the identification and capitalisation[2] of key lessons drawn from the programme.

This project, between France and the United Kingdom, is based on an analysis of a cluster of the following Interreg IV A projects: CAMIS, ChanneLIS, CHARM 3, CRESH, LiCCo, Marinexus, MERiFIC, OFELIA, PANACHE, SETARMS and VALMER.

The results of PEGASEAS will:
- Offer new insights into effective Channel Governance,
- Provide clear, powerful, communicable and coherent advice targeted to marine governance practitioners and policy-makers,
- Communicate and share experiences and practices,
- Provide an input to discussions regarding potential actions to be supported during the Interreg V programming period (2014-2020).

PEGASEAS will tailor its findings to align with current and forthcoming marine policy and law to facilitate their integration into governance practice. The deliverables will feed directly into enhanced policy or practice and therefore seek to generate and demonstrate impact on the governance of the Channel.

Further information **www.pegaseas.eu**

Veules-les-Roses, Upper Normandy (© Pauline Blumerel)

La Cité de la Mer à Cherbourg (© Norbert Girard / La Cité de la Mer)

Brittany Ferries MV Armorique in Roscoff Ferry Port (© Wilfried Thomas / Station Biologique de Roscoff)

Cuttlefish (© Jean-Paul Robin / La Cité de la Mer)

2 Capitalisation is an approach that focuses on collecting, analysing and disseminating the thematic knowledge which can be gained by examining projects related to the same topic

Edited by Laëtitia Petit (Agence des aires marines protégées) and Angela Carpenter (Plymouth University)

THE CLUSTER

CAMIS – *Channel Arc Manche Integrated Strategy [2009/2013]*
The aim of CAMIS was to develop an integrated maritime strategy for the Channel area as well as a range of tools to promote Franco-British cooperation in governance, the maritime economy, transport, maritime safety and knowledge of the Channel area. Over a period of four years, CAMIS brought together 19 partner organisations, while involving hundreds of stakeholders in the Channel area in its work. http://camis.arcmanche.eu

ChanneLIS – *Channel Library and Information Services [2011/2015]*
The project will bring closer together library resources on both sides of the Channel. Working together, the National Marine Biological Library at the Marine Biological Association of the UK in Plymouth and the library of the Station Biologique de Roscoff in France will create a shared database of their holdings of material relevant to the scientific study of the Channel. The project will especially aim to catalogue the libraries' holdings of grey literature in order to raise awareness of and facilitate access to these sorts of documents. This database will be made available on-line from early 2015. www.channelis.eu/

CHARM 3 – *Channel integrated Approach for marine Resource Management [2008/2012]*
The CHARM 3 project provided a multidisciplinary integrated approach that offers decision makers a status report of the English Channel ecosystem and a range of tools based on scientific knowledge for the sustainable management of living marine resources. CHARM 3 provided a coherent synthesis of (i) political orientations defined within a multilateral framework, (ii) research outputs from the international scientific community and (iii) a range of operational tools for the sustainable and fair exploitation of marine resources. www.charm-project.org/en

CRESH – *Cephalopod Recruitment from English Channel Spawning Habitats [2009/2012]*
The project increased the knowledge on the cephalopods (squids and cuttlefish), residing in the Channel and which are important resources for fisheries. It reports data on (i) their natural habitats with detailed studies at spawning sites, (ii) their environmental preferences in the egg and juvenile stages, (iii) their migrations, and (iv) their stock status and exploitation rate. The research undertaken on both sides of the Channel was mostly disseminated through meetings with stakeholders and local authorities and scientific publications. http://www.unicaen.fr/ufr/ibfa/cresh/

LiCCo – *Living with a Changing Coast [2011/2014]*
The LiCCo project covers seven sites in England and France. It aims to help coastal communities to better understand and prepare for the impacts of climate change, including sea level rise and coastline erosion. It will also raise awareness to the impacts of a changing coast within the different communities. www.licco.eu/

Marinexus – *Mechanisms of Change in the English Channel [2010/2014]*
The project, between France and the UK, aimed to raise awareness of the adverse effects of human activity on marine ecosystems and to encourage the sustainable development in the Channel area. The principal objective of this project was to create a cross-channel network of research structures working on the changes related to human activity within coastal and open water ecosystems in the western Channel. It also disseminated its results to the general public and schoolchildren, but also stakeholders, local authorities and charities. www.marinexus.org/

MERiFIC – *Marine Energy in Far Peripheral and Island Communities [2009/2014]*
The project seeks to advance the adoption of marine energy across the two regions of Cornwall and Finistère and the island communities of le Parc Naturel Marin d'Iroise and the Isles of Scilly. The project will work to identify the specific opportunities and issues faced by peripheral and island communities in exploiting marine renewable energy resources with the aim of developing tool kits and resources for use by other similar communities. www.merific.eu

OFELIA – *Offshore Foundations Environmental Impact Assessment [2013/2015]*
The aim of the project is to establish cross-channel collaboration, in order to improve our understanding of the environmental impacts of offshore wind farm foundations. The partners will work closely together to identify conditions and problems at existing sites, and risk scenarios for future developments; to determine relevant parameters to be introduced into regional models and assess the model improvements. http://www.interreg-ofelia.eu/

PANACHE – *Protected Area Network Across the Channel Ecosystem [2012/2015]*
This project between France and the UK aims at a better protection of the Channel marine environment through the networking of existing marine protected areas. The objectives are to assess the existing marine protected areas network for its ecological coherence; to mutualise knowledge on monitoring techniques, share positive experiences; to build greater coherence and foster dialogue for a better management of marine protected areas; to increase general awareness of marine protected areas; to develop a public GIS database. www.panache.eu.com

SETARMS – *Sustainable Environmental Treatment and Reuse of Marine Sediment [2010/2014]*
The project aimed to find sustainable economic and environmental solutions to dredged sediment management. SETARMS brought together 12 partners organisations to work jointly for the economic development of Channel sea ports by developing sustainable management practices for marine sediment. They have considered economic, environmental, social and regulatory aspects. www.setarms.org/en/

VALMER – *Valuing Marine Ecosystem Services in the Western Channel Region [2012/2015]*
VALMER is a Franco-British cooperation project that brings together research institutes, local authorities and stakeholders to explore the use of ecosystem service valuation for the management and planning of the Western Channel marine area. One of the main objectives of this project is to develop a framework for valuing ecosystem services and to apply this to a number of case study areas in France and the UK. www.valmer.eu

CONTENTS

Goury, Lower Normandy (©CRT Normandie)

ABOUT THE COMPENDIUM

The objective of the compendium is to communicate the analysis undertaken by the PEGASEAS project to identify key lessons related to the improvement of sustainable marine governance of the Channel ecosystem. Those lessons which can be disseminated more widely.

Key lessons were collected through the completion of a matrix which provided means of extracting and analysing cross-cutting factors supporting effective Channel governance in order to produce the reports compiled here under the following six themes:

- Marine Ecosystems Dynamics and Management
- Management and Use of Information and Data
- Pressure and Activity on the Marine Environment
- Governance at Multiple Scales in the Channel
- Partnerships
- Communication and Stakeholder Involvement

For each of these themes, questions were defined and refined through meetings. The reports contained in this compendium present the results of the collection and analysis of information from a range of projects, including a number outside the PEGASEAS cluster (see acknowledgements).

KEY MESSAGES

The analysis of the projects within the PEGASEAS cluster produced a number of key messages to support effective marine governance, both at a cross-Channel level and more broadly within the EU and thus their wider dissemination will enable the Channel community to capitalise on the success of Interreg IVA.

MARINE ECOSYSTEMS DYNAMICS AND MANAGEMENT

- An in depth understanding of changes and trends in the marine environment is required. Consequently its effective management needs long term monitoring to determine long term changes and provide a basis for evidence-based marine governance.
- Linkages between marine and coastal ecosystem processes, functions, ecosystem services remain poorly understood and should be a key focus for future research effort.
- Knowledge based tools such as Ecosystem Services Assessment and scenario building exercises, involving stakeholders, have been shown to be able to support effective decision making.
- Specific research gaps have been identified for marine litter and for underwater noise and electromagnetic fields; in particular there is a need to develop indicators for these features.
- It is important that there are effective methods of compiling data which enables the information to be available to all.

MANAGEMENT AND USE OF INFORMATION AND DATA

- Collecting and sharing data on a cross-border scale has many challenges, including geographic gaps and unrepresentative data, language barriers and discrepancies between the methodological and technical terms used.
- Best practices, such as shared databases, catalogues of databases, and crowd-sourcing activities, should be developed and further shared.
- Efforts should be made to ensure that data gained through European projects are readily accessible and interoperable, in accordance with the INSPIRE Directive.
- Interreg programmes should ensure the long term sustainability of information and data tools developed within projects.
- Further efforts are needed to improve awareness of information and data tools to support effective governance of the Channel.

PRESSURE AND ACTIVITY ON THE MARINE ENVIRONMENT

Pressures affecting marine ecosystems should be carefully considered within decision-making processes therefore, a coordinated effort involving close monitoring and information transfer across the Channel should address environmental quality issues by:

- Developing common, repeatable methodologies and adopting best practice protocols to assess human impacts and the benefits of marine protected areas;
- Identifying ways to minimize negative environmental impacts of marine renewable energy developments, dredging, marine litter and invasive species;
- Informing the management of commercial fishing activities through mapping the location and intensity of fishing activities.

These efforts can be supported by adopting integrated marine and coastal governance approaches and by:

- Promoting stakeholders to work together to identify the best management options to deal with human impacts and minimise the threat to marine ecosystems at risk, at the regional level in France and the UK, and also across the Channel;
- Providing decision-makers with information to understand the risks and benefits of different activities in the Channel;
- Supporting improved and collaborative marine planning and risk assessment by local, regional and Channel scale stakeholders;
- Integrating environmental, social and economic assessments of human activities in management processes.

GOVERNANCE AT MULTIPLE SCALES IN THE CHANNEL

- Overcoming barriers and obstacles to effective Channel scale governance requires the implementation of cross-sectoral, multi-disciplinary and integrated approaches.
- The implementation of decision-making tools, such as Ecosystem Service Assessment and valuation, should be based on long term considerations relevant to marine ecosystems.
- In order to improve communication and awareness within the marine stakeholder community a mutual understanding of policies, information and data, and vocabulary should be fostered.
- Mechanisms for co-operation and co-ordination between French and British competent authorities should be improved to enable consistent implementation of regulatory measures to ensure coherent Channel governance.

PARTNERSHIPS

- Integrated partnerships have proven effective at incorporating different interests and expertise to achieve the goal of improved marine governance.
- Bringing together research and managers through partnerships should become more important in the future in order to support involvement and collaboration among a wide range of stakeholders.
- The projects have provided valuable opportunities to address marine governance challenges in the Channel area and have supported the development of new partnerships.

COMMUNICATION AND STAKEHOLDER INVOLVEMENT

- Projects have typically targeted policy-makers and government agencies, industry, science community and NGOs as audiences for communication however there is opportunity to enhance this with the general public and schools in order to broaden involvement with marine governance.
- The effectiveness of communication efforts needs to be evaluated in order to identify those with longevity and suitability to marine governance.
- Effective communication to the public is necessary to garner support for improved governance.
- Stakeholder workshops and interviews are an effective approach to communication to underpin effective marine governance.
- With the growth of new technologies to access information, it is likely that video and multimedia platforms are used to disseminate information to a wide audience.

MARINE ECOSYSTEMS DYNAMICS AND MANAGEMENT

01 Integration and sharing of data on marine ecosystems.

02 Supporting Marine Strategy Framework Directive indicator development.

03 The role of long term monitoring in short term policies.

04 Marine ecosystems knowledge to support an ecosystem-based management approach.

01

Integration and sharing of data on marine ecosystems.

ABSTRACT

Integration and data sharing on marine ecosystem constitute two major contributors to ecosystem management. In this report, we present the different methods that have been used to integrate and share data in the context of Interreg IVA France (Channel) – England projects. Identification of limits and barriers encountered within these projects may help to improve our capacity to lead future projects, notably those involved in marine ecosystem management.

KEY WORDS

ACCESSIBILITY
DATA SHARING
QUALITY OF WORK
REPORTS
WEBSITES

DESCRIPTION OF KEY FINDINGS

Data integration - i.e. how databases are stored

Within Interreg IVA projects such as CAMIS, ChanneLIS, CHARM 3, CRESH, LiCCo, Marinexus, MERiFIC, OFELIA, PANACHE, SETARMS and VALMER, marine ecosystem data were mostly obtained by:

- consultation of pre-existing documents (e.g. legislation, reports, datasets, models outputs, etc.)
- *in situ* samplings (e.g. scientific survey campaigns on a boat in the CHARM 3 project or monitoring techniques using FerryBox, cross-channel transects, Continuous Plankton Recorder, fixed stations within the Marinexus project, seabed towed video , marine birds studies and multi-beam sonar as in PANACHE project)
- molecular studies (e.g., barcoding within Marinexus)
- model outputs (e.g. MARXAN model in PANACHE project)
- satellite imagery.
- direct requests to experts.

In developing the outputs/deliverables within Interreg IVA projects, various methods were used in order to integrate marine ecosystem data. The vast majority of outputs/deliverables were logically integrated within technical or scientific reports (see Figure 1), as these were a required deliverable of the Interreg projects. Other

integration methods were used including: databases, meetings (oral presentation/ posters), maps, scientific journals papers, conference abstracts, mathematical models, technical reports, web atlas, workshops, websites, etc., however this was to a lesser extent when compared to the examination of the reports (see figure 1).

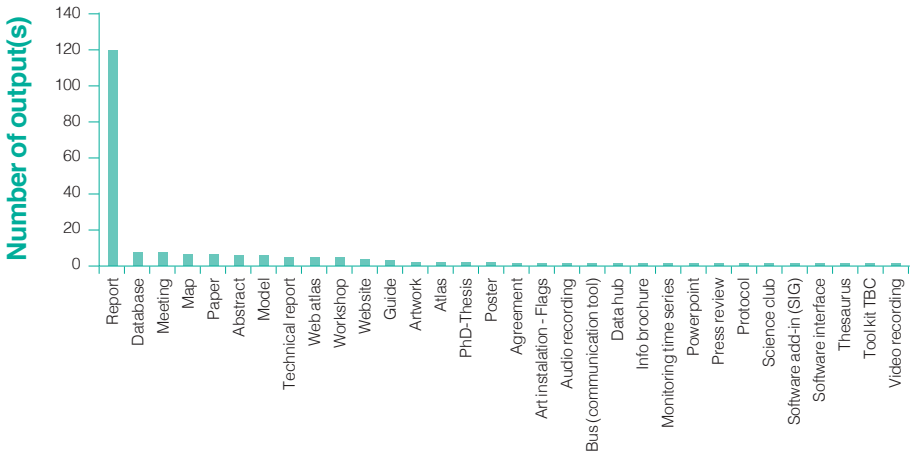


Figure 1. The use of different integration methods within the overall outputs of Interreg IVA projects (across the six PEGASEAS themes).

Data sharing

Methods

Within Interreg IVA projects, raw marine ecosystem data has been shared between partners by email, and are usually not made public.

Unlike raw data, outputs/deliverables of Interreg IVA projects have been made available to the public. For example, the CHARM 3 project provided several maps of species distribution available in the French data infrastructure for marine environment 'SEXTANT'[1]. In addition, several websites have been created in order to facilitate data and information sharing (e.g. CHARM 3[2], PANACHE[3] and Marinexus[4]). Another sharing method was the CHARM 2 Atlas[5]. It was designed in order to (i) integrate diverse marine environment and biological data on habitats, important species and marine living resources in the Eastern Channel, (ii) develop tools to aid decision-making and marine environmental planning, (iii) evaluate and compare cross-border policies and legal frameworks for marine resource management, and (iv) disseminate the Atlas-based information to increase public awareness.

Limits/barriers

Within Interreg IVA projects, raw data have not been made public. Despite the INSPIRE Directive[6], this is a common situation in the domain of information control and knowledge management, intellectual property, data ownership, sensitive data (exploited or threatened species), etc. As such, data integration/sharing is often limited with scientific and industrial sectors becoming increasingly competitive. In fact, nowadays, scientific and industrial sectors are highly competitive. The control of information is therefore important for scientific, industrial or cultural notoriety of the various institutions (universities, research institutes and other organisations involved in research and innovation). Confidentiality and copyright is an essential component of the protection of knowledge: it is the only way to protect know-how and patentable inventions. Due to the enforcement of data systems property, data integration becomes limited and therefore slows down the progress of numerous domains, for example science and governance.

Limited data sharing will inevitably reduce the homogeneity of systems used by partners and therefore multiplies efforts and costs. This strategy forces each user to find the information he/she needs by himself/herself, for example by consulting institutions belonging to other networks than the working group itself. This could

1 CHARM 2 and 3 (undated). *Metadata catalog of spatial data sets.* Available at: http://www.ifremer.fr/sextant/fr/web/charm/geocatalogue

2 CHARM – see: http://www.charm-project.org/fr/

3 PANACHE – see: http://www.panache.eu.com

4 Marinexus – see: http://www.marinexus.org/?lang=fr

5 CHARM 2 (2009): Channel Habitat Atlas for Marine Resource Management. Available at: http://archimer.ifremer.fr/doc/2009/rapport-7377.pdf

6 European Commission (2007). *Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).* More information available at: http://inspire.ec.europa.eu/

lead to several biases (e.g., two individuals working on the same theme in a given ecosystem may have different datasets such as, for example different sea surface temperature data extracted from model outputs and satellites). In this example, when data are inaccessible to external institutions (e.g. for physico-chemical parameters), lack of data sharing can then generate differences in the results of scientific studies.

Despite data becoming increasingly reliable, scientists may often spend time checking its reliability due to this wide range of data sources. In that case, the risk is the collection and focus on poor quality data which may generate wrong conclusions. Several project leaders and partners agreed that it would be useful if future project funders will need to make database completion mandatory and in a compatible format (standard). This could become a mandatory deliverable for future projects. Several national and international databases already exist and are particularly efficient (e.g. landings data by the International Council for the Exploration of the Sea).

In contrast to raw data, outputs/deliverables within Interreg IVA projects were accessible (to citizens, scientists, stakeholders, etc.). Nevertheless, only 40% of these outputs were directly accessible (e.g. direct access to a given website, report, etc.) and this implies that a request for desired information needs to be sent to specific persons, especially for reports. The difficulty of data access is accentuated by the fact that it is sometimes problematic to identify which person must be contacted to collect information (or data). This means that stakeholders such as professional organisations, businesses, associations, consultancies and also citizens do not have easy access to project deliverables although technically they are publicly accessible. It may therefore, be worth recommending the inclusion of contact details from which to obtain data as a standard.

Another barrier has been identified by project leaders: data sharing by using websites presents the constraint that they must be regularly updated. The persons involved in a specific project do not necessarily have time (because of fixed-term contracts or other projects in progress) to update these websites and/or format the data to make them compatible to all users. As a result, the websites may become useless if the database or the retained information is out of date. Nowadays, the tendency is that each project has its own website although themes can be sometimes quite similar between projects. The consequence is that the information about a given theme/problem is dispersed and thus its' access is time-consuming. To solve this issue, for a given theme/problem, the use of a generic website (i.e., one which contains several project websites that concern the given theme/problem) or common database (e.g. the Atlantic North East Database accessible through the OSPAR, PANACHE or MAIA website) could be useful, most notably in order to bring together all available information about a theme, rather than scatter it.

Finally, it was noted that socio-economic outputs were more difficult to access than scientific outputs, probably because of their sensitivity (see Figure 2).

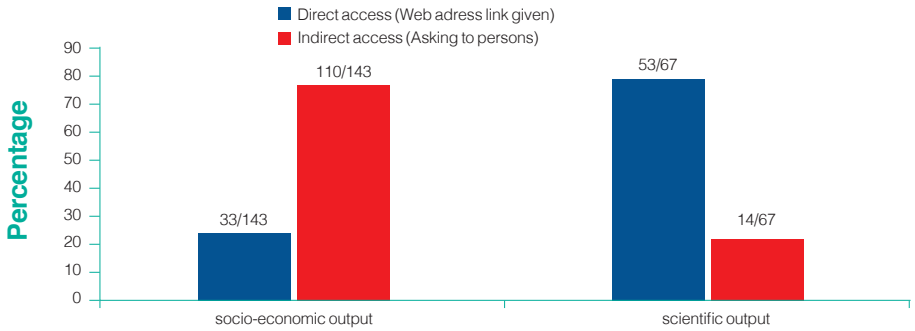


Figure 2. Accessibility to different outputs types within Interreg IVA projects (across the six PEGASEAS themes).

CONCLUSIONS/WORK LEADS

- Raw data are essentially exchanged between experts by email. These data are most often inaccessible to the general public.
- Project outputs are essentially exchanged by reports. Obtaining these reports often requires personal request to producers.
- Limits and barriers mainly concern sharing methods.
- Where the data are public and accessible, data are, often not easily found (direct vs. indirect access).
- Without the enforcement of a consistent data system, data integration/sharing becomes limited (risk of loss of quality of information/data).
- Data sharing via websites involves making regular updates.
- There may be multiple websites within a given theme.
- Scientific publications are not always publicly available.
- Socio-economic outputs were more difficult to access than scientific outputs.
- Data access is still too limited for public stakeholders: with no data available, the interpretation of results is difficult for decision-makers.

Recommendations

- It is important to produce common methodologies for the acquisition, storage, classification and validation of data (and metadata) to reduce time delays and to enhance the quality of work.
- A solution to make data sharing more efficient would be for funders to require all project partners to fill in databases, that are using a compatible format (i.e. usable by all). The implementation of a generic website (i.e., one which integrates several project websites that deal with the given theme/problem) could also be relevant.
- Outputs/deliverables must be attributed to the author, with a key person as a contact.

02 Supporting Marine Strategy Framework Directive indicator development.

ABSTRACT

Interreg IVA projects have used and/or developed several types of ecosystem dynamic indicators. These indicators could potentially be used to assess or monitor progress towards achieving "good environmental status" (GES) of the marine ecosystem, as required by the European Union "Marine Strategy Framework Directive" (MSFD)[1]. The various potential indicators used and developed by the projects examined here, most commonly align with the D1 - Biological diversity and the D3 - Commercial fish descriptors. However, research gaps were observed in the areas of marine litter and underwater noise/energy descriptors.

KEY WORDS

DESCRIPTOR

ECOSYSTEM DYNAMICS

INDICATOR

MARINE STRATEGY FRAMEWORK DIRECTIVE

DESCRIPTION OF KEY FINDINGS

A number of words are used in this report that have specific meanings in the context of the PEGASEAS project cluster. These are:

- Biological diversity: Variety of life, which can be measured via genetic, species or ecosystem variations within a certain area or habitat.
- Descriptor: a qualitative statement of one specific aspect of the good environmental status of marine environment, for the Marine Strategy Framework Directive.
- Indicator: It evaluates the state of the environment in a more practical and economical way than recording every variable of the environment. It can be a status, pressure and/or a response of the environment.
- Marine litter (or Marine debris): This is human-created waste, which is released in the marine environment.
- Marine Strategy Framework Directive (MSFD): this EU Directive establishes a framework within which Member States shall take the necessary measures to achieve or maintain Good Environmental Status (GES) in the marine environment by the year 2020 at the latest.

1 European Community (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).* Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

Indicators are invaluable in the development of monitoring methods, allowing assessment of ecosystems where it is not feasible for the full range of variables to be measured. Indicators allow a suite of variables to be assessed which are representative of the ecosystem and therefore provide a measure of the state of the environment, allowing assessment of how this can be maintained or improved to achieve GES. Research to date has shown that common methods and indices are necessary to allow direct comparison of scientific results across local, regional and global scales. The broad scope of Interreg projects means that they cover many scientific domains and the majority of them use or develop indicators to assess the state of the environment. With political support, these may be used to inform directives such as the MSFD, the Habitats Directive and the Common Fisheries Policy (CFP). Each directive has a different specific purpose but their overarching aim is to promote a healthy, clean and productive marine environment that is managed sustainably. The MSFD constitutes a vital environmental component of the European Union's future Integrated Maritime Policy. This policy is designed to achieve the full economic potential of the oceans and seas in harmony with the marine environment through implementation of the Ecosystem Approach, a holistic strategy of managing the marine environment.

Potential Indicators

As part of the MSFD, eleven descriptors of GES were produced by the European Commission and several similar indicators were identified within Directives such as CFP. Table 1 shows a list of potential scientific indicators that were used or developed during specific Interreg IVA projects[2] that could also be used as indicators within other Directives however, many of them have not yet been linked to policy (please note, this list is not exhaustive).

In Table 1, the descriptors of the MSFD were cited in the order they appear in that document, to facilitate the general comprehension of the Table. As explained above, the MSFD is accepted for the EU and looks at the general marine environment domain compared to other Directives that are more specific or national.

The eleven descriptors of GES produced for the MSFD are:

- D1 Biological diversity;
- D2 Non-indigenous species;
- D3 Commercial fish;
- D4 Food web;
- D5 Eutrophication;
- D6 Sea-floor integrity;
- D7 Hydrographical conditions;
- D8 Contaminants and pollution effects;
- D9 Contaminants in fish and other seafood;
- D10 Marine litter;
- D11 Underwater noise/energy.

2 The projects outputs used for this report were: CRESH, CHARM 2 and 3, Marinexus, PANACHE, VALMER, EASYCO, ARCOPOL, RINSE, MESSCENE, AARC, and CHRONEXPO.

Type of dynamic ecosystem	Interreg IVA scientific indicators	Potential contribution to MSFD descriptor
Cephalopods	**Cephalopods (squid and cuttlefish):** Biodiversity Spatial distribution Distribution of egg clusters Proportion of prey species	D1, D3 and D4
	Spawning sites of cuttlefish: Structure (size, type of substratum) Spatial and temporal changes/distribution (abiotic and biotic parameters)	D1,D3 and D7
	Life cycle of cuttlefish: Measurement of the poly-modal decomposition and quantity of lipofuscin (age pigment)	D3 and D1
Vertebrates	**Cetaceans, Seals and Sea turtles:** Abundance Distribution	D1 and D4
	Fish: Abundance Distribution Community structures Nursing habitats Relationship spawning/nursery sites and recruitment Prediction of population trajectories (under the following scenarios: nursery habitat degradation and fishing pressure)	D1 and D3
	Spatial distribution of fishing activities and efforts	D3
	Diversity of large marine vertebrates	D1 and D4
	Birds: Abundance Distribution Breeding succes Hydrocarbon contamination and microplastics ingestion Functional areas: foraging site	D1, D4, D8 and D10
Non-indigenous species	**Native and non-indigenous tunicate *(Botrylloides)* and invasive ascidian *Asterocarpa*:** Genetic population/population structure Spatial distribution Abundance	D2 and D1
	Invasive macroalgae *Undaria pinnatifida* and tunicate *Ciona intestinalis*: Spatial distribution	D2 and D1
	Identification of spatial and temporal distribution of invasive species in both sides of the Channel	D2 and D1
Marine (phyto/zoo/ ichthyo-) Plankton	Diversity/species identification Population structure/community Abundance Spatial and temporal distribution	D1 and D5
	Physicochemical, biological and photosynthetic parameters Primary production and productivity	D1, D4 and D7
Filter feeders	Growth Carrying capacity Primary production	D1 and D4
Benthic population	**Benthic community (micro and macro):** Diversity Sensitive habitats Abundance Spatial and temporal distribution	D1, D3 and D4
	Subtidal fine sand macrobenthic community: Diversity Abundance Environmental changes of abiotic and biotic parameters	D1, D4 and D7
	Presence/absence probabilities for key benthic and demersal species in various climate change scenarios	D3 and D1
Food web	Structure Biomass Consumption rate Ecotrophic efficiency Food conversion efficiency Changes due to fishing, implementation of MPA and climate changes	D4, D4, D1 and D7
Biogeochemical dynamics	Abiotic parameters of coastal environment (e.g. temperature, nutrients concentration and optics) Biogeochemical parameters Air-sea CO2	D7 and D5
	Forecast of waves, currents and meteorology in the whole Atlantic Space	D7
Aggregate extraction	Evaluation and forecast of the impact of aggregate extraction on food web functioning	D1, D3, D4 and D7
Contamination	Toxicological indicators on 24 hazardous and noxious substances	D8, D9 and D3
	Values of contamination and decontamination of acrylonitile in sea bass	D9 and D3
	Measurements of the effects of chronic exposure of marine species to human-generated pollutants and pesticides by using macroscopic parameters of these organisms (e.g. enzymatic activities, expression of interest genes, status of body tissues, genotoxicity, development of the larvae stages, reproduction changes, adults survival, spawning and developmental success of the embryos)	D9 and D3
	Nutrient discharges in coastal zones (from industrial effluents, agricultural runoff, and municipal sewage)	D8 and D5

Table 1: Potential scientific indicators developed in the Interreg IVA projects and the MSFD descriptors to which they could potentially relate. The final column identifies which descriptor the indicator relates to in terms of monitoring towards GES of the marine environment.

In order to identify gaps in potential MSFD indicators developed during the Interreg IVA projects, the project outputs were analysed in terms of their relation to those descriptors (as described in Table 1) and the results are shown in Figure 1. D1 - Biological diversity and D3 - Commercial fish were studied most frequently, followed by the D4 - Food webs, D5 - Eutrophication and D7 - Hydrographical conditions. This figure highlights that among the indicators proposed within the Interreg IVA projects, some aspects of MSFD were not investigated in significant detail, or at all in the case of marine litter and underwater noise/energy.

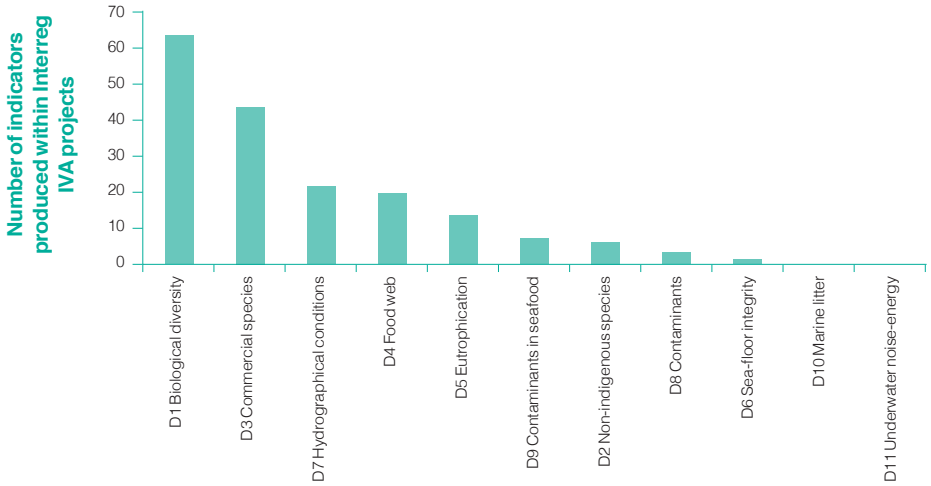


Figure 1: Number of indicators produced within the Interreg IVA projects that could be related to MSFD descriptors.

Gaps

Marine litter (D10) was not taken into account within Interreg IVA projects, except microplastics in the project MICRO (Interreg IVA 2 Seas) and some monitoring studies of marine birds in PANACHE (D8 and D10). Human pressures on the coast and at sea increased during the last century with industrialisation, urbanisation, port activities, fishing, maritime transport and tourism development. These activities notably generate marine litter, which can cause negative effects on organisms and their environment. Marine litter is mainly composed of plastic, glass, metal, paper, cardboard, fabric and wood. In addition to the aesthetic nuisance of such an increase in anthropogenic activity, studies have shown many potentially harmful effects to the marine environment such as increased transport, persistent organic pollutants, the diffusion of toxic compounds (e.g. pharmaceutical drugs, chemicals), transportation of non-native species, distribution of algae associated with red tides, entanglement of large marine organisms, mortality of many marine species (marine mammals, seabirds, turtles) and changes in the structure of benthic communities.

The noise pollution relative to marine energies (D11) was also not taken into account within Interreg IVA projects. Increased noise in the ocean can reduce communication ranges of marine species, which is likely to affect a cetacean behaviour. It is now recognized that some species are able to adapt to this change in the acoustic environment, but the variability of anthropogenic pressures generally operates at shorter temporal scales than species adaptation. Therefore, this pollution type (amplitude and temporal variations) must be assessed in order to assess good environmental status. This was unfortunately not taken into account within Interreg IVA projects although the English Channel ecosystem is highly subjected to the establishment of marine energies and maritime traffic and therefore to noise pollution.

The remaining MSFD descriptors (from D1-Biological diversity to D9- Contaminants in fish and other seafood) were used and/developed within Interreg IVA projects but several gaps have still been identified for descriptors 1, 2 and 8.

Indicators on Biological diversity (D1) were largely investigated but several gaps are identified. Species were the most often considered independently and classical Biological diversity index were poorly used at the community scale (i.e. all species taken together within an index). Several distribution maps were produced (one map per species) but none were done at community scale.

Indicators on non-indigenous species introduced by human activities (D2) were identified during the Marinexus project but the possible impacts of such non-indigenous species (ascidians, brown algae, etc.) on the rest of ecosystems were not investigated (e.g. trophic cascade, competitive exclusion, etc.).

CONCLUSIONS/WORK LEADS

Descriptors used or produced within the Interreg IVA projects focused on MSFD descriptors:

- Biological diversity (D1)
- Non-indigenous species (D2)
- Commercial species (D3)
- Food webs (D4)
- Eutrophication (D5)
- Sea-floor integrity (D6)
- Hydrographical conditions (D7)
- Contaminants and pollution effects (D8)
- Contaminants in fish and other seafood (D9)

The descriptors most studied were D1 and D3, followed by D4, D5 and D7.

Gaps were identified for:

- Marine litter (D10)
- Marine energies including underwater noise pollution (D11)

Negligible gaps were identified for:

- Biological diversity (at both population and community scale D1)
- Non-indigenous species (impacts on other biological compartments D2).

03 The role of long term monitoring in short term policies.

ABSTRACT

Long term monitoring plays a crucial role in developing responsible and effective marine policy. It is vital any changes, environmentally driven or anthropogenic, are recognised and properly understood to ensure suitable measures are taken to help protect our marine ecosystem. These actions can only be proposed and implemented if there is a baseline of information against which to assess them, and this relies wholly on the wealth of information long term monitoring programmes provide. The projects within the PEGASEAS cluster demonstrate the importance of long term monitoring in promoting sustainable governance of the Channel's marine ecosystem.

KEY WORDS

BASELINE DATA
GOVERNANCE
HABITATS
INDICATORS
LONG TERM MONITORING
PRESSURES
TRENDS

DESCRIPTION OF KEY FINDINGS

Introduction

The natural marine environment is subject to fluctuations that occur on a broad range of time scales, from diurnal tidal rhythms, to seasonal cycles, to inter annual changes, to climate oscillations which operate on both decadal and multi-decadal time scales. In addition to natural variability, anthropogenic pressures and climate change exhort significant pressure on marine ecosystems.

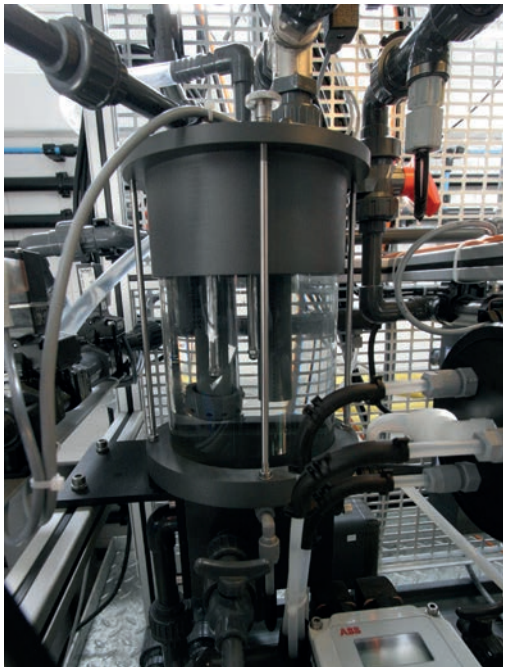
Marine monitoring plays a key role in advancing understanding of our marine environment by providing important scientific information on how the physical, chemical and biological components interact and change over time. Data and research obtained through monitoring programmes, especially those which are decades in length, form an evidence base which support decision-making by government bodies and environmental managers.

Many monitoring programmes are set up as part of short term projects and are discontinued when the project ends. Government policy typically operates on short (3-6 year) time-scales and ecological change may not be observed over just one political term. In order to identify changes and cycles in the environment, we

rely on established datasets, many of which are products of long term monitoring programmes that have the ability to reveal trends and patterns in the marine environment. Some changes occur so gradually, over many decades, that monitoring over extended periods of time is the only means of revealing these trends.

The purpose of this report is to highlight where products of long term monitoring have contributed to a series of projects, which together seek to improve our understanding and ultimately governance of the marine environment, on which we so heavily depend.

Biogeochemical dynamics



A Ferry Box system, installed onboard MV Armorique (Brittany Ferries). (© Yann Fontana / Station Biologique de Roscoff)

The biogeochemical properties of cross-Channel surface waters have been characterized along Channel Ferry crossing routes thanks to the installation of FerryBox systems onboard[1][2]. Continuous and high-frequency observations of physicochemical (e.g. temperature, light etc.) and biological (chlorophyll, phytoplankton species etc.) parameters were made, in order to understand factors controlling primary production and phytoplankton biomass. These measurements enabled areas within the Channel to be defined by different limiting environmental factors for primary production[3]. This contributes to an enhanced understanding of variability in ecosystem productivity as a whole. FerryBoxes were also used for the first time to investigate CO_2 system dynamics along a latitudinal gradient in the Western Channel[4]. Results highlighted the dynamics of the air-sea CO_2 fluxes, the main greenhouse gas, and more generally the dynamics of the ecosystems from diurnal to inter-annual time scales.

In addition to cross-Channel transects; coastal environment data series at fixed stations (Plymouth and Roscoff) were also sampled[5]. Biogeochemical parameters measured included Conductivity, Temperature and Depth (CTD), nutrient concentration, and optical parameters. The combined approach of a ferry line and fixed stations is a valuable strategy and provides a robust assessment of biogeochemical dynamics.

Plankton

Dr Walne deploying a CPR from a Brittany Ferries ship in the Channel (© Sir Alister Hardy Foundation for Ocean Science)

Plankton (the microscopic algae and animals at the base of the marine foodweb) are sensitive to changes in their environment, and as such can act as key indicators of the health of our seas.

The Continuous Plankton Recorder (CPR) has monitored plankton in the North Atlantic for over 80 years and has accrued a vast and detailed time-series. The Marinexus project contributed to the CPR survey by

1 Station Biologique de Roscoff (undated). *Roscoff – FerryBox Project.* Available at: http://abims.sb-roscoff.fr/hf/

2 CHARM (undated). *Action 2: Phyto- and zoo-plankton.* Available at: http://www.charm-project.org/en/over/actions/97-action-2-phyto-and-zoo-plankton

3 Napoléon, C., V. Raimbault, L. Fiant, P. Riou, S. Lefebvre, L. Lampert and P Claquin. (2012). *Spatiotemporal dynamics of physicochemical and photosynthetic parameters in the central English Channel.* In: Journal of Sea Research 69: pp 43-52

4 Marrec, P., T. Cariou, E. Collin, A. Durand, M. Latimer, E. Macé, P. Morin, S. Raimund, M. Vernet and Y Bozec. (2013). *Seasonal and latitudinal variability of the CO2 system in the western English Channel based on Voluntary Observing Ship (VOS) measurements.* In: Marine Chemistry 155: pp. 29-41

5 MARINEXUS (2010). *Marinexus, our shared sea: mechanisms of ecosystem change in the western Channel.* Progress report # 1. Ref: 1956 / 4073

regularly collecting plankton community composition and biomass data over four years between Plymouth and Roscoff. These data support research progressing the wider understanding of the state of the marine environment in the western Channel, and serve to inform indicators for current national and European legislative drivers, including the Marine Strategy Framework Directive (MSFD[6]). The CPR survey provides a valuable data set as not only does it have a historic dataset which serves as a baseline for comparisons against new data, but it monitors plankton continuously across long distances, offering a regional picture of plankton dynamics. This information is essential if we are to understand variation in species diversity across the Channel, which is important to take into account when developing cross-Channel policy to promote effective governance.

Monitoring plankton is critical when assessing the replenishment of exploited commercial fish stocks. The early stages of fish life cycles take place within the plankton and are highly sensitive to a suite of environmental factors including temperature, salinity, currents and predation. The Eastern Channel is well known for hosting spawning grounds, however, the distribution of these early development stages and the way in which environmental factors affect the distribution have until now been poorly documented. The CHARM 3 project[7] produced annual and seasonal distribution and abundance maps of fish eggs[8] and larvae, which highlight both geographical and temporal differences of species and life cycle stages. The mapping of these habitats was an important step towards improving the understanding of processes that influence the critical phases of the fish life cycle. This information contributes directly to effective and sustainable management of Marine Protected Areas (MPAs) that aim to conserve and protect important habitats from potentially damaging anthropogenic activities.

The survival of larval fish is strongly related to the availability of their food supply, plankton. The timing and abundance of plankton is affected by water temperature and nutrient availability, both of which are predicted to alter as a result of climate change. The CHARM 3 project compared two long-term plankton time series in the western and eastern Channel and also collected new data to explore regional differences in biodiversity patterns and ecosystem function. These findings showed significant difference in sea surface temperature and, consequently, potential variation in phytoplankton species composition between the two sites[9].

Non-native species and sessile faunas

Marine organisms are naturally limited in their distribution by factors such as currents, winds and temperature. However, anthropogenic activity, principally the expansion of the shipping industry, has had a significant impact on the introduction of species' to new sites.

Harbours and marinas are recognised as key locations for the establishment and spread of non-native species. The Marinexus project carried out a series of experiments and surveys in these man-made habitats in north west Brittany and south west England, monitoring the prevalence of invasive species. Through this project the first record of a species of sea squirt (*Asterocarpa humilis*), previously only found in the Southern Hemisphere, was reported in Brittany.

Ballast water plays a key role in transporting species from port to port on an international scale. Analysis of cross-Channel ferry ballast water revealed not only the presence of invasive invertebrates, but also dinoflagellate cysts (phytoplankton) - a potential source of blooms, toxic to both marine life and man. These findings highlight the importance of monitoring 'at risk' localities in particular, as without these records introductions of potentially harmful non-native species may go unnoticed. Only by having a time series can we recognise the presence of non-native species, and determine whether they are one off recordings or represent the introduction and establishment of new populations. Monitoring the spread of non-native species is important as they often have significant economic impacts and serious negative consequences for biodiversity.

6 Marine Strategy Framework Directive Homepage. Available at http://www.msfd.eu/

7 CHARM (undated). *Action 8: Cartography & habitat modelling.* Available at: http://www.charm-project.org/en/over/actions/103-action-8-cartography-habitat-modelling

8 Lelièvre, S., E. Antajan and S. Vaz. (2012). *Comparison of traditional microscopy and digitized image analysis to identify and delineate pelagic fish egg spatial distribution.* In: Journal of Plankton Research 34(6): pp. 470-483.

9 Halsband-Lenk, C. and E. Antajan (2010). *Zooplankton time-series analyses in the English Channel: potential for regional multimetric foodweb indices.* In: Proceedings of the Joint ICES/CIESM Workshop to Compare Zooplankton Ecology and Methodologies between the Mediterranean and the North Atlantic (WKZEM)

Species composition and trophic structure of macrobenthic communities vary naturally over time. The Marinexus project enabled the continuation of a long term data series using the well-established MarClim protocol for rocky shore species and also expansion of a 35 year long monitoring programme of a sub-tidal fine sand macrobenthic community in the Bay of Morlaix (Brittany). Both studies revealed a high variety of temporal changes among species, suggesting that responses to environmental changes are mainly species specific. The latter programme also highlighted that changes occurring in the macrobenthic community as a result of environmental change affected communities in terms of trophic structure and function[10]. In marine environments, separating global environmental change from the effects of natural variability in regional areas in time and space relies wholly on sustained broad scale and long-term observations.

Recommendations are often made at the planning level to assess potential impacts on environments as a consequence of proposed human activity. For example, experimental sites in the Marine Natural Park of Iroise have been selected to monitor the effects of seaweed dredging over a 10 year time scale, before this practice is authorised for the region. Established datasets are uncommon, and it is important to recognise there is significant value in starting a long term monitoring programme, where none currently exist.

Mega vertebrates

European herring gull by the cliffs at Etretat, Upper Normandy (© CRT Normandie)

Changes in climate variability are predicted to have important implications for marine top predators. These animals are typically long lived and produce few offspring, so long term datasets are required to study population changes. The CHARM 3 project examined datasets on seabird's reproductive biology and foraging behaviour in the Channel and prey availability of marine predators. By integrating these datasets, more accurate predictions of current and future consequences of changes to the Channel ecosystem are able to be made.

The Channel consists of many habitat types, each hosting a diverse array of marine life. Determining species actual and potential distributions is essential for effective conservation and management. A key output of the CHARM 3 project was the development of a series of interactive, freely available online maps[11], which offer significant insight into the habitats, flora and fauna of the Channel.

10 Mieszkowska, N., R. Leaper, P. Moore, M.A. Kendall, M.T. Burrows, D. Lear, E. Poloczanska, K. Hiscock, P.S. Moschella, R.C. Thompson, R.J. Herbert, D. Laffoley, J. Baxter, A.J. Southward and S.J. Hawkins. (2005). *Marine biodiversity and climate change: assessing and predicting the influence of climatic change using intertidal rocky shore biota.* In: Marine Biological Association of The United Kingdom. Occasional Publications 20(2005): pp. 1-53.

11 CHARM 2 and 3 (undated): *Metadata catalog of spatial data sets.* Available at: http://www.ifremer.fr/sextant/en/web/charm/geocatalogue

Monitoring spatial and temporal variation in species abundance is important if we are to conserve and manage populations. Long term data sets contribute to our understanding of where best to set up MPAs for transient megafauna and to develop appropriate and effective conservation management plans in cross-Channel partnerships[12] (as observed in PANACHE).

Marine Protected Area monitoring

At the European level, diverse policies and frameworks are in place to ensure the continued monitoring of the state of the marine environment, e.g. OSPAR convention[13], the MSFD, the EU Water Framework Directive[14], the Habitats Directive[15] and the Common Fisheries Policy[16]. Legislation to include monitoring has also been developed and implemented at the national level; in the UK, the criteria to select and maintain MPAs (which include Special Areas of Conservation and Special Protected Areas) stem from the application of the Habitats Directive; in France this directive has been translated into the "Code de l'Environnement". In order to fulfil the EU requirements, member states have in place frameworks to guide organised monitoring programmes. For example, the UK Marine Monitoring and Assessment Strategy co-ordinates the provision of monitoring information required to support policy, operational and management decisions.

Monitoring data for MPAs' management plans can be obtained through two different approaches. The first one is a top-down approach in which referral organisations provide MPAs managers with advices. This has mainly been established in the UK but has also occured at the scale of the Channel coast in France. The second, implemented at the MPAs scale, traces the data back up through a bottom-up approach. It is necessary to combine the two approaches in order to provide a regional context to data that has been locally collected to ensure a good assessment of MPAs effectiveness.

Most monitoring involves the identification of features, such as habitat type and species composition; however social and economic features are now also starting to be recorded in both countries, which offer a more holistic view. In the UK, monitoring frequencies differ considerably between features, MPAs and MPA categories. Most monitoring occurs on a multi-annual basis (approximately every 6 years), although in some MPAs, annual or even monthly monitoring takes place. Endangered features or those at a higher risk of degradation are generally more frequently monitored. In France, the majority of monitoring activities are not standardised, however efforts are being made to create an inventory of monitoring protocols.

Monitoring in MPAs is an important tool in implementing marine policies, developing marine spatial plans and can provide supportive information in designating new protected areas. For example, data on seagrass habitat was used to identify a Marine Conservation Zone for the Solent Seagrass project[17] and data from long term monitoring of seed mussels were used to assess potential impacts of a proposed fishery[18].

Monitoring is essential in assessing the effectiveness of protected areas and should form the basis of adaptive and effective management. An MPA indicator "dashboard" is currently being developed by the Agence des aires marines protégées in partnership with MPA managers, research institutions and other stakeholders. It uses a common assessment framework based on indicators that are integrated at different scales: from individual MPAs, to indicate the evolution of each indicator at each new management plan, to regional and national scales, to obtain a strategic overview of the network. Assessing the ecological coherence of MPA networks as a whole requires the use the long term monitoring data to characterise the criteria needed for the assessment methods.

12 Hastie, G.D, B. Wilson and P.M. Thompson (2003 cited in Pikesley, S. K., M.J. Witt, T. Hardy, J. Loveridge, J. Loveridge, R . Williams and B.J. Godley. (2012). *Cetacean sightings and strandings: evidence for spatial and temporal trends.* In: Journal of the Marine Biological Association of the United Kingdom 92(08): pp. 1809-1820.

13 OSPAR Commission website. Available at: http://www.ospar.org/

14 European Commission (2000): The EU Water Framework Directive: integrated river basin management for Europe. Directive 2000/60/EC. Available at: http://ec.europa.eu/environment/water/water-framework/index_en.html

15 European Commission. The Habitats Directive: About the Habitats Directive. Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

16 European Commission. The Common Fisheries Policy. Available at: http://ec.europa.eu/fisheries/cfp/index_en.htm

17 PANACHE (2014), *Report on Marine Monitoring by Wildlife Trusts along the south coast of England.* Available at: http://www.panache.eu.com

18 PANACHE (2014), *Report on Inshore Fisheries and Conservation Authorities and Marine Protected Area Monitoring and Management (temporary title).* Available at: http://www.panache.eu.com

CONCLUSIONS

Baseline data is crucial when setting environmental targets for policy, e.g. the Good Environmental Status targets as part of the MSFD. Baselines provide the context against which to interpret changes observed during new policy-led initiatives. Long term monitoring datasets afford unique value in developing models that influence management decisions and policy. Correctly identifying ecosystem responses to anthropogenic or climatic drivers is essential if we are to select appropriate indicators, set attainable environmental targets and ultimately help decision-makers allocate management resources most effectively. Multi-decadal data sets are fundamentally the most valuable tool in informing the advancement of our understanding of changes in the marine ecosystems, reducing scientific uncertainty and ultimately increasing the robustness of management decisions[19].

Despite their recognised importance in informing policy and ultimately contributing to recognising and managing change in our ecosystems, the number of established long term monitoring programmes currently in existence is low. Duarte et al.[20] declared that 'long-term monitoring programs are, paradoxically, among the shortest projects in marine science: many are initiated, but few survive a decade'. Funding bodies are more likely to support short term projects with clearly defined deliverables/results, rather than long term monitoring programmes, which may not yield results during the life of the project.

In conclusion, long-term data series are of significant interest and value for short-term policies for 3 key reasons:

- A complement of monitoring systems is required in order to obtain a realistic and comprehensive understanding of our marine ecosystem. Automated or semi-automated systems, e.g. CPRs and FerryBoxes, can be instrumented with oceanographic sensors, and allow an expansive and cost efficient geographical coverage for a subset of the ecosystem components e.g. plankton and physico-chemical parameters. Other monitoring platforms such as scientific cruises, planes or satellites enable data to be collected on higher trophic levels e.g. top predators and fish.
- Long term high frequency data series enable us to better understand trends and shifts in ecosystems and how they respond to both anthropogenic and environmental pressures.
- This knowledge is fundamental in selecting appropriate indicators, setting attainable environmental targets, allocating resources most effectively and informing current and future national and European legislative drivers.

19 McQuatters-Gollop, A. (2012). Challenges for implementing the Marine Strategy Framework Directive in a climate of macroecological change. In: Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 370(1980): pp. 5636-5655.

20 Duarte, C. M., J. Cebrian, and N Marbà. (1992). Uncertainty of detecting sea change. In: Nature 356(6366): pp. 190-190.

04 Marine ecosystems knowledge to support an ecosystem-based management approach.

ABSTRACT

Human activities within the Channel region impose significant pressures on the marine environment, which contribute to human well-being through different ecosystem services provided by diverse ecosystems. Understanding marine ecosystems and their dynamics and translating this knowledge into practical measures is crucial to ensure sustainable management. In order to define the most appropriate management strategies/, tools are made available such as the ecosystems services assessment, scenario building, engaging stakeholders, or methods to assess the ecological coherence of marine protected areas (MPAs). This report discusses the tools developed or tested by PEGASEAS cluster projects.

KEY WORDS

BIODIVERSITY
DECISION-MAKING
ECOSYSTEM SERVICES
GOVERNANCE
HUMAN ACTIVITIES
INTEGRATED MANAGEMENT
KNOWLEDGE
MARINE PROTECTED AREAS

DESCRIPTION OF KEY FINDINGS

Introduction

The United Nations Convention on Biological Diversity[1] describes an ecosystem approach as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way". Article 2 of that convention defines that an ecosystem is "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit"[2]. While our knowledge and understanding of marine ecosystem dynamics is improving, the heterogeneity and complexity of the system, and the high level of uncertainty, make it extremely difficult to translate this knowledge into effective management. Across a number of projects examined by PEGASEAS, different tools have been developed, tested and used in the range of projects. Some are presented in this report including the assessment of the ecological coherence of MPAs network in PANACHE, the Ecosystem Service Assessment (ESA) approach trialled in case studies of VALMER or the scenario building exercise used in LiCCo and in VALMER. These tools should inform and support decision-making processes as well as promote effective, efficient governance.

1 United Nations (undated). *UN Convention on Biological Diversity website.* Available at: http://www.cbd.int/ecosystem/default.shtml

2 United Nations (undated). *Convention on Biological Diversity, Article 2, Use of Terms.* Available at: http://www.cbd.int/convention/articles/default.shtml?a=cbd-02

Managing marine protected areas: towards an ecological coherence

The use of scientific knowledge within an ecosystem-based management framework is examined by the PANACHE project which considers both evidence collection and the assessment of the ecological coherence of MPAs networks. Evidence collection, to inform decision-making, may consist of ecological and/or socio-economic data, for example, to monitor the location of features (habitat, species, etc) or the location of specific fishing activities. The evidence-based marine management cycle is a common framework for decision making used by the IFCA[3] which has undertaken a number of appropriate assessments[4], within protected areas, investigating the impacts of proposed fisheries along the UK Channel coast. These include a study of the Portland mussel beds with fishing surveys, using a towed video sledge, and the use of data over the period 1991-2012.

Ecosystem-based management also occurs over a wider scale i.e. the network of MPAs. Several criteria have been identified by PANACHE to help build and assess an ecologically coherent network of MPAs. These are representivity, replication, adequacy, connectivity, level of protection, and resilience[5].

A number of approaches for assessing and measuring ecological coherence of MPA networks have also been considered by PANACHE[6]. These include: (1) an expert knowledge based method which combines a scoring system with the subjective perceptions of the person allocating the scoring; (2) a matrix/spreadsheet reporting method which undertakes a species-habitat assessment and considers the spatial distribution of protected features and makes the use of existing data; and (3) the GIS-based spatial analysis to evaluate spatial distributions and is therefore less reliant on subjective opinions. The type of data required for these criteria and approaches are, for example, distribution maps of features, MPA network maps, list of features protected by MPAs, and biogeographic region maps. There is however a lack of data to assess the coherence of the network.

Assessing ecosystems services: improving knowledge and informing decision-making

Ecosystem services have been defined by the Millennium Ecosystem Assessment[7] as the benefits people gain from ecosystems. Ecosystems contribute to human well-being through three types of services: (1) provisioning services, (2) regulating services and (3) cultural services. The fourth type of ecosystem services, supporting services, can be considered as those that allow the existence of the three others.

While assessing ecosystem services has a crucial role in integrating knowledge at the border of human and social sciences and ecology, it is also important to develop ways to make this concept operational and useful to management. Within the VALMER project, the ecosystem service approach is used at different management levels as the six study sites are different from one another as regards their management context. For example, while the *Parc naturel marin d'Iroise* is a well-established MPA with a Management council and an active 15 year-management plan, the *Golfe normand-breton* site is still under discussion. The management issues they are facing are thus different, and call for different ecosystem services assessment techniques. Different interdisciplinary methods are therefore being used to assess marine ecosystem services, ranging from social science techniques such as questionnaires to mathematical models (e.g. Kelp fields model). As such, the knowledge required and used refer to biophysical parameters (e.g. density of kelp fields) as well as socio-economic ones (e.g. how much people are willing to protect seagrass beds); and always depends on the ecosystem under study, on the type of ecosystem services to be assessed, and on the assessment approach itself. The first phase of assessment will result in a better understanding of the ecological system and the flow from ecological functions to societal benefits even though further research will be necessary to improve our knowledge on interactions between habitats, functionalities and ecosystem services. Economic valuation of ecosystem services take place in

3 Association of Inshore Fisheries and Conservation Authorities. http://www.association-ifca.org.uk

4 Appropriate Assessments are a requirement of Articles 6(3) and 6(4) of the Habitats Directive, for example, which requires any plan or project not directly connected with, or necessary to, the management of a European Marine Site but likely to have an impact on that site, to have an appropriate assessment of the implications of that plan or project. See: http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm~art6

5 PANACHE (2014). Report on *Criteria for Assessing Ecological Coherence of MPA Network, A Review*. Available at: http://www.panache.eu.com

6PANACHE (2014). Report on *Methods for Assessing Ecological Coherence of MPA Networks, A review*. Available at: http://www.panache.eu.com

7 Millennium Ecosystems Assessment (2005). *Ecosystems and Human Well-being: Policy Responses, Volume 3, page vii*. Available at: http://www.maweb.org/documents/document.772.aspx.pdf

several study sites, testing various methods (e.g. travel cost method, contingent valuation, choice experiment) and consider different types of ecosystem services. Also, tools to explore ecosystem services trade-offs are being used to produce management solutions which focus on sustainable use whilst ensuring/maintaining or restoring ecosystem function. Involving stakeholders in the process ensures a common understanding and ownership of these management outcomes.

A common cross-border understanding of the marine environment and ecosystem services should ensure the sustainable environmental development of the shared space within the Channel, and ecosystem services assessment should provide an ideal framework to achieve that understanding.

Shellfish farming in the Golfe normand-breton (© Xavier Desmier / Les Champs photographiques)

Supporting decision-making under uncertainty: building scenarios

The Channel region (and wider seas and oceans) faces an uncertain future in light of climate change risks, changes in uses (e.g. fisheries, maritime transport), and technological developments (e.g. marine renewable energy). Two projects examined by PEGASEAS – LiCCo and VALMER – seek to develop scenarios (known as a prospective approach in France) to highlight different possible futures and their implications in the field of natural resources management and urban planning. Both projects stress the necessity to involve stakeholders as soon as possible in the process to ensure the effective use of scenarios in management. This is also a way to integrate local knowledge.

Climate change will affect communities living and working on the open coast, in particular the ones more exposed to onshore winds and wave action leading to a greater risk of flooding and more vulnerability to erosion. It is therefore important to understand how the coastal environment might change and whether the impacts will have a positive or negative effect on communities. Alongside the development of indicators of change (e.g. through the observation of coastal waders), the LiCCo project builds scenarios in order to understand how stakeholders and users of the Normandie coastal area might react to change by 2025 and 2050, and how their decisions might impact activities and local development. As part of the scenario building process, strong communication and sensitisation strategies have been implemented, towards the different stakeholders (e.g. local politicians, social and professional groups), which ensure an understanding of the issues at stake and relevant considerations during the scenario exercise.

In order to translate and apply ecosystem services concepts into operational management, the VALMER project undertakes a participatory scenario building exercise. Its goal is to link uncertainty about the future to current management considerations, creating a co-learning process by thinking of the future in terms of the ecosystem services we need, we want or we may impact. Knowledge acquired during the ecosystem services assessment is mobilised, along with new ideas, perceptions and facts brought by stakeholders during dedicated workshops. In the *Golfe normand-breton* study site, the scenario exercise seeks to characterize the evolution of ecosystem services in relation to the changes in some critical economic and ecologic uncertainties. To come up with these critical uncertainties, the 'pestle method[8]' has been used, engaging stakeholders in defining what they consider the most critical uncertainties to be taken into account and imagine how they could evolve in a near future. Among the panel of ecosystem services delivered by the marine environment, two have been chosen thanks to the application of a *triage process*[9]: a provisioning service offshore (e.g. fish harvesting) and a coastal cultural service (e.g. recreational activities).

A number of tools have been developed to support those participatory scenarios. These include: (i) a *numerical platform* to gather and organise multi-dimensional information, (ii) *economic and ecosystem accounting* to quantitatively assess current ecosystem services and their evolution according to each explored scenario, and (iii) *ecosystem service numerical modelling* to compare the potential gain or loss of ecosystem functionalities and services resulting from different societal choices and related cumulative pressures.

Involving stakeholders: ensuring the inclusion of knowledge in decision-making

The CAMIS project addressed the challenge of preparing a platform for marine governance in the Channel region. This consisted of two key elements, the Integrated Maritime Strategy (IMS)[10] for the Channel and Cross Channel Forums. Both of these tools were supported by the Cross Channel Resource Centre and the Channel Atlas. The project also undertook action development work on several topics by involving stakeholders. The project demonstrated that it is essential to create an environment of involvement for stakeholders which leads to the ownership of decisions. In an attempt to link the decisions required to manage an environment as complex as the marine environment and management concepts such as ecosystem services it is essential to adopt an open and clear approach to decision-making.

The ecosystem services concept and results are, in fact, complex to understand and should be used with extreme caution for ecosystem based management. Stakeholders, especially policy and decision-makers, should be included at the very base of any tool development in order to better understand the uncertainty and limitation of generated results for management.

The success or otherwise of conveying the benefits of an ecosystem services approach to those in a position to make decisions is very much dependent on quality of the discussions, communication and involvement, and by also making sure that all parties affected by decisions are given an opportunity to participate in the process and contribute to the discussions. Both LiCCo and VALMER projects engage stakeholders, especially through the scenario building exercise, to ensure that decisions are both understood and supported by affected parties.

8 The pestle analysis is a way to organize ideas, trends or possible futures into different categories (e.g. Political, Economic, Social, Technologic, Legal and Environmental) and to consider all the aspects of a problem

9 This "triage process" presented in Pendleton et al (2014) is intended to help defining the aim, scope, methods and tool of the ecosystem services assessment in order to make it meaningful (interpretable), useful (in relation to management concerns, needs and projects) and feasible (according to the available knowledge and means). See: Pendleton, L., R. Mongruel, N. Beaumont, T. Hooper M. Charles, M. (2014) *A Triage Approach to Improve the Relevance of Marine Ecosystem Services Assessments.* Marine Ecology Progress Series, (submitted for publication)

10 CAMIS (2013). *Integrated Maritime Strategy for the Channel Region: A Plan for Action.* Available at: https://camis.arcmanche.eu/stock/files/user4/13_247_Camis_doc_strategie_maritime_UK_BD_1.pdf

CONCLUSIONS/WORK LEADS

Various knowledge-based tools are developed and used in order to inform and support marine ecosystems management.

With regard to MPA management, PANACHE has demonstrated that knowledge can be used in its simplest form through evidence collection and into the evidence-based marine management cycle for assessing human activities' impacts for example. Other criteria and methods also require different knowledge in order to assess the ecological coherence of the MPA network and therefore provide better protection of the marine biodiversity.

In order to assess ecosystem services delivered by the marine environment, a framework combining biophysical data on ecosystems, monetary data and non monetary data on benefit flows has been developed. Then, so as to link uncertainty to the management considerations and create a co-learning process, VALMER seeks to build plausible scenarios to explore possible impacts on marine ecosystem services. This has the potential to help with ecosystem management by:

- allowing to involve the stakeholders of the sites which are using an ecosytem services assessment approach and by using the data and tools developed;
- linking the natural and human environments in order to understand the pressures and impacts of activities.

LiCCo is also using a scenario building approach, in conjunction with analysis of historical data and environmental monitoring systems to identify the possible impacts of climate change and to assist with planning to mitigate or adapt to such events.

CAMIS demonstrated the essential nature of open and transparent governance in the research of an agreement of actions that affect the marine environment. A platform for discussion, the 'Cross Channel Forum' was developed and highlighted the value of unambiguous information being available in a clear format. It also demonstrated the need to hear all voices from large governance structures or from small organisations and, in open discussion, critique these contributions. For the future, it is proposed that the tools developed in the CAMIS project are re-examined and refined with a view to establishing them in the longer term as a means of participatory governance.

Developing for the marine environment an ecosystem based management will require further development of innovative and operational tools and supporting methodologies. The projects discussed in this report use combinations of tools and methods which may be applicable to different sectors, regions, scales and over long periods of time. Further research is therefore needed to assess their applicability in this way.

PANACHE, VALMER and LiCCo are ongoing projects and further results regarding MPA management, ecosystem services and scenario building are expected.

MANAGEMENT AND USE OF INFORMATION AND DATA

Management and use of data supporting effective marine governance.

05 Management and use of data supporting effective marine governance.

ABSTRACT

Information is the cornerstone of decision-making and governance, providing managers and decision-makers with knowledge and evidence to make choices and monitor the marine ecosystem. The different Interreg IVA Channel area projects gathered within PEGASEAS have produced a range of information tools aiming to support effective marine governance: datasheets and maps, databases and modelling systems. Whilst identifying the advantages of these various tools, this report also highlights some issues and challenges which should be addressed in the future so as to ensure compliance with the INSPIRE Directive principles (European Directive 2007/2/EC)[1].

KEY WORDS

ACCESSIBILITY
DATA
INFORMATION
EMODNET
INSPIRE DIRECTIVE
INTEROPERABILITY
MARINE KNOWLEDGE 2020
METADATA
SUSTAINABILITY
VISIBILITY

DESCRIPTION OF KEY FINDINGS

This report discusses the management and use of information/processed data produced by different projects, rather than the collection of raw data.

The academic community has spent years discussing and clarifying what constitutes data, information and knowledge. The diagram on the right, known as the "DIKW Pyramid", shows the relationship (and the hierarchy) between data, information, knowledge and wisdom[2].

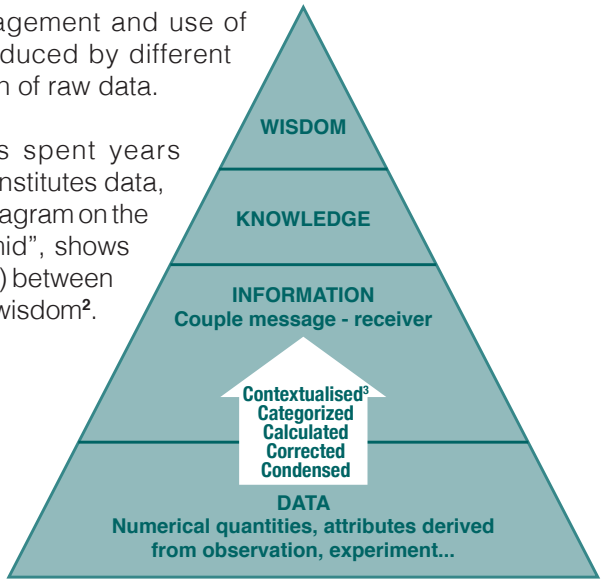


Figure 1: DIKW Pyramid (Source: adapted from www.trainmor-knowmore.eu and from Leibowitz, J., "The Knowledge Management Handbook", CRC Press LLC, 2003)

1 European Commission (2007). *Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).* http://eur-lex.europa.eu/legal-content/EN/ALL/;jsessionid=QKWvTNrRGMwjF0t6JLGqyW1R4J7pNqshGJNyLpRnPZP5QFGqDQNz!-2145467722?uri=CELEX:32007L0002. More information available at: http://inspire.ec.europa.eu/

2 European Commission – Education and Culture (2005-2008). *Trainmor website – 1.3.2 Basic Knowledge Concepts – Data, Information, Knowledge and Wisdom.* Available at: http://www.trainmor-knowmore.eu/FBC5DDB3.en.aspx.

3 Davenport, T.H. and L. Prusak, *Working Knowledge: How Organizations Manage What They Know.* Harvard Business School Press, Boston, 1998.

"Data" are a set of discrete objective facts about an event or a process which have little use by themselves unless converted into information. Data are numerical quantities or other attributes derived from observation, experiment, or calculation. "Information" can be defined as items of data which have been condensed, contextualized, categorized, calculated or corrected[3]. Thus, information paints a bigger picture; it is data with relevance and purpose.

Information is the cornerstone of decision-making and governance, providing the public with knowledge and evidence to make choices and monitor the ecosystem. The management and use of information and data is such an important issue that a coordinated action across the European Union was required.

The INSPIRE Directive, which came into force on 15 May 2007, aims to create an EU Spatial Data Infrastructure (SDI). This will enable the sharing of environmental spatial information among public sector organisations in order to facilitate public access to spatial information across Europe. INSPIRE is based on the following principles:

- Data should be collected only once and kept where they can be maintained most effectively;
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications;
- It should be possible for information collected at one level/scale to be shared with all levels/scales; detailed for thorough investigations, general for strategic purposes;
- Geographic information needed for good governance at all levels should be readily and transparently available;
- The information should be accompanied by complete metadata on the conditions under which targeted spatial information can be accessed and used, the quality and validity of such information, limitations on public access and the public authorities in charge of that information

Launched in September 2010, the EU's **"Marine Knowledge 2020" initiative**[4] provides a unifying framework for all ongoing activities on marine observation within the EU. It embraces the full data lifecycle, from initial observation through to interpretation, processing and dissemination. It is based on basic principles including "collect data once and use them for many purposes" and "data should be interoperable, accessible and free of restrictions on use". The initiative also created the "European Marine Observation and Data Network" **(EMODnet)**, whose aim is to unlock fragmented and hidden marine data resources and to make these available to individuals and organisations, and to facilitate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardised and harmonised marine data[5].

In this context, this report first identifies how data were converted into information within the various Interreg projects dealing with various aspects of the Channel Ecosystem and its management. Then, it highlights some issues and challenges which should be addressed in the future so as to comply with the above-mentioned INSPIRE principles and fully contribute to "Marine Knowledge 2020".

Typology of information tools developed to support effective marine governance

The different tools developed can be classified into three categories, according to the way data were converted into information: datasheets and maps (data were condensed and contextualized), databases (data were categorized) and modelling systems (data were calculated).

3 Davenport, T.H. and L. Prusak, *Working Knowledge: How Organizations Manage What They Know*. Harvard Business School Press, Boston, 1998.

4 European Commission (2010). *Communication from the Commission to the European Parliament and the Council "Marine Knowledge 2020: marine data and observation for smart and sustainable growth*. COM/2010/0461 final. Available at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52010DC0461

5 European Marine Observation and Data Network website. Available at: www.emodnet.eu

Datasheets and maps

Two mapping tools were developed within CAMIS: the "Cross-Channel Atlas" and a printed document entitled «Focusing on the Channel».

(1) The **"Cross-Channel Atlas"**[6] was initiated by the Caen University in 1994 and continues to be regularly updated through Espace Manche Development Initiative (EMDI) and CAMIS projects. The maps, data and analyses provide information and gives insight into the whole Channel area. Topics covered include geographical information, population, transport, environment, economy, energies, culture and training and research. The aim is to further develop the knowledge of the Channel area and contribute to the development and planning of initiatives as well as to co-operation schemes between both countries whilst retaining a Channel scale approach. The Atlas is supporting decision-making and the dissemination of knowledge about the Channel region. It enables different scales of analysis to be conducted, from local to global scale, and investigation of current and future issues.

(2) **"Focusing on the Channel"** is an A3 document including 11 datasheets on the following topics: seabed morphology and fishing resources, organisation of space, shipping, fishing industry, pleasure-boating, marine renewable energy, land/sea interface, vulnerability, maritime accidents. For each topic, diagrams, maps, graphs and short analysis are provided.

Two mapping tools were also developed within CHARM 3.

(1) In September 2012, a **distribution map of large marine vertebrates biodiversity** was finalized. This tool is based on the marine data structure of Sextant (run by Ifremer) and provides a starting point for future spatial planning[7].

(2) A **Fisheries Atlas** was also produced[8]. Covering the period 2000-2010, this tool provides an integrated overview of fisheries in the English Channel through a series of indicators, charts and maps on the production and fishing effort in the Channel. It includes several factsheets on the fishing fleet in the Channel, each country, key species and key gear types. Each factsheet includes illustrative maps and charts.

CRESH worked on **mapping potential spawning sites of cuttlefish** at the scale of the English Channel by an analysis of the distribution of suitable habitats.

The marine birds data collected within the PANACHE project were added to the Sextant webGIS.

We can also mention the work carried out within ARCOPOL, part-financed by the Atlantic Area Transnational Programme. ARCOPOL produced **several datasheets** including key information to improve prevention, response and mitigation capabilities against oil, HNS and inert spills[9].

Databases

The **"Cross-Channel Resource Centre"**, developed within CAMIS, is made of three databases[10]:

(1) A «Stakeholders» database that identifies key organisations in maritime and coastal areas, as well as in the fields of research and innovation. In particular, it aims to help French and British stakeholders find partners on the other side of the Channel in order to carry out potential future cooperation projects;

(2) A «Projects» database, which identifies projects that are now complete or still under way. These include projects supported by Interreg or other funding programmes which focus on at least one of the five major themes of the CAMIS project, in particular in the field of integrated marine and coastal area management, marine and coastal risks, knowledge and preservation of marine environment. The database aims to raise awareness of a range of projects in the Channel area which highlight best practice and complementarities, as well as identifying new areas for cooperation;

6 University of Caen Basse-Normandie. Cross Channel Atlas. Available at: http://atlas-transmanche.certic.unicaen.fr.

7 CHARM (undated). *Sextant Tool webpage.* Available at: www.charm-project.org/fr/outils/sextant/sextant-outils.

8 CHARM (undated). *Channel Fisheries Atlas.* Available at: www.charm-project.org/fr/outils/atlas-des-pecheries/atlas-des-pêcheries-outils.

9 ARCOPOL (undated). *Activity 6.* Available at: www.arcopol.eu/arcopol/buscaDocu.aspx?act=A6

10 CAMIS (undated). *The Cross Channel Resource Centre.* Available at: https://camis.arcmanche.eu/resources/

(3) An «Atlas-Observatories» database lists various atlases and observatories that provide information, analysis, maps or data on the Channel area. These are either data specific to the Channel area, or at broader scale such as at French and British domestic or European level. These atlases and observatories deal with the sea, the coastline and more general maritime issues.

The "Cross-Channel Resource Centre" is both a tool for the dissemination of knowledge and a collaboration platform.

Within CHARM 3, a multidisciplinary database with metadata (called **"Gazetteer"**) was created[11]. It constitutes a valuable tool for managers across the study area as it will avoid unnecessary duplication of effort.

ChanneLIS is currently developing an online **bibliographic database of marine scientific literature** pertaining to the Channel held in the libraries of relevant institutions (with a focus on historical and grey literature). The database will organize bibliographic records through normal categories (author, date, country, keywords), but also in terms of defined geographic zones and scientific themes. The organization of the records will enable targeted and accurate searches.

OFELIA has set up an online **database of available information on wind farm developments** in the Channel region. This available information includes everything found or provided by the external partners: data sites, reports and author contacts, papers, events, etc.

Also, within the ARCOPOLplus project (part-financed by the Atlantic Area Transnational Programme), a **"Hazardous & Noxious Substances spill incidents Data Base"[12]**, was developed providing information on previous HNS spills as well as datasheets (with weathering and fate information).

PORTONOVO, also part-financed by the Atlantic Area Transnational Programme, has developed a tool called **"Decision Support System" (DSS)**, that allows the processing, storage and interchange of all information related with water quality under a decision making perspective in harbour areas. The system has been designed to centralize all the information under a cloud computing environment, maximising use and performance for users and provide maximum security and reliability.

A geoportal has been created to answer the need of the managers, national and international bodies, linked to the database "North-East Atlantic" created during the MAIA and PANACHE projects, together with the OSPAR secretariat. It should allow to share official and updated information concerning MPAs.

Modelling systems

CRESH has developed **a two stage biomass model** to assess the English Channel cuttlefish stock, as well as a presence-only maximum entropy (MaxEnt) modelling approach to predict the distribution of benthic cuttlefish egg clusters.

ARCOPOLplus has developed **HNS modelling software** able to simulate transport and chemical fate of a few number of typical chemical substances[13].

PORTONOVO has developed and applied **five modelling methodologies** for the study and the management of harbours: a numerical modelling procedure to evaluate water flushing time in port areas, a GIS method for harbour areas zoning regarding socioeconomic activities, a numerical modelling procedure for the evaluation of areas affected by different kinds of contaminants, a procedure for the estimation of the recovery potential time of effected waters and a methodology to integrate modelling results into a Geographical Information System.

11 CHARM (undated). *Gazettier.* Available at: www.charm-project.org/fr/outils/index-geographique/gazettier-outils

12 ciimar (undated). *Hazardous and Noxious Substances Spill Incidents.* Searchable database. Available at: www.ciimar.up.pt/hns/

13 Fernandez, R. (2013). *Technical Report on HNS model implementation. Selection of HNS for modelling applications.* Pub: 28/12/2012. Available at: www.arcopol.eu/fichaDocumento.aspx?id=6

Issues and challenges to be addressed in the future

Data collection

Data collection can prove to be a really difficult task. Indeed, there is often **a lack of homogeneity** between data provided by different contributors, resulting in geographic gaps and unrepresentativeness of data. **Some methodological difficulties** are also often raised due to the different geographical information systems that are used and the language barriers (it can be difficult to find an adequate translation of technical terms)[14].

Thus, there is a need to develop and share best practice for data collection. A good example is the "VALMER spatial data management advice note" (in progress), which will describe the current issues and best practice for the collation, storage and management of social and economic data.

In addition, it is also important to develop a bilingual thesauri and shared electronic platforms to store and collect data (or metadata). For instance, within ChanneLIS, the National Marine Biological Library at the Marine Biological Association of the UK in Plymouth and the library of the Station Biologique de Roscoff in France will create a shared database of their holdings of material relevant to the scientific study of the Channel[15]. Also, for building up the CHARM 3 Fisheries Atlas, a common database of data from England (CEFAS) and France (Ifremer) was created[16].

"Crowd-sourcing" could be a good way to overcome this problem of lack of data. "Crowd-sourcing is a type of participative activity (usually online) in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task"[17]. For instance, this method was developed by the Marinexus project through several "Bioblitz" events. A "Bioblitz" is a 24 hour event involving scientists, the public, outreach experts and various stakeholders with a view to recording all the living species within a designated area. Three events were organized in Cornwall from 2011 to 2013. All the data collected was processed and passed to the National Biodiversity Network and DASSH (Data Archive for Seabed Species and Habitats)[18]. In the PANACHE project, citizen science actions have been organised on each side of the Channel. A tool to collect data has, for example, been developed through a partnership with the Planète Mer NGO.

However, it should be pointed out that the volume of responses does not necessarily create a high quality result. Thus, crowd-sourcing should always be combined with a quality monitoring process.

Accessibility

The INSPIRE Directive requires public authorities to make sure data is accessible, that it can be shared and used by everyone. It covers spatial data sets that are in electronic format, held by a public authority and relate to one or more of the 34 themes listed in its three annexes[19].

However, spatial datasets, series or services covered by the INSPIRE directive do not have to be made available to the public if any of the following conditions apply:

- It is not in electronic format;
- The Intellectual Property Rights or copyright of the data, or part thereof, belongs to a third party that has not given permission for its re-use;
- The protection of the environment to which such information relates, such as the location of rare species;
- It effects the confidentiality of personal data and/or files relating to a natural person where that person has not consented to the disclosure of that information to the public;

14 A number of projects, including CAMIS and CHARM3, had to deal with these difficulties.

15 See CHANNELis website: www.channelis.eu

16 This database, called "Harmonie", is hosted by Ifremer (http://sih.ifremer.fr/)

17 Estellés-Arolas, E. and F.G. Ladrón-de-Guevara (2013). *An African American Paternal Lineage Adds an Extremely Ancient Root to the Human Y Chromosome Phylogenetic Tree.* In: The American Society of Human Genetics, 92(3): pp. 454-459.

18 Further information available at: www.mba.ac.uk/education/Bioblitz.

19 These themes are listed at: http://inspire.ec.europa.eu/index.cfm/pageid/2/list/7

- The interests or protection of any person who supplied the information on a voluntary basis without a legal obligation to do so, and who also has not given permission to disclose this information;
- It is sensitive to international relations, public security or national defence;
- The confidentiality of commercial or industrial information, where such confidentiality is provided for by national or Community law to protect a legitimate economic interest, including the public interest in maintaining statistical confidentiality and tax secrecy;
- The confidentiality of the proceedings of public authorities, where such confidentiality is provided for by law;
- The course of justice, the ability of any person to receive a fair trial or the ability of a public authority to conduct an enquiry of a criminal nature.

INSPIRE is made of five components:

- Metadata - descriptions of the spatial i.e. 'data about data';
- Interoperability of Spatial Data Sets and Services;
- Network Services - to make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services;
- Data Sharing - to allow an 'as easy as possible' data exchange between public bodies and to allow third parties, especially citizens to have an as much as possible free and easy access to spatial information covered by INSPIRE;
- Coordination and Monitoring Measures – to monitor the organizational and management aspects of the INSPIRE implementation.

Thus, the INSPIRE directive is addressing the key issues of data accessibility and interoperability. However, the specific case of the European territorial cooperation projects is not considered. Indeed, which body/organization should be responsible for making data available? Is it the lead partner, the partner which has collected or processed data, the Interreg programme Managing Authority or the European Commission? This question should be further explored, so as to avoid any legal void.

Sustainability

At the end of the projects, the various websites are not updated further or even disappear. As a consequence, the databases which were accessible through these websites disappear as well. This may be due to a lack of resources or a "deadweight" effect.

Thus, it is essential that project partners identify as soon as possible a leading organisation, a partnership and funding beyond the Interreg programme funding or any other way to keep the tools up-to-date and develop them further. For instance, the CRESH biomass model was implemented into a software application in order to facilitate routine assessment by an ICES[20] working group.

To ensure sustainability, it is suggested that **additional Interreg rules are introduced** for how databases should be stored and managed, to increase sustainability requirements. This could be done by asking further details in the application form or by making sustainability measures a compulsory deliverable (with some dedicated budget).

Visibility

One cannot but notice that there is a plethora of databases, with various thematic focuses and different scales. However, this diversity, combined with a lack of communication on these tools, affects their visibility. Thus, there is a need to increase communication on the various tools which has been developed within the projects, by organizing specific conferences, using social networks or listing all of them on a website (a "database of databases").

Besides, the consolidation of existing information and data should be further encouraged. Any unnecessary duplication should be avoided and it should be

20 International Council for the Exploration of the Sea (CIEM: Conseil International pour l'Exploration de la Mer). Website available at: www.ices.dk

investigated whether the various existing databases match real needs and are useful for decision-makers and the general public or not. It should be examined as well how Interreg projects can feed the existing databases and observatories, such as ICES database at the International level[21], EMODnet and the European Environment Agency data centres[22] at the European level and national databases (such as "Système d'Information Nature et Paysages"[23], Sextant 's marine and coastal geographic data structure in France or the Marine Environmental Data and Information Network (MEDIN) portal in UK[24]).

On that point, the following good practices are worth mentioning: the Cross-Channel Resource Centre and the Channel programme. By listing all the atlases and observatories providing information, analysis, maps or data on maritime issues in the Channel area, the above-mentioned **"Cross-Channel Resource Centre"**, contributes to improving their visibility and avoiding any further duplication. However, this could be done on a larger scale (and not only on maritime issues) by the Interreg IVA France (Channel) – England programme or the INTERACT programme[25].

The **"Channel Programme"**, developed and led by Ifremer Boulogne-sur-Mer, is a multi-disciplinary informal initiative gathering scientists, managers and decision-makers with a view to implementing an ecosystem-based approach to marine resources management. In particular, the Channel programme aims to communicate information and exchange knowledge gained from the research, so that it can be efficiently integrated into public policies. The aim is also to collectively develop research capacities in the Channel area. The Channel programme is built upon four major areas of research (habitats, trophic networks, sustainable management and socio-economy) and two transversal activities (communication and tools). It is developed through research projects, gathered together under the "Channel programme" label, and public conferences that are organized on a annual basis[26].

CONCLUSIONS/WORK LEADS

The main conclusions coming out from this report are the following:

- The different Interreg IVA Channel area projects gathered within PEGASEAS have produced a range of information aiming to support effective marine governance: datasheets and maps, databases and modelling systems;
- So as to overcome the various challenges related to data collection (geographic gaps and unrepresentativeness of data, discrepancies between the methodology and technical terms used, language barriers), there is a need to develop and share best practice on a cross-channel scale as well as bilingual thesauri and shared electronic platforms to store and collect data. Also, crowd-sourcing practices should be further encouraged;
- The INSPIRE directive is addressing the key issues of data accessibility and interoperability. However, the specific case of the European territorial cooperation projects is not considered and should be further explored;
- In order to ensure sustainability, it is suggested that additional Interreg rules are introduced regarding how databases should be stored and managed;
- There is a need to increase communication on the various tools which have been developed within the projects and further encourage the consolidation of existing knowledge and data.

21 ICES (undated). *ICES Data Portal*. Available at: http://ecosystemdata.ices.dk/

22 European Environment Agency (undated). European Data Centres. Available at: www.eea.europa.eu/data-and-maps/european-data-centres

23 Nature France website. Available at: www.naturefrance.fr/

24 Marine Environmental Data and Information Network website. Available at: www.oceannet.org

25 Funded by the ERDF and national contributions, the INTERACT programme aims to exchange information and best practises among cooperation programmes and make projects results more visible. More information at: www.interact-eu.net.

26 Ifremer website (undated). *Channel Programme*. Available at: http://wwz.ifremer.fr/defimanche_eng

In order to move forward on these issues, two avenues of work could be explored:

- To develop and implement a territorial cooperation project gathering national agencies, universities and local authorities with the aim to exchange best practice and methodology on marine data collection, storage and management. This project could be co-funded by the Interreg VA France (Channel) – England or, on a broader scale, by the future Interreg Europe programme;
- Discuss the potential, for the INTERACT programme, for example, to lead a specific working group aiming to examine how the information and data produced by the Interreg projects could be more accessible, visible and sustainable. It should be investigated as well to which extent they can feed EMODnet and other European and national data portals.

PRESSURE AND ACTIVITY ON THE MARINE ENVIRONMENT

06 Assessment of the impact of human activities on marine environment.

07 Effective practices to manage the impact of the human activities on the marine environment.

08 Collective opportunities of managing activities to support sustainable marine governance.

06 Assessment of the impact of human activities on marine environment.

ABSTRACT

Ecosystem-based management is an integrated approach to managing human activities to ensure coexistence of healthy ecosystems and those activities. The European Union Marine Strategy Framework Directive (MSFD) identifies that "pressure on natural marine resources and the demand for marine ecological services are often too high" regardless of where their effects occur"[1]. Strict management to preserve natural environments is therefore needed, and the impacts of human activities on the marine environment, in particular, are to be carefully evaluated. While some environmentally sensitive sites are now protected, many had been chosen before the classification of sensitive areas, as locations for implementation of activities with potentially damaging consequences for the natural environment. This report identifies some of the key findings from the Interreg IVA projects analysis (one project not funded by Interreg was also examined as it proved relevant for this report) and identifies examples of further research arising from that analysis.

KEY WORDS

BIODIVERSITY
CLIMATE CHANGE
FISHERIES
MARINE RESOURCE EXPLOITATION
VECTORS OF INVASIVE SPECIES

DESCRIPTION OF KEY FINDINGS

People have always been attracted to coastal areas, spaces which open onto the wider world and which foster economic, social and cultural exchanges. The Channel represents such a space which links Britain and the continent. This narrow strip of land overlooks one of the busiest maritime regions in the world, where many different activities compete and jostle for space.

Commercial vessels, fishermen, military vessels, yachting enthusiasts and tourists are the main actors using the sea, while a range of marine industrial activities are concentrated on land and near coastal waters (for example aquaculture, farming, aggregate extraction, shipbuilding and harbour activities). The region is also home to many activities related to tourism and recreation. More recently has been the development of marine renewable energy sources (MREs) such as wind-farms, on and off shore, which are starting to impact on an already complex area.

1 European Community (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)*. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

Such human uses often generate negative effects on marine ecosystems, and their associated biological diversity. Both sides of the Channel area extend over 5,500 km with a wide variety of landscapes and habitats. The Channel and associated coastal areas are rich ecosystems in terms of biodiversity and commercial fishery resources (CHARM 2 Atlas[2]).

The various projects examined for this report covered a broad range of human activities affecting the Channel ecosystem. These include: businesses operating in sensitive coastal and offshore environments (CAMIS), climate warming, CO_2 partial pressure increase and acidification (Marinexus), marine and coastal tourism (CAMIS), recreational yachting (Marinexus), fisheries, kelp harvest and implementation of Marine Protected Areas (CHARM 3, PANACHE), marine renewable energy (MERiFIC, OFELIA), dredging, sand and aggregate extraction (SETARMS, CHARM 3)

Four main topics have been identified through this assessment of the impact of human activities on the marine environment: (1) managing emergent technologies, (2) managing ecosystems within marine protected areas, (3) managing issues of environmental quality, and (4) cooperation for cross-Channel scale monitoring.

Managing Emergent Technologies

Marine and offshore energies have environmental impacts, which vary depending on according to the location and structures used on the continental shelf and the coastal zones. There is then a need to characterize and quantify these impacts at different temporal and spatial scales.

The lessons learnt on environmental impacts for sustainable energy projects (see bibliographic reviews of research publications in MERiFIC[3] and OFELIA[4] projects), are:

- Marine Renewable Energy (MRE) devices have impacts on the physical processes around the device. The consequences may be felt locally to regionally (see OFELIA project for details) on the sea surface (changes of wave patterns), on the ocean currents (flow speed and direction), on the seabed (scour pits, changes of navigation channels), and also on the coastline (coastal erosion or accretion). In return, these physical impacts have been shown to affect marine life such as seabirds, mammals, fish and benthic communities.
- MRE devices also act as physical barriers (i.e., risk of collision) and generate noise as well as electromagnetic fields.
- MRE devices act as artificial reefs, and hence shelter higher fish densities and biomass than the surrounding pelagic environment.

Ecosystem management in marine protected areas

Several lessons have been learnt with regards to better management of marine protected areas. CAMIS, for example, identified that there is a need for businesses to increase their awareness of sustainability issues and to integrate these into their practices, especially when operating close to conservation areas (such as MPAs or Areas of Outstanding Natural Beauty). In this context, local authorities and policy makers should be expected to bring their support and encourage sustainable development in Small and Medium sized Enterprises' (SMES), by recognising their valuable role in local and regional economies.

In respect of managing fisheries within designated conservation areas, the PANACHE project identified that a common and replicable methodology is needed to identify areas with intense human pressures/impacts and to understand how implementation of spatial management measures may affect the inshore fishing industry. In return assessing the level of risk that fishing activities present to the protected species and habitats in European Marine Sites, and focusing first on high-risk sites, is a good way for decision-makers to identify priorities for actions.

2 CHARM 2 (2009): *Channel Habitat Atlas for marine Resource Management*. Available at: http://archimer.ifremer.fr/doc/2009/rapport-7377.pdf

3 MERiFIC (2012). *Documentary summary of the environmental impact of renewable marine energy. Section 3*. Available at: http://www.merific.eu/files2/3-2-1_Documentary_summary_EN-MERiFIC-web.pdf

4 OFELIA (2013). *Publications – Article EWEA 2013*. Available at: http://www.interreg-ofelia.eu/

Management issues of environmental quality in the Channel

Some issues that have been identified are related to contamination by hazardous substances such as oil spills and physical damage. For example, the relative abundance of pollution-sensitive species may generate trophic cascade effects and modifications in ecosystem functioning (Marinexus).

In the context of dredging and substrate extraction, the SETARMS[5] project showed that there is a need to anticipate future environmental regulations, and in particular the equipment to reduce negative effects on abiotic conditions. It is also important to make recommendation for port managers and to have groups and organisations working on the management of harbour sediments at different scales (international, European, France, UK). In a complex regulatory environment, activities are conducted before, during and after risk assessment and actions devoted to reduce negative effects on ecosystems. This requires a serious improvement in dredging techniques and also preventative actions (e.g. providing information and educating users, etc.).

Fishing Boat Heading to Sutton Harbour, Plymouth (© Angela Carpenter / Plymouth University)

In the domain of fisheries, there has always been a conflict between the concept of sustainable fisheries and the short-term economic objectives of fishermen, with fishermen basing their decisions on where and when to fish according to several factors such as size of vessel, running costs and past performance (CHARM 3). The consequences of human activities can be observed for many fish species. For example, there are disturbances on sole (*Solea solea*) population due to nursery habitat degradation and fishing pressure.

Kelp (large brown algae) exploitation should be carefully planned and monitored to prevent spatial discontinuity between populations that would induce deleterious cascade effects along the Channel coasts. Exploitation can alter population connectivity, thus impairing vital gene fluxes between source and sink populations. In addition, seaweed dredging activities can alter seaweeds substrates (i.e., the *Laminaria hyperborea* harvesting apparatus is a dredge equipped with knives which alter the substrate by breaking or turning over rocks and boulders) and should therefore be monitored in experimental sites before authorisation.

5 SETARMS – see http://www.setarms.org/

Monitoring of invasive species in harbours and marinas: on the left, a newly immersed settlement panel; on the right, a panel covered with the invasive ascidian Ciona intestinalis spp after a year of immersion. (© Wilfried Thomas / Station Biologique de Roscoff)

Human activities can also favour the introduction of non-indigenous species. For example, artificial habitats such as ports and marinas provide new substrates (quays, jetties, pontoons and buoys) that may be colonised by native, but also non-native and potentially invasive, species. Maritime traffic and recreational yachting activities are considered as primary dissemination vectors for non-native species via, for example, ballast tanks (see Marinexus project for details[6]) or ship hulls.

Invasive mollusc Crepidula fornicata (© Yann Fontana / Station Biologique de Roscoff)

Climate change effects are characterised by global warming and CO_2 partial pressure increase in the atmosphere. The CHARM 3 project produced several maps showing the probable distribution of key benthic and demersal species in various climate change scenarios (especially temperature increase). Results from the Marinexus project showed different patterns in the control of air–sea CO_2 fluxes in the different provinces of the Western Channel where hydrographical properties differ across the area. As for the effects of climate change on biodiversity, the ability to resist change differs among species. For example, the invasive slipper limpet *Crepidula fornicata* was shown to be resistant to increasing water temperatures and acidification (i.e. atmospheric CO_2 increase).

Cooperating for cross-Channel scale monitoring

It is important to ensure that consistent monitoring exists at a cross-Channel scale; it thus implies the need for common measures to monitor the marine environment, coordinate activities and disseminate examples of best practice.

The PEGASEAS project analysis led us to the following main lessons:

- Despite the development of a transnational overview of fisheries, it is still necessary to integrate data into a common database and to fill gaps in the representativeness of the data relative to the impacts of human activities.

6 Marinexus – see http://www.marinexus.org/

- Further information on the fishing fleets in the UK, France, and the Channel Islands, is needed to improve their management (i.e. vessels number, types of fish caught and fishing gear used).
- A cross-Channel latitudinal approach combining the use of Voluntary Observing Ships (VOS) tracks such as ferries and fixed coastal observatories stations on each side of the Channel provided new insights into the control of air–sea CO_2 fluxes in the Western Channel.

CONCLUSIONS/WORK LEADS

Inputs for future projects:

Scaling aspects
Fisheries: need to acquire both qualitative and quantitative data related to fishing activities in the region scale to gain more insight into the fishing industry and their impacts on marine living resources and ecosystems.

MREs: need for multi-scale research on physical and ecological impacts of MREs, and especially a need for monitoring the environmental impacts of MRE projects at regional scales.

Climate change: the importance of taking into account the hydrological structure of the water column at regional scale was highlighted; an interesting approach was the implication of private structures (cf the ferry companies in Marinexus) for large geographical scale data acquisitions, and partnerships of this type must be encouraged.

Dredging: need for groups and organisations working on the management of harbour sediments at different scales (international, European, France, UK) (cf SETARMS).

Implementation of common methodologies and support of data sharing
Cross-Channel scale studies would greatly benefit from improved data sharing and the use of common/harmonized methods. As identified by the PEGASEAS Cross Channel Forum in Southampton, April 2014, this could be through a budgetary allocation within project funding for consultation and knowledge exchange. That forum also identified the need for improved collaboration and developing relationships between local authorities across France, England and the Channel Islands.

Long-term monitoring
Climate change: need for long-term observation of marine ecosystems to produce better understanding and anticipation of future environmental changes. An interesting approach was the implication of private structures (cf the ferry companies in Marinexus) for large geographical scale data acquisitions, and partnerships of this type must be encouraged.

MREs: need for long-term studies of environmental impacts of MRE devices.

Recommendations for harbours and marina management

Invasive species: coastal navigation and cross-Channel navigation participate in the dissemination of invasive species, by way of ballast tanks and fouling on ships' hulls. This result highlights the importance of the ratification of the 2004 Ballast Water Convention[7]. It also highlights the need for future projects to define specific recommendations for marina managers, and to increase their knowledge of the problem and species concerned.

Dredging and substrate extraction: need for recommendations for port managers

Definition of marine protected areas

Genetic data provide valuable indicators of environmental status and studies of populations connectivity should be conducted prior to the definition of marine protected areas (as in PANACHE).

7 International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. For further information see: http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx

07

Effective practices to manage the impact of the human activities on the marine environment.

ABSTRACT

The marine environment includes the waters of seas and estuaries, the seabed and its subsoils, and all marine wildlife within its sea and coastal habitats. It is a precious asset, a heritage that must be protected, conserved and effectively valued. A wide range of human activities take place in and around the cross-Channel region and, in order to safeguard the long-term productivity of economic and social activities taking place in the Channel, while also managing the impact of those activities on the different ecosystems, urgent protection efforts in this region are necessary. Best practice examples and lessons learnt from a number of projects within the Interreg IV programme are discussed. Recommendations and areas for further research are then identified.

KEY WORDS

ECOSYSTEM-BASED MANAGEMENT
HUMAN IMPACT
INTEGRATED MANAGEMENT
CLIMATE CHANGE IMPACTS
MARITIME SAFETY
MITIGATION STRATEGIES

DESCRIPTION OF KEY FINDINGS

Introduction

The marine environment in the cross-Channel region is a great contributor to economic prosperity, social well-being and quality of life. It is a major route for both passenger and cargo shipping and therefore is an area where maritime safety and pollution prevention are of great importance. The cross-Channel region constitutes a fund of resources which can be used to achieve greater economic potential, so its protection is crucial, more so because the marine environment is deteriorating fast. There is an increasing density and diversity of activities in an already busy sea area, leading to increasing pressures on space and resources which may be approaching saturation. This is particularly evident in the Dover Straits, the narrowest part of the Channel Sea[1].

There are a variety of lessons arising from the Interreg IVA France (Channel) – England programme pertaining to effective practices for the management of the impact of human activities on the marine environment. The discussion below categorises these lessons into four themes: managing emergent technologies;

1 CAMIS (2013). *Integrated Maritime Strategy for the Channel Region: a Plan for Action*, page 29. Available at: https://camis.arcmanche.eu/stock/files/user4/13_247_Camis_doc_strategie_maritime_UK_BD_1.pdf

managing issues of marine pollution from ships; managing fisheries impact on habitats in marine protected areas; and managing issues of environmental quality.

Managing Emergent Technologies

Best practice within sustainable energy projects (e.g., MERiFIC and OFELIA) includes the following recommendations:

- Appraisal of projects should be done in the context of ecosystem stressors and receptors;[2]
- Mitigation of environmental impacts requires a good understanding of the marine renewable energy (MRE) device impacts at local (< 1km), distant (1-10km), and regional (> 10km) scales;
- Colocation of different sustainable energy devices (e.g.: wind and wave) may be considered whenever possible, to reduce the environmental impacts;[3]
- Bio-fouling may be exploited for synergies between MRE devices and fish stock restoration, aquaculture, leisure activities, or other;
- Best practice recommendations are needed to address disturbances induced by MRE devices (risk of collision, noise, electromagnetic fields) and their impacts on wildlife and fish stocks, for example;
- Measures for enhancing the integration and public acceptance of MRE projects should be implemented, to avoid social and economic impacts, for example on local residents and tourism.

Managing issues of marine pollution from ships

The CAMIS project[4] has raised a number of issues in relation to marine pollution and oil spills from ships, including that the risk of accidental marine pollution is not falling, but changing and becoming more complex to manage as a result of high maritime traffic density, transportation of dangerous goods, difficult navigation conditions, and major sea/land exchanges. These incidents can have harmful impacts on human life, cause environmental damage, and have economic consequences. The Cross Channel Declaration on Shipping Incidents and Marine Pollution developed through CAMIS[5] represents a commitment at local and regional levels for common action to reduce the occurrence and impact of marine pollution from shipping incidents. The Declaration calls for improved cooperation, information and communication in response to the threat of pollution from ships. The dissemination of information relating to pollution is seen as key to resolving issues and reducing risk. That information will also be of assistance in responding to marine pollution incidents rapidly and with the correct tools to deal with the specific type of pollution.

CAMIS also identified that the tools required to deal with oil spill clean-up differ from those required for chemical spills, which needs to be considered throughout spill planning, data provision and response. ARCOPOLplus has addressed this, by developing a Hazardous and Noxious Substances (HNS) Spill Incidents Database[6]. The database includes information on previous spills and datasheets, including weathering and fate information, for chemicals. A risk-based prioritisation tool was developed which allows prioritisation of HNS transported within a region or port, based upon chemical and toxicological data and user-defined local shipping information.

Managing fisheries impact on habitats in marine protected areas

The Sussex Inshore Fisheries and Conservation Authority (IFCA) has been working within PANACHE on exchanges with French partners about fisheries risk assessment. This project is ongoing until June 2015 but has already had some positive results. In European Marine Sites, the management of commercial fishing activities is based on the assessment of the impact of those activities to ensure they are compatible with the regulations implemented in such areas (risk assessment of the fishing activity). A matrix-type approach to identify whether an activity needs management measures is used to provide a matrix risk classification. Through one case study in the UK, the project has highlighted a number of factors which could improve

2 McMurray, G. (2008). *Wave Energy Ecological Effects Workshop: Ecological Assessment Briefing Paper.* In C. E. Tortorici (ed), "Ecological effects of wave energy development in the Pacific North West: A scientific workshop". NOAA Technical Memorandum NMFS-SPO-92.

3 Wilhelmsson, D., T. Malm, J. Tchou, G. Sarantakos, N. McCormick, S. Luitjens, M. Gullström, J.K. Patterson Edwards, O. Amir and A. Dubi, (eds (2010). *Greening Blue Energy: Identifying and managing the biodiversity risks and opportunities of offshore renewable energy.* Switzerland: IUCN

4 CAMIS (2013). *Risk of Marine Pollution in the Channel*, page 9. Available at: https://camis.arcmanche.eu/stock/files/user4/230_camis_securite_maquette_UK_BD_page_page.pdf

5 CAMIS (2013). *Declaration of intent of the English Channel local and regional government organisations on shipping incidents and maritime pollution, Caen, 20th March 2013.* Available at: https://camis.arcmanche.eu/stock/files/user4/Declaration_Franco_Britannique_Scurit_Maritime_Mars2013_2.pdf

6 See ARCOPOLplus video at http://vimeo.com/74646735

fisheries management within designated areas:

- accurate maps showing the clustering of different types of fishing activity are an important tool for the implementation of marine policies, development of marine spatial plans and to reduce conflict in the marine environment;
- information on fishing effort provides an insight into where pressures and impacts on the marine environment are most intense;
- it is important to know how the implementation of spatial management measures may affect the industry;
- such knowledge can be used to attempt to reduce conflict between stakeholders in the area.

The project also identifies that Vessel Monitoring Systems cannot track vessel under 12m, which makes mapping difficult. A repeatable methodology using existing data was developed to address this problem. Map analysis may prove useful in developing a risk-based approach to the management of UK MPAs network.

Managing Issues of Environmental Quality

A number of projects have considered environmental quality management issues. For example, the PORTONOVO project has developed a decision-making tool together with creation of a standard method for the management of water bodies in ports. Likewise, the SETARMS dredging project has raised a number of recommendations which can be grouped under two main headings – governance tools and environmental issues[7].

Governance tools

The multiplicity of international bodies, European and French related to dredging shows the complexity of this issue for which there is no short term solution. The sharing of knowledge and good practices was identified as vital by SETARMS, and a number of working groups have been created to that end. Monitoring of feedback from the different European countries in respect of sediment recovery was also highlighted as valuable, helping to identify areas of best practice.

Environmental issues

- Keep the watch on upcoming regulatory developments.

SETARMS identified that legislation is becoming more restrictive in both how and where sediments are disposed of. Changes and developments in legislation therefore need to be monitored as these will have an impact on dredging activities.

- Anticipation and planning of dredging

The preparation of management plans for dredging is critical to provide a vision over the long term for dredging operations, and to anticipate/identify the interactions between dredging activity and marine protected areas. Port planning for dredging operations need to take into account the whole geographical area of the port, including the furthest areas it extends upstream, in order to identify the different types of sediments deposited in the port, their chemical content, as well as their potential impact on biodiversity. A management plan will also allow to better involve the public and stakeholder associations.

As part of the planning process, the identification of areas where dredging presents an environmental risk needs to be taken into account, in order to develop adapted solutions in those areas. Furthermore the potential for ports to group together and pool resources by, for example, jointly funding the acquisition of new equipment, sharing best practice for dealing with specific problems, or identifying the requirements of new regulations, should also be explored.

7 See APLM - IN VIVO (2013). *Etude de la réglementation sur les opérations de dragage – Vol 2: enjeux environnementaux* and APLM - IN VIVO (2013). *Etude de la réglementation sur les opérations de dragage – Vol 3: outils de gouvernance*

• Control of pollution sources

With increasingly stringent regulatory constraints, the prevention of solid and liquid pollution remains an important issue. The prevention of pollution in areas of dredging would result in improvements in water quality. SETARMS highlighted that port basins can be subject to different types of pollution due to port activities, car parks and industries located within them, but also to upstream pollution sources when ports are located on rivers. Along with the pursuit of the implementation of adapted collection and treatment systems, the improvement of surface water quality must therefore be carried out at two scales: at the watershed scale, with the involvement of managers of ports in the Water Framework Directive River Basin Management Plans[8] (renamed SAGE in France), and at the harbour scale, where all activities should be taken into account.

• Macro-waste management

SETARMS identifies that prevention remains the most effective solution to limit the volume of macro-waste collected at the same time as dredging sediment. Consequently, raising awareness about the impact of dumping waste, together with provision of facilities to dispose of waste appropriately, is essential. Raising awareness might be done either by providing information around the port, or through meetings with the port boards. The establishment and maintenance of infrastructure for the collection of waste in ports must also be conducted in a concomitant way.

Invasive kelps Undaria pinnatifida growing on a floating marina pontoon (foreground) and on a vessel hull (background). (© Wilfried Thomas / Station Biologique de Roscoff)

• Control of invasive species

The Marinexus project has examined the role of maritime transport in the dissemination of non-native species in the Channel and highlighted that artificial habitats provided by harbours and marinas are inhabited by numerous non-native species (macroalgae, invertebrates, or plankton)[9]. Cross-channel and coastal navigation between harbours facilitates the spread, and possibly primary introduction, of these non-native species, particularly via ballast tanks and boat hulls (especially leisure boats). Awareness raising and education of harbours managers and boat owners appears a priority if we want to (1) effectively monitor the spread of invasive species and (2) respond to the problem. One of the outputs of Marinexus is an identification guide of non-native species for the English coast of the Channel,

8 European Commission. *River Basin Management Plans 2009-2015 – Information on availability by country*. Available at: http://ec.europa.eu/environment/water/participation/map_mc/map.htm

9 Marinexus (2010). *Marinexus, our shared sea: mechanisms of ecosystem change in the western Channel*. Progress report # 1 - 6. Ref: 1956 / 4073

and a similar guide will be produced for the French coast as one of the outputs of the PEGASEAS Project communication and dissemination action. Exhibitions were also produced for the general public during the Marinexus project, and new ones will be created that will target port managers and boat owners. In combination with awareness raising activities, practical measures such as periodic hull scraping should be encouraged to limit the transport of non-native species. Finally, ratification by the UK of the 2004 Ballast Water Convention[10] should be encouraged (France ratified the convention in 2008) to minimize the risk of invasive species larval transport.

CONCLUSIONS/WORK LEADS

Drawing from the above discussion the following conclusions and work leads are particularly worthy of attention:

Managing Emergent Technologies
Environmental effect assessments (including both positive and negative effects), should be part of any emergent technology development schemes. More research is needed, in particular, to compare the environmental impacts at MRE development sites using collocation of different technologies, synergies with fisheries and aquaculture, or habitat restoration, with the environmental impacts at MRE sites not using such approaches.

Managing issues of marine pollution from ships
Continued development of databases looking at past pollution incidents (for both oil and chemical spills), including the environmental impacts of substances on the marine environment, will provide useful tools for pollution response activities such as those carried out by the European Maritime Safety Agency through its operational tasks[11]. Identification of areas and ecosystems at high risk of damage from spills, vessel tracking systems for high-risk cargoes, and weather and tidal forecasting are just some of the factors that need to be taken into account. The tools developed by CAMIS and ARCOPOLplus will prove very helpful in dealing with such spills and further research should be undertaken into how they could be used more widely, and by which organisations.

Managing Ecosystems within designated conservation areas
PANACHE has already identified a number of areas where activities such as fishing can be better managed in designated conservation areas. The project has currently undertaken case studies on the UK Channel coast. The project is ongoing and further outputs will be presented in due course, opening up further areas of research into the applicability of its methods and tools in other parts of the Channel and different types of conservation areas.

Managing Issues of Environmental Quality
Dredging ensures the accessibility and safety of waterways. It may also be a source of sand and gravel with an economic value. The dissemination and disposal of dredged sediment on the seabed can however disrupt the marine life through the modification of the habitat (bathymetry, sediment type, modification/destruction of benthic fauna) and the trophic network[12]. The SETARMS project led to the research of sustainable solutions for the dredging of the local ports of the Channel.

10 International Maritime Organization (undated). *International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.* For further information see: http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx

11 European Maritime Safety Agency (undated). *Operational Tasks.* Available at: http://www.emsa.europa.eu/operations.html

12 Marmin S. (2013). *Impacts biosédimentaires des expérimentations de clapages en baie de Seine sur la communauté des sables moyens propres à Nephtys cirrosa.* PhD Thesis, Université de Caen, 249p.

The conducted studies proposed possible opportunities for future research, including assessing the most appropriate period in which to undertake the dredging activities. It also proposed the development of methods (1) to better identify the toxic substances in dredged sediment and (2) to determine ways to minimize environmental impacts when collecting sediment. Port authorities are already working to reduce the impacts of dredging activities through environmental monitoring to measure the dredging impacts and assessing the performance of the proposed measures to suppress, reduce or compensate those impacts by:

- providing a baseline against which any change to the initial state of the environment can be measured
- using real time monitoring
- assessing the mid or long term impacts of extraction and immersion operations on the marine fauna and flora.

As far as non-native species are concerned, additional research is also needed to better understand the mechanisms of biological invasions and to define actions that could be taken to reduce their spread or minimise their impacts.

08 Collective opportunities of managing activities to support sustainable marine governance.

ABSTRACT

Collective opportunities can be identified across the whole geographic area of the Channel and throughout the managed activities that take place in that area. This report examines the findings of a number of projects in relation to the opportunities to be gained from taking an ecosystems approach to managing activities in the Channel region, and identifies areas where further work is required.

KEY WORDS

COASTAL ENVIRONMENT
GOVERNANCE
HUMAN ACTIVITIES
INTEGRATED MANAGEMENT
MARINE ENVIRONMENT
POLICY
RISK MANAGEMENT

DESCRIPTION OF KEY FINDINGS

Introduction

The Channel region is rich in a number of ecologically sensitive marine environments such as estuaries and bays which, as well as being environmentally significant areas, support a diverse range of activities. Those activities include very large ports (e.g. container ports, oil terminals, ferry ports), marinas, tourist-related businesses (e.g. hotels, leisure parks, restaurants, shops) and also transport companies, shipping operators, ship-building and maintenance, fisheries, aquaculture, and most recently development of marine renewable energy (MRE) activities.

Managing the ecosystem sustainably, whilst also allowing human activities to operate, grow and generate economic security to the region, is an issue highlighted in the EU Marine Strategy Framework Directive (MSFD). It noted that by "applying an ecosystem-based approach to the management of human activities while enabling a sustainable use of marine goods and services, priority should be given to achieving or maintaining good environmental status in the Community's marine environment, to continuing its protection and preservation, and to preventing subsequent deterioration"[1].

1 European Community (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)*. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

Colocation, where different activities take place in the same area, or where different stakeholders have a management role, for example fisheries and MREs, means that collective or coordinated management activities would be beneficial in better managing the ecosystems while allowing businesses to operate and to avoid conflict between different activities.

Managing the Channel region in an ecologically sensitive way requires an understanding of not just the different ecosystems but also of the needs of the various stakeholders who use them, the roles of the governance and policy actors and regulators (local, regional, national and international) who have jurisdiction over different areas or activities and the economic benefits and/or costs of the activities taking place in the region.

Cross Channel Opportunities (UK/FR)

The Channel is an area of interchange with multiple activities involving the UK, France and other countries from which arise collective opportunities of management.

The CAMIS project has developed Cross-Channel Forums (CCF) to address the challenge of preparing a platform for marine governance and an effective Integrated Maritime Strategy (IMS). The IMS was produced, at the Channel scale, through the involvement of the relevant authorities with a range of stakeholders' representatives at a regional level in France and the UK, while the CCFs have brought together different networks and helped build links between local, regional and national maritime debates. The CCF gave the opportunity to gather stakeholders and knowledge through the exchange and discussion of ideas.

Local scale challenges and opportunities are considered in the CAMIS project and it recognised the need to maintain links with neighbouring seas.

Opportunities to integrate sustainability into managing business activities and the environment

The projects examined within the PEGASEAS cluster have stressed the importance of developing and managing human activities in terms of good environmental, social and economic integration.

The CAMIS project examined how businesses, operating within the boundaries of ecologically sensitive environments such as Marine Protected Areas or *Areas of Outstanding Natural Beauty*, perceive their relationship with their environment. The project also examined how businesses could be supported in a way that encourages economic development whilst also protecting and maintaining sensitive ecosystems. CAMIS highlights that there is a genuine need for businesses to take steps to both increase awareness of sustainability issues and to integrate these into their business practices. Larger companies are often more able to implement changes needed to achieve sustainable business practices than small and medium sized enterprises (SME); and that "a move towards more integration across marine and coastal governance could, in theory, support businesses within coastal communities, with decisions makers able to develop policies that conserve the environment and [foster] business growth".[2]

The MERiFIC project has examined policy frameworks for marine renewable energy (MRE) in the UK and France. It has reviewed national policy frameworks and examined a range of different MRE technologies, together with the financial support, incentives and roles of key organisations in each country. MRE developments may be collocated in natural marine parks or in fisheries/aquaculture areas. It is therefore important to manage these developments in terms of good environmental, social and economic integration and to facilitate good projects rather than exclude them.

2 CAMIS (2013). *Socio-Economic Impact of business activity in sensitive maritime environments in the Channel region etc. – Final Report*. Available at: https://camis.arcmanche.eu/stock/files/user4/CHC_Project_FINAL_REPORT.pdf

Dieppe harbour (© Nathalie Dumay / Association des Ports Locaux de la Manche)

Within the marinas and ports sectors, a set of opportunities have been identified to address common problems and generate integrated responses.

The CAMIS project has examined the concept of "Port Centricity" (Growth and Diversity for Local Ports) highlighting that, ports can gain a competitive edge by diversifying their activities and strengthening their relations with other local port stakeholders.[3] That document, identifying seven types of "port clusters", has been produced to facilitate port development in the Channel area. It describes Green Clusters - groups of companies located within ports that focus on environmental or 'green' initiatives – and notes that, by working together in environmentally focused port centric clusters, businesses can ensure that ports are actively engaged in initiatives that support environmental protection and sustainability, whilst also supporting growth and development.

Also related to managing port environments, PORTONOVO has worked in a transnational and multidisciplinary context in the field of port water quality. Its ultimate goal was to install a common Decision Support System (DSS) for the management of the activities carried out in port waters along the Atlantic Area. The project developed a methodology based on eight interrelated activities that were applied on some geographically strategic ports of the Atlantic Area, guaranteeing a wide spectrum of costal and hydromorphological characteristics.

A number of factors driving development and change of the Channel's marina sector were also identified through the work of CAMIS. These include: the recent economic downturn; rising costs impacting on the number of moorings; and implications of environmental and planning legislation such as dredging and marine protected areas.[4] However, it identifies opportunities for marinas to become involved in environmental research through collaboration with universities and research centres. It also notes that good marinas should have a thorough understanding of the environmental and planning legislation impacting the sector, through improved relationships with policy makers and increased involvement with the marine planning process and future policy development. Marinas should also have strong environmental strategies in place, engage widely to improve awareness among staff and customers, and ensure the sector is as ecologically sustainable as possible.

3 CAMIS (2013). *Port Centricity: Growth and Diversity for Local Ports.* Available at: https://camis.arcmanche.eu/stock/files/user4/Port_Centricity_EN.pdf

4 CAMIS (2013). *Marina 2020: A Vision for the Future Sustainability of Channel/Arc Manche Marinas – Industry Report – Recommendations for Best Practice.* Available at: https://camis.arcmanche.eu/stock/files/user4/Marina_2020_industry_report.pdf

Risk management

Diverse human activities take place within the Channel, each with their own specific risks and impacts. The collective management of these activities can help reduce their incidence. The Cross Channel Declaration on Shipping Incidents and Marine Pollution[5] of the CAMIS project represents a commitment from local and regional councils to act together to reduce the occurrence and impact of marine pollution from shipping incidents. The Declaration has been underpinned through a meeting of elected representatives from councils around the Channel area both from the UK and France. From the Declaration, an Action Plan is to be developed. Potential opportunities from the forthcoming Interreg V Programme are to be identified and both the French lead (Vigipol) and the UK lead (Local Government Association) hope to see a clear forward plan set in place for the Autumn of 2014.

The cliffs at Etretat, Upper Normandy (© Région Haute-Normandie)

Over the Channel, environmental changes linked to anthropogenic pressures need to be addressed through adaptation and mitigation. The LiCCo project looks at improving the understanding the effects of climate change impacting the coastline (sea-level rise and erosion) and the coastal communities and how to adapt to a changing coast. One of the tools used to promote an Integrated Coastal Zone Management (ICZM) is the scenario building using historical records from a number of locations on either of the Channel. Engaging local stakeholders in the adaptation scenario building through workshops and engagement events provides a collective approach to manage the coastline regards to climate change. In fact understanding how the coast might change will allow to identify the risks and opportunities and to take adequate and collective actions.

Ecosystem services

VALMER is an interdisciplinary project, developing guidelines for assessing marine ecosystem services (ES) and applying them to real marine management issues at local and regional scales. Working collectively with natural scientists, economists, social scientists, managers and other stakeholders, this ongoing project is using and developing methodologies for ecosystems services assessment and testing their usefulness to engage stakeholders and to inform and support decision-making processes. It is seeking to identify the benefits of using an ecosystem services approach through applying scenarios to ecosystem services assessments in six study areas in south west England and in Brittany. Although only part way through the process, it appears that the ESA may have helped managers at one of the case study sites to: enhance and structure knowledge, gather data and information on the socio-ecosystem; create trust and common understanding between stakeholders; help find technical solutions; help identify the best management options; highlight areas where management measures and decisions are required and help define a coastal and maritime vision[6].

The results of VALMER will feed into a number of recommendations for ES experts and practitioners. A detailed analysis of the ES approach is being conducted at each case study site, and more empirical evidence will be available at the end of the project in March 2015.

5 CAMIS (2013). *Declaration of intent of the English Channel local and regional government organisations on shipping incidents and maritime pollution, Caen, 20th March 2013.* Available at: https://camis.arcmanche.eu/stock/files/user4/Declaration_Franco_Britannique_Scurit_Maritime_Mars2013_2.pdf

6 VALMER (2014). *Building site based scenarios: Tools and approaches for the implementation in the VALMER project. Scenario Technical Guidelines*, VALMER Action 3.1, January 2014. Available online at: http://www.valmer.eu/wp-content/uploads/2014/01/scenario_technical_guidelines_WP31.pdf

CONCLUSIONS/WORK LEADS

The various projects discussed in this report highlight the breadth of research going on in different sectors, all of which could be integrated into a common ecosystem services management regime with collective opportunities.

As demonstrated by CAMIS, Cross-Channel opportunities and stakeholders' involvement can be increased with the development of Cross Channel Forums.

- These forums should be further developed to foster the links between local, regional and national levels.

Opportunities for a "green" development have also been identified for different sectors such as ports and marinas. CAMIS set out recommendations for both businesses and local authorities/policy makers to improve business awareness of green opportunities and stakeholder awareness of environmental issues.

Environmental issues should therefore be more integrated into businesses for a sustainable development. The compliance with environmental regulations and requirements should also provide an incentive into adapting existing activities through innovations or developing new areas of activities.

- These recommendations should be applied to different sectors, areas and scales across the Channel and their impact and effectiveness on improved management of ecosystems should be identified.

The issue of collocation, in an increasingly used narrow marine area, such as the Channel, makes it vital that *collective activities are identified and managed appropriately*.

The methodologies developed by the MERiFIC, LiCCo and PORTONOVO projects will provide further tools to better manage different activities and ecosystems more effectively, and will be particularly relevant in areas where two or more activities are collocated.

- The projects' tools should be tested:
- in co-location scenarios to identify their impact on conflict between uses and users of the marine ecosystem at different scales
- for their applicability in areas where activities are excluded or restricted to better manage/maintain an ecosystem at risk from human activities or the impacts of climate change.

The ongoing research of the VALMER project, on the use of an ecosystem services approach, will produce methods to improve management and provide an improved evidence base for management, by highlighting the relationship between ecosystems and human activities.

- The applicability of the projects findings should be tested in diverse ecosystems, and by different stakeholders.

- A range of scenarios should be tested to identify economic impacts and environmental consequences of different management decisions.

The PEGASEAS cluster projects have all developed methodologies which may be applicable to different geographic areas or ecosystems and further research is required to test their applicability in that way; best practices should be exchange across the different projects and activities.

GOVERNANCE AT MULTIPLE SCALES IN THE CHANNEL

09 Obstacles and barriers encountered in developing policies and frameworks between different sectors.

10 Integration of the different scales (ecosystemic, governance) into policies and frameworks to support sustainable marine governance.

09

Obstacles and barriers encountered in developing policies and frameworks between different sectors.

ABSTRACT

In this report we consider some of the obstacles or barriers identified by the various Interreg IVA projects and identify areas requiring further research to overcome these barriers across policy areas and sectors in the cross-Channel region.

KEY WORDS

GOVERNANCE
INTEGRATED MARINE STRATEGY
MARINE ECOSYSTEM MANAGEMENT
MARINE ENVIRONMENT

DESCRIPTION OF KEY FINDINGS

Introduction

For the effective management of the marine environment of the Channel, it is necessary to take into account the diverse range of actors (e.g. fishermen, ferry operators, recreational yachtsmen, harbour authorities, Marine Renewable Energies, etc.) using it for different purposes. A wide variety of economic activities can be observed along both sides of the Channel coasts, while the introduction of marine renewable energy activities are set to expand across the region over the next few years. The Integrated Marine Strategy for the Channel region (CAMIS project)[1] highlights the density, and diversity of activities in the region and also the complexity of managing these, noting that "Stakeholders recognise that the Channel is very busy with many users and interests; it is considered that it may be at, or near, saturation point. The projected increase in future use of this space is a concern for many". In some areas, such as the Dover Strait, the concentration of activities is particularly high (NOSTRA)[2].

At the same time, the region is governed at different levels – by local, regional and national governments and agencies, and the various Directorates-General of the European Commission. This is also supplemented by the standardisation, cooperation and demarcation actions of international agencies ranging from regional convention secretariats to United Nations representative bodies. Additionally, there are a wide range of non-governmental organisations concerned with protection of the environment (e.g. cultural heritage, wildlife and the coastal environment). As the CAMIS project noted, it is important to consider the legislation that manages the use of ecological marine resources in terms of effective alignment between policies, as these resources are not restricted by the limits of national boundaries.

1 CAMIS (2013). *Integrated Marine Strategy for the Channel Region: A Plan for Action.* Available at: https://camis.arcmanche.eu/documents

2 A general presentation of the strait issues is available at: http://www.nostraproject.eu/

This report aims to identify obstacles and barriers encountered by the Interreg projects regarding policies and frameworks in the different sectors. Some of these projects had the objective of *reconciling various interests related to sectoral issues through improved management or better governance*.

The sectors studied were: Fishing resources (CHARM 3 and its predecessor CHARM 2, AARC), Maritime pollution (CAMIS, ARCOPOL), Port and dredging sediments (SETARMS), Marine renewable energy (MERiFIC, OFELIA), Coastal erosion and flooding (LiCCo), and Quality of water (WATER, PORTONOVO). For each of these sectors, different issues were observed concerning policies and framework.

The PISCES project, which set the ecosystem approach for the Celtic Seas within the context of the Marine Strategy Framework Directive (MSFD) identified a number of potential barriers or challenges to multi-scale governance[3]. The challenges identified are equally relevant to the cross-Channel area regarding policies and frameworks across different sections. Those challenges include:

- **Multiple jurisdictions** with a complex range of political, administrative and management boundaries.
- **Ambiguity of marine governance arrangements**, with considerable legal uncertainties and uncertainty regarding institutional responsibilities leading to policies and regulations having unclear boundaries.
- **Policies and framework are different according to the sector**. Fisheries are currently managed separately on a sectoral basis under the Common Fisheries Policy (and are often excluded from national marine spatial planning regimes), creating challenges for policy coordination with national marine strategy measures. There are also the water framework directive, habitats directive, birds directive, environmental quality standards and the regional sea convention.
- **Regionally coordinated marine spatial planning is not in place**, although it is becoming established through various national and EC-led initiatives. The UK is developing a series of fully integrated marine plans. In France, marine spatial planning is moving forward on a more sectoral basis, including the delineation of marine energy zones and spatial protection measures for biodiversity (marine parks).
- **Some sectors can be more challenging to communicate with than others**. For example, anglers often act independently, while tourism and marine leisure can have multiple associations (e.g. marine federations, yachting associations and marina operators, etc.). These sectors are subject to minimal central regulation, making it harder to fully understand levels of involvement and interaction.
- **The vocabulary is different** between stakeholders, decision-makers and scientists. This was identified by the ChanneLIS project, for example, which *particularly identified language as a barrier* which should be partly redressed through the production of a Bilingual Thesaurus as an output of that project. A similar language barrier may have been identified by other projects. This issue was also highlighted at PEGASEAS Cross Channel Forum (CCF1) in Southampton which noted that it is important to verify that all parties are using the same vocabulary and this might be possible through the use of a common glossary.
- It would be easier to discuss issues between sectors if the number of representatives by sector was lower and represented the point of view of the majority of the sector.

Some of the projects are more directly focused on the development of *integrated approaches and enabling tools and methods*: CHARM 3, ChanneLIS, VALMER, PANACHE, NOSTRA, and PISCES, while CAMIS considered both sectoral issues and developing integrated approaches.

At the first PEGASEAS Forum in April 2014, it was noted that one of the barriers observed in the projects was that if issues were not made public or communicated to the public, then their importance was considered lower by the policy-makers. As a consequence, it is harder to find funding and to deal with the issues.

3 PISCES Project (2012). *A guide to implementing the ecosystem approach through the Marine Strategy Framework Directive*. Available at: http://assets.wwf.org.uk/downloads/the_pisces_guide.pdf

A further barrier, identified at the first PEGASEAS Forum, was that decision-makers try to improve the system although sometimes the system already in place is efficient and there is therefore no need to change it. Each location is different, and the issues and problems should be identified and solved locally it they are not already tackled at a national level.

Sector Specific Lessons

Fishing

To improve marine resource management in the Eastern Channel, CHARM 2 produced a Channel Habitat Atlas of the different fish species observed in the eastern Channel as there was nothing similar, despite numerous studies on fish species.[4] The atlas could serve as a marine spatial planning tool and help to develop fisheries conservation planning. One of the gaps identified is **the lack of integration of socio-economic factors and analysis showing a link with policy and legal frameworks**. In the Atlas, there is a review of legal framework (Chapter 2) by sector that showed the application fields (i.e. International, community, French and English laws) and the type of regulation (e.g. directives, statutory instruments, law, regulations). This review shows that it is complicated, as there are several types of application fields and regulations, which are difficult to understand for most of the scientists and stakeholders.

Another of the issues on the fishery sector observed by the AARC Project is the need for different authorities to be involved in the management process of Integrated Water Resource Management (IWRM). Until now, the resources from marine (i.e. few miles from the coast), coastal and fresh-water are currently managed separately, but all aim to deliver a strategy for IWRM.

Marine Pollution

The **Cross Channel Declaration on Shipping Incidents and Marine Pollution developed through CAMIS represents a commitment from local and regional councils** to act together in order to reduce the occurrence and the impact of marine pollution from incidents. It showed that the risk of accidental maritime pollution is not falling, but changing and becoming more complex. Due to the changes in maritime activities new types of risks and pollutions should be anticipated (hazardous or noxious substances, container losses), which is not always the case.

According to the research made by CHARM, the international regulations strongly encourage cooperation between States to facilitate the exchange of knowledge and techniques to combat pollution. There is also a common system from the community regulation that will help to prevent and contend the pollution such as the European Maritime Security Agency.

In order to improve the contingency planning system facing oil and hazardous or noxious substances' spills, the ARCOPOL project developed operational tools including procedures, allowing the assessment of economic and environmental damages caused by marine pollution.

Dredging Sediments

Difficulties were observed in the SETARMS project as national (and also European) guidelines are not always clear. A lack of information and guidance for local organisations makes understanding and applying the different regulations concerning the dredging sediments and the application of procedures more complicated. The time taken to apply procedures may be quite long as studies into their implementation may be done at a local level and on a case by case basis. Some blockages in the process were also observed from the technical administrative points of views. In order to make the regulation clearer, SETARMS produced some guidance for reconciling the need for port dredging and environmental regulations.

4 CHARM 2 (2009): Channel Habitat Atlas for Marine Resource Management. Available at: http://archimer.ifremer.fr/doc/2009/rapport-7377.pdf

An issue relevant to ports in England is that they operate under different types of structures: trust, commercial, etc. and have different strategies which may not comply with the various interests.

Marine Renewable Energy

The social acceptability of projects often represents an issue for the development of MRE. As a result there is a need for involving stakeholders and local communities in an appropriate way. In order to improve their involvement the MERiFIC project has produced a toolkit for successfully engaging stakeholders in the development of MRE activities.

Coastal Erosion and Flooding

In a number of places coastal defence has proven to be a costly and inefficient solution in the long term to address coastal erosion and flooding. However managing retreat is never an easy option as far as local communities are concerned and they may be resistant to any change which puts their homes or livelihoods under threat. The LiCCo project has developed approaches and decision-making tools to assist in the preparation for, and adaption to, the impacts of climate change, sea level rise and erosion on the natural and human environment. It investigates social, economic and environmental impacts and uses workshops and engagement events to discuss coastal management strategies with coastal communities.

Water Quality

Ecosystem services are often not appropriately valued and following this could deteriorate as a result. WATER has been developing market based catchment restoration schemes based on a Payment for Ecosystem Services model. An improved understanding of the economic, social and environmental benefits is highlighted as a key element for implementing this model.

In some areas such as ports, which are dedicated to the development of specific economic activities it is particularly necessary to reconcile those activities with the fulfilment of the environmental objectives of the Water Framework Directive[5]. PORTONOVO has been developing a decision support system for the management of activities taking place in port waters to comply with the European legal framework related to ports water quality under the WFD. Environmental risk assessment is an element of this system and may assist ports in achieving improved management of their environment while maintaining their economic activities.

Development of integrated approaches, enabling tools and methods

CHARM 3 strengthened the multidisciplinary nature of the CHARM 2 research through an ecosystemic approach, i.e. an "integrated" approach of the management of marine resources (living, mineral, human) using data on biological (benthic invertebrates and marine fish) and human activities (for example aggregate extraction, fishing, tourism, etc.). Data is also used to study issues relating to marine conservation planning in the eastern Channel, in order to reduce their impact. This approach has helped delineate sensitive zones of the Channel ecosystem with regard to the conservation of biodiversity, potentially contributing to marine spatial planning, while emphasising a range of constraints to effective governance.

CHARM 3 has also highlighted the value of coastal identity. It was noted at the PEGASEAS Cross Channel Forum 1 in Southampton that fishing can add value to some locations as a tourist attraction. However, non-marketable/intangible benefits, for example the attractiveness of a location, are usually undervalued and need to be taken into account by policy makers.

5 European Commission (2000): *The EU Water Framework Directive: integrated river basin management for Europe.* Directive 2000/60/EC. Available online: http://ec.europa.eu/environment/water/water-framework/index_en.html

CAMIS (notably the governance strand thereof) highlighted the benefits of, and need for, integration of governance activities across different aspects and scales of governance, highlighted through that project's Cross Channel Forums. Some examples are provided as regards conflict reduction and cross border resource management when different sectors compete for the same marine resource or area (fishing / offshore wind farms, sand and gravel extraction). There is currently a lack of an overall approach for the various uses of the marine space with no real marine planning being undertaken by French and British authorities. CAMIS provides an integrated maritime strategy for the Channel region, which should be used as a framework for action. An action plan has been established to make progress in this direction. A cross-Channel forum has been tested as an appropriate tool gathering stakeholders from the various sectors with an interest in the Channel management and development.

The ecosystem services approach of VALMER, which undertakes ecosystem services assessment and uses their results to influence management, attempts to better communicate the connection between human wellbeing and ecosystems by linking the benefits that we obtain back to the environmental processes that provide them.[6] This would also support the *integration of governance activities* between different sectors and stakeholders in the Channel region.

PANACHE assesses various approaches, criteria and methods for ensuring the ecological coherence of MPA networks. The project highlights and addresses the need for crossing and integrating various approaches and data for governance, as well as the need and importance of considering human activities that take place in MPAs. Within the project, discussions between different type of stakeholders have raised the fact that a more integrated approach in the designation, management and monitoring of marine protected areas within wider maritime spatial planning and integrated coastal management strategies could have beneficial effects. Case studies about marine protection in the sector of fisheries highlighted the need for involving all stakeholders to develop a relevant sustainable management strategy.

NOSTRA develops a best practice guide for the sustainable management of straits considering both the preservation of biodiversity and natural heritage and the economic functions of these areas. *The need to engage with stakeholders from various sectors interested in these areas was particularly identified as critical in their effective governance and part of the best practice identified*.

PISCES *recognises the need for stakeholder engagement, and has assessed methodologies and processes for involving representatives from various sectors*. A transnational, multi-sector forum is recommended to foster greater communication, cohesion and integration across borders and sectors, which were identified as constraints that needed to be addressed for effective governance.

6 VALMER (undated). *Ecosystem Services webpage*. Available at http://www.valmer.eu/ecosystem-services.

CONCLUSIONS/WORK LEADS

Some common themes are highlighted from the assessment of the projects. These include the need for a cross-sectoral approach when dealing with issues, the need for stakeholder involvement at different levels, and the need for improved communication and awareness both within and between sectors. Also identified, however, are issues around a lack of common language, a lack of equivalency in information available in France and the UK, and conflict between different users, all of which may provide barriers to governing the Channel at multiple scales.

The projects put forward various mechanisms to overcome obstacles and barriers in different sectors through the introduction of integrated approaches, enabling tools, examples of best practice etc.

10 Integration of the different scales (ecosystemic, governance) into policies and frameworks to support sustainable marine governance.

ABSTRACT

The English Channel is one of Europe's most intensively used areas for marine human activities. Managing those activities on only one scale is not appropriate due to factors such as: (1) the transboundary market for shipping, marine energy, marine aggregates, tourism, water-sports, leisure and fisheries; (2) the absence of frontiers for species and ecological processes; (3) the growth in transboundary cooperation arising out of European policies and funding (Interreg programs); (4) sectoral interests and issues having both local and macro-scale dimensions; and (5) growing recognition of the need for public and stakeholder consultation within governance.

KEY WORDS

GOVERNANCE
INTEGRATION
MANAGEMENT
MARINE ACTIVITIES
MARINE PROTECTED AREAS
MULTI-SCALE

DESCRIPTION OF KEY FINDINGS

Introduction

The governance of the Channel must be considered at different spatial scales due to the multiplicity of agencies and bodies with responsibility for its management and protection. For example, at an international level, the English Channel is recognized as a strategic maritime route. The United Kingdom (UK) and France are parties of the OSPAR convention which aims to protect the marine environment through its commitments under five thematic strategies[1] - biodiversity and ecosystems, eutrophication, hazardous substances, offshore industries and radioactive substances. The European common policies and directives are also very significant in sea management, starting with the over-arching Marine Framework Strategy Directive (MFSD), but also through sectorial ones such as the Common Fisheries Policy, Natura 2000 and directives relating to bathing waters and nitrates, for example.

1 OSPAR Commission (2010). *North-East Atlantic Environment Strategy*. OSPAR Agreement 2010-3. Available at: http://www.ospar.org/html_documents/ospar/html/10-03e_nea_environment_strategy.pdf

Considering this very prevalent international context, the governance of the Sea is organised, in France:

- At the national level around a National Council for Sea and Shoreline (Conseil National pour la Mer et le Littoral) and a dedicated State Secretary. The national level is still predominant for the sea management (adoption of laws, regulations and main strategies).
- At the regional level with maritime councils ('Conseils Maritimes de Façade': one of which is dedicated to the Northern Sea and the Channel) and regional competent State services (e.g. direction interrégionale de la mer, Directions Régionales de l'Environnement de l'Aménagement et du Logement) under the authorities of maritime prefects. There is also an increasing role of regional public authorities (region and department) in maritime policies. This scale is in charge of elaborating programs of measures for the MFSD, strategic documents (*Documents stratégiques de façade*) and future Marine Spatial Planning developments.
- At the local level for MPAs management, fisheries, harbours and renewable maritime energy farms, dedicated councils and committees are put in place by the State services.

In the UK:

- Nationally, the key policy is the 'Marine Policy Statement'[2], a framework for preparing Marine Plans and making decisions affecting the marine environment. For England, Marine Plans, policies and decisions are adopted by the UK Government. Emergency planning and response is undertaken at a UK level in all territorial waters.
- There is no regional government comparable to France. Government agencies deliver services at a strategic scale, involving local authority administrative areas to deliver policy from central government. For example, coastal defences (e.g. Shoreline Management Plans, Regional Flood and Coastal Committees) are based on areas that have 'natural' boundaries; 'Inshore Fisheries and Conservation Authorities' are based on local authority administration boundaries.
- Local level 'governance' is delivered through local authorities and County, Unitary and District/Borough councils. Powers and duties at District/Unitary scale include: beach management, coastal defence installations, and running 'municipal' ports. All levels have a responsibility for emergency planning (shoreline only), with County authorities providing coordination for larger incidents. Local authorities have no jurisdiction beyond the Mean Low Water mark, except for some powers relating to controlling inshore water-based activity, e.g. bathing areas.
- The UK has numerous marine and coastal partnerships providing a non-statutory coordination mechanism and operating under the principles of Integrated Coastal Zone Management.

The projects involved in the PEGASEAS cluster operate on scales different from the regional, national and European scales of governance. They can be spatial (referring to the identification of spatial patterns such as local and regional), temporal (to do with the frequency of occurrence) and decisional (which can be different from the spatial scale of effective management). The projects have developed or are developing tools, methods, space and active collaboration across a wide range of fields for transboundary cooperation.

Although networks are in place or in development to facilitate transboundary co-operation and trans-sectoral approaches, a gap still exists within policies which remain more sectoral or limited by regional or national boundaries, and/or inappropriate time frames. One of the purposes of this report is to extract a range of material that will bridge this gap and identify lessons on how to integrate the different scales into policies/frameworks to support marine effective governance.

2 GOV.UK Website. *UK Marine Policy Statement 2011*. Available at: https://www.gov.uk/government/publications/uk-marine-policy-statement

Data collection and analysis for use by decision-makers

The significant outputs from previous projects have been analysed and organised in order to be used by decision-makers at different scales to support effective governance.

The CHARM 2 project collected, analysed and modelled marine data in the Eastern Channel, culminating in a published atlas[3] and proposals in term of MPA implementation and management of marine resources and fisheries activities. This holistic synthesis is important in order to identify local stakeholders and responsibilities for management. However, there is the potential to lose important habitat or functionality by considering only its value and status at a local level rather than within the broader Channel context. The CHARM 3 project has therefore broadened the field of study to the Western Channel and expanded into new discipline and sectoral areas.

The availability of only the synthesis and published results for decision makers was identified as a limitation of CHARM 2. Moreover some of the undertaken analyses and modelling were rather theoretical and somewhat disconnected from real policies. In some situations, the requirements of decision makers may mean that the actual data should also be made available to undertake new analysis, rather than only a published synthesis.

Prior to taking decisions or making changes in policies/frameworks, it is also important to take into account the temporal scale, as the information observed at a specific date might not be relevant for long-term decisions. The use of models can, however, help to predict possible changes that will occur over months, years or decades. A model developed by the CRESH project is able to estimate the exploitation rate and the stock-recruitment relationship for cuttlefish in real time using current data and also data from previous years. The results obtained could help decision-makers to change policies if it was observed that the stock was decreasing for example.

The on-going OFELIA project[4] noted, the data requirements necessary for effective governance are ever increasing. Pushed by the blue growth momentum, regional, national and EU active policies, marine energy technologies are rapidly being introduced in the Channel. Dedicated to the assessment of the environmental impacts of existing and planned wind-farms at both local and regional scales, the added value of this project should be to specifically deal with Channel environmental issues and to bring answers collectively to assist the management of this growing sector, rather than relying on piecemeal observations.

Stakeholder involvement through the scales

Stakeholders have their own spatial and time scales for their activities. As we deal with human activities, we have to consider and give opportunities to take into account those scales. The duty of decision makers is to cross activities and marine environment scales for an effective management.

A key observation is the need to involve stakeholders such as fisheries representatives or regional and state authorities (as occurred during the CHARM project, phase 2 & 3), to incorporate and cross-analyse their views for richness of information and to facilitate the future use of the outputs. There is no doubt that the results of CHARM will be useful to a wide range of decision makers and stakeholders thanks to better connections and access to data as they have now been published.

The need for local involvement of stakeholders has also been considered as part of the LiCCo project, which addresses the challenge facing the Channel shorelines given the effects of climate change and sea-level rise. In that context, the LiCCo project considers local involvement of stakeholders and the development of scenarios to adapt to climate change impact and identify potential opportunities.

3 CHARM 2 (2009). Channel Habitat Atlas for Marine Resource Management. Available at: http://archimer.ifremer.fr/doc/00000/7377/

4 OFELIA. See: http://www.interreg-ofelia.eu/

The lessons learnt from this project (stakeholder involvement, methodological tools and shared culture of risk) should be very useful to concretely implement regional and national strategies in term of climate changes adaptation and management of the coastline.

The CAMIS project involved the relevant authorities at a regional level in France and the UK, together with a range of stakeholders' representatives in a very broad and ambitious desire to implement an Integrated Maritime Strategy (IMS) at the Channel scale[5]. That strategy also considers local scale challenges and opportunities. As a result, the scale of the cross-Channel forums has captured other networks such as the coastal partnerships and Conseil Maritime de Façade which operate at smaller scales within the Channel. Finally it also recognised the need for maintaining links with neighbouring sea areas (the North East Atlantic and the North Sea). The tools developed (database, atlas, etc.) and the cross-channel forums built the link between local, regional and national maritime debates and fill an existing gap. There is a potential for the CAMIS tools and forums to become relevant for ICZM and/or MSP in the Channel, which depends on State and European authorities.

Coherence

As we share the common environment and it is impossible to segregate each issue, each area of the Channel, each activity and to manage them separately, effective governance must lead to coherent management. The projects give opportunities to apply such principle in concrete domains.

The in-depth investigation of specific issues and sectors has enabled, as demonstrated by the SETARMS project, the promotion of best practices, the study of opportunities (e.g. sediment re-use) and the proposal of options to implement facilities (common markets, joint purchases) for collective management. The availability of such decision-aids to decision-makers is a potentially valuable asset for effective marine governance. As with other sectors and beyond their particular scale of management, ports face the same environmental context and share the same issues of increasing demand for the modernisation of fleet, leisure boating, dredging activities and environmental regulations and policies which makes the recommendations of projects such as SETARMS applicable across the spatial scales within the Channel.

In the same spirit as the former Interreg IV MAIA project, the on-going PANACHE[6] project is dedicated to MPA issues. The project demonstrates that coherence and complementarity is needed to integrate the different scales into policies/frameworks to support effective marine governance. By testing different methods of assessing ecological coherence of the network, by compiling and sharing methods of management and monitoring and by developing citizen science, its purpose is to bring coherent answers to similar problematic issues. It also points out the need for complementarity – to identify, organize and tackle issues at the appropriate scale: not only locally but also regionally, by group of nearby sites in order to act as a real network and not only as a collection of individual cases. One of its goals was to place the results of MPA monitoring at the heart of MPA management with the needs of MPA networks being taken into account in other and wider sectoral and maritime policies. Coordination of the management of MPAs is in place in both countries but the challenge will be to cross the border and apply common methods.

In the VALMER Project, 6 sites are playing the role of pilot sites in the Channel context and beyond. At this scale, the project aims to share scientific approaches which could be quite different and significantly influence the results of their implementation although they are tackling similar issues, addressing the need for transferability and useability of methods. There is also a need for the techniques to be available and suitable for use by decision-makers and stakeholders.

5 CAMIS (2013). *Integrated Maritime Strategy for the Channel Region: A Plan for Action*. Available at: https://camis.arcmanche.eu/stock/files/user4/13_247_Camis_doc_strategie_maritime_UK_BD.pdf

6 PANACHE project (2014) - www.panache.eu.com

Environmental services

Maintaining or restoring environmental services could result from effective management in situations where management measures are accepted by stakeholders. The VALMER project deals with the scale of management of MPAs at a local level, quite original in a context where global scales are normally considered. In that domain therefore, the interconnections between macro and local scales are relevant to enhance the quality of decision.

In addition, a further observation is the need for appropriate techniques to level the playing field between marketed goods and the non-marketed environmental goods and services, which cross the scales. In the active world of ecosystem services valuation, the specificity and the originality of VALMER is to apply this rather theoretical concept to effective management. As the project is ongoing, we can only talk about expectations, which is making available an approach for managers that will use the inputs of multidisciplinary science data at every useful scale, together with analyses and modelling for decision making on complex issues. The hope is that this kind of approach will help to overcome gaps in debates that are currently too sector-oriented, too short-term and market oriented.

The ecosystem services valuation approach within VALMER will also help to legitimise the ecosystem approach and MPA management also highlighted as necessary to address the needs of effective multi-sectoral and multi-scale governance. For example, in the Iroise Marine Park, the challenge is to collectively manage the huge kelp field of Molène archipelago, not only as an exploited marine resource but also as a whole ecosystem provides a range of different services such as leisure services, which are separate from specific marine resources.

CONCLUSIONS/WORK LEADS

The projects examined by the PEGASEAS project encompass every scale of management and a large variety of activities. Decision makers and managers have been provided with tools, and a range of various materials to assist their activities. They include professional networks, databases, methods, models, analyses, forums, etc.

Various levels of results have been achieved as the projects are at different stages, some sectors of activities have not been covered. Despite this, a number of conclusions can be drawn:

For data collection, there is a need to:

- Bridge important gaps at a regional scale, which is important to feed into local decisions,
- Highlight the importance for long-term studies for decision-making.
- Increase the availability of data, results and tools for decision making and management.

For stakeholder involvement, there is a need to:

- Develop opportunities and tools at both temporal and spatial scales of activities. The challenge is to use different outputs together and to link them with the different scales.

For coherence of management, there is a need to:

- Improved coherence of management for MPAs, harbours, marine energies and, moving forward, they must be applied and develop for other sectors.

For ecosystem services, there is a need to:

- Bring together stakeholders across scales and activities to manage the Channel. Further research is necessary to identify the synergies and benefits coming from this approach.
- Complete the global or regional approaches by conducing analyses at local MPA scale.
- Give opportunities to spread methods in management of MPAs at Channel scale.

In some cases, Interreg projects should lead to improved policies which will better consider various scales of management. From other projects, research carried out in one area of the Channel should be repeated in other areas as a way of identifying whether they are applicable elsewhere.

Moreover, the different time scales of environmental studies must be taken into account within the short term policies and decisions. Effective governance and adaptive management of marine activities must give importance also to those different time scales and to long term monitoring.

For the next Interreg program attention should be paid to interconnections between projects to increase reciprocal benefits, the availability of tools and data, and the effective application of them in the particular and active context of MSP implementation (EU-directive in progress).

PARTNERSHIPS

11 Partnerships established across the Channel supporting sustainable marine governance.

11 Partnerships established across the Channel supporting sustainable marine governance.

ABSTRACT

This report discusses the various forms of partnerships established across the Channel that potentially relate to sustainable marine governance. It is based on a review of experiences from the projects in PEGASEAS, including Interreg project partnerships themselves, in order to (1) identify different forms of partnerships and (2) determine how projects contribute to their development. This report presents a typology of partnerships supporting marine governance, which are found in the Channel region, with Interreg projects representing only one type of partnership. It then reviews the benefits and difficulties of project partnerships and reflects on how new project activity can be used as an opportunity to (1) build a temporary partnership or (2) to establish a more formal or long-term partnership.

KEY WORDS

GOVERNANCE
PARTNERSHIPS
MANAGERS
STAKEHOLDERS
RESEARCH
POLICY
NGO

DESCRIPTION OF KEY FINDINGS

A partnership is a relationship between individuals or groups, in which they agree to cooperate to achieve their mutual interests. They may have some sort of formal agreement as a basis, which may also be legal in nature. Marine and coastal governance is complex as it deals with many different interests, causes and campaigns, responsibilities, policy issues and sectors at inter-related scales. Partnerships can provide a mechanism to bring together and coordinate the complex elements of marine and coastal governance. In this way the activities of interested parties are more effective, support more efficient management and contribute towards meeting sustainability goals.

As a capitalization project, PEGASEAS provides the opportunity to examine the different forms of cooperation, considering the question: 'What are the forms of partnership in the Channel region that support marine governance?' For the purposes of this report, the definition of partnerships excludes commercial partnerships where services are provided for monetary reward or individuals working together. The first section proposes a typology of the partnerships observed in the Channel area that relate to coastal and marine governance. The second section identifies

key benefits and difficulties encountered in transnational projects. This is based on interviews conducted with project leaders in the PEGASEAS cluster. This review of partnerships does not include the discussion about stakeholders and public engagement which is dealt with separately under the theme "communication and stakeholder involvement".

A typology of partnerships that support marine and coastal governance

A partnership is considered in this section to be any form of voluntary cooperation amongst organisations that has specific defined and agreed purposes from which mutual benefits are expected. Such partnerships are very variable according to their attributes, which include:

- Their purpose (campaigning, managing, guiding etc.)
- The type of partners involved
- The lead organisation (local government, industry, third sector or research)
- Their duration (limited or not)
- Their status (forming a legal entity or not)
- If they are funded publically or by private/voluntary subscription

Marine and coastal governance partnerships usually involve three different kinds of partners:

- Organisations with legally defined responsibilities (e.g. central or local government);
- Organisations representing interests (sectors, professions) or causes and campaigns (NGOs); and
- Experts (technical or scientific).

Two main kinds of partnerships are considered in this report, based on their relevance to the issue of developing partnerships for better environmental governance of the Channel:

- Sectoral Partnerships where participants have similar needs and expectations : e.g. a knowledge or data based partnership of scientists from different organizations or disciplines; a policy based partnership of managers from different sectors or governments or a campaigning partnership of stakeholder groups
- Integrated Partnerships which include several sectors. Such partnerships have proved very valuable in environmental management. They have great value in knowledge development and sharing, policy design and policy implementation or awareness raising. However, they can be more difficult to develop as they require people to collaborate across their organisations' 'cultural' boundaries and areas of interest.

Research partnerships exist in many different forms. Some are found in the formal structure of research organisations, such as joint research units or institutes where people from different disciplines and institutions work together. Others are more limited in duration and exist for a specific purpose. Projects funded by competitive calls are now the most common way to work in research and, in many cases, funding bodies call for collaboration between two or more organisations thus increasing the amount of scientific partnerships. Competitive calls are widely used to promote applied science, with incentives to work and partnership across discipline boundaries, and particularly for collaboration between natural and social sciences. That has, in turn, created an impetus for more formal cooperation agreements in the form of Memoranda of Agreement, and eventually re-organisation of research, allowing for more lasting collaborations. The calls for research projects also often refer to the need for inclusion of end-users, policy-makers and stakeholders. This has opened the door to science led integrated partnerships. This has proven to be essential in the area of environmental management as a way to link science and policy in which national funding agencies play a key part. The research Framework Programs of the European Union (e.g. Horizon 2020 over the next few years), has also fostered international collaboration in research over the past decades and has emphasized the need for inclusion of industry and other stakeholders.

It is generally considered that industry, as well as large NGOs, are very well versed in bringing groups together in order to lobby for their interests or concerns. The CAMIS project emphasises the fact that closer collaboration among the actors of given sectors such as ports, marinas or tourism should be encouraged, as more coordination provides potential for greater regional economic growth. The SETARMS project also indicated that such partnerships among operators could help facilitate collaboration and sharing experiences; in order to deal with environmental problems.

Environmental management is a domain for policy-makers at different levels and sectors within their administration to work together. Issues have become more complex and more inclusive. Participatory governance has been recognized as a way to improve policy efficiency, enabling stakeholders and scientists to work more closely. Beyond the simple consultation of stakeholders or ordering of expertise services, managers are engaging more in integrated partnerships under the aegis of projects, and even beyond. The reason for that is in part regulatory, as most national and European legislation in the domain of environmental management requires that such partnerships be instituted for the purpose of formal engagement. However, the ever-increasing complexity of issues also requires that cooperation be developed on a voluntary basis within day to day actions. Delivering planning and management of coastal and marine space at scales that are meaningful for environmental management, including considering the connection with watersheds, is a typical example. The implementation of the Water Framework Directive[1] and Marine Strategy Framework[2] Directive (WFD and MSFD) poses the challenge of such policy partnership across the Channel. At regional or global scales, international fora such as the OSPAR Commission[3] or the International Maritime Organization (IMO)[4] provide a framework for international cooperation in different fields. However, as demonstrated by projects dealing with marine conservation or invasive species in the Channel area, there is a need for cooperation at smaller scales and in many different areas. The Interreg projects are a good example of that, although the engagement of managers and local governments in such projects is not always easy to obtain for various technical and political reasons.

Most would not contest that integrated partnerships are essential for addressing environmental challenges. They are complex and require that policy-makers, managers, stakeholders and scientists work closely together. They can be science-, industry- or management-led projects or more lasting partnerships. Within the Channel area, it is recognised that Interreg is an important source of funding for such collaboration at the international level. More lasting partnerships exist also at different levels, from local to national. Some of them are statutory, and have to be set up formally as part of schemes to implement environmental policies (Water Framework Directive, Natura 2020, Marine Protected Areas) so as to guarantee some level of stakeholder engagement. Others are voluntary, with an emblematic example being the coastal forums in the UK. The consultative Sea and Coast Conference in Brittany[5] is one such example. This conference was established by the Brittany Region in 2009 as a consultative forum for stakeholders, local and state administration to discuss the coastal and marine policy agenda. It meets three or four times a year.

As mentioned already, the duration of partnerships is an important factor. Some partnerships exist in the long-term whereas others are more transient. The objectives of the partnership can often influence this; for example a partnership focused on a single and local environmental issue may resolve this relatively quickly so allowing the partnership to be dissolved. A partnership with a more complex set of issues to overcome may take longer or the partnership may have as an objective, for example, the long-term 'good management' of a site, therefore requiring its existence over many years.

1 European Commission (2000): *The EU Water Framework Directive: integrated river basin management for Europe.* Directive 2000/60/EC. Available at: http://ec.europa.eu/environment/water/water-framework/index_en.html

2 European Community (2008). *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).* Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

3 OSPAR Commission Website Available at: http://www.ospar.org/

4 International Maritime Organization Website. Available at: http://www.imo.org/Pages/home.aspx

5 For further information see: http://www.bretagne.fr/internet/jcms/prod_207274/16e-conference-regionale-de-la-mer-et-du-littoral

A long-term partnership may also need some sort of formal agreement whereas collaboration between researchers for a particular project may be able to undertake its work without this formality. Such a formal agreement can in turn be implemented within a legal structure. Many are found in the form of association or charity. This allows for the members to act collectively as one legal entity but also to pool resources and to voice their opinions more efficiently. Such bodies, whether they be sectoral partnerships like an association representing an industry or an integrated partnership like a coastal forum in UK, are very valuable partners in projects as demonstrated by many Interreg projects. Such projects help maintain these partnerships to develop their action in the long term.

There are many way for a temporary partnership to be given longer duration for their action. Some projects, like the CHARM project, have been given the opportunity by Interreg to pursue their action under successive projects. In other cases, organisations from different sectors or with different functions have collaborated in projects that have provided opportunities to develop the scope of their cooperation in different areas and with different sources of funding. In that sense, Interreg programs provide a unique opportunity for organisations with very different cultures and interests to come to work together and create new partnerships.

As a last comment, we may also say that it is often useful to undertake an analysis of a partnership to review its effectiveness. This can be undertaken from within the partnership but can, on occasion, have a more objective critique if done externally such as by a specially initiated project or by a specialist consultant.

Advantages and difficulties of partnerships

Partnerships provide a unique opportunity for those with a common interest to come together. Integration of many interests is therefore considered to be the key strength and value of partnerships. The common interests may be very general, such as the overall well-being of an area, or it may be very specific, and relate to a particular habitat or biological community. Partnerships can help overcome the differences in culture between organisations and sectoral groups. This section of the report analyses both the advantages of partnerships and some of the difficulties they encounter.

The way the partnership is made up depends very much on who needs to get involved according to their 'stake,' expertise or aspiration for change. A clear advantage of a partnership is therefore that a wide range of skills and expertise can be brought together. A range of different areas of expertise have been identified from the projects that have been analysed as part of the PEGASEAS project.

This benefits expected from these partnerships are numerous, including:

- Advice and experience, bringing different perspectives to the common research;
- Competences/skills on specific subjects, scientific methods, modelling and analysis;
- Data (for example to build models, study temporal series, make comparative analysis);
- The use of their laboratory and the sharing of materials/instruments and tools (for example in the CRESH project, the exchange of cuttlefish samples allowed to save time, get access to samples from different areas).

Partnerships often reveal new and useful links and opportunities to collaborate. An example is the cross Channel data collection enabled by Ifremer's links with Brittany Ferries within the CHARM project. Different benefits were observed when stakeholders or managers were involved in the partnership as their expertise of the marine governance was different from the scientist expertise. Partners may have interest in sharing:

- Knowledge and skills, which are really different according to the way that organizations (research or management) work, their experience, or their home country.
- Recommendations and advice. For example, in several Interreg projects such as VALMER and CRESH, meetings, fora and round-tables were organised with practitioners to talk about progress from the projects, explain their findings and also to acquire some feedbacks and comments from practitioners. By sharing field and scientific knowledge, the partners are able to produce management guidelines including research concerns and fitting local context. This is very valuable for long lasting sustainable governance. Besides that, working with researchers can provide scientific grounds to managers' action. It prevents the unjustified call into question of the managing propositions or actions and so is an important support to effective governance.

The CAMIS project has extensively used forums and workshops for sharing knowledge and skills, and to deliver recommendations and advice. There has been a real added value in the uniqueness of the partnership and the amount of communication and engagement.

In the Marinexus project, **volunteers** were involved within partnerships, specifically contributing to MPA monitoring and invasive species recording. Without these volunteers, the project would not have managed to collect such a large amount of data. The volunteers also gained benefits, specifically in the form of training, new knowledge and had a raised level of awareness.

The CAMIS project is a unique case considering the diversity of its partnership and the wide coverage of issues. It created a momentum for a durable cooperation among authorities across the Channel, with support from scientists and sectors. If supported further (financially and politically), this could lead to the creation of a permanent non-statutory forum that could advise policy and foster regional cooperation within and across sectors. Environmental governance and economic development would both benefit from the existence of such a forum.

Although most of the projects involved in PEGASEAS have a strong research component, the CAMIS project also highlighted the potential for partnerships among authorities or business operators[6]. Beyond the recognized benefits for economic development, these could also be advocated as a way to improve the environmental governance of the Channel. The SETARMS project, run by local and port authorities, addressed the issue of ports sediment management, a major environmental concern. Such cooperation allows for sharing of experience, expertise and resources. Many more environmental issues could be addressed in that way.

Thus, partnerships create links and enrich partner networks on which new projects or management organisations could rely on. In the case of European projects, they help develop a stronger cross-Channel link through common goals and activities. Finally whatever the form of the collaboration, working with different partners requires the building of common objectives and a shared governance of the project. This generates more robust results and brings different and new perspectives to the work.

Each of the studied projects had their own difficulties, which often depended on their size and budget but some of them seem quite common across all projects. The following reviews the difficulties most commonly mentioned by project leaders that have been interviewed.

Language: The need to work in both English and French in cross-Channel projects requires an amount of time and money that is often underestimated. Unfortunately it is not possible for all the partners to speak both English and French fluently. As a result, communication can be difficult during meetings. In the same way, it has sometimes been difficult to set up real cross-border exchange activities.

6 See CAMIS Project Final Report at http://camis.arcmanche.eu/stock/files/user4/CHC Project FINAL REPORT.pdf (p. 27), and more sectoral reports about marinas (Marina 2020) at: https://camis.arcmanche.eu/stock/files/user4/Marina_2020_industry_report.pdf or the collaboration between port and local authorities (Port centricity) at: https://camis.arcmanche.eu/stock/files/user4/Port_Centricity_EN.pdf

Good communication is essential in projects and to be sure that everyone fully understands the meetings, it is essential to plan budget and time for translation. Each meeting and report should be in both languages (French and English for cross-Channel projects). One way to facilitate the meetings can be to do the PowerPoint presentation in one language and the talk in another. However, this may result in some confusion among the audience who understand both languages if the spoken and written content does not match. An alternative is the use of simultaneous or consecutive translation, but again confusion may occur if the translator does not interpret the spoken word in accordance with the content appearing in the PowerPoint. Different options for ensuring successful delivery of material to a mixed-language audience need to therefore be considered more often in planning events, for example.

Administrative management: Another issue raised by some project partners is that some people/organisation have encountered problems with regards to the complexity of the procedures, and suggest that making more details and explanations available would be welcomed. For example, this might include the need for training staff in the appropriate administrative skills necessary to deal with financial aspects of projects. While partners from businesses may have people with the appropriate skills already in place, some potential project partners may not be able to afford to employ people to undertake these tasks, particularly voluntary sector organisations. Appropriate training to help those organisations be able to participate in projects and to understand the administrative tasks and budget claims, for example, may need to be factored into grant applications, or negotiated between partners, to permit all partners to benefit from the skills and time required to complete the administrative aspects of a project. Clearly setting administrative rules at the beginning of the program and maintaining these throughout a project, particularly for expenses claiming, would be particularly beneficial. This could help minimise any issues towards the end of projects when partnerships are being dismantled and final outputs, deliverables or financial elements need to be completed.

Identifying partners and partners' relationships: It is not always easy to primarily identify which partnerships might be useful. Thus, the absence of industry was observed in several projects. They could have helped by advising on the research they would be interested in, providing tools, methods, access and contacts. When the projects were research (or stakeholder) -focused, the absence of stakeholders (or scientists and/or practitioners and/or judicial partner) was sometimes felt. However, to get involved in scientific partnerships, management agencies need to work on emerging themes that interest researchers. Unfortunately it is administratively heavy and not all types of organizations can participate as real project partners (and not solely be a research support). By having partnerships of these different governance components, the projects outputs could have been even better.

Data collection, exchange and communication: To avoid problem of data exchange, it should be clear which data should be exchanged between partners during the projects, which data/outputs should be communicated (via internet, papers, etc.) and shared with the public to raise awareness, avoid duplication and improve the governance with the exception of sensitive data. The partners should know if that would be the case before the start of the projects. For access to sensitive data, agreement on who should have access should be approved in advance. In addition, agreement between partners should be done at the start of the project in order to avoid, inconsistencies in data types, classification and incompatibility of data aggregation, for example. It also should be clear from the start of the project that each important outcome should be communicated by, for example, publishing scientific papers.

Coordination: Coordinators or project managers should monitor whether every partnership is working correctly (for example, the progress). In order to be sure that all partners are doing their actions fully and in time, every step should be fully explained in the project grant proposal. In case of non-compliance, modifications should be able to be made (e.g. redistribution of the funding).

There are project management issues in coordinating the different contributions by members of the partnership into common deliverables. The work done by people during the projects is never equal; some people will be more involved than others, especially in projects with a large number of partners. This might be due to different goals in the governance domains; in that case everything should be clear between partners from the beginning.

The coordinators should organise meetings in convenient place for most of the partners to be sure to have a high level of participation (a remote location is time consuming and expensive for some partners to attend).

Stakeholder and manager involvement: Some groups seem to not be receptive to scientific meetings (i.e. weak audience of practitioners). The question here is whether they do not want to hear scientist recommendations, or is it rather a problem of approach; do scientists overawe other partners? Is there a lack of capacity within research to communicate its findings? In addition, it appears that managers and policy-makers change quite often (depending on career stage or local authority elections, for example) and it makes the relationship more difficult if there is no continuity in representation. Some staff may have responsibility for an issue but are too busy to fully participate as they have other work responsibilities.

Finally, for some stakeholders and managers the fact that scientists solicit their advice or spread scientific concerns/knowledge without really getting involved in the field is a barrier to the establishment of a strong, long-lasting partnership. It also compromises the effective application of scientific recommendations. Thus, to build real cooperation and effective common work in 'governance' projects, the partners (both scientists and stakeholders) must share the management issues and not confine themselves to their direct interests. Inclusiveness should be a key concern for project leaders, both for internal coordination and for the engagement of stakeholders and managers.

CONCLUSIONS/WORK LEADS

There are a wide range of partnerships which are of value for management and governance as it means more contacts, collective work opportunities and better information. Projects (within or outside Interreg) give the opportunity to establish, strengthen and develop collaborative relationships. Thus, the more complex the governance is, the more important and integrated partnerships need to be. Indeed, sustainable marine governance requires scientific knowledge in many different fields and the involvement and collaboration of a wide range of stakeholders. It therefore appears that research-manager partnerships will become more and more important in the future.

Involving managers from local, regional, national or cross-border scales may be difficult in partnership proceedings, but is offers benefits for the different collaborators as it stimulates cooperation. However, the relevance of a particular type of partnership depends on the purpose. For instance, adaptation to climate change, setting of MPAs, management of invasive species, safety of maritime traffic or fisheries management are themes for which cross-Channel partnerships (involving experts and managers) is very appropriate. However some problems will, by contrast, require strong local-level collaboration, with stakeholders being advised by experts (e.g issues of coastal water quality, planning of marine spaces). Sharing of concerns or experience among authorities, NGOs or businesses, or delivering environmental policy, does not necessarily require the presence of scientists.

Thus, an interesting way to promote effective marine and coastal governance would be to know what facilitates or complicates the feasibility of the collaboration and the institutionalization of partnerships. It is often difficult to work across political boundaries (inter-regional, international) although resource or environmental management requires cooperation for ecological or socio-economic reasons. In any case, communication and end-user engagement appear to be key factors for success, as they raise ownership of the outcomes of the collaborative work conducted under partnerships. Few specific areas of concern to be considered in the future were raised during the interviews conducted with project leaders or partners. They are the need:

- to consider and facilitate the participation of all parties needed to complete the objectives of a project; this includes particular attention to potential partners raising issues about their capacity to raise match funding or the necessary administrative skills,
- to support by training, and exchange of experience, adequate coordination capacity so that project implementation is carefully monitored,
- to address, in detail, the conditions for exchange and sharing of data when developing the project, so that it does not become an issue that impacts on the project's realisation; and also the conditions for communicating information outside the project,
- to consider that language is a major barrier to effective collaborative work across the Channel; sufficient resources should be devoted to ensure good communication within projects. The quality of exchanges should be a primary concern of the coordinators.

Finally, it is essential that the objectives of a project, or any other form of temporary or long-lasting partnership, be clearly set out and shared among all partners from the start. Good governance of partnership should also set clear procedures to make adjustments in the work plan in such a way that all parties concerned are involved and that the reasons for any changes be transparent to all in the project.

COMMUNICATION AND STAKEHOLDER INVOLVEMENT

12 Informative communication on Channel governance and marine ecosystems.

13 Participative and consultative communication on Channel governance and marine ecosystems.

12 Informative communication on Channel governance and marine ecosystems.

ABSTRACT

Informative Communication has been undertaken by the Interreg IV projects reviewed. It is an essential element of these projects in order to raise awareness of the work undertaken and as a first step for developing participation in Channel governance. Four audience groups have been identified: Policy makers and government; Industry/Science Community/Sectoral/NGOs; Community/General public; and Schools. The varieties of communication methods are reviewed, by audience and key findings are discussed.

KEY WORDS

DISPLAY
EDUCATION
INFORMATIVE COMMUNICATION
OUTREACH
PRESENTATION

DESCRIPTION OF KEY FINDINGS

Communication and stakeholder involvement are at the heart of the Interreg IV projects and deliverables. Projects have utilised a broad range of approaches to communicate key messages and project findings to audiences ranging from school groups to key policy makers, NGOs and industry representatives. An overview of the approaches used by the project teams is given below. The report also provides case study examples of best practice and lessons learnt from specific projects.

Informative communication is defined in this context as providing knowledge, in particular useful or interesting information. It is most often a one-way flow of information. Informative communication can be useful for sharing complex expert knowledge but in more understandable formats. 'Information' is the first stage in the 'wheel of participation'[1]. The approach is used widely to develop effective develop citizen participation and has been widely adapted to guide effective citizen engagement and public impact. The wheel describes 4 stages, from 'Information' to 'Consultation', 'Participation' and finally 'Empowerment'. The wheel demonstrates the importance of 'High-Quality Information' in supporting the wider participation process. The wheel also shows that providing 'minimal communication' or 'limited information' is unlikely to lead to effective participation in governance processes. Key to the provision of 'good quality information' is 'providing information that the community wants and/or needs'. This has been

1 Davidson, S. (1998). *Spinning the wheel of empowerment.* In: Planning, 1262(3), pp. 14-15.

the focus of the majority of Interreg IV funded project communication activity. When developing informative communication tools and techniques, consultation processes and evaluation have been widely undertaken to better understand audience type. In these cases, information provision has been tailored accordingly to the audience. Participative and consultative communications have also been undertaken through Interreg IV projects and these are described in the related report "Participative and consultative communication on Channel governance and marine ecosystems".

Informative communication has been the most commonly used form of information dissemination by Interreg IV projects. A likely explanation of this is its efficiency at reaching large numbers of people. Additionally, given the limited timeframe of the projects, there is a need to develop 'legacy' resources, which must be available and useful beyond the project's scope. These are often provided in an online format or left with organisations to distribute during their day-to-day role within organisations, e.g. at education events. For example, species identification guides produced for school children as part of the Marinexus project. Also online reports and tools produced for many of the Interreg IV funded projects, including CAMIS and CHARM. However, compared to higher level participative and consultative communication, impact is often harder to ascertain and engagement is usually on a more superficial level. Although not specifically included within this review, use of 'the media' (newspapers, T.V and Radio) has proved an effective means of communicating with the public. The use of web-based press releases and targeted correspondence with journalists has generated valuable publicity. There is still however a need to improve the links between the projects and the press, both in France and the UK.

Across the 10 Interreg IV projects reviewed in the writing of this report, there has been a lack of effective evaluations looking into the different types of communication tools and methods. However, there is a need to evaluate the relative impacts of activities in terms of understanding and behavioural change. These findings should be shared and used to develop effective mechanisms for communication in future projects.

The tools and methods of informative communication used in Interreg IV projects fell into four broad categories:

1. ***Printed resources***, such as written reports, newsletters, leaflets, posters, signage, banners and press articles.
2. ***Websites***, usually providing information about project outputs, web-based tools, updates and information about partners.
3. ***Media***, such as image galleries, training and informative films and audio resources.
4. ***In person (verbal)*** communication such as training workshops, talks and event stands.

Project \ Communication type	Policy makers and government				Industry/Science Community/ Sectoral/NGO				Community/ general public				Schools			
	Printed	Website	Média	In person	Printed	Website	Média	In person	Printed	Website	Média	In person	Printed	Website	Média	In person
Marinexus	●			●		●			●	●	●	●	●	●	●	●
VALMER	●	●	●	●	●	●	●				●					
SETARMS	●	●		●	●	●		●		●						
CRESH	●			●	●		●	●	●	●	●	●				
CHARM 2 & 3	●	●			●	●			●	●		●				
PANACHE		●		●	●	●		●	●	●	●	●	●	●	●	●
LiCCo	●	●		●	●	●		●		●	●	●	●		●	●
OFELIA		●		●		●		●		●		●				●
MERiFIC	●					●										
CAMIS	●	●		●	●	●		●					●			

Table 1: The use of communication tools and methods in Interreg projects and their primary target audience.

For the purposes of this review, target audiences have been divided into four categories. These are:

- *Policy Makers and Government* - Anyone involved in developing, implementing and enforcing policy to manage activities within the English Channel Catchment.
- *Industry/Science Community/Sectoral/NGO* - Anyone, using the marine environment in a professional capacity, studying or protecting marine resources and the marine environment.
- *Community/ General Public* - Anyone engaged in visiting, or living in the vicinity of the English Channel catchment, without a specific, known professional or management interest.
- *Schools* - Anyone within the formal education system from early years to University students.

There is inevitably some overlap between audience groups and many resources will have been developed for use by representatives from more than one of these categories. The following sections provide additional detail about some of the communication methods, summarised in table 1.

Policy Makers and Government

Providing high quality information to policy makers and government agencies is a key step towards influencing effective governance and guiding the sustainable management of Channel resources. Many Interreg IV projects require dissemination of their work at this level. These projects developed a number of tools specifically for communicating with policy makers and stakeholders. The key to success of these tools and methods has been in the understanding of the needs of the audience. In many cases, participative and consultative engagement was undertaken in order to produce effective communication tools. For example, the Integrated Maritime Strategy produced within CAMIS was developed in consultation with a wide variety of stakeholders. The Strategy was developed as a tool to support effective management of the Channel. The project team also developed a 'Cross Channel Atlas'[2], including information about the geography, population, transport, environment, economy, culture, and training and research. The aim of this was to further develop the knowledge of the Channel area, and contribute to the development and planning of initiatives as well as to co-operation schemes shared between both countries, whilst retaining a Channel scale approach. The Cross-Channel Atlas is supporting decision-making and the dissemination of knowledge about the Channel region. It enables different scales of analysis to be conducted, from local to global scale, and investigation of current and future issues.

2 University of Caen Basse-Normandie. *Cross Channel Atlas*. Available at: http://atlas-transmanche.certic.unicaen.fr

CHARM 2 & 3 produced a series of more than 13 technical reports and synthesis papers designed for use by regional and national management authorities on a range of subjects, including marine fish distribution and the diversification of fisheries. VALMER will produce an advice note on the application of the ecosystem service approach in marine governance and a guide on the use of the ecosystem service approach as a tool for stakeholder engagement in marine governance. This method is a common way of communicating technical information to governing bodies and generating useful resources.

Several projects have produced practical tools for environmental managers. For example, waterproof species identification guidebooks and monitoring protocols were produced as part of the Marinexus project for use in the effective management of non-native species.

The most widely used forms of informative communication used to reach this audience was 'in person' and 'web-based' communication with respectively 8 and 7 projects out of the 10 projects reviewed using these methods (see table 1). Projects made use of opportunities to present at existing workshops, conferences and other events. Many also organised promotions events of their own. The majority of projects produced web-based resources aimed at this audience. Several projects (for example, CAMIS, CHARM and VALMER) produced online 'resource libraries' in order to make available a range of tools and reports. None of the projects reviewed used targeted media (video, audio, etc) in order to communicate with this audience. Media can be a powerful communication tool. However identifying an appropriate way to present such resources to this audience can be problematic.

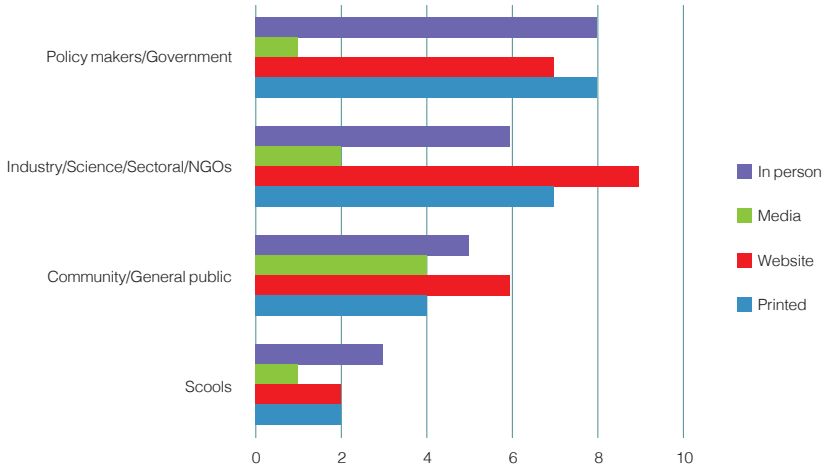


Fig 1: Number of projects using selected informative communication methods targeted at specific audience groups

Industry / Science Community / Sectoral / NGOs

A range of 'Best practice guides' were developed, specifically targeting users groups. For example the CRESH project produced a guidance document to advise the fishing community about issues relating to cuttlefish harvesting. The SETARMS project produced guidance documents for port managers regarding good practice in dredging.

Resources such as the CAMIS 'Cross Channel Atlas' described previously have been developed for industrial, scientific and sectoral audiences, as well as for policy makers and government. The atlas is a good example of a multi audience resource, which integrates information in a single place making it available and widely usable.

In order to effectively communicate research outputs to the science community with integrity, peer reviewed scientific publications are a key communication mechanism. The process is often time consuming and can be slow. However it is well established in the science community and the most important way of

communicating and validating ideas with this audience. Scientists working in several Interreg funded projects (including CRESH, Marinexus, VALMER, CHARM and CAMIS) involving original scientific research have produced and published scientific papers as part of their work with several others 'in press' or in preparation. Nine of the 10 projects reviewed generated web-based resources aimed at this audience, making web resources for this audience the most commonly used form of communication overall (see fig 1).

Community / general public

Communication with the general public or community is otherwise known as 'Public outreach'. Although this form of communication targets the general public, it often engages representatives from other groups that have a personal interest. Therefore, public outreach can be described as 'non audience specific', providing general communication to a range of audiences (e.g., representatives from industry, NGOs and those from a science or policy background). Even when targeting a general audience, it is important to ensure that resources and activities also target specific audiences and it is usually necessary to divide the audience into specific subsets. For example, activities taking place in an aquarium setting will often be developed for a younger audience, but talks given during an evening will often be targeted at a more knowledgeable (if non-specialist) adult audience. In this case, the language and type of resource used will be adapted in order to communicate to this non-specialist group.

Interactive workshop aboard MV Armorique (Brittany Ferries) during "Science on board" events. (© Maud Millet / les Petits Débrouillards Grand Ouest)

The projects reviewed engaged in public awareness, through public events and lectures, website development and the use of other general forms of communication. Examples from the Marinexus project included science talks and a film shown on Brittany Ferries. Science stage-shows were also developed and run in public spaces and at the National Marine Aquarium in Plymouth (UK). The use of this novel method for engaging wider audience to gain greater interest in scientific subjects and issues related to governance of the English Channel were well received. Science displays and interactive workshops also took place on board public ferries and at large public events on both sides of the channel. Marinexus also developed public artworks, including a sculpture in Roscoff (France) and a series of large flags displayed on the waterfront. Such high profile activities helped raise awareness of the project and generated additional interest in web-based information resources.

Several Interreg IV projects made use of existing events as a way of promoting their messages and ensuring good-sized audiences. Examples of these events include World Oceans Day and National Science and Engineering Week in the UK. Incorporating public outreach activities in with these annual, large-scale events was highly attractive to the press and allowed projects to work with an already established audience.

The general public were the main audience for most multimedia resources. For example, videos were produced as part of Marinexus to appeal to this audience. VALMER is also producing a film to explain the ecosystem services approach to a broad audience, including the general public. Seven of the ten projects reviewed specifically targeted members of this audience (see table1) with websites being the most commonly used method.

Schools

Often referred to as 'schools outreach', engagement with young people in a formal learning environment can be an effective method of community engagement, helping to develop and change long-term values and skills for the future. School children often share information and key messages learnt with their peers and family. Engaging effectively with schools can be challenging initially as messages, resources and activities must be incorporated within the school curriculum, considering learning targets. Informative communication is far more effective if combined with participative communication 'learning by doing' and by involving the learner in the development of an effective education program. Combined with educator training and active participation by teachers, printed, web and media resources can be created. The most effective school outreach programs are developed with teachers and provide resources and experiences that enhance their own teaching and learning. Examples are those resources used within the Marinexus and PANACHE programs. Marinexus worked with a variety of school year groups, developing school science clubs, shore visits, science cruises and laboratory sessions.

Engagement with schools has been relatively low throughout the Interreg IV projects reviewed, with only 4 of the 10 projects undertaking work in this area. Reasons for this may be that working with school groups is quite specialist and there are often complexities in integrating communication that also helps teachers develop their required curriculum. It is also often perceived that work targeting school children takes a long time to benefit and influence governance as school children are not yet able to vote and are seldom involved in policy development. This may explain why schools have not been targeted by the majority of projects. It is also possible that school groups will have been targeted within the 'general public' category outside their formal education setting. One method used in a number of Interreg IV projects was for scientists and experts to visit classrooms and take part in workshops. This relatively low-cost method of school engagement can be extremely valuable, presenting a positive impression of the project and providing aspirational experiences for school children.

CONCLUSIONS/WORK LEADS

- Interreg IV projects in general provided information to a wide and diverse audience on both sides of the channel, developing many novel methods of communication to enhance perception and engagement.
- All of the projects reviewed have undertaken Informative communication for policy makers and government agencies, Industry/Science Community/Sectoral/ NGO. Schools were not targeted by all projects. Of those reviewed, three did not target Community/general public audiences and six did not target schools audiences.
- There is a need to evaluate the effectiveness of communication efforts and make the findings publicly available in order to support future work.
- Whilst some projects have made use of multimedia platforms in order to communicate information, this has not been a widely used method compared to other tools. With developments in public use of the internet and the use of new technology to access information, it is likely that in the future, use of video and other media will become increasingly important in order to effectively engage desired audiences.
- Interreg IV projects produced many high quality information resources. However a sense of ownership and participation in the development of these tools is key to ensure good uptake and use.
- The most effective communication methods involved consultation and participation from audiences in order to develop useful, meaningful information provision. It is suggested that this interaction is vital and should be considered at the beginning of all projects where communication is required.

13

Participative and consultative communication on Channel governance and marine ecosystems.

ABSTRACT

Participative and consultative communication, which involves the audience in an activity or social process, has been undertaken to a lower extent than informative communication but it is still an important component of the 10 Interreg IVA projects reviewed. The engagement of various audiences is one of the key requirements for projects funded by Interreg. The review of projects illustrates that there is a great diversity of ways to foster engagement. These range from survey based consultation to knowledge sharing and knowledge co-development, but also by promoting citizen and participative science. In the report, they are presented according to the typology of audiences: Policy Makers and Government; Industry/ Science/Sectoral/NGOs; Community/General Public; and Schools.

KEY WORDS

COMMUNICATION
CONSULTATIVE
ENGAGEMENT
GENERAL PUBLIC
PARTICIPATIVE
POLICY MAKERS
SCHOOLS
STAKEHOLDERS

DESCRIPTION OF KEY FINDINGS

Communication and stakeholder/policy maker involvement are at the heart of all Interreg IV projects and deliverables. Participatory mechanisms for facilitating engagement include traditional tools, for example, surveys, workshops and events, but also other more innovative ways such as citizen science events, regional forums and scenario building exercises. Projects have utilised a broad range of approaches to communicate key messages and project findings, to engage audiences ranging from school groups to key policy makers, NGOs and industry representatives. This report provides an overview of the approaches used within the various Interreg projects. It also provides examples of best practice and lessons learnt in the form of case studies from selected projects.

Participative and consultative communication is defined in this context as the involvement of audiences within an activity or process. By encouraging participation within an aspect of the process, participants are stimulated to contribute to its development and have a stake in the outcome of the process; enabling communication to be more effective. It is worth highlighting that in many cases, project teams sought the participation of fewer participants in order to allow

more meaningful involvement by participants. This also increased the quality of the communication, i.e. whilst reaching fewer people, those engaged gained a higher understanding of the issues raised.

Many projects utilised participative engagement to develop informative communication tools or to deliver their outputs directly. This method is known to increase uptake of information and ensure that these tools are as effective and as user-friendly as possible. In a few cases, participation was also developed as an in-built mechanism to deliver the project. Surveys such as opinion polls or more targeted evaluation work, were conducted to gather information. Although these are one way communication exercises, they are a primary tool used within large consultation processes. Meetings such as workshops or conferences have been organised so as to allow a range of audiences to have a voice in the various projects. This two-way communication can be slightly more restrictive in terms of numbers of participants who can effectively engage with the process. More sophisticated techniques, such as participatory foresight and scenario building, have also been implemented. They are often time-consuming to run because that they require a series of face-to-face exchanges with the same audience and often engage with a range of different audiences when multiple stakeholder groups are concerned. However, they provide rich opportunities for engagement that eventually support and contribute to the policy making process.

The same typology of audiences used to discuss informative communication is used here to present the findings in different contexts. The table below illustrates the interaction with key groups participating in projects in the PEGASEAS cluster.

Sector / Project	Policy makers and government	Industry/ Science/ sectoral/ NGO	Community/ general public	Schools
Marinexus		●	●	●
VALMER	●	●	●	
SETARMS	●	●	●	
CRESH	●	●		
PANACHE	●	●	●	●
CHARM2&3	●	●	●	
LiCCo	●	●		
OFELIA				
MERiFIC	●	●		
CAMIS	●	●		

Table: Interactions between PEGASEAS cluster projects and audience types

Policy makers and government

Participative engagement with policy makers and government provided a key focus for a number of Interreg projects. Workshops, focus groups and working groups were used within the CAMIS, CRESH, Marinexus, VALMER and LiCCo projects, amongst others. These communication efforts demonstrated the importance of two-way discussions and the need for audiences, such as policy makers, to meet face to face with scientists and information providers; in order to better understand the evolving evidence base. The CAMIS project, for example, used the participative process in order to share information and discuss common issues faced by different sectors and their challenges for the future, including the development of a number of policy tools. Marinexus has also engaged policy makers in participatory actions so as to promote marine biodiversity topics within the policy agenda.

A cross-border tool box was developed for the management of Marine Protected Areas (MPAs) within the framework of PANACHE project. As a result of the shared data base and the support of national bodies (Natural England, Joint Nature Conservation Committee, French MPA Agency), MPAs managers will be able to access up to dated information on the status and responsibility of their MPAs (for each species and habitat), and effective measures for monitoring and valuation of the marine ecosystems. This will also give managers the opportunity to enter new data and lessons learnt on the management of MPAs in a friendly way. Effective use and dissemination of work by MPA managers will contribute to the improvement of regional coherence of management plans and result in more focused priorities for MPAs.

The VALMER project has brought together scientists, stakeholders, Local Authority policy makers and managers in order to undertake Ecosystem Service Assessments, supporting marine conservation and planning efforts. This has been achieved through the co-development of a knowledge sharing platform and will be further developed through participatory scenario building exercises to develop visions and to support management strategy evaluation. The project is working with policy makers to identify and signpost opportunities for the direct use of ecosystem services assessment outputs.

A frequently reported difficulty in engaging with policy-makers and government is the rapidly changing political and governance climate, including changes in elected representatives and technical staff which impacts on their engagement. To engage with an externally funded project, managers must be confident that the project is more likely to help them in their work than to create new problems. Researchers are sometimes perceived as threat to their authority in the public arena. Inviting policy makers and managers to commit to the participatory process of a project from the early stage of its development is probably a good way to reduce this risk. Time is also a limiting factor for policy makers and other organisations. While they may like to be involved in a project, they may have to choose between that and other priorities, leaving them with little or no time to become involved.

Industry / Science / Sectoral / NGO

This group is defined as anyone using the marine environment in a professional capacity, involved in studying and/or protecting marine resources and the marine environment. Like policy makers and Government, using participation is more effective than mere one-way information provision, as it ensures that experience and expertise based knowledge is taken on board within the project. It also increases the potential for the project to lead to direct operational changes, for example by changing behaviours, by changing management rules or policy focus, or in promoting new areas for research or monitoring.

The CRESH project interacted with fisherman during a series of meetings. Part of the meetings involved presenting information to industry participants while other parts were more participative. Stakeholder engagement highlighted the major concerns of fishermen but also increased the number of interconnections with industry and allowed dialogue to continue. The CHARM project did the same, but instead engaged with a broader range of interests groups. This project has provided an opportunity for potentially conflicting groups to engage in a positive dialogue. SETARMS engaged port authorities and the dredging industry with the management of sediment dredging and the potential impacts it may have on the environment. Marinexus and other projects engaged with the ferry and maritime transport industry in order to support science and collect data on invasive species, for example. CAMIS engaged with a wide audience from marine industry, NGOs and policy makers through a series of forums that have been furthered by PEGASEAS. These forums could eventually be adopted by local authorities across the Channel, becoming a permanent Channel Forum.

Such engagement is also useful for the scientific community to better share knowledge and experience. The VALMER project has invited seagrass researchers from France to contribute to the on-going evaluation of Gulf of Morbihan. Local managers have been engaged in this process, allowing for a better understanding of science and policy issues by both parties. Other examples from VALMER include (1) the valuation of recreational benefits derived from landscapes and biodiversity in Poole Harbour, (2) the ecosystem services based assessments conducted for the Normand-Breton Gulf site and (3) the evaluation of management strategies for kelp exploitation in the Natural Marine Park of Iroise Sea. In many instances, the projects have been the first to foster communication across disciplines, particularly between natural sciences and social sciences. The projects have provided a suitable context for interactions between policy makers and stakeholders, enabling environmental governance to be discussed from an applied science perspective.

Community / general public

The projects often targeted and linked their participative engagement efforts to existing public events; in order to achieve access to this key group. In many cases participation and engagement with the projects has been enabled by citizen science activities, for example in the case of PANACHE and Marinexus. During these events, citizens were informed about specific topics relating to the marine environment and, through related activities, were asked to record their findings. For example, participants recorded sightings of marine megafauna seen while snorkelling or diving, which contributed directly to their awareness and understanding. The quality and level of understanding provided by this type of engagement is high, however numbers are often lower than traditional communication efforts, for example, through stands/posters and lectures. When these methods are combined at public exhibitions, a particularly high impact has been recorded. Within the VALMER project, sea users such as recreational divers and anglers have also been engaged within the projects' case study sites, helping to input data records, providing a personal understanding of site ecosystems and helping to validate mapping efforts.

The Marinexus bus, an exhibition vehicle equipped with a mobile laboratory for educational events. (© Maud Millet / les Petits Débrouillards Grand Ouest)

The Marinexus project also involved 24 hour 'Bioblitz' events which provided survey events for the public and local schools. Three Bioblitz events were conducted at locations in South Devon and Cornwall. The Marinexus Bus (a mobile laboratory) attended these events. The aim was to engage the public in marine and terrestrial species, by asking them to record species information in a 24 hour period within a specific sampling area. These events were supported by scientists, amateur naturalists and a range of stakeholders. All attendees worked together in order to map species and learn about the conservation of wildlife. Bioblitzes are excellent local awareness raising and community events. The feedback is incredibly positive and numbers engaged are good. They are however time consuming and involve the goodwill of many partners working together.

Regular survey activities involving groups of interested volunteers have also been undertaken by the Marinexus and PANACHE teams (e.g. the Shoresearch or Biolit). This method engages the public over a longer timeframe and eventually brings about strong support for the work being undertaken and an interest in the results.

Public surveys have also been conducted in VALMER in order to evaluate public willingness to support public effort to preserve or restore ecosystem services in different environments. PEGASEAS will also conduct a public survey in order

to gather citizen views about priorities for the environmental governance of the coasts and sea in the Channel Area.

Other communication tools are also considered including the "serious game" software to be created by the PANACHE project. Organizing "science cafés" or public debates about scientific controversies, for example about climate change or biodiversity conservation, is also a way to reach the public beyond those who commonly participate in workshop because of their position as stakeholders.

Schools

As with public participation, engagement with schools requires significant time commitment by project staff; however the level of engagement experienced is often stronger and extremely rewarding. The use of this method was limited in projects, however key examples are reflected in the Marinexus project. These include the marine Bioblitz in England, and attendance at interactive shows and fairs of the 'Marinexus Bus' in France (a travelling laboratory for children to participate by using microscopes and materials to investigate marine life). Involving school students in citizen science projects and recording the distribution of, for example, non-native species, proved to be an extremely valuable communication tool and generated data that could be directly utilised by research scientists. Providing opportunities for youth to learn about science with concrete experience, a form of outreach named "science mediation" in France, is a powerful way to raise interest in such initiatives. The youth forum run by PANACHE is another example of how to interactively engage the young public in marine science.

CONCLUSIONS/WORK LEADS

- Interreg projects have all developed a participatory component in their actions so to ensure some level of engagement from their targeted audiences.
- Consultative and participatory communication is generally acknowledged as a useful way to increase the impact of the project. Engagement is considered to be a key element for better ownership of project outputs thus enhancing their impact on people and policies.
- The most common form of engagement is done by face to face interviews and workshops where findings are presented and outputs discussed. Though the number of people involved is limited, this is often considered as the most effective way to engage in a two-ways communication process within the time and resources limitations of projects.
- Some of the projects have placed participation at the core of their action either to advance public and policy debate on controversial issues; to foster scientific knowledge integration; to gather knowledge from people's experience; or to raise awareness about issues such as threats to the environment and biodiversity conservation.
- Many different techniques have been used including innovative tools such as engaging the schools and communities in participatory and citizen science initiatives through events or networks; participatory assessment of policy issues; and foresight and scenario work. These should be encouraged so to allow for refinement by more testing and to increase dissemination and ownership.

- Vision development, based on participative foresight, is of significant importance to the future governance of the Channel. This could be further taken up under the format of Channel Forums initiated by CAMIS but also at a more local scale or on a sectoral or issue basis.
- Information and communication technology offers many opportunities for innovative ways of creating interactions during the course of the project but also beyond the life of the projects.
- Few Interreg IV projects have used large survey methodologies to gather views and opinions from the public, but it is also a way to raise interest for their products. This is probably explained by the resources required, for an impact that is very difficult to assess.
- Participation by policy-makers or stakeholders can become difficult if perceived as a risk to the formal policy process or a threat to particular interests. It can also easily be spoiled by specific interests. Participation should be carefully designed and managed so as to avoid these risks. Key representatives of targeted audiences should be engaged at the earliest possible stage of designing participatory processes.

GENERAL CONCLUSIONS

The wide range of activities occuring in the Channel region place significant pressures on the marine environment and on the range of ecosystems located within it. The pressures include an increasing need to find greener, renewable energy sources and responses to the potential risks posed by climate change. Further examples include the need to maintain, or even increase, fish stocks at the same time as supporting the regions' commercial fishing industry, and supporting shipping which plays a vital role in the transport of goods and people, both across and along the Channel. Although shipping is key to the socio-economic viability of the Channel, the threat of pollution from ships (and other sources) continues to be a significant concern.

Given the variety of pressures that the Channel ecosystem faces, there is a need to understand marine ecosystem dynamics and how different species and populations interact and respond to change and how the implication of those changes might be managed. In that context, Interreg projects have emphasized the need for accurate information and long-term data, which in turn will help support decision making and provide a baseline against which any future decisions can be measured. The long term data series should be used to assess the habitats and species conservation state allowing to measure the evolution of the good environmental state and to answer the European Directives requirements such as the MFSD. The assessment of the consistency and management of the marine protected areas network (e.g. through dashboard) also requires those data series.

The Interreg projects have identified a number of challenges related to data collection, including the need to develop and share best practice on a cross-Channel scale, to develop bilingual material, and to create shared electronic platforms to store data. The implementation of the INSPIRE Directive principles, particularly with regard to data accessibility and interoperability, within the framework of EU territorial cooperation projects should be further explored. The PEGASEAS project has identified how research conducted by existing projects could help the data challenges. This includes: (1) developing and implementing territorial cooperation projects to enable national authorities, universities and local authorities to exchange best practice and methods of marine data collection, storage and management; and (2) through the EU INTERACT programme, developing a specific working group to examine how information and data produced by Interreg projects could be made more accessible, visible and sustainable, and the extent to which it could feed into EMODnet and other European or national data portals.

There is a clear need for accurate and accessible long-term data, which can help predict the environmental, economic and social impacts of human activities. It is also important to ensure that the appropriate management of both living and non-living Channel resources is supported by strengthening the links between stakeholders, including policy makers, scientists, business representatives, and local populations, and by understanding what has happened in the past in order to develop scenarios for the future. From an economic standpoint, managing change through an integrated approach across different sectors, and bringing together a wide range of stakeholders, could support sustainable development of businesses operating in the Channel region and help maintain the region's economic security. Managing risk, by identifying potential threats in the short and longer terms, is also important to help regional stakeholders to effectively collaborate to plan for the future in ways that will best protect the environment

from human impacts and enable humans to adapt to long-term environmental change. In particular, there is a fundamental need to bridge the gap between projects and policies. This requires a move away from temporary projects which are unable to take into account how the ecology and environment of the region change over time, towards more long-standing arrangements which make use of the growing body of scientific knowledge coming out of Interreg-funded (and other) projects. In this way, the wide range of stakeholders involved in Channel governance can take action to develop effective co-ordination at a regional scale, to ensure sustainable development of the area.

INTERREG projects all included a communication strategy to inform targeted groups about their outcomes. They have provided information to a wide and diverse audience on both sides of the Channel, developing many novel methods of communication to enhance engagement. The materials produced have provided informative communication for policy makers and government agencies, for industry, scientists, specialist sectors and NGOs and, to a lesser extent, schools. Indeed it has been noted that the general public and schools are not always considered in communication efforts despite there being consensus about the importance of raising awareness among the young public, and getting them to engage, through greater knowledge or action, in the conservation of the marine environment. Communicating to the general public about marine governance in the Channel might require a specific agenda to ensure more coherence in messages.

Many projects have engaged their end-users through interviews, meetings or workshops. This engagement has been only consultative in some cases. More rarely, there has been a real process of engagement of end-users to deliver co-constructed outputs. Such rich participatory processes are a key to effective governance but they need to be carefully designed and managed to be successful. There is a recognised need to evaluate the effectiveness of communication efforts and make the findings publicly available in order to support future communication. Potential future work could include a public communication campaign to highlight its importance.

Project partnerships are becoming more and more common in research, in management and between economic sectors and civil society. Partnerships therefore support more effective marine governance in the Channel area. Although they may be limited in time and purpose, projects can be an effective means to initiate new collaboration that will last beyond the lifetime of a project. They should also be considered as a mean to consolidate statutory or voluntary partnerships that deliver sustainability through long term actions. It is important that all attributes of a good quality project be fulfilled and that participation in projects and their realisation is not hampered by administrative complexity or lack of support. Interreg funding of PEGASEAS and its contributing projects has enabled partnerships between different stakeholders to be developed and will provide opportunities to take marine environmental research and more effective governance of the Channel.

THE PARTNERSHIP – AUTHORS

THE PARTNERSHIP

The coordination of this compendium was led by the Agence des aires marines protégées and co-led by Plymouth University. All the partners of the PEGASEAS project provided their inputs and worked towards the development and completion of the compendium.

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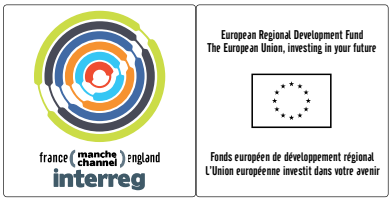
Further information **www.pegaseas.eu**



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