Indicators Guidelines

To adopt an indicators-based approach to evaluate coastal sustainable development

DEDUCE consortium

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DÉVELOPPEMENT DURABLE
DES ZONES CÔTIÈRES EUROPÉENNES

PROJET COFINANCE
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SUMMARY

The Indicators Guidelines (IG) report contains the most significant conclusions, results and products obtained from the development of the INTERREG IIIC South DEDUCE project during the period 2004-2007.

The general goal of the project is to test the set of indicators proposed in 2003 by the EU Working Group on Indicators and Data at various scales and levels of governance. This covers European level, the member states, regional and local authorities.

The calculation process developed by the DEDUCE partners, pursues two objectives:

- To propose a **common methodological framework**,
- To illustrate the **relevance and usefulness of the indicators** approach.

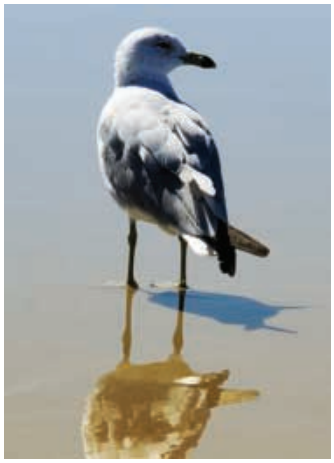
The IG is intended to demonstrate, that the current coastal policy framework does not define a **consistent and common approach to the measurement and evaluation of** the levels of **sustainability in EU coastal and maritime** zones (Chapter 2). Despite this, some emerging and existing integrated policies, such as the EU Green Paper on Maritime Policy and the European Strategy for Sustainable Development do consider this approach. Only a few existing policies (e.g. EU Water Framework Directive) define the indicators and thresholds of acceptance in detail.

The IG presents and explains the DEDUCE **proposal for a methodological framework for indicators** of sustainable development for coastal and maritime zones (Chapter 3). In so doing, it addresses this lack of common approach. This proposal is structured into three main components corresponding to the following three main questions:

- **How can we calculate indicators according to a common methodology?**
  45 measurements have a standard format that is suitable for all EU regions and countries,
- **What are the main problems and obstacles for the calculation process?**
  180 reports on different scales describe the difficulties, strengths and weaknesses in obtaining and handling data for a particular measurement,
- **How can we start integrating results and conclusions and what is the outcome of the calculation process?**
  25 fact sheets demonstrate the benefits of a comparative analysis between and across different geographical levels.

These and other complementary products from the DEDUCE project are available on the website www.deduce.eu.

The methodological development also includes a pragmatic view for the implementation of the INSPIRE Directive for the coastal and maritime zones using a common spatial data infrastructure. The difficulties and barriers to developing this infrastructure are analysed from responses to a questionnaire regarding existing GIS applications for the coast from the DEDUCE partners.




Arguments in support of the **usefulness of the methodological framework for indicators of sustainable development** in coastal and maritime zones are discussed along the following lines (Chapter 4):

- The usefulness of evaluating **planning and management** in the coastal and maritime zone,
- The usefulness of integrating and **co-ordinating analysis and research** in the coastal and maritime zone,
- The possibility of improving the **visibility and perception** of the coastal and maritime zone.

The IG also includes examples of the practical application of this methodological framework by means of seven experiences from EU to local level. The seven fact sheets are structured according to the seven goals of the EU ICZM Recommendation (2002). They include the results of calculations, the integrated analysis and practical utilities of the indicators framework application (Chapter 5).

The last chapter of the IG report (Chapter 6) summarises:

- The final **evaluation of the calculation process** developed by DEDUCE partners,
- The **recommendations for improving the set** of indicators proposed by the EU Working Group on Indicators and Data, based on 6 National Workshops and the Technical Conference held in Tarragona (March 2007),
- The **further work needed** to complete the indicators framework approach in order to build a consistent maritime information system.

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1 INTRODUCTION

1.1 DEDUCE BACKGROUND AND CONTEXT

The coastal system is very **complex**. On one hand, the coastal zone is the **interface** between **the land and the sea**; therefore, it is affected both by terrestrial and marine processes. On the other hand, **human presence and activity is very intense** and coastal zones are subject to powerful and growing **pressures and impacts**.

As a result of the confluence of these **multiple economic, social and environmental factors and conflicting interests** at all scales in the European coastal zones, a high number of diverse issues are at stake here. Consequently, some of the biggest challenges to the achievement of sustainable development appear in the coastal zones.

The social and economic driving forces in coastal zones create impacts and risks. The following scheme shows how these **impacts and risks** can affect and have a **backlash on** coastal societies and economies.

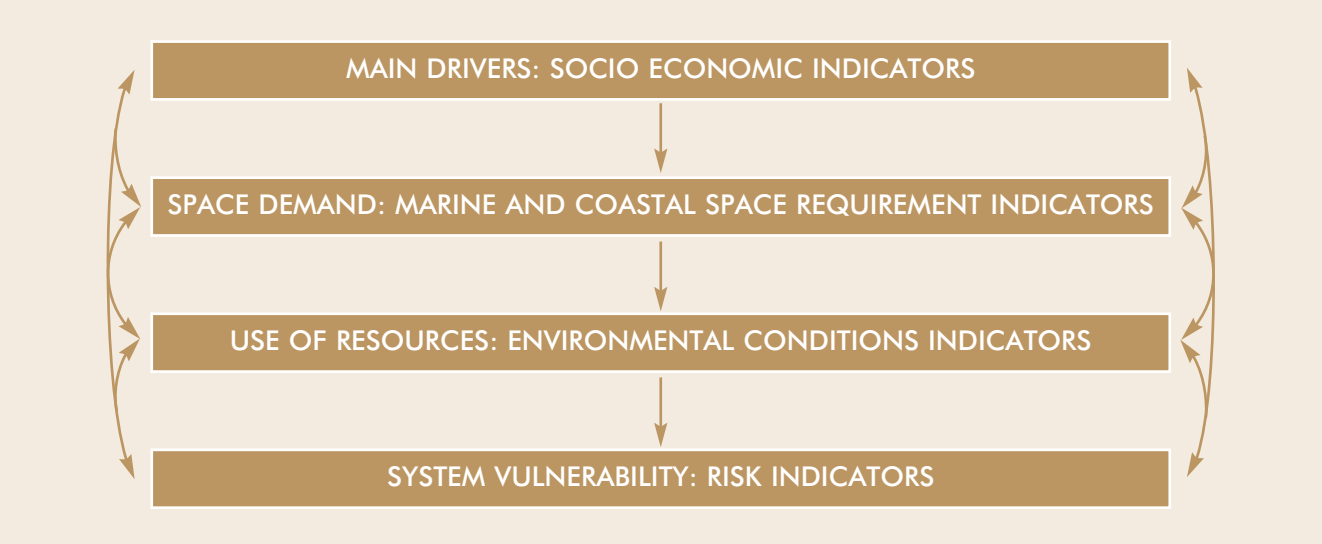


Fig. 1: Interactions and cause/effect relationships in the coastal zone.

In addition, the current **fragmented visions and information flows for the coast do not support an integrated understanding** of the coastal system as a whole nor do they support well-balanced decisions that ensure appropriate management. The problem is that these partial and sectoral visions are still quite dominant. In conclusion, it seems necessary to build an **information system based on objective data** in **support of an integrated vision and to draw a compatible view** of the different visions and interests existing in the coastal zone.

1.1.1 Integrated Coastal Zone Management and indicators

In view of serious threats on the European coast, on 30th May 2002 the European Parliament and the Council approved **Recommendation 2002/413/CE** concerning the implementation of the integrated management of coastal zones (ICZM) in Europe with the aim of guiding the European coastal zones towards more sustainable scenarios. In this recommendation, the member states were requested to report back to the Commission 45 months after the official approval, i.e. on February 2006, about their experience gained with the **implementation of ICZM**. The Recommendation also underlines the **importance of objective and scientifically underpinned data for monitoring and benchmarking sustainable development (SD) at the coast**.

For the implementation of ICZM, the Directorate-General of Environment (DG-ENV) of the European Commission set up the European ICZM expert group. It is composed of all 20 coastal member states and two candidate states. Its first meeting took place in October 2002.

The European ICZM expert group recognized the importance of indicators and created an "indicators and data" working group (WG-ID), which began to work in February 2003. It is led by the European Topic Centre on Terrestrial Environment (ETC-TE), a partner of DEDUCE project. The WG-ID was instructed to draw up a list of indicators and assist in coordinating the definition of the way in which the member states should calculate the indicators. At the end of 2003, after a thorough review of all existing indicators for the coast and for SD, the **WG-ID proposed that member states and candidate countries employ two sets of indicators**:

- **Progress indicators** – An indicator set to measure the progress of the implementation of ICZM.
- **Indicators of Sustainable Development (ISD)** – A core set of 27 indicators, composed of 46 measurements, to monitor sustainable development of the coastal zone.

The SD indicators proposed by the WG-ID are listed in the following table:

GOALS	INDICATORS	MEASUREMENTS
To control further development of the undeveloped coast as appropriate.	1. DEMAND FOR PROPERTY ON THE COAST	1.1. Size, density and proportion of the population living on the coast
		1.2. Value of residential property
	2. AREA OF BUILT-UP LAND	2.1. Percentage of built-up land by distance from the coastline
	3. RATE OF DEVELOPMENT OF PREVIOUSLY UNDEVELOPED LAND	3.1. Area converted from non-developed to developed land uses
	4. DEMAND FOR ROAD TRAVEL ON THE COAST	4.1. Volume of traffic on coastal motorways and major roads
	5. PRESSURE FOR COASTAL AND MARINE RECREATION	5.1. Number of berths and moorings for recreational boating
	6. LAND TAKEN UP BY INTENSIVE AGRICULTURE	6.1. Proportion of agricultural land farmed intensively
To protect, enhance and celebrate natural and cultural diversity.	7. AMOUNT OF SEMI-NATURAL HABITAT	7.1. Area of semi-natural habitat
	8. AREA OF LAND AND SEA PROTECTED BY STATUTORY DESIGNATIONS	8.1. Area protected for nature conservation, landscape and heritage
	9. EFFECTIVE MANAGEMENT OF DESIGNATED SITES	9.1. Rate of loss of or damage to, protected areas
	10. CHANGE IN SIGNIFICANCE COASTAL AND MARINE HABITATS AND SPECIES	10.1. Status and trend of specified habitats and species
		10.2. Number of species per habitat type
		10.3. Number of Red List coastal area species
	11. LOSS OF CULTURAL DISTINCTIVENESS	11.1. Number and value of sales of local products with regional quality labels or European PDO/PGI/TSG
	12. PATTERNS OF SECTORAL EMPLOYMENT	12.1. Full time, part time and seasonal employment per sector
		12.2. Value added per sector

To promote and support a dynamic and sustainable coastal economy.	13. VOLUME OF PORT TRAFFIC	13.1. Number of incoming and outgoing passengers per port
		13.2. Total volume of goods handled per port
		13.3. Proportion of goods carried by short sea routes
	14. INTENSITY OF TOURISM	14.1. Number of overnight stays in tourist accommodation
		14.2. Occupancy rate of bed places
	15. SUSTAINABLE TOURISM	15.1. Number of tourist accommodation units holding EU Eco-label
		15.2. Ratio of overnight stays to number of residents
To ensure that beaches are clean and that coastal waters are unpolluted.	16. QUALITY OF BATHING WATER	16.1. Percentage of bathing waters compliant with the guide value of the European Bathing Water Directive
	17. AMOUNT OF COASTAL, ESTUARINE AND MARINE LITTER	17.1. Volume of litter collected per given length of shoreline
	18. CONCENTRATION OF NUTRIENTS IN COASTAL WATERS	18.1. Riverine and direct inputs of nitrogen and phosphorus in inshore waters
	19. AMOUNT OF OIL POLLUTION	19.1. Volume of accidental oil spills
		19.2. Number of observed oil slicks from aerial surveillance
To reduce social exclusion and promote social cohesion in coastal.	20. DEGREE OF SOCIAL COHESION	20.1. Indices of social exclusion by area
	21. RELATIVE HOUSEHOLD PROSPERITY	21.1. Average household income
		21.2. Percentage of population with a higher education qualification
	22. SECOND AND HOLIDAY HOMES	22.1. Ratio of first to second and holiday homes
To use natural resources wisely.	23. FISH STOCKS AND FISH LANDINGS	23.1. State of the main fish stocks by species and sea area
		23.2. Recruitment and spawning stock biomass by species
		23.3. Landings and fish mortality by species
		23.4. Value of landings by port and species
	24. WATER CONSUMPTION	24.1. Number of days of reduced supply
To recognise the threat to coastal zones posed by climate change and to ensure appropriate and ecologically responsible coastal protection.	25. SEA LEVEL RISE AND EXTREME WEATHER CONDITIONS	25.1. Number of 'stormy days'
		25.2. Rise in sea level relative to land
		25.3. Length of protected and defended coastline
	26. COASTAL EROSION AND ACCRETION	26.1. Length of dynamic coastline
		26.2. Area and volume of sand nourishment
		26.3. Number of people living within an 'at risk' zone
	27. NATURAL, HUMAN AND ECONOMIC ASSETS AT RISK	27.1. Area of protected sites within an 'at risk' zone
		27.2. Value of economic assets within an 'at risk' zone

Used together, the two sets should reveal the degree to which **implementation of ICZM can be correlated to a more sustainable coast**. That is, decisions using an integrated approach should see a positive effect in the state of the coast and consequently, progress towards sustainable development. The **indicators measuring progress in achieving sustainable development of the coast** will in turn feed back to give policymakers an indication of the need for further action in ICZM.

The two indicator sets were developed and discussed within the EU ICZM Expert Group. The list of ISD was **accepted in 2004**, with the instruction to have the **indicators tested and validated during the following years** (until 2006).

1.1.2 Testing the set of indicators

For the **ICZM Progress** indicators, **methodological guidelines** were presented to the EU ICZM Expert Group in 2004 to encourage member states to conduct the testing. Between 2004 and 2005, the members of the WG-ID conducted a number of **tests** in their countries and in some regions to see how the indicator set worked. Additionally, some tests also took place through the CoPraNet project. Overall, 8 of the 20 coastal MS of the EU have tested the ICZM Progress indicators, representing 40% participation. To obtain the results, most member states organised ad-hoc workshops with representatives of different administrative levels and sectoral stakeholders, as well as bilateral consultations. The results of the tests show **progress between 2000 and 2005 in the implementation of actions towards ICZM**.

The national strategies on ICZM requested by the European Recommendation are **good references as a test case for the application of the ISD**. During 2006, 18 countries, including all of the DEDUCE partner states, sent a report on the implementation of their ICZM national strategies to the DG-ENV. The main outcome and development on coastal indicators in their national strategies are summarised as follows:

Belgium dedicates a chapter of its "National Belgian Report on the implementation of Recommendation 2002/413/EC, Integrated Coastal Zone Management" to indicators, giving special importance to the role of indicators in the ICZM process. The report uses results of the progress indicators and some SD indicators. However, Belgium has also set up a "sustainability barometer" for the coast, where part of the EU ICZM indicators are developed and used.

In **France**, the ICZM National Strategy gives high importance to indicators and data. The integrated management is based on key information such as data and indicators tailored for the different coastal zones and the challenges that they face. France makes a distinction between management indicators and evaluation/assessment indicators.

The **Latvian** national report on ICZM ("Statement on the Progress of Implementation of the EC Recommendation 2002/413/EC on Integrated Coastal Zone Management", Latvia, May 2006) refers to monitoring as an important action to follow up ICZM progress and SD at the coast. However, the report does not mention any indicator.

In **Malta**, the National Strategy for ICZM is based on the "Coastal Strategy Topic Paper" which was compiled in 2002 by the Planning Authority. The National Report on ICZM submitted in 2006 utilises some results from the SD indicators to give an update of the current state of natural and cultural coastal resources and marine use. The report also uses the results of the Progress Indicators test in its evaluation of the administrative framework for ICZM.

In **Poland**, the report "Towards a National Strategy of Integrated Coastal Zone Management" (November 2005) uses indicators of ICZM in some chapters and follows the model of the EU ICZM set of SD indicators. One of the actions envisaged in the strategy is to provide easily accessible, understandable, reliable and relevant information about the coastal zone.

In **Spain**, the report on "Integrated Coastal Zones Management in Spain" (2006) has performed a very complete use of the EU indicators, developing the 27 ISD for Spain, some being compared among regions.

Apart from National Strategies, **other initiatives** on ISD in coastal zones have to be considered: **dissemination and training books**, national observatories and regional projects. One that is particularly interesting to mention is the Dutch report "European Sustainability Indicators for Coastal Zones in The Netherlands: A first Inventory" (2006) published by Flanders Marine Institute (VLIZ, Belgium). The book presents the development of the 27 EU ISD and their measurements for the coastal zones of The Netherlands. There is a fact sheet for each indicator with maps and tables summarising results and key messages, indicating what the measurement shows, why to monitor it and what are the implications for planning and managing the coast.

Some **national observatories** that take coastal SD indicators on board have been launched since 2002 and are still operative today. Examples are: l'Observatoire du littoral (IFEN, FRANCE) and El Observatorio de la Sostenibilidad (Ministry of Environment, Spain).

Finally, different **EU projects**, such as COST-ESF, CorePoint and, of course, DEDUCE, have recognised the EU WG-ID SD indicators as the basis of coastal monitoring.

1.1.3 The DEDUCE project

The WG-ID of the EU ICZM Expert Group promoted the idea of undertaking a project for testing the listed SD indicators on different scales, among some public institutions. The **project DEDUCE** was then designed and presented to the **INTERREG III C South** programme by the following institutions:

- Department of Environment and Housing, Catalan Government, Spain (Lead Partner),
- El Prat de Llobregat local council, Spain,
- Viladecans local council, Spain,
- Autonomous University of Barcelona – European Topic Centre on Terrestrial Environment (ETC-TE), European Environment Agency, Spain,
- French Institute for the Environment (IFEN), depending on the French Ministry for the Environment,
- Malta Environment and Planning Authority (MEPA), Malta,
- Province of West Flanders, Belgium,
- University of Latvia, Latvia,
- Maritime Institute in Gdańsk, Poland.

The DEDUCE project, (Développement Durable des Zones Côtieres Européennes or Sustainable Development of European Coastal Zones), was approved and financed by Interreg IIIC-South. The project lifetime was from January 2005 until June 2007.

The key challenge of DEDUCE is to **prove the usefulness, viability and necessity** of an **integrated approach to information management** by means of environmental and socioeconomic **indicators** for measuring the degree **of sustainable development of the European coastal zones**. The broad objective of DEDUCE is **to validate the methodological tools** necessary for optimal decision making

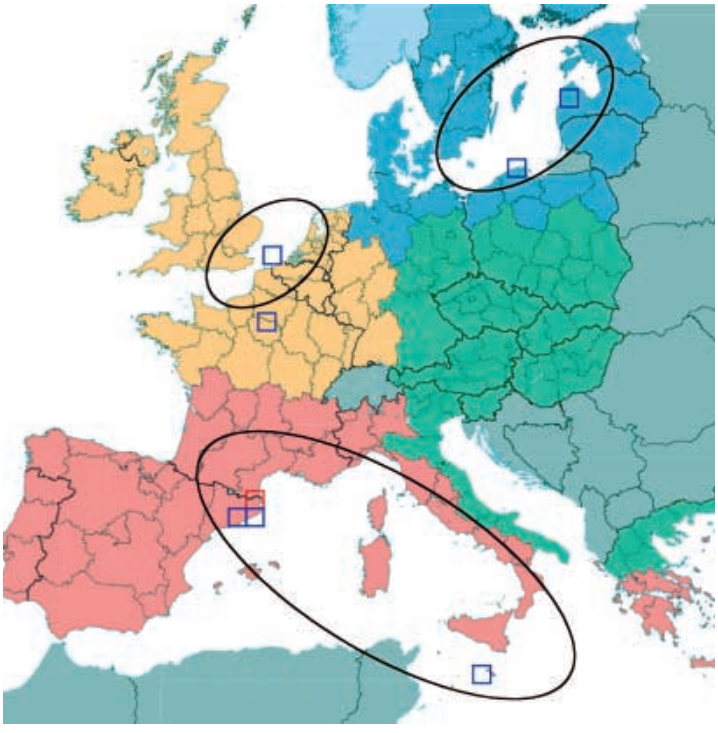


Fig. 2: Map representing geographical coverage of partners of DEDUCE project.

at the coast. Its main task is to develop the methodology, calculate and validate the WG-ID ISD set at different levels and scales: European, national, regional and local, to measure and monitor SD in coastal zones.

The methodological framework **developed** in DEDUCE includes 3 tools for indicator calculation and a proposal for a system and format for data storage and communication:

- Tools for indicators calculation: Standard Indicator Format (SIF), Reporting Sheet (RS) and Indicators Fact Sheet (IFS),
- Tools for data and indicators storage and communication: regional Coastal Observatory and model of State of the Coast Report.

1.2 MAIN GOAL OF THE INDICATORS GUIDELINES

The **task of measuring coastal sustainability** as developed by the DEDUCE partners in their respective regions and countries **using the ISD** provides a **useful experience for institutions** that want to replicate this effort. In addition, DEDUCE has organised 6 **workshops** on measuring coastal sustainability with the participation of approximately 500 participants.

The present Indicators Guidelines **summarise the lessons learnt** in the DEDUCE project **regarding two main aims**:

1) To propose a **common methodological framework for calculating and reporting indicators (MFISD)**. This proposal is based on the availability of data, calculation experiences and the analysis of the weaknesses and strengths of the development and testing process.

2) To illustrate the **usefulness of the coastal ISD approach to develop ICZM** in EU, national and regional strategies and planning.

The agreement on the indicator set and the standardisation of methodology and formats for compilation and presentation of results ensures the comparability, correct assessment and aggregation of the results obtained in different countries and at different scales around Europe. Moreover, the identification of data gaps or limitations will allow prioritisation of effort on the monitoring of required datasets.

Finally, the Indicators Guidelines contribute to the analysis of the indicators-based approach as a **common tool to support the policy integration process** since **common indicators streamline integrated information management** among different stakeholders.




1.3 ORGANISATION OF THE INDICATORS GUIDELINES

The Indicators Guidelines are organised to achieve these two main aims.

After the introduction, the **second chapter briefly analyses the existing coastal policy framework in relation to the ISD set**. It provides an overview of the legal basis of the issues measured by the chosen indicators.

The **third chapter introduces the DEDUCE methodological tools**. It particularly addresses questions related to the data gathering process, the indicators methodology for calculation and the integration and comparison of results. It also deals with Geographical Information Systems (GIS). It analyses the usefulness of GIS for assessing coastal sustainability. It incorporates information of the GISs of the different partners and the specific experience implemented by DEDUCE.

The **fourth chapter** discusses the practical utility of an indicators-based approach especially for the decision making process.

The **fifth chapter** compiles experiences obtained during the DEDUCE data collection and treatment and illustrates the results from EU to local level. It includes one indicator for each of the seven goals of the recommendation in a format named Indicator Fact Sheet (7 in total).

The Indicators Guidelines **conclude with a discussion and a list of recommendations** for the proficient measurement of sustainable development in coastal zones.

The DEDUCE **products and documents** are accessible on the **DEDUCE website** www.deduce.eu.

2 CURRENT COASTAL POLICY FRAMEWORK AND THE SD INDICATORS

2.1 POLICIES INTERACTING ON THE COAST

Recognising coastal problems and the need for their adequate management as a major issue, has been a long and difficult process. **Coastal zones cannot** be well **managed** – and in fact are not – **by a single piece of legislation**. The complexity of coastal systems requires **an appropriate and integrated blend of different policy instruments** (sectoral, cross-cutting and integrated policies), which should target **the sustainable development** of coastal zones.

The coastal system is a space in which **most of the EU policies interact**. Policies that interact with the coastal and marine zones can be structured into economic, social and environmental policies.

Group	Policies mainly interacting with coastal and marine zones
ECONOMIC	Maritime Transport, Ports, Coastal Tourism, Fisheries, Energy, Industrial coastal activities.
SOCIAL	Immigration, Employment.
ENVIRONMENTAL	Water, Erosion, Flooding, Climate change, Wastes, Biodiversity (Habitat and Bird Directives), Soil, Marine Directive.

Previous EU initiatives, such as the **demonstration projects on ICZM (1996-1999) have proven relevant** for the development of a policy framework for the coast.

The development of any EU Integrated Policy for the coast faces the difficulty of having to **articulate** all of these **policies in a coherent way**. For this reason, specific ICZM regulations today play the important role of facilitating links between existent policies, which have proven to be relatively weak. By means of focusing specifically on the coast, ICZM policies are building a coherent policy frame for coastal zones.

There are two main existing European policy instruments that, for the moment, provide integration criteria for the entire policy framework:

- The EU Recommendation on ICZM,
- The European Sustainable Development Strategy.

In addition, it is necessary to consider a set of **emerging policies** that are preparing a **new phase in this interaction**, such as the Marine Directive proposal, the Floods Directive proposal and the future EU Maritime Policy. Consequently, **the Green Paper** "Towards a Future Maritime Policy for the Union: a European Vision for the Oceans and Seas" is a **fundamental work** for the integration of the policies for European coastal and marine areas.

The main question now is how the national strategies for ICZM will be further developed and what will follow.

It is also important to consider the relationship between ISD and emerging information policies: the Directive 2003/4 on **public access to environmental information**, the **INSPIRE Directive** (Infrastructure for Spatial Information in Europe) and the future **European Monitoring Observation Data Network** (EMODNET) which has now started within the EU Green Paper Framework. EMODNET will provide an interesting mechanism for future integration in the maritime information system.

Ultimately, **ICZM has its value per se**. It is not just a mere mechanism for the sampling of all policies and action plans that interact in the coastal zone or a box which can contain the combined efforts of the implementing mechanisms of the existing directives that spatially interact on the coast. Its added value is perceived at the level of benefit to the stakeholders, to the wider coastal community, in terms of avoided costs in planning and implementation and in building **open and transparent administration** systems for more equitable and sustainable communities.

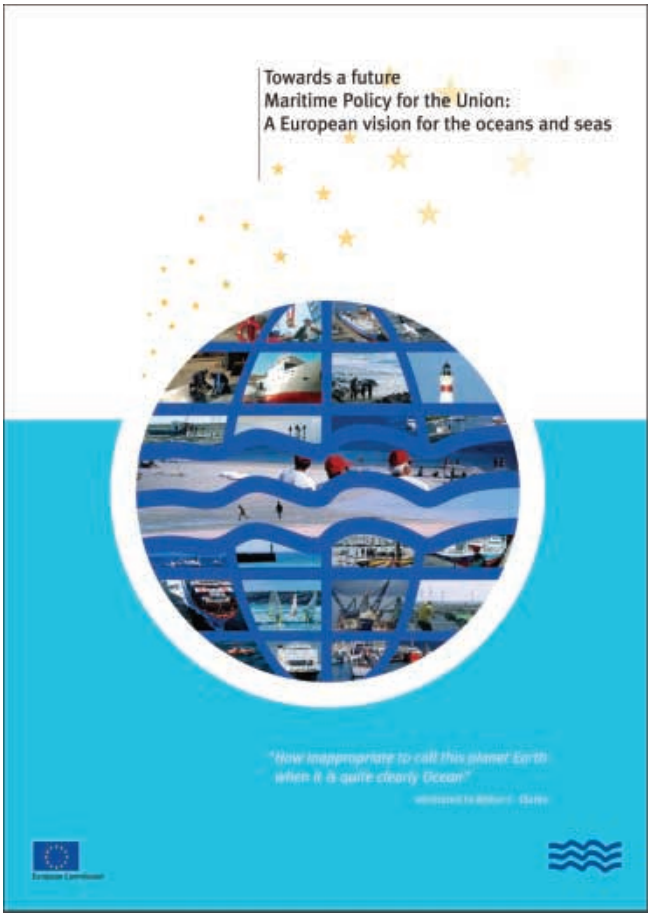


Fig. 3: Cover of publication "Towards a Future Maritime Policy for the Union: a European Vision for the Oceans and Seas".

2.2 SD INDICATORS AND COASTAL POLICIES

One of the strategic approaches of the Sixth **Community Environment Action Program** is sub-titled **"Progress should be measured through indicators and benchmarking"** under the heading "Integration of environmental concerns into other policies". Nevertheless, only a **limited number of regulations and policies** affecting coastal zones or seas **have a legal definition and basis for indicators** and, moreover, they are **not co-ordinated**.

In addition, the Green Paper on the future EU Maritime Policy explains that good planning and management in the coastal and marine zones is impossible in the absence of information. At the same time, it recognises that there **is a lack of indicators, measurements and data** available on different issues **related to this new EU policy**. The numerous **efforts on coastal and marine monitoring are dispersed and not co-ordinated**. In fact, the current coastal **policy framework does not provide a complete legal basis with which to build a common and efficient information system** for the coastal and marine zones.

There is a huge lack of regulations to define the SD indicators, when considering the importance of sustainable development of coastal and marine areas.

The process of establishing a set of **SD indicators and levels of acceptance with a legal basis** in coastal and marine zones **is not easy**. Before that, a significant scientific, technical and administrative effort, as well as the achievement of consensus with stakeholder groups, must be carried out for the definition of indicators and targets. It also implies agreement between involved public administrations on the intensity of monitoring and the resources required.

The following step is a thorough debate on the social and economic feasibility of implementing thresholds as a legal obligation. Finally, a legal basis must complete the administrative procedures in order for them to be approved.

At this point, the Indicators Guidelines will briefly analyse the coastal policy framework in relation to sustainability indicators. Next, this document offers an **overview of the policy framework related to the SD indicators** proposed by the WG-ID and approved by the EU ICZM Expert Group. The assessment of indicators is structured by goals in three main blocks: territorial and ecological goals, social and economical goals and environmental quality and risk goals. From this analysis, we can conclude that:

1) There are **different levels of regulations** of the indicators according to **different sustainability issues**.
2) The policies that affect the coastal and maritime zone **generally do not define** the **indicators and the levels of sustainability**.

2.2.1 Territorial and ecological goals

Changes in land use depend on the economic and social demand. Hence there is a potential correlation between the results of the **socio-economic and land use indicators**. For instance, if a tourist policy aims for an increase in the number of overnight stays in tourist accommodation, this may result in an increasing demand for berths and moorings for recreational boating or urban space for tourism and recreation uses.

Goal	SD Indicator	Related regulation
1. Territorial development	· Demand for property on the coast · Area of built up-land · Rate of urban development · Road travel on the coast · Marine recreation · Intensive agriculture	· Directive 2001/42, plans · Directive 1985/337, impacts
2. Diversity protection	· Semi natural habitats · Land and sea protection · Nature management · Marine habitats and species	· Directive 1992/43, habitats · Directive 1979/409, birds

The European **territorial and ecological policies** and regulations generally **do not define indicators** nor establish which must be their **thresholds for the evaluation of levels of sustainability**.

Hence, the experience developed by the EEA in relation to the Land Ecosystems Accounting Methodology (LEAC) will be very useful for the final methodological definition of the indicators and measurements to be established through European legislation for future coastal territorial development.

One European example of the definition of levels of sustainability is the proposal for 33% ("*le tiers sauvage*") of land to be destined for conservation purposes in coastal territories of France, proposed by the 'Conservatoire du Littoral' in 2006.

Although the Habitats Directive defines the obligation to report on the evolution and effectiveness of habitat and species management within the Natura 2000 Network and the wider territory, it is necessary to develop a regulation in order to ensure homogeneity in this reporting.

In conclusion, the compliance of urban and territorial policies needs to define indicators and levels of sustainability by means of specific or integrated regulation within a framework of controlled land use and destination. The inexistence of this regulation inevitably leads to speculation in most coastal territories.

2.2.2 Social and economic goals

In general the **statistical systems are quite well developed** in terms of social and economic issues. However, the EU regulations related to socioeconomic policies **do not strictly define the specific indicators and their respective targets** to measure sustainability and the effectiveness of policies. The most common economic indicators usually quantify economic growth. From a sustainable development point of view, however, these indicators need a change of meaning. The new versions of socioeconomic policies related to coastal zones and/or the integrated maritime policy **must define the common indicators to be used to evaluate the sustainability** of the economic activities at the coast. In this sense, the Technical Conference of DEDUCE (Tarragona-Spain, March 2007) is a useful reference in this discussion (see also chapter 6). Nevertheless, as a general conclusion, there is **no legal basis for socioeconomic indicators, thresholds and targets**.

Goal	SD Indicator	Related regulation
3. Sustainable Economy	· Cultural distinctiveness · Sectoral employment · Port traffic · Intensity of tourism · Sustainable tourism	· Council Resolution, 2002 · Decision 1145/2002, measures in employment · Regulation 761/2001, EMAS
5. Social exclusion and cohesion	· Social exclusion · Household prosperity · Second homes	· Regulation 883/2004, social security · Regulation 1177/2003, statistics on living conditions
6. Fisheries	· Landings of fish	

2.2.3 Environmental quality and risk goals

The environmental impacts are a consequence of the development process but it must be understood that these impacts in turn affect (usually causing damage) the social and economic activities that lie at the origin of the impact.

Goal	SD Indicator	Related regulation
4. Waters and beaches	· Quality of bathing waters · Waste water discharge · Amount of oil pollution	· Directive 2006/7, bathing waters · Directive 2000/60, water framework · Directive 2005/35, ship-source pollution · Regulation 725/2004, ship and port facility security · Directive 2000/59, ship waste · Marine Directive (not yet approved)
6. Natural resources	· Water resources · Fish stocks	· Directive 2000/60, water framework · Directive 98/83, quality of water for human consumption · Regulation 869/2004, control measures to fishing · Regulation 2287/2003, limitation in fish catch · Regulation 2371/2002, sustainable exploitation of fisheries
7. Climate change	· Natural, human and economics assets at risk	· Flood Directive (proposal agreement April 2007)

For this reason, the **territorial indicators** are **correlated** with the **environmental** ones. For example, the most impacted coastal water bodies are generally near the big cities or near the most developed coastal territories.

The environmental policies address environmental impacts but also aim at avoiding damage on social and economic assets. This is illustrated using an example in coastal waters: new berths and moorings cause the enlargement of port areas and semi-enclosed waters, generally increasing the incidence of toxic algae blooms and sanitary and human health risks.

In general, the **environmental policies** include better definition of indicators and sustainability levels because they are equipped with **regulations that try to define indicators, measurements and thresholds** to evaluate and assess the results of the policies. The clearest example is the Water Framework Directive, which establishes detailed qualitative and quantitative characteristics on monitoring and thresholds to be achieved in the coastal waters bodies by 2015.

In conclusion, **effective policies** are those that have generated **tightly linked indicators**.

2.2.4 Information policy

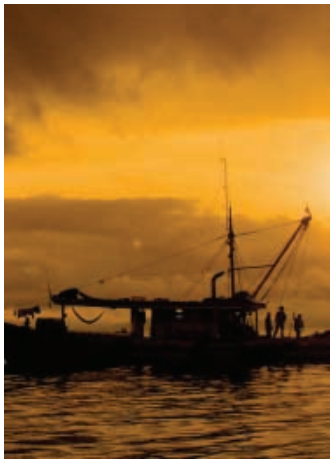
The information policy has a transversal effect on all the goals and indicators. In this case the two main Directives do not define indicators to either measure effectiveness or levels of sustainability. Still, they can serve as a framework to develop the definition of the SD Indicators for the coastal zones in terms of methodological approach for data management as well as dissemination of information.

Goal	SD Indicator	Related regulation
All	All	· Directive 2003/4, public access to environmental information · Directive 2007/2, INSPIRE

2.2.5 The information system for the new Integrated Policies

The preceding analysis on the current regulation has evidenced a **general lack of obligations on data collection and calculation processes**. Nevertheless, the emergent **integrated policies would solve this deficit** through specific regulations, the indicators targets and thresholds for member states.






Now, with the European Commission's **initiative for a new integrated policy** for the maritime zone, it is a **good moment to discuss** which kind of information system is needed as an instrument of policy. Examples include the recent development of EMODNET (European Monitoring Observation Data Network, one of the 31 projects for developing in Green Book on Maritime Policy) and EMMA (Expert Group on Monitoring and Assessment) for the Marine Strategy Work Programme.

The experimentation and studies carried out by the **DEDUCE project is useful information** that might be taken into account for the design and implementation of an Information System on the Sustainability of the European Maritime Zone. Nevertheless, **further work is needed** to build this system.

Different local and regional experiences in the EU, including DEDUCE, demonstrate powerful arguments for the development of an efficient framework based on the indicators approach for Maritime Policy (see chapters 4 and 5). Those indicators have different functions: from monitoring and communication to assessment and decision-making. The indicators approach provides:

- **Clear and objective** description of the sustainability situation and trends,
- A documented basis for the **identification of problems** and a **co-ordinated** definition of **policy aims**,
- Appraisal and evaluation of policy impact – in other words, **policy effectiveness**,
- **Social visibility** of thresholds, trends and progress as well as content for successful **communication**.

The Maritime Policy is a transversal policy linking a number of interacting policies. Consequently, one of its most important objectives will be to make **very different policies, plans, projects and interests compatible**. The **clarity** and objectivity of the maritime perspective will be an essential condition for deciding the future actions that also make economic, social, territorial and environmental interests compatible. This **makes the indicators approach indispensable**. In this sense, **investing** in the development of an indicators framework and in a maritime and coastal information system is considered to be a step in the right direction for measuring sustainable development in European coastal zones.

3 METHODOLOGICAL DEVELOPMENT

The present chapter introduces and explains the methodological framework as developed in DEDUCE. This framework aims to address the lack of a common approach in measuring sustainable development in Europe's coastal and maritime zones. The chapter is structured along the following lines:

- The **components and formats** that constitute the methodological framework for indicators of sustainable development – MFISD,
- The existing sources of **information and data**,
- The **spatial dimension** of the indicators and GIS,
- The **evaluation** of the calculation process conducted by the DEDUCE partners.

3.1 METHODOLOGICAL FRAMEWORK FOR INDICATORS OF SUSTAINABLE DEVELOPMENT (MFISD)

A common framework is needed in order to **benchmark, compare** and **visualise** the **state of the coast in Europe**. Increasingly, the effectiveness and **impact** of EU and national/local **coastal policies** requires evaluation, particularly in terms of sustainable development (SD) (see Chapter 2).

The **starting point of DEDUCE** is the set of **27 indicators and 45 measurements** for SD in coastal zones, as defined by the Working Group on Indicators and Data **(WG-ID)** (see Chapter 1). By itself, this list does not allow calculation of the indicators and measurements without first developing the **detailed methodological procedures**, carried out by the DEDUCE project.

The DEDUCE project proposes an **MFISD** for the coastal zones of Europe as a tool that addresses this need. This framework consists of the following three components and formats:

1) **The Standard Indicator Format – SIF:** defines and describes the methodology of calculation.

2) **The Reporting Sheet – RS:** captures the results of calculations in terms of output (data, graph or map) and evaluation of the obtained values and data production process.

3) **The Indicator Fact Sheet – IFS:** summarises and disseminates the main information obtained by partners on each indicator. The graphs, maps and comparative analysis are its main components.

These components and formats are available from the website www.deduce.eu.

3.1.1 The Standard Indicator Format – SIF

Format

The SIF is designed to achieve a **common understanding** of the **purpose and definitions** of the indicator measurements in the SD indicator set. It establishes a common **methodology** for calculating and presenting data and for the consequent trend analysis and benchmarking. For each of the 45 measurements, there is one SIF containing the following information:

- **Identification:** name and number of the measurement and its indicator.

- The **Relevance** and purpose of the measurement **for sustainable development** in coastal zones, with reference to the main EU and/or national coastal policies and its relationship to a particular goal of the ICZM Recommendation.

- A list of the **parameters** that must be calculated for the measurement, including the precise units in which they are expressed (percentage, ratio, km^2). These parameters add a further level of precision to the measurements.

- **Coverage:** the **spatial coverage** defines the boundaries for the basic sampling units (e.g. individual sampling points, 10km buffers, municipalities or NUTS5) and spatial coverage of the sampling areas (e.g. all coastal and non-coastal municipalities of the coastal NUTS2 region). The **temporal coverage sets** minimum standards for the frequency of sampling years/points (e.g. annual data), aggregation levels (e.g. from January to July) and the length of time series (e.g. from 1970 onwards).

- **Data sources:** identifies 'best fit' sources of data (e.g. EU databases in compliance with EU Directives), describes and evaluates strengths and weaknesses where relevant.

- **Methodology:** step-by-step guidance with operations for producing comparable calculation results. For each calculation step (sum, division, average) in the left column, the corresponding result or expected product is described in the right column.

- **Visualisation:** guidance on common formats to present results (titles, sources, classes, colours) and illustrations (bar, line, pie charts, maps).

- **Improvements:** optional steps or alternatives to the previous calculation procedure in order to obtain more valuable results or results on different scales.

Procedure

The DEDUCE network (NMG) produces an **SIF draft** with input from external expertise where required. The guidance provided in the SIF is screened for relevance, applicability and suitability to represent each of the national and local situations of the MS coastal zones. On **agreement on the revised SIF** draft, calculation is initiated. A final revision of the SIF is to be conducted in case outcomes of the calculations require fine-tuning of the definitions and the methodology.

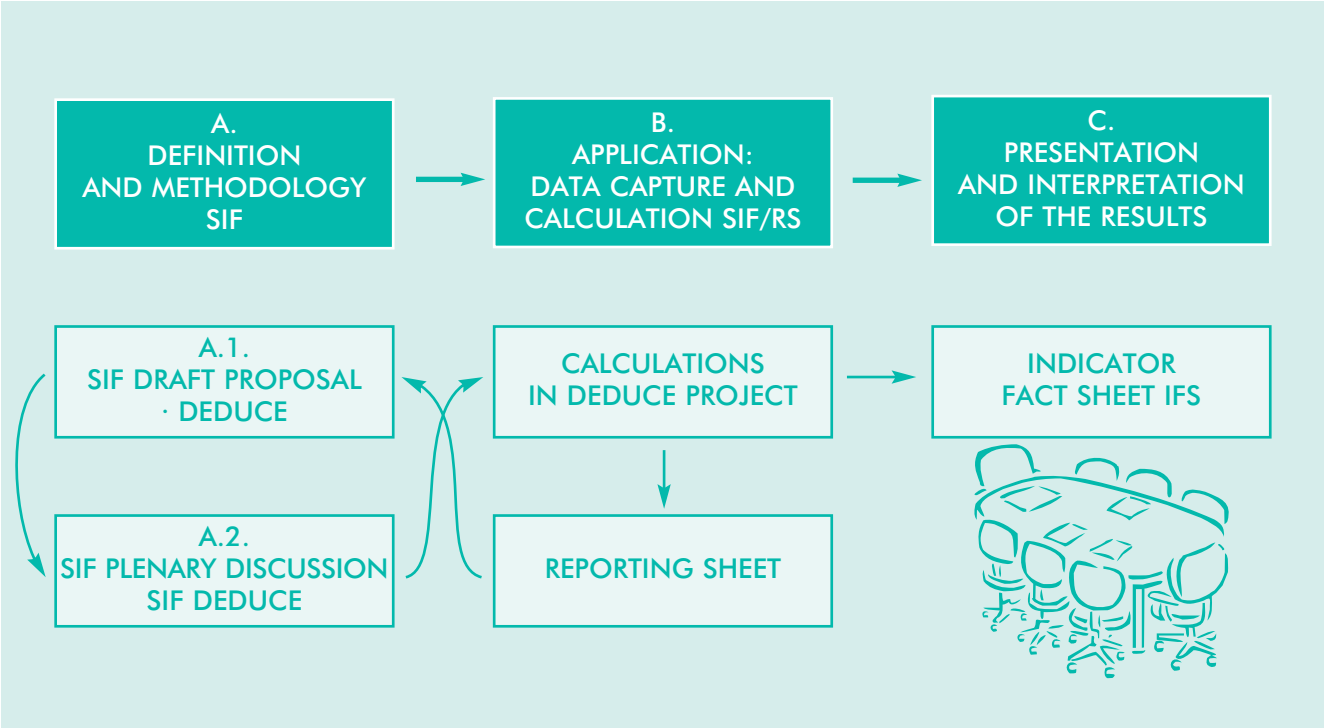


Fig. 4: Procedure of common definition and calculation of indicators in DEDUCE project.

3.1.2 The Reporting Sheet

Format

The calculation of each measurement is **summarised in the Reporting Sheet**. Findings related to data sources and calculations (including maps and graphs) are covered in the RS, according to SIF format and style guidance. However, it also contains an evaluation of the values obtained and the data production process (see DEDUCE website www.deduce.eu):

- **Identification:** name and number of the measurement and its indicator and name of the partner that completed the RS.
- **Results:** in addition to graphs and maps, the RS provides a **key message** that, in few words, summarises the most relevant findings on trends that may be revealed by the measurement. It also contains further comments, including reference to the coastal zone by comparison to the hinterland.
- **Data source:** reports on datasets and data providers consulted.
- **Coverage:** the **spatial coverage** reports the lowest level at which data has been collected. **Coastal zone:** reports spatial units and scale of the 'coastal zone' for a particular measurement (e.g. amalgamated municipalities that border the coastline). **Hinterland:** where applicable, reports on the spatial units and coverage of the area with which the coastal zone is compared within the wider reference: e.g. the 'coastal zone' represented by the amalgamated municipalities that border the coastline and 'hinterland' represented by the wider reference region. The **temporal resolution and coverage** reports the time intervals of sampling points and the time scales on which data was collected to calculate the measurement.
- **Evaluation** of consulted data sources: Each partner records **strengths and weaknesses** in **availability and accessibility** as well as the accuracy and reliability of data. The next point identifies the sensitivity of the measurement to changes over time. Eventually, partners must complete an SIF evaluation and general appreciation of both the data and statistical process. The main aim is to evaluate the usefulness and relevance of the measurement for understanding sustainable development of the coast.
- **Integration** with other indicators: provides initial information to examine interaction between indicators.
- Suggestions for **improvements:** partners incorporate a general appreciation of what further details or information is needed to allow for proper analysis of the data in terms of sustainable development or further disaggregation needed in order to link with other indicators.

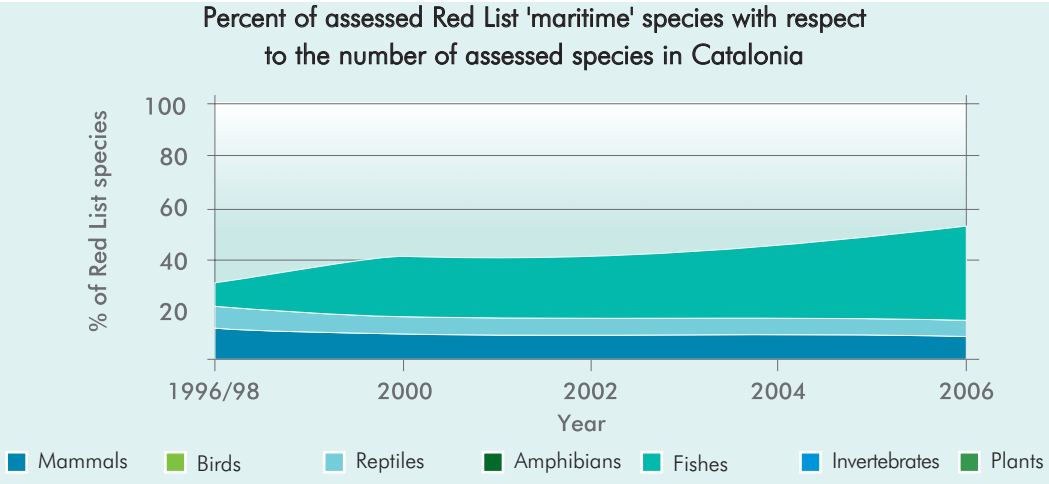
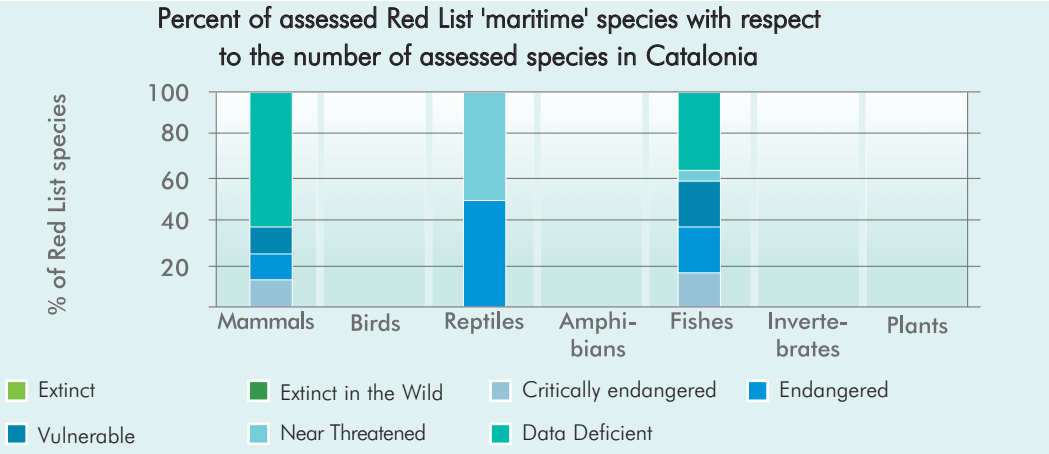
Procedure

Calculations and corresponding evaluations are discussed in the NMG. Special attention is given to the central question '*does the current indicator/measurement definition allow for an analysis in terms of sustainability for the coastal zone*'? Applicability of the indicators from the local to the European level is tested.

The main results of this analysis are summarised in Chapter 6. Detailed information by country (region) and by measurement can be consulted on the DEDUCE website (www.deduce.eu). An example of a completed reporting sheet is included for measurement 10.3 'Change to significant coastal and marine habitats and species', for the region of Cataluna (Gencat, Department the Environment and Housing).

10	Change to significant coastal and marine habitats and species
10.3.	Number of Red List maritime species
Partner	Department of Environment and Housing

RESULTS

Key Message	The data available are very limited to some taxonomic groups, therefore the results only reveals the situation of a part of the species. Species living in the sea are the most threatened species, especially fishes. During the last decade in Catalonia, the number of fish species included in the Red List have increased from 2 to 12.
Graph 1	
Map / graph 2	
What does the measurement tell us?	The data available are very limited because on one hand, the status of species of plants or invertebrates is not available, and on the other hand more than 25% of considered species require more data for a classification of the threat it is submitted (data deficient). Almost all the marine species included in Red List in Catalonia are fishes (12 species), marine mammals (3 species) and reptiles (2 species, the loggerhead and the Mediterranean turtle). In contrast, all bird marine species that inhabit Catalonia and that are included in the list of IUCN are classified as low risk -least concern that means that they are not included in the Red List. There are 4 marine species with some presence in Catalonia that are included in the class of critically endangered, 6 are endangered, 5 vulnerable and 2 near threatened. The rise in number of species in Red List can be produced by an upper knowledge of the situation of species, but, in this case, the ascent is originated clearly by the worst situation of species. A conclusion that we can obtain regarding the result is that the fishing activity in Catalonia endangers some marine species.
Data source	Data are obtained from the IUCN databank. The identification of species as marine and with presence in Catalonia is an own task. It have been done by means of selection of marine species as option for the search criteria of IUCN web site and, also, in the case of terrestrial species, analysing their geographical distribution. For this purpose information of the list of threatened species of the Spanish Ministry of Environment have been consulted.

COVERAGE	
Spatial resolution	
Coastal zone	Coastal and marine (sea) habitats. The marine coverage reach beyond the coastal coverage
Hinterland	
Temporal resolution	Each 2 years since 1998 to 2006

Evaluation	Strengths	Weaknesses
Accessibility of data	The web site of IUCN offers free the consulting to red list data-base. It presents a very good search interface that allows introducing a lot of search criteria. The results are offered quickly and they are linked with pages with more information about each species, for instance distribution or evolution in classification.	Search for coverage lower than national is not possible in the IUCN red list data bank. Moreover, selection of maritime species is not available: the search allows selection of marine species and, on the other hand, it can be selected the habitat, in this case coastal. There is not a red list made for national of regional administration of Catalonia. However, national and regional administrations have drawn up lists of threatened and protected species, but this classification does not match with the classes required by SIF (CR, EN, VU …).
Reliability and Quality of data	There are no doubts about how a species is classified. The procedure for calculating the measurement is clear and exact.	Even though people use the same data bank (IUCN red list), the results can be significantly different depending on who search and obtain data. The reason is that it must be chosen, among species of 'red list', the species that have presence in precise coverage and that are considered as maritime and it depends of the knowledge and the criteria of people who implement the methodology. For instance, they can have different opinions about whether mammal marine species has presence in a detailed coverage or whether an aquatic bird is maritime or not because it can live also in lakes. Important groups of species (plants and invertebrates) are not included in the results for Catalonia.
Sensitivity of the indicator	The up-dating of the Red List provides yearly variations. The results in Catalonia have revealed important changes in results along a decade. Variation usually consists in new incorporations to the list and in few cases shift of category.	
Evaluation	All measures related with biological phenomena, like this one, are difficult. The great advantage of this measurement is that the IUCN concentrates efforts about the status of conservation of species and it exposes clearly the obtained data (Red List data bank). The results are not absolutely reliable because it requires an own task of identification of species with presence in the terrestrial coverage and that they must be considered as maritime. Other limitation is that we have not found data for invertebrates or plants. Nevertheless, the obtained results seem to reflect the general situation: rise of threats on wildlife, specially marine species (fish and mammals).	
Integration with other indicators	This measurement is much related with the measure 10.1 – Status and trend of specified habitat and species. Moreover, it is much related with indicators of protected land (indicators 8 and 9). But at the same time, there is a relation with an indicator of pressure: 23 – Fish stocks and fish landings and the status of sea waters 17, 18 and 19 (not with the indicator of quality of bathing water).	
Suggestions for improvements	The graphs show portions, but it is important to include results in absolute terms (numbers of species) by means of modification of a suggested graph (i.e. graph 2) or by inclusion of a new graph. One of the search options of the IUCN red list data bank is "What system is this species found in?" One of the three possible responses is marine. The definition of SIF for marine species, using this search criteria, instead the results of maritime species, will reduce the task of calculation and it increases a lot the reliability of results, because it avoids other types of classifications.	

Fig. 5: Reporting Sheet for Measurement 10.3 prepared by DMAH (Government of Catalonia).

3.1.3 The Indicator Fact Sheet

Format

Information sources and calculations are described (SIF, RS) and reported (RS) by measurement. Since the **IFS presents and discusses the results of the combined measurements of each indicator, it provides** a **first step in the process of integrating data** and analysis. Furthermore, The IFS outlined by DEDUCE gathers **the most relevant information contained in the partners' RS**. It is also a step towards **integrating information at different levels and scales** and achieving coherence in the understanding of the varied processes that take place at local level. Nevertheless, the IFS can also be used for communicating the results of just one partner or a restricted geographic area.

The IFS describes the following issues:

- **Identification:** the number and name of the indicator.
- **Key Message:** summarises the key findings of the results of measurement.
- **Why monitor the indicator:** explains the indicator measurements and their relevance in relation to one of the goals of the EU ICZM Recommendation. It describes the environmental and/or socio-economic processes for which the indicator has been developed and for which it is indicative.
- **What does the indicator show** from European to local level: it contains the most relevant results obtained (graphs and maps) and their evaluation. The information is organised by measurement and geographic level. It illustrates how the information at the European level is related to a mosaic of different and varied situations at local level. It is a first step towards integrating information at different levels and scales and achieving coherence in looking at the different processes that take place at the local level.
- What are the **implications for planning and managing** the coast: explains how the indicator can serve the coastal planning, management and decision-making processes. Relevance to coastal policies and the relationship to policy targets and levels of sustainability is discussed.
- **Data sources:** lists data sources, providers and partners consulted for the different measurements.

Fig. 6: An example (cover page) of an IFS on ports.

- **Further work needed:** suggestions for improving data quality and availability as well as proposals for complementary measurements to monitor progress towards sustainable development in coastal zones.
- **Reliability** of the indicator and measurements: levels of accuracy and uncertainty in sampling procedures and data management.

- **References:** a brief list of the main references for the indicator.

- **Related Indicators:** causal relationship with other indicators and policy domains.

Procedure

After the calculation rounds, the RS from different partners are obtained and aggregated. The graphs, maps and **comments obtained on results and calculation procedures are summarised in an IFS** developed by the partner responsible for the particular goal. The IFS draft is discussed for a final consensus on the IFS for each indicator. **Special attention** is given to the central question of whether the current indicator/measurement definitions and the **methodology allow for analysis in terms of sustainability for the coastal zone** (see Chapter 6).

3.2. EXISTING INFORMATION AND DATA SOURCES

3.2.1. Information sources

The first – and often most time-consuming – component of the calculation of the measurement is the search for the most accurate and best available raw data. In most cases but not for all measurements, the SIF points out the best fit for purpose source of data.

A **variety of sources** provide data to calculate the indicators and measurements to monitor sustainable development in coastal zones:

a) In **Eurostat-European databases** data is systematically compiled for 7 of the 27 WG-ID indicators (8 of the 45 measurements), ranging from socio-economic (population, ports, tourism) to environmental data (bathing water quality, nutrients). Data may be collected in response to reporting obligations for the member states under the specific data gathering regulations or on the request of policymakers and end-users.

b) **European funded projects** (Eurosion, ESA-GSE Water, MESH, COMRISK, etc.) have generated data for coastal zones, reflecting the demand for timely and scientifically underpinned data for planning purposes and policy impact evaluations in Europe's coastal zones.

c) **International Conventions**: ICES, OSPAR, CORINE Land Cover, HELCOM, Barcelona Convention.

d) Institutionally embedded data collections hosted by **top-level research centres** include data e.g. on sea level (PSMSL-Proudman Oceanographic Laboratory, Joint Research Centre), location and extent of wetlands of international interest (Ramsar) and Red list species (IUCN) and many others (EUROBIS, GOOS, IMEDEA, etc.).

e) **National, regional or local statistics and databases from public administration** are the main sources for local datasets on population, social and economic surveys generated through census events and for environmental data generated through specialist studies and monitoring conducted by MS.

f) **Voluntary networks** may provide long-term data series (e.g. marine litter, some OSPAR EQOs).

The preferable source of raw data is Eurostat because information is collected, described and stored in a coherent way for all the MS. However, **the huge volume and large scope of information from Eurostat or other international databases is not always valid for DEDUCE purposes** due to the inappropriateness of scale and level to **calculate values for the coastal coverage**. DEDUCE partners have had to direct their search efforts towards other, usually regional sources, to obtain the detailed information that is required.

Figure 7. indicates the number of calculations per measurement conducted by DEDUCE partners and hence the number of RS per measurement. The **absence of tests** for a particular measurement is **explained by the lack of data. A minimum of 4 tests** was set as a standard (red line) in order to allow for subsequently relevant integrated analysis (IFS).

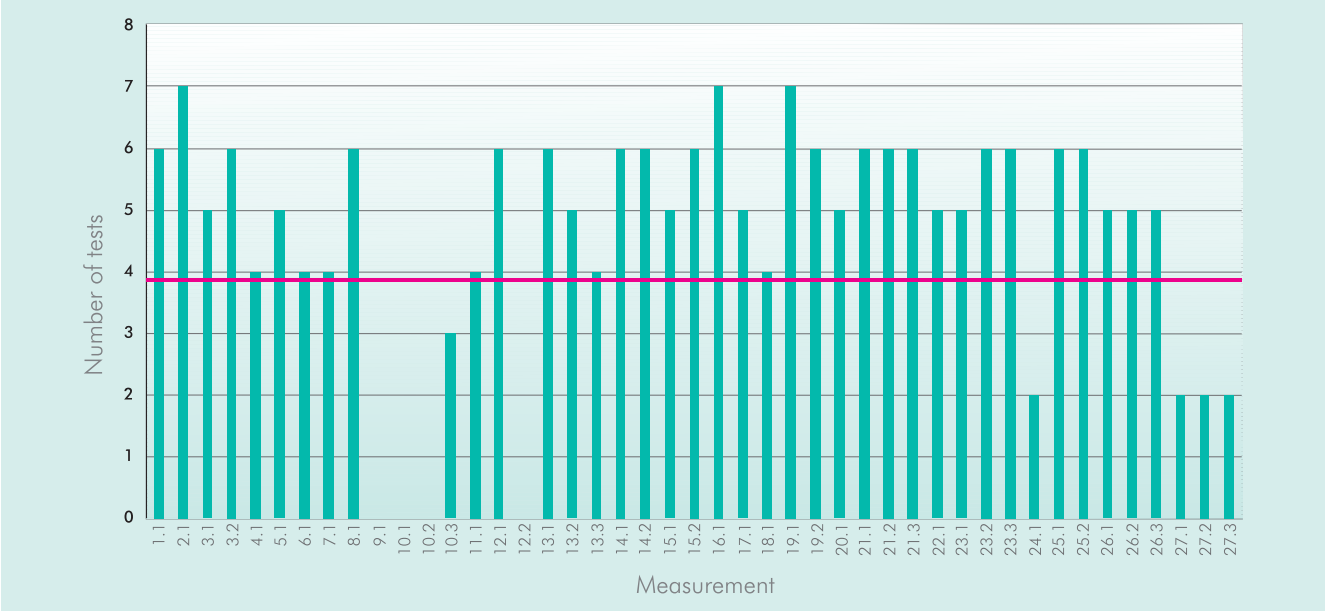


Fig. 7: Number of tests per measurement done by DEDUCE.

Evaluation of the indicators and measurements

The data available for the 45 measurements and SIF were evaluated according to 5 criteria which were scored by objectively identifiable values from 0 (lowest) to 5 (best score). Score '0' is assigned in case no existing data is available: consequently the other 4 criteria are scored as '0'. The maximum score is given in the following cases:

Criteria	Maximal value score 5
Thematic Availability	Measurement and parameters calculated in full accordance with SIF
Accessibility	Raw data freely accessible & downloadable on-line
Spatial coverage	100% coverage and accuracy (e.g. Census data)
Temporal coverage	Frequency, period and timeliness of the data collection and reporting are excellent for the purpose of the measurement
Reliability	Complete coverage, complying with best available quality standards & quality control

The results of this analysis are presented and discussed in Chapter 6.1.

The table below summarises the average scores for all partners (6), by criterion, as well as by the overall (unweighted) score for each of the 45 measurements.

Colours refer to the seven goals of the EU ICZM Recommendation. For measurements marked with (*), data is available in Eurostat or European databases. Data for the measurements marked with (#) are available from European funded projects or international conventions.

Measurement	Thematic Availability	Accessi-bility	Spatial coverage	Temporal coverage	Reliability	Average score
16.1. Percent of bathing waters compliant with the guide value of the European Bathing Water Directive*	4,71	4,71	4,86	4,86	4,80	4,79
13.2. Total volume of goods handled per port*	4,57	4,57	4,86	4,71	4,60	4,66
1.1. Size, density and proportion of the population living on the coast*	4,86	4,29	4,71	4,43	4,80	4,62
13.1. Number of incoming and outgoing passengers per port*	4,43	4,57	4,71	4,43	4,20	4,47
2.1. Percent of built-up land by distance from the coastline #	4,57	4,14	4,71	3,86	4,80	4,42
23.3. Landings and fish mortality by species*	4,17	4,50	4,17	4,67	4,25	4,35
23.4. Value of landings by port and species	4,29	4,57	4,29	4,71	3,80	4,33
15.1. Number of tourist accommodations holding EU Eco-label*	4,33	4,33	4,67	3,83	4,20	4,27
8.1. Area protected for nature conservation, landscape and heritage	4,00	3,86	4,86	3,57	4,80	4,22
25.2. Rise in sea level relative to land	4,14	3,86	4,29	4,29	4,40	4,19
19.1. Volume of accidental oil spills #	4,14	4,57	3,86	4,29	4,00	4,17
21.2. Percent of population with a higher education qualification	4,29	3,29	4,29	3,86	4,80	4,10
21.1. Average household income	4,43	4,43	2,57	4,43	4,20	4,01
12.1. Full time, part time and seasonal employment per sector	3,83	3,50	3,00	4,17	4,50	3,80
25.3. Length of protected and defended coastline #	4,29	3,29	4,57	2,86	4,00	3,80
3.1. Area converted from non-developed to developed land uses #	3,14	3,14	4,00	3,71	4,80	3,76
13.3. Proportion of goods carried by short sea routes	3,57	3,43	3,57	4,14	3,60	3,66
26.1. Length of dynamic coastline #	3,57	3,86	4,71	2,29	3,80	3,65
19.2. Number of observed oil slicks from aerial surveillance #	3,57	3,57	3,71	3,71	3,40	3,59
15.2. Ratio of overnight stays to number of residents	4,17	3,83	2,83	3,83	3,20	3,57
14.1. Number of overnight stays in tourist accommodation*	3,71	3,86	2,71	4,00	3,20	3,50
18.1. Riverine and direct inputs of nitrogen and phosphorus inshore waters*	3,50	3,33	3,50	3,00	3,40	3,35
14.2. Occupancy rate of bed places	3,71	3,86	2,14	4,14	2,80	3,33
7.1. Area of semi-natural habitat	3,43	3,00	3,43	2,71	3,80	3,27
22.1. Ratio of first to second and holiday homes	2,86	2,86	4,14	3,29	3,20	3,27
20.1. Indices of social exclusion by area	3,00	2,86	3,00	3,43	3,80	3,22
11.1. Number and value of sales of local products with regional quality labels or European PDO/PGI/TSG *	3,14	3,86	3,00	2,86	3,20	3,21
23.2. Recruitment and spawning stock biomass by species	3,60	3,40	3,20	3,60	2,25	3,21
23.1. State of the main fish stocks by species and sea area #	3,50	2,83	3,17	3,33	3,00	3,17
6.1. Proportion of agricultural land farmed intensively #	2,67	3,67	3,18	2,80	3,40	3,14
5.1. Number of berths and moorings for recreational boating	3,43	2,29	3,76	1,71	4,00	3,06
4.1. Volume of traffic on coastal motorways and major roads	3,00	2,57	3,14	3,00	3,40	3,02
26.2. Area and volume of sand nourishment	2,57	2,86	3,00	3,00	3,00	2,89
25.1. Number of 'stormy days'	2,00	2,20	3,40	3,40	3,00	2,80

Measurement	Thematic Availability	Accessi-bility	Spatial coverage	Temporal coverage	Reliability	Average score
10.3. Number of Red List coastal area species	2,00	3,17	2,00	1,83	3,25	2,45
1.2. Value of residential property.	1,86	2,86	2,29	2,29	2,40	2,34
17.1. Volume of litter collected per given length of shoreline	1,86	2,71	1,71	1,43	2,20	1,98
27.1. Area of protected sites within an 'at risk' zone	2,00	1,80	2,20	1,20	1,00	1,64
26.3. Number of people living within an 'at risk' zone	1,20	1,60	1,40	1,20	1,00	1,28
23.5. Number of days of reduced supply	1,50	1,17	1,50	0,83	1,00	1,20
27.2. Value of economic assets within an 'at risk' zone	1,20	1,00	1,40	0,40	0,75	0,95
10.1. Status and trend of specified habitats and species	0,50	2,00	1,00	0,50	0,00	0,80
9.1. Rate of loss of, or damage to, protected areas	0,50	2,00	0,50	0,50	0,00	0,70
10.2. Number of species per habitat type	0,33	1,33	0,67	0,33	0,00	0,53
12.2. Value added per sector	0,50	0,00	0,00	0,00	0,00	0,10

The indicators on bathing water quality, population size and density, volume of port traffic, area of built-up land and fish landings are best scored by all partners alike and obtain averaged scores above '4' for each of the five criteria.

As a first conclusion we can state that for only 40% (18) of the WG-ID measurements proposed, the data is available from EU databases or from other international databases with the same format to perform comparable calculations. Of these, the data reported for at least 3 measurements is not relevant for the purpose of analysis of the coastal zones. For at least 27 measurements, no reliable data exist at the European level.
This finding illustrates that only a limited number of policies that are relevant for coastal zones actually have the required instrumentation for the data gathering required to evaluate their impact on the coast.

3.2.2 Questions on the databases

The indicators calculations conducted in the DEDUCE project and based on European and national/local databases listed above, confirm that significant problems persist for monitoring sustainable development in coastal zones and, consequently, for monitoring according to common standards in Europe. The main problems are summarised below:

a) **The Coast and especially the maritime areas are largely invisible in terms of information**. The coastal zone is not covered as a distinct reporting unit or a specific coverage in most GIS or user interfaces in most information sources and databases.

b) The calculation of measurements for coastal coverage requires **raw data defined at local scale**, because the definition of the accurate administrative coastal coverage is composed by coastal municipalities (NUTS 5), except at European scale. It very often implies that the raw data needs to report municipal values. These **local parameters are not easily accessible** because data are generally accessible as aggregated values for upper administrative units. Most data are referred by NUTS 2-3 but they are generally too broad to generate the appropriate data for the purpose of analysing the state of the coast.

c) **Lack of coherence in data gathering programs concerning the geographic and temporal coverage and the definition of measurements**, mainly due to the absence of coast-specific policies and the deficient perspective of European policies for benchmarking or analysis. The monitoring of coastal zones can not use the coherent

European-wide databases (common methodology in data gathering and reporting) due to the aforementioned problems of reporting scale. On the other hand, top-level scientific information to underpin indicator calculations generated within Research Centres or specialist public administrations and agencies may have limited scope (methodology, definitions, coverage), which restricts application to a wider region or issue.

1) Differences in **geographic and temporal** coverage:

Differences in **statistical geography** between countries: the statistical building blocks, the criteria for their design and the area they cover may vary significantly between MS. This may result in a bias in calculations and in comparison of 'the coastal zone' between coastal MS, in particular for population and socio-economic data.

Inappropriate **reporting format** for analysis of thematic issues for the coast: e.g. NUTS2 or NUTS3, amalgamation of coastal and hinterland municipalities into one reporting unit and inconsistencies in the level of reporting unit between countries and/or over time (e.g. changing boundaries of statistical units over time).

Differences in composition of sampling units for different reporting purposes: e.g. tourism reports may collate seaside towns into one 'coastal' reporting unit at the national level, while related indicators e.g. population data, age structure, waste disposal etc. are reported at NUTS 5.

Frequency and interval of sampling may not coincide between countries (e.g. years of decennial census events), restricting comparison at EU level. Frequency and year of sampling for two related indicators or composed indicators (e.g. number of overnight stays and numbers of resident population) may not coincide, generating an unknown bias in results.

2) Differences in thematic definitions and methodology:

Variety in working definitions at the national and local level restricts comparison of datasets at the EU level. NUTS and LAU codes for administrative units, NACE codes for economic sectors, ILO definitions for (un)employment, ISCED categories for educational qualifications, EUNIS habitat types, CLC land use categories, are just a few examples of the efforts made in streamlining metadata at EU and international level. Further work is required in this area.

Changes in methodology over time, within the data gathering program, may create a hiatus and/or a breach in time series: changes in measuring instruments, modifications in the location of measuring stations, changes in weighting factors in the analysis of data from surveys, etc.

d) Information collected through one-off surveys or studies at European scale without a follow-up remain a picture ('t_0') taken out of a context (trend) in the **absence of time series**.

e) Finally, **restrictions in accessibility and copyright** of data and information remain an obstacle at all levels. Accessibility may be also be hindered by measures to protect entities where sample size is too small.

These problems have negative consequences for the analysis of the state of the coast:

- Piecemeal and sectoral perception and evaluation of the coast.
- Mostly qualitative descriptions of the coast: at the most a 'state of affairs' in the absence of baseline data and time series.
- Lack of benchmarking between localities, coastal zones, regions, MS, in absence of comparable spatial units/time series (SEAL).

3.3 SPATIAL DIMENSION OF THE INDICATORS AND GEOGRAPHICAL INFORMATION SYSTEM – GIS

One of the first issues in developing a common methodology to calculate measurements is achieving agreement on the spatial coverage: what does '**the coastal zone**' mean? What are the **boundaries** of the area to measure? Defining the appropriate unit for data collection and reporting depends on the existing systems for data sampling and storage but in the first place, on the nature of the data and the purpose for which it is collected.

Moreover, **integrated management of the coastal zone is participative by nature** and encompasses **economic, environmental and social** information. The question therefore is 'how can a data and information system address a **multi-thematic** and **multi-purpose** framework for integrated management? Furthermore, how can it be made **comprehensive, accessible and useful at the different scales and users' levels**? GIS enables us to store and manage environmental, social and economic data, to integrate this data in a spatial dimension and disseminate it in a comprehensive format.

3.3.1 The Coast as a spatial unit

Although in practice, one uniform definition for the coast as a spatial unit seems an artificial approach, a common definition of 'coastal' versus 'hinterland' by **thematic issue** seems to be operable and meaningful. Besides, achieving a uniform definition of the 'coastal zone' throughout European varied coastlines would fail to take into account the **richness in morphology and the nature** of the coast and its **socio-economic characteristics and patterns of development**.

- Socio-demographic data and most of the social measurements are collected for **administrative units**, to support policy and decision making for issues addressed at the administration level. Except at the European level, the coastal coverage is reported by the amalgamation of coastal NUTS 5.

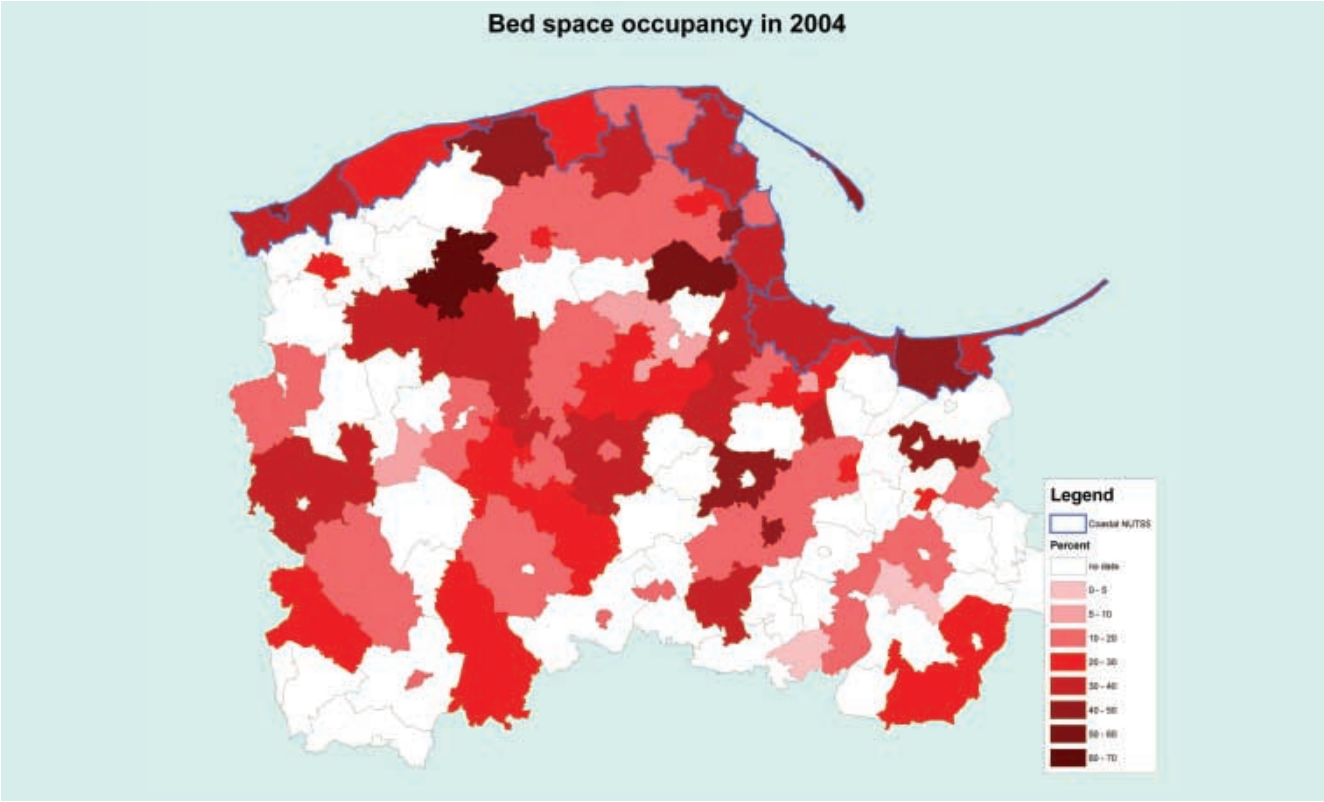


Fig. 8: Statistical data reported by municipality in the Bay of Gdańsk, Poland (Maritime Institute in Gdańsk).

- Data on water quality, marine recreation, fish landings, port traffic or sea level rise are collected at **sampling sites or stations** and reported for simple geographic coordinates. For other measurements, for instance the indicator of coastal erosion, the coastal coverage is the coastline.

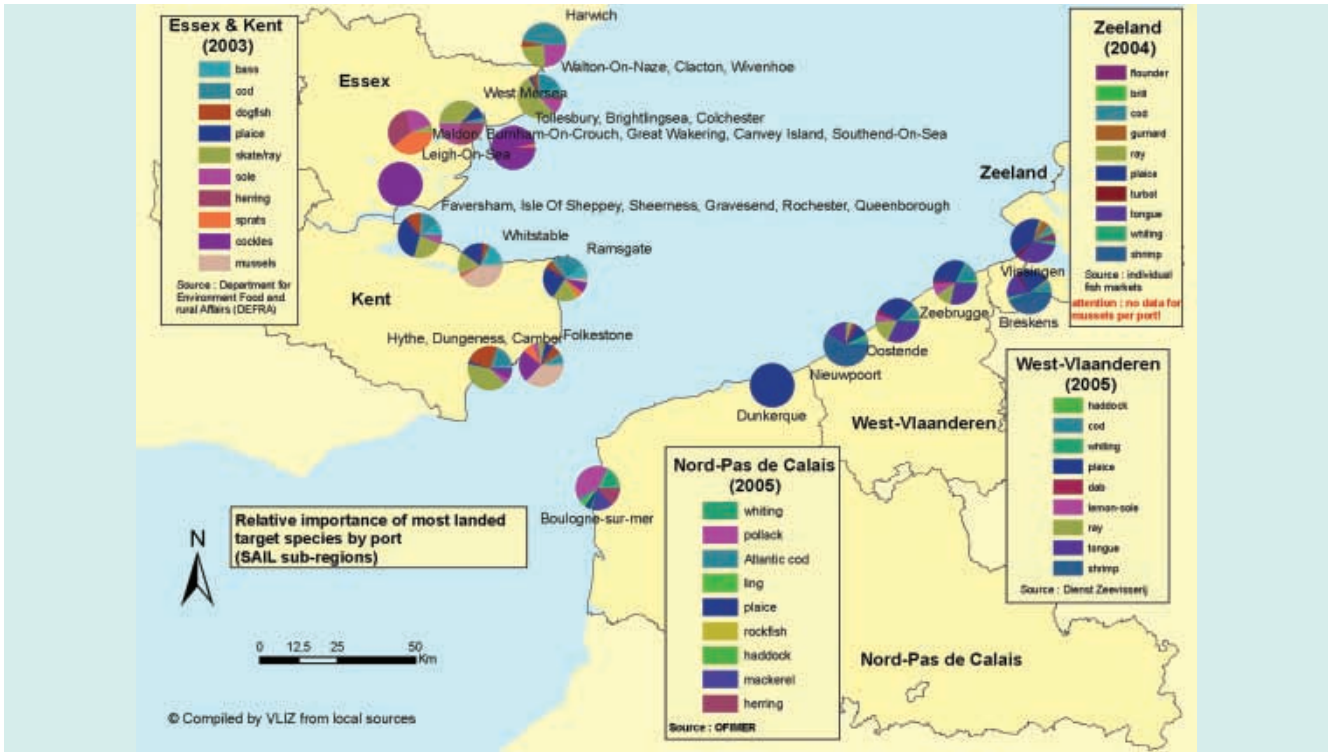


Fig. 9: Proportion of most landed commercial target species by port in the southern North Sea (VLIZ, 2006).

- For thematic issues (e.g. tourism) data may be collected and reported for functional groups of **amalgamated municipalities**, towns or clusters of information and sampling points. In the methodology (SIF) the number of these cases was kept to a minimum because it presents obstacles for a comparable coverage between different countries.

- **Finally, for a number of indicators the coastal coverage is defined as terrestrial and/or marines buffers** or shapes of equal distance from the coastline. 'Coastal' is identified by terrestrial coastal belts of 1km and 10km and a marine belt of 10km seawards. Buffer coverage is generally used for data obtained of mapped areas, mainly land use issues (build-up and fragmentation of land, protected areas, etc.).

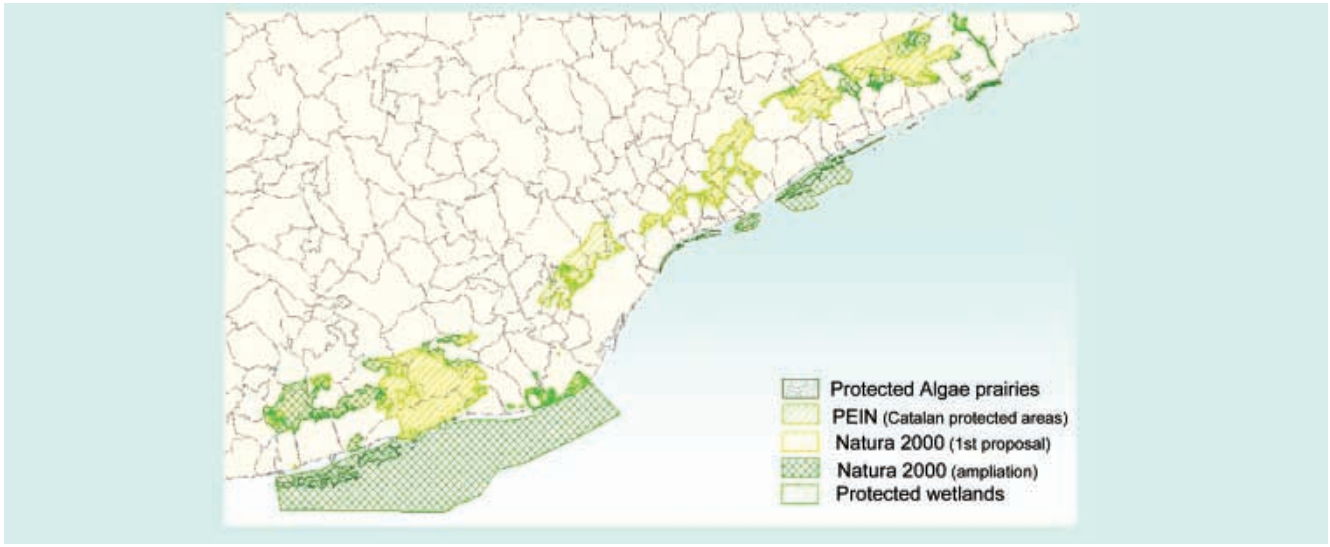


Fig.10: Protected land in the 10km coastal buffer in the province of Barcelona (Gencat).

Moreover, a number of indicators introduce the hinterland coverage, as the complementary area in the wider reference region. The variety in spatial references of raw data explains the different 'thematic' definitions for the coast (one 'coastal zone' for nature conservation, one for socio-economic data, etc.). Different indicators may not relate to comparable formats, generating problems for correlation and vertical integration between indicators. Again the message is to strive for **a balance between relevance at local level while maintaining significance at European scale**. In practice however this means that different sources of data need to be 'mined' when problems in compatibility arise.

If indicators are policy driven and dictated by the nature of the measurement then inevitably the 'geographical unit' will be different for different measurements. Too much focus on **one single definition for the coast** may result in **loss** of scope where the coast is represented by a smooth line, however with hardly any **relevance or affinity to those living on the coast** or to the **policymakers**.

So, is there only one coast?

The best way to allow for the comparison of indicators at all levels is a **bottom-up approach in data collecting and information systems**: starting from reliable and sound data at the local level and aggregating this at higher levels in common databases. Consistent data and data flow should provide a more realistic picture of processes taking place at 'the coast' and support the decision in planning at different levels (from municipality to national to EU level).

The main observation is to collect data at the smallest – and most sensible – level possible in order to 'repackage' the information for the coastal zone and amalgamate the local datasets at higher levels as required. Even so, indicators have to be useful to municipalities and MS if their systematic use at a European scale is to be supported in the long-term. In this regard – and in terms of cost-benefit considerations – the streamlining of data flow in Europe becomes very important. The EU Statistical Programme Committee (SPC) and spatial data initiatives (INSPIRE and MOTIIV) can play leading roles in this process.

3.3.2 Geographical Information System for the coast

Two types of data can be restored with a GIS and be redistributed through the Internet:

A. **Geographical information** such as land use and its evolution, the boundaries of protected areas, hydrography and outlines of rivers, bathymetry, etc. This information is framing data. It allows the inclusion/understanding of how the territory is organised and provides visualisation of the interface between land and sea.

Fig.11: Geographical and statistical data on coastal areas (IFEN).

B. **Statistical data**: this information is often represented according to an administrative grid (e.g. population density in coastal Nuts 5). It can also be assigned to points like most of the measurements related to marine water quality. This infor-

mation can support an understanding of the level of sustainability of the coastal development and the impact of the implemented policies. Indicators developed within the framework of the DEDUCE project are a part of this information.

GIS implemented by DEDUCE partners

An inventory and brief analysis of the GIS implemented by the DEDUCE partners for the coast allows some conclusions to be drawn, as summarised below. For the complete report and recommendations, reference is made to the DEDUCE website (www.deduce.eu):

- The design, the application, the nature of data, the software and the dissemination of information are very variable according to the partners, their function and the geographical scope and scale of their area of interest.
- Maritime data are less available and scarce compared to the terrestrial data. The coastal area and the land and sea interface is also the interface between two separate information systems that are at present difficult to make compatible.
  - On the terrestrial part, there is plentiful data generated through census on various scales of administrative meshes and geographical information on land use and natural spaces. For that reason, information is generally accessible for the whole territory in a continuous manner.
  - On the marine part, less data is available and is mainly related to water quality and zoning: lawful limits of fishing, zoning in the jurisdiction and boundaries of different thematic competence, localisation of marine flora. The nature of the data is therefore very different at sea and on land.
  - Consequently, it is often very difficult to obtain continuous information and an integrated vision that covers the land/sea interface.
- There are few coast-specific GIS. The DEDUCE partners very often form part of complex national/regional networks of competencies and data exchange schemes. There is not a single referring Institute for thematic coastal information, planning and management. Competencies are often spread over several organisations. In addition, there are hardly any initiatives for federative structures like observatories that could support a co-ordinated data management process. The implementation of coastal GIS is therefore made much more complex.

Towards a partnership GIS on Internet

GIS are essential as a system for the storage, handling and integration of spatial data to monitor and measure SD in coastal zones and disseminate it in a comprehensive format. An interesting example is the French observatory: **www.ifen.fr/littoral/index.htm**.

Several obstacles persist in the building of a harmonised coastal GIS at European level:
- Incompatibility of scales,
- Interoperability of data, formats and projection systems,
- Lack of common standards, protocols and metadata,
- Data copyright and cost-related issues.

These obstacles are addressed through the recommendations of the INSPIRE Directive and the MOTIIVE project (Global Monitoring and Environmental System and Marine Data Harmonisation):

- Defining common standards, protocols, formats and reference systems,
- Defining and enforcing international data quality standards.

To be placed at the disposal of the end-user through two main concepts:
- Seamless discovery: agreement at EU level for data description, common metadata definitions, common protocols for data access and the sharing policy,
- Seamless use: allowing easy identification of available data and the fit for the purpose of datasets.

4. THE USEFULNESS OF A METHODOLOGICAL FRAMEWORK FOR INDICATORS OF SUSTAINABLE DEVELOPMENT IN COASTAL ZONES

In well-informed societies efforts are conducted to bridge the gap between science, policy-makers and society at large, through transparency and effectively targeted communication strategies.

The usefulness of the SD indicators approach is that it provides a tool for a sustainability appraisal and assessment of policies – in particular of the measures and actions developed or to be developed in coastal zones. Citizens, policy-makers, scientists and other stakeholders can be informed on what is going on in coastal areas, what their role/responsibility/impact consists of and what is being done to address these impacts. Basically, indicators enhance objectivity and transparency in all phases of ICZM.

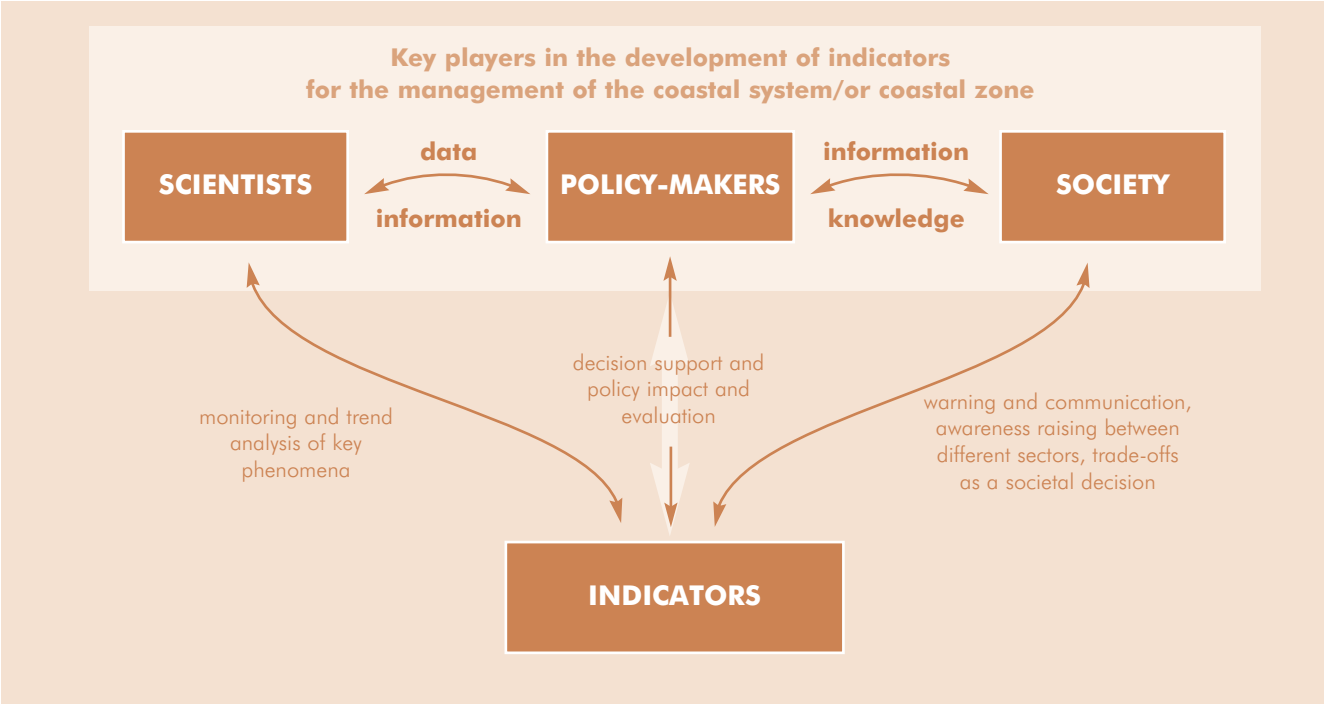


Fig. 12: Information flux and role of indicators.

For well-informed decision-making, policy-makers need to turn to science while scientists need to understand the importance of delivering **information** in a **format that is relevant and useful to policymakers**.

The **EU ICZM Recommendation** encouraged member states to report on the state of the coast, based on objective and scientifically underpinned information, in order to make the coast visible and to monitor whether we are moving towards a more sustainable future for our coasts in Europe. So far, a number of MS are using indicators and quantitative evaluations to assess and report on the state of their coast (see Chapter 1).

The first **EU Strategy for Sustainable Development** (Gothenburg, June 2001) sets out a commitment for the "use of indicators for monitoring long-term progress towards meeting the targets of SD and assist decision-makers and inform the general public about achievements, trade-offs and failures in attaining the commonly agreed objectives of SD". This strategy was reviewed in 2005; the renewed strategy focuses on the need to have an operative set of indicators of SD to be monitored every 2 years. Thus, the Commission recognises the importance of objective and sound information systems to monitor achievements and evaluate policies and plans.

The Methodological Framework for Indicators of Sustainable Development (MFISD) provides a powerful tool for a **standardised measurement of progress** towards sustainable development, to support **better-informed decision-making** and promote **objective and transparent communication** on the efficient use of public funds. Its explanatory and suggestive power is particularly useful to show **trends and linkages between related policy** domains.

A MFISD for Europe's coastal zones is one of the tools for efficient monitoring of and transparent communication on sustainability in these sensitive regions. In spite of the difficulties in making it instrumental, there is a **scope for further development**. Alternatively, in a scenario without a MFISD for the coast, the processes and the coast itself remain largely invisible to all of us.

The main users of the MF are policy-makers, scientists and the general public. Therefore this chapter is structured into 3 main parts:

- Reviewing the coastal planning and management,
- Integrating the coastal analysis,
- Improving the visibility and perception of the coast.

4.1. REVIEWING THE COASTAL PLANNING AND MANAGEMENT

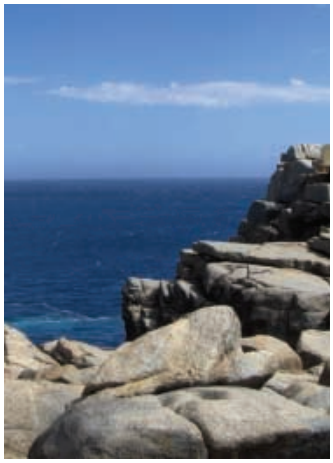
4.1.1. The indicators approach and ICZM policy

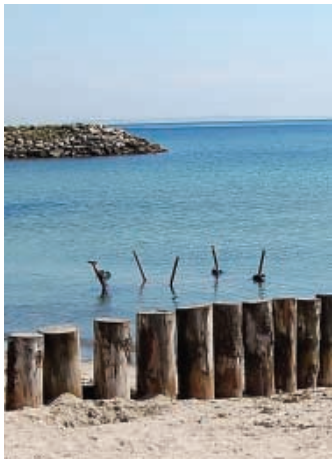
Policies are often drawn up in response to specific management problems and the coastal zone is not an exception to this approach. Efficient ICZM policies should:

- Be based on clearly **defined strategies**,
- Set forward **concise action** plans,
- Establish objective **management targets** based on quantitative and qualitative criteria that can be **objectively verified**.

For an effective decision-making process related to coastal policy options, appraisal and evaluation:

- Targets need to be **measurable**,
- Alternatives need to be appraised (ex ante) before management options are put in place,
- Appraisal must include a **cost-benefit analysis** based on objectively agreed and transparent criteria,
- **Progress** in **achieving the objectives** must be **measured** from a baseline and aimed at a measurable target.






Hence, the outcomes and impact of ICZM and SD policies and plans need to be assessed – did we meet the targets? Are trends going in the desired direction set by the targets? This does not necessarily include an evaluation of whether the actual situation is sustainable or not. Indicators serve **both ends and each step of the policy cycle** – clearly stated strategies and well focused policies and action plans generate readily identifiable indicators, which in their turn support policy evaluation and revision.

Effective ICZM depends on a strategic policy development with objectives and targets that are applicable to different administrative levels. Similarly this hierarchical approach can be adopted in the MFSID by establishing priority or headline indicators that can enable integrated analysis and approach.

Ideally, indicators should be embedded in EU or international legislation (Habitat&Birds Directives, Favourable Conservation Status, good chemical and ecological water quality status, mandatory value for BWQ, etc.). These are endorsed by EU legislation and are harnessed with the necessary legal instruments for follow-up (monitoring, reporting) and sanctions. Problems may arise when the formats and targets put forward by the MFISD or the monitoring framework are lacking in legal backup. In relation to their usefulness for policymakers or in other words for ICZM, the indicators may have different qualities:

- Strategic versus "daily" management indicators,
- Direct versus long-term impact,
- Constant (permanent) versus temporary features,
- Specialist-reflexive versus general-intuitive.

4.1.2. The indicators and the coastal monitoring system

Focused policies with **clear quantitative and qualitative targets** tend to generate specific indicators that facilitate the monitoring of objectives and hence the **evaluation of the effectiveness of these policies**. A clear linkage between policy objectives and a set of carefully selected indicators facilitates the subsequent steps of developing common definitions and methodologies to perform comparable indicator calculations and trend analysis.

Moreover, tight policy linkages of the indicators assure relevance for the user and stimulate effective utilisation of indicators in decision-making. In this context, a monitoring framework **establishes a structured approach to policy** and decision-making and provides a **consistent communication tool** for use by various stakeholders.

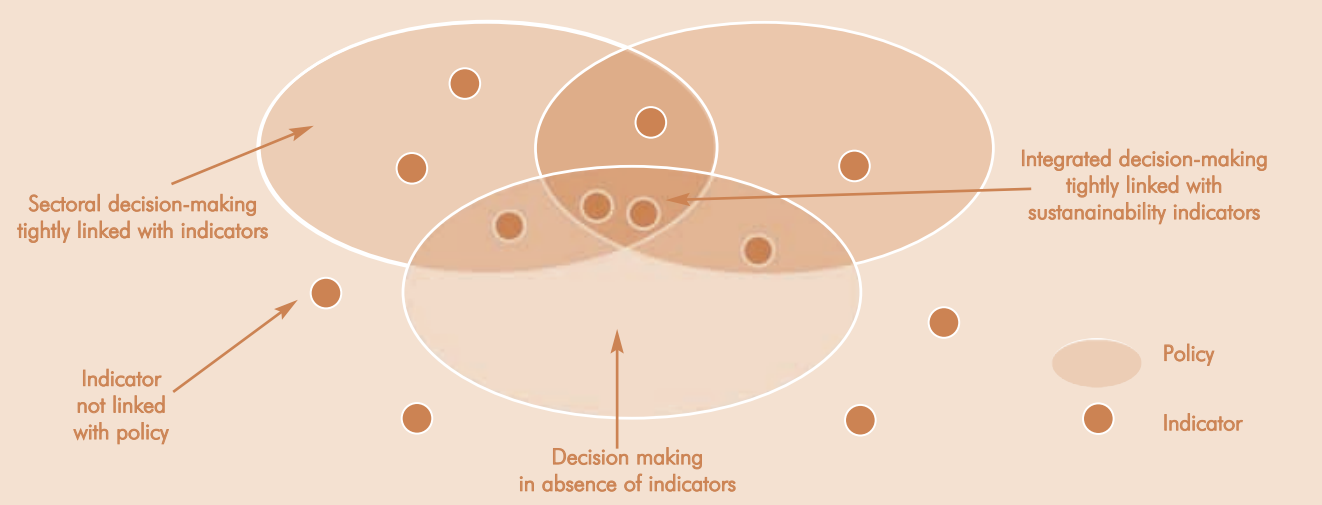


Fig. 13: Linkages between policies and indicators.

Some **indicators are common to different policies. However**, their **targets can be opposite** according to the policy domain they are used for – e.g. the volume of fish landings is an indicator for fisheries policy but is also relevant to

nature protection policies. The targets pursued in both sectoral policies have a different context and so the thresholds may differ substantially. Both target values need to be adjusted to a common goal if sustainable development is pursued. Targets for one policy may also affect the indicator of another policy, e.g. an increase in intensity of coastal tourism can have negative consequences for coastal cultural distinctiveness.

An MFISD provides a **coherent structure** in which **policy linkages** are presented and relationships with relevant indicators for priority policy issues are identified at different levels of the policy cycle.

The coastal monitoring framework is embedded in the MFISD and is backed up by coastal policies that unavoidably (and evidently should) overlap. Some driving forces, such as energy use, affect development in several themes. Some address a specific domain (e.g. erosion) while others affect a wider number of socio-economic and environmental issues (development at the coast). The **framework** must be **flexible** in order to **adjust to possible changes in policy priorities and objectives**, in line with issues emerging from the review cycle of strategy and plans.

Three examples illustrate how monitoring frameworks and decision support systems have been put in place for coastal zones and transitional waters:

1) The Water Framework Directive

Achieving "**good environmental quality status**" is measured by a set of balanced and combined biotic and chemical parameters that give an indication of the quality status of the water bodies. Different targets are set according to the objectives and the "destination" of the water body, hence **weighting environmental and socio-economic** objectives. Indicators monitor pressure and impact separately; the classification of the impact is made according to the result of the impact indicator. i.e. The number of parameters that have exceeded the thresholds; the same for the evaluation of pressure. The final result is delivered in terms of risk category; it combines the pressure and impact categories.

RISK		PRESSURES				
		High	Middle	Low	Exempt	No data
IMPACTS	High	High				
	Middle		Middle			
	Low			Low		
	Exempt				Exempt	
	No data					No data

Fig.14: Classification matrix of risk indicators in the Water Framework Directive.

2) IMAGINE – Plan Bleu (UNEP MAP):

Proposes a method for a good understanding of the coastal issues and the relevant players involved as well as defining a common set of indicators that describe the situation. To determine sustainability, minimal and maximum values are attributed to each indicator between which the criteria for adhering to sustainable development are assessed. Through this method of **participatory planning**, which is applied at the local scale, stakeholders need to work for **consensus** on the following issues:

- Define a set of headline issues
- Translate main issues into agreed indicators
- Achieve consensus on values and ranges of sustainability for each indicator according to priority for action.

3) Dashboard for Sustainable Development

The Dashboard of Sustainability of IISD is an online tool designed to be understood by experts, the media, policy-makers and the general public.

Using the metaphor of a vehicle's instrument panel, it displays country-specific **assessments of economic, environmental, social and institutional performance toward (or away from) sustainability**.

The Dashboard of Sustainability displays the United Nations' core set of sustainability indicators. As a contribution to the World Summit on Sustainable Development in 2002, IISD expanded the Dashboard to provide users with the functionality to compare 10 years of environmental, social and economic data. The Dashboard also displays the Millennium Development Goals indicator set.

It was developed by the Consultative Group on Sustainable Development Indicators, an international team of measurement experts, co-ordinated by the International Institute for Sustainable Development (IISD). The Dashboard project is part of the sustainability indicator initiative of the Bellagio Forum.

These three methods suggest that thresholds should be defined and, if possible, through an **integrated planning process based on consensus and active involvement of stakeholders**. Policymakers can find this approach beneficial for the implementation of proposed policies and actions. In assigning targets and thresholds for SD, achieving consensus means accepting trade-offs. These trade-offs can only be identified by mutually weighting the different objectives. A complete picture of the targets for each of the sectoral objectives is needed in order to balance and set realistic goals & targets.

4.1.3. Adaptation of indicators

Changes may occur as ICZM and SD policy priorities in the EU change over time but also in the inter-regional and intra-regional variability sense. Headline indicators may be complemented with indicators that express the particular identity of the coastal zone (e.g. particular fishing practices, highly prioritised species/habitat) or indicators that express very specific priority issues over time (e.g. TBT in marinas and ports) and may be replaced by others once the issue has been proved to be effectively addressed by policy and enforcement.

In the workshops on coastal indicators organised in the DEDUCE project, the dilemma was raised as to whether the set of SD indicators and the calculation methodology must be common for all European coastal zones or, on the contrary, each coverage must have and develop its own set and methodology according to its own policy objectives, observed problems and the possibilities for monitoring. There are arguments for both options:

Reasons for a common SD indicator set	Reasons for a variable indicator set
Comparisons between countries and regions as well as prioritisations at EU level are possible	Provides knowledge on issues that are not addressed in a common set or not calculated in a common framework
Integration at all scale and bottom-up aggregating is feasible. It allows for measuring the coast at European level	It uses all the possibilities of data previously collected in the coverage. The possibilities for calculation are higher because it can adapt measurements to existing data
Formal commitment to monitoring by all public administrations	Coastal monitoring programmes are defined by the situation of each coast
Creates commonality of effort	Avoids significant effort in the harmonisation of interoperable data systems
The obligation of implementation of a common list of indicators does not restrict each administration from adding specific indicators of its interest for the coastal zone	Avoids using resources on measuring issues which are not of interest to a specific coastal coverage

Flexibility should be the general message. However, although local relevance of the indicators must be taken into consideration at all times, in order to ensure support and commitment at the local level, the European perspective and compliance with reporting obligations and sustainability targets at the EU level cannot be forgotten.

4.2. INTEGRATING THE COASTAL ANALYSIS

Calculating the 27 SD indicators and 45 measurements (DEDUCE project) pointed out that it is possible and necessary to develop an **integrated analysis** of the calculation results.

It is mainly the task of scientists from the respective environmental, social and economic fields, to **describe the types of relationship and uncover causes and effects**. Bringing in a combination of techniques and concepts from different disciplines may provide a way of establishing a practical tool for integrated analysis. One example that illustrates this process is the approach taken for water management in the WFD.

4.2.1. The relationships between the indicators

The need to move away from a sectoral analysis and policy evaluation has been demonstrated repeatedly. Although frameworks and techniques for conducting an integrated analysis have been tested at a very local level, examples at national and supra-national level are scarce. Still, there is scope for further development.

Key elements in this analysis are:

- Defining **cause-effect** relationships,
- Establishing agreed **thresholds and targets**,
- Weighting the **relative value** of the indicators in the analysis or decision-making process. Although the indicators may be set in a common monitoring system, the weight given to each indicator in the decision support system may differ between coastal zones or systems.

The **DPSIR** (UNEP/GRID, OECD) developed for the State of the Environment Reporting or its simplified version **PSR**, addresses questions and issues in terms of cause-effect. Pressure, Driver and State indicators quantify the processes that shape and change the coastal communities and environment, while State, Impact and Response indicators measure how we are coping with these changes towards more sustainable trends.

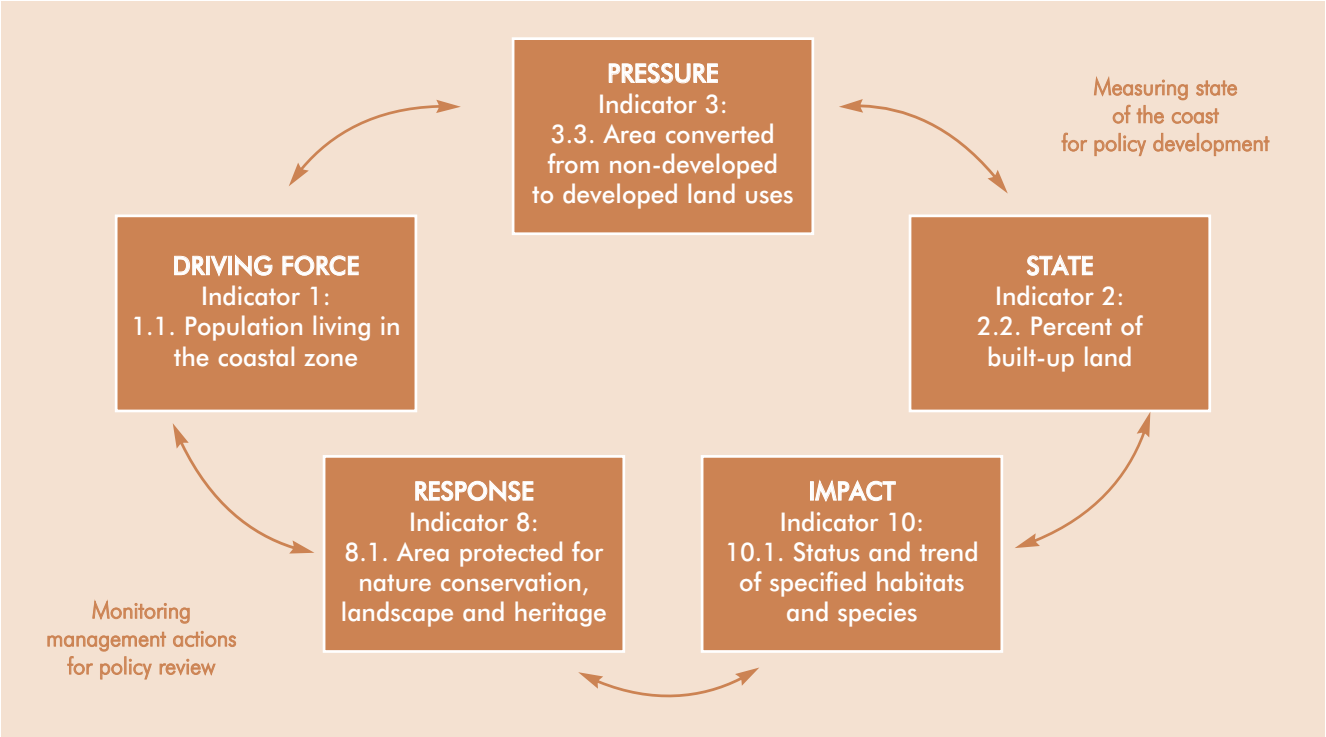


Fig. 15: DPSIR indicator model illustrated in the policy cycle for coastal management.

4.2.2. Benefits and difficulties for integrated analysis

The **benefits** of moving away from a sectoral approach towards an integrated framework for decision-making, policy appraisal and evaluation, are multiple. The challenge of SD in coastal zones and ICZM is to become aware of linkages between economic, social and environmental dimensions and provide an integrated vision of the evolution in coastal zones. Potential trade-offs or synergies (win-win) need to be identified. Once these linkages are identified, efforts can be put into priority issues – minimising trade-offs or conflicts and maximising the synergies through appropriate policies and policy integrations. This can only be achieved through integrated analysis.

However, good examples of appropriate methodologies and practical experiences of integrated analysis are scarce. It is a complex issue and the knowledge to implement this in practice is limited. Indicators are imperfect and the list and set of ISD is open to criticism and should be regarded as a cyclic process. In practice, integrated analysis is mostly limited to proposing linkages between indicators within policy field or between domains. Moreover, these linkages are often based on hypothesis instead of field evidence.

4.2.3. Alternatives, possibilities and models

Integrated analysis with indicators can be achieved at different levels:

a) Policy Framework approach: PSR and analysis of linkages between indicators can be qualitative or quantitative. A scatter plot can be developed with the correlation between indicators, whereby indicators with strong linkages to a wider number of policies for the coast can be regarded as 'headline indicators' (e.g. age structure and proportion of second homes is positively correlated with average prices of property).

b) Spatial analysis: A geographic information system allows for combined analysis of a particular score or benchmarks on one or more indicator value. As such, coastal zones can be evaluated and compared for a number of scores – e.g. the highest percentiles for population density, value of property, second homes and age structure at the Belgian coast.

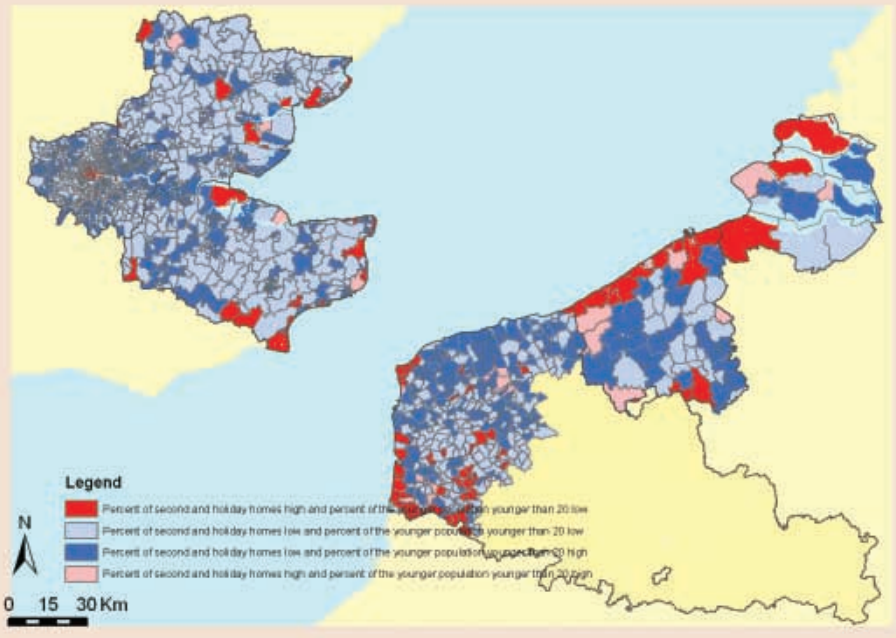


Fig. 16: Map of the relationship between the percent of the population younger than 20 and the percent of second and holiday homes © VLIZ (De Hauwere), 2006.

The **Land and Ecosystem Accounts** (LEAC, European Topic Centre on Land Use and Spatial Information) provides a useful application for the spatial indicators to achieve easy, comprehensive and integrated access to land cover data showing the "stock" available for each land cover class and providing information on changes in land use.

c) Multi-factorial analysis: looking at different social, economic and environmental indicators pertaining to a common issue (e.g. adaptation to climate change) allows for a multi-factor and integrated analysis. However, extreme care should be given to the quality of the data and in practice many of the a priori assumptions and requirements for conducting this analysis cannot be achieved using the current datasets.

4.3. IMPROVING THE VISIBILITY AND PERCEPTION OF THE COAST

Usually, awareness of coastal issues is related to accidents and ecological disasters, as in case of the Prestige oil spill. However, people are less alerted by **transcendent and deep socio-economic and environmental transformations of the coastal areas**, even when they occur over short time intervals. The underlying cause is often found in a deficit of solvent knowledge and complete information addressed to the wider public.

The SD Indicators approach can be very useful in tackling public awareness and attention to important coastal and maritime phenomena.

4.3.1. Social commitment to coastal sustainability

Progress towards sustainability cannot and will not happen with decisions or measurements from policies alone, in the absence of social commitment.

The **incorrect or inexistent vision** of coastal and marine processes often lies at the origin of **unsustainable behaviour**, whereas promoting an integrated understanding of the processes that take place in coastal areas and showing how these affect our lives, may stimulate citizens' and stakeholders' towards more sustainable behaviour. This is a long-term and tedious process since it requires **profound social changes**.

Fragmented knowledge of the coastal system is one of the main causes of persisting unsustainable trends in the coastal zones. In this sense, improving the holistic perception of the coast is one of the main utilities of the indicator approach.

4.3.2. Integrated perception versus sectoral vision

The first conceptual step in this process towards achieving an integrated vision is to consider the **cost/benefit balance** of actions. Generally, socio-economic models generate gains (economic benefits, employment, services, etc.) but also losses (natural heritage, pollution, etc.). Most of these costs or losses are invisible to society. It is therefore necessary to provide a clear and balanced vision of those costs and to compare them with the benefits in the accounting and decision-making.

The cost/benefit analysis unavoidably leads to **evaluating policy options**. Pursuing progress on some objectives can hamper the succession of other priority targets. In general, economic growth is not decoupled from environmental impact; therefore recognition of the linkages of policy impact between different sectors is fundamental.

Moreover, comprehensible information is needed both on the actual state of resources and on the evolution and trend (scenario-building). Results from the DEDUCE project show that the indicators approach allows for the visualisation of the main coastal and marine processes in an **integrated view and with a temporal and spatial dimension**.

4.3.3. Social participation and policy assessment

Communication about the state and trends in coastal sustainability, in particular on the evolution of response indicators, provides information on the effectiveness of public administration and of policies in addressing society's needs. In this sense, indicators contribute to a greater objectivity and transparency of the public administration and policy evaluation.

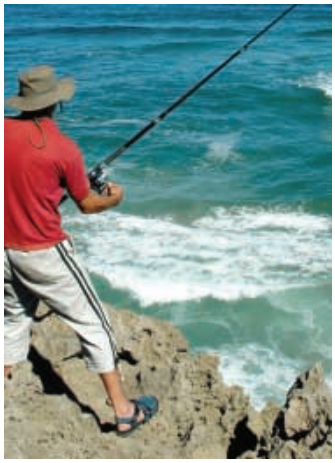
Intuitively, the public may perceive where tight and coherent linkages exist between indicators and policies. This will facilitate communication when trying to achieve consensus in defining objectives and target values. Furthermore, correct appraisal by the general public promotes and stimulates public participation, improves awareness and can build confidence in the decision-making process.

4.3.4. Language for effective social communication

The main results of the DEDUCE project are developed in technical language. However, the results of indicators are of interest to the wider public. In this sense, it is necessary to **adapt the format** of the indicators results in order to transmit a clear and understandable message to users and to promote more intensive and effective public participation.

This "translation" requires input on behalf of communication specialists. Chapter 6 includes some broad recommendations on aspects to be considered in a communication strategy for the ISD for coastal zones.

The indicators approach is by nature a powerful and visual instrument to transmit messages. In fact, most measurements provide results that can be intuitively grasped by laymen.

5 EXPERIENCES FROM EU LEVEL TO LOCAL LEVEL

In order to illustrate the work done by Deduce and to have an overall view of the products obtained, in this chapter we present the results of several indicators (one for each goal), as they are represented in the respective IFSs. As stated in Chapter 3, the IFS integrates the most relevant information for each indicator and the different levels and scales are analysed together.

The indicators that we present here are:

- 2. Area of built-up land,
- 8. Area of land and sea protected by statutory designations,
- 13. Volume of port traffic,
- 16. Quality of bathing water,
- 21. Relative household prosperity,
- 23. Fish stocks and fish landings,
- 26. Coastal erosion and accretion.

Twenty-three IFSs are accessible on the DEDUCE website www.deduce.eu.

5.1 TO CONTROL FURTHER DEVELOPMENT OF THE UNDEVELOPED COAST

Amongst the set of indicators that monitor the goal, "to control as appropriate further development of undeveloped coast", the indicator **2. Area of built-up land**, is one of the most significant of the main drivers concerning coastal development. We present here the results obtained as they are shown in the IFS, for the only measurement it contains – 2.1 **Percentage of built-up land by distance from the coastline**.

There are many factors that contribute to the calculation and follow-up of this indicator. The increase in built-up area has the highest impacts on the environment due to sealing of soil as well as disturbances resulting from transport, noise, resource use, waste dumping and pollution. Transport networks, which connect cities, add to the fragmentation and degradation of the natural landscape. The intensity and patterns of urban sprawl are the result of three main factors – economic development, demand for housing and the extension of transport networks. Although subsidiarity rules assign land and urban planning responsibilities to national and regional levels, most European policies have a direct or indirect effect on urban development.

Fig. 17: Cala del Mal Pas, Benidorm (Alacant), Spain.

Key message

- Over recent decades built-up area has been steadily increasing all over Europe.
- In western European countries, the built-up area is increasing faster than the population.
- There is intensive development near the coastline adjacent to the most interesting coastal biotopes that represent an important barrier to the fluxes between land and sea.
- The proximity of this development to the sea adds extreme vulnerability to the settlements in relation to sea storms, floods and other exceptional events.

The results show that, during the last decade, **significant land use and land cover changes** can be observed in the **10 kilometre coastal strip** of the five **European regional seas**. In general terms, the artificial use of the coastal zone has grown intensively, **especially in the Mediterranean** (804 km^2) and **in the Atlantic** (690 km^2). The North Sea shows

a smaller growth of built up (235 km^2), together with the Baltic Sea (142 km^2) and the Black Sea with the lowest value of change (11km^2). However, in relative terms, in relation to the total area of the assessed coastal zone, the change to artificial surfaces is almost 15% in the Atlantic, 10% in the Mediterranean, 8% in the North Sea and 5% in the Baltic Sea. In the Black Sea changes to built-up land represent ca 2.5%. **Gains in built-up area represent the highest individual change and land cover change in the coastal zones of regional sea catchments**.

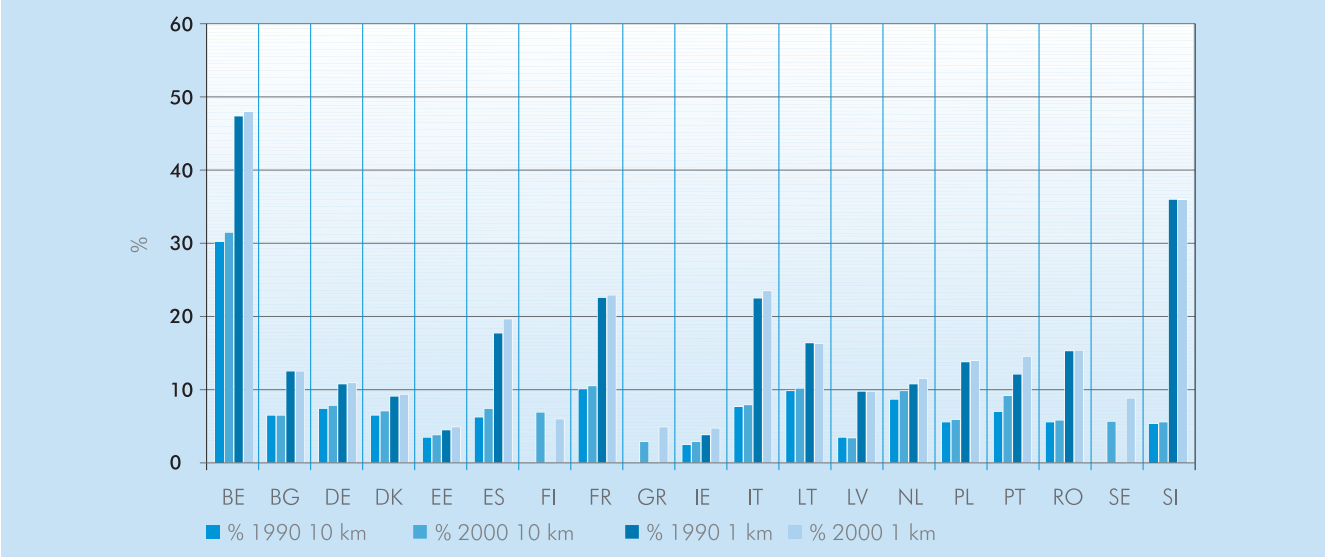
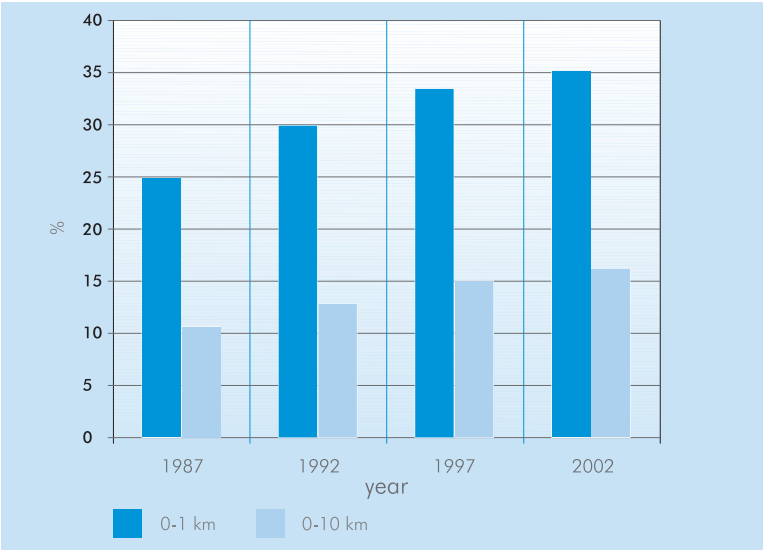


Fig. 18: Percent of built-up in 10 km and 1 km coastal buffer by NUTS3 (source: EEA, ETC-TE, 2005).

Growth of urban artificial surfaces in the coastal zone of **Europe** has continued. Projected on the basis of **annual growth rate** observed during 1990-2000, it is predicted that by 2004 the 1990 levels will be **exceeded by 12%**. In this period, the fastest development has occurred in Portugal (34%), Ireland (27%) and Spain (18%), followed by France, Italy and Greece. **The most affected regional seacoast is the western Mediterranean**.

Inside the 10km coastal zone, **urban surfaces are dominant in the first kilometre** from the shoreline. In several coastal regions of Belgium, Italy, France and Spain the **coverage of built-up areas** in the first kilometre of the coastal strip **exceeds 45%**. In these areas, further development is sprawling to the coastal hinterland. In 2000 the share of area covered by artificial surfaces was 25% higher at the coast than inland. During 1990-2000, trends in European coastal zone show that growth rate of built-up areas at the coast has been about 1/3 faster than inland.



Analysing the built-up land by distance from the coastline at the **regional level**, it becomes apparent that urban surfaces are far more prevalent at 1km from the coastline than in the land area 10km from the coast.

Therefore **the immediate coastal strip** (first kilometre from the coastline landwards) is the area under the most **intense pressure**, in some areas of the coast, especially on the **Mediterranean coast** (Catalonia, Viladecans and Malta where the rate of increase in built up land for 0-1km for the 1990 to 2000 period was 3%).

Fig. 19: Percent of built-up areas in Catalonia in 1 km and 10 km coastal buffers, 1987-2002 (source: Generalitat de Catalunya, 2005).

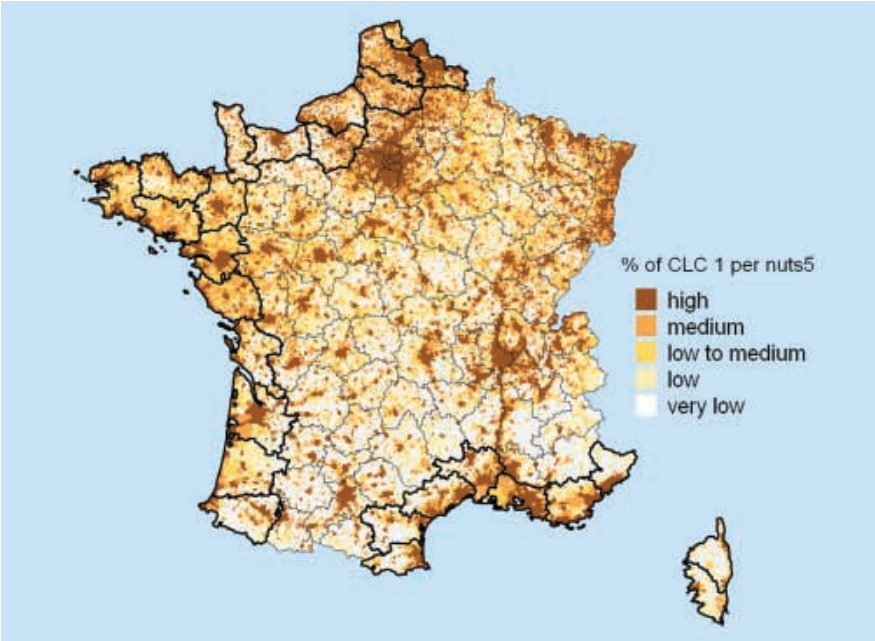


Fig. 20: Built-up land in France in 2000 (source: UE, IFEN, CORINE Land Cover 2000, Observatoire du littoral).

In the **Atlantic**, a significant part of the **French coast**is also intensively occupied, including even the wild coast of Brittany. However, trends show that new constructions are sprawling further from the coastline, provoking a shift to more **occupation of the second and third development front of the coast**. The immediate coastline is reserved for the seasonal tourist whilst the coastal hinterland is becoming the place of annual residents, most of whom continue to work in the coastal cities or in tourist activities.

Many **North Sea coasts** are also very intensively built-up. The coastal zone of the southern North Sea is on average more urbanised than the inland areas (16% versus 10%) in 2000. There is a considerable difference between the various sub-regions. Essex and Zeeland are the less urbanised (10% and 4% respectively).

The average percentage of built-up land on the coast of Zeeland is higher (7%) and increasing more rapidly, compared to the hinterland. The coastal zones of West-Vlaanderen (27%) and Nord-Pas de Calais (26%) are highly urbanised. **The rate of urbanisation in the coastal zone is still 1.32 times higher than in the hinterland**.

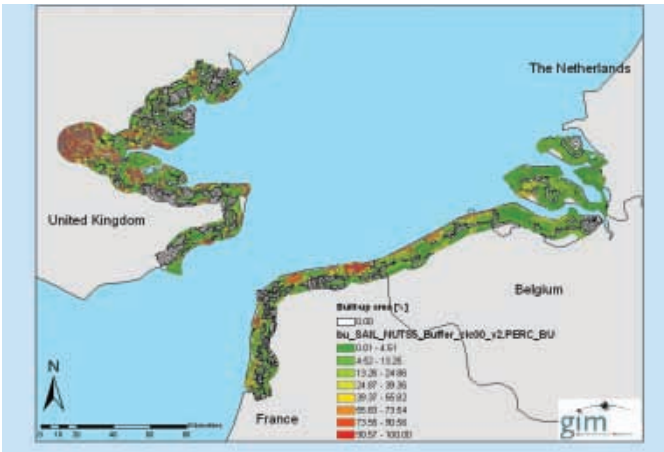


Fig. 21: Percent of built-up area in 2000 in the Southern North Sea Region.

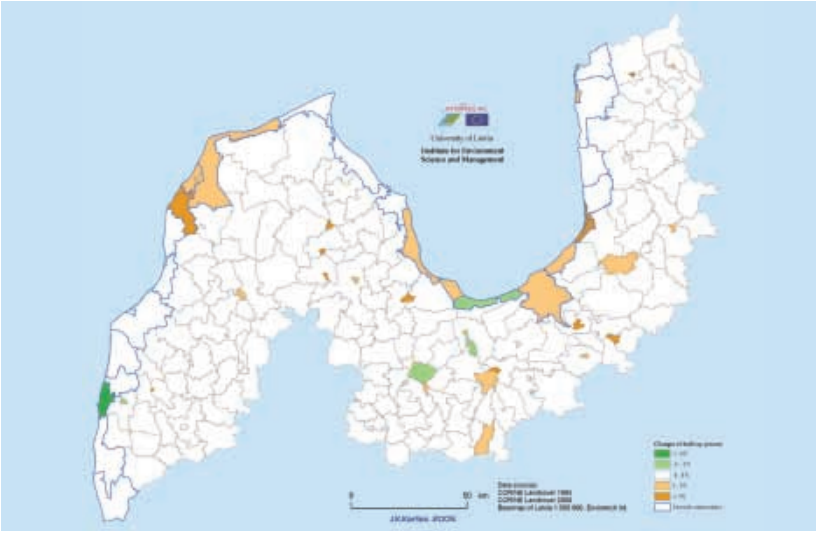


Fig. 22: Changes of built-up land percent from 1995 to 2000, Latvia.

On the other hand, in the regions located in the **Baltic Sea** the **situation is different** due to the reduced share of built-up land located in the coastal areas by comparison with the Mediterranean and even with the Atlantic.

Generally speaking, **the data on built-up areas is not homogeneous** for all DEDUCE partners. There are important data gaps due to spatial resolution (minimum mapping unit does not allow highly accurate interpretation) of the datasets available and temporal inconsistencies due to the different temporal periods analysed.

5.2 TO PROTECT NATURAL AND CULTURAL HERITAGE

One of the 6 indicators proposed by the EU WG-ID to monitor the protection of natural and cultural heritage is the indicator **8. Area of land and sea protected by statutory designations**. This indicator allows measurement of the obligation of the different levels of authorities to protect nature, landscapes and heritage in the coastal areas. It has only one measurement – 8.1. **Area protected for nature conservation, landscape or heritage**.

There are different ways to protect areas – local laws, national acts and European directives like the Birds Directive and the Habitats Directive.

Fig. 23: S. Colas, Camargue, France.

One of the major supporting reasons for monitoring this indicator in the coastal zones is that these, like many other interfaces between two distinct territories, are very rich ecological spaces, both at sea and on land. With very specific species (birds or plants for example), they are undergoing a very strong human pressure. Residential areas are very important due to the population densities and, in many countries, there are significant conflicts between this strong anthropisation and the maintenance of natural areas. The surface area of natural spaces is decreasing on all coastlines. That is why it is very important to measure what we are doing to protect them.

Key message

- Maritime and terrestrial coastal zones are generally well protected.
- The share of the territory designated is more significant near the sea (less than 1km from the coast) than in the hinterland.
- The share of European protection compared to national protection is very variable. It depends on national methods for identifying Natura 2000 sites.

At the **European level**, it is very difficult to take into account all of the national ways to protect nature, landscapes and heritage. However, it is possible to work on the Natura 2000 database, which is homogeneous in all European countries. The values show that **higher protection is located in the first kilometre inland and at the seaside**, by comparison with the 10km coastal strip. It reflects **the importance of the marine and coastal natural habitats**.

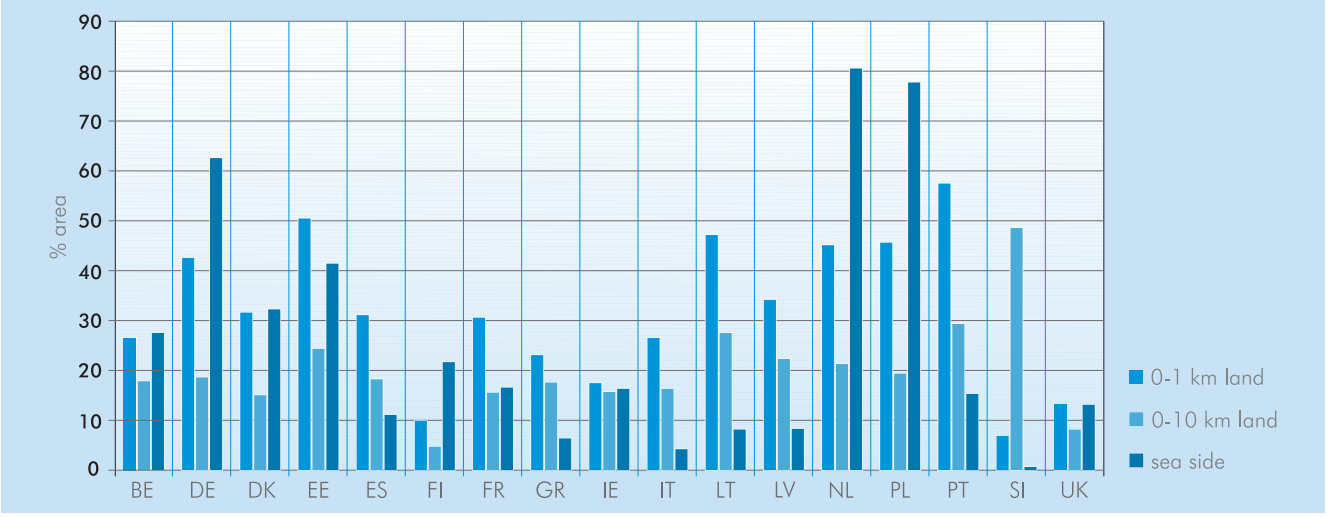


Fig. 24: Percent of land covered by Natura 2000 designated areas by countries, 2000.

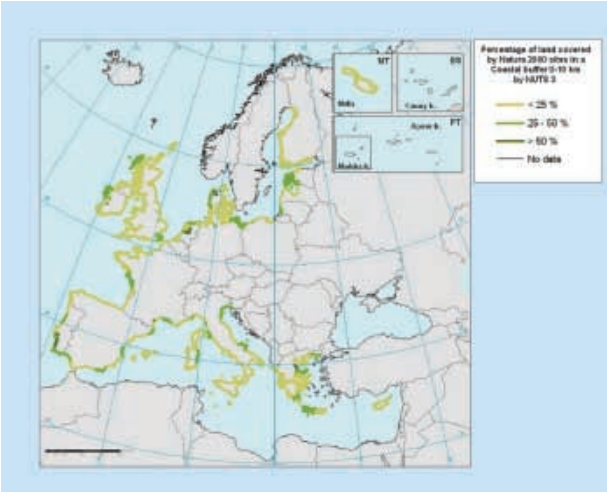


Fig. 25: Coastal areas protected by Natura 2000, based on Natura 2000 database.

All of the analyses carried out by the DEDUCE partners concerning indicator 8 show that **the maritime and terrestrial coastal zones are generally well protected**. By taking into account the Natura 2000 sites on all of the European coasts, it is notable that, in many countries, the share of the territory designated is more significant near the sea (less than 1km far from the coast) than in the hinterland.

That shows the importance of the natural areas on the coasts and the relevance of their protection. In most European countries, the share of the territories designated in **Natura 2000 near the sea is higher than 20%**. Conversely, **in coastal seas** (less than 10 kilometres from the coast), the share of the **territories protected by Natura 2000 is more random**. This depends on the policies of the different member states and certainly on **scientific knowledge** which **is often disparate in marine biology**.

In **Poland**, for example, the percentage of protected areas in the reference region of Pomorze is 39% and has increased by ca. 10% since 1995. This increase is mainly due to the establishment of Natura 2000 protected areas on the sea. The **percentage of marine Natura 2000 areas in the sea buffer zone is ca. 63%**.

This increase of Natura 2000 protected areas is detected by several DEDUCE partners, where the designation of sites is implemented gradually by the European country.

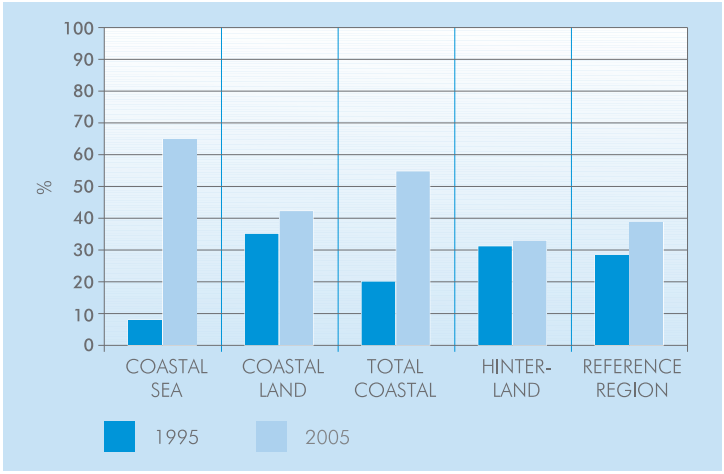


Fig. 26: Trend of the percent of protected area in the coastal zone (sea, land and both), in the hinterland and in the wider reference region, Poland.

The share of European protection compared to national protection is very variable.

For example in Sail sub-regions on the **North Sea coasts**, it varies between 10% in France (Nord-Pas de Calais) and more than 90% in Belgium (West-Vlanderen). We are unable to define an average level for the European coasts.

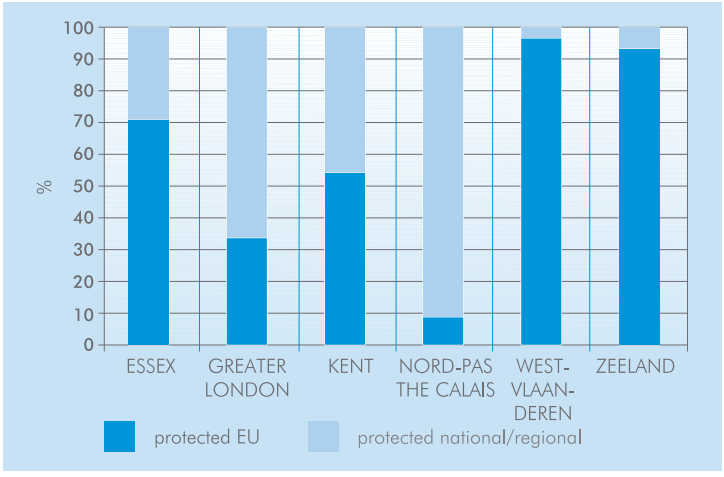


Fig. 27: Percent of EU protected areas at the coast, as a proportion of the total protected areas in SAIL sub-regions, 2004.

Fig. 28: Area of sea and land protected by statutory designation in 2005, Malta.

In most of the cases, we only have **data available** on natural heritage but **nothing on cultural heritage**. It is different in **Malta** where we have specific data on cultural heritage.

The proportion of land area protected by statutory designation increases as one gets closer to the coastline indicating the degree of importance of the Maltese coast when compared to the inland areas. Protection within the marine environment is relatively less than the landward component of the coastal zone in all three categories.

This indicator might be more profoundly evaluated with the indicator for effective management (favourable conservation status) and the presence of management plans. Moreover, if it is intended to compare the level of protection in different countries or regions, it is **very important to have comparable data** and to clearly define different levels of protected areas. This point is very important but it is not easy because **there are several states of protection which have very different definitions** from each other (national protection measures are very different from each other and only international protection measures such as Natura 2000 can be easily compared).

5.3 TO PROMOTE A SUSTAINABLE COASTAL ECONOMY

One of the interesting indicators proposed by EU WG-ID, for measuring the sustainable economic opportunities and employment options (goal 3), is indicator **13. Volume of port traffic**. Ports are major economic drivers both for the transport of people and the transport of goods between different places. They are also used for the support of economic activities in the hinterland because they act as a crucial connection between sea and land transport. On the other hand, one should also consider the negative effects of port traffic on the environment. For example, land use (often in priority coastal habitats) and air or water pollution.

Fig. 29: Port of Ostend, West-Vlaanderen, Belgium © Maritieme Dienstverlening Kust-Afdeling Kust.

Amongst the 3 measurements covered by this indicator, measurement 13.2 (**Total volume of goods handled per port**) is highlighted here because transport of goods is the core business of most major ports and is a common parameter for evaluating trends in port development all over Europe. An increasing throughput of goods year-on-year will lead to a demand for additional port infrastructure such as new docks, roads, economy and environment.

Key message

- Volume of port traffic is increasing around Europe and is related to the growth of harbour infrastructures.
- The volume of goods handled is highest in the countries bordering the North Sea.

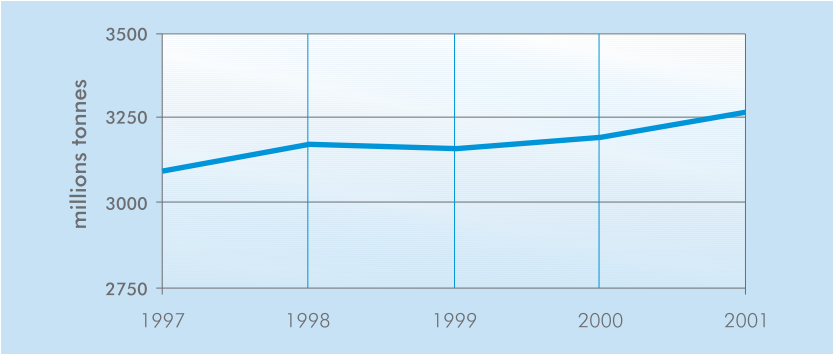


Fig. 30: Goods transport in Europe (1 million t.), source: Eurostat.

Europe has approximately 1,200 maritime ports which handle nearly 1 billion tonnes of cargo per year. **Circa 90% of the EU external trade is shipped by sea**. The EU merchant fleet is therefore the world leader, both in terms of tonnage and by flag, especially in the container ship category. In the White Paper on European Transport Policy for 2010, maritime transport is also clearly identified as a key priority. The **increase in the number of tonnes of goods transported** (from 3101 million tonnes in 1997 to 3267 million tonnes in 2001) is **directly related to the growth of harbour infrastructures all over Europe**, with the collateral effects on land take-up in the coastal areas.

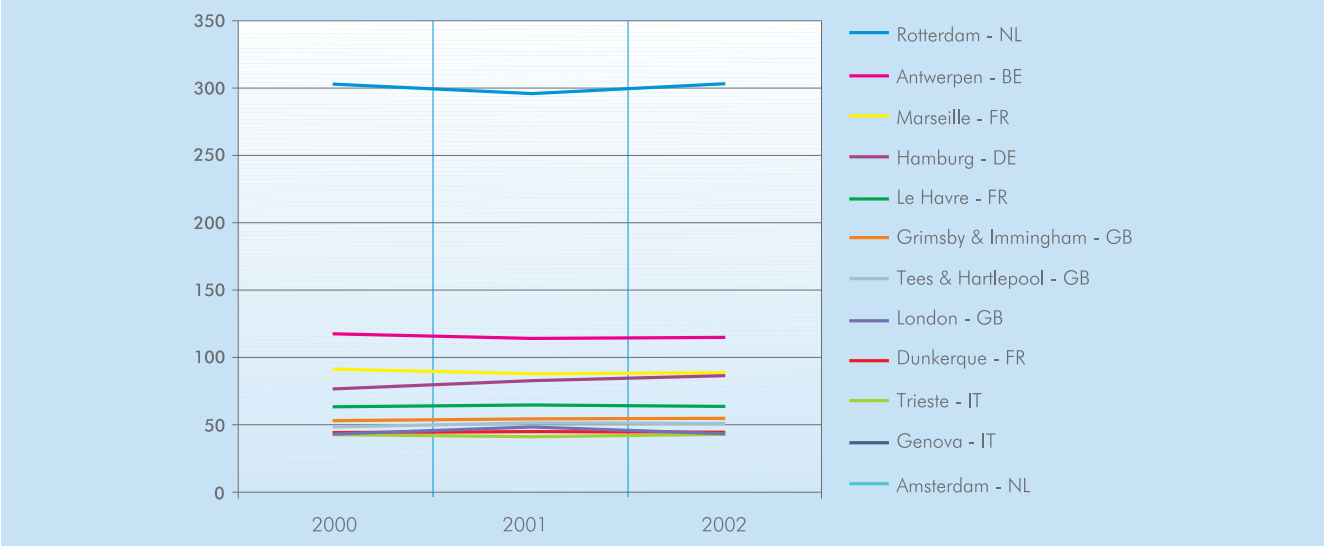


Fig. 31: Goods transport in Top EU ports (1 million t.), source: Eurostat.

In the Eurostat Database only figures for the main ports are included.

Rotterdam, the major port in The Netherlands, is the leader in Europe for the handling of goods. Each year, close to 300 million tonnes is shipped, which is well above all the other European ports. Antwerp, the second port in terms of volume, handles less than half that of Rotterdam (115 million tonnes). The other major ports handle between 40 and 90 million tonnes per annum.

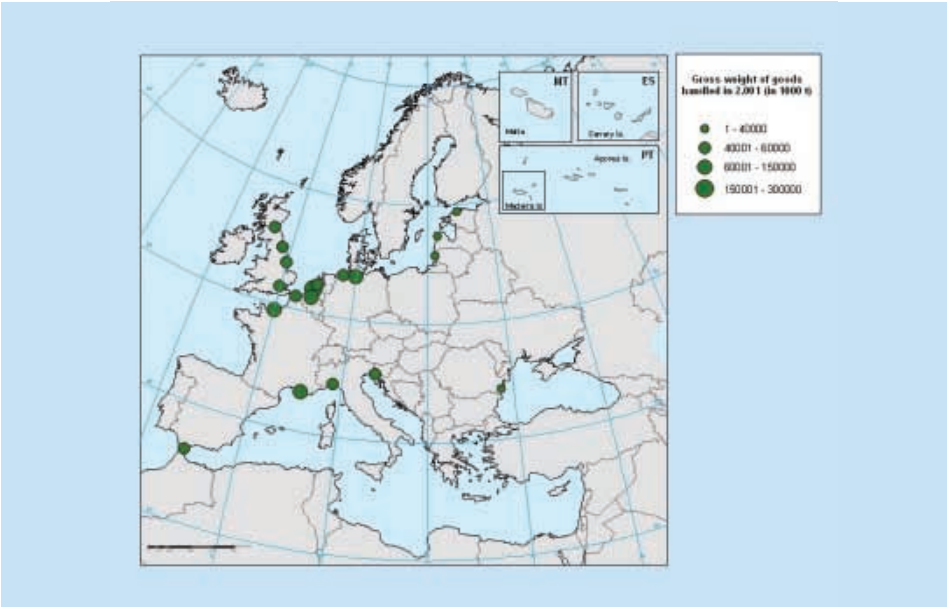


Fig. 32: Gross weight of goods handled in 2001 (1000 t.), source: EEA-ETC TE, 2005.

A number of major ports are situated around the **North Sea** (Rotterdam, Antwerp, Le Havre, Grimsby and Immingham, London, etc.) as well as in the **Mediterranean** (Marseille, Genoa and Trieste). There is **no transport of goods in ports bordering the Atlantic**.

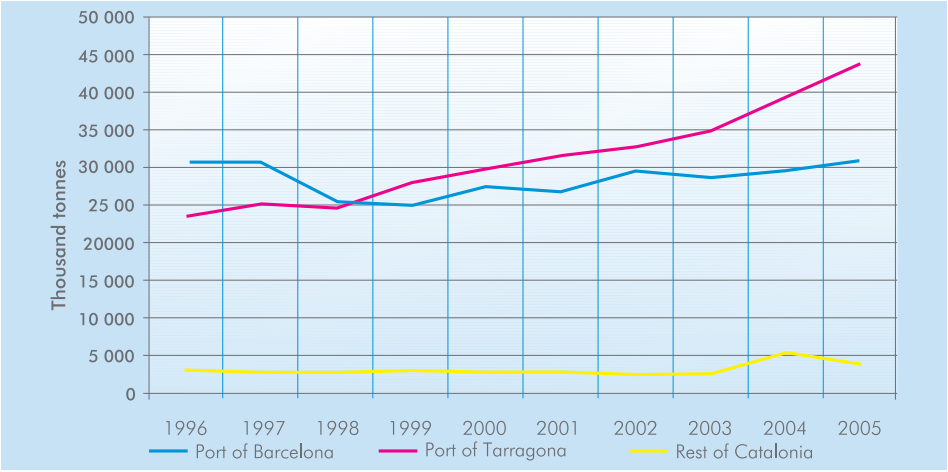


Fig. 33: Goods handled per port in Catalonia (1000 t.).

For most of the **regions or countries** there is **one major port** handling the highest volume of goods over time (Latvia: Ventspils, Poland: Gdańsk, Malta: Marsaxlokk, West-Vlaanderen: Zeebrugge, Nord-Pas de Calais: Dunkerque, etc.). In Catalonia, the differences between the two main ports of Barcelona and Tarragona, are small.

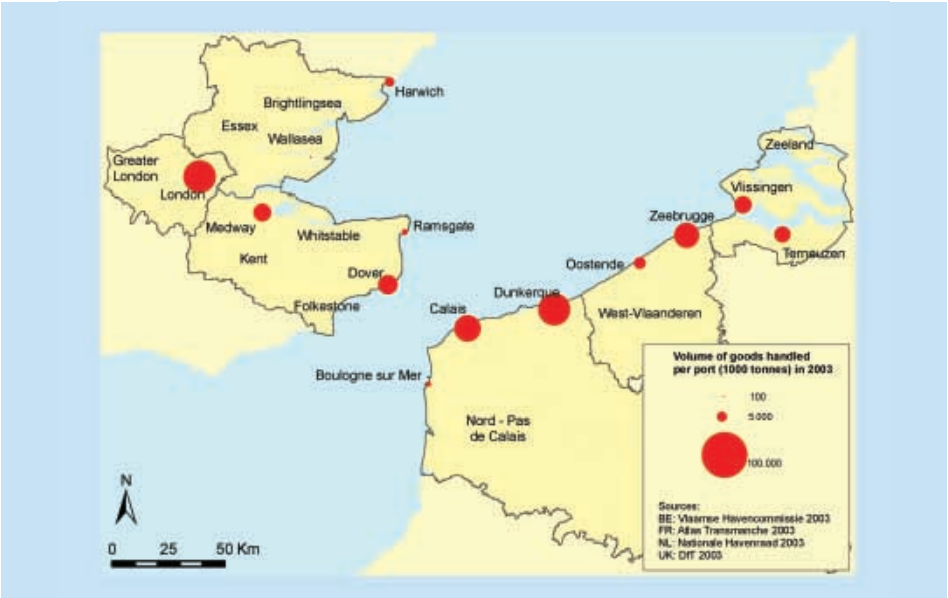


Fig. 34: Volume of goods handled per port (1000 t.) in 2003, © Compiled by VLIZ.

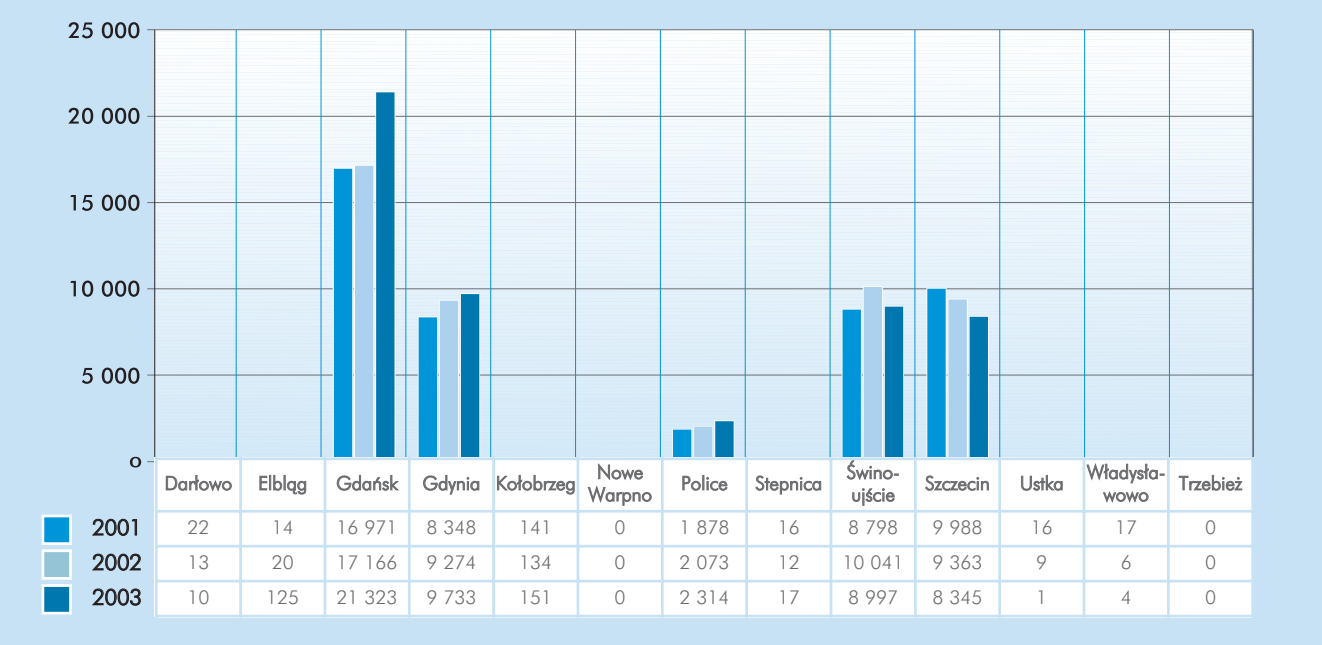
Comparing the ports in the coastal zone of countries bordering the **southern North Sea** (excluding Antwerp) there is **intense traffic with the mainland**, especially Nord-Pas de Calais and the United Kingdom. Dunkerque, to the north of the region Nord-Pas de Calais, handled about **50 million tonnes in 2003** and Dover, in the region of Kent, about 18 million tonnes of goods.

The **total volume of goods handled** in ports of the south-

ern North Sea region has **increased by more than 60%** over the **last twenty years**. In 2003, about 250 million tonnes were handled in the ports bordering the southern North Sea.

Compared to the ports bordering the southern North Sea, the volume of goods transported by the DEDUCE regions located in the **Baltic Sea** is much lower. In Poland for example, the total volume of goods handled is almost the same as in the major port of Nord-Pas de Calais (Dunkerque) in 2003 (50 million tonnes).

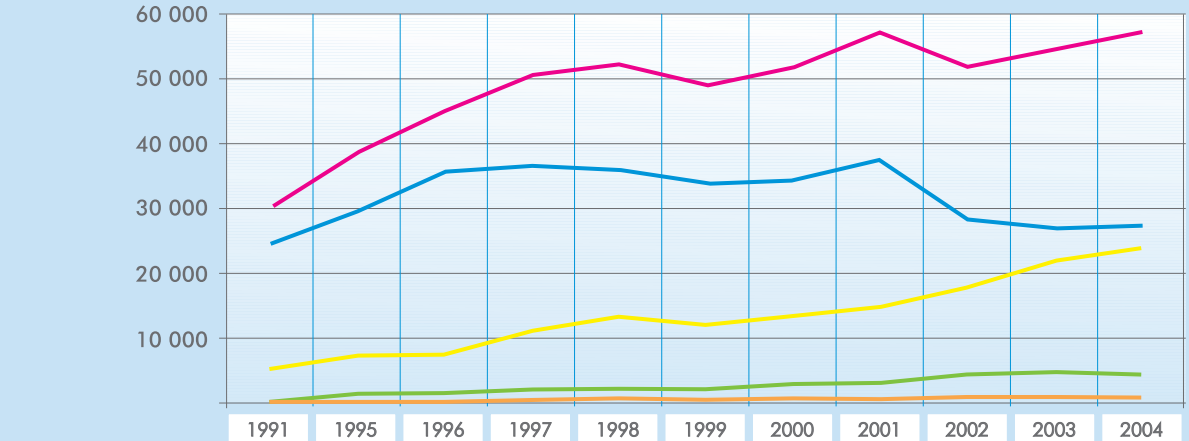
The general trend in **Polish ports** is a small increase in total goods handled (from 46 million in 2001 to 51 million tonnes in 2003). This is the case for Gdańsk, Gdynia and Police. For the second largest ports of Poland (Świnoujście and Szczecin) the trend is respectively stable or decreasing.



	Darłowo	Elbląg	Gdańsk	Gdynia	Kołobrzeg	Nowe Warpno	Police	Stepnica	Świno-ujście	Szczecin	Ustka	Władysła-wowo	Trzebież
2001	22	14	16 971	8 348	141	0	1 878	16	8 798	9 988	16	17	0
2002	13	20	17 166	9 274	134	0	2 073	12	10 041	9 363	9	6	0
2003	10	125	21 323	9 733	151	0	2 314	17	8 997	8 345	1	4	0

Fig. 35: Total annual seaborne transport of Polish ports (1000 t.).

In Latvia, also on the **Baltic Sea**, a fast increase was observed up to 1998. After that, the trend remained stable.



	1991	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Cargoes turnover - total	3 0281	38 985	45 034	50 689	52 292	49 032	51 843	56 918	52 155	54 755	57 400
Riga	5 523	7 453	7 457	11 213	13 315	12 012	13 352	14 883	18 108	21 722	23 991
Ventspills	24 758	29 623	35 744	36 780	36 046	34 137	34 755	37 937	28 704	27 316	27 805
Liepāja	0	1 440	1 609	2 296	2 297	2 324	2 965	3 260	4 318	4 858	4 474
minor ports	0	469	224	400	634	559	771	838	1 025	859	1 130

Fig. 36: Volume of goods handled per port in Latvia (1000 t.).

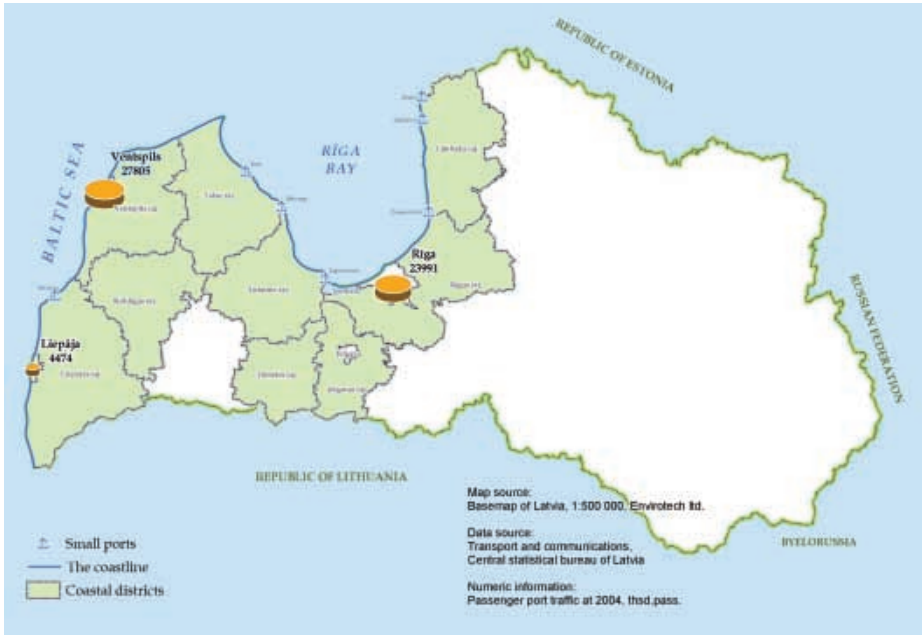


Fig. 37: Cargo traffic in ports, Latvia.

The largest transport of goods in Latvia occurred in 2004 in the ports of Ventspils (28 million tonnes) and Riga (24 million tonnes). However, the dominance of the port of Ventspils is decreasing for several reasons. Firstly, the port worked close to its maximum carrying capacity in 2001. The second reason is political; namely the withdrawal of a certain amount of trans-shipping products on behalf of Russia. The final reason for the decreasing dominance of Ventspils is the rapidly growing volumes in Riga since 1996, and the acceleration of the rate of increase too.

The role of Liepãja and other minor ports is still insignificant but **the volume of goods handled grows constantly**.

The EUROSTAT database is a reliable source for this indicator because trends are available. It is updated annually and it has a common reporting format and quality parameters. On the other hand, for smaller ports it is best to check local sources. Although there is a clear indication of the scale of cargo handling within each port, the economic importance of the port may be more clearly understood if there is corresponding financial information. Another issue is the risk of reporting containers in transit twice – first as imports and then again as exports. This might give an inaccurate result for port volumes.

5.4 TO ENSURE THAT BEACHES ARE CLEAN AND COASTAL WATERS ARE UNPOLLUTED

30 years have passed since the European Bathing Water Directive was introduced as an attempt to cleanse bathing waters without restricting further development on the coast. One of the 4 indicators proposed by the EU-WG to assess goal 4, "To ensure the beaches are clean and that coastal waters are unpolluted" is, **16. Quality of Bathing Water**, which is based on the accomplishment of the European Bathing Water Directive. This indicator has one measurement – the **Percentage of coastal bathing waters compliant with the guide value of the European Bathing Water Directive**, which we present here.

This Directive specifies 19 parameters to be monitored, although priority is given to two microbiological parameters – total and faecal coliforms – and three physico-chemical parameters – mineral oils, surface-active substances (persistent foam resulting from the presence of detergents) and phenols.

The quality of bathing waters is of great importance for several reasons. Dirty water is most of all a hazard to bathers (causing gastric and skin problems) thus having an influence on the economic status of tourist destinations. Europeans are very concerned about water quality in sea, coasts, rivers and lakes. They put good bathing water quality on the first line when judging their immediate living environment. Knowing they have clean and safe water to swim or play in is an important factor in their choice of a holiday or weekend destination. For the tourist industry, clean and safe water is also an important argument in attracting visitors to an area.

The measurement should tell us about any changes in cleanliness that have occurred during the past twenty years in order for us to assess the effect on water quality of improvements in wastewater treatment plants.

Key message

- The quality of water at designated bathing beaches in Europe (coastal and inland) has improved throughout the 1990s.
- In 2002, 96% of coastal bathing waters and 91% of inland bathing waters complied with the mandatory standards.
- Despite this improvement, 13% of Europe's coastal bathing waters and 36% of Europe's inland bathing beaches still do not meet (non-mandatory) guide values even though the bathing water directive was adopted almost 25 years ago.

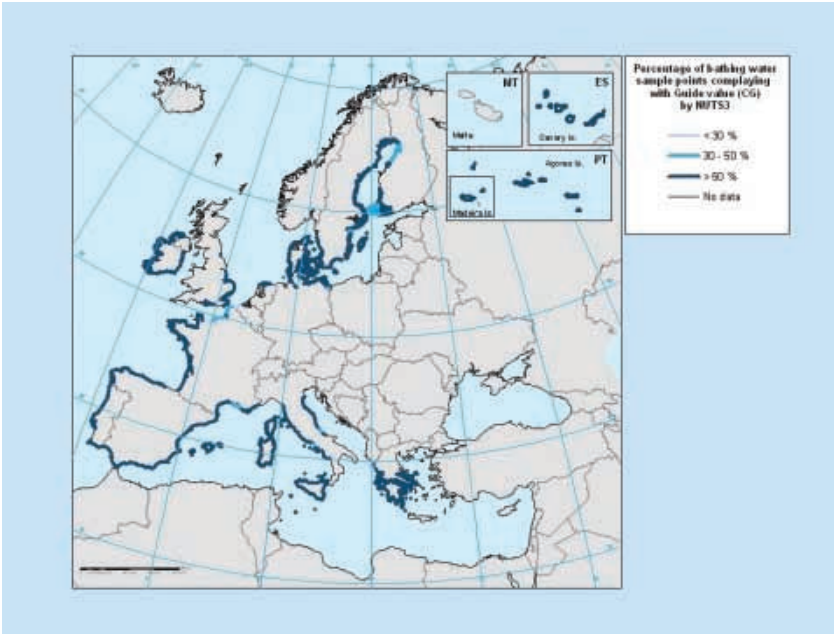


Fig. 38: European Bathing Water Quality, 2003.

The results gathered at EU level shows that the **quality of water** at the **designated bathing beaches** in Europe (coastal and inland) improved throughout the 1990s in terms of compliance with the mandatory standards laid down in the Bathing Waters Directive. Looking further into the details – in 2002, 96% of coastal bathing waters and 91% of inland bathing waters complied with the mandatory standards. Despite this improvement, 13% of Europe's coastal bathing waters and 36% of Europe's inland bathing beaches still do not meet (non-mandatory) guide values even though the bathing water directive was adopted almost 30 years ago.

The original aim of the 1976 Directive was for member states to meet the prescribed standards by the end of 1985. This was not achieved even when member states had invested significant amounts of money in the improvement of sewage treatment processes. In some cases, this work did not result in full compliance with bathing water quality standards because of diffuse pollution which still remains a source of microbiological and other contamination (e.g. Morecambe Bay, UK; Jones et al 1999).

It is worth underlining that the implementation of the Urban Waste Water Treatment Directive has also contributed significantly to the improvement of surface water quality including bathing waters.

It is notable that the data obtained at the EU level only concerns the "old" EU countries.

When looking at the Catalonian coast, there has not been any point of control observed below the mandatory level since 2003. These very good results are even a little better than the Spanish average since 1996. This indicator clearly reflects the efforts made on improvement of the sewage infrastructure.

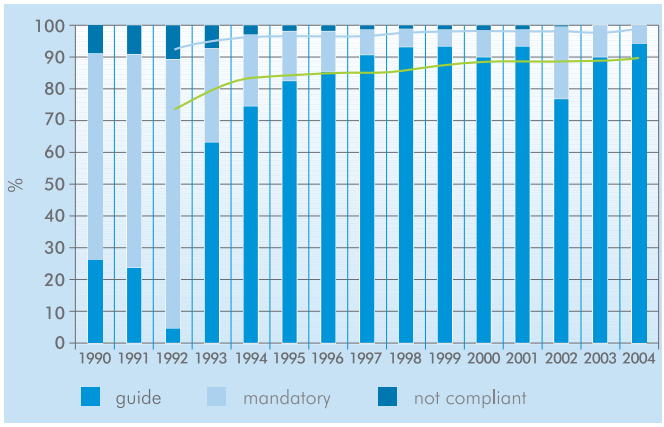


Fig. 39: Quality of Bathing Waters – the Catalan coast.

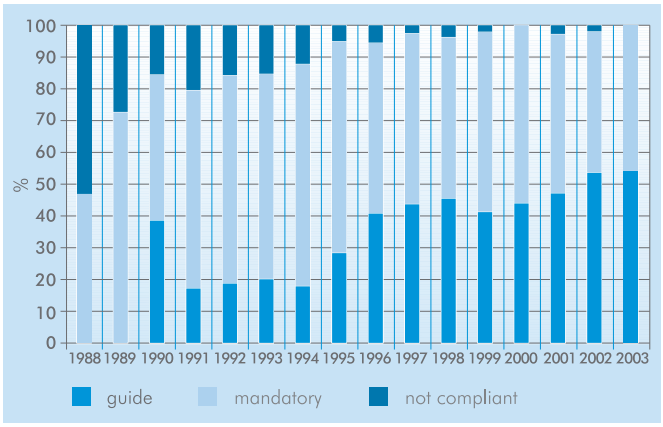


Fig. 40: Quality of Bathing Waters – North Sea region.

In the southern part of the North Sea region the water quality at designated bathing areas improved steadily throughout the 1990s. In 2004, 98% of the sampled coastal bathing waters within the region complied with the mandatory standards, while 58% of the sites complied with the guide value, which is 20 times stricter.

In France in 2003, only 2% of the sampling points were not compliant with the European Directive.

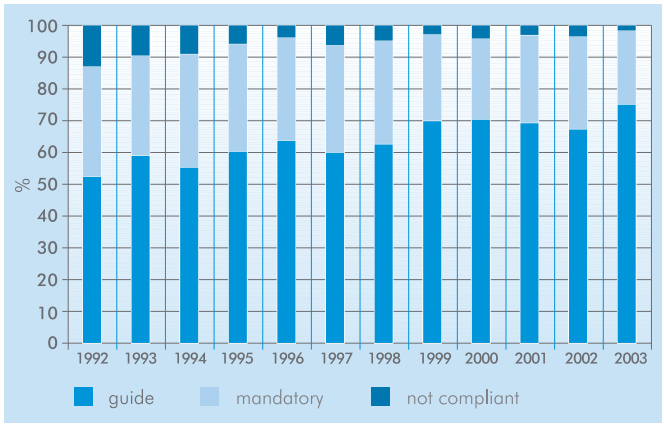


Fig. 41: Quality of Bathing Waters – the French coast.

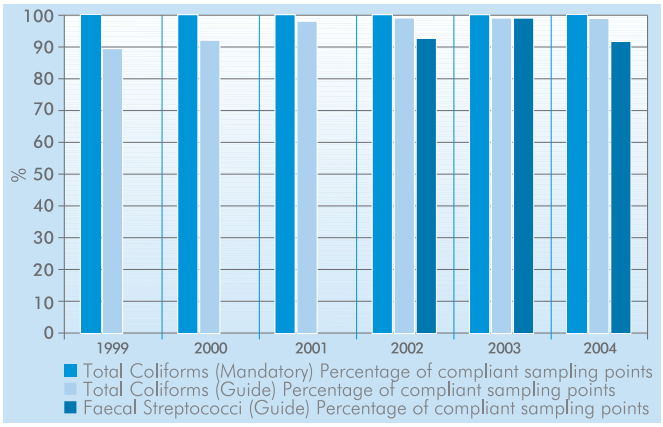


Fig. 42: Quality of Bathing Waters – Malta.

When looking at the data from Latvia and Poland, the fulfilment of the BWD requirements is not complete even though the situation is improving.

In Latvia, starting from 2003 more than 80% of bathing areas are now compliant with guided and mandatory values. All bathing areas not compliant with BDW are located in the eastern part of the Gulf of Riga and it is most probably a consequence of river pollutants transported by coastal currents.

In the Pomeranian Voivodship (Poland), the costal bathing water quality has been systematically improving over the last four years. Nevertheless the number of coastal bathing areas satisfying the "guide" European standard is

smaller than in most European coastal countries. In 2004, the percentage of such bathing areas reached 30.49% while the two closed bathing waters amount to only 2.44% of all coastal bathing waters. The quality of these two closed bathing waters should be improved by extending the collector of the existing water treatment plant seawards.

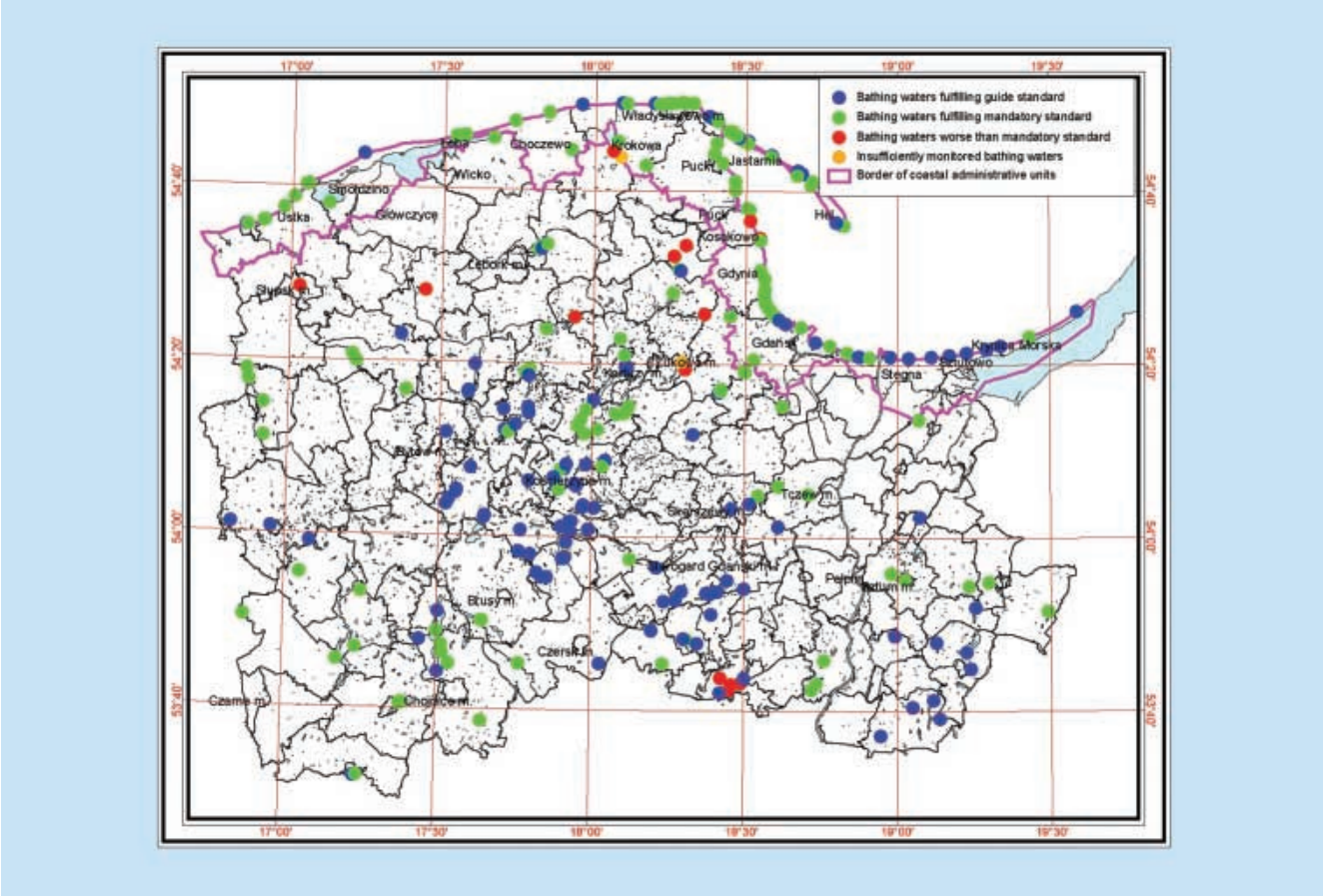


Fig. 43: Quality of Coastal and Inland Bathing Waters, Pomeranian Region, 2004.

The 1976 Bathing Water Directive mirrors the state of technical knowledge and experience of the early 1970s – since that time, epidemiological knowledge has progressed and managerial methods have improved, leading to the **new Directive 2006/7/EC**. The new Directive lays down provisions for more sophisticated monitoring and classification of bathing water. It also provides for extensive public information and participation in line with the Århus Convention as well as for comprehensive and modern management measures.

5.5 TO REDUCE SOCIAL EXCLUSION AND PROMOTE SOCIAL COHESION

Monitoring the trends in coastal communities can help us to identify whether coastal communities are any different from other areas. Amongst the 3 indicators that monitor the social exclusion and cohesion in the coastal communities, we present here the results of indicator 21. Relative household prosperity, which is aimed at providing a picture of the social and economic structure of the coastal zone. The indicator has 3 measurements – 21.1. Average household income; 21.2. Percentage of the population with a higher education qualification and 21.3. Value of residential property.

Fig. 44: New residential development along the coast in Sliema, Malta. Photo: S. Formosa

Information about household earnings and education qualifications (measurements 21.1 and 21.2) will help us to paint a fairly detailed picture of the social structure of the coastal zone and to identify the level of social cohesion and equity present. The third measurement (21.3) has not been represented in the IFS as reliable data could not be obtained for all study areas of the DEDUCE project.

Key message

- Despite regional differences, average household income has increased at European level over the last decade.
- Living at the coast does not immediately imply a higher or lower income – this is mainly influenced by the type and scale of economic activities occurring at the coast, potentially determined by the presence of large cities that act as employment nodes.

Existing data on **household income** is **only available at national levels** and does not allow for analysis between coastal and non-coastal areas at European level. Data for 1995 to 2004 suggest an overall **increase at national level for all**

member states. There are however regional differences, with the North being relatively more affluent than the Mediterranean and the new eastern European member states, with the latter earning the lowest average household income.

Those trends are reflected in the results from the DEDUCE partners – the median household income in coastal NUTS 5 in 2001 for Zeeland was more than €17,3; the average household income per inhabitant for Catalonia was around €11,8 and around €6,1 per annum in the Pomeranian Voivodship (Poland).

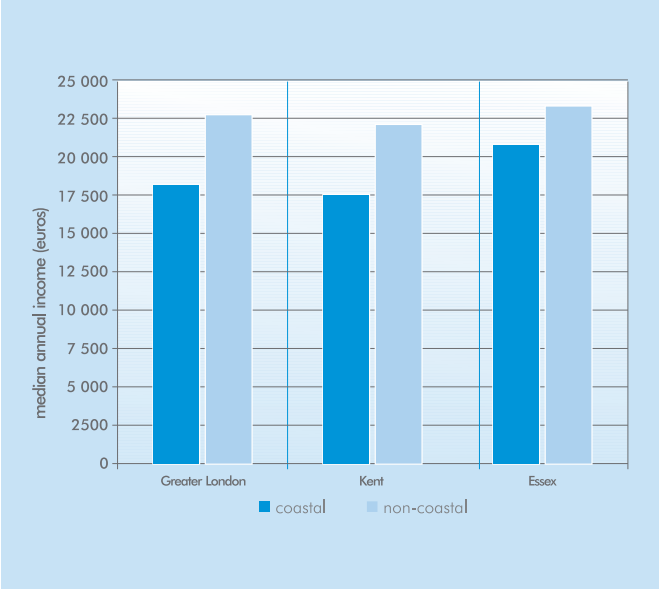


Fig. 45: Median annual income, Greater London, Kent and Essex, 2001, source: Office for national statistics (ONS).

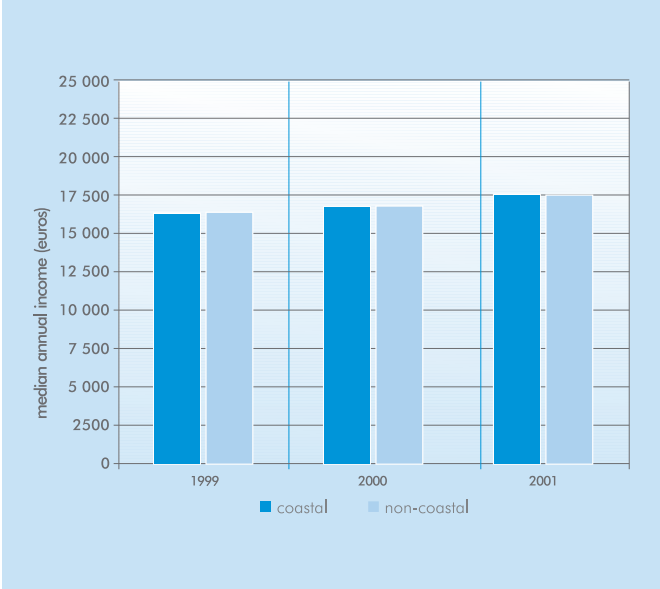


Fig. 46: Median annual income, Zeeland, 1999 – 2001, source: Central Bureau voor de Statistiek (CBS).

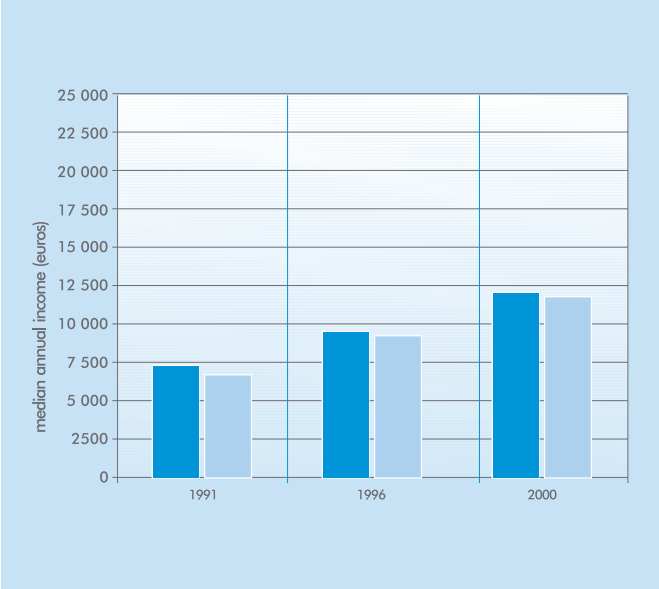


Fig. 47: Average annual earnings of households, Catalonia 1991–2000, source: IDESCAT.

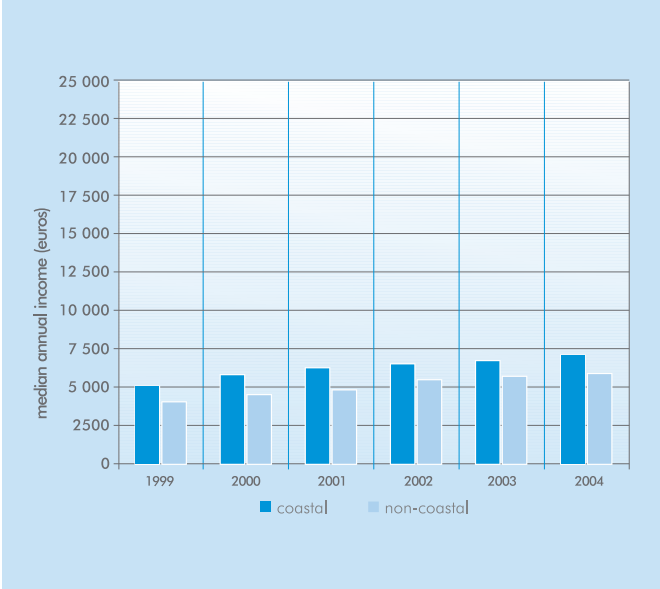


Fig. 48: Average annual earnings, years, Pomeranian Region, 1999 – 2004, source: Statistical Yearbook Poland.

The northern European coast illustrates differences even from west to east, where the coastal population in the southern North Sea is on average less affluent than the population in the hinterland, except for Zeeland. On the other hand in Gdańsk the reverse holds true, although the difference in earnings between the coastal and remaining counties is gradually becoming smaller.

In the Pomeranian Voivodship in the north of Poland and in Catalonia, the higher average income earners live along the Vistula river and in the coastal areas of Barcelona, respectively.

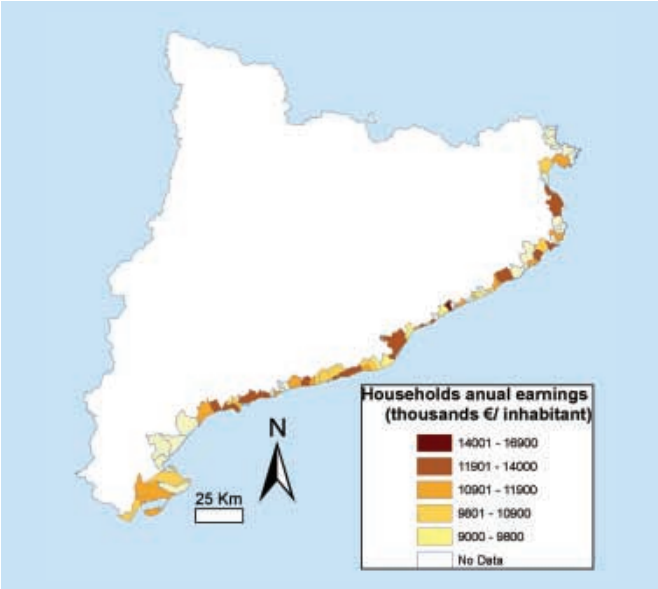


Fig. 49: Average earnings per inhabitant in Catalonia, source: Department of Housing and Environment, Gencat.

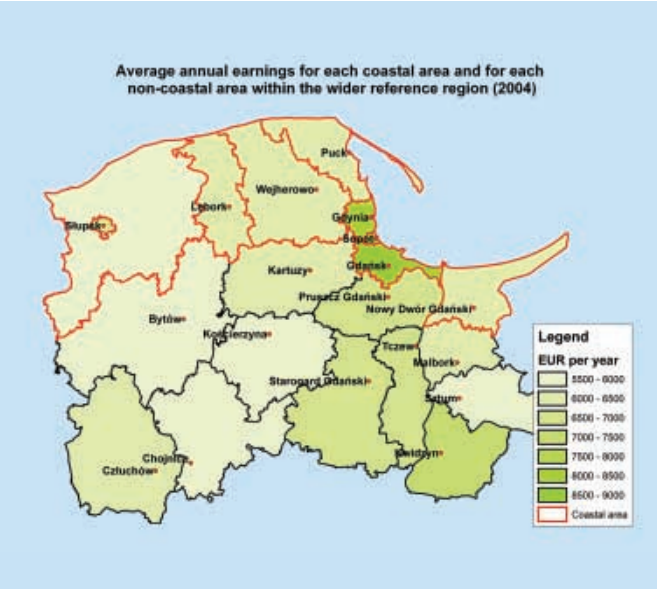


Fig. 50: Average annual earnings for each coastal area and for each non-coastal area within the wider reference region, Pomeranian Region, 2004, source: Maritime Institute in Gdańsk.

More **in-depth evaluation on the economic well-being** of coastal communities can be obtained through information on **educational achievement**, assuming that the higher the educational achievement the greater the prosperity of an individual or community. At European scale, **coastal communities have a slightly lower population with higher education qualification**. The same trends were observed for the southern North Sea region.

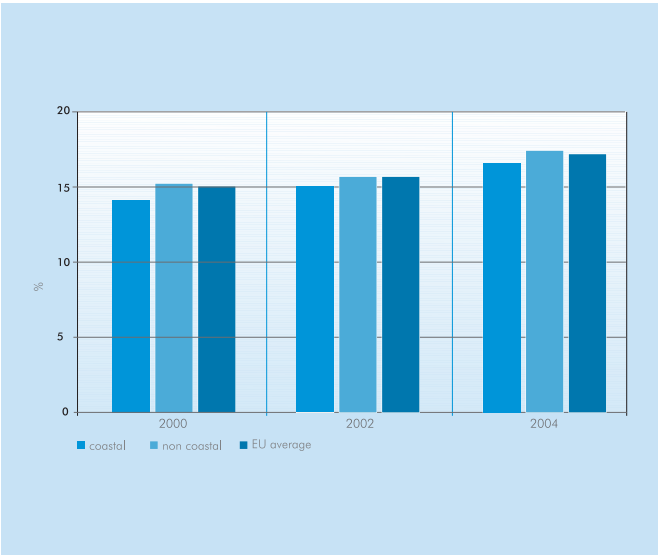


Fig. 51: EU population with higher education qualification (level 506 ISCDE 97), NUTS 2.

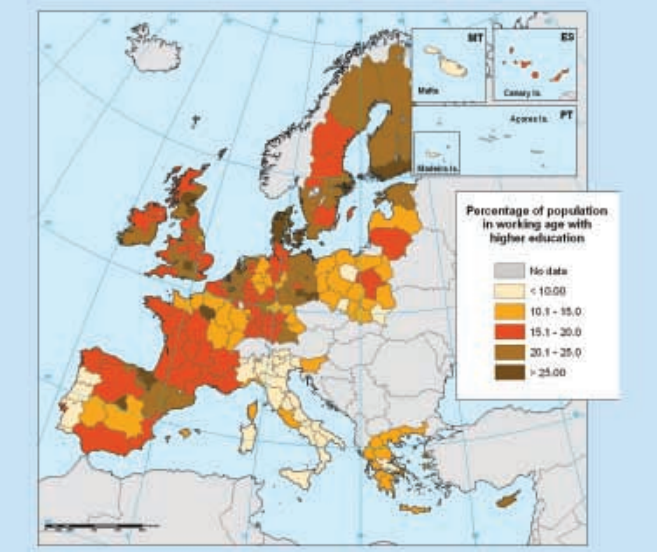


Fig. 52: Percent of population in working age with a higher education qualification (level 5-6 ISCDE 97), NUTS 2, 2004.

The opposite was observed for northern coastal zones of Poland and Latvia. It is interesting to note that, as could be expected, the location of major cities influences the socio-economic status of the surrounding communities. Additional influence may also arise from the presence of universities and research institutes in such cities, as in Gdańsk and Riga.

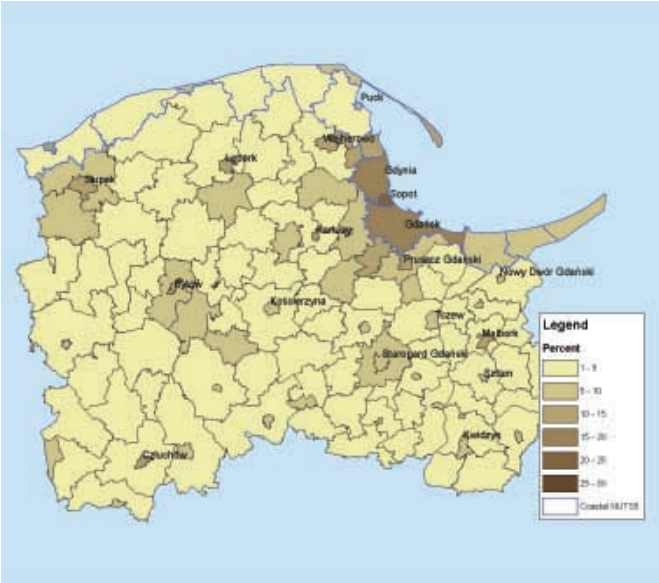


Fig. 53: Percent of the population of working age with a higher education qualification in every NUTS5, Pomeranian Region, source: Maritime Institute in Gdańsk.

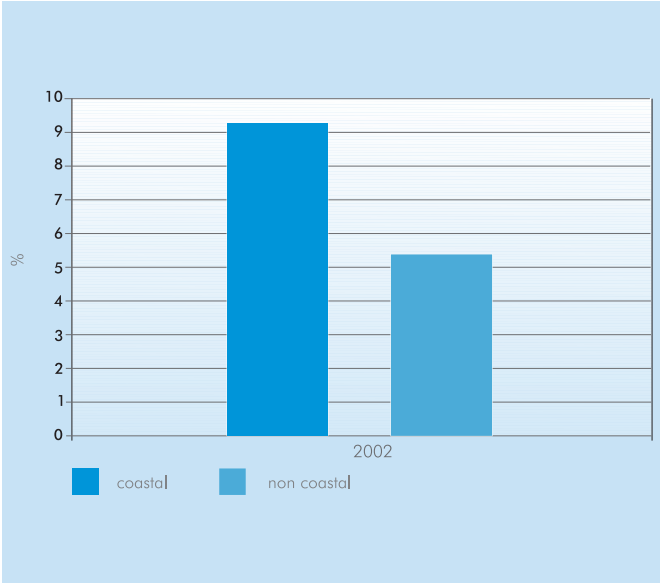


Fig. 54: Percentage of population with a higher education qualification – Poland, source: National General Census.

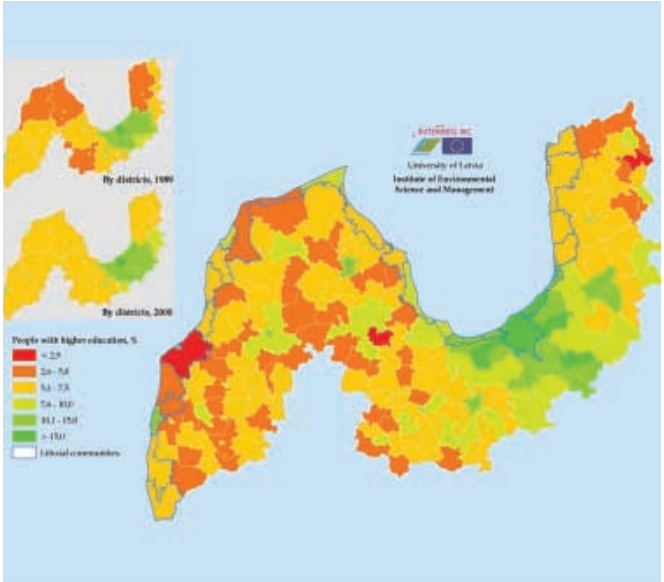


Fig. 55: Percentage of population with higher education by NUTS5 level, Census 2000.

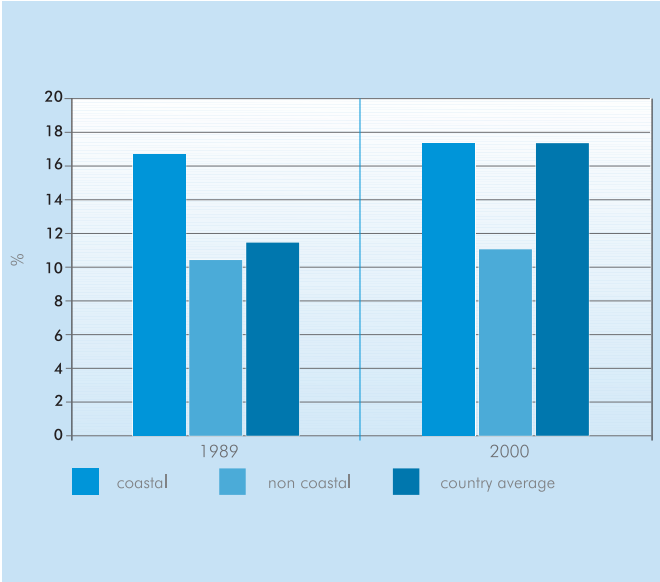


Fig. 56: Percentage of population with higher education qualification – Latvia, source: Central statistical bureau.

As most of the data for these measurements are collated by national statistical institutions they are considered to be reliable. There are elements that affect reliability in terms of comparability in that not all partners have the data at the same level. In addition, the parameters for calculating household income may also differ. On the other hand, at European level the salaries represented are only for industries and services. At EU level, there is a need for information to be available at least at the NUTS 2 level, to allow for comparison between coastal and non-coastal areas. DEDUCE partners suggest the need to identify acceptable threshold levels to determine what is considered to be a poor or rich household income to enable further comparison amongst different regions. Since income calculations are different for the various countries, further work is required to determine a methodology for a common definition. For coastal zones in which a particular industry is flag-shipped as the driver for economic development such as tourism or shipping, a correlation needs to be established between the importance of that industry, in terms of employment and intensity of economic activity, with household income.

5.6 TO USE NATURAL RESOURCES WISELY

One of the most exploited resources in the maritime zone has been fish stocks. Historically, fisheries were one of the most important sectors of the economy of coastal territories. Although the importance of fisheries is today decreasing, fisheries still constitute a part of the economy in coastal areas, as a source of income for local fishing and retail trade. For many ports, the fishing industry is their lifeblood. Additionally, fisheries are related to the maintenance of cultural diversity in coastal territories as well as to providing a traditional type of occupation and the creation of traditional local products.

Fig. 57: Latvian fishermen.

One of the 2 indicators proposed by the EU WG-ID, to monitor whether we are using our resources wisely or not, is indicator **23. Fish stocks and fish landings**, which we present here.

EU policies and, in particular, the Common Fisheries Policy (CFP), aim for sustainable fishing over a long period through appropriate stock assessment within a healthy ecosystem. Stock assessment generally aims to estimate the current stock size and its potential for increase. These results can be used to predict future stock sizes based on a range of possible management measures. The most obvious impact that fishing has on the ecosystem is the removal of organisms from the environment – the catch.

Indicator 23 includes three measurements – **the state of the main fish stocks by species and sea area, Landings by species and Value of landings per port and per species**. Each of the measurements monitors particular aspects of fishing. The interpretation of the state of fishing and related trends has to be based on complex integration and evaluation of information provided by all three measurements.

Key message

- Different trends in the state of the main fish stocks are observed, though in the last few years over-fished stocks are gaining in importance. There is a lack of information in some regions.
- Total landings are decreasing in the main European fishing ports.
- The trends in the value of landings differ among regions, some having a stable trend (France), some others a decreasing one (Catalonia) and others an increasing trend (Malta).

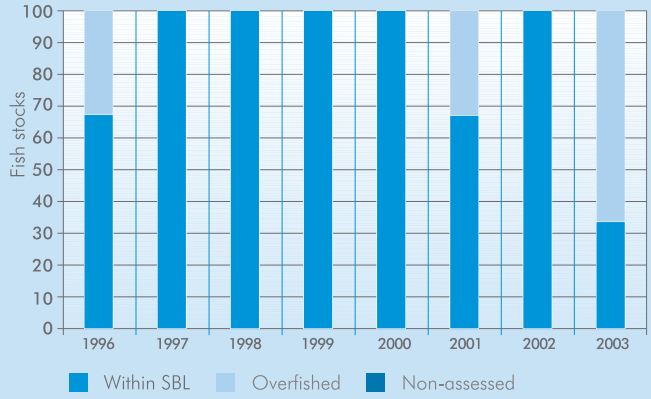


Fig. 58: Fish stocks in the Polish EEZ fished within safe biological limits and overfished stocks, 1996 – 2003.

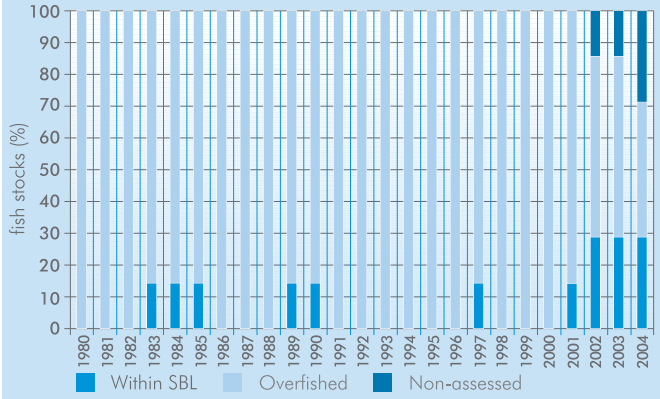


Fig. 59: Fish stocks around the Southern North Sea (ICES area IVC) within safe biological limits and overfished stocks, 1980 – 2003.

In the period **1997-2000 and in 2002, 100% of the commercial fish stocks** in the **Polish EEZ** were **within the safe biological limits** (SBL). However, data **from 2003 onwards** show a critical situation in Polish fisheries since more than 60% of stocks are **over-fished**. The future of the fishing industry looks bleak. A loss of jobs should be expected, which means that other types of work and new alternative activities should be provided.

An **opposite trend** can be seen at the **southern North Sea** regions – since 1980, the proportion of commercial fish stocks within SBL has never exceeded 29% of all formally assessed stocks, in any given year. Herring and haddock fisheries were within SBL between 2002 and 2003. Plaice has been over-fished except in 1983-1985.

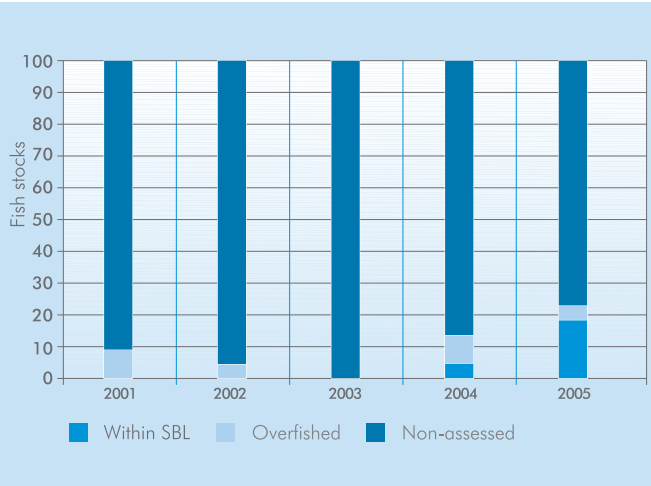


Fig. 60: Fish stocks around fishing areas near Catalonia within safe biological limits and overfished stocks, 2001 – 2005.

In the **Mediterranean Sea** there is a significant **lack of information** on the status of fish stocks – only 8 of the 22 more common fished species were assessed between 2001 and 2005. Amongst the assessed species, 5 (anchovy, swordfish, horse, pilchard and red mullet) are within SBL and 3 (bream, hake and blue-fin tuna) are outside SBL. This imposes the need to preserve and guarantee their ecological sustainability. In the period 2001-2005, the status of the red mullet and anchovy improved, since they were included in the SBL.

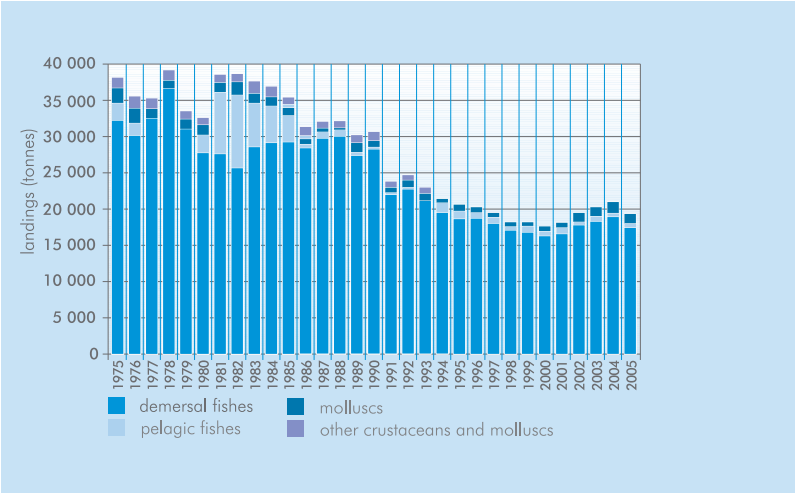


Fig. 61: Annual landings by major group of species, West-Vlaanderen, 1975 – 2005.

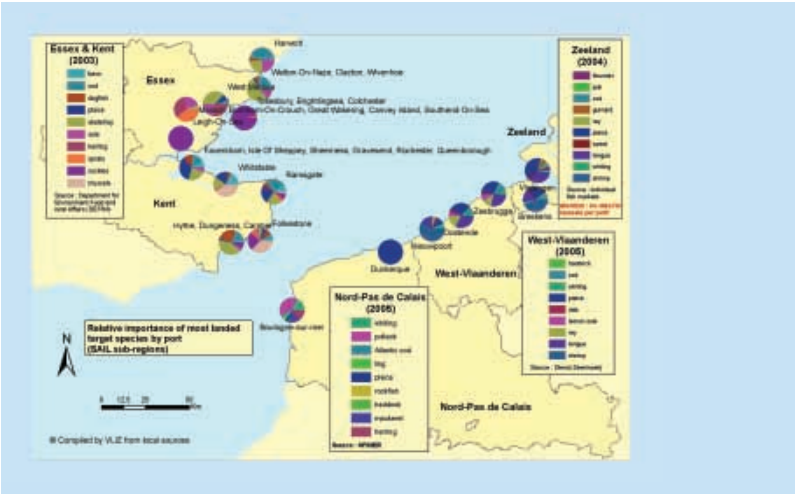


Fig. 62: Relative importance of most landed target species by port, SAIL sub-regions.

Looking at the **volume of fish landings**, it can be seen that both in West-Vlaanderen (17,000 tonnes in 2005, see graph) and Nord-Pas de Calais (30,800 tonnes in 2005) the **demersal fish** are the **most landed fish** over the whole period, whereas in Zeeland (37,000 tonnes in 2004), Essex (10,000 tonnes in 2003) and Kent (300 tonnes in 2003) the **molluscs** represent the largest volume. The **total amount of landed fish is decreasing in Zeeland, West-Vlaanderen and Nord-Pas de Calais** and fluctuates in the regions of Essex and Kent. In the late 1980s, the most commonly landed species in West-Vlaanderen were cod (15,000 tonnes in 1978) and plaice (12,000 tonnes in 1990). However, this is changing to plaice and tongue with about 4000 tonnes in 2005. Also in Zeeland, the mussel is by far the most landed species. In Nord-Pas de Calais, the most landed fish is pollack but this is decreasing significanty. For Kent and Essex, the cockle is by far the most landed species over the period 2000 to 2003 (between 8000 and 10,000 tonnes landed in Essex and around 1600 tonnes landed in Kent).

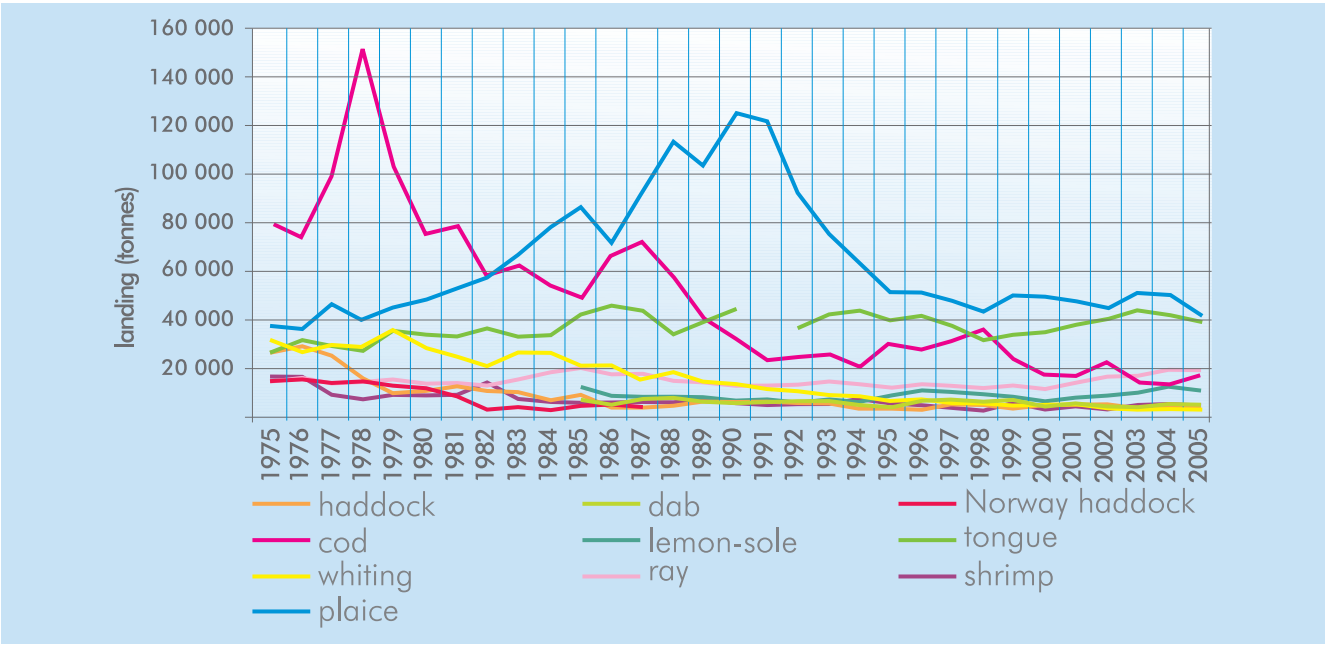


Fig. 63: Landings of most landed target species, West-Vlaanderen, 1975 – 2005.

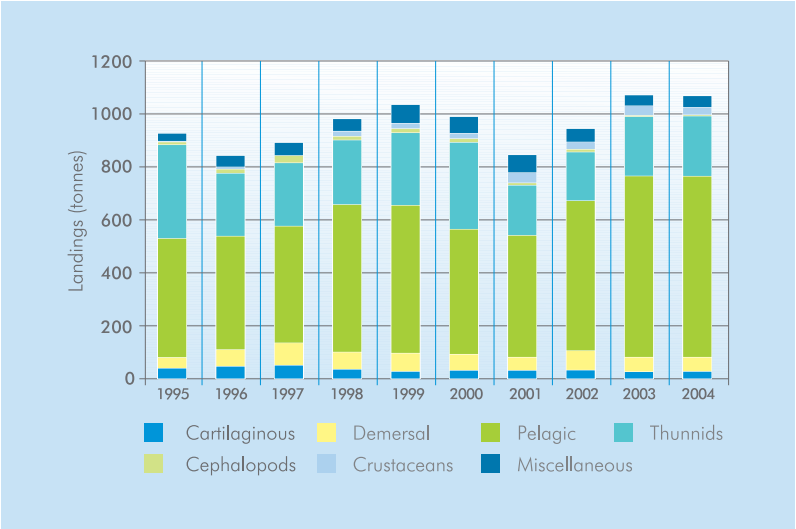


Fig. 64: Annual landings by major group of species in Malta (port of Valletta).

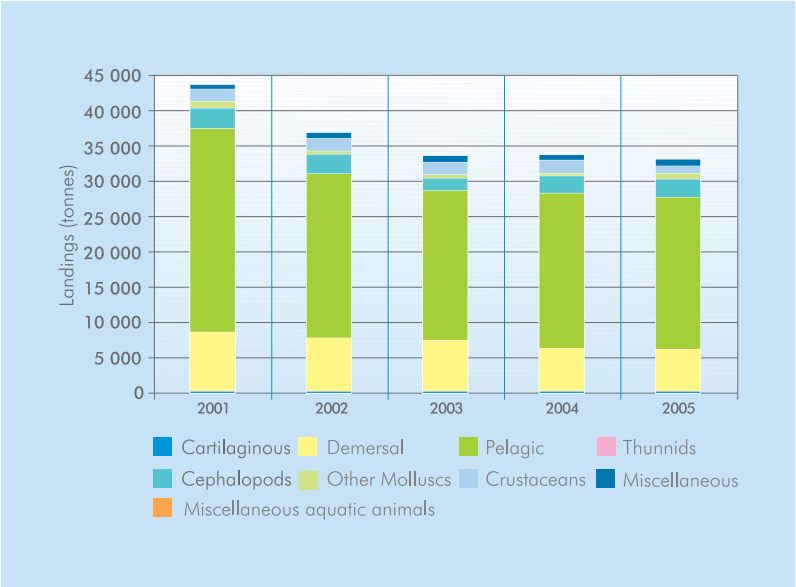


Fig. 65: Annual landings by major group of species in Catalonia.

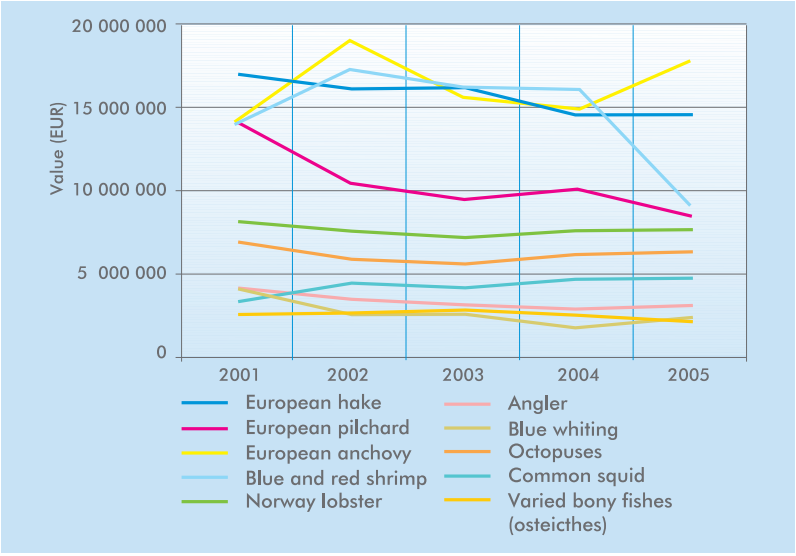


Fig. 66: Annual value of landings of the most target species in Catalonia, 2001 – 2005.

In **Malta** and **Catalonia** the most landed groups are pelagic fishes.

In Malta, annual fish landings, which are **dominated by the pelagic and thunnid** major groups, seem to be **cyclical**. Landings for crustaceans and pelagics have experienced an overall increase, whilst for cartilagenous fish, landings have decreased, over a 10 year period.

In **Catalonia**, the **landings** of marine species have **stabilised since 2003** at 33 million kg per year. However, the loss between 2001 and 2005 was higher than 10M kg. A longer period of assessment (1990-2005) shows that the volume of the last 3 years is the lowest since 1993 (max. of 60M kg in 1994) but it is higher than the previous period, 1990-1992 (around 26M kg/year). The most landed groups of species have experienced a continued decrease during last decade. The reduction has been significant for all marine fishes (demersal, pelagic and thunnids) as well as for molluscs (cephalopods) and crustaceans.

The **European pilchard** is the **most landed** species in Catalonia and it is also the species with **the most significant drop in landings** during the last 5 years. The main landed group of species are fishes, which account for 84% of the total volume of landings (64% are pelagic and 19% demersal) but there is a remarkable 9% of cephalopods and 4% of crustaceans.

Looking at the **annual value of landings**, results show that in **France** this value is about 1 billion Euros since 2000 and it has **varied little** over that period. In France, as in Malta, the **tunas** are the most important landed species in both volume and economic terms. They represent about 15 to

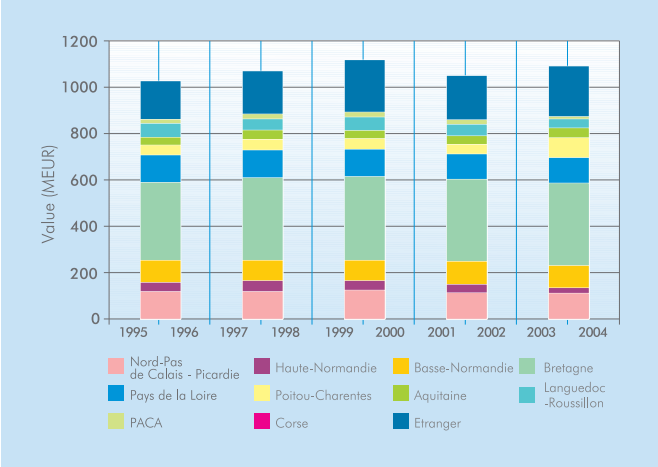


Fig. 67: Annual value of landings by region in France.

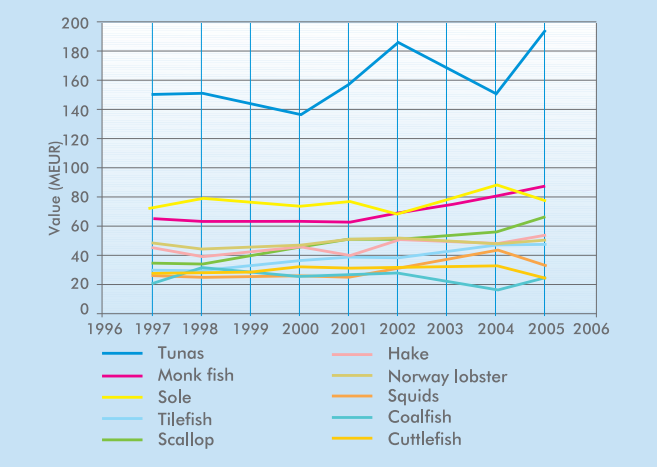


Fig. 68: Annual value of landings of most valued species in France.

20% of the total value. The most important region is Brittany which represents 30% of the total value of landings. This phenomenon also happens in the **southern North Sea**, where each region also has one outstanding port in the value of fish landings.

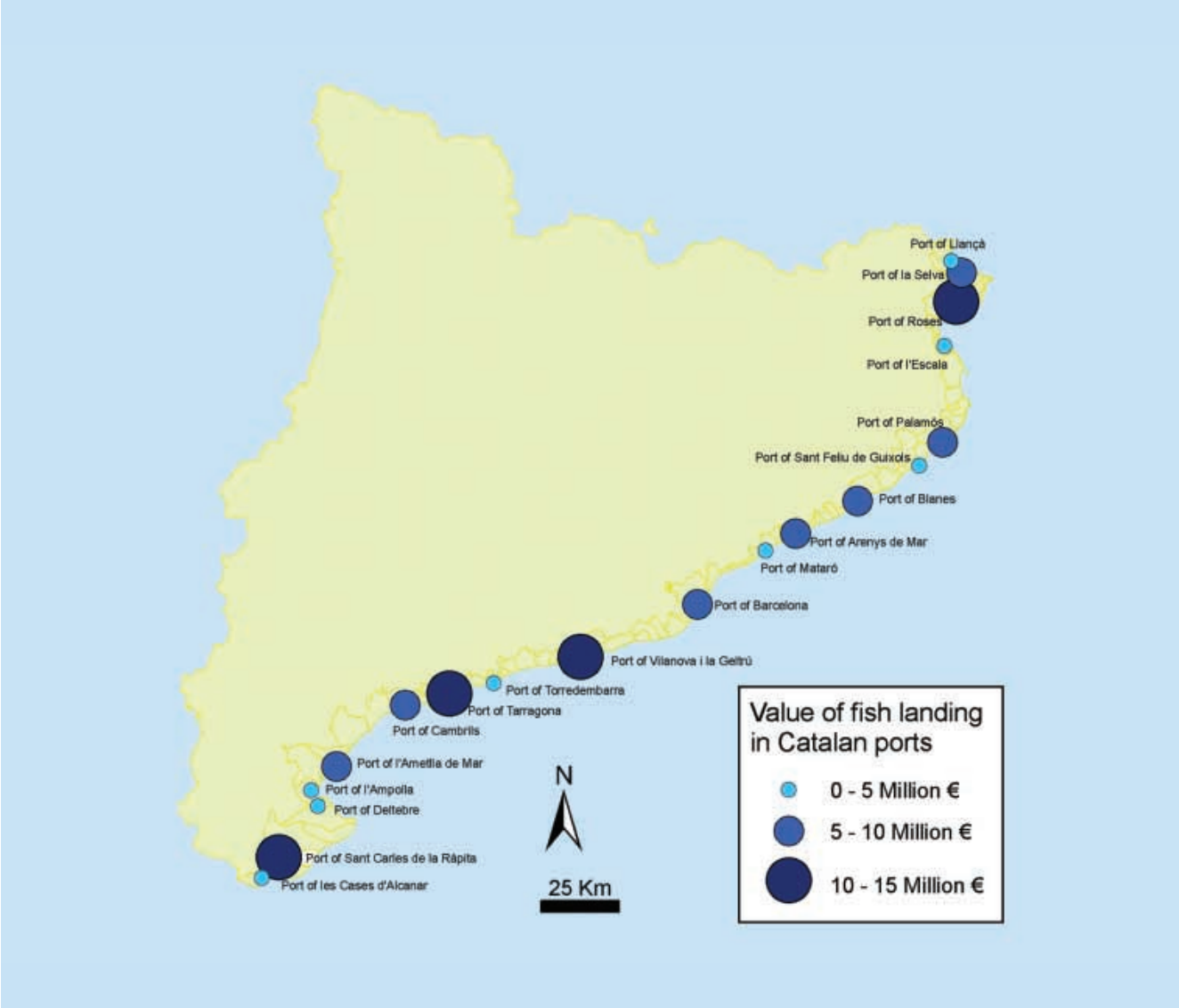


Fig. 69: Value of fish landing in Catalan ports.

On the other hand, in **Catalonia** the **economic contribution** of the fishing activity is **distributed** all around the coast by **several ports** that have a high contribution to the total value of landings. Moreover, the relative importance of each fishing port has not changed over time. Another substantial distinction of Catalonia is the decreasing trend observed in the **value of landings**, which has been **progressively reduced** from about 20% (23 M€) in 2001 to a total value of 116 M€ in 2005. This reduction does not impact on global coastal economy because the value of fish landings has a low contribution. However, it may imply economic problems for fishermen.

In Catalonia the species with the **highest value of landings** during 2001-2005 were the **European anchovy, the European hake and the shrimp**. Their position here is very different to their position in relation to the volume of landings. The main difference relates to shrimps. Their high economic importance and their low importance in terms of volume imply scarcity and/or over-exploitation. The shrimp is the species with the highest drop in the value of total landings and, in spite of increasing price, it cannot entirely compensate for the reduction in the volume of landings.

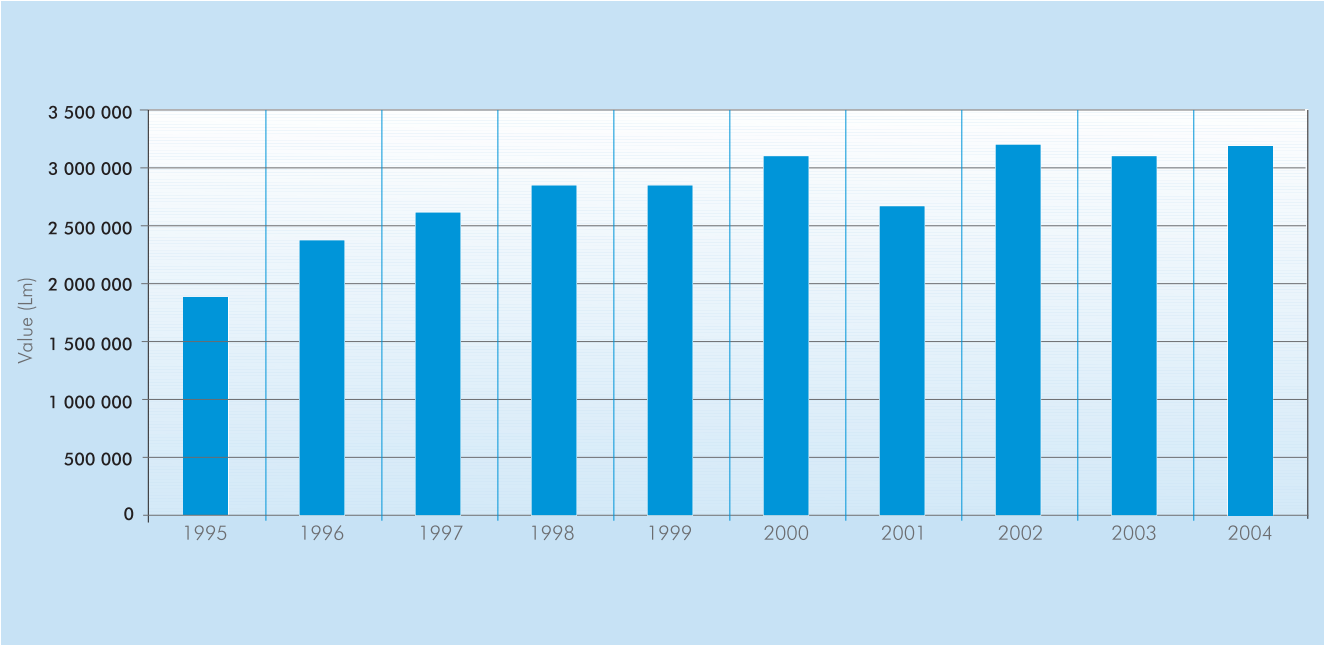


Fig. 70: Annual value of landings in the Maltese Islands.

Finally, in **Malta**, the annual **value of landings has increased** significantly over a 10-year period. The largest group are pelagics and thunnids, both in terms of landings and of total value, followed by crustaceans and demersal species, with the highest values being for **blue-fin tuna**. Of particular interest is the higher value attributed to demersal species, which are not caught in the same volumes as pelagics and thunnids.




5.7 TO RECOGNISE THE THREAT TO COASTAL ZONES POSED BY CLIMATE CHANGE AND TO ENSURE APPROPIATE AND ECOLOGICALLY RESPONSIBLE COASTAL PROTECTION

Climate change appears to be one of the most serious global threats expected in the foreseeable future, especially for the coastal zones. The shift that a given region may experience in its "average weather" due to climate change is translated into several effects. For example, higher sea levels could increase coastal erosion and damage from storm surges as well as presenting problems for coastal infrastructure such as harbours, water supplies and sewage disposal systems.

Fig. 71: Władysławowo harbour, Poland. Photo: © Piotr Domaradzki.

Three indicators have been defined for measurement of the threat to coastal zones posed by climate change and how appropriate and ecologically responsible coastal protection is ensured. Here we present the results of indicator **26. Coastal erosion and accretion**, which measures changes in shoreline dynamics and the efforts to directly counteract the adverse effects of these dynamics. Detailed monitoring of these changes is very important, especially, if we take into account that the effects of climate change can increase substantially over the next 100 years. Information on shoreline changes can help to predict the future changes and to prepare and develop adaptation policies concerning climate change effects.

Coastal erosion and related flood and landslide phenomena normally generate very high economic, social and environmental costs. In order to prevent and avoid these costs, it is necessary to have very good and detailed information about the real impacts in the past and in the present.

The indicator has 3 measurements, all of them represented in the IFS – **Length of protected and defended coastline**, **Length of dynamic coastline** and **Area and volume of sand nourishment**.

Key message

- All the coastal EU member states have problems with coastal erosion. Over 20% of the evaluated European coastline is affected. These problems can increase as a result of the effects of climate change.
- Defence of the coastline is a very ancient procedure for the mitigation of coastal erosion. The location of the defences reflects where the most significant problems are and introduces to its economical dimension.
- Proper knowledge of past and present erosion impacts, achieved inter alia by means of careful monitoring, will allow for better, more sustainable management and protection of the coastline.

The EUROSION project has classified 70% of the **European** coastline according to the sedimentary processes. Around **20% of the European coast is affected by erosion** while accumulation processes prevail along 13%. Of the European coastline, the highest percentage of coast length is in the Mediterranean and the Black Sea. The Baltic Sea is the only European Sea where the portion of accumulative coast is bigger than that of eroding coasts.

Fig. 72: Coastal erosion patterns; Length of coastline dynamics, based on EUROSION database.

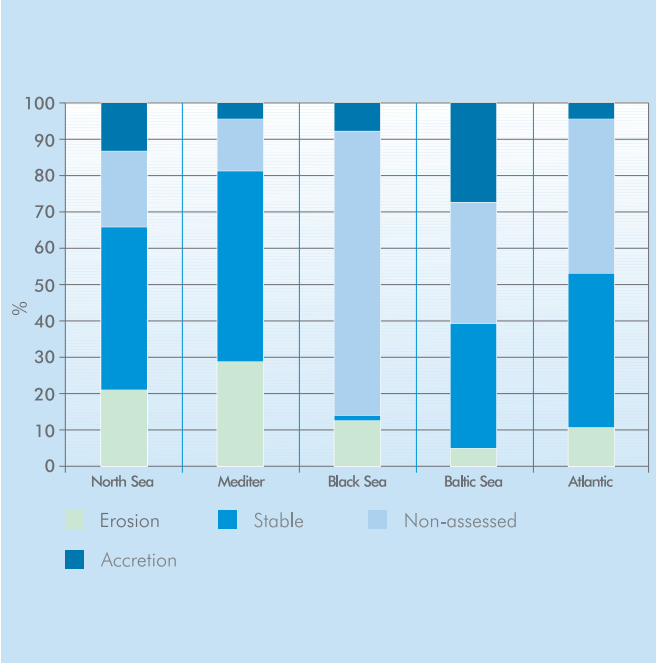


Fig. 73: Length of dynamic coastline in Europe, 2004.

The quality of the EUROSION database allows for the observation of problems of coastal erosion not only at national but also at regional scale. The map of erosion trends for the Catalan coastline shows, as an illustrative example, **territorial differences** that cannot be observed in the European map.

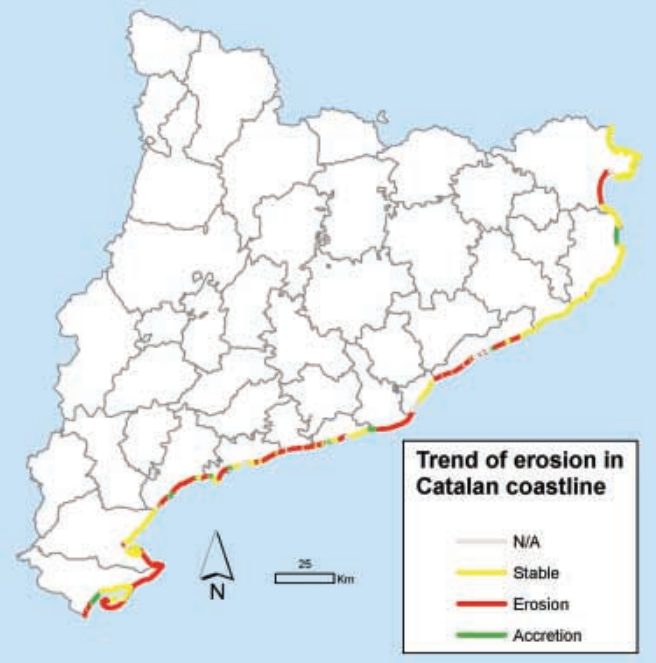


Fig. 74: Trend of erosion in Catalan coastline.

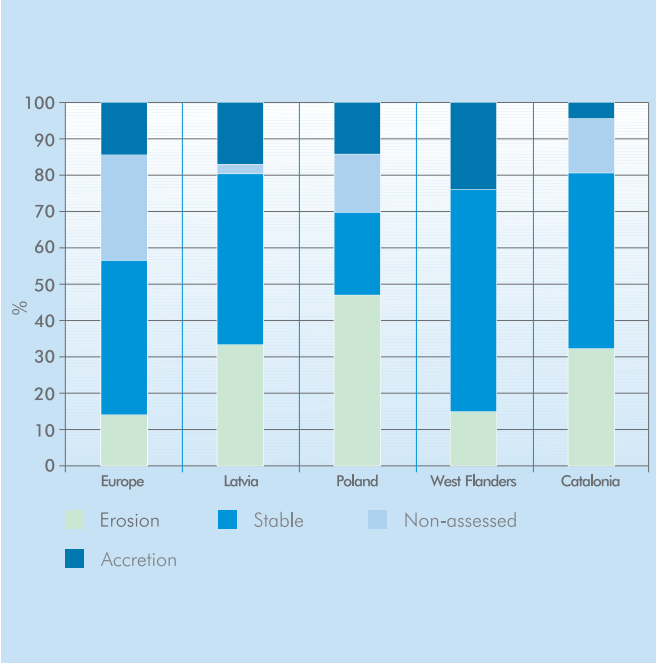


Fig. 75: Length of dynamic coastline, DEDUCE partners, 2004.

Coastal erosion assessed by the DEDUCE partners in their coverage is higher than the European average except for the West-Flanders coast. It must be emphasised that, despite the Baltic Sea, where coastal erosion is least present, almost all the problem areas are located along the Polish and Latvian coast. **Over 47% of the Polish coastline and 33% of the Latvian coastline is subject to substantial erosion**.

A **significant part of the European coastline is artificial** – 3.4% is covered by **harbours** while along 1.8% there are **other protective structures**. Therefore, more than the 5% of the European coastline is **protected and defended** against erosion by so-called "hard" structures.

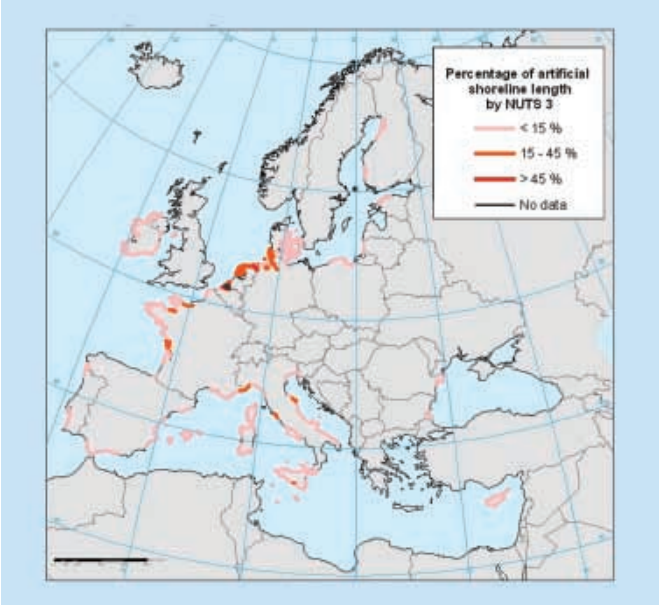


Fig. 76: Percentage of artificial shoreline length by NUTS3, source: ETC-ET (EEA).

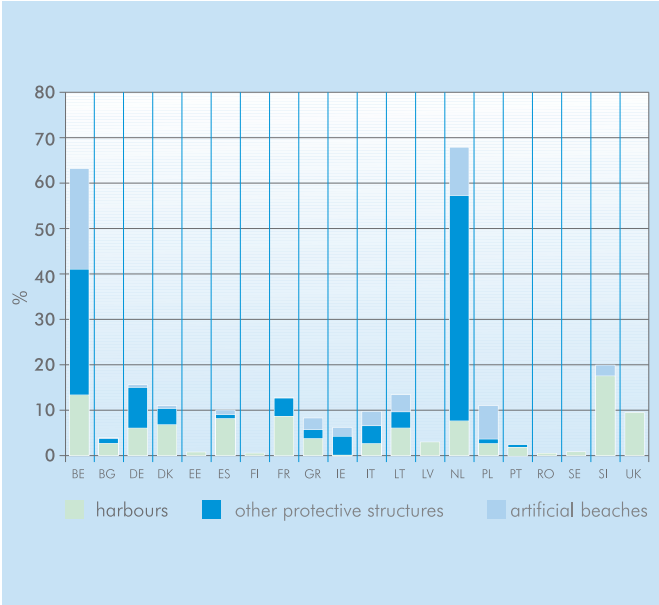


Fig. 77: Protected and defended coastline in the European countries, 2004.

The level of protection differs a lot between coasts and countries. According to EUROSION, **artificial shorelines prevail over the natural ones in 21 European regions** (NUTS3). The main areas with an artificial coastline are **located in the North Sea** – Belgium and The Netherlands show the highest level of defended and protected coast in Europe. This is explained by the fact that extensive areas of those countries have been retrieved from the sea and by the significance and magnitude of their major ports.

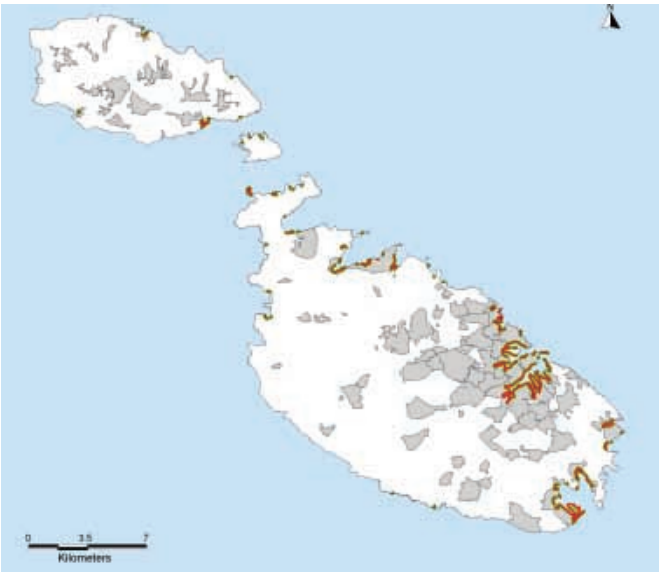


Fig. 78: Artificial shoreline in Malta, source: MEPA.

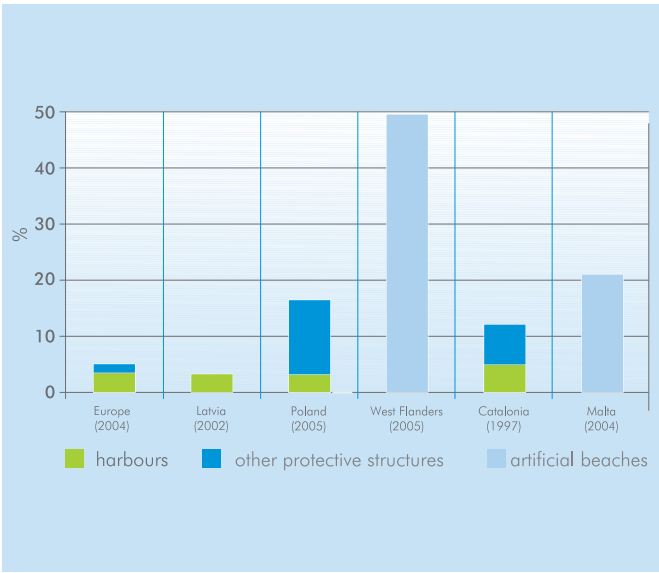


Fig. 79: Protected and defended coastline, source: DEDUCE Project.

Apart from **West-Flanders**, which has almost **50% artificial coastline**, the percentage of protected coastline of DEDUCE partners is much higher than the European average. The exception is **Latvia**, where **only 3.1% of the coast is protected** and the length of protected coast has not increased in the last 20-25 years. This only concerns port areas, whereas the rest of the coastline is not defended at all.

The level of coastal artificialisation in **Malta** is really **high – 20.9%** (20.4%, ten years earlier). It is mostly related to harbour, recreation or road development infrastructure. There are **no specific devices for erosion protection**.

France has a high presence of artificial/protected coast – 9% of harbours and 3.7% of coastal defence structures. Harbours take up more of the North Sea coast and coastal defence structures of the Mediterranean coast.

Lengths of coastline protected against erosion by hard structures in Poland and Catalonia are 13.1% and 7.1% respectively. They are larger than the length of coast taken up by harbour protection, 3.1% and 5.1%.

Another way of responding to coastal erosion is **sand nourishment** of beaches and foreshore. This "soft-engineering" technique has become the preferred method for coastal protection in European countries. Nourishment is **especially important at the coast of Belgium** (22.1% of coastline are nourished beaches according to EUROSION), **The Netherlands** (10.7%) and **Poland** (7.1%). In other countries, such as Spain or France, sand nourishment is also relevant but its incidence is more local.

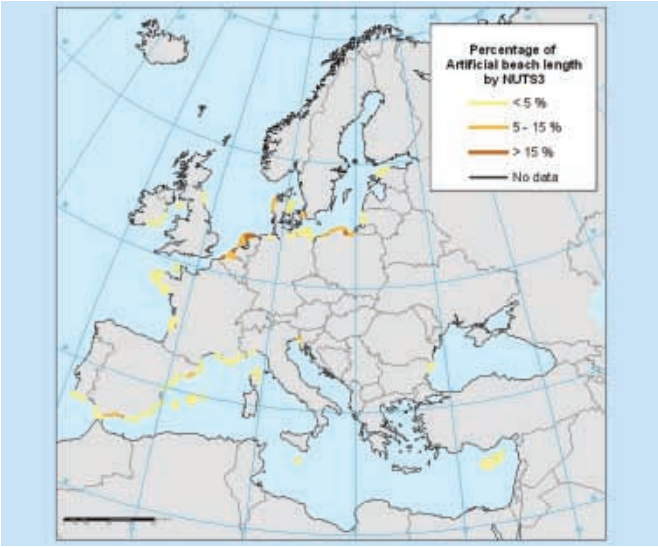


Fig. 80: Protected and defended coastline, based on Geology, Geomorphology and Erosion Trend Version 2.1, source: EUROSION, 2004.

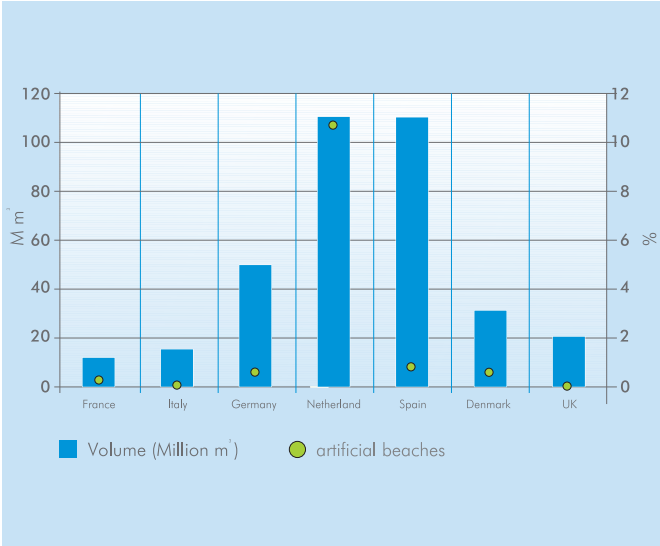


Fig. 81: Length and Volume of beach nourishment in some European countries until 2002.

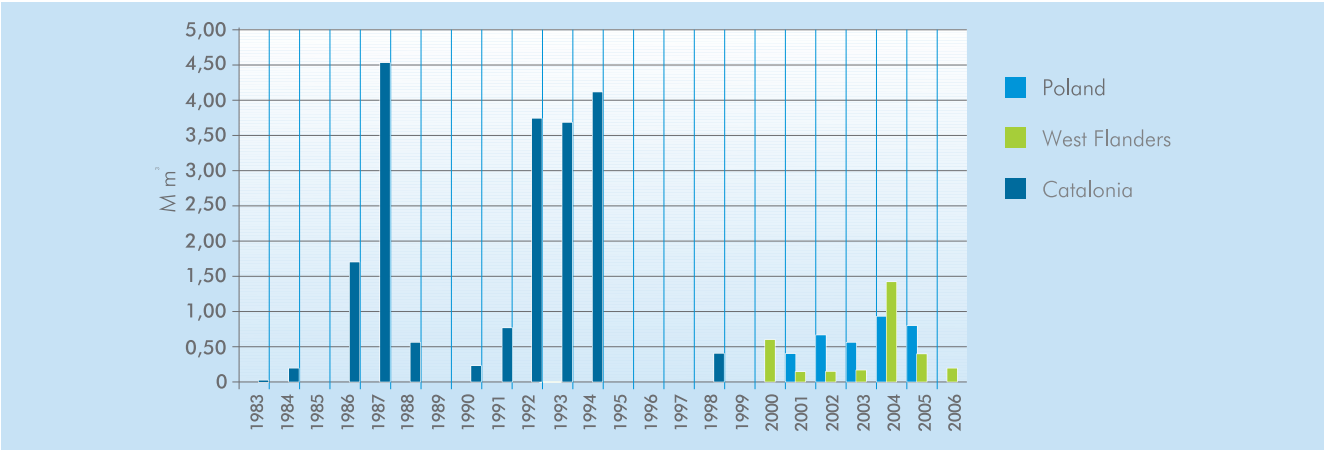


Fig. 82: Length and volume of sand nourishment, source: DEDUCE Project.

In contrast to the previously shown measurements, **data on length and volume of sand nourishment are very difficult to compile**, there is a lack of monitoring data. The results are, therefore not as reliable.

Annual values collected by DEDUCE partners reveal that the annual fluctuations are very large. There are two reasons for this. The first is that, to some extent and in some regions exclusively (Catalonia), the volume of nourishment corresponds to the variable effect of coastal storms; the second is that nourishment operations depend on the political decision to spend public money on an action which to some authorities seems to result in relatively short term effects. Consequently, the graph reflects that the administration has questioned the feasibility of the effort in Catalonia since 1998. In contrast to this situation, in Poland and West-Flanders nourishment is the preferred method of coastal protection and is seen as feasible only if carried out in a systematic and pre-planned manner.

6. CONCLUSIONS AND RECOMMENDATIONS

The calculations conducted by the DEDUCE partners lead to a number of conclusions regarding the usefulness of the WG-ID set of indicators for measuring sustainable development of the European coast. This final chapter presents:

- Evaluation and main conclusions from the calculation process,
- Recommendations from reviewing the WG-ID indicators proposal,
- Further work needed to build an evaluation model for sustainable development in coastal and maritime zones.

The recommendations should **facilitate the application of ISD** in other regions, member states and interested organisations. The chapter concludes with **future lines of work** to be developed in order to use the ISD framework in supporting decision-making for Europe's coastal zones.

6.1 EVALUATING THE CALCULATION PROCESS

A central question that is kept in mind throughout the entire calculation process is, 'Is the existing data accessible, accurate and reliable for measuring SD in coastal zones?'

This question is addressed by means of five criteria:

1) **Thematic availability:** is the appropriate data available to calculate and deliver the products as defined and described in the SIF?
2) **Accessibility:** is the data accessible in the appropriate format and through user-friendly media? Are there any significant copyright restrictions?
3) **Spatial coverage:** does the spatial resolution, level and scale of the data allow for analysis of the coastal zone?
4) **Temporal coverage:** is the data of the required temporal resolution and are appropriate time series available to allow for (future) trend analysis?
5) **Reliability:** is the quality of the statistical production process satisfactory? Do sampling, gathering and handling procedures live up to the expected standards?

The DEDUCE partners developed a scoring mechanism for each of these 5 criteria and scores from 0-5 were assigned. After each partner scored their own results, an overall DEDUCE evaluation was undertaken by averaging the scores for each of the 45 measurements. Consequently, each of these measurements has one final (averaged) score for each of the 5 criteria. The 45 measurements (see Chapter 1) are grouped according to their corresponding goal, following the seven goals of the EU ICZM Recommendation. The final product is one diagram per goal (7), each containing one averaged score (0-5) per criterion (5).

The diagrams in the following pages summarise the technical evaluation of the 45 measurements, as conducted by the DEDUCE partners. Each of the five axes on the diagrams refers to one of the five criteria mentioned above. The scores (from 0 to 5) reported in the diagrams represent averaged scores compiled from the DEDUCE partners evaluation forms. For each goal, the positive and negative qualities of the data are also highlighted.

These evaluations are by no means intended as absolute scores. They should be regarded as a method of bringing objectivity into an otherwise subjective evaluation by the use of criteria with verifiable scores. They allow for an overall view of conclusions and comparison between partners and their experiences.

Goal 1 diagram (7 measurements)

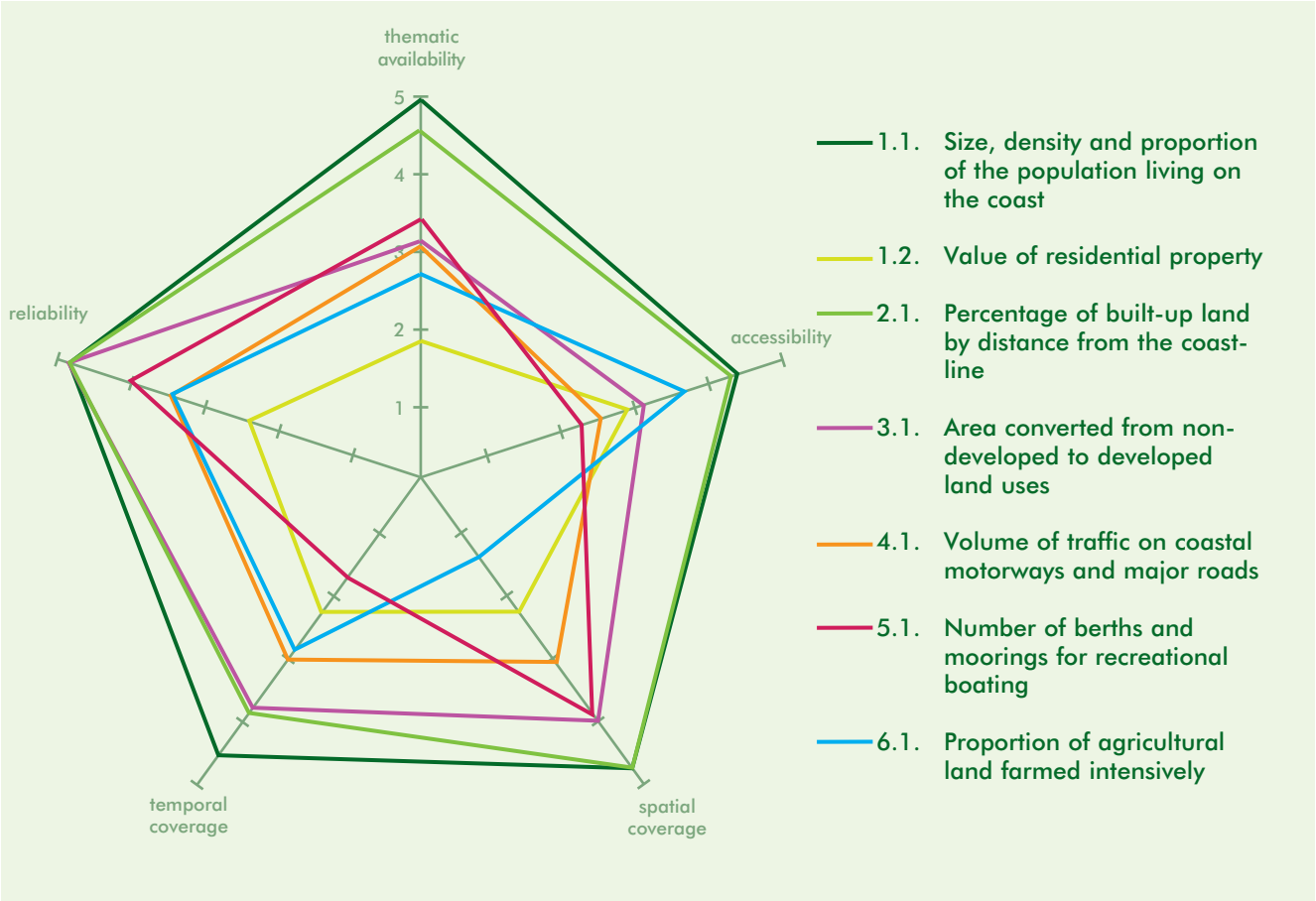


Fig. 83: Average of the qualitative appraisal on measurements of coastal urban development.

(+) Two measurements score visibly higher than the remaining 5, for all 5 criteria taken together. These are, 'size, density and proportion of the population living on the coast' and 'percentage of built-up land by distance from the coastline'. The data are obtained from national census providers and from Corine Land Cover respectively.

(–) Most partners encounter difficulty in obtaining reliable data at the required spatial scale for the measurement 'value of residential property'. Moreover, the data is generally derived from information on the sales and actual transactions of property on the market and therefore represents an estimation of the average value of sold property in a given area for a given year.

(–) Data on the 'number of berths and moorings' generally has a low temporal coverage (no time series are kept on marinas) and is not accessible from centralised databases: contacting the marinas individually is often the only way to obtain data.

Goal 2 diagram (7 measurements)

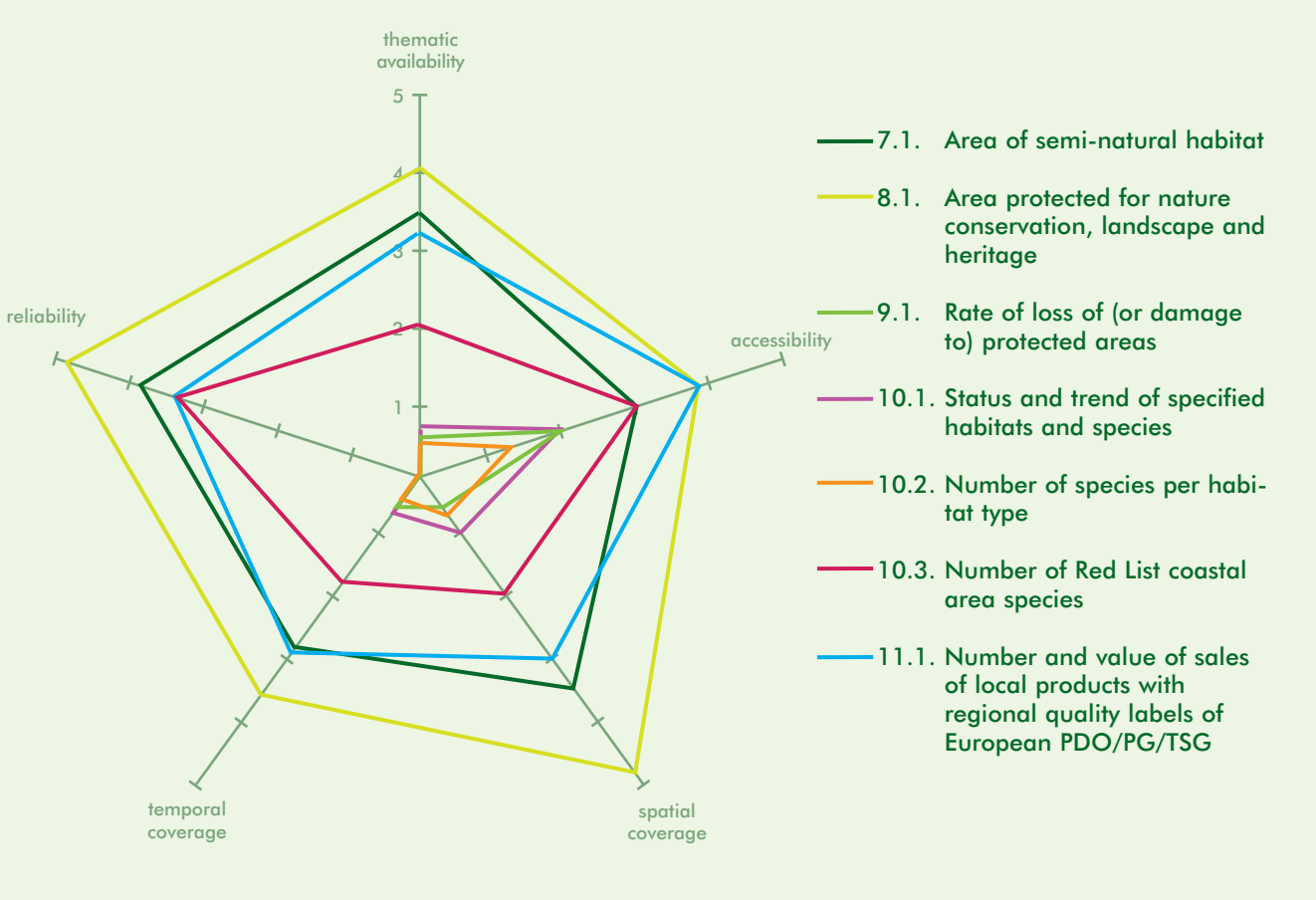


Fig. 84: Average of the qualitative appraisal on measurements of natural and cultural diversity.

(+) The measurements for Goal 2 obtain low scores, except for the 'area protected for nature conservation, landscape and heritage', which is rated quite good for spatial coverage (most data providers deliver shape files) and reliability. This is particularly true for the Habitat and Bird Directive areas (Natura 2000).

(–) The obstacle in the thematic coverage of measurement 8.1 refers to the variety in categories of statutory designations at the national and local level. In some cases no clear distinction is possible between designations for cultural purposes and areas designated for the protection of natural heritage.

(–) The low scores obtained for the measurements related to status, trends and number of species can be explained both by the lack of data and/or the fact that these data are, for the time being, incomplete, stored in local databases or obtained from literature/expert judgment.

An additional obstacle arises from the fact that there is no standard 'coastal' definition for habitat and species; consequently, there is no 'coastal' reporting format of data and monitoring products available.

Goal 3 diagram (9 measurements)

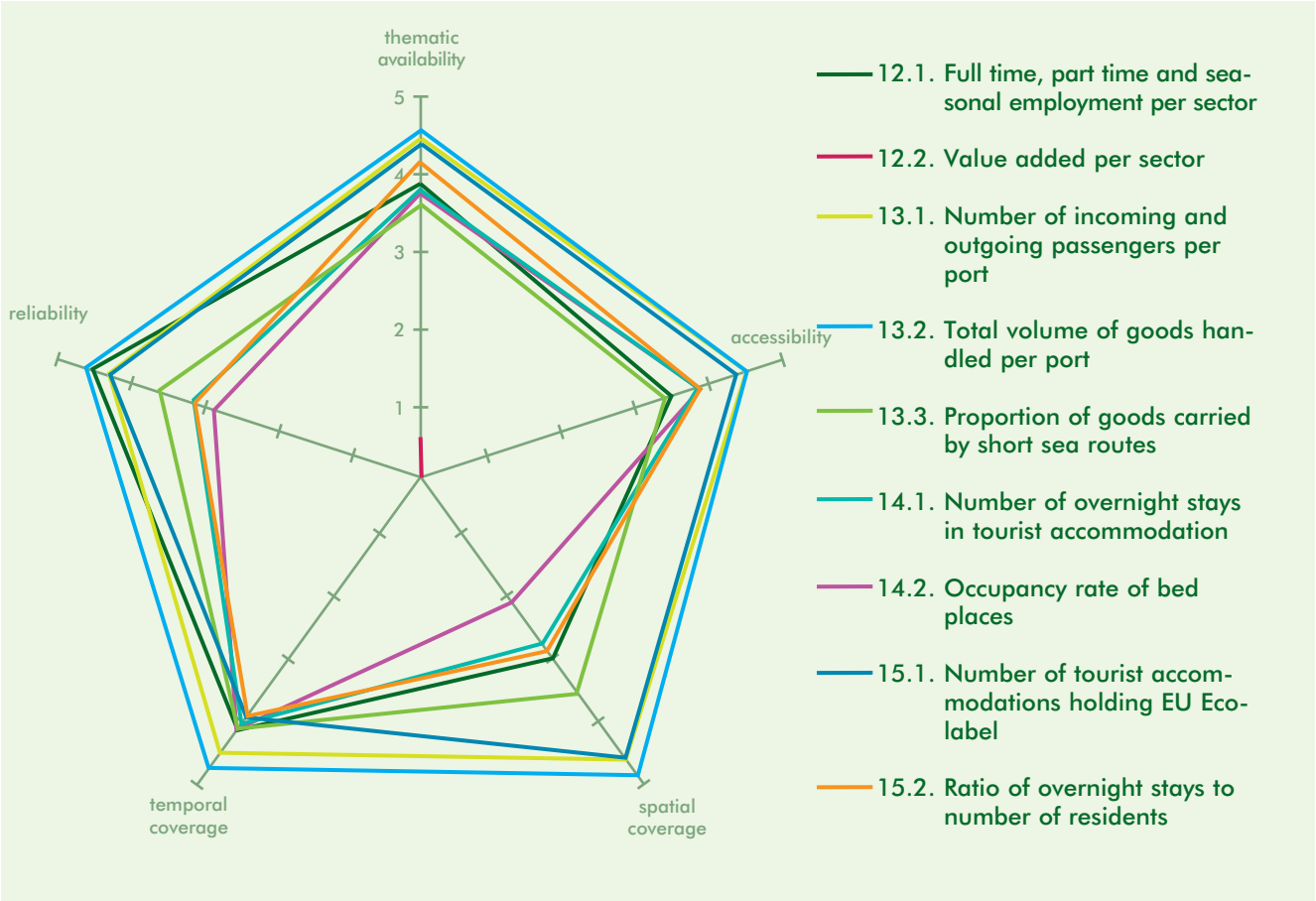


Fig. 85: Average of the qualitative appraisal on measurements of coastal economy.

(+) Overall, the measurements for Goal 3 obtain high scores, particularly for thematic and temporal coverage. The port measurements score well for all five criteria.

(–) In spite of being an important driver for most coastal zones, the measurements for tourism score lower, mainly because the spatial coverage is insufficient to allow analysis for the coast or because of difficulty in accessing the data.

(–) For the 'value added per sector', methodological development for common calculations encountered major obstacles. No SIF is available for this measurement.

Goal 4 diagram (5 measurements)

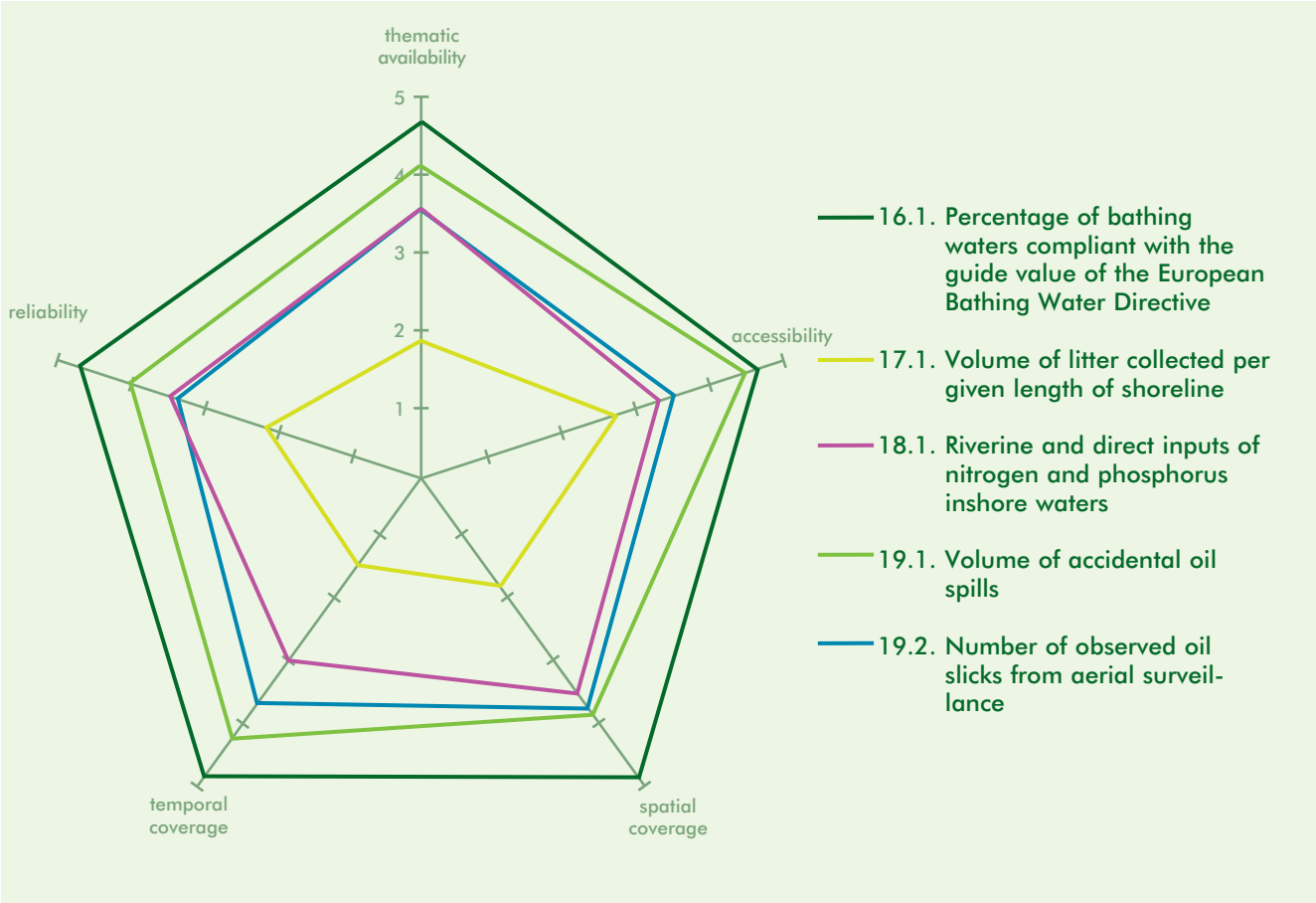


Fig. 86: Average of the qualitative appraisal on measurements of beaches and coastal waters.

(+) Overall, the measurements for Goal 4 obtain good scores, in particular the 'percentage of bathing waters compliant with the guide value of the Bathing Water Directive' which was the measurement best valued for all criteria and by all partners alike. Since data on marine water quality is often generated for the purpose of compliance with EU or regional conventions and agreements, relevant and reliable data is generated at least for most of the regional waters.

(–) The 'volume of litter' scores lowest within the set of measurements for Goal 4. Problems in achieving reliable quality standards and (common) methodologies are the main cause. Still, part of the data is generated through sustained efforts from highly committed volunteer networks, e.g. around the southern North Sea).

Because of its scope, the measurement 'riverine and direct inputs of nitrogen and phosphorus to inshore waters' was replaced by '(average winter) concentration of nutrients in coastal waters'. Therefore the scores refer to the latter.

Goal 5 diagram (4 measurements)

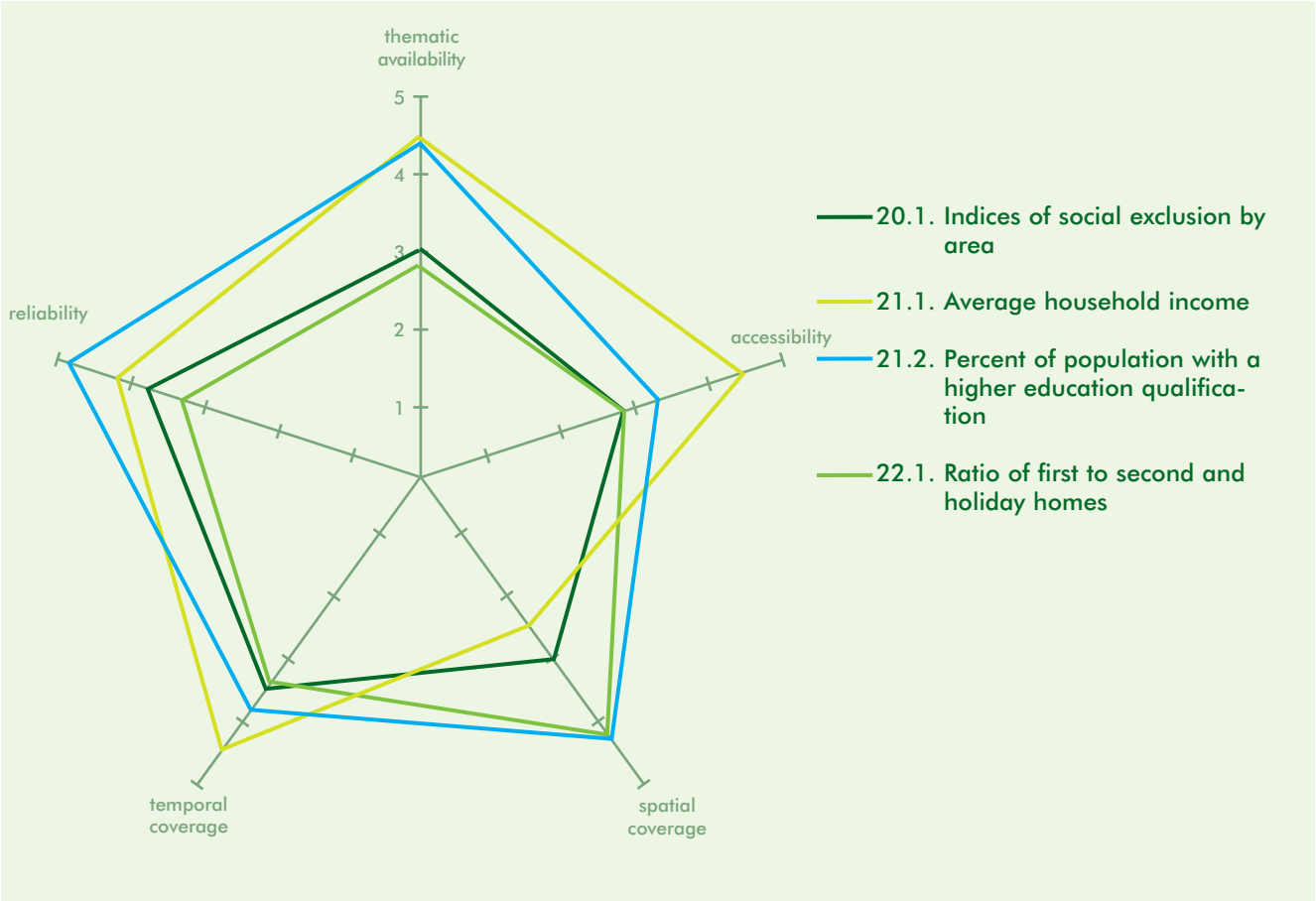


Fig. 87: Average of the qualitative appraisal on social measurements.

(+) Overall, the measurements for Goal 5 obtain good scores especially for reliability, temporal and thematic coverage, mainly because most of the data is obtained from census surveys.

(+) Measurements on second homes and higher education qualifications score highest on spatial coverage.

(–) Except for the measurement on average household income, the data for Goal 5 measurements seem to be less accessible overall.

Improvements should be attempted for the data on 'indices of social exclusion by area' and for the reliability of the data on second homes.

Goal 6 diagram (5 measurements)

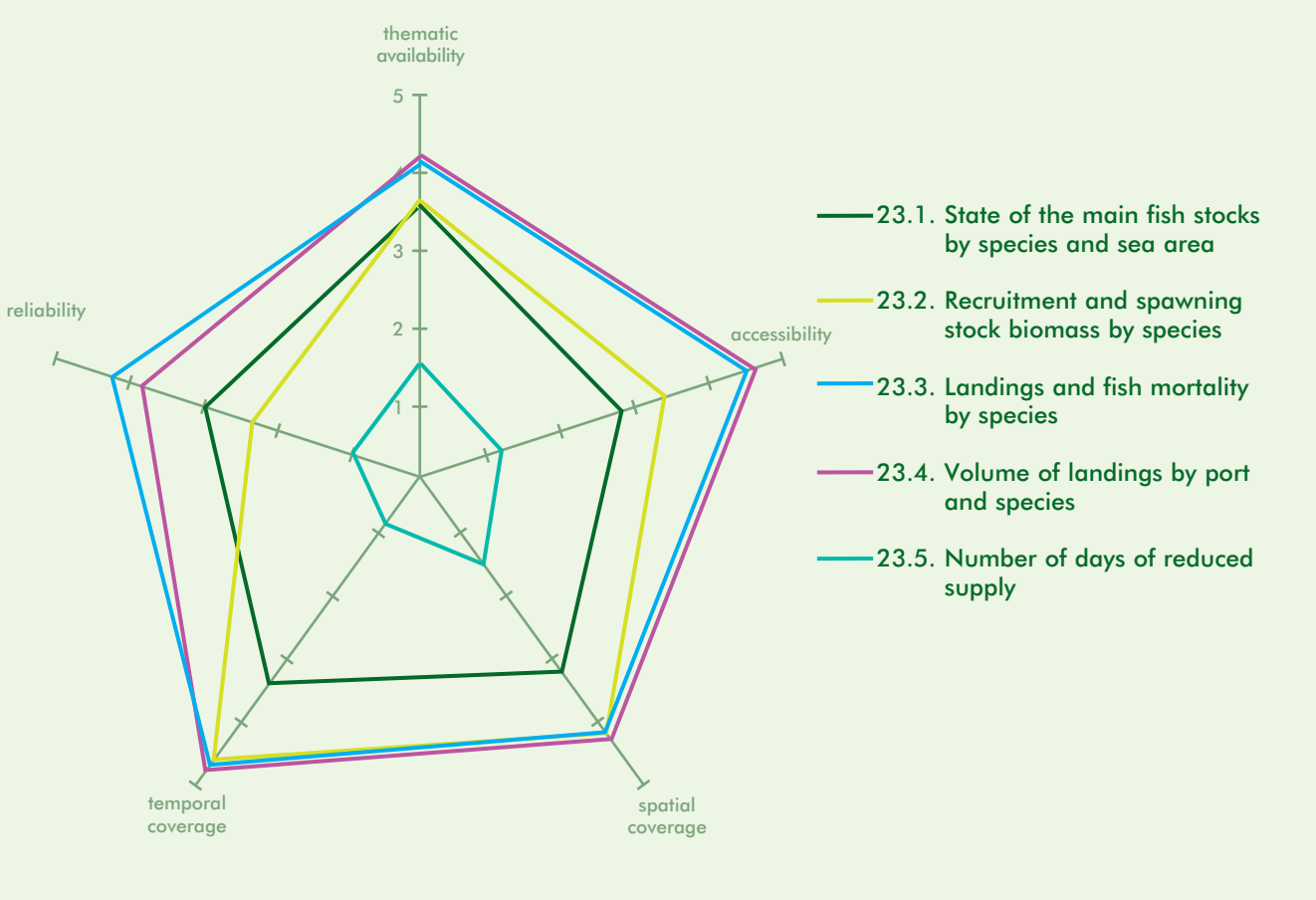


Fig. 88: Average of the qualitative appraisal on measurements of use of natural resources.

(+) Measurements on the value of landings and fish mortality score the highest of the set for all 5 criteria, suggesting that there is adequate data for the purpose of the indicator.

(–) The measurements on fish stocks score less probably since stock assessments are not performed comprehensively throughout the DEDUCE partners' territory.

(–) Low scores were assigned to the measurement on reduced supply of drinking water perhaps suggesting that not enough emphasis has yet been placed on this issue so reflecting the lack of adequate data.

Goal 7 diagram (8 measurements)

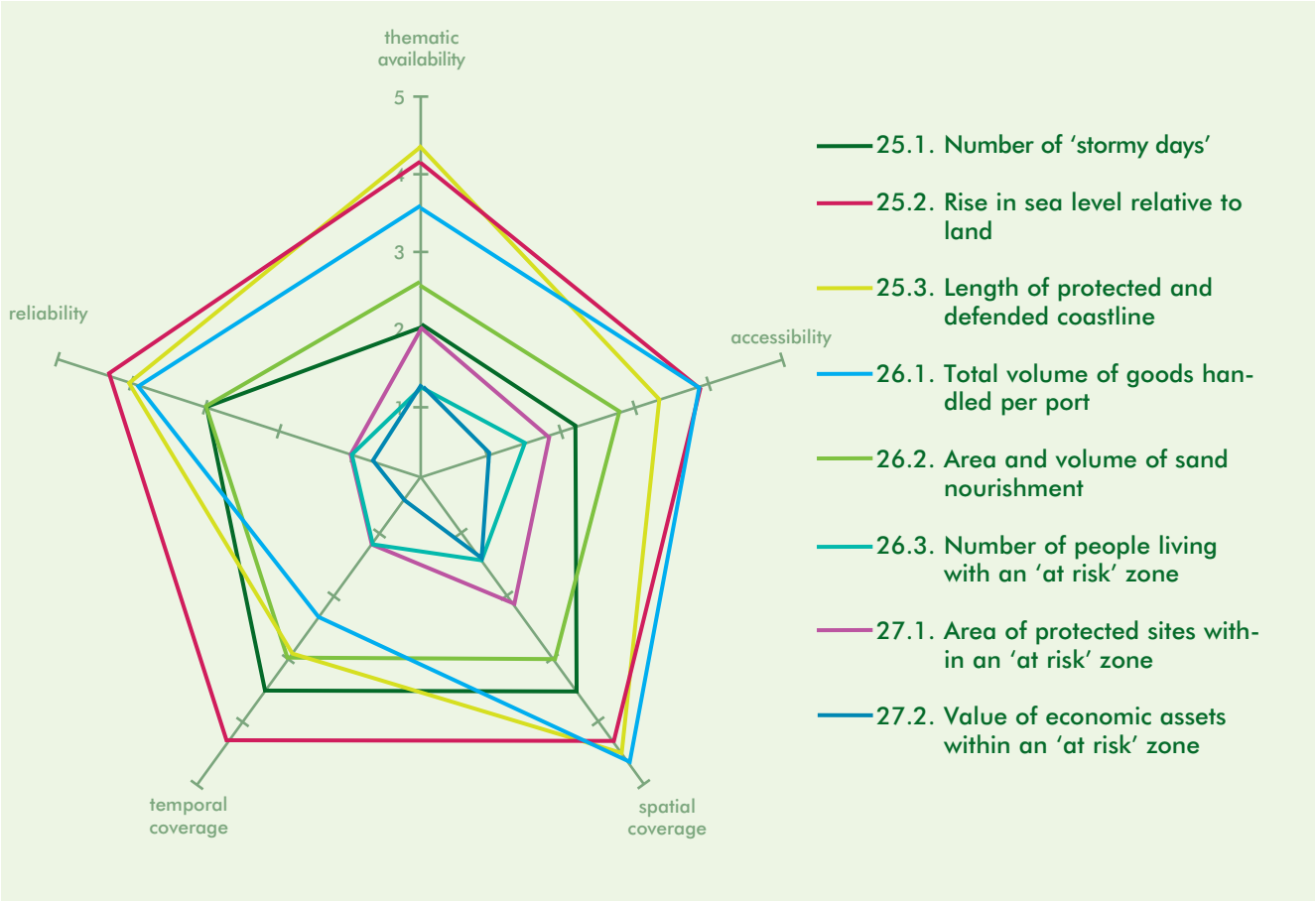


Fig. 89: Average of the qualitative appraisal on measurements of threat by climate change.

(+) The quality of the data that monitors the rise in sea level relative to land is of the highest standard in some regions of Europe (e.g. southern North Sea and Atlantic Ocean), mainly due to an excellent network of national data providers that have streamlined metadata and data transfer according to common standards. Quality control is assured by an expert institute.

(–) Data related to or derived from the boundaries of the area at risk from flooding is scarce in most partners' cases. Lowest scores are obtained for data on risk evaluation, suggesting that more work needs to be done to address this thematic issue.

6.2 REVIEWING THE SET OF INDICATORS

A good deal of expert opinion was gathered from the regional assessment workshops organised throughout 2005 and 2006 as well as the technical conference panel and debate (Tarragona, 2nd March 2007). This served as additional input during the discussions within the DEDUCE network, both on the usefulness of the set of ISD as well as regarding the process and the indicators-based approach.

The current review includes most of these opinions and views and briefly comments on strengths and weaknesses of the indicator set. Specific proposals for fine-tuning or the inclusion of complementary measurements are provided for each of the seven goals of the ICZM Recommendation.

6.2.1 Goal 1: Development at the coast

Land take is a "hot" topic in terms of sustainable coastal land use. Taking into account this premise, both Indicators 2 (Area of built up land) and 3 (Rate of development on previous undeveloped land) are key indicators to address the first goal of the EU ICZM Recommendation "*to control as appropriate further development of the undeveloped coast*". The additional measurement 'rate of development on previously developed land' was considered by the partners as a definition of the use of space that relates more to sustainable development. However, for the current test-cases, insufficient data was available to conduct an evaluation.

The trends in the coastal population and population density (Indicator 1) as well as the demand for road travel on the coast (Indicator 4), show us two of the main driving forces of land development on the EU coasts. In that sense, these measurements provide essential collateral information to monitor the objective of this goal.

The measurement on intensive agriculture (Indicator 6) provides information on the changes in land use for agriculture purposes. However, it is not entirely relevant for all of the coastal zones. In addition there is still a need for a practical **definition of 'intensive'** that is suitable for regions as different as one can find from northern to southern Europe, while grasping the essence and purpose of the ISD.

In general, the indicators proposed for measuring the sustainability of the processes related to Goal 1 are useful. Even so, it must be pointed out that they are **predominantly land-based**, with the exception of the number of moorings and berths (Indicator 5). There is, therefore, a shortage of indicator(s) to monitor how marine space is allocated and occupied by different users over time.

This deficiency can be addressed by one measurement related to the **total allocated area of the 'wet' coastal and maritime zone for infrastructure** (energy, sea bed protection, maritime transport, communication, monitoring, aqua/mari-culture, etc.) and a second one related to the **use of marine space** for transient maritime activities (navigation, fishing, recreation, mineral extraction and dredging areas).

6.2.2 Goal 2: Natural and cultural diversity

The indicators and measurements related to Goal 2, "*to protect, enhance and celebrate natural and cultural diversity*", mostly address the need to evaluate sustainability levels and trends in biodiversity but not the cultural diversity.

The "area of semi-natural habitat" (Indicator 7), provides a complementary measurement to the 'development of the undeveloped coast' (Goal 1), since the percentage of natural and semi-natural habitats in the coastal zone is related to the spatial distribution of developed areas.

The 'areas protected by statutory designations' (Indicator 8) show us the level of protection of coastal habitat. This is especially relevant in a context of high pressure from the coastal urban development. In this sense it provides a good and clear measurement of the first part of Goal 2.

The current proposal is to modify the name of Indicator 9 to: "status of species and habitats present in protected areas". The calculation of this indicator must be based on the Natura 2000 reporting regulations (favourable conservation status) in order to serve the purpose of evaluating the efficiency of protection instruments.

Indicator 10, on significant habitats and species, should be reduced to two measurements showing trends of common species and habitats alongside with the trends of common threatened species characteristic of both coastal and marine ecosystems.

6.2.3 Goal 3: Sustainable coastal economies

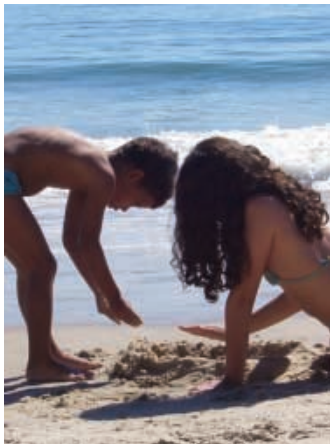
Nine measurements of the WG-ID proposal address sustainable coastal economies. The measurements addressing **port-related activities (3)** score quite well in terms of the technical evaluation mainly because of the easy access to harmonised datasets at European level. Although they provide a good basis for measuring further growth in maritime economies, they may prove to score less as tools for the evaluation of sustainability especially if we fail to provide a tight linkage with other indicators such as sustainable employment and sustainable transport. In particular the impact of ports and maritime activities on socio-economics and the environment requires taking a thorough look at issues that are generally **externalised by the current economic models. Cost-benefits in terms of energy use, emissions (in water and air) and waste generation needs to be taken into account.**

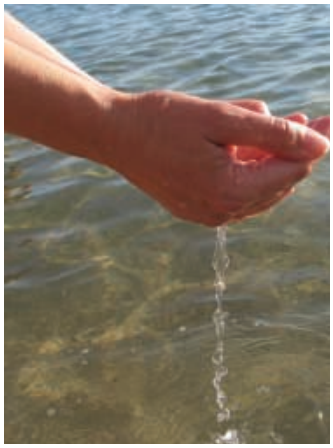
The measurements on **tourism (4)** score lower mainly because of insufficient spatial and temporal coverage or because the data is less accessible. Again, they may prove to be useful for measuring whether we are moving towards more sustainable economies if tight linkages exist with other indicators in the set (added value per sector, sustainable and qualitative employment). Further work is needed to ensure a realistic estimate of the **true population in peak seasons (resident + floating)** is taken into account and to improve our **understanding of the impact that these population levels have in terms of the social and environmental carrying capacity of the coastal zones, their communities and heritage.**

The indicator of **ecological quality labels** for tourist accommodation and infrastructure **encompasses aspects of sustainable tourism and recreation** activities. However, the impact of their extent, even in the long-term, cannot be expected to address the full magnitude of the problem. Further consolidation of these labels and **embedding the concept of sustainable coastal tourism in broader strategies and policies for the coast** is essential.

Measuring **added value of economic sectors** is relevant for the evaluation of sustainable development, provided that 1) the division of the sub-sectors are relevant for the coast and 2) the results can be clearly related to social (e.g. (un)employment) and environmental cost (e.g. wastes) of production.

Finally, the measurement on the value of landings of fish and produce from the sea is considered to have closer affinity with evaluating sustainable economies than with the sustainable use of resources.



6.2.4 Goal 4: Water quality

The indicators related to Goal 4 'To ensure that beaches are clean and that coastal waters are unpolluted' address some of the most evident threats to beaches and coastal waters.

"Quality of bathing water" (16.1) and "Amount of coastal litter" (17.1) are measurements **linking** tightly the **status of the environment** with the potential **sustainability of welfare of coastal communities** through direct impact on e.g. tourism. Achieving continuous improvement in those two aspects of coastal environment and anthropogenic pressure can be well understood by the general public: it is about increasing the number of bathing areas complying with the guide value of the BWD as well as decreasing the amount of coastal litter There are however a few improvements which can be recommended for consideration such as **more sensitive criteria** for different types of water bodies: the actual Bathing Water Quality Directive is related mostly to sewage induced pollution parameters.

The latter two – "Concentration of nutrients in coastal waters" (18.1) and "Amount of oil pollution" (19.1 and 19.2) are intended to show how well different policies work for the prevention of pollution of coastal waters. They represent major continuous threats of agriculture and urban pollution load (18.1) and major accidental pollution load (19.1 and 19.2). In this case, mechanisms aimed at decreasing the amount of pollution are supportive of sustainable development. However there are a few caveats – in case of 'the number of oil slicks detected', the definition should be changed to 'number of oil slicks detected per aerial surveillance flight hour' since the latter is considered to be less biased by search/monitoring effort.

The suggestion is to further complement this goal with indicators on chemical and biological status of coastal water bodies, as defined for the Water Framework directive.

All Goal 4 indicators are of the "daily" management type and can be well understood by politicians as well as by the general public.

6.2.5 Goal 5: Social cohesion

The indicators identified for Goal 5 "To reduce social exclusion and promote social cohesion in coastal communities" are useful for describing the state of the socio-economic system in the coastal zone and comparing this with the hinterland. However they appear less suitable for measuring progress towards social cohesion (the sustainability goal). A composite measurement based on different parameters that address both exclusion and cohesion could be developed to provide a better idea of this complex issue. The new measurement or indicator could be related to:

- human health,
- access to socially-cohesive infrastructures,
- enhancement of social capital,
- public access to coastal and marine spaces and resources.

These are aspects that can help develop a more complex picture of coastal communities and so help to develop a more specific cohesion policy for them.

6.2.6 Goal 6 Wise use of resources

There are two indicators defined for the goal 'wise use of resources'; one on fisheries and another on water consumption. Of course drinking water and fish stocks are not the only resources of coastal areas, although other resources such as land or natural heritage are monitored in other goals and are not, therefore, considered again here. Other resources, such as energy or prime material (also the wastes derived from their use) are not included in the list of indicators.

The current proposal is to modify some of the measurements of the indicator on fish stocks and fish landings. The usefulness of the measurement on recruitment and spawning stock biomass by species is to be proven; it is at least very difficult to calculate and on the other hand is partly included in the measurement on the state of main fish stocks (safe biological limits). The measurement on values of landings is considered to be more related to Goal 3 on sustainable coastal economy. Therefore, the indicator on **sustainable fishing** in this goal consists of the landings and fishing mortality (the sum of landings and discards, in cases where data on discards are available and of sufficient accuracy by species) and state of the main fish stocks by species and sea areas. Even so, the **effect of fishing on the wider ecosystem** (non-commercial species and trophic levels) **is not addressed by these measurements**.

The indicator on water consumption is evaluated by the measurement 'numbers of days of reduced supply'. There is a general lack of information on this issue. Consequently, the suggestion is to substitute this by e.g. 'drinking water consumption per day per capita'.

As suggested for the measurements in Goal 3, the evaluation of a wise use of resources requires measurements on the use of energy and the generation of wastes related to exploitation of resources and production processes.

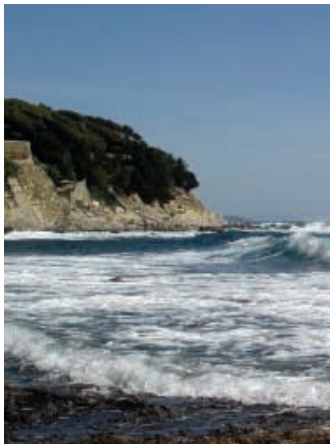
6.2.7 Goal: 7 Climate change and coastal protection

The climate change signals proposed by WG ID (number of stormy days 25.1 and sea level rise 25.2) provide partial information of these driving forces that generate increasing impacts over the integrity and sustainability of the coastal zones. Other signals to include in Indicator 25 are measurements related to the sea and air temperature and others in relation to the wind direction and intensity.

The length of dynamic coastline (26.2) reflects, in part, the impacts on and the vulnerability of coastal zones. The complete characterisation of these impacts requires a **better definition and knowledge of the sediment balance** in each coastal unit. The loss of beaches by erosion is one main problem for sustainability in tourist zones at the coast which depend largely on the beach surface.

The length of protected and defended coastline (26.1) and area and volume of sand nourishment (26.3) show the engineering response to particular erosion problems and the needs of ports and infrastructures. Putting these parameters in monetary terms would allow for visualisation of the **cost of maintaining these assets** for e.g. tourism (sandy beaches) and port economy.

The indicator 'natural, human and economic assets at risk' (measurements 27.1, 27.2 and 27.3) allows for the combination of views of the expected scenarios in relation to the effects of climate change. Indicator 27 should also address additional risks related to climate change such as the changes in sanitary (human health) and environmental conditions. The sustainability, in this case is the minimisation of the risk. However, the methodological difficulties of calculating the risk zones are substantial.

6.3 FURTHER LINES OF WORK

The DEDUCE recommendations presented above are complemented with a proposal regarding further work needed. They represent the point of view of the DEDUCE partners and their networks, to complete the ISD framework and to increase its usefulness to the most significant users: policy makers, scientists and the interested public. The most relevant future lines of work are:

- To define a system for evaluating sustainability,
- To establish the relationship of the ISD with the ICZM progress and governance indicators,
- To build a communication strategy around the indicators.

6.3.1 Defining the sustainability evaluation system

While calculating and evaluating the indicators, the DEDUCE partners have given the necessary attention to the issues of sustainability. Although these issues are quite complex, they need to be addressed in further detail in order to be able to use the ISD framework:

- defining the interactions between objectives, indicators and measurements,
- establishing the (mechanism for defining) sustainability thresholds and targets.

In relation to the first line, the DEDUCE products demonstrate how many of these interactions are considered. However, further work is needed to **build a model or mechanism for integrated analysis**. This framework must be constructed using different **methodological approaches** such as cost/benefit analysis, DPSIR framework (EEA, 2000 and UNESCO 2006), spatial analysis, multifactor and covariance analysis.

Another way to address these interactions is to **select the most significant processes** and establish evidence in the **correlation between indicators**. One interesting example is the correlation between the changes in regional sea climates by the warming of air and sea surface temperature (SST) and changes in marine ecosystems (JRC, 2006). This correlation demonstrated the cause-effect relationship between sea temperature and changes in composition, abundance and distribution of a substantial number of marine species. We can therefore conclude that sea temperature is a significant measurement (not included in the current ISD set) for understanding the changes in marine biodiversity (Goal 2, Indicators 9 and 10 of the WG ID proposal). Over fishing and its impact on the abundance and composition of benthic (and other marine) life is another measurement that is useful to consider in this analysis (see also Indicator 23).

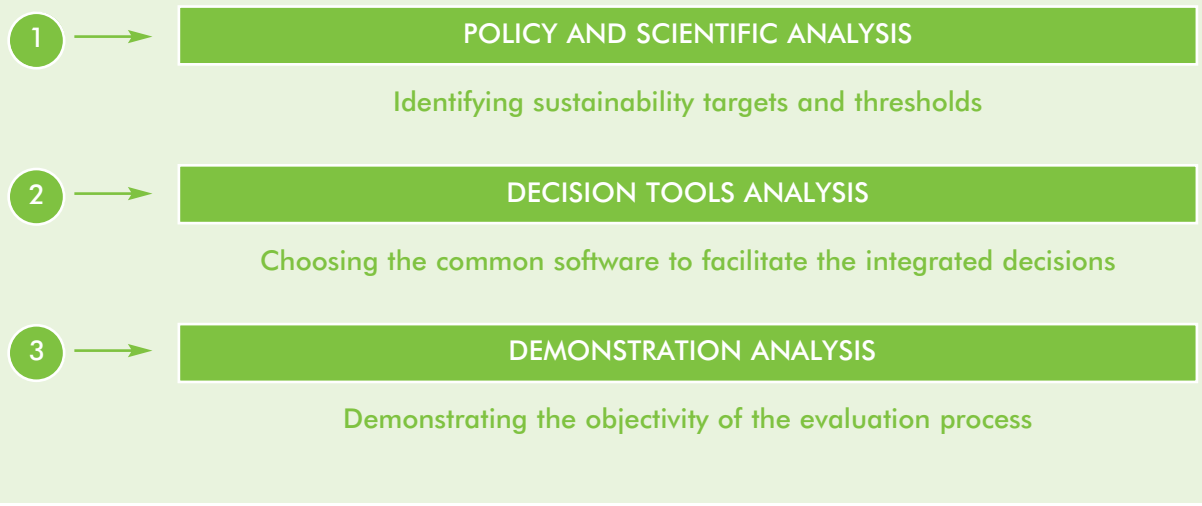
On the terrestrial side of the coast, the changes in the terrestrial species and habitats (Goal 2, Indicators 7 and 10) are often linked to changes in land use (Goal 1, Indicators 2 and 3).

These and other examples show us the importance of this line of work in order to provide a more comprehensive and dynamic vision of the coastal and maritime processes. The understanding of correlations between indicators is particularly important and useful for preparing a response on behalf of the main agents – policy makers, research and training and civil society. However, **caution** is required with the interpretation of cause-effect and correlations – **what works for one region or coastal ecosystem, is not necessarily applicable for another**. In this case good governance depends on the quality of knowledge.

The second line of work is to develop a model for evaluating sustainability, based on the SD indicators. Even with the perfect set of ISD alone, it is very difficult, if not impossible, to address the decision-making process. The value of an indicator does not per se provide the key as to whether we are moving in the right direction and if we are moving at the right pace. The data and calculated indicators need to be placed within a practical model to facilitate integrated evaluation in terms of sustainability. The relative weights and levels of acceptability for each of the indicators

provide the boundaries of the model. These are steered by societal and political choices and priorities. It is necessary to agree how MS and regions will process the data and indicators to facilitate the decision.

The figure below proposes three main steps towards such an evaluation model:



6.3.2 Providing the link with governance indicators and progress in ICZM

Management and governance performance in the coastal and marine system are crucial in obtaining the proposed targets and impacts for sustainable development at all levels. However in the WG-ID set of ISD, the majority of the indicators are of the pressure, state or impact type. Few measurements **address management responses** to the main issues identified – the 'area of land and sea protected for nature designations' or 'tourist accommodation holding EU eco-label' can be considered as response indicators.

A new project or programme is required to look at these management response indicators and the possibility of developing an **objective related to the performance of the coastal and maritime management system**. In this sense, the work delivered by the EU ICZM expert group in testing and applying the ICZM progress indicator in member states is a very valuable starting point. It is a complex task. However, it is necessary to further explore the linkages between good governance (both private and public response) and delivered examples of sustainability 'in the field'. These demonstrations of good practice in their turn strengthen and increase support for SD.

6.3.3 Building a communication strategy around the indicators

The last line of work envisaged by the DEDUCE partners in working with indicators is the need of an effective communication strategy.

Ensuring an objective and sound (scientifically underpinned where feasible) interpretation of the results obtained, requires appropriate dissemination.

The communication and interpretation efforts developed by the DEDUCE partners focused on 6 Regional Assessment workshops (Latvia, Poland, Belgium, France, Spain and Malta) in which the technical level and the local/national network of data providers and users groups were targeted. However it is necessary to define strategic target groups and objectives and to accompany the indicators-based approach with a permanent communication strategy.

Public behaviour depends, in part, on levels of awareness, knowledge and comprehension, in this case of the coastal and marine processes. In this sense, the results obtained from the calculation process alone, will not achieve the ultimate goal of steering public behaviour towards more sustainable responses.

The final level of impact of the information products can be strengthened and visibly enhanced through a communication strategy based on different components:

- INFORMATION: To accede to clear information on the main processes,
- COMMUNICATION: To facilitate the debate between different agents,
- PARTICIPATION: People want to become involved if stimulated in the right way,
- ACTION: promoting real changes in the behaviour of people.

Improved governance and management is not only translated as more effective and efficient management; 'better' governance also means management that can rely on the support of society. The role of objective and reliable information in building this social and societal basis cannot be underestimated. Information flow is of particular importance for improved governance in coastal and marine zones which have been largely invisible to policy-makers and society at large.

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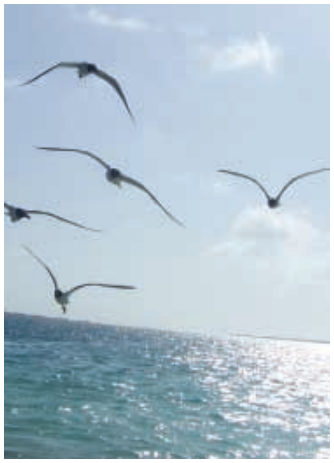
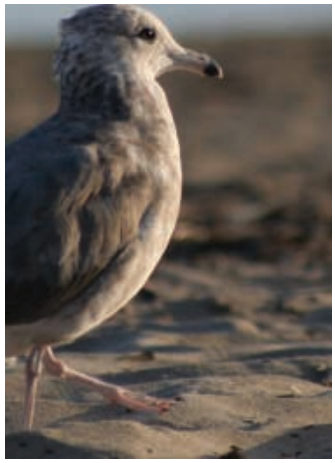

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ICES: International Council for the Exploration of the Sea. http://www.ices.dk

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LIST OF ACRONIMS

BWQ	Bathing Water Quality.
CFP	Common Fisheries Policy.
CLC	CORINE Land Cover.
COMRISK	Common strategies to reduce the risk of storms floods in coastal lowlands project.
CorePoint	Project titled Coastal Research Policy Integration.
CORINE	European project on Coordination of Information on the Environment.
COST-ESF	Intergovernmental framework for European Co-operation in the field of Scientific and Technical Research.
DEDUCE	Project titled "Développement Durable des Zones Côtieres Européennes" or Sustainable Development of European Coastal Zones.
DG-ENV	Directorate-General of Environment of the European Commission.
DPSIR	Driving Forces, Pressures, State, Impacts and Responses (framework for indicators set).
EC	European Community.
EEA	European Environment Agency.
EEZ	Exclusive Economic Zone. It is a marine coverage.
EMMA	Expert Group on Monitoring and Assessment for the Marine Strategy Work Programme.
EMODNET	European Monitoring Observation Data Network.
EQO	Ecological Quality Objective of the OSPAR.
ESA-GSE water	Initiative on coastal water quality monitoring developed by the European Spatial Agency – GMES (Global Monitoring for Environment and Security) Services Element.
ETC-TE	European Topic Centre on Terrestrial Environment. It is nowadays the European Topic Centre Land Use and Spatial Information ETC-LUSI. It is part of the European Environmental Information and Observation Network (EIONET) depending on the European Environment Agency. It depends also of the Autonomous University of Barcelona.
EU	European Union.
EUNIS	European Nature Information System by the European Environment Agency.
EUROBIS	The European Ocean Biogeographic Information System that is provided by The EU Network of Excellence Marine Biodiversity and Ecosystem (MARBEF).
EUROSION	European initiative for sustainable coastal erosion management.
Eurostat	EU Statistical Agency.
GIS	Geographical Information Systems.
GOOS	Permanent global system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide.
HELCOM	The Helsinki Commission. It works to protect the marine environment of the Baltic Sea from all sources of pollution.
ICES	International Council for the Exploration of the Sea.
ICZM	Integrated management of coastal zone.
IFEN	French Institute for the Environment, depending on the French Ministry for the Environment.
IFS	Indicators Fact Sheet.
IISD	International Institute for Sustainable Development.
ILO	International Labour Organization.
IMEDEA	Institut Mediterrani d'Estudis Avançats (Mediterranean Institute for Advanced Studies).
INSPIRE	Infrastructure for Spatial Information in Europe.
INTERREG	The Interregional Cooperation Programme of the European Union.
ISCED	International Standard Classification of Education.
ISD	Indicators of Sustainable Development.
IUCN	International Union for the Conservation of Nature and Natural Resources, it uses also the most common name of "World Conservation Union".

LAU	Local Administrative Units. Official EU codification.
LEAC	Land Ecosystems Accounting Methodology.
MEPA	Malta Environment and Planning Authority.
MESH	Mapping European Seabed Habitats project.
MFISD	Methodological framework for calculating and reporting indicators.
MOTIVE	Global Monitoring and Environmental System and Marine Data Harmonisation project.
NACE	EU nomenclature of economical activities.
Natura 2000	Network of European protected sites for nature conservation originated in the EU Nature Directive.
NMG	DEDUCE network.
NUTS	Nomenclature of Territorial Units for Statistics. This official codification in EU classifies similar administrative units of the Member States.
OECD	Organisation for Economic Co-operation and Development
OSPAR	Convention and commission guiding international cooperation on the protection of the marine environment of the North-East Atlantic.
PA	Protected Area.
PSMSL	Permanent Service for Mean Sea Level. It is implemented by the Joint Research Centre: Proudman Oceanographic Laboratory.
PSR	Pressures, State, Impacts and Responses (framework for indicators set).
RAMSAR	Convention on wetlands signed in Ramsar (Iran) in 1971.
RS	Reporting Sheet.
SAIL	Schéma d'Aménagement Intégré du Littoral (Scheme of Integrated Management of Littoral. The part one of this project was founded by INTERREG IIC. Its aim is to help manage the issues affecting the coastlines and communities bordering the Southern North Sea Area.
SBL	Safe Biological Limits (in this publication for fished species).
SD	Sustainable development.
SEAL	Comparable spatial units/time series.
SIF	Standard Indicator Format.
SPC	EU Statistical Programme Committee.
TBT	Tributyltin (trialkyl organotin compound)
UNEP/GRID-Arendal	Key Polar Center of the United Nations Environment Programme, specifically inside the Global and Regional Integrated on Data. It is placed in Arendal (Norway).
VLIZ	Flanders Marine Institute.
WFD	Water Framework Directive (2000/60/EC).
WG-ID	Indicators and data working group created by the European ICZM expert group.

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