

# 1. ELOISE research and the implementation of EU policy in the coastal zone

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## Abstract

This paper presents a timely review of European coastal research as brought together in the ELOISE programme, at the end of its third phase of funding. The programme is intended to be the response of the EC to the challenge highlighted by the Land-Ocean Interactions in the Coastal Zone research project (LOICZ). Following a review of policy issues in the European coastal zones, and EU initiatives to address them, we assess the actual and potential contributions of research project findings to ELOISE objectives, and to the implementation of EU policy legislation affecting the coast. We identify several discrepancies between the project outputs of the ELOISE programme and the information needs arising from the implementation of the relevant directives. We suggest underlying causes for these discrepancies, and propose new research priorities to mitigate the information gap problem.

## Introduction

The ELOISE (European Land-Ocean Interaction and Shelf Exchange Studies) research programme has been formulated as the contribution of the European Community to the challenges described in the Coastal Zone core project of the International Geosphere-Biosphere Programme (Cadée et al. 1994). It also represents a research contribution to the EU initiative on Integrated Coastal Zone Management. The ELOISE programme has been guided by a Science Plan, which was drafted by a discussion panel of experts in the Roosendaal workshop (Cadée et al. 1994).

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Research funding in the EU is currently undergoing a major reorientation in both funding mechanisms and focus with the launching of the 6<sup>th</sup> Framework. A review of the productivity of the ELOISE programme in previous framework programmes appears timely, particularly where it concerns contributions to policy implementation in the coastal zone.

Two previous Implementation Reports (Nolan et al. 1998; Barthel et al. 1999) describe Phases I and II of ELOISE and the efforts to mould a coherent package of research projects. This paper aims to provide an assessment of the achievements of ELOISE with respect to (i) the key objectives of the cluster as described in the first two implementation reports, and (ii) the contribution of the ELOISE projects to the implementation of EU policies in the coastal zone; in particular with respect to Water Framework Directive, the Habitats Directive, and the Bathing Water Directive. The evaluation is based on an overview of the ELOISE projects and data derived from a brief questionnaire to project coordinators (see annexe 1).

The authors first summarise the vision and objectives of the ELOISE programme, and then review the current policy issues in the European coastal zone, before presenting the output of the ELOISE evaluation. The paper finally concludes with suggested new priorities for research.

## **The ELOISE programme**

### **The ELOISE vision**

The general aim of ELOISE, as described in the ELOISE Science Plan (Cadée et al. 1994), is “to develop a coherent European [coastal zone] research programme of high scientific value and relevance to human society”. As such, it constitutes the European contribution to the Land-Ocean Interactions in the Coastal Zone (LOICZ) project, a core project of the IGBP Global Change Programme established in 1993, designed to elucidate issues concerning the role of coastal areas in the global climate system, and the potential response of coastal systems to all sources of global change (Cadée et al. 1994). More specific objectives, agreed during the Rosendaal workshop, which brought together European scientists and representatives of the European Commission and LOICZ in 1994, are also described in the Science Plan: (i) to determine the role of coastal seas in land-ocean interactions (including shelf-sea interactions along the shelf edge) in the perspective of global change (*Global Cycles*); (ii) to determine the regional and global consequences of human impact through pollution, eutrophication, and physical disturbance on land-ocean interactions in the coastal zone (*Human Impacts*); (iii) to formulate a strategic approach to the management of sustainable coastal zone resource use and development, and to investigate information, policy and market failures that hamper sustainable coastal resources management (*Socio-economic Development*); (iv) to determine which methodology – including technologies, data management and modelling – and instrumentation is needed to implement ELOISE (*Infrastructure and Implementation*). These sub-objectives determine the four Research Foci of the ELOISE programme.

The programme is intended to contribute to other activities of the Commission in the fields of integrated coastal zone management and of spatial planning. The means to realise this contribution, however, remain unspecified, other than the topics of the four ELOISE foci, used to bring different research projects together.

## **Programme**

The complete ELOISE programme consists of a considerable number of research projects in the 4<sup>th</sup> and 5<sup>th</sup> framework (29 in total 1999, about 53 by the end of FP5) plus a number of additional activities and accompanying measures. An important activity has been the annual ELOISE Scientific Conferences, of which 5 have been organised so far.

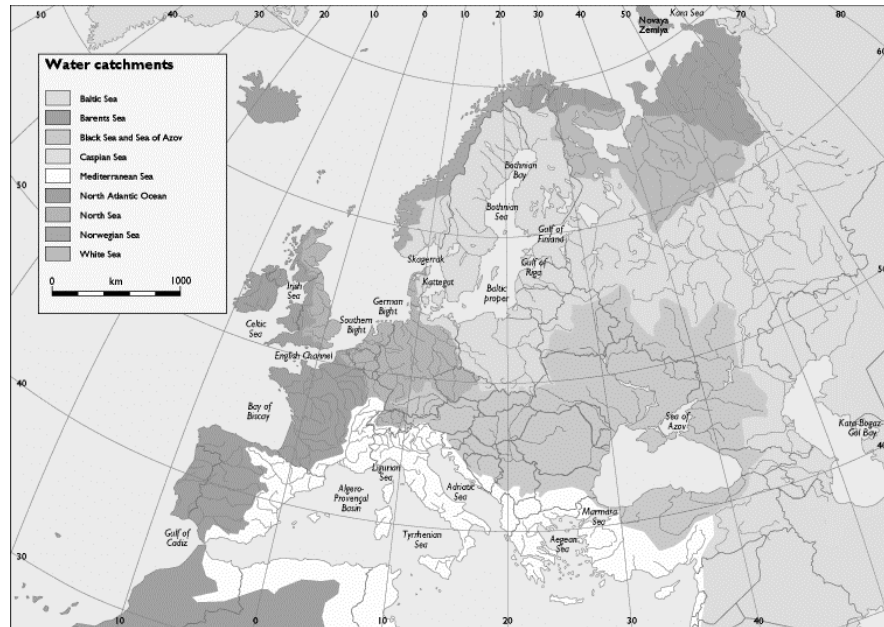
The ELOISE programme was jointly implemented in the fourth framework programme by the MAST and the ENVIRONMENT AND CLIMATE Programmes and continued under FP5 in Thematic Programme 4 (Energy, Environment and Sustainable Development) in the key actions "Sustainable marine ecosystems" and "Sustainable Management and Quality of Water".

In addition to the grouping of projects in four foci, ELOISE research is coordinated through cross-project working groups, which approximately match with the foci: (1) biogeochemical cycles and fluxes; (2) ecosystem structures and functioning, human impacts; (3) modelling and data management; and (4) coastal zone management and integration of natural and socio-economic science. The working groups identified the remaining gaps after phases I and II (Barthel et al. 1999). One of the most important aspects was the lack of socio-economic research. It was identified as a priority for FP5, along with the need to "identify and assess societal and policy responses for sustainable management of coastal zones and their resources.

## **Policy issues in the European coastal zone**

### **The current situation**

The main environmental concerns in the European coastal areas were identified in the European Commission Communication on Integrated Coastal Zone management strategy, and later described in more details in the DOBRIS assessment report (Stanners and Bourdeau 2001). The primary concerns can be categorised as: habitat and biodiversity loss, including fisheries; water quality; sea level rise and coastal erosion. Behind these environmental changes are socio-economic and physical drivers, investigated by Turner et al. (1998b) and also reviewed in the DOBRIS report. These include climate-related pressures, pressures resulting from anthropogenic actions, related to urbanisation and demographic changes, tourism, port and harbour development, agricultural intensification, industrial development, marine aggregates extraction, and fisheries and aquaculture.



**Fig. 1.** Europe's seas with subsidiary seas and bays and catchments. (From Stanners and Bourdeau 1991)

Given geographical and cultural differences, the priorities clearly vary across European coastal regions (Fig. 1). The Dobris report provides an overview of the regional differences in the main environmental concerns in maritime and coastal zones. Table 1 extracts from the literature and summarises the main issues and their spatial relevance, as well as the drivers behind change, and policy responses at the European level.

Some of the environmental problems, such as toxic contamination, are widespread across Europe, others such as oil spill damages, and bacteriological quality issues are more localised. Eutrophication affects most seas, particularly the North, Irish, Baltic and Black Seas, whereas it is more localised in the Mediterranean (Adriatic Sea; Ærteberg et al. 2001) and the North Atlantic. The report concludes that the Mediterranean, Baltic, Black and North seas are the seas receiving consistently the highest loads of land-based or riverine contaminants. The northern seas (White, Barents and Norwegian seas) consistently receive small loads of contaminants. This was largely confirmed by the foresight exercise reported in Nunneri et al. (this volume).

Most environmental problems identified by leading experts have reached the attention of policy makers and have provoked a policy response, a few examples are included in Table 2. The European Union has produced a number of initiatives affecting the coastal zone, including specific directives. This policy regime is reviewed in more detail in the next section.

**Table 1.** Major environmental issues in European coastal waters and associated drivers and responses at the European level (adapted from Stanners and Bourdeau 1991)

Environmental Issues (Impacts)	Drivers	Pressures	Spatial Extent	Response at European level
Eutrophication	Agriculture, Urbanisation, Industry	Diffuse pollution (N,P), waste emissions	Most seas. Relatively less important in North Atlantic Ocean, Norwegian, Barents and White seas	Water Framework Directive, Nitrates Directive, Urban Waste Water Directive
Overfishing, loss of biodiversity	Fisheries, population growth	Fish catches, fishing gear	All seas. Especially North Sea, Wadden Sea, Black Sea, Barent, North sea	Common Fisheries Policy
Deterioration of bacteriological quality, health impacts	Agriculture, urbanisation, industry	Waste emissions, agricultural runoff	Mediterranean, Black Sea, North sea	Bathing Directive
Habitat loss	Agriculture, Tourism, Climate Change (atmospheric emissions)	Habitat conversion (e.g. drainage), ports and touristic development, coastal erosion, sea level rise	European regions with high tourism and intensive agriculture, low lying coasts and deltas (sea level rise)	Birds and Habitats Directives
Toxic contamination (loss of biodiversity, health risk)	Industry, urbanisation, transport	Emissions of contaminants (heavy metals, synthetic organic compounds), contaminated sediments	All seas, especially around major European estuaries (less Barent and Norwegian sea)	Water Framework Directive, dangerous substances Directive, Seveso II Directive, IPPC Directive
Oil spill related ecological impacts	Maritime transport	Dumping, shipping accidents	Mediterranean, Black, Caspian, Norwegian, North sea	Regulation on prohibition of transport of heavy oils in single-hulled tankers; Erika I and II legislation packages.

## **EU policy in the coastal zone**

In effect, most EU policies and instruments have some impact on the coastal zone. This section broadly describes these interactions before selecting the main areas of recent policy initiatives, which have most relevance to the evaluation of ELOISE projects.

A review of the influence of European policies on the evolution of coastal zones (IEEP 1999) concluded that EU policies have had far ranging consequences on European coasts. Policies encompassing significant drivers, such as the Common Agricultural Policy and Common fisheries policy indirectly influence coastal environments. The Structural and Cohesion Policy fund has also had a significant impact through the targeting of funds towards less developed coastal regions. This section describes EU policy initiatives in the Coastal Zone before focusing on specific legislation, which have had a particular influence on the coast.

### ***EU initiatives in the coastal zone***

EU activities concerning the coastal zone were initiated through international conventions covering its regional seas (Fig. 2). During the 1970s, the EU became for example a signatory of the Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (1972); the Paris Convention for Prevention of Marine Pollution from Land-Based Sources and the Helsinki Convention for the protection of the Marine Environment of the Baltic Sea (1974); and the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution (1976). The Oslo and Paris conventions later merged into the Convention for the Protection of the Marine Environment of the northeast Atlantic (OSPAR) in 1992, while the Helsinki and Barcelona conventions were revised in 1992 and 1995 respectively. Integration of policies progressed in the 1980s, with the adoption of a European Coastal Charter in 1983.

It wasn't until 1992, however, with the new environmental remit brought by the Maastricht treaty, that a Council resolution calling for the development of a European strategy on coastal zones was adopted. A three-year demonstration programme on integrated coastal zone management lead to a European Commission Communication entitled "Towards a European Integrated Coastal Zone Management (ICZM) Strategy. General principles and Policy Options. A reflection Paper" (EC 1999), and a proposal for a European Parliament and Council Recommendation concerning the implementation of Integrated Coastal Zone Management in Europe (COM/00/545 of 8 Sept. 2000). The European Parliament and Council adopted this recommendation in 2002 (2002/413/EC). The ICZM demonstration programme generated some agreed general principles for good management of coastal zones (Box 1).

The Strategy defines Integrated Coastal Zone Management (ICZM) as a "dynamic, continuous and iterative process designed to promote sustainable management of coastal zones" (EC 1999). Following on from the conclusions of the demonstration programme, the ICZM Strategy recommends to: (i) promote ICZM within the member States and at the "Regional Seas" level; (ii) make EU policies compatible with ICZM; (iii) promote dialogue between European Coastal Stake-

holders; (iv) develop best ICZM practice; (v) generate information and knowledge about the coastal zone; (vi) disseminate information and raise public awareness.

**Box 1.** General principles for good management of coastal zones (EC 1999)

- Take a wide-ranging perspective
- Build on an understanding of specific conditions in the area of interest
- Work with natural processes
- Ensure that decisions taken today do not foreclose options for the future
- Use participatory planning to develop consensus
- Ensure the support and involvement of all relevant administrative bodies
- Use a combination of instruments

The Strategy also underlines that because of the diverse physical, economic, cultural and institutional characteristics of Member States, the response adopted should be flexible and problem-oriented. The philosophy underpinning the strategy is one of governance by partnership with civil society, with the EU providing leadership and guidance to support implementation at other levels. Where relevant, the Strategy builds on existing instruments and programmes, which often have not been necessarily designed with coastal zones in mind.

The Recommendation of the European Parliament and of the Council resulting from the European Commission's communication recommends that Member States take a strategic approach to the management of their coastal zones based on: (i) the protection of the coastal environment, following an ecosystem-based approach; (ii) the recognition of the threats of climate change and sea level rise to coastal zones; (iii) appropriate and ecologically responsible measures; (iv) sustainable economic opportunities and employment options; (v) a functional social and cultural system in local communities; (vi) adequate accessible land for the public; (vii) the maintenance or promotion of cohesion in the case of remote coastal communities; (viii) improved coordination of the actions of all relevant authorities, both at sea and on land. Member States should conduct or update an overall stocktaking to analyse which major actors, laws and institutions influence the management of their coastal zone. Based on the result of this stock-taking exercise, Member States should develop a national strategy, or where appropriate several strategies, following the principles of ICZM as described in the European Strategy. These strategies might be specific to the coastal zone, or be part of a geographically broader programme for promoting integrated management of a wider area, and should include a number of steps (Box 2).

The Commission is to review this Recommendation within 55 months following the date of its adoption and submit an evaluation report accompanied if appropriate by a proposal for further Community action.

**Box 2.** National Strategies for ICZM (OJEC L 14, pp 24-27)

National strategies should:

- Identify the roles of the different administrative actors whose competence includes activities or resources related to the coastal zone, as well as mechanisms for their coordination;
- Identify the appropriate mix of instruments for implementation of ICZM principles.

In particular Member States should consider:

- Develop national strategic plans for the coast;
- Include land purchase mechanisms and declarations of public domain;
- Develop contractual or voluntary agreements with coastal zone users;
- Harness economic and fiscal incentives;
- Work through regional development mechanisms;
- Develop or maintain national/regional/local legislation or policies and programmes addressing marine and terrestrial areas together;
- Identify measures to promote bottom-up initiatives where needed, and examine how to make best use of existing financing mechanisms both at European and national levels;
- Identify mechanisms to ensure full and coordinated implementation and application of Community legislation and policies that have an impact on coastal areas;
- Include adequate systems for monitoring and disseminating information to the public about their coastal zone;
- Determine how appropriate national training and education programmes can support implementation of ICZM principles in the coastal zone.

***EU legislation in the coastal zone***

Although there is no specific European legislation concerning the coastal zone, a number of directives have had an indirect impact (Fig. 2). For example, the Sewage Sludge and the Landfill Directives control activities that might lead to deterioration of coastal waters. The Environmental Impact Assessment Directive (EIA), and the Strategic Environmental Assessment (SEA) Directive require that significant environmental impacts of projects (EIA) and policies, plans and programmes (SEA) are identified and assessed and taken into account in the decision-making process to which the public can participate. This applies to projects and policies affecting the coastal zone and can therefore be expected to have a significant impact. In the most recent phase of EU legislation, two Directives have had or are expected to have very significant impacts on the coast, and they are described here in more detail.

***The WFD and daughter directives***

The Water Framework Directive is one of the few examples of policy response addressing water quality issues at the catchment scale. Adopted in June 2000, it integrates previously existing water legislation, updates existing directives according to new scientific knowledge, and strengthens existing legal obligations to ensure better compliance (Kaika and Page 2002). Earlier legislation on water (see



Fig. 2) had gone through two distinct phases (Kallis and Butler 2001, Kaika and Page 2002). The first one (1975-1987) was primarily concerned with public health, and setting standards for water quality for different uses (drinking, fishing, shellfish and bathing). In the second phase (1988-1996), priorities shifted towards pollution control, in particular for urban wastewater and agricultural run-off, with an effort to set emission limit values for different pollutants in water bodies. The third phase, which saw the birth of the Water Framework Directive, came after a state of the environment report showed that these policies had been effective in terms of reducing point source pollution, but that diffuse pollution remained a major problem (EEA 1998, Kaika et al. 2002). The new Directive is an attempt at more integrated and sustainable water management, expanding the scope of water protection for the first time to all waters, from surface water to ground water, and from freshwater ecosystems to estuaries and coastal waters. It encapsulates the new directions in European environmental policy institutionalised in the Maastricht treaty in 1992 and further reinforced by the Amsterdam treaty in 1997. The Member States agreed to sustainable development as a Community policy, to the Community being responsible for environmental policy within the limits of subsidiarity, and to the integration of environmental policy into other community policies. More specifically the precautionary principle, the principle of prevention of pollution at source, and the polluter-pays principle were all adopted (Barth and Fawell 2001).

Kallis and Butler (2001) point out that the directive introduces both new goals, and new means of achieving them (new organisational framework, and new measures). The overall goal is a “good” and non-deteriorating “status for all waters (surface, underground and coastal). This includes a “good” ecological and chemical quality status for surface water. Ecological status involves criteria for assessment divided into biological, hydromorphological and supporting physico-elements for rivers, lakes, transitional and “heavily modified” water bodies. For groundwater, the goal is a “good status” defined in terms of chemical and quantitative properties. A principle of “no direct discharges” to groundwater is also established, with some exemptions (e.g. mining). In addition, “protected zones”, including areas currently protected by European legislation such as the Habitats Directive, should also be established, with higher quality objectives.

Organisation-wise, measures to achieve the new goals will be co-ordinated at the level of river basin districts, i.e. hydrological units and not political boundaries. Authorities should set up River Basin Management Plans, to be reviewed every 6 years, based on identifying river basin characteristics, assessing pressures and impacts on water bodies, and drawing on an economic analysis of water uses within the catchment. Monitoring is also an essential component, determining the necessity for additional measures. Finally, an important innovation introduced by the Directive is to widen participation in water policy-making: river basin management plans should involve extensive consultation and public access to information.

Following the Driver Pressure State Impact Response terminology (Turner et al. 1998a), the main “response” element of the directive is the programme of measures. “Basic” measures should be incorporated in every river basin management plan, at a minimum including those required to implement other EU legisla-

tion for the protection of water (see Fig. 2). If this doesn't suffice to achieve good water status, additional measures should be introduced, following a "combined approach", which brings together two existing strategies of Environmental Quality Standards (EQS – the legal upper limits of pollutant concentrations in water bodies) and Emission Limit Values (EVL – the upper limits of pollutant emissions into the environment). ELVs are first applied, through the introduction of best available technology for point source pollution, or best environmental practice for diffuse pollution. If this is not enough to reach EQSs, more stringent ELVs must then be applied in an iterative process. Furthermore, Member States should follow the principle of full cost recovery of water services, ensuring that water pricing policies are in place to "provide adequate incentives" for efficient use of water.

Although it does not target coastal zones specifically, the Directive does cover coastal water quality in its objective for good quality status, and provides a good example of integrated catchment management, addressing the issue of diffuse pollution of coastal waters.

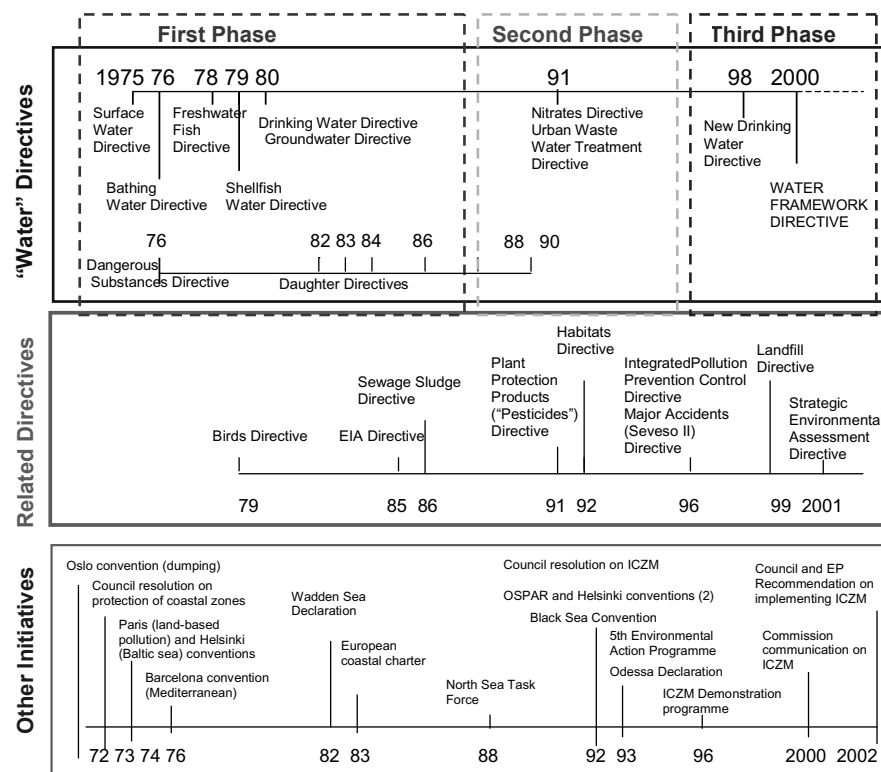


Fig. 2. EU initiatives having an effect on water and coastal zones

### ***The Habitat and Birds Directives***

As a signatory of the 1992 United Nations Convention on Biological Diversity, the EU is obliged under Article 6 to draw up a strategy to predict, prevent and tackle at source biodiversity loss in Western Europe. The two most important planks of EU biodiversity policy upon which the current Strategy builds are the 1979 Birds Directive and the 1992 Habitats Directive (Ledoux et al. 2000). Together, they aim to create a network of designated areas (Natura 2000) to protect habitats and species of community-wide importance, on a biogeographical basis<sup>2</sup>. It is, in effect, a “no-net-loss” policy, in so far as it requires all Natura 2000 areas to be protected from deterioration and damage.

The Wild Birds Directive, adopted in 1979, requires Member States to maintain populations of wild birds, to protect their habitats, to regulate hunting and trading, and to prohibit certain methods of killing. The establishment of special protected areas (SPAs) is a central component of the philosophy of the Directive. The Directive, as subsequently revised on a number of occasions since 1979, identifies a priority list of over 170 birds. Under Article 4, Member States are required to identify “the most suitable territories” (SPAs) under their jurisdiction in order to protect these species, and do all they can to ensure that the SPAs are not degraded, polluted or otherwise disturbed. Implementation of the Directive has, however, been extremely poor (Wils 1994).

The Habitats Directive was intended to remedy some of the deficiencies of the Birds Directive and extend the level of protection to a wider range of species and habitat types. The Directive aims to achieve a “favourable conservation status” for a long list of habitat types and species included in two extensive lists of habitat types (Annex I) and species (Annex II) of Community importance. The ecological term ‘favourable conservation status’ is defined with reference to such factors as the amount of habitat remaining, population dynamics and trends in the natural range of species. To these ends, Member States are required to identify and protect Special Areas of Conservation (SACs) in which the necessary steps are taken to ensure that the priority habitats and species therein are maintained at, or restored to, a favourable conservation status.

The Member States are required to take all appropriate steps to avoid the deterioration of those habitats and species for which protection is required. Under articles 6(3), a plan or project likely to have a significant effect on a Natura 2000 site must undergo assessment to determine whether it would damage the nature conservation interest of the site. If the plan or project is thought to impose a significant threat, it can only go ahead if (1) there is *no alternative solution*; (2) its implementation is of *overriding public interest*; (3) member states must provide compensatory measures which may include habitat restoration or recreation of the same type of habitat on the same site or elsewhere. Where the site hosts species and/or habitats listed as a priority by the Directive, under Article 6(4), development is permitted only on the grounds of: (1) human health and public safety; (2) “beneficial consequences of primary importance for the environment”; (3) (subject

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<sup>2</sup> The selection of designated areas is not done on a country-by-country basis, but takes into account their biogeographic specificities. Six biogeographic regions were identified within EU countries.

to an opinion by the Commission), “other imperative reasons of overriding public interest.”

A significant number of habitat types listed in Annex II of the Directive are located in the coastal fringe (dunes, mud flats, coastal lagoons, coastal freshwater wetlands, etc.). In addition, the Habitats Directive specifically establishes Marine Special Areas of Conservation. The Habitats Directive can therefore be expected to have a major impact on the coast. In its strict interpretation, the compensation requirement for displaced habitats also applies to habitats lost through natural, or semi-natural causes, such as sea level rise and coastal erosion, which is likely to have far reaching consequences given the current climate change predictions. In the UK, for example, relevant authorities are anticipating this need for compensation and are planning ahead by recreating coastal habitats through managed realignment – realigning existing hard defences further inland thereby recreating intertidal habitats (Ledoux et al. 2003).

## **Research support for policy implementation: The ELOISE contribution**

In this section, we present an evaluation of the ELOISE cluster contribution to EU policy implementation. All coordinators of past and ongoing ELOISE projects were contacted to assess the direct and indirect relevance of current and recent coastal research for European policy and management (57 projects in total). 7 additional projects outside the ELOISE cluster were also selected for inclusion in the analysis to avoid identifying gaps that were covered outside this programme. The research objectives of the projects published on the CORDIS database were compared with the foci identified within ELOISE as well as with policy objectives in the EU directives relevant to European coastal waters identified above and summarised in Table 2.

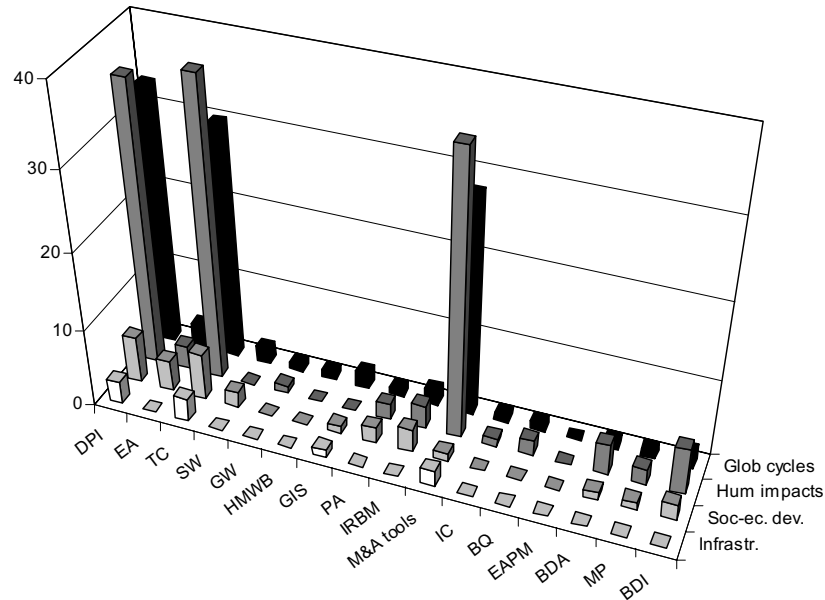
The results were compiled in a spreadsheet that was sent to all coordinators. Coordinators were asked to check whether they agreed with the way the objectives of their project were assessed, and update them if necessary. They were also asked to provide in their own words 3 key points where they thought their research was contributing to future coastal zone management and policy. A reminder was sent to coordinators before the deadline. Overall, 18 replies were received out of the sixty-two projects identified, which represents a response rate of 29%, which is close to the average response rate in postal surveys. The analysis of the spreadsheet relies on the data updated by coordinators for the 18 replies received, and on our own assessment of the research objectives for the remainder of the projects. For the sake of transparency, we list the names of projects that provided a direct input in the survey (Appendix 1).

The results of the survey are presented in Fig. 3. The figure shows quite clearly that the majority of projects address the global cycles and human impacts ELOISE foci. Although one can expect some progress since the last evaluation, there are still a minority of projects looking at practical approaches for sustainable coastal zone resource use and development (socio-economic development) and the methodology and instrumentation need to implement ELOISE (infrastructure).

**Table 2.** The four ELOISE foci and major policy components of the three relevant EU-directives

ELOISE foci/topics:	Global Cycles Human Impacts Socio-Economic Development Infrastructure
Water framework directive objectives:	Drivers, Pressures and Impacts Economic Analysis GQS: transitional and coastal waters GQS: surface waters GQS: groundwater Heavily modified water bodies Geographical information systems Participatory approaches Integrated River Basin Management Monitoring and assessment tools Intercalibration
Bathing water directive:	Bacteriological quality assessment Economic analysis of policy measures
Habitat directive objectives:	Biodiversity assessment Management plans/policy measures Impact of activities on biodiversity

ELOISE related projects are quite narrowly focused in terms of their contribution to the implementation of European policy. The majority of projects contribute to identifying drivers and pressures of environmental change, and to developing monitoring and assessment tools. This is a positive point as identifying the sources of change is key to developing policy instruments for environmental protection. Monitoring is also a core element of the Water Framework Directive. It is not surprising that a very large majority of projects contribute to identifying good quality status in transitional and coastal waters, since the main focus of ELOISE is on coastal issues. Surface water, groundwater, and heavily modified water body issues are probably covered in other clusters or research programmes. However, it is quite clear from the results that not enough research is devoted to economic analysis, participatory approaches and integrated management. Other key tools like GIS and intercalibration methods are also lacking. Not much research seems to address bacteriological water quality issues, and given the forthcoming revision of the bathing water directive, this is likely to need further attention. Finally, not enough projects were identified as contributing directly to the implementation of the Habitats Directive, especially regarding management issues. It is probable that a number of biodiversity projects were funded under other programmes, but given the likely impact of the Habitats Directive in the coastal zone; ELOISE should perhaps play a greater role in this area.



**Fig. 3.** Allocation of the number of projects per ELOISE focus and policy objectives of EU directives. The four ELOISE foci are global cycles, human impacts, socio-economic development and infrastructure. Further legend: Water Framework Directive objectives: DPI: drivers, pressures and impacts; EA: economic analysis; TC: good quality status of transitional and coastal waters; SW: good quality status of surface waters; GW: good quality status of groundwater; HMWB: heavily modified water bodies; GIS: geographical information systems; PA: participatory approaches; IRBM: integrated river basin management; M&A tools: monitoring and assessment tools; IC: Intercalibration. Bathing Water Directive objectives: BQ: Bacteriological quality assessment; EAPM: economic analysis of policy measures. Habitat Directive objectives: BDA: biodiversity assessment; MP: management plans/policy measures; BDI: impact of environmental change and human activities on biodiversity.

In interpreting these results, it is important to keep in mind that this evaluation inevitably contained some element of subjective interpretation – either from the project coordinators, or from the authors of this report. A good understanding of the meaning and scope of the ELOISE foci and EU policy objectives is also assumed (e.g. the contents of the infrastructure focus might not have been clear to all). Nevertheless, the sharp contrast and clarity of the results mean that while recognising that there is some degree of subjectivity, the overall result is probably robust.

The results of this survey also need to be viewed alongside a review of the published papers produced by ELOISE scientists, laid down in Chapter 2 (Herman et al). This review highlights the fact that significant advances in individual scientific topics have been made but that a common scientific infrastructure (including databases) has yet to be established. Such an infrastructure would form the necessary

foundation for future applications of applied research in the context of EU policy and legislation.

## **New priorities**

Research into coastal zone issues is vital to implementing EU policy. The EU ICZM strategy includes a requirement to generate information and knowledge about the coastal zone. While, along with the authors of the previous ELOISE evaluations, we recognise that research funding has been largely based on expert-based judgement of project quality and only to a limited extent on the existing science plan, future research should have a stronger focus on policy implementation needs.

In terms of areas of policy, we have identified that the bulk of the research contributes to specific areas of implementation of the Water Framework Directive, e.g. the understanding of drivers, pressures and impacts (see also Herman et al. Chapter 2). The Directive is an ambitious piece of legislation, and the research needs are indeed huge (e.g. Ledoux and Burgess 2002). There is some basis for recommending however, that some research funds are also targeted towards implementation of the Bathing Water Directive, especially in the light of the ongoing revision, and of the Habitats Directive with a specific focus on the coastal zone, where ecosystems are very dynamic and management issues likely to be significant.

As far as specific research tools and methodologies are concerned, more attention needs to be placed on translating and integrating natural sciences into decision-making processes. Intercalibration, Geographical Information Systems (GIS), economic analysis, participatory approaches and integrated assessment methodologies all need to be developed further to achieve this integration, and equip managers with the right decision tools to face future coastal zone management challenges. The papers selected for this workshop provide examples of application and an opportunity to assess and discuss opportunities for further development.

For the shorter-term needs of European coastal research, we conclude from the above that:

1. A better orchestration of the investment of resources is required to meet implementation research needs. A change in evaluation in funding and evaluation procedures might be necessary. The Framework Programme 6 is an opportunity to bring these changes about;
2. For a successful implementation of the Water Framework Directive and other European legislation, integration of natural sciences, economic analysis and participatory approaches, for example within the framework of integrated assessment requires further attention (Turner, 2000). This needs willingness and ability to operate across monodisciplinary boundaries at individual and institutional level, but also time and resources. European centres and networks where longer-term interdisciplinary research effort into coastal science and management is institutionalised can play a key role. Again, FP6 instruments and the

new European Research Area can be useful in supporting and encouraging the appropriate research structures;

3. The catchment component of 'catchment-coast interactions', as identified in the LOICZ science plan and adopted by ELOISE, has lagged behind and should receive a stronger focus, within the perspective of regional seas;
4. Global change is the backdrop of the whole LOICZ programme and consequently of ELOISE. Its implications for the understanding and management of European coastal seas, however, remain largely unaddressed.

We argue that a new vision for the longer-term development of the European coasts is needed. Reaching the goals of the WFD, namely the achievement of a good ecological station for all European waters, will require mutual interplay of policy makers, coastal management and the coastal science community, building on cooperation, multidisciplinary and a better understanding of regional seas and societal needs.

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## Appendix 1: List of projects that provided input in the survey

Project Acronym	Full title of the project	Project Coordinator	Project duration
ELOISE Projects			
COSA	Costal Sands as Biocatalytical Filters	Dr. Markus Huettel	2002-05
DANUBS	Nutrient Management in the Danube Basin and its impact on the Black Sea	Prof. D. Helmut Kroiss	2001-05
DOMAINE	Dissolved organic matter (DOM) in coastal ecosystems: transport, dynamics and environmental impacts	Prof. Morten Søndergaard	2001-03
EROS-21	Biogeochemical Interactions between the Danube River and the North-Western Black Sea.	Dr. Jean-Marie Martin	1996-98
EUROCAT	European Catchments - Catchments changes and their impact on the coast	Prof. Willem Salomons	2001-04
M&MS	Monitoring & Managing of European seagrass beds	Ass. Prof. Jens Borum	2001-04
MEAD	Marine Effects of Atmospheric Deposition	Prof. Tim Jickells	2000-03
MERCYMS	An integrated approach to assess the mercury cycling in the Mediterranean basin	Prof. Nicola Pirrone	2003-05
MOLTEN	Monitoring long-term trends in eutrophication and nutrients in the coastal zone: Creation of guidelines for the evaluation of background conditions, anthropogenic influence and recovery	Dr. Daniel Conley	2001-04
NTAP	Nutrient dynamics mediated through turbulence and plankton interactions	Dr. Celia Marrase	2001-04
PROTECT	PRediction Of The Erosion of Cliffed Terrains	Dr. Jonathan Busby	2001-04
SIGNAL	Significance of External / Anthropogenic Nitrogen for Central Baltic Sea N-Cycling	Dr. Maren Voss	2000-03
STREAMES	Human effects on nutrient cycling in fluvial ecosystems: Development of an Expert System to assess stream water quality management at reach scale.	Dr. Francesc Sabater	2001-04
TIDE	Tidal Inlets Dynamics and Environment	Dr. Marco Marani	2002-05

Non-ELOISE projects			
BIOBS	Evaluation of coastal pollution status and bioindicators for the Black Sea	James Wilson	2002-05
DINAS-COAST	Dynamic and interactive assessment of national, regional and global vulnerability of coastal zones to climate change and sea-level rise	Richard Klein	2001-04
EUROSION	A European initiative for sustainable coastal erosion management	Stephane Lombardo	2002-03
EVALUWET	European valuation and assessment tools supporting wetland ecosystem legislation	Ed Maltby	2001-04



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