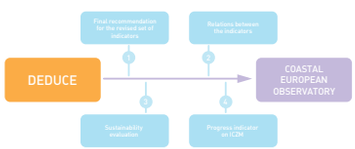
DEDUCE (Développement Durable des Zones Côtières Européennes) is a transnational project supported by Interreg IIIC-South Community Initiative Programme. Its main objective is to evaluate the utility of indicators for an optimal decision making at the coast following the principles of the EU Recommendation concerning the implementation of Integrated Coastal Zone Management.

USING INDICATORS TO MEASURE SUSTAINABLE DEVELOPMENT AT THE EUROPEAN COASTS.

Several experts from the European coastal states meet in Tarragona (Spain) at the Deduce technical conference to debate about the usefulness of the sustainable development indicators proposed by the EU to measure the sustainability of the European coasts.

> > > THE EFFECTS OF CLIMATE CHANGE IN COASTAL AREAS

> > > USING INDICATORS TO MEASURE SUSTAINABLE DEVELOPMENT OF THE EUROPEAN COAST



> > > DEDUCE IS AT ITS FINAL PHASE, WHAT'S NEXT?

Projet cofinancé par la Union Européenne
Nord Est SUD Ouest INTERREG IIIC

WHAT IS DEDUCE?

DEDUCE (Développement Durable des Zones Côtières Européennes) is a transnational project about Integrated Coastal Zone Management (ICZM), co-financed by the European Commission and the participating regions, in the framework of the Interreg IIIC-South. Its main objective is to evaluate the utility of indicators for an optimal decision-making at the coast, following the principles and criteria established by the EU Recommendation on ICZM. Nine partners representing all decision-making levels (European, national, regional and local) are carrying out the project, which runs from October 2004 to June 2007.

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The Deduce Newsletter has been produced in cooperation with the partners of the Deduce project. Please, contact: **deduce@litoralconsul.com** for further information

Context of DEDUCE

On May 30, 2002, the European Parliament and the Council adopted the Recommendation concerning the implementation of ICZM with the aim of fostering the development of integrated management strategies to guide the European coastal zones towards more sustainable scenarios.

In the framework of implementing the EU Recommendation, the European Commission created an Expert Group on ICZM, which established a Working Group on Indicators and Data (WG-ID). The result of the work carried out by WG-ID is a list of twenty-seven indicators that are structured as per the seven main objectives of the European Recommendation:

- **To control, as appropriate, further development of the undeveloped coast.**
- **To protect, enhance and celebrate, natural and cultural diversity.**
- **To promote and support a dynamic and sustainable coastal economy.**
- **To ensure that beaches are clean and the coastal waters are unpolluted.**
- **To reduce social exclusion and promote social cohesion in coastal communities.**
- **To use natural resources wisely.**
- **To recognise the threat to coastal zones posed by climate change and to ensure appropriate and ecologically responsible coastal protection.**

CLIMATE CHANGE AND COASTAL AREAS

By Xavier Martí, Sebastián Gómez, Enric Aragonès (Generalitat of Catalonia, Spain), and Jose Jiménez (Polytechnic University of Catalonia, Spain)

The integrity of coastal territories is at risk. One of the major economic, social, and environmental threats for these zones in the coming years is climate change. The need to reduce vulnerability from the effects of climate change forces coastal communities to define and implement a policy of adaptation.

Wladislawowo harbour and Hel Peninsula

Introduction

The first step for adapting and adjusting human activity in the coastal zones against climate change is to overcome the barriers related to uncertainty and inexact information. Lack of reliable data produces errors in projections, particularly in defining areas at risk and in evaluating the natural, human, and economic assets at risk within them.

Indicators

The coastal stakeholders (land owners, companies, scientists, administrators, ecologists, public, etc.) need to know the level and type of risk together with the potential area likely to be affected with some degree of certainty. Reliable information enables the formulation of measures to minimise such risks.

Consequently, any set of indicators on coastal zones has to include indicators addressing the impacts of climate change.

The list that is being developed and tested by DEDUCE includes a group of indicators on climate change in response to the respective goal of the EU ICZM Recommendation:

"To recognise the threat to coastal zones posed by climate change and to ensure appropriate and ecologically responsible coastal protection."

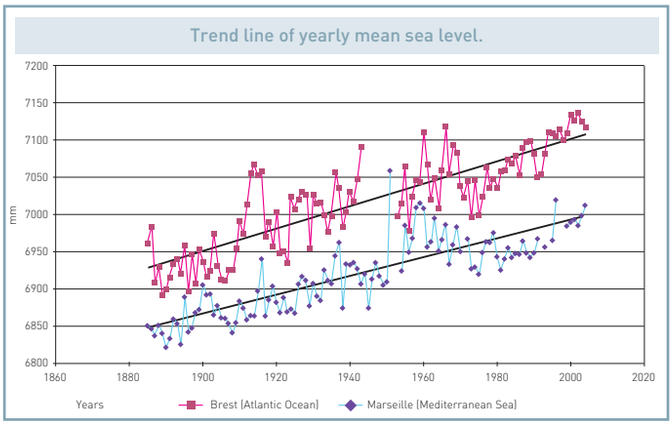
There are three indicators, with eight measures in total, being tested in DEDUCE. The first one deals with oceanographic phenomena related to climate change: sea level rise and marine storms. The second one deals with coastal erosion and accretion. And the third indicator values the coastal assets at risk in natural, human, and economic terms.

From the work undertaken so far, it becomes clear that the development of such measurements is a very laborious and complex task, particularly for the last indicator (valuation of risk), since risk calculation depends on a lot of variables and is dependant on the local characteristics.

This article highlights the issues raised in developing a workable methodology for these indicators. The proposed methodology in DEDUCE is seen as a first step in the process towards obtaining the correct information necessary to define the right adaptation measures.

Sea level rise and marine storms

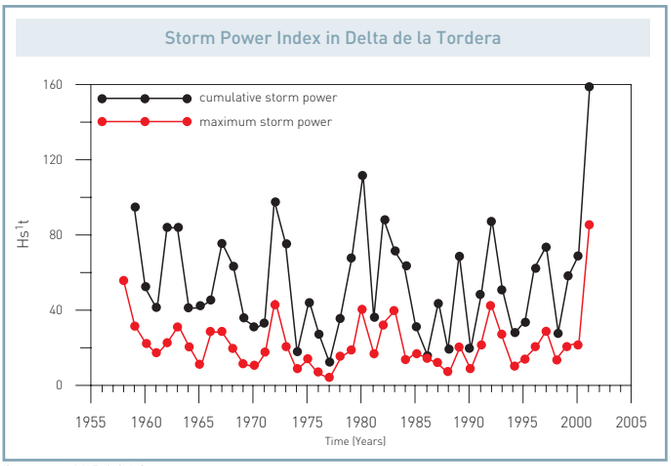
The results obtained for the first measurement seem to reflect the known trends in sea level rise, where results reveal a clear increasing trend.



Source: Permanent Service for Mean Sea Level

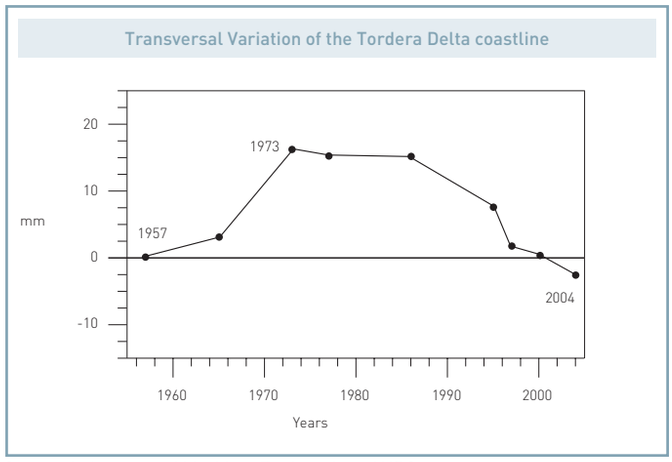
The graph indicates a rise in sea level of about 20 cm over two centuries. It is interesting to note that **there are regional differences** with more fluctuations along the Atlantic French coast than in the Mediterranean Sea.

Another measurement tested to look at climate change is the number of stormy days. Meteorological data (e.g., wind speed and intensity) imply one way of measuring this indicator. Another possibility is to look at the impacts of marine data to identify the intensity of marine storms. Experts on climate change forecast **a rise in the incidence of marine storms.** We can consider that marine storms take place when the wind intensity recorded in coastal meteorological stations or wave heights recorded in marine buoys surpass a threshold (specific for each coast) during a given time period. The **Marine Storm Power index (MSP)** is an accurate parameter to evaluate the incidence of marine storms. It consists of the mathematical integration of the square of significant wave heights over a given time. The calculation of this parameter is more complex than the relatively simple temporal count of stormy days but it provides a better monitoring tool of the erosion potential of storms. The annual cumulative MSP of all the storms alongside with the maximum value associated to a single storm, along the Catalan coast, have been calculated. Despite the lack of data, results in Catalonia show a high degree of variability from year to year, and no statistically significant trend is observed. However, the calculated linear regression shows an increase in three of the four analysed buoys.



Source: HIPOCAS

The Storm Power Index determines the erosion effect but it is not the only factor, as revealed by data from the Tordera Delta coastline. With a significant increasing trend in storm power, storm-induced damages have increased during the last decade (e.g. Jiménez et al., 2002). This has occurred due to the progressive narrowing of the beach as a consequence of coastal dynamics (not related to storms), especially after the decade of the 1970s when millions of cubic metres of sand were dredged from the Tordera river bed. This serves to illustrate that **induced coastal damages are usually associated with processes acting at different scales, which need to be jointly considered to properly estimate the total risk.**



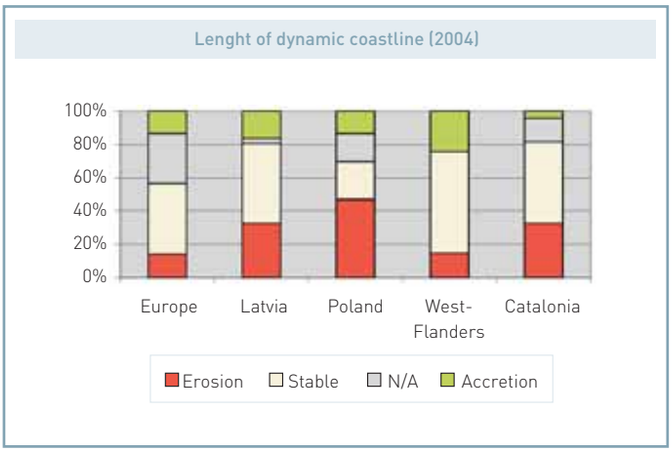
Source: Laboratory of Maritime Engineering of UPC

Coastal erosion

The second indicator specifically measures different parameters of coastal erosion and accretion. Measurements look at the evolution of protected and defended coastlines and trends in sand nourishment (volume and location). Measuring the length of artificial coast data may illustrate that such development has not been taken in response to climate change but as part of other urban or port-related projects. Coastal erosion can be accelerated by human activities with climate change possibly magnifying these effects. Data interpretation is therefore important to obtain the maximum benefits from these measurements.

The length of dynamic coastline only reveals the present situation hindering the possibility of estimating trends on climate change effects. The EUrosion project (funded by the European Commission) has classified most part of European coastline into three categories: stable, eroding, and accreting coastline.

Results reveal that the portion of eroding coastline covered by most DEDUCE partners is higher than the European average. It should be noted that the objectives of the EUrosion project aim at developing a broad, EU level, assessment at 1:000.000. Hence the results are not always relevant or accurate at the local level.



Source: DEDUCE Project using EUROSION Database

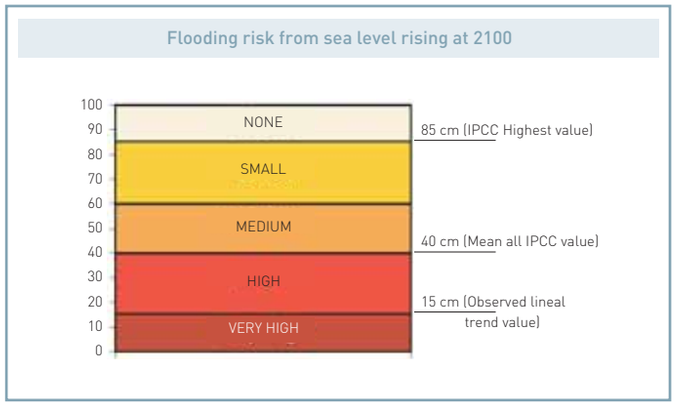
Risk assessment

The indicator valuing risk is one of **the most interesting indicators on climate change effects.** The **first task** done by DEDUCE for this indicator was **to specify the risks derived of climate change.** The proposed DEDUCE methodology has taken into account the conclusions reached by the Intergovernmental Panel on Climate Change (IPCC), where climate change is expected to lead to sea level rise, increased levels of inundation and storm flooding, accelerated coastal erosion, seawater intrusion into fresh groundwater, encroachment of tidal waters into estuaries and river systems, and elevation of sea temperatures.

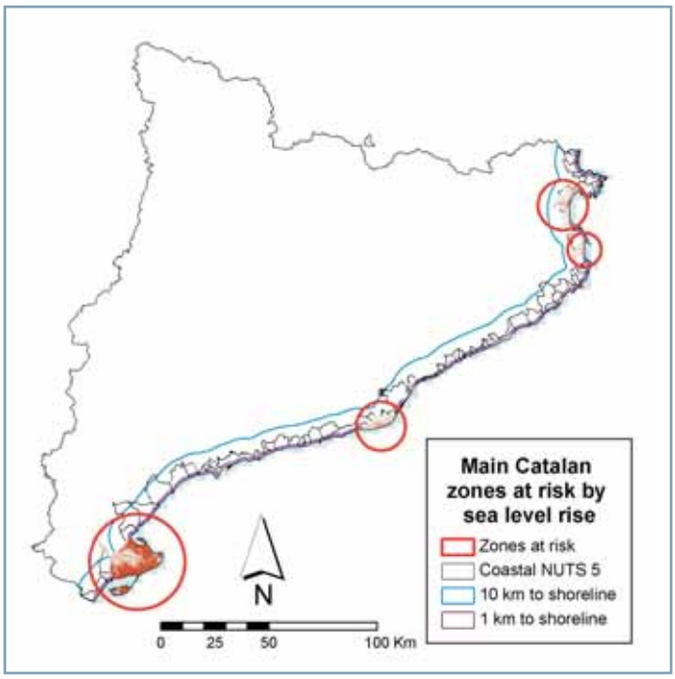
The risks considered in the indicator methodology **are limited to the ones that can be geographically referred,** and therefore, effects on ecosystems or human activities by direct temperature rise have been excluded. The indicator is accordingly based on four processes that can be originated or modulated by climate change: Relative Sea Level Rise (RSLR), Coastal erosion, River flooding, and Marine Storm flooding. The parameters necessary to understand the causes of risk are different.

The four processes are correlated, posing an added difficulty to calculate the area at risk. However, at this stage, the methodology proposes to draw separate risk areas for each of the four types of risks. This delimitation is being accomplished by means of computer spatial analysis on a Digital Terrain Model from topography of 1:5,000 scale. It is a difficult process to adopt for regional coverage.

In order to define the contour elevation reached by the permanent marine flooding risk at the Catalan coast, a probability analysis was made based upon the IPCC report (2001) and upon the longest series of sea level records in the Western Mediterranean coast. The first hypothesis is that **the coastal territories under 40 cm have a high risk of permanent flooding in the next 100 years**. A more precise calculation would have to include subsidence (the vertical displacement of land) but this parameter varies across localities.



Applying these levels to the Catalan coast, it is evident that the areas with high risk are the deltaic systems, and specially the Ebre Delta.



Whilst the area at risk by river erosion is already delimited by specific studies carried out by water institutions, such forecasts might not include the effects of climate change. To-date neither the areas associated to the risk of flooding by marine storms nor the areas at risk from coastal erosion have been delineated.

This would require adjustments of available models and the need for data that is currently not available – such as the rate of transversal erosion of the Catalan coast.

The French National Observatory on the Effects by Climatic Warming (ONERC), which was created in 2001, is conducting an evaluation of the coastal areas at risk in France, as part of the effects of climate change.

Once the areas of risk are drawn, the next step for the measurement will be to estimate the population, natural areas, and economical assets within them.

Concluding remarks

From the Catalan experience within the DEDUCE work, we can conclude that the correct definition of the area at risk in relation to climate change depends on the following three important factors:

1) The need to understand the importance of the local component. Local and detailed studies will permit the best and more exact definition of the risk area, and the respective damage to the natural, human, and economic assets. In this sense it is necessary to emphasise that adaptation policy must be locally specific, since the pressures (relative to land sea level rise and marine storm power) and the impacts (flooding and erosion) vary a lot depending on the local characteristics;

2) The need for an intensive effort to obtain more detailed information especially in relation to:

>> Detailed topography and bathymetry of the –5 m to 5m elevation level

>> Impacts and damage over the natural, human and economic assets registration

3) The need to perform and homogenise methodologies to calculate damages on the natural, human and economic assets. Methodologies must assume some simplifications as avoiding correlation among factors, evolution or coastal land occupation or effects of new human devices on coastal line.

>>> THE CASE OF THE EBRE DELTA

By Carlos Peña Martínez, Subdirector of the coastal service, Spanish Ministry of Environment, and Gisela Loran Benavent, Environment Division, Workshop of Environmental Engineering, SL

The Ebre Delta, located in the northeast of the Iberian Peninsula, is one of the most important Mediterranean wetland zones; it is outstanding for its great diversity of habitats and species in a relatively reduced space (330 km^2).

The main problem currently affecting the Ebre Delta is a deficit in sediment supply. The contribution of fluvial sediments has been reduced notably during the last years, due to the construction of big dams along the Ebre River.

This deficit has resulted in the reshaping of the coastline as a result of wave action which is the determining factor in processes of erosion and sediment transport and deposition.

This lack of sediment supply poses the delta to a risk of inundation and even continued reduction in size as a result of a possible increase in sea level in the next decade, caused by climate change. This risk is augmented when taking into account the subsidence rate (levels) of the delta bed.

The coastline of the delta exhibits a high dynamism, modifying its size and the extent of human activities according to the fragile equilibrium of the fluvial and coastal sedimentary contributions, water flows, coastal dynamics, and changes in sea level.

The combined effect of sediment deficit, coastal dynamics (waves, circulation, etc) and increased sea level translates into the following geomorhological impacts on the EbreDelta:

- Regression of the coastline in many areas
- Increased risk of flooding to the older part of the Delta
- Variation in the zones of sediment accumulation
- Increase of the breaks of coastal barriers

Approximately 40% of the delta surface has some form of legal protection: in 1984, the area was declared as a zone of special interest for the conservation of the halophilic vegetation (Dijkema et al, 1984); in 1986, the Nature Reserve of the Ebre Delta was created; in 1993, it was designated as a Ramsar site, and catalogued as a Zone of Special Protection for the birds (ZEPA). Finally, the Ebre Delta is part of the Natura 2000 network under the Habitats Directive of the European Union. This important contribution to the European biodiversity is not foreign to the human population that occupies the delta. Rice-growing and fishing activities have been the main engines of the economy of the delta and the food source for its inhabitants for centuries.

These activities have modified the delta floors and the distribution of the fluvial water across channels creating a complex territorial structure where human activity and the natural patrimony are intimately dependent.

Therefore, **the impacts of climate change on the delta would not only affect its rich natural patrimony, but also would put in crisis the economic and structural model of the territory.**

At present, the Ministry of Environment is writing up a plan for the sustainable management of the coast in the Ebre Delta, which highlights the mitigation and adaptation strategies to climate change, as well as plans for measuring and monitoring detailed aspects like sea level rise, fluvial contributions, subsidence, and sedimentary balances.

The first analyses already carried out highlight an important change in erosion trends in the adjacent zones to the outlet of the Ebre Delta. Areas that some ten years ago showed accumulation of sediments are currently in an erosive phase, with a trend of a strong backward movement of the coastline both to the north as well as in the south of the outlet. These effects may speed up in a very important way considering a possible increase of the sea level in the next 30–40 years.

The strategies for coastal management in the Ebre Delta will have to consider the high level of uncertainty with respect to the prediction of climate change at the regional level. The ranks of variability in the predictions of sea level rise are too important for a coastal zone as low as the Ebre Delta. Considering different values of predicted increase of the MSL (from the lowest values, some 15 cm in the next 50 years, to those that predict some 50 cm) suppose drastic variations in the phenomena of erosion and especially on the flooding areas of the delta.

Therefore, it seems that measures for better predictions on the impacts of climate change at this land-sea interface and the subsequent adaptation strategies should be given a priority to mitigation measures in order to enable a more flexible use of this coastal area.

USING INDICATORS TO MEASURE SUSTAINABLE DEVELOPMENT OF THE EUROPEAN COAST

THE DEDUCE TECHNICAL CONFERENCE

Tarragona (Spain) – 2nd March 2007

Tarragona (Spain)

The DEDUCE partners organised a conference in the World Heritage coastal city of Tarragona (Catalonia, Spain) with the aim of evaluating the usefulness of the indicators proposed by the EU Integrated Coastal Zone Management (ICZM) Working Group on Indicators and Data. This evaluation is based on the results of the calculations undertaken by the DEDUCE partners over the last three years.

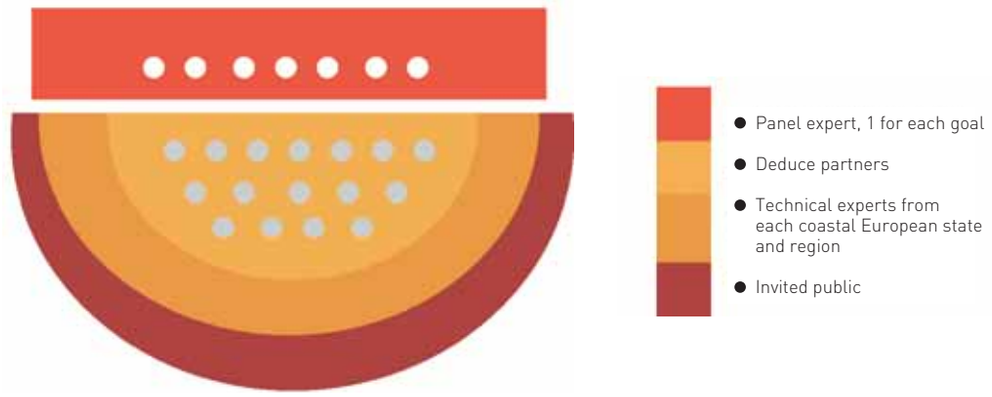
DEDUCE is an Interreg IIIC – South project with the objective of validating the methodological tools necessary for an optimal decision-making at the coast, following the principles and criteria established by the EU ICZM Recommendation.

Who should attend? The conference is intended for all those with an interest in measuring sustainability at the coast (spatial planning, conservation, economic sectors, water management, marine resources, risk and climate change, etc.).

The conference is organised in three parts: the presentation and discussion of the results of the DEDUCE project, the indicator expert panel, and the debate on the linkage with the EU Green Paper on Maritime Policy.

The expert panel is structured according to the seven goals of the EU Recommendation on ICZM. Each expert will evaluate the feasibility of the proposed indicators for the respective goal.

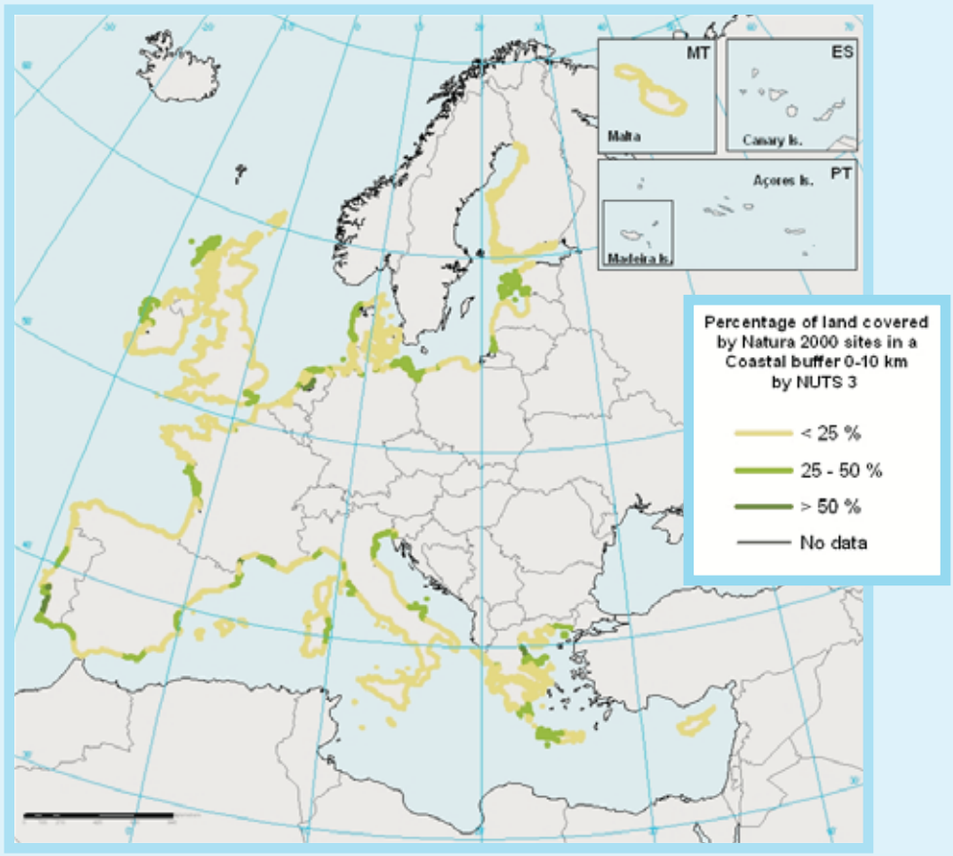
During the programme, there will be plenty of opportunities for questions and debates.



> > > PRESENTATION

By Ronan Uhel, Group Leader,
BSS Spatial analysis, EEA

The DEDUCE Technical Conference and this discussion on indicators for measuring sustainability for coastal zones is an interesting opportunity to agree on the main lines of a future work to consolidate a European network platform to measure objectively what sustainable development of the coastal zones means. Coasts represent the link between land and sea. Many important European policies are implemented on this strategic and fragile space: Natura 2000, Water Framework Directive, EU Maritime Policy Green Paper, ICZM, etc.



One of the indicators that Deduce has been testing: Area of land and sea protected by statutory designations. The map shows the percent of land protected by Natura 2000 within the 0-10 km coastal buffer (ETC/TE).

All these inter-related policies need the best information in order to assess their implementation and their benefits. For this, indicators are very relevant tools for the policy makers at the European, national, and local level.

The invited experts give their view on each of the seven goals of the ICZM EU Recommendation, presenting their conclusions on the calculation processes, which were developed in the course of the past three years by the DEDUCE partners, showing us the fundaments of a performed set of sustainability indicators for the coasts. Their views are supported by years of experience of bridging the gap between information and decision-making.

The EEA is very interested in the results of this conference and in its conclusions. In this sense, we are engaged to obtain, in a short term, a consensus between European coastal states and regions on the use of the DEDUCE indicators.

> > > GOAL 1 "TO CONTROL AS APPROPRIATE FURTHER DEVELOPMENT OF THE UNDEVELOPED COAST"

By Françoise Breton (ETC/LUSI)

One of the main problems for European coastal sustainability, as recognised in the recent EEA (European Environmental Agency) report "The changing faces of Europe's coastal areas," is urban development which is sprawling along most of the EU coasts, affecting mostly undeveloped and natural coasts. The goal defined by the ICZM EU Recommendation, "to control as appropriate further development of undeveloped coast," is thus very important in terms of sustainability. Uncontrolled development has left an impact on landscape especially in natural and semi-natural areas, giving way to habitat fragmentation and soil sealing with important consequences on biodiversity.

The DEDUCE work provided methodology, calculation experience, and comparative analysis over eight measurements for this Goal 1. These measurements are briefly discussed in this paper.

Indicator 1 – Demand for property at the coast

Measurement 1.1. Size, density and proportion of the population living in the coastal zone

The coastal zone experiences a very high demand for living and leisure related activities, and thus it is important to know the current demographic structure and the degree of population density within coastal areas, in relation to the hinterland. Measurements show how the coastal zone differs from the rest of the wider coastal region but also highlight differences within the coastal zone itself.

Tracking changes on the distribution of population of a coastal region over time will help to assess the amount of pressure being exerted on coastal resources. This is a basic measurement because it enables assessment of other trends (such as built-up, number of births, etc).

Seasonal population should also be monitored systematically to understand changes in pressure over the year. A common methodology should be agreed on to tackle this issue.

However, all the above measurements are not sufficient to answer the demand for property at the coast, because not all the house owners are included in the census. More effort should be made to monitor land- and property ownership by foreigners not living within the coastal zone.

Indicator 2 – Area of built-up land

Measurement 2.1 Percent of built-up land by distance from the coastline

It is important to know the real impact of building at the coast in comparison to the wider region. It is also interesting to understand the pattern of building intensity and to measure if it has been higher along the coastal strip or if it has spread in a wider territory.

The methodology used, applying buffers, is correct, and gives interesting results. However, it is possible to make it still better following the Land and Ecosystem Account (LEAC) methodology developed by the European Environment Agency.[1]

It is possible to use a standard grid of 1 km x 1 km (and also 100 m x 100 m) to catch the urban land classes of Corine Land Cover (CLC) and measure its area in each cell. Cells can be also identified in relation to their distance to coastline. Using a grid is better than using a simple buffer, since each cell can have other attributes assigned (elevation, population, price of land, etc.), which allow to make a deeper analysis and to compare the distance from the coast with other parameters.

Cala del Mal Pas, Benidorm (Alacant), Spain

Indicator 3 – Development of brownfield land

Measurement 3.1 Percent of new development on previously developed land

Compact cities and villages take less land than dispersed settlements, and are considered as a more sustainable model (multifunctional towns, easy-to-access services, etc).

This measurement is based on the assumption that all sites in built-up areas are brownfield, which can draw an error

1. See "EEA Report No 11/2006. Land accounts for Europe 1990–2000" in the following address. http://reports.eea.europa.eu/eea_report_2006_11/en

depending on the different definition given to the limits of the built-up areas. Using the Urban Morphologic Zones (UMZ)[2] database can be very helpful to define urban zones limits. UMZ database exists at present for all European urban areas. UMZ should definitively help to better identify sites inside urban areas, and also, in a next phase, the possibility to get a better view of the urban covers where building up has taken place.

During 2007, the EEA will deliver a more complete UMZ database, making this resource available where CLC exists.

Measurement 3.2 Area converted from non-developed to developed land use

During the last decades, the coastal zone has suffered a very high process of urbanization including the loss of rural and natural areas.

With CLC database it is possible now to follow the process in two decades, for 1980, 1990, and 2000. The new version CLC2006 will be also available soon thus enabling further trend analysis. The methodology can be still better if the previously undeveloped areas are classified (CLC classes and other uses) and given a value. The LEAC methodology and the use of grids can also be used to measure these trends, and compare coastal and non coastal areas. The LEAC coastal database will be available during 2007.

The DEDUCE indicators should also include new developments occurring within the marine space which implies the need for further development of the methodology for this measurement.

Indicator 4 – Demand for road travel at the coast

Measurement 4.1 Volume of traffic on coastal motorways and major roads

The volume of traffic is the data used to define the necessity of new road infrastructures. In monitoring the average number of vehicles per day moving along the coast, one can obtain information on the level of pressures that exist within that coast.

The measurement is important but would have a higher added value if the volume of traffic can be related with the transport network in a coastal region, with mobility indices, travel time to access main cities, noise maps, and traffic accidents.

Moreover, new transport investment, in particular motorway construction, has proved to be a powerful stimulant for new development and sprawl. This relation should be further explored for coastal areas.

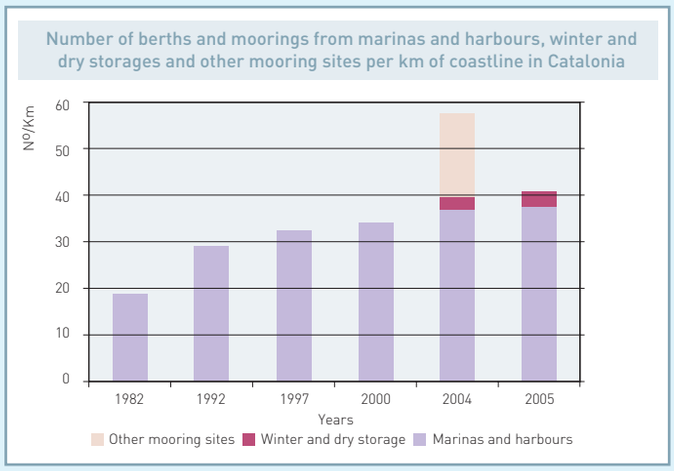
Indicator 5 – Pressure for coastal and marine recreation

Measurement 5.1 Number of berths and moorings and dry-stack storage capacity for recreational boating

The capacity space for recreational boating is a pressure measurement but also an impact measurement. In terms of pressure this measurement enables a better understanding of the demand from recreational boating through the monitoring of total port capacity. In terms of impact this measurement provides the extent of marine and terrestrial space occupied by boats.

This occupied space is often used only for parking in some countries or regions, not really for developing the maritime culture as happens in others (Goal 2).

This measurement should be compared with other parameters according to the cultural aspects of boat users, to understand how, when, and for which purpose boats are used. Another interesting parameter to be associated with this is the cost of a boat by region/country and both ecological externalities and economic return for the local population.



Source: CSIC, 1997 and GISA, 2005

Results of the measurement 5.1 in Catalunya (Department of Environment and Housing, Generalitat de Catalunya).

Indicator 6 – Land take by intensive agriculture

Measurement 6.1 Proportion of agricultural land farmed intensively

From the last reflections in the Working Group on Soils discussing the Soil Thematic Strategy, the use of CLC to define the intensive agriculture, as it has been done in DEDUCE, was not recommended. The options were to use other concepts such as resource consumption (machines, tons of fertilizer per hectare).

2. Definition available in page 49 of the "EEA Report No 10/2006 Urban sprawl in Europe – The ignored challenge" http://reports.eea.europa.eu/eea_report_2006_10/en/eea_report_10_2006.pdf

The core set of the EEA (2001) uses the CLC classification to define intensive agriculture. However in recent years, the Indicator Reporting on the Integration of Environmental Concerns into Agricultural Policy (IRENA)[3] has developed an indicator on agriculture intensity more focused in "Information on input use, production output and labour cost".

There is also the option to add on and link this information with the type of agriculture activity and the existing herd/animals per hectare.

General negative impact of intensive agriculture: with more extension of agriculture areas there is a better facility and efficiency to use big machines BUT due to the loss of mosaic landscape there is a major risk of soil erosion and loss of biodiversity.

On the other hand, intensive agriculture is an impact measurement that shows the land surface dedicated to these uses.

Conclusions

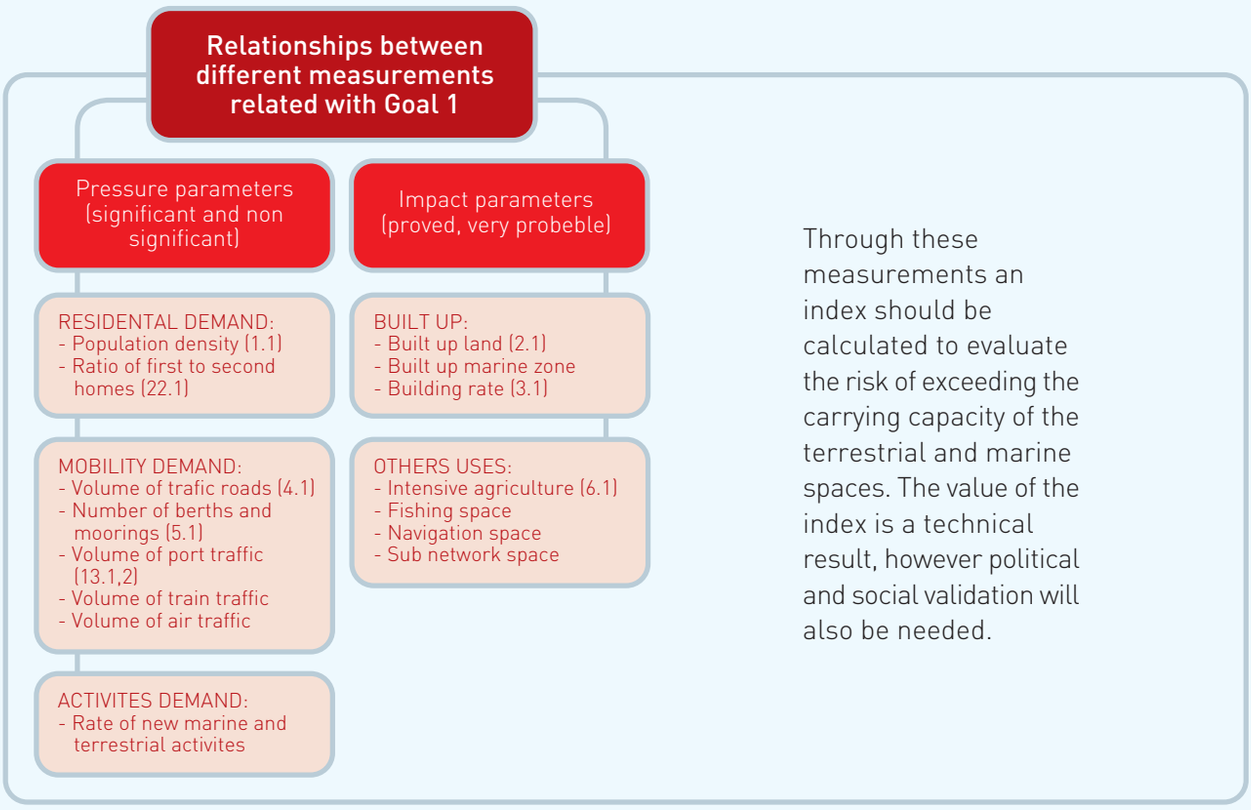
The above indicators are useful to measure processes related to Goal 1. They are, however, mainly land based. With the exception of moorings and berths, there is a lack of indicators to look at how much marine space is being used at different times (aquaculture, mineral extraction, energy, etc). To support the Green Book on maritime issues and the sea/coast policies, we will need to map navigational routes and volume of traffic, ports, and other maritime infrastructure, wind farms and oil platforms, etc. It would be very interesting to have a map of the benthic communities to see the impact these new uses and development can have on posidonia meadows, rocky shore, etc.

A cross analysis of all the objectives and indicators used should be very helpful, as there is definitely a relation between, for example, Goal 1 (pressure on undeveloped land) and Goal 2 (protect, enhance and celebrate natural and cultural diversity), and Goal 7 on risk and climate change issues.

The carrying capacity of the marine and terrestrial space matters as in different coastal areas the capacity of the territories to support the land uses and human activities has been surpassed. Consequently coastal systems cannot perform their natural functions, and lose their value for the society.

For this reason, there is a need to control further development of undeveloped land, to understand the state, the pressures and the impacts on land cover that still has natural value. On the other hand, undeveloped land should be valued as a natural capital, to balance better tourist development models and returns to the local population (the economics but also the quality of life and the index of local control on coastal resources).

In the following scheme, a number of measurements made in the DEDUCE Project are ordered taking into account the causal relationships between them.



3. http://themes.eea.europa.eu/IMS_IRENA/Topics/IRENA

> > > GOAL 2 "TO PROTECT, ENHANCE, AND CELEBRATE NATURAL AND CULTURAL DIVERSITY"

By Sophie Condé (ETC/BD Paris), with comments from Sébastien Colas (IFEN)

Most of the comments and proposals for this revision are made thanks to the results achieved during the last two years within the project entitled "Streamlining European Biodiversity Indicators"[4] that aims to propose a common framework of indicators in order to assess the 2010 target[5] at EU, Pan-European and national levels. This project is led by the European Environment Agency and UNEP-Europe.

Indicator 7 – Area of natural and semi-natural habitat

Measurement 7.1. Area of natural and semi-natural habitat

Being aware of the current evolution of the coastal zones, it is important monitor the trends of those elements that play various biological and ecological roles in the marine and terrestrial coastal ecosystems: habitats provide fish and invertebrates nursing and feeding grounds, provide protection against erosion, filter waters, etc. All these functions are crucial for the sustainability of the coastal regions and the preservation of their different activities (fisheries, land management, tourism, etc.).

The issue of the definition of natural and semi-natural habitats can be discussed; however, no common and clear definition of a semi-natural habitat exists for the moment. We can assume that fully natural habitats do not exist any more in Europe because all habitats are under human influence, although not all of them are used or managed.

The important point is to include in this indicator habitats with a low level of human intervention (intertidal flats, bare rocks, salt marshes, etc.) and habitats that can be regularly used or managed (dunes, coastal forests, salines, pastures and grasslands, etc.) but are of importance for the biodiversity aspect.

The use of a common typology (e.g. CLC) all across Europe may weaken the indicator, since different regions have their own climatic, geological, biological, ecological characteristics alongside with their own socio-economic practices. Therefore, the selection of habitats to be included in the indicator must use a common typology but must be based on the biogeographic characteristics of each region.

National or local data sources provide a better resolution than CLC data layer. But the advantage of CLC data is to provide a common scale across the countries.

Rear dune Picardie

Indicator 8 – Area of land and sea protected by statutory designations

Measurement 8.1. Area protected for nature conservation, landscape, or heritage

The increasing attractiveness of coastal zones implies specific policies and tools that help to preserve landscapes and areas of biological and ecological interests. This indicator expresses the efforts made by the different local and national authorities.

Systems of protected/designated sites may range from very strict nature reserves and national parks to more flexible protection such as landscape parks and areas under specific conservation management. In addition, these instruments are elaborated at different geographical levels (international, EU and national levels). Therefore, it should be important to make a distinction between broad types of protection and also between geographical levels. It helps to show the level of responsibility of each international, national, and local body but also to reveal the importance of these protected areas at different levels.

The distinction between marine, terrestrial, and mixed sites should be of high interest. Data on protected areas are quite well collected. One limitation can be the availability of site boundaries; if not available for calculation, potential overlap between national sites and overlap between EU sites and national sites may overestimate the results.

Indicator 9 – Effective management of designated sites

Measurement 9.1. Rate of loss of, or damage to, protected areas

The proposed title needs to be modified because even if some protected areas could be of low quality due to ineffective management or protection, the rate of loss of protected areas in terms of surface area should be quite low, and therefore, not actually meaningful.

Most of the designated sites have management plans, and the efficiency of these plans must be evaluated according to the specific goals of each site and criteria of the instrument on which the designation of the site relies. An analysis of a complete network of sites designated under a specific

4. http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995
5. The target is to halt the loss of biodiversity in 2010.

instrument will evaluate its real efficiency. Most of the protected area networks are just working to implement a monitoring process; therefore, the results are still missing.

The effective management of the designated sites can be evaluated through the assessment of conservation status of species and habitats present in the sites.

The SEBI2010 project proposes two indicators that rely on the future Natura 2000 reporting[6]: Change in the status of species of European interest and Change in status of habitats of European interest. Indicator 9.1 can be inspired from them.

In terms of data availability, it must be noted that the first national reports from Member States are not expected before mid-2007.

Arcachon Basin (France)

Indicator 10 – Change to significant coastal and marine habitats and species

Measurement 10.1. Status and trend of specified habitats and species

Trends of species population and size of habitats increase knowledge on the state of biodiversity. Negative trends of coastal species and loss of coastal habitats will alert to implement or to review environmental but also sectorial policies that may be the cause of these negative results.

Methodology may rely on the SEBI indicators dedicated to species and habitats.[7] One of them, with regard to seabed grasses, is being developed.

An example of methodology used for terrestrial species (birds and butterflies) can be found there:
http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/fol322248
National example on the populations of coastal and sea birds in England:
http://www.defra.gov.uk/wildlife-countryside/biodiversity/biostrat/indocators/pdf/m1-indicator0603.pdf
http://www.defra.gov.uk/wildlife-countryside/biodiversity/biostrat/indocators/chapter7.htm

For species, a selection of marine and coastal species must be made according to the different regions and in view of the data availability. The same approach applies for habitats.

Measurement 10.2. Number of species per habitat type

This state indicator may show the importance of some habitats as species reservoirs but its implementation will be quite difficult; for terrestrial inland habitats, evaluation of species can be limited to vertebrates, higher plants, and "main" invertebrates, but for marine and coastal habitats, it will be irrelevant due to the importance of invertebrates and algae.

Due to these limitations of relevancy and feasibility, it is recommended to delete this indicator and to focus on 10.1 and 10.3.

Measurement 10.3. Number of red list coastal area species

Monitoring species known as threatened according to the IUCN assessment, is of high importance either to show that negative impacts have not been reduced or to demonstrate that some specific action plans are efficient or insufficient.

Comparison between numbers of threatened species is not always meaningful if it is not carefully handled, with all the necessary details. A "new" threatened species can occur due to the fact that it has not been registered in a previous assessment or due to a taxonomic change. In most cases the change in the number of threatened species shows an improvement in knowledge.

It is also important to know that a species assessed as threatened at a local level is not necessarily threatened at the global level except if it is an endemic.

It will be extremely useful to calculate the population trends of coastal and marine threatened species (as for Indicator 10.1) together with species conservation action plans if it these exists.

At a local level, it will be easier to work out than at the European level, with each region selecting species that threatened at its level and are regularly monitored. The selection can also be based on species of European interest (species listed in Annex II, Habitats Directive).

Conclusions

In conclusion, indicators on natural and semi-natural habitats (Indicator 7) and on protected areas (Indicator 8) will provide a general overview of the state of coastal and marine ecosystems. Indicator 9 must be renamed to "Status of species and habitats present in protected areas" based on the Natura 2000 methodology, in order to evaluate the efficiency of protection instruments. Indicator 10 on significant habitats and species must be reduced to two sub-indicators showing trends of common species and habitats alongside with the trends of threatened species characteristic of both coastal and marine ecosystems.

This subset included in the full ICZM set will help to measure how far biodiversity concerns are integrated in the management of coastal areas.

6. http://biodiversityeionet.europa.eu/activities/Natura_2000/MONITORING.pdf
7. http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/fol208355

> > > GOAL 3 "TO PROMOTE AND SUPPORT A DYNAMIC AND SUSTAINABLE COASTAL ECONOMY"

By Bernard MAZIJN, Director, Head of the Policy Unit, State Secretary for Sustainable Development and Social Economy. Visiting Professor/President, Ghent University – Centre for Sustainable Development

1. Introduction

The Brundtland definition of sustainable development has often been quoted. The importance of the three pillars (i.e., ecological, social, and economic pillar) – sometimes enriched with the institutional and cultural dimension – has been stressed at all times since the Rio Conference. Lately both (definition and pillars) have been interconnected by explaining that environmental protection forms a condition with the objective to develop the society by means of the economy.

It is within this context that a strategy for an Integrated Coastal Zone Management (ICZM) should be framed and seen as part of a National Strategy for Sustainable Development.[8] A set of key indicators is meant to measure sustainable development in a certain area, such as the coastal zone. It is also a learning tool at the strategic level for all actors involved in ICZM, based on the follow-up of the evolutions over time.

The design of a set of key indicators should be based on a common vision of the sustainable development, c.q. ICZM, based on the following principles[9]:

- In relation to the environmental pillar: rational use of the space and environment, stand still of the quality of the environment, protection of the biodiversity, safeguard of the quality of the private and public infrastructure;
- In relation to the social pillar: equity, social cohesion, open attitude and diversity, solidarity;
- In relation to the economic pillar: an optimum between the supply and demand in a quantitative as well as in a qualitative way.

In fact, developing a common vision before working at a list of key indicators is one of the internationally accepted Bellagio Principles[10] "These principles serve as guidelines for the whole of the assessment process including the choice and design of indicators, their interpretation and communication of the result." In total, ten principles have been defined: guiding vision and goals; holistic perspective; essential elements; adequate scope; practical focus; openness; effective communication; broad participation; ongoing assessment; institutional capacity.

2. Goal 3 and the listed indicators

This paper is an input to the DEDUCE Technical Conference (Tarragona, March 2nd, 2007), especially related to Goal 3 – "Sustainable economic opportunities and employment options.[11]" It reviews the four related indicators (composed of several measurements) proposed by the ICZM Working Group on Indicators and Data (WG-ID) in 2004[12]:

12 Patterns of sectoral employment
- 12.1 Full time, part time, and seasonal employment per sector
- 12.2 Value added per sector

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 accommodations holding EU Eco-label
- 15.2 Ratio of overnight stays per number of residents

Discussing the different indicators (and measurements) in detail, the question of whether and how Goal 3 is in line with the principles related to the economic pillar, as mentioned in 1. Introduction, calls for an answer. In other words, is the supply side as well as the demand side reflected in the proposed indicators from a quantitative and a qualitative point of view?

8. See the conclusions of the European Council of Gothenburg (15–16 June 2001) and the Plan of Implementation (Art. 163) of the World Summit for Sustainable Development in Johannesburg (26 August – 4 September 2002)
9. See e.g. De Rynck, F., et al., Normative Kader Stadsmonitor (in Eng. "Normative Framework for Monitoring the City"), UGhent-CDO, 2002.:
10. See Hardi, P., and Zdan, T., Assessing Sustainable Development – Principles in Practice, IISD, 1997.:
11. See Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Council Zone Management in Europe (2002/413/EC).
12. It should be noted that Indicator 12 often is ranked as an indicator for the social pillar of sustainable development.:

2.1. Indicator on the patterns of sectoral employment

The development of employment options is one of the main topics that are taken into consideration in the local strategies. By following changes in employment in the economic sectors (tourism, port, etc.), trends and developing patterns can be detected. A sustainable society is partially realised with the creation of stable and qualitative jobs within different sectors. This indicator roughly demonstrates whether this goal is achieved.

Within the context of sustainable development, (un)employment is an important socio-economic indicator. Taking into account the principles valid for the economic (and social) pillar, it may be expected that the measurements are defined as – indeed – employment per sector, and also as unemployment per group of the population (or any ratio). There above, it can also be stated that there is a need for qualitative indications of the employment in the coastal zone (personal statute, payment, etc.). These kinds of measurements can complete the image of the employment pattern.

Measurement 12.1, further defined in the methodological worksheets as "Employment by economic activity, employment status and place of work," seems to take into account all those considerations by using a long set of parameters. However, it can be discussed if this indicator/measurement is meeting the Bellagio Principles. At least three principles are not applicable: practical focus; openness; effective communication. Therefore, it can be recommended to split the indicator and/or the measurements in different parts and to look carefully if the proposed methodology is that easy to be repeated every one, two, or three years.

The measurement **"Value added per sector"** gives an indication of competitiveness. This can be influenced by different factors such as intensity of capital, the organisation structure, a technical progress, etc. However, from a sustainability point of view, the question arises how the measurement "Value added per sector" (under the indicator "Patterns of employment") is interpreted: labour is often seen as a cost. So, a decrease in this measurement could plead for more capital-intensive rather than labour-intensive investments at the coast, e.g. in the port. There above, companies that have registered offices outside of the region, but their activities are in the region, are not included. In other words: for those companies, datasets on added value are seldom de-centralized and hence cannot be traced down to activities actually developed at the coastal zone.

Fish market in Brugge (Belgium) / author : VLIZ (Hamerlynck)

2.2. Indicator on the volume of ports

Maritime activities have a clear economic and social impact. Ports have fluctuating degrees of benefits or disadvantages to the local and regional economy and to the environment. Ports are also important for the support of economic activities in the hinterland, since they act as a crucial connection between the sea and land transport. The measurements under the indicator **"Volume of port traffic"** provide a good view of the development of a harbour and its economic activity. Except for some observations, a general support can be expressed for the three measurements in terms of being quantitative measurements:

The **"Number of incoming and outgoing passengers per port"** is a significant source of income, and shutting down a ferry service or building a new terminal for cruise ships can drastically change the future development. The significance of local tourism, the demand for port services, and the pressure to expand port infrastructure (e.g. building roads), therefore, should not be underestimated. For passenger numbers, counts of cruise passengers are only made in ports where they (dis)embark. Hence for some ports passenger numbers reflect only part of the total movements and give no indication of the importance of cruise tourism to port economics.

Demonstrating the relative importance of ports within coastal economies is not an easy task. Nowadays, cargo is loaded and unloaded mechanically, making it hard to evaluate the effect of changes in the **"Volume of goods handled per port,"** e.g. on the local employment in ports. It is also difficult to trace whether the income of ports is invested in the local economy or if the money is spent elsewhere. It is certain, however, that a year-to-year increase in handling capacity will require an expansion of the port facilities, such as extra dockyards and roads, coastal defence structures, and new repositories to store the goods. This will induce both positive and negative effects on the local and regional economy and the environment.

Having an insight on the **"Proportion of domestic freight carried by sea"** is indeed crucial for sustainable development. The functional unit of a "ton-transport-kilometre" calculating the environmental impact is one element for promoting short sea routes. However, more accurate statistics are needed. Data for short sea shipping and oil pipelines are based on estimations, and the data are not readily accessible for all ports.

And last but not least, in relation to the quantitative aspects of this indicator, it should be stressed that the match between the increasing volume and the feasibility of handling it will be determined by taking into account environmental and social considerations.

Regarding the local impact of the "volume of goods," it could be related to the "value added" in the coastal zone (see the second measurement under the indicator "Patterns of sectoral employment.") This would enable us to measure whether increasing volumes of handled goods are actually stimulating the local economy/ are actually resulting in a stimulation of the development of the local economy (different from port activities).

Containertraffic in Zeebrugge (Belgium) / author : VLIZ (Delva)

2.3. Indicator on the intensity of tourism

From the perspective of being a quantitative indicator, this indicator with its two measurements is capturing part of what it was intended to capture. The question arises why the day-to-day tourists are not included; neither is the number of non-residential apartments (rented accommodation) at the coast. Both are important drivers of the coastal economy and the inclusion of data on both issues needs to be stimulated, taking into account the environmental and social concerns. The latter plays a role when optimising the supply and demand within the context of sustainable development.

The proposed indicator and its measurements fail to describe the qualitative offer of tourist infrastructure. This refers, inter alia, to the accessibility of the hotels, apartments, etc. and to the attainableness by (public) transport.

Monitoring trends in the volume and quality of tourism provides coastal municipalities and planners with substantial data and – in combination with other measurements such as population numbers, population density, and number of second homes – it can lead to an interpretation of the data in a much broader context for the purpose of integrated planning. However, in spite of the importance of tourism for many coastal economies, the data are surprisingly scarce and scattered.

Beachpalace Blankenberge (Belgium) / author : Daniel de Kievith

2.4. Indicator on sustainable tourism

The number of overnight stays in tourist accommodations may affect the social and economic development of a certain area. The extent of residential tourism should be taken into account when defining the social carrying capacity of a coastal community. Sustainable tourism requires a proposal for development in which the people, the environment, and the local culture are respected. This will enhance the quality of life, benefiting both the tourists and the local population. So, the proposed indicator with its two measurements is for sure contributing to an assessment within the context of sustainable development.

However, a couple of observations are justified. Currently, not all prestigious eco-labels for tourist accommodations operating in the EU have joined the VISIT label. It will also demand further time and effort to increase the adherence of accommodation to the EU Flower eco-label. Local datasets are available from the national focal points only. The quality and availability of time series may vary between the responsible label administrators and coordinators for each

country. The ratio of overnight stays to the number of residents is too coarse at the district level, since tourist pressure at the coast is concentrated in specific bathing resorts. For a more accurate evaluation of the pressure exerted by tourism, the number of overnight stays spent in second homes and rented property, and the seasonal character of these, also should be taken into account. Finally, we need to know more about the impact of visitors on local landscapes and social/natural environment.

3. In conclusion

This paper deals with the indicators and their measurements proposed under Goal 3 – "Sustainable economic opportunities and employment options" of the DEDUCE project. The indicators are focussing on employment and on economic sectors (port, tourism).

Before discussing the different measurements, the introduction describes, what could be expected within the context of sustainable development. The framework and the Bellagio Principles have been shortly reiterated.

Another conclusion is related to the observation that most indicators/measurements deal with quantitative aspects lacking equally important socio-economic qualitative considerations. Besides the fact that this is related to an optimisation of supply and demand, it is crucial for a long-term perspective of the socio-economic development of the coastal zone within the context of sustainable development.

In other words, local communities in the coastal zone depending only on the volume of port traffic and intensity of tourism are a weakness of socio-economic development. Within the Belgian context, for example, another indicator has been proposed: the number of starting enterprises versus the failures in year X, focusing on SME's (small and medium enterprises) and independents.

In conclusion, the proposed indicators to measure progress in achieving sustainable economic opportunities and employment options (Goal 3) form a first basis that should benefit from further discussion. Fine-tuning of the proposed indicators should possibly be complemented with additional indicators, in particular, measurements to address the degree of sustainability of the economic activities.

One major conclusion is that each of the indicators /measurements should be linked to other ones. Interlinkages between indicators/measurements are important. Reflection on whether or not an increase in indicator value is contributing to sustainable development should be discussed.

European Eco-label (http://ec.europa.eu/envionment/ecolabel/index_en.htm)

> > > GOAL 4 "TO ENSURE THAT BEACHES ARE CLEAN AND THAT COASTAL WATERS ARE UNPOLLUTED"

Dr Maciej Borsa, Deputy Director, Department of Spatial Order and Architecture, Ministry of Construction, Poland and Clive Gilbert, Technical Director, Schéma d'Aménagement Intégré du Littoral (SAIL)

Litter-strewn beaches, dirty water and oiled seabirds are obvious signs of an environment under stress. But polluted coasts and seas do not impact only on the environment. In the late 1980s, it was estimated that algal blooms in the northern Adriatic led to tourism losses of around EUR 150 million each year. Again, closure of fishing grounds because of diarrhetic shellfish poisoning cost coastal communities in Galicia over EUR 360 million in lost wages during the mid-1990s. The EU and other international organisations have introduced a series of regulations over the past thirty years aimed at reducing pollution incidents. Hence the indicators used to assess goal 4 describe both the state of the coast and the effectiveness of abatement strategies. The Water Framework Directive is the latest piece of legislation designed not only to evaluate water quality but also to identify the drivers and pressures leading to environmental degradation.

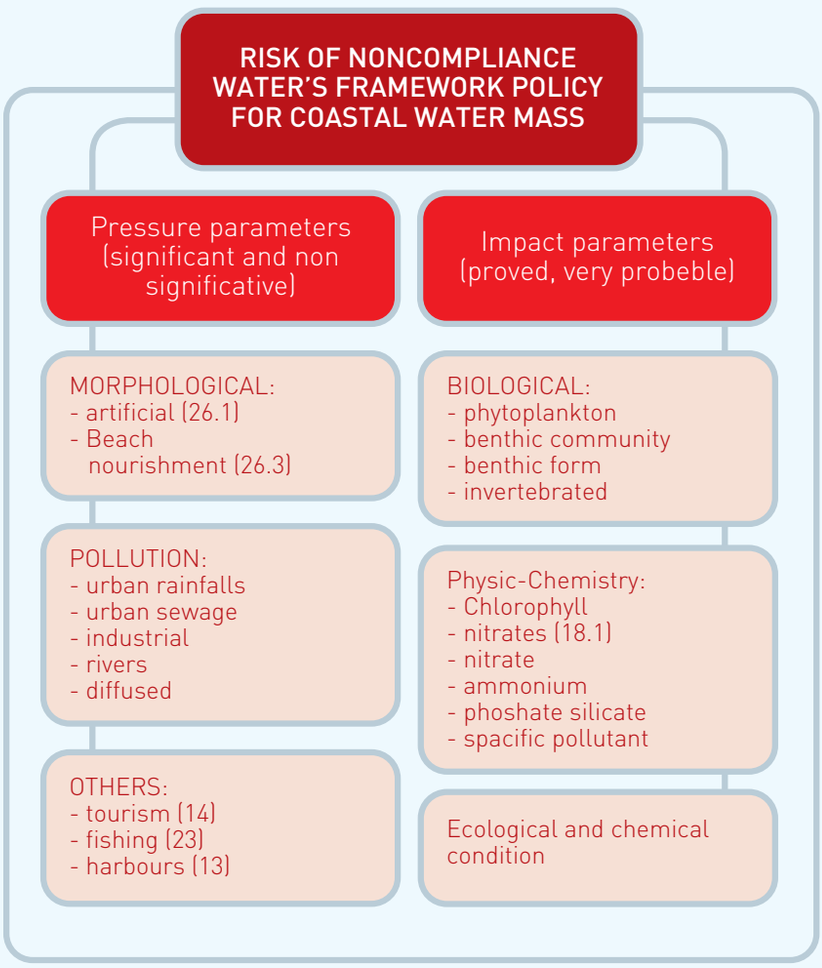
Indicator 16 – Quality of bathing water

Measurement 16.1 – Percent of coastal bathing waters compliant with the guide value of the european bathing water directive

Dirty seawater is a hazard to bathers. It commonly causes diarrhoea and gastro-enteritis and, more rarely, life-threatening illnesses such as salmonella and hepatitis.

Dirty water is also a threat to marine life and a deterrent to holidaymakers and tourists. The Bathing Water Directive was introduced in 1976 in an attempt to cleanse bathing waters without restricting further development at the coast. The indicator should evaluate whether or not regulation has had the desired effect.

Samples of bathing water are taken at regular intervals at designated sites by national or regional authorities two weeks before and then during the bathing season. The samples are analysed for the presence of coliform bacteria, faecal coliform bacteria and faecal streptococcus bacteria. Results are displayed locally during the season and also reported to the European Environmental Agency which posts them on a dedicated website. The total population of sampling points should include those that are non-compliant and care must be taken with so-called 'wet weather waivers' but other than that, calculating the measurement is straightforward.



The indicator scores well on a number of counts. Data are produced across Europe to a common protocol thus allowing comparisons to be made between and within countries and regions. As the indicator is based on results from many thousands of sampling points, it is possible to track compliance at any geographical scale, from country to region to holiday resort to specific bay or beach. There is a demonstrable trend and clear inferences can be drawn about the relationship between the regulation and the results. Quality of bathing water is one of 37 core environmental indicators monitored by the European Environment Agency.

Almost 95% of sites monitored for dirty seawater comply annually with the Directive's Mandatory value; between 80% and 85% meet the 20 times stricter Guide value (although the long-term trend of rising compliance has been disrupted in a number of countries over the past several years, mainly as a result of shifting weather patterns). Increased compliance is almost always a result of investment in sewage treatment plants. The indicator suggests, therefore, that environmental degradation can be decoupled from development by targeted regulation. Although a revised Bathing Water Directive was introduced in March 2006 with new emphases on public information and forecasting short-term pollution incidents, the scheme does not necessitate changing the current measurement.

Indicator 17 – Amount of coastal, estuarine and marine litter

Measurement 17.1 – Volume of litter collected per given length of shoreline

There is no doubt as to the economic, social and environmental damage caused by coastal and marine litter. It is estimated that 100,000 sea mammals are killed each year worldwide by ingesting plastic bags or bottles, or becoming entwined in discarded fishing line. A survey of dead fulmars in the Southern North Sea over a five-year period revealed that 98% had plastic debris in their stomachs. A Marine Conservation Society Beachwatch survey in 2003 in the UK recorded an average of 2,000 pieces of litter per kilometre of coastline. Items collected regularly include sewage-related debris, medical waste, oils and fats, polystyrene and plastics of all sorts.

Litter-strewn beaches are a deterrent to holidaymakers and tourists and local authorities spend millions each year in collecting litter from beaches and inshore waters. The International Convention for the Prevention of Pollution from Ships forbids dumping at sea; so does the London Convention (1972), the OSPAR Convention (1992) and the Barcelona Convention (1999 and 2004). Most recently, the EU Port Reception Facility Directive (2002) was introduced to enforce the proper disposal of waste from ships in port. The indicator, therefore, has four objectives: to raise awareness of the significance of the issue, to monitor trends in the volume of litter discarded, to identify sources of litter ahead of targeting perpetrators, and to evaluate the relative success of regulations in tackling the problem.

Despite the significance of the issue, data collection is piecemeal and annual surveys are largely dependent on the goodwill and enthusiasm of volunteers and NGOs. Where surveys do take place, they are often conducted under the auspices of the International Coastal Cleanup of the Ocean Conservancy which receives results and makes them available to enquirers. Since 2000, OSPAR has co-ordinated regional surveys in the North Sea and North West Atlantic. Attention is now being directed to streamlining methodologies and reporting formats. Most voluntary sector surveys count numbers of items of litter per given length of coastline whereas municipalities generally report volume of litter collected by weight. It should be possible to agree on a consistent method of determining the amount of litter discarded. By weight is satisfactory providing that municipalities (or whoever is responsible for collection and disposal) separate material into that gathered from proper reception facilities ('good' litter) and that collected from the environment ('bad' litter). Because this would impose a considerable cost in both time and money on local authorities, it is unlikely to happen. Hence number of items collected per given stretch of coast is preferred.

This method has an advantage in that it only gathers 'bad' litter and thus makes it easier to identify the source. Trends in the volume of discarded litter suggested by the indicator can be no more than indicative while data collection relies on sample surveys which necessarily vary from place to place and year to year. Having said that the indicator can play a role in drawing attention to the economic and environmental cost of coastal and marine litter.

Noirmoutiers (France)

For example, almost all European pleasure boating associations have now adopted codes of conduct which they recommend to their members. Waste disposal facilities are more widespread and user-friendly and many holiday resorts display information about litter and its varying

impacts. Research has also demonstrated that tough regulations can force changes in behaviour if waste disposal is easy and ubiquitous. If surveys isolate wilfully discarded material from that disposed of responsibly, it is possible sometimes to identify the source and hence target the perpetrator. The way forward is to encourage each of the existing Conventions to include coastal and marine litter in their list of Ecological Quality Objectives which should ensure greater governmental concern than has been in evidence before now.

Indicator 18: Amount of nutrients in coastal waters
Measurement 18.1: Average winter concentrations of nitrates and phosphates in coastal waters

Nutrient enrichment or eutrophication can cause excessive growth of phytoplankton. The consequent 'algal blooms' disrupt normal functioning of ecosystems leading to decreased biodiversity, changes in species composition and dominance, and toxicity effects. Under eutrophic conditions, dissolved oxygen increases during the day but is greatly reduced after dark by the respiring algae and by micro organisms that feed on the increasing mass of dead algae.

When dissolved oxygen levels decline to hypoxic levels, fish and other marine animals suffocate. As a result, creatures such as fish, shrimp, and especially immobile bottom dwellers die off. In extreme cases, anaerobic conditions ensue, promoting growth of bacteria that produce toxins deadly to birds and mammals. Human activities can accelerate the rate at which nutrients enter ecosystems. Runoff from agriculture and development, pollution from septic systems and sewers, and other human-related activities, increase the flux of both inorganic nutrients and organic substances into coastal marine ecosystems. The concentration of nutrients in coastal (and offshore) waters has been monitored in northern Europe for more than twenty years.

The indicator is based on data collected by Member States and forwarded to the relevant Convention. The International Council for the Exploration of the Sea is responsible for deep water assessment. Protocols for measuring enrichment are well-established and derived information is widely available.

The problem with the data is not with its collection but with its interpretation. Generally speaking, there is a direct correlation between enhanced nutrient levels in coastal waters and input of nutrient loads from both point and diffuse sources. Again speaking generally, nitrogen is associated with run-off from agriculture and phosphorous with run-off from built-up areas. The difficulty lies when greater precision is required. Eutrophication can result free from human agency and be subject to local weather conditions, degree of salinity, surface water temperatures, prevalent biodiversity, and so on.

Extraneous factors are minimised in winter. Besides, in winter biological uptake and turnover is at its lowest which result in the highest inorganic nutrient concentrations. Hence the measurement used to monitor the indicator – average winter concentrations – is considered satisfactory.

Indicator 19: Amount of oil pollution
Measurement 19.1: Volume of accidental oil spills
Measurement 19.2: Number of observed oil slicks from aerial surveillance

Aerial surveillance of illegal and accidental discharges is carried out by special aircraft that cover part of the eastern Atlantic, the North Sea, the Baltic sea and the northern part of the western Mediterranean. More recently, remote sensing has been used successfully to detect oil slicks in the Mediterranean. Data on spills is also collected by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea and the International Tanker Owners Pollution Federation. The picture overall is encouraging. The number of slicks (and by inference the volume of oil) has been either stable or reducing for the past twenty years or so. There are more oil slicks than accidents because of illegal discharges.

Data collected are reliable, robust, accurate and the results easily obtained. Trends are detectable and comparable between regional seas. There are methodological discrepancies but these are being ironed out. However, no surveillance is conducted across large parts of the central and eastern Mediterranean.

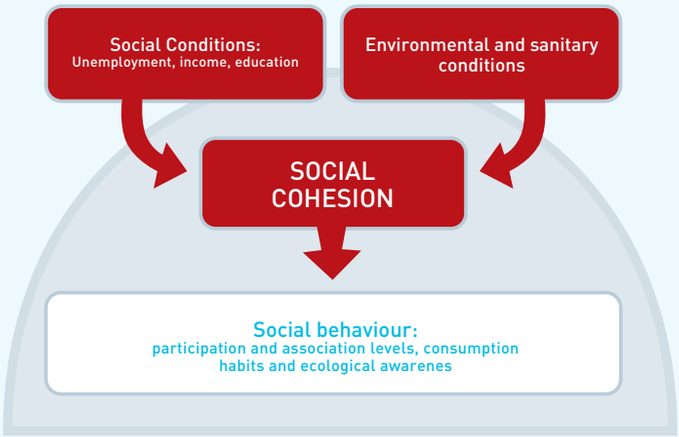
Oil spills are confined mainly to navigation corridors and may cause significant local damage on beaches, and to fish, shellfish and bird populations. Paradoxically, in areas of intense shipping activity such as the southern North Sea through which pass on average 250 ships per day, the cumulative volume of small discharges, the majority less than $1m_3$, can often exceed the amount of oil lost in a major accident such as that of the Sea Empress or Erika. Collecting information about small spills is difficult and costly. Systems for monitoring beaches and inshore waters are ideally included in regional authority emergency response schemes.

Aerial (or satellite or radar) surveillance is necessary for monitoring large sea areas. The results from such programmes indicate whether or not various technological improvements to ships and navigation, geographical restrictions on where ships can sail, improvements in training for masters and crews, plus the impact of prosecutions for illegal discharges (a rare commodity), are all having an effect on the amount of oil spilled. However, the cumulative impact of small spills is probably underestimated. Long-term research has shown that the number of oiled seabirds is an excellent surrogate for chronic oil pollution at sea. Hence it may be advantageous to develop a further measurement which monitors the number of oiled seabirds of a particular species as a proportion of the total population of that species.

> > > GOAL 5 "TO REDUCE SOCIAL EXCLUSION AND PROMOTE SOCIAL COHESION IN COASTAL COMMUNITIES"

By Stefano Belfiore (Intergovernmental Oceanographic Commission), Saviour Formosa (MEPA), Michelle Borg, (MEPA)

This paper reviews the indicators proposed by the Working Group on Indicators and Data of the EU ICZM Expert Group for measuring social inclusion and cohesion in the coastal zone, taking into account the tests carried out by the DEDUCE project in 2006.



Indicator 20 – Degree of social exclusion

Measurement 20.1. Indices of deprivation

One of the objectives of ICZM is to reduce social exclusion and promote social cohesion in coastal communities, which can be measured by focusing on aspects such as employment/unemployment and deprivation. This allows coastal managers to consider the concerns and interests of stakeholders, measure and evaluate the impacts of management decisions on coastal communities, and demonstrate the social value of coastal and marine resources.

This measurement has two parameters: (a) the rate of unemployment and (b) a national or regional representative measure of the rate of deprivation to be calculated at NUTS 5 level for the three most recent census or sampling points. While the rate of unemployment is a commonly utilized parameter of social exclusion, no common definition of deprivation exists. The proposed methodology suggests flexibility in the identification of the appropriate parameter depending on the national or regional context. Coastal specificities that may require appropriate social policies can be identified when comparing rates of unemployment and deprivation in coastal and non-coastal NUTS 5.

It appears that, when taken in isolation, the rate of unemployment may reveal differences between coastal and inland regions without explaining them. In order to monitor whether changes in the coastal economy and ICZM interventions affect the social structure of coastal communities it may be interesting to consider the rate of unemployment in relation to coastal and marine-related activities. Such correlation can highlight whether changes in the rate of unemployment are a result of phasing out of traditional coastal activities such as shipping, shipbuilding and fisheries, and creation of new livelihoods or substitution jobs. In this regard, unemployment can also be seen in relation to the dependency of coastal communities from coastal resources.

While a single measure of deprivation, tailored to national and regional specificities, may suffice, it could be interesting to look at measures of multiple deprivations as deprivation is a multi-dimensional concept that may include material, social, or relational aspects[13]. Deprivation could also refer to acceptable environmental conditions related to human health, access to socially-cohesive infrastructures, enhancement of the social capital, public access to coastal and marine spaces and resources, as well as household and land/water tenure, family allowances, or work injuries. It may be opportune to investigate the possibility of improving this measurement into a composite one that includes one base measurement with parameters that address both social exclusion and inclusion. Issues such as intergenerational solidarity and safety factors need to be considered to enable a community to be coherent and thus allow for a degree of measurement for social cohesion.

This approach may allow better linking the parameters to other indicators of other domains, provided that necessities that are specific to coastal zones are identified.

Regional and local data appear to be normally available for the two parameters from statistical institutes and ministries of labour and industry. Temporal resolution can be done yearly or more.

Indicator 21 – Relative household prosperity

Measurement 21.1. Average annual earnings

Information on average annual earnings as an expression of household prosperity allows for comparisons among regions (coastal and hinterland) and different economic structures.

The measurement is based on two parameters: (a) the median gross annual earnings of employees living at the coast and (b) the median gross annual earnings of employees

13. Townsend, P. "Deprivation", Journal of Social Policy, 16 (1987), pp. 125–146.

living in non-coastal areas in the wider reference region. The parameter should be seen in conjunction with the demographic structure of coastal communities. The economic importance of the coastal zone, that is, the direct benefit values of products and services derived from the coastal zone, is also important. Attention should also be paid to aspects concerning the nature and duration of employment and seasonality.

Data appear to be generally available although not at the required NUTS 5 level.

Measurement 21.2. Percentage of population with a higher education qualification

A higher education qualification is an expression of wealth. Measuring the percentage of population of working age with a higher education qualification in the coastal zones and comparing to non-coastal zones may provide additional information to shape the image of coastal socioeconomic systems.

The measurement relies on two simple parameters, (a) the percentage of population of working age with a higher education qualification living in coastal NUTS 5 and (b) the same parameter calculated in the non-coastal NUTS 5 in the wider reference region, for at least the three most recent census points. The methodology refers to the UNESCO International Standard Classification of Education (ISCED).

As the data are derived from census, they can be related to other parameters such as age, sex, employment, status, ethnicity, and other household characteristics. It would be interesting to tabulate the parameter to the average earning, to see if qualified persons are underpaid to limitations in the job offer in the coastal zone with respect to other areas.

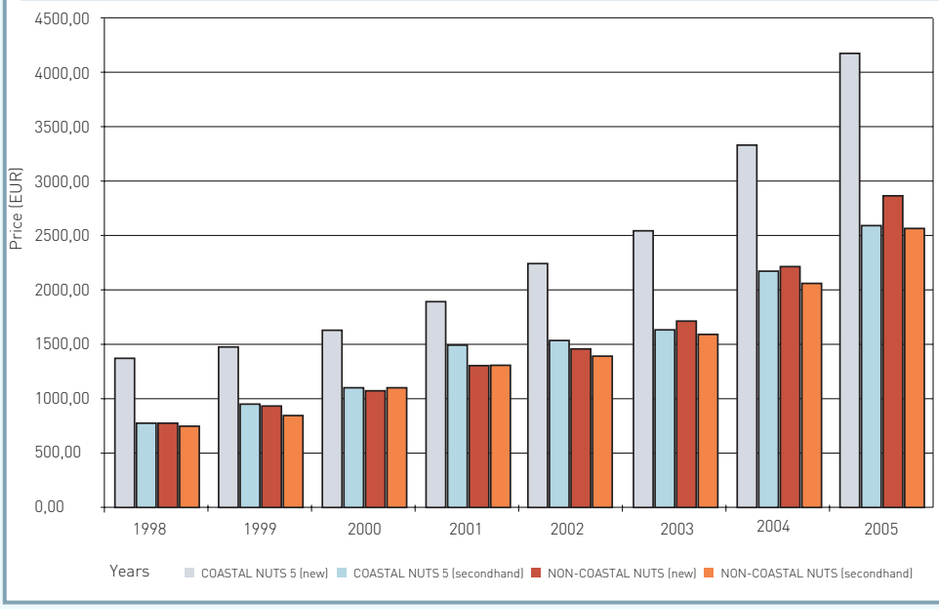
Information on higher education qualification is available from national censuses and relatively easy to obtain. However, the temporal frequency of decennial census could be improved.

Measurement 21.3. Value of residential property

The value of residential property is an expression of the demand for space and housing in the coastal zone. The attractiveness of the coastal environment should determine higher prices of residential property than inland, with the possible exception of major cities, which usually have higher prices regardless of their distance from the coast. The measurement together with the average annual earnings can reveal possible equity problems like the ability of local residents to purchase property at the coast. On the other hand, higher values of residential property lead to displacement of community, and therefore, could lead to social exclusion.

The measurement has two parameters: (a) the average annual price of residential property at the coast and (b) the average annual price of residential property in non-coastal areas within the wider reference region. The first parameter is measured in postcodes bordering the coast and across a minimum of five years. The first parameter should be

Trend on the price of residential property in costal and non-coastal minicipalities of Catalonia, 1998 - 2005



Source: Results of Measurment 21.3 in Catalunga (Generaltat de Catalunga)

compared with the second one across increasing spatial distances from the coast, to determine the threshold after which the value of residential property raises significantly due to the proximity to the coast. The measure can be related to other aspects of social security, such as ownership of a house vs. renting.

The value of residential property is a factor of location, access to services, etc.; therefore, different comparisons should be explored. Changes in the value of residential property should be related also to planning and zoning measures, for example, legislation limiting building in the coastal strip; in this regard, the price could be a function of the limitation of access to the coast.

Data should be available from registers of land and property sales at the national and regional level; however, at times the available data has proved to be unreliable and highly volatile. Attention should be paid to the need to compare the same types of residential property.

Indicator 22 – Number of second homes

Measurement 22.1. Ratio of first to second homes

The presence of second homes can reveal important aspects of the socioeconomic system of the coastal zone. Firstly, second homes are an expression of the attractiveness of a certain location; and secondly, a high presence of second homes in the coastal zone can have significant social impacts. As the housing market evolves towards higher prices housing affordability for local residents may decrease, yet a high presence of second homes can generate local services that may have not been available before. The coastal landscape can be upset by second and holiday homes that do not follow a building style harmonized with the local tradition. At the same time, derelict areas, especially in urban waterfronts, can be revitalized with second and holiday homes.

The measurement consists of three parameters: (a) the number of second homes in coastal NUTS 5 as a proportion of all homes in coastal NUTS 5, (b) the number of second homes in non-coastal NUTS 5 in the wider reference region as a proportion of all homes in non-coastal NUTS 5 in the wider reference region, and (c) the number of second homes in coastal NUTS 5 as a proportion of the total number of second homes in the wider reference region. Particular attention is needed to address the issue of vacancy or irregular use of second homes, as this can be an expression of speculation and social inequity, limiting access to the coast to local residents.

Data appear to be available from housing census on a decennial base, although it should be collected more frequently if a more reliable measurement is desired.

Conclusions and recommendations

The indicator and measurements proposed to address the fifth objective of the EU ICZM Recommendation are quite functional to describe key aspects of the socioeconomic system in the coastal zone and to compare it to the hinterland. However, they seem intended to describe the coastal zone for a state of the coast report, and thus, appear less suitable to measure progress towards the aforementioned objective. In most European countries, the coastal zone is not the subject of specific policies, making it difficult to correlate changes in the suggested parameters to interventions in the coastal zones, especially through ICZM programmes and projects encompassing socioeconomic objectives.

Some recommendations are provided under the sections of the individual measures; however, in general the conceptual framework underlying the indicators could be made more visible. In this regard, the role of each indicator within such a framework could be highlighted, as well as their mutual relationships. The overall goal to reduce social exclusion and promote social cohesion in coastal communities could be improved by developing a composite measurement based on different parameters that address both exclusion and cohesion. In this regard, the conceptual framework of the European System of Social Indicators (ESSI)[14] could provide inspiration to explore other dimensions surrounding the concepts of quality of life, social cohesion, and sustainability. A bigger challenge is needed to address the immaterial dimensions of social cohesion, namely, social relations and ties.

In addition the DEDUCE experience in calculating these indicators suggests that there is little coherent data availability across Member States, spread across the different NUTS levels. This issue is reflected in the other DEDUCE indicators where partners use data from diverse sources that would have been gathered for other purposes than those requested for DEDUCE analysis.
It is recommended that the original WG-ID indicators should still be used applied, though they need methodological refinement in order to serve the social role of the coastal zone better.

14. Berger-Schmitt, R., Noll, H. H. Conceptual Framework and Structure of a European System of Social Indicators, EuReporting Working Paper 9, Mannheim 2000.

> > > GOAL 6 "TO USE NATURAL RESOURCES WISELY"

By Çvalds Urtâns, Latvian Fishermen federation

Indicator 23 - Fish stocks and fish landings

Historically fisheries were one of the most important sectors of the economy of coastal territories. Although today the importance of fisheries is 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, 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 production of traditional local products.

"Fish stocks and fish landings" includes three measurements. Each of the measurements monitors particular aspects of fishery. The interpretation of the state of fishery and related trends has to be based on complex integration and evaluation of information provided by all three measurements.

EU policies, 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.

Measurement 23.1 "State of the main fish stocks by species and sea area"

"State of the main fish stocks by species and sea area" relates to the catches of a number of stocks that have been assessed to be outside safe biological limits. In general terms, it is considered that a stock is within safe biological limits if its current biomass is above the value corresponding to a precautionary approach advocated by the International Council for the Exploration of the Sea (ICES). In general, a stock becomes over-fished when mortality from fishing and other causes exceeds recruitment and growth. An indication of the sustainability of fisheries in a particular area is the ratio of the number of over-fished stocks (those that are outside safe biological limits) to the total number of commercial stocks. A high value of this ratio identifies areas under heavy pressure from fishing.

Measurement 23.2 "Landings by species"

"Landings by species" monitors annual landings by major groups of species and by most landed species. It has to be noted that increases or decreases in landings, by themselves, do not signal a healthy or unhealthy fishing industry or environment, as increases in fish landings may be driven by either increasing amounts of available fish or increasing fishing efforts. Similarly, decreasing landings may be the result of a lack of available fish or a change in management measures or fishing patterns. However, most of European fish catches are regulated by Total Allowable Catches (TACs), management mechanisms restricting the amount of fish that can be removed from the sea each year and giving each country a "quota" of fish that it is allowed to catch. Policies are increasingly aiming to balance the amount of fish removed to the stocks' ability to cope with the effect of artificially removing a proportion of the population. The individual country then divides its quota among the various sectors of its fishing fleet. Therefore, in order to set TACs and ensure compliance, it is necessary to monitor the landings of fishing vessels as well as catches, taking into account the discards "i.e".

It is important that part of the coastal population gets enough profit from the income arising from fishing activities.

Measurement 23.3 "Value of landings by port and species"

"Value of landings by port and species" monitors the annual value of landings by port in the reference region, the total value of landings at each fishing port by major group of species, for the latest year, and the annual value of landings by the most commercial species in the reference region.

With a sustained decrease in landings, an increase in prices is to be expected for species with a high demand in the market. The increase in fish prices that can be originated from a lower level of captures, if these are derived not from the scarcity of fish stocks but from more strict regulations and come with reduction of costs, may lead to the maintenance of the fishing profits and hence to the economic viability for fishermen involved, which can be seen as a positive evolution. On the other hand, there is no advantage in an increased value of landings if these are originated by the scarcity of fish stocks caused by over-fishing and come with an increased fishing effort. This situation may finally lead to the abandoning of a specific fishery in some coastal areas due to unsustainable cost-benefit ratios. Hence the same trend of values of landing can be interpreted as positive or negative depending on the cause of variation of prices (reduction of stocks, more appreciation from consumers or captures reduction as result), for which the interpretation must be made together with the other measurements of this indicator.

The lessons learned from the test calculations of Indicator 23 for the Eastern Baltics, namely, the Latvian part of the Gulf of Riga and open Baltic Sea coast are presented below. Historically, coastal fishery in Latvia, like in Estonia and Lithuania, has been the main occupation of inhabitants of coastal municipalities. The Latvian coastline is around of 494 km. According to the National Fisheries Strategic Plan, the coastal areas in Latvia are very sensitive and there are around 1500 coastal fishermen. Today this sector is affected by a reduction in production, and the risk of social exclusion is likely to be very high.

Latvian fishermen

To assess the practical applicability of the fishery indicator, we consider it may be useful to evaluate this indicator in correspondence with the following four criteria:

- clearness of the definition and content of the indicator and related measurements,
- importance of the indicator in the context of decision-making,
- availability of data, and
- organisation of communications with relevant target groups and their potential participation in the measurements of indicator's values.

Below we point out the main conclusions:

1. Clearness of the content. The indicator in general is well defined, however a problem may arise because occasionally it is rather difficult to divide fish stocks by areas due to migratory species.

2. Importance of the indicator. The knowledge of fish stock has valuable significance in the long-term to enable better use of coastal fish resources and the development of coastal fishery in areas where other economic activities are hardly possible.

Values of the measurement "Landings by species" are determined by different factors; however, the dominating ones are fish stocks and fishing quotas. The measurement is very sensitive regarding the situation and changes in the sea ecosystem.

The measurement "Value of landings by port and species" contains very important information characterising human interaction with the sea. It is very sensitive regarding both the situation with fish stocks and the economical activity of harbours which is connected with employment and social welfare. At the same time this measurement is simple and illustrative for decision-making – especially with the high sensitivity of this measurement for small harbours where the data is available at a harbour level. On the other hand, the sensitivity of this measurement to the economy of large coastal cities is significantly less. A calculation for Latvia for the period 2000–2004 indicates the oscillation of the value of landings around the medium level without significant changes.

The Latvian Fishermen Federation, which represents coastal fishermen, is interested in long-term stability of coastal fishery without long fisheries bans, which would cause irreversible social consequences. In the short-term, the indicator is very important for measures to optimise coastal fishery: to identify where best to invest money for an annual fisheries season. The calculation of this indicator and the information obtained is directly connected with political decision-making and can influence them.

For example, cod is very valuable and an endangered fish species in the Baltic, even in coastal waters. The political decision taken in Latvia is to allow coastal commercial fishermen to catch cod for commercial purposes, through a special permission that prohibits its consumption by the fishermen themselves.

3. Data availability and communication. Fish stock evaluation is a rather difficult task and needs special methods. The estimation of the main fish species' stocks is permanently carried out in scientific institutions (fisheries or marine research institutes, agencies). The raw data belong to these organizations or ICES working groups; the costs for information that can be obtained from such data are very high. The Latvian Fishermen Federation like others has a possibility to obtain information from scientific publications or special fisheries yearbooks, or other public sources. At the same time, the communication and involvement of coastal fishermen could be realized through: 1) special informative seminars – discussions, 2) scientific cooperation with a clear aim – to obtain valid basic data of the main fish species from commercial fishery or inventory surveys from fishing vessels.

Conclusion

The feasibility of the proposed indicator and the related measurements for the respective goal is good. The indicator calculation methodology provides results that have clear links with decision-making procedures and may be used to improve decision-making quality. More importantly, the indicator methodology is well understandable by key-target groups, and thus, provides space for the establishment of good communication between decision-makers and target groups. The aspect of communication is very important in this case, since fishery, especially coastal fishery, is a very sensitive issue and the information provided by this indicator helps to understand the necessity of introducing particular management mechanisms, many of which have a restrictive character

Indicator 24 - Water consumption

24.1 Number of days of reduced supply

The indicator has one measurement, monitoring annual number of days of reduced water supply in coastal and non-coastal NUTS 5. Water supply has become an expected part of modern urban living. Water supply system failures may occur for many reasons, such as natural causes exceeding the design parameters of the system (e.g., droughts and floods), and human causes such as population growth that raises the system's demands above its capacity. Seasonal population growth is one of the major risks to raise the system's demands above its capacity in tourism-intensive coastal territories. The number of days of reduced supply is conceptually related to the probability of supply system failure (whatever the reason), and the rate, occurrence, and consequences of failure can be measured. At the moment, the work on the testing of this indicator calculation methodology is in progress.

> > > GOAL 7 "TO RECOGNISE THE THREAT TO COASTAL ZONES POSED BY CLIMATE CHANGE AND TO ENSURE APPROPIATE AND ECOLOGICALLY RESPONSIBLE COASTAL PROTECTION"

By Jordi Galofré, Head of Tarragona Coastal Service, Coastal Directorate, Ministry of Environment, Spain. January 2007

As a preliminary comment it can be concluded that no structural division or identification classification have been made in this list of indicators. In the review of the state of art on indicators, a general framework can be found based on the Pressure–State–Response model, and a classification on Environmental, Socio-economics, and Governance indicators can be achieved as a theoretical exercise. All these analyses have been skipped in the DEDUCE programme and thus can have an influence on the final conclusions of this work. No rules, no strategies, and no methodologies validate the list of indicators.

The three aspects included in this objective: sea level rise and extreme weather conditions; coastal erosion and accretion; and natural, human and economic assets at risk, are not well related to the pressure–state–response model. The first one is related to pressures in the coastal area and the second and third ones to response. It is difficult to identify state indicators.

Indicator 25 – Sea level rise and extreme weather conditions

Measurement 25.1. Number of "stormy days"

The number of "stormy days" is a physical measurement that is useful from an environmental aspect and it can be considered as a pressure indicator from a functional approach. It is necessary to define the threshold of "stormy days", something that is often not clearly attained, and also to define in depth the parameters that can determine it, such as: wave height, atmospheric pressure, tides, duration of severe conditions, etc.

For the evaluation, it is necessary to define the variable that must be measured. Based on statistical records, forecasting analysis of different variables that can be used for the evaluation of "stormy days" must be previously defined.

Depending on the defined variable and the final use of the indicator, as well as other considerations, a good indicator can finally be chosen.

Measurement 25.2. Rise of the sea level related to land

The rise of sea level relative to land as proved by monitoring and field data analysis from the data obtained during the last 40 years is assumed to be 2.5 mm/year. It follows that in 2050 it is reasonable to consider a 15 cm rise in sea level at the European coast. Subsidence also has an impact in the relationship between the land and sea. It varies from 0 mm/year in consolidated land to 2 mm/year in delta areas like the Ebro Delta.

Different institutions are evaluating this aspect and some feasible results have been published. Now, some new data will appear reviewing it.

These data are extremely important as a direct or indirect indicator that has to be considered in all steps of the pressure–state–response model and in the environmental, socio-economics, and governance classification.

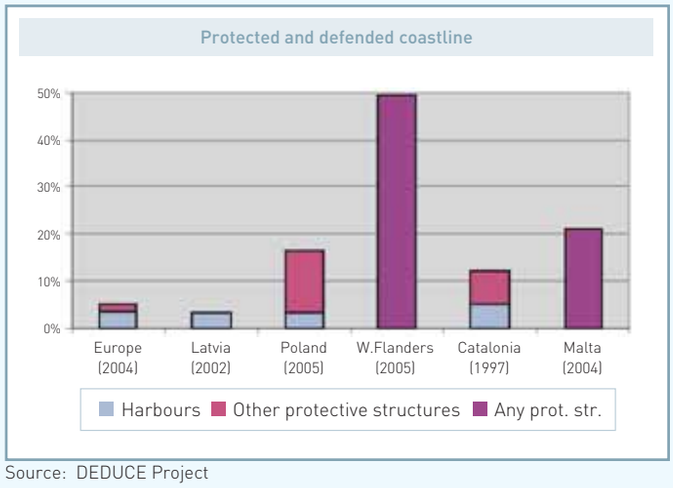
Indicator 26 – Coastal erosion and accretion

Measurement 26.1. Length of protected and defended coastline

Physical measures seem to be bi-univocal links that can give good indicators. In this case the undefined concept of protected and defended coast can introduce some distortion. Different interpretations of protection like hard or soft, effectiveness, durability, type, etc., can be reached in order to obtain a good definition. It is not clear what needs to be measured.

According to previous considerations, the role of physical features, as indicators, are not always well defined. Some questions therefore arise: What does the indicator want to measure? Is it a direct or indirect indicator? Which is the variable chosen? etc., and the answer is not always evident. The definition of the parameters involved in this indicator need to be defined in order to evaluate it.

This indicator can be used as an index of coastal vulnerability. It can be related to state and pressure areas. Also, it is an environmental indicator that has an effect on socio-economic aspects and has consequence on governance issues. In order to guarantee its effectiveness, it is necessary to define it accurately, as well as to establish a threshold for it.



Source: DEDUCE Project

Measurement 26.2. Length of dynamic coastline

In this point the concepts for Indicator 26.1 are applicable: the term "dynamic coast" is not clearly defined. Erosion rate, beach variability, static or dynamic equilibrium, etc., are concepts that need to be defined as well.

The evaluation depends on the parameters chosen and the objective of the indicator. It is necessary to define the indicator's role within the pressure–state–response model and with which division it is associated whether environmental, socio-economics, or governance. The definition of the measurement will depend on the objective it is intended to measure.

In conclusion, it is a good measurement of the coastal vulnerability if the parameters and goals are well defined.

Measurement 26.3. Area and volume of sand nourishment

In this case the variable is well defined; the amount of sand used in filling eroded beaches or beaches with a negative sedimentary balance. It is necessary to relate this indicator to other parameters like coastline length, affected area, frequency, etc. It is not an absolute value and has direct relation with 26.1 and 26.2. It is not an independent indicator. A new redefinition of the indicator 26 is needed.

The indicator is directly measured and evaluated, in m^3, but it's purpose is not clear. Other parameters are needed to make the indicator effective.

The application must be done taking in account the measurements for 26.1 and 26.2 since this is not an independent indicator. Other parameters need to be included for feasibility.

Indicator 27 – Natural, human, and economic assets at risk

Measurement 27.1. Number of people living in "at risk" zone

The definition of "at risk" zone is not clear. First of all, it is necessary to define a methodology that allows the determination of the "at risk" zone, such as flooding area, topographic levels, physiographic area, population density, etc. The number of people living in this area can then be defined. Methods to measure probability can also be used for this purpose.

It can be evaluated directly once the "at risk" zone is accurately defined. The different areas where people live, with their respective probabilities can be determined, according with the definition of the "at risk" zone. Depending on the objective and meaning of "at risk" zone many different applications can be made.

Measurement 27.2. Area of protected sites within "at risk" zone

As with measurement 27.1, the definition of "at risk" zone is unclear. This concept needs to be exactly determined in order to choose the right area. Protected sites are really important for environmental health. This environmental indicator can be useful to determine the state of the coast and can also be related to pressures and responses.

If "at risk" zone is defined, the area of protected sites can be accurately determined. Actually, it is necessary to link these measurements and the goals of ICZM that will make the indicator useful.

Basically it would be a good indicator of vulnerability if it is well defined and determined. It is necessary to establish links with other ICZM indicators.

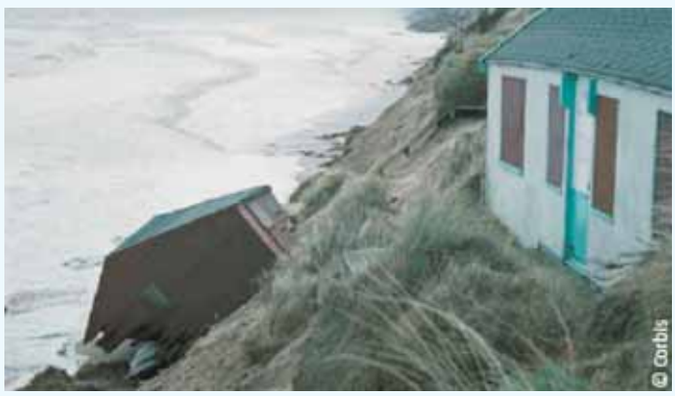
Measurement 27.3. Value of economic assets within "at risk" zone

Once again the definition of "at risk" zone must be exactly defined. The economic assets would be a socio-economic indicator involved in pressure and response areas. It is necessary to define the goals of this indicator in order to identify the appropriate measurement.

Evaluation depends on the definition of 'at risk' zone together with the application of economical skills.

This indicator can be useful in socio-economic aspects and also can help governance. The application has a direct relationship with the definition of the indicator.

In conclusion, an in-depth review of the list of indicators needs to be done in order to obtain objective observation of ICZM, which is the ultimate purpose of these indicators.



> > > GREEN PAPER "TOWARDS A FUTURE MARITIME POLICY FOR THE UNION: A EUROPEAN VISION FOR THE OCEANS AND SEAS". DATA.

This document is an introduction to the EU Green Paper on a Future Maritime Policy focusing on those parts relevant to data, prepared by a representative of the European Commission's Maritime Policy Task Force.

"The European marine observing system" is fragmented: in 35 countries bordering the European seas there are more than 600 scientific data collecting laboratories from governmental organizations and private industry, and they produce data for a variety of mostly very specific purposes. They collect data by using various sensors on board research vessels, submarines, fixed and drifting platforms, airplanes and satellites to measure physical, geophysical, geological, biological, climate and chemical parameters, biological species, underwater archaeological sites, etc. And the situation concerning the coastal data is quite similar.

The cost of these observations and the need for more integrated ocean governance raise the question whether the optimum benefit is currently being derived from all the data collected, i.e. whether data are available to all users that could derive benefit from them in their applications. The collected data are neither easily accessible, nor standardized and they reveal a significant number of information gaps. They are not always validated and their security and availability in the future is unsure. They are usually evaluated and analysed without common methods that avoid their sharing in the scientific community. International cooperation, e.g., the scientific assessment of fish stocks or for the evaluation of the quality of the marine environment has resulted in different data collection arrangements for the different European seas. Although there are universally acknowledged interdependencies between the data needs of fisheries management, environmental monitoring, oceanography, coastal management or defence and meteorology, each sector's efforts to coordinate data collection and access on a European scale are largely independent of other parallel initiatives, but this is not only the case for marine and coastal data and monitoring. So far, our policies on maritime transport, industry, coastal regions, offshore energy, fisheries, marine environment, socio-economic cohesion and in other relevant areas have developed separately. Few have examined how these policies could be combined to reinforce each other. The time is therefore ripe to bring all these elements together and forge a new vision of how to manage our relations with the oceans. And it is clear that such a challenge requires an effort that transcends national borders.

With all this in mind, the Commission pinpointed "the particular need for an all-embracing maritime policy aimed at developing a thriving maritime economy and the full potential of sea-based activity in an environmentally sustainable manner" in its Strategic Objectives for 2005–2009. The European Commission decided that a Green Paper on a future EU Maritime Policy, to be adopted in the first half of 2006, should constitute a first step towards the establishment of such an all-embracing EU Maritime Policy.

Commissioner Borg chairs the Steering Group of Commissioners for the Green Paper on an all embracing Maritime Policy for the European Union
From left: Commissioner for the Environment Stavros Dimas, Commissioner for Science and Research Janez Potoènik, Commissioner for Transport Jacques Barrot, Commissioner for Regional Policy Danuta Hübner, Commissioner for Fisheries and Maritime Affairs Joe Borg, Commissioner for Enterprise and Industry Günter Verheugen, Commissioner for Energy Andris Piebalgs

The Green Paper "Towards a future Maritime Policy for the Union: a European vision for the oceans and seas" seeks, in the wider maritime sphere, to stimulate growth and jobs under the Lisbon agenda in a sustainable manner that ensures the protection of the marine environment. In so doing it recognises the key-role played by the oceans in enhancing the quality of life of the ever-growing numbers of EU citizens who live, work, and take their holidays in coastal regions. The link between these elements is the seas and oceans which surround our continent and our outermost regions, and which perform multiple functions.

Chapter 4 of the Green Paper (**Providing the tools to manage our Relations with the Oceans**) examines a number of important tools for enhancing the sustainable management of our relations with the oceans and seas. It reflects on the type of data that need to be made available, both on the oceans and seas themselves and on related human activities, and identifies the need for setting up a comprehensive EU

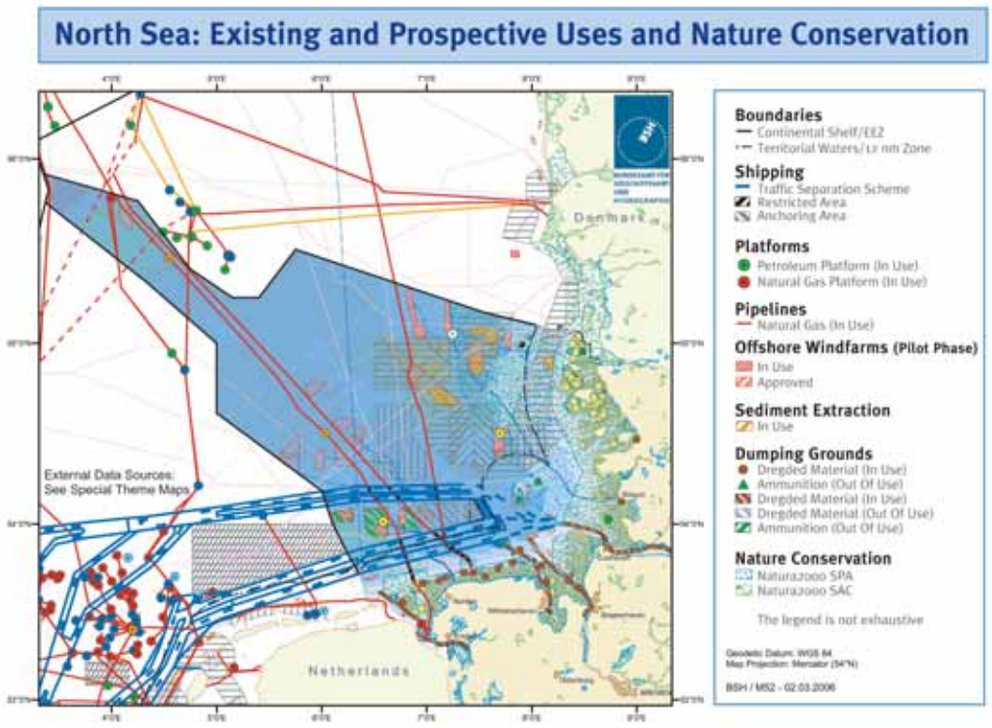
network for marine data and to further integrate and develop the existing networks aiming to identify the movements of vessels on EU coastal waters. It calls for spatial planning systems to regulate economic activities in coastal waters, building on the ecosystem-based management approach already proposed in the EU Thematic Marine Strategy.

It's clear that the EU needs to monitor the state of the planet's seas and oceans because it is committed to their sustainable exploitation and because a better knowledge of their functioning is needed if we are to understand and predict the future environmental conditions of the planet, including its terrestrial component. Similarly, socio-economic data on the EU maritime sector is in most of the cases neither comprehensive nor extensive. A number of initiatives are already underway to improve the EU's capabilities in this field, but moving from the current patchwork of activities with scattered data collections, heterogeneous formats, uncertain access to information, and sporadic monitoring will require extra efforts over and above those that are already planned.

Optimal conditions for policy making need full and reliable sets of data that are gathered and maintained in a reliable manner. They require maps to delineate seabed habitats and zones for human activities. They require the application of mathematical models for simulating natural processes and human activities and for forecasting weather events or climate changes. They require the production of indicators that allow Europeans to monitor trends in the pressure on ecosystems and to assess their health. Such indicators will facilitate tools for the optimum decision making on the coasts and seas at all levels (European, national, regional, and local) assuring a more sustainable development of the activities that take place on them and guaranteeing an appropriate protection of the environment.

In addition to the improvement of the data sets, the EU could consider setting up a European Marine Observation and Data Network that would provide a sustainable focus for improving interoperability and increasing access to data. It should not aim to provide services to end-users but rather be a source of primary and processed data that can serve both public institutions, including their researchers, and commercial providers. These will then be able to answer specific questions and provide services in sectors such as shipping, fisheries, oil exploration, offshore construction, aquaculture, tourism development, coastal protection and defence, and so on.

To the same end, the rationalisation and improvement of the existing data systems determine the basis for the settlement of management tools, which help to coordinate all maritime activities ensuring economically and environmentally sustainable development of coastal regions. An innovative and multi-purpose system of marine spatial planning, closely connected to planning mechanisms on lands, will offer a better management of these areas, providing security for investment, ensuring harmonious and sustainable use of the space and avoiding duplication of regulations.



With permission from the *Bundesamt für Seeschifffahrt und Hydrographie*.

There is an almost universal consensus that this is an area where action at the EU level provides added value. The physical, chemical, biological and socio-economical connections between national waters must be mirrored in monitoring systems that combine the efforts of single nations into a wider endeavour that allows a complete picture of processes, changes and threats to be built up from a national to a regional and, ultimately, global scale.

These are the reasons why all these points of debate and many others concerning the different maritime policies and activities that take place in the European seas and oceans are raised in the Green Paper on a Future Maritime Policy for the EU and in its background papers in order to be used as a source of inspiration for an extensive debate among all maritime stakeholders, member states, organisations, and citizens.

As a decision-maker, the Commission wants to make sure that policy-making is conducted with the stakeholders in mind. To this end, the Green Paper on a future Maritime Policy examines the state of the oceans and seas and the policies dealing with them and launches a wide and intensive public debate on a future Maritime Policy for the EU, which treats the oceans and seas in a holistic way, focusing mainly on matters where EU action is required because it adds value to national and local action.

The Green Paper stimulates a debate, both on the principle of the EU adopting an overall approach to maritime policy and on the many ideas for action, amongst stakeholders and at all levels of governance. The debate will run until 30 June 2007. The Commission wishes to base its further work in this area on the views received from stakeholders that have so far participated in the consultation process and from other relevant stakeholders that are invited to contribute to it either by attending the several events that are taking place all around Europe or by sending comments and opinions, by e-mail or by post, to the Maritime Policy Task Force.

In this line, the organisation of the different events within the framework of the DEDUCE provides a valuable support to the consultation process driven by the Commission. They gather researchers and specialists in the area of data management and in integrated coastal zone management from several regions of Europe, providing different knowledge and expertise. The contribution of the DEDUCE to the construction of the future maritime policy for the EU will be, undoubtedly, very helpful to find out ways in which an enhanced system of data and indicators proportionate the tools to successfully implement ICZM and Marine Spatial Planning. With this in mind, the Commission would ask to explore the ways in which ICZM and MSP could be successfully implemented through the enhancement of the tools, data and indicators for a better management of the European coasts and seas.

> > > WHAT'S NEXT?

By Xavier Martí (DEDUCE coordinator)

The DEDUCE experience will be very useful to consolidate, in the future, a European Platform for Monitoring and for Measuring the Sustainable Development of the Coastal Zones. The DEDUCE network has facilitated the development of methodologies for the calculation, integrated analysis, and presentation forms of the indicators of SD in European coastal zones.

However, as it has been evidenced in the DEDUCE experience, a lot of work remains in order to consolidate a Coastal Information System. The integration of results from different partners has shown the degree of complexity and difficulties of such a task.

The DEDUCE project will produce the Coastal Sustainability Indicator Guidelines (currently in its final phase of preparation), which are the guidelines for the methodological framework for indicators of sustainable development in coastal zones. These guidelines will be presented and delivered to the European decision makers, especially, the Task Force for the Integrated Maritime Policy, in Brussels, in June 2007.

The guidelines will contribute to the standardisation (agreed methodology of measurement), compilation, and comparison of data compiled in different countries and at different scales. This product will contain a common methodological framework for calculating, reporting and comparing indicators. Furthermore, the guidelines will illustrate the usefulness of coastal indicators as an approach to develop ICZM strategies and plans at EU, national and regional levels. The Indicator Guidelines can contribute to the further development of indicators as a common tool to support the ICZM process and extend their use in coastal management and protection measures as well as providing information to the public.

The guidelines will provide specific strategies and action lines in developing the next steps to build the aforementioned European platform for monitoring of the coastal zone, as a network that includes all the coastal regions, States, and obviously, the European Institutions.

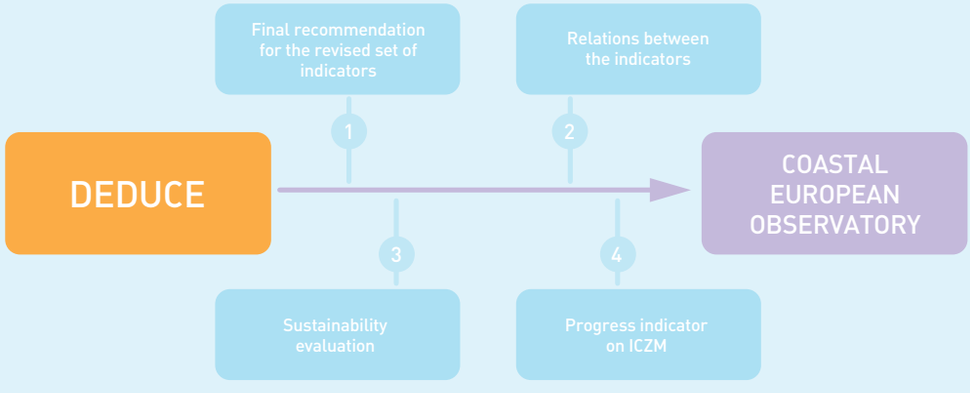
The **first recommendation** is to modify the indicator list proposed by the Expert Group and WG-ID (seven goals, 27 indicators, and 46 measurements) taking into consideration the DEDUCE experience and the required contributions from experts. It is appreciated that there is a need for new indicators, because some issues are not monitored, whilst others might need to be modified. In addition, it would be interesting if the new or modified indicators adopt the formats generated by DEDUCE for a detailed description of their methodologies and their presentation forms.

The **second recommendation** is to define the relationship between the indicators by defining priority indicators and sub-indicators with their respective parameters or measurements. In this sense it could develop into a useful framework such as the model adopted by the Water Framework Directive.

A **third recommendation**, following the approval of the final indicator list, is to define the thresholds of sustainability or acceptability for each indicator. Whilst a lot of work has already been done for some areas (for instance, the Water Framework Directive), in other aspects – such as the economic and social elements – more work needs to be done, perhaps building upon the work already carried out by Blue Plan. This issue implies a very difficult process as it would entail the necessary legal support (as in the WFD) to approve acceptable thresholds.

A **fourth, very important recommendation** is to link the Coastal Sustainable Development Indicators set with the Progress Indicator on ICZM. Information about progress in the integrated management system is fundamental in order to compare the different forms of governance within Member States in order to achieve coastal sustainability.

Finally, the **last recommendation** proposes the creation of a Coastal European Observatory that will act as a network allowing data aggregation from the local level to the European level (bottom-up approach) using data coming from the different institutions. This Observatory will be crucial to homogenise and organise all the systems required to calculate a final set of indicators.



NEWS AND ANNOUNCEMENTS

REGIONAL ASSESSMENT WORKSHOPS

1st Regional Conference on the development of an ICZM strategy for the Pomeranian Voivodship

The conference took place on 27 October 2006 in Krokowa, with 54 participants from the central government, Navy, Marshal's Office of the Pomeranian Voivodship, Maritime Offices, water management, forestry and nature protection authorities, the Voivodship's coastal municipalities, the Gdansk University, and the Maritime Institute in Gdansk. The Conference has been a combined effort of two European Union Interreg projects related to costal zone management –**DEDUCE** and **PlanCoast** (related to spatial planning of marine areas). The Conference was also a Regional Assessment Workshop for indicators developed and calculated during Deduce project.

In his introduction to the conference, Mr. M. Struk, the Deputy Marshal of the Pomeranian Voivodship, stated that insufficient co-ordination between the various interests resulted in the loss of economical opportunities, environmental damage, and social conflict. Therefore, an ICZM Strategy for the region is not just a sensible thing to do, it is a necessity.

The discussions confirmed that inconsistencies of the legal system, and the fact that the coastal zone and its specificity, in spite of many improvements, remain still insufficiently "visible" in law, are indeed often an important, though not the only source of conflict.

It was also stressed that the role of spatial planning in the coastal zone should be strengthened.

The Progress Indicator was found to be a good tool for assessing the progress of ICZM. The SD Indicators seem to be a good tool for supporting long-term decision-making and assessing the effect(s) of hitherto made decisions. However, it seems that some of the SD Indicators require improvement to fit to the needs of the enlarged EU, and to the needs and specifics of the Member States, especially the new MS.

Andrzej Cieslak (IMG)

Regional Conference in Krokowa (Poland) Oktober 2006

Workshop "Development of Latvian Coast and Establishment of Coastal Information System", Riga, 18 October, 2006

The Institute for Environmental Science and Management of the University of Latvia organised a workshop to assess the coastal indicator system elaborated under the frame of DEDUCE project. 56 participants represented four key-target groups:

(1) Local governments,
(2) District governments and regional development agencies,
(3) State environment protection and regional management institutions,
(4) Non-governmental organisations, development planning consultants etc

The workshop started with an introduction to the role of indicators in development planning in general. Presentation of DEDUCE project goals and achievable results followed; special attention was paid to testing of indicator calculation methodology in the coastal conditions of Latvia.

During the final interactive groupwork session, three main issues were discussed:

- Applicability of indicators for coastal planning in general;
- The indicator system of DEDUCE project, particularly the structure of the offered system and the prerequisites for prospective introduction in Latvia;
- Proposals for further work – extending of issues already covered by the DEDUCE indicators system; particularly, landscape evaluation was considered as crucial.

The indicator system elaborated under the frame of DEDUCE project in general was evaluated positively. Introduction of this system will provide new information and knowledge both to local governments and national institutions responsible for coastal management and in future might contribute to the optimisation of human and financial resources.

Raimonds Emsteins (Instituite for Environmental Science and Magagement, Latvijas Universitate)

Latvia

> > > Spanish Seminar on Indicators for integrated Coastal zone management Barcelona, 1 December 2006

As an important part of the implementation of the DEDUCE project, the Department of Environment and Housing of the Catalan Government (DMAH) organised the Spanish seminar on coastal indicators. On 1 December 2006, the seminar took place in the headquarters of DMAH.

The achieved total attendance was 59 persons. Around 75% came from Catalonia; the other participants came from other Spanish locations, except two participants, who came from Portugal and Belgium. Almost all participants belong to national, regional, or local public administration or research and academic institutions.

The seminar started with a presentation on DEDUCE and some draft results. Next, the director of the Coasts Service of Tarragona province informed about the future ICAM protocol. The last presentation of institutional works was a presentation of the Green Book of Maritime Policy, communicated by a member of the Maritime Policy Task Force.

Nonetheless, the central point of the seminar was the discussion on indicators and measurements for the coastal zone. The most remarkable conclusions of the discussion were the following ones:

1. DEDUCE was assessed as a positive contribution for the coastal policy, but it is an initial work on coastal or sea monitoring.
2. The set of indicators of DEDUCE should be improved due to the lack of monitored topics, and generally, the lack of relationship between the objective, an indicator, and measurement.
3. The calculation of common indicators for different areas requires a considerable effort. In some cases, a lot of indicators cannot be calculated in a common way for different zones. Despite the difficulty, the effort of convergence must be made.
4. The coastal monitoring has to be considered as a process and the beginning must be simple. The first step is to consider the political objectives, and the questions have to be answered.
5. There are severe and immediate threats for the coast, mainly urban development and climate change.
6. Institutions must improve their policy: they have to act urgently concerning the coastal issues, with clear lines of action, and resources are needed for obtaining good knowledge, which is the base of a good management.

Sebastian Gomez and Xavier Martí (Department of Environment and Housing, Government of Catalunya)

FINAL EVENT

Belgium, Brussels 1st June 2007 Final presentation

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- **Department of Environment and Housing, Government of Catalonia (Lead Partner):** http://mediambient.gencat.net/cat/inici.jsp
- **European Topic Center on Terrestrial Environment (ETC/TE):** http://terrestrial.eionet.eu.int
- **Malta Environment and Planning Authority (MEPA):** http://www.mepa.org.mt
- **IFEN (French Environment Institute):** http://www.ifen.fr
- **University of Latvia:** http://www.lu.lv
- **Province of West-Flanders (consortium):** http://www.kustbeheer.be (consortium coordination)
- **Maritime Institute in Gdansk:** http://www.im.gda.pl
- **El Prat de Llobregat Town Council:** http://www.aj-elprat.es
- **Viladecans Town Council:** http://www.aj-viladecans.es