The Role of Indicators in Science Based Integrated Coastal Zone Management in the Balearic Islands

(Understanding interdisciplinary processes and their interactions in the coastal zone -at different spatial and temporal scales- as a basis for sound and sustainable management)

Prof. Joaquín Tintoré and ICZM Balearic Islands' project team

IMEDEA (CSIC-UIB)

Outline of this presentation

1. What is ICZM?
2. What is the general frame, basic principles and challenges: sustainability?
3. What is the role of science on implementing ICZM?
4. What is IMEDEA?
5. What are the major scientific achievements from IMEDEA for ICZM?
6. What is Balearic Islands ICZM project and why do we need indicators?
7. What are the basic categories of indicators?
8. What are the criteria for selecting indicators?
9. What are the challenges in implementing indicators?
10. What is the process for developing an initial proposal of indicators for Balearic Islands ICZM project?
11. Working example: preliminary results on GIS and indicators in Balearic Islands ICZM project
12. Conclusions

What is ICZM?

ICZM is a process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resources and space.

ICZM is grounded in the concept that the management of coastal and ocean resources and space should be as fully integrated as are the ecosystems making up the coastal and ocean realms (Cicin-Sain and Knecht1998).

What is the general frame, basic principles and challenges?: sustainability

The concept

- Sustainable development:

"...the development that satisfies the needs from the present without compromising the capacities of future generations to fulfil their own needs"

Comisión Mundial del Medio Ambiente y Desarrollo, 1987, informe *Brundtland*

- Also:

"Sustainable development implies an increase in quality of life within the limits of the ecosystems"

Programa de Medio Ambiente de las Naciones Unidas y Fondo Mundial de la Naturaleza, 1991

What is the general frame, basic principles and challenges?: sustainability

The sustainability principle requires the sustainable management of environmental resources, whether in their pristine state or through sympathetic utilisation, to ensure that the legacy of our current activity does not impose excessive burden on future generations.

The concept of sustainability has been roughly partitioned into two approaches: weak sustainability and **strong sustainability**.

Weak sustainability requires that the total stock of capital, whether man made or natural, be maintained and rests upon the assumption of substitutability between these two types of capital.

Economic theory suggests that decreasing supplies of natural resources will tend to increase their price, encouraging more efficient use, substitution with other goods, and technological advancement. However, complete substitution will not always be possible due to availability of substitution opportunities.

Cited from Ecological economics and coastal zone ecosystems' values: an overview. Turner, R. K., Bateman, I.J., Adger, W.N., Kluwer Academic Publications, Studies in Ecological Economics. ISBN 0-7923-6504-6, 2001.

What is the general frame, basic principles and challenges?: sustainability

There is also the question whether man made capital is able to fully compensate for all functions provided by complex ecosystems and the existence of 'critical' natural capital and thresholds beyond which reversal is not possible. Hence, the more stringent interpretation of:

Strong sustainability requires that the total stock of natural capital be non-declining. Natural and man-made capital, rather than regarded as substitutes, can be interpreted as complements (Daly, 1995).

On the basis of strong sustainability criterion, projects considered in isolation are likely to be rejected since most development projects impinge to some degree on the environment.

Cited from Ecological economics and coastal zone ecosystems' values: an overview. Turner, R. K., Bateman, I.J., Adger, W.N., Kluwer Academic Publications, Studies in Ecological Economics. ISBN 0-7923-6504-6, 2001.

What is the general frame, basic principles and challenges?: sustainability

Main ideas:

1. Development has an economical, social and environmental dimension, and will only be sustainable if we can find equilibrium between them.
2. This equilibrium has to be found using at every time the best available knowledge existing, the best scientific and technological knowledge, internationally accepted.
3. To advance towards more sustainable attitudes implies considering sustainability as a process.
4. The advance towards sustainability is a positive change. The strategies imply a positive change for citizens employment and welfare.
5. Sustainable development is a clear strategic opportunity on a medium/long range, with possible adjustments being needed on the short term.
6. The institutional leadership and compromise together with the social consensus are key elements of the process towards sustainability.

(adapted from ICZM, EC)

What is the general frame, basic principles and challenges?: sustainability

Sustainability, Ocean Commission – 2004; USA "Principles and guidelines for coastal and marine policies"

Guiding Principles

As described in Chapter 3, the Commission's work was guided by a set of fundamental principles. These principles underlie all the recommendations and should form the basis of a comprehensive national ocean policy:

- *Sustainability:* Ocean policy should be designed to meet the needs of the present generation without compromising the ability of future generations to meet their needs.
- *Stewardship:* The principle of stewardship applies both to the government and to every citizen. The U.S. government holds ocean and coastal resources in the public trust—a special responsibility that necessitates balancing different uses of those resources for the continued benefit of all Americans. Just as important, every member of the public should recognize the value of the oceans and coasts, supporting appropriate policies and acting responsibly while minimizing negative environmental impacts.
- *Ocean–Land–Atmosphere Connections:* Ocean policies should be based on the recognition that the oceans, land, and atmosphere are inextricably intertwined and that actions that affect one Earth system component are likely to affect another.
- *Ecosystem-based Management:* U.S. ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including humans and nonhuman species and the environments in which they live. Applying this principle will require defining relevant geographic management areas based on ecosystem, rather than political, boundaries.
- *Multiple Use Management:* The many potentially beneficial uses of ocean and coastal resources should be acknowledged and managed in a way that balances competing uses, while preserving and protecting the overall integrity of the ocean and coastal environment.

What is the role of science on implementing ICZM?

The new role of science in XXI's century society

"It is not an exaggeration to assert that without science there can be no sustainable development"

3ª Sesión de la Comisión de Desarrollo Sostenible UN, 1995

- Knowledge of the system is a key element to reach a true sustainable development. This implies high quality research, tools and instrumentation (data, indicators, thresholds, predictive capabilities, etc.)

A scientific approach should guarantee:

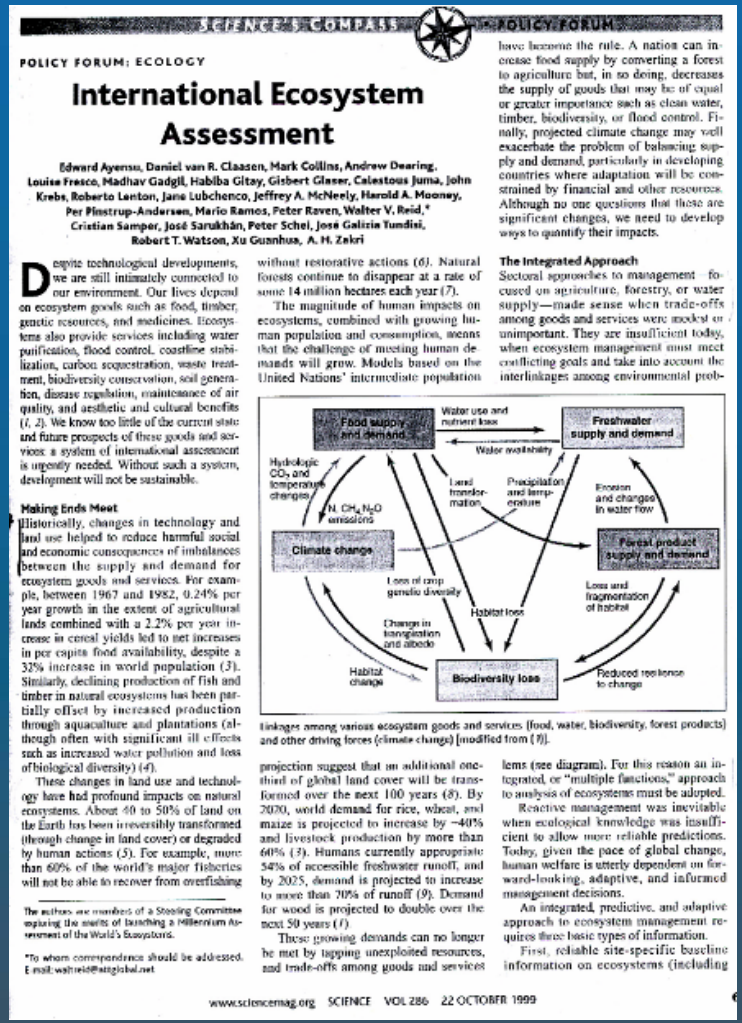
- A consensus by means of quantifications with reliable methodologies, reproducible and internationally established.
- A reliability of the data.
- A theoretical background internationally accepted.

What is the role of science on implementing ICZM?

- Society is turning towards science.
- Not only during crisis or catastrophic events (health, environment, food, energy, etc.)
- As an element of the decision making process that guarantees independence and reliability due to the existence of an evaluation system internationally accepted.

'Strong science for wise decision'.

What is the role of science on implementing ICZM?



SCIENCE'S COMPASS — POLICY FORUM

POLICY FORUM: ECOLOGY

International Ecosystem Assessment

Edward Ayensu, Daniel van R. Claasen, Mark Collins, Andrew Dearing, Louise Fresco, Madhav Gadgil, Habiba Gitay, Gisbert Glaser, Calestous Juma, John Krebs, Roberto Lenton, Jane Lubchenco, Jeffrey A. McNeely, Harold A. Mooney, Per Pinstrup-Andersen, Mario Ramos, Peter Raven, Walter V. Reid,* Cristian Samper, José Sarukhán, Peter Schei, José Galizia Tundisi, Robert T. Watson, Xu Guanhua, A. H. Zakri

Despite technological developments, we are still intimately connected to our environment. Our lives depend on ecosystem goods such as food, timber, genetic resources, and medicines. Ecosystems also provide services including water purification, flood control, coastline stabilization, carbon sequestration, waste treatment, biodiversity conservation, soil generation, disease regulation, maintenance of air quality, and aesthetic and cultural benefits (*1*, *2*). We know too little of the current state and future prospects of these goods and services a system of international assessment is urgently needed. Without such a system, development will not be sustainable.

Making Ends Meet

Historically, changes in technology and land use helped to reduce harmful social and economic consequences of imbalances between the supply and demand for ecosystem goods and services. For example, between 1967 and 1982, 0.24% per year growth in the extent of agricultural lands combined with a 2.2% per year increase in cereal yields led to net increases in per capita food availability, despite a 32% increase in world population (*3*). Similarly, declining production of fish and timber in natural ecosystems has been partially offset by increased production through aquaculture and plantations (although often with significant ill effects such as increased water pollution and loss of biological diversity) (*4*).

These changes in land use and technology have had profound impacts on natural ecosystems. About 40 to 50% of land on the Earth has been irreversibly transformed (through change in land cover) or degraded by human actions (*5*). For example, more than 60% of the world's major fisheries will not be able to recover from overfishing without restorative actions (*6*). Natural forests continue to disappear at a rate of some 14 million hectares each year (*7*).

The magnitude of human impacts on ecosystems, combined with growing human population and consumption, means that the challenge of meeting human demands will grow. Models based on the United Nations' intermediate population projection suggest that an additional one-third of global land cover will be transformed over the next 100 years (*8*). By 2020, world demand for rice, wheat, and maize is projected to increase by ~40% and livestock production by more than 60% (*3*). Humans currently appropriate 54% of accessible freshwater runoff, and by 2025, demand is projected to increase to more than 70% of runoff (*9*). Demand for wood is projected to double over the next 50 years (*1*).

These growing demands can no longer be met by tapping unexploited resources, and trade-offs among goods and services have become the rule. A nation can increase food supply by converting a forest to agriculture but, in so doing, decreases the supply of goods that may be of equal or greater importance such as clean water, timber, biodiversity, or flood control. Finally, projected climate change may well exacerbate the problem of balancing supply and demand, particularly in developing countries where adaptation will be constrained by financial and other resources. Although no one questions that these are significant changes, we need to develop ways to quantify their impacts.

The Integrated Approach

Sectoral approaches to management—focused on agriculture, forestry, or water supply—made sense when trade-offs among goods and services were modest or unimportant. They are insufficient today, when ecosystem management must meet conflicting goals and take into account the interlinkages among environmental problems (see diagram). For this reason an integrated, or "multiple functions," approach to analysis of ecosystems must be adopted.

Linkages among various ecosystem goods and services (food, water, biodiversity, forest products) and other driving forces (climate change) [modified from (*1*)].

Reactive management was inevitable when ecological knowledge was insufficient to allow more reliable predictions. Today, given the pace of global change, human welfare is utterly dependent on forward-looking, adaptive, and informed management decisions.

An integrated, predictive, and adaptive approach to ecosystem management requires three basic types of information.

First, reliable site-specific baseline information on ecosystems (including

The authors are members of a Steering Committee exploring the merits of launching a Millennium Assessment of the World's Ecosystems.

*To whom correspondence should be addressed. E-mail: walt.reid@mtglobal.net

- Peer reviewed papers that establish solid theoretical backgrounds
- Independent system of evaluation
- Science Citation Index

What is the role of science on implementing ICZM?

Scientific needs:

Ocean Commission, 2004

Box 25.1 Examples of Ocean and Coastal Science Needs

Fundamental knowledge about oceans and coasts is essential for assessing and predicting the status of marine resources, finding beneficial new uses of ocean resources, and implementing an ecosystem-based management approach. Greater understanding of these environments will enable policy makers and managers to make wise, science-based decisions at the national, regional, state, tribal, and local levels. However, to achieve this level of understanding, significantly more research will be needed as indicated throughout this report. The list below gives some idea of the range of topics to be covered, although it is by no means a comprehensive list of all needed research.

Aquaculture
- determination of the environmental impacts of marine aquaculture and the development of best management practices
- knowledge about the impacts of aquaculture feeds, species introductions, and the use of chemicals and pharmaceuticals in aquaculture practices

Biodiversity
- baseline measurements of marine biodiversity on different scales (i.e., communities, populations, and individuals)
- methods to mitigate human activities that adversely affect biodiversity and marine ecosystems

Climate Change
- better understanding of the ocean's role in global carbon and heat cycling
- predictive models of the effects of global warming, including sea-level rise and changes in global circulation

Coastal Habitat
- knowledge about the structure and functioning of coastal habitats and how human activities and natural events affect them
- effective habitat restoration techniques

Coral Reefs
- measurements of ocean temperature, currents, and other variables that affect changes in coral communities
- prediction of the impacts of global climate change and other natural and human-induced events on coral communities
- comprehension about the distribution and ecology of cold water corals

Fisheries
- better understanding of the relationship between fisheries and ecosystem dynamics, including the identification of essential habitat
- measures of the social science and economic aspects of fisheries

International Science
- international scientific partnerships to enhance long-term ocean science and management capacity in other nations

Invasive Species
- comprehension of how or why certain species become invasive
- understanding about why certain factors make an ecosystem more susceptible to invasions
- new techniques for invasive species identification and eradication
- new ballast water treatment and exchange techniques

Marine Debris
- knowledge about debris behavior in the marine environment and its ecological effects on organisms and ecosystems
- effective debris control measures
- identification of marine debris sources

Marine Mammals and Protected Species
- expanded understanding of basic biology and population status
- understanding of the effects of noise, coastal development, offshore oil and gas exploration, vessel traffic, military activities, and marine debris on these species
- methods to mitigate harmful impacts on these animals

Natural Hazards
- basic understanding and site-specific knowledge about a range of natural coastal hazards
- new methods for tracking and predicting hazards and assessing risks
- techniques to mitigate hazard events

Oceans and Human Health
- discovery of new marine bioproducts
- elucidation of the interrelations and causal effects of marine pollution, harmful algal blooms, ecosystem alteration, and emerging marine diseases in disease events
- new methods to monitor and mitigate threats to human health in marine and freshwater systems

Offshore Energy and Minerals
- understanding of cumulative, low-level, and chronic impacts of oil and gas activities on marine environments
- evaluation of the risks to the marine environment due to aging pipelines
- evaluation of the environmental effects of OCS mineral and sediment use

Regional Understanding
- regional-scale research programs to understand ecosystem processes
- integration of biological, physical, and chemical research on a regional, ecosystem basis

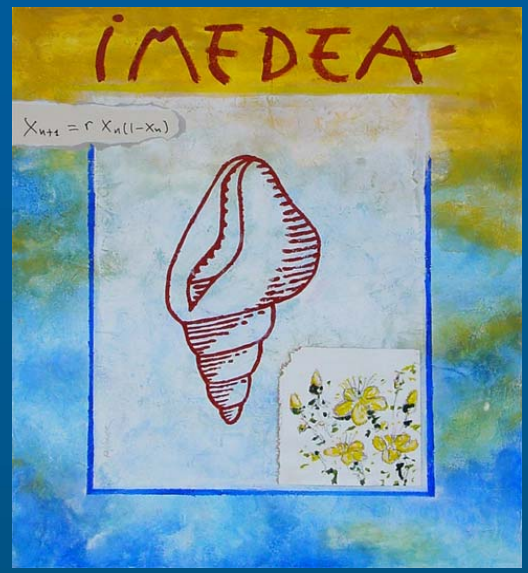
Sediment
- data on sediment processes in the marine environment on regional and national scales
- innovative techniques and technologies for managing marine sediment
- comprehensive information about the source, movement, volume, quality, and appropriate use or disposal of sediment—particularly contaminated sediment

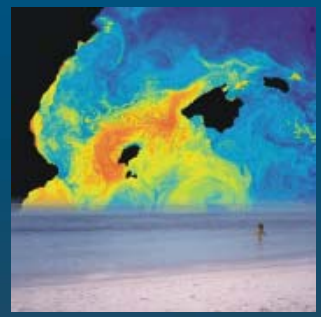
Socioeconomic Science
- operational data on the economic factors and human dimension affecting ocean and coastal areas and activities

Vessel Pollution
- understanding of cumulative impacts of commercial and recreational vessel pollution on ecologically sensitive areas
- knowledge of impacts of vessel air emissions, particularly in ports and inland
- disposal options for concentrated sludge resulting from advanced sewage treatment on large passenger vessels

Water Pollution
- advanced treatment options for eliminating nitrogen, phosphorus, and other emerging contaminants, such as pharmaceuticals, from wastewater discharges
- new methods for removing nutrients and pathogens in coastal runoff
- new models and measures of atmospheric transport and deposition of pollutants

What is IMEDEA?





Mallorca Island, Esporles http://www.imedea.csic.es

Summary examples of IMEDEA know how for ICZM

- Currents in the Balearic Sea for Search and Rescue Operations.
- Beach variability and relations to *Posidonia Oceanica* (Magaluff)
- Beach erosion (Magaluff, Santa Ponsa, Bahía Alcudia, Cala Millor, Cala San Vicente
- Beach fill processes (Cala San Vicente, Cala Millor, Bahía de Alcudia)
- Harbour oscillations (Puerto de Calanova, Ciutadella, La Rápita)
- Bay of Palma conditions in support to Olympic candidate (Palma-Madrid, 2012) and America's Cup candidate (Palma)
- Residence time in harbours and bays (Parque Nacional de Cabrera)
- Water quality and HABS (Paguera, Eivissa, new network observations)
- Sustainable beaches (Calvià)
- Operational systems for rip currents and waves in beaches (being implemented)
- Operational system for rissagues forecasting at Ciutadella harbour (just started)

What is the ICZM Balearic Islands Project?

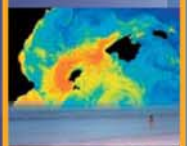
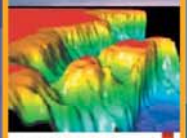
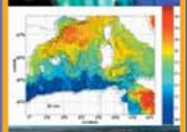
Objective: to implement science-based ICZM in the Balearics with the overall goal of achieving sustainability in the coastal zone (2005-2007) .

Project Structure:

- To identify and develop tools needed for ICZM implementation
  - . GIS
  - . Coastal Observatory / Technological platform (data)
- To identify and start horizontal projects needed for ICZM implementation
  - . Coastal Zone Characterization and definition of homogeneous units
  - . Indicators proposal
- To identify research priorities identified for ICZM implementation
  - . 25 ongoing research projects
- To advance on transfer of knowledge (from science to society and from society to science, two sided)

Indicators: are essential for assessing and monitoring both

– the state and evolution of the coastal zone
– the progress of ICZM initiatives





Indicators and ICZM Balearic Islands's project

We are trying to establish "Criteria for a first proposal of ICZM Balearic Islands' project Indicators" (just started October 2006).

We are carrying out a detailed analysis of state of the art initiatives "Indicators and ICZM" and are trying to interact with well established international initiatives such as DEDUCE: lessons to learn

? Locally relevant (i.e. encompasses major issues affecting the sustainability of the coastal zone of the Balearic Islands).

? Politically relevant (i.e. incorporates, where feasible, essential political standards and priorities).

✓ Internationally relevant (i.e. incorporates, where feasible, internationally recognized standards and indicators).

? Scientifically and practically viable (i.e. manageable in length, consists of indicators that are measurable, interpretable, cost-effective, sensitive, specific etc.).

? Ensure efficient and productive coordination and lack of replication of ongoing ICZM/indicator related projects and activities.

Indicator Categories for ICZM

Three types of indicators are needed to “measure” ICZM (IOC – UNESCO, 2006):

1. Governance: designed to measure the performance of responses to mitigate human pressures on the coastal and marine environment. They also measure progress and quality of the governance process itself, that is, the extent to which a programme is addressing the issue(s) that triggered the development of the programme in the first place.

2. Ecological: measure the condition and trends in the state of the ecosystem, in particular biological organization, vigour and geological, physical and chemical properties.

3. Socio-economic: there are four broad dimensions to the socio-economic aspects of ICZM – economic, environmental, public health and safety, and social dimensions. These are collectively united under the concept of sustainable development, which is a central goal of ICZM.

Indicators and ICZM Balearic Islands's project

Problems initially detected and Challenges

- Lack of coordination and cooperation among parties involved in indicator development leads to too much repetition and inefficiency.
- ICZM and indicators appear to be not generic, rather, they are site specific and restricted by political and local realities, and by availability of financial and human resources.
- We need to strongly work on identifying the maximum (but realistic) acceptable number of core of indicators grouped in well founded Indicator Categories. We need to address the applicability of such core of indicators to all types of Coastal Systems or to well thought sub-systems.
- Identifying viable, consistent data sources.
- Identifying scale of measurements.
- Finding a balance between reality and comprehensiveness.
- Balancing sustainability goals and political realities.

Indicators and ICZM Balearic Islands's project

Process for Developing an Indicator Proposal for ICZM Balearic Islands' project:

- Identify and define major issues affecting coastal zone of Balearic Islands (i.e. governance, ecological, socio-economic).
- Identify specific objectives for addressing each of the issues and, using international standards, identify a series of potential indicators and associated measurements for determining if these objectives are being achieved (indicator database).
- Consult with experts and individuals with different expertise (at university/research level and also with stakeholders, etc – including *CES, Cámara Comercio, Círculo de Economía, Fomento Turismo, Sindicatos,* etc.) already involved in indicator measurement in the Balearics in order to refine and adapt the extended list and incorporate any significant work that is already being done.
- Update and amend list after consultation with experts using and indicator evaluation table.
- Solidify partnerships with relevant organizations to implement measurement of indicators.
- Develop proposals for obtaining measurements for indicators that are not readily available but essential for the project.

ICZM_Balearic Islands project new tools: GIS development

International Referneces :
Marine Data Model
Biodiversity Data Model
Other…

Marine/Terrestrial Data

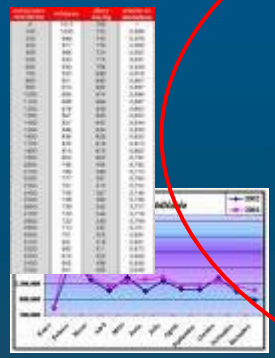
Quality Control

ICMZ DATA MODEL DESIGN
Logical / Physical

DATA LOAD
+ Metadata References

Diverse Data Sources

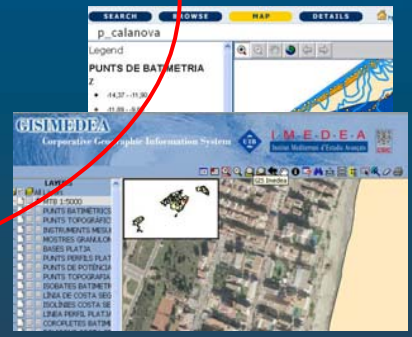
GIS_ICZM



Indicators

DATA ANALYSIS & DSS

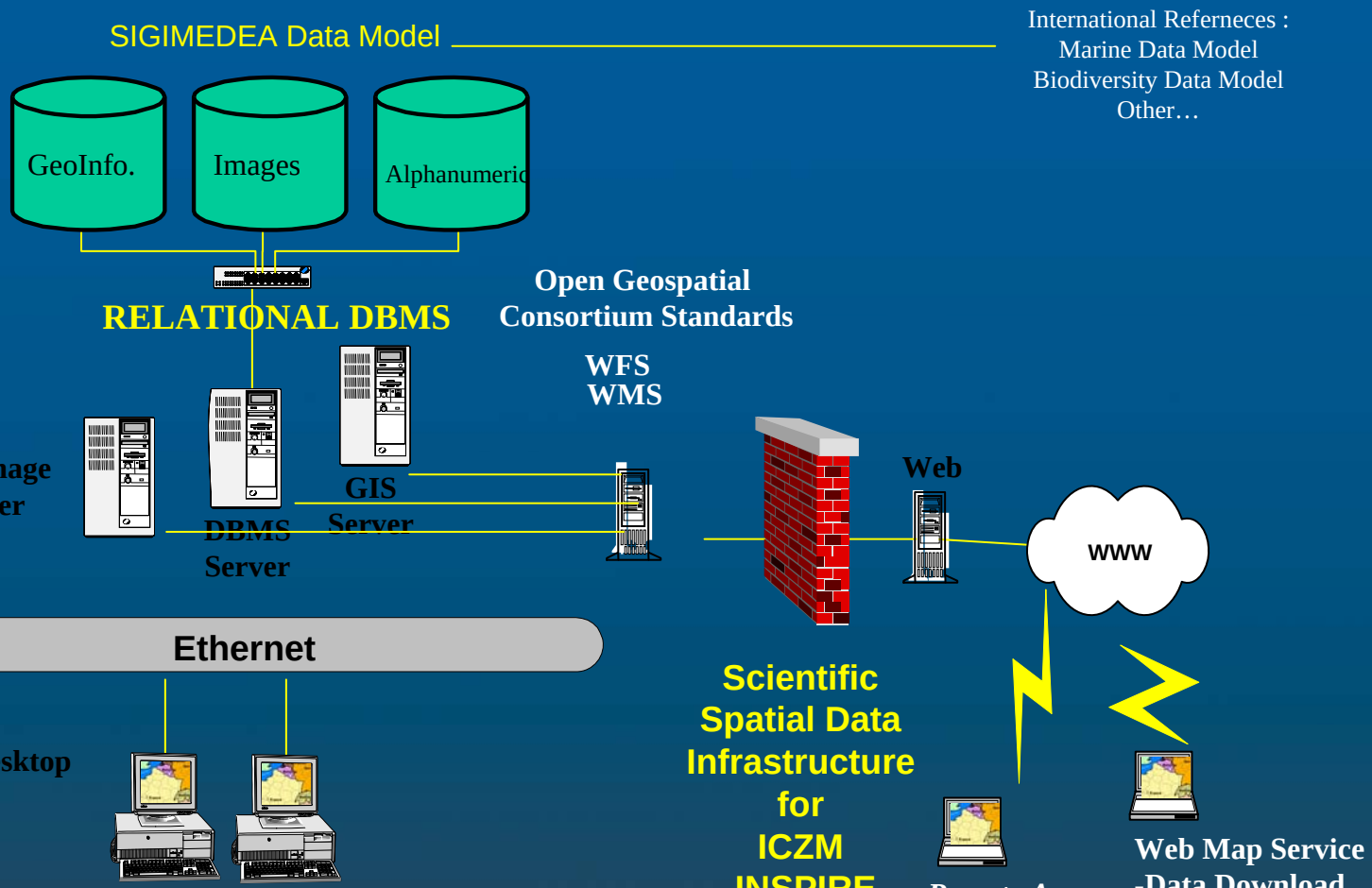
DATA SEARCH, QUERY & DOWNLOAD



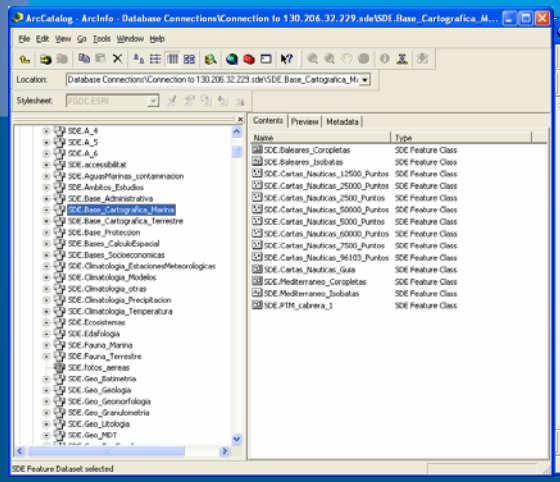
Interoperability
Scientific Spatial Data Infrastructure

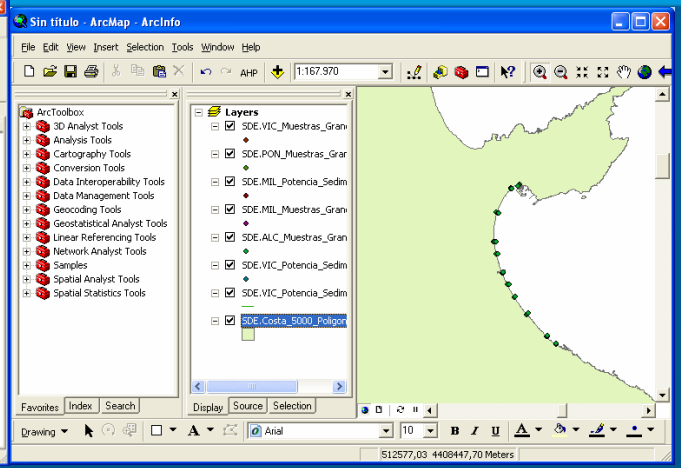
Data interchange Standards

GIS for ICZM_Balearic Islands project: arquitecture



GIS for ICZM_Balearic Islands project: cycle





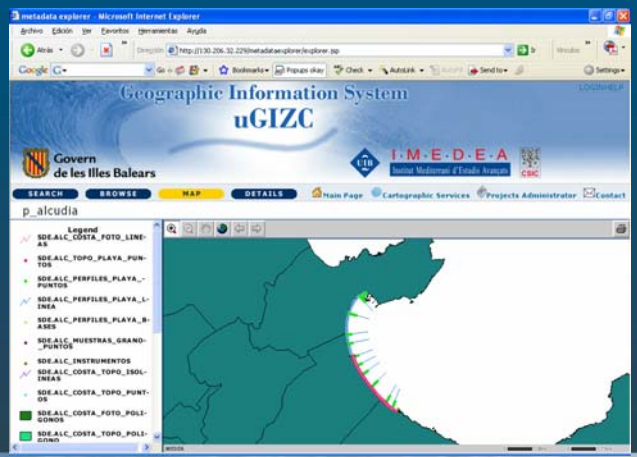
GIS Desktop

Heavy DB Clients

Local Acces

SIGIZC

Remote Data Acces



Web Map Services

1. Metadata Explorer

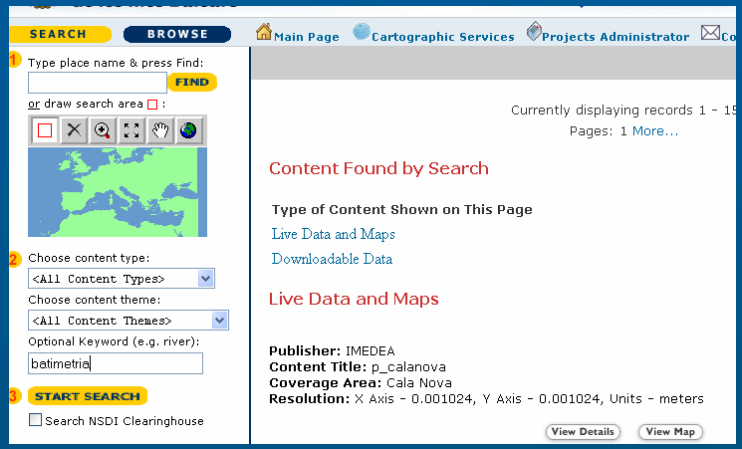
2. Cartographic Viewer

Thin DB Clients

SIGIZC : Searching Data..

GIS Data documented using Metadata Standards ISO 9.115 , OGC

The user can search data directly using the a metadata management tool :



WMS/WFS services have been developed in the context of INSPIRE , compliant with INSPIRE principles and Open GIS Consortium standards. In practice, this means that the layers can be viewed through any Web Mapping Service Client (WMS Standalone or Web viewer, ESRI ArcGIS). Metadata are also Available.

Or go directly to view or download data using a thematic index of data structured in four topics :

Environmental Variable

The GIS database has a thematic structure in 20 categories using the same model that propose the INSPIRE initiative (Infrastructure for Spatial Information in Europe) of the European Union

ICMZ Area

The Data is indexed in one or more ICMZ areas :

Litoral Global Change
Biodiversity
Quality and Emergence
Operational Oceanography
New Marine Technologies
Socioeconomic Analyst

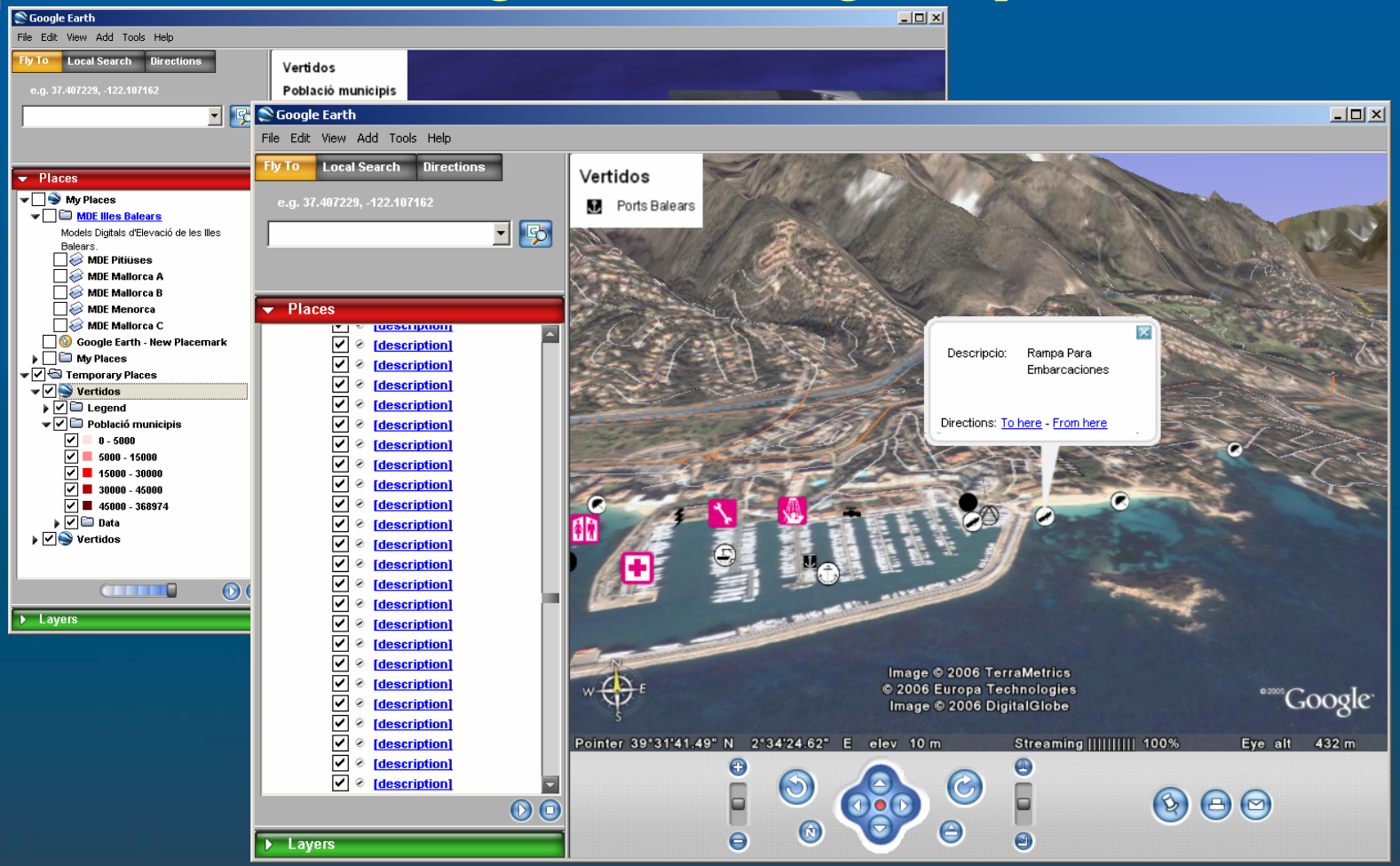
Research Project

The data mantain information about the research project that belong

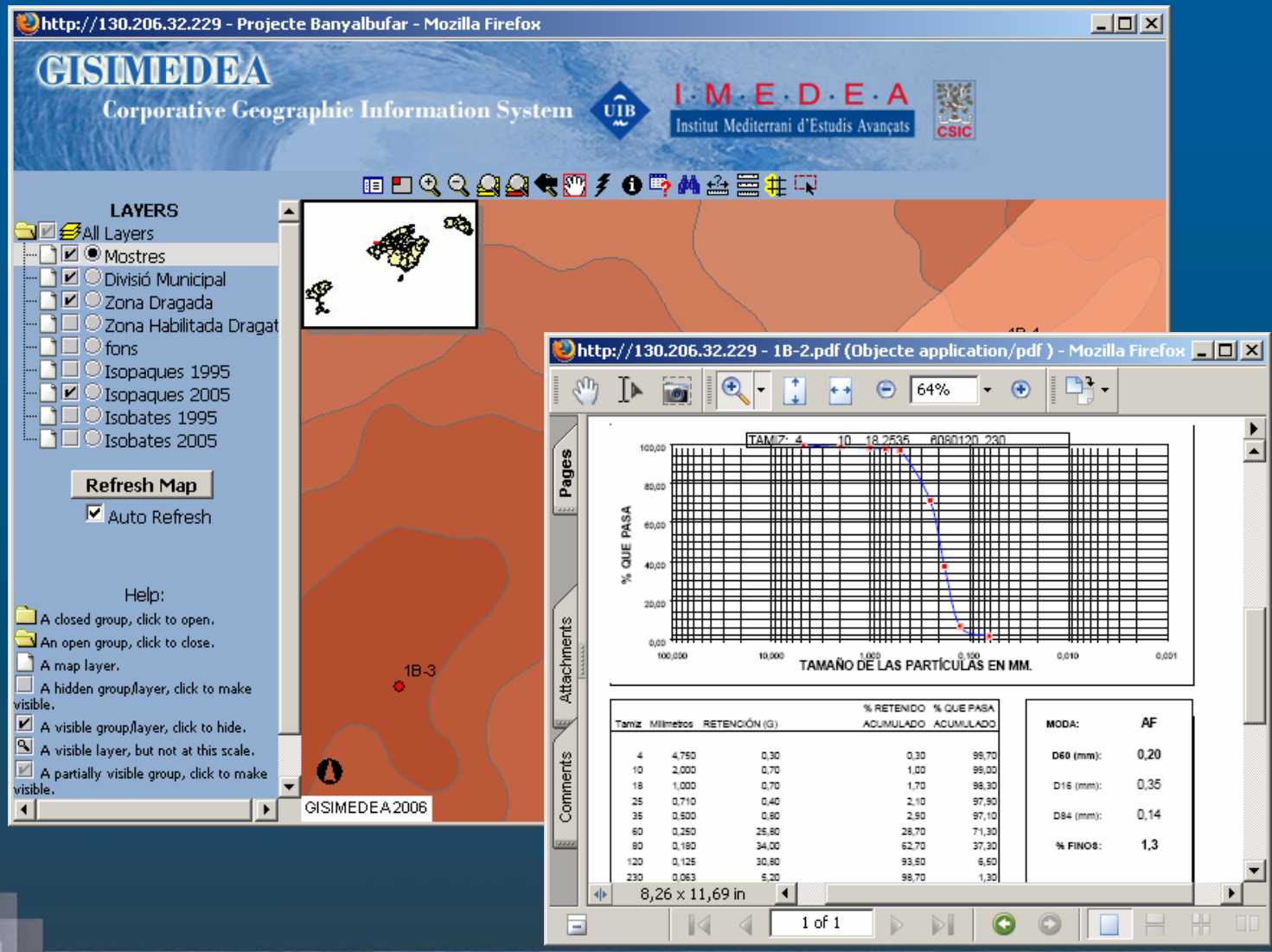
Geographic Location

GIS for ICZM_Balearic Islands project: data viewer

Google Earth / Google Maps

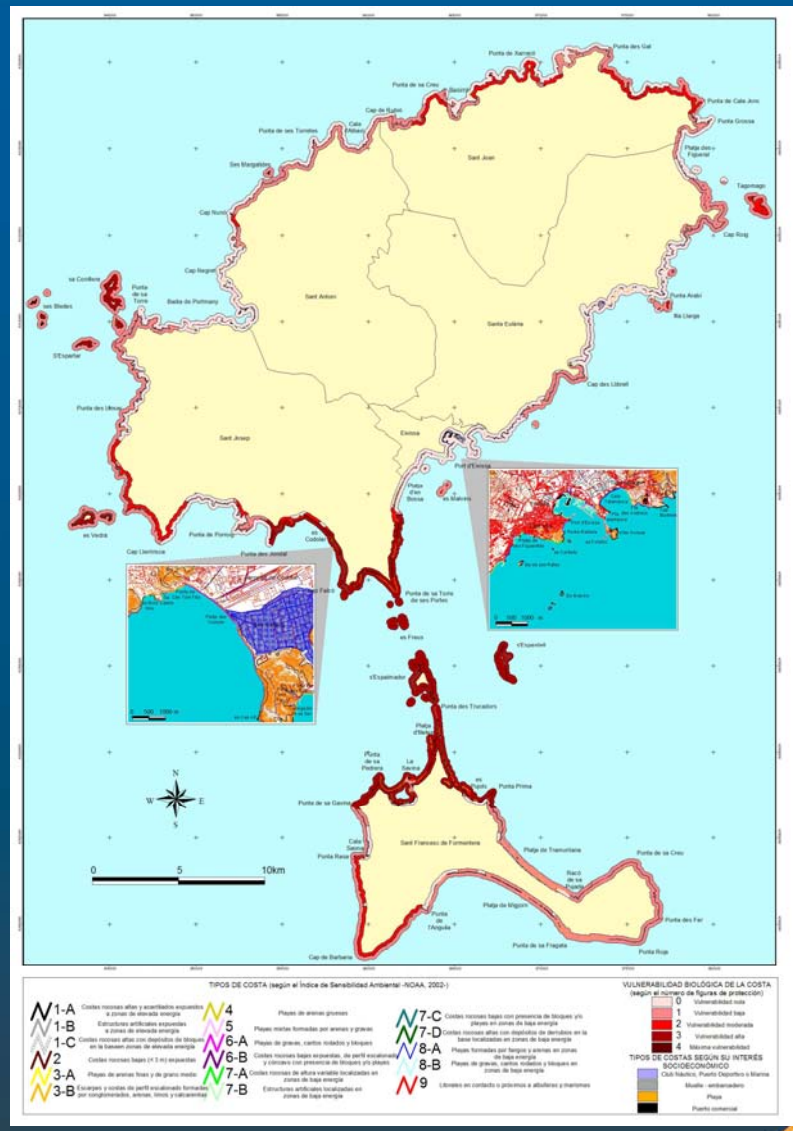


GIS for ICZM_Balearic Islands project: map viewer

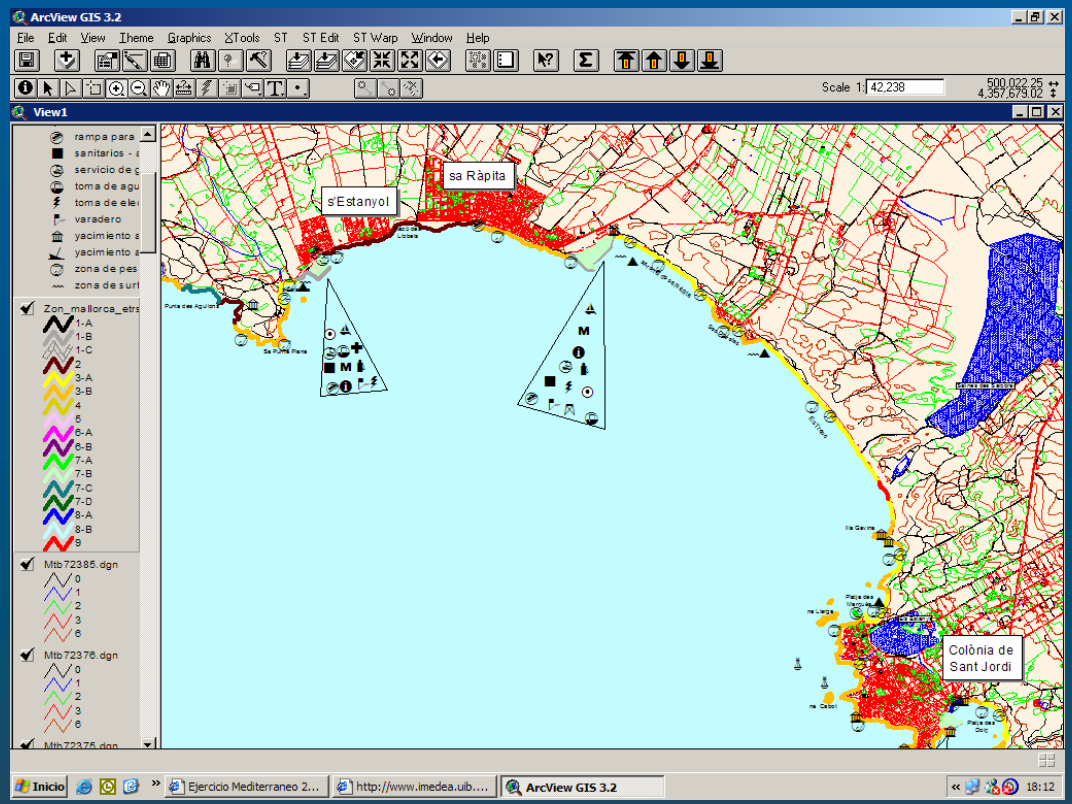


Coastal Characterisation for ICZM_Balearic Islands project:

Characterization of the different types of coast: vulnerability and ESI.



Coastal Characterisation for ICZM_Balearic Islands project:



Based on a Geographical Information System (GIS)

Incorporates all the available information, identifies resources at risk, establishes protection priorities and appropriate response.

Desarrollo urbanístico en el litoral Illes Balears

Objetivo general: realizar un ánalisis territorial sobre la afección de los asentamientos urbanos y las edificaciones sobre el litoral

Objetivos específicos:

- Estructuración y sistematización de los datos urbanísticos, de ordenación territorial y de ocupación real

- Evaluación según ámbito territorial municipal y según franjas desde la costa: 0-500, 500-1.000, 1.000-10.000 y más de 10.000 m

- Comparativa con otros territorios de características físicas y/o sociales similares.

Desarrollo urbanístico en el litoral Illes Balears

Categorías establecidas:

1 Zonas con clasificación urbanística de suelo úrbano o urbanizable siempre que este transformado (construido o urbanizado) según su definición normativa

2 Zonas con clasificación urbanística de suelo úrbano o urbanizable siempre que NO este transformado (construido o urbanizado) según su definición normativa

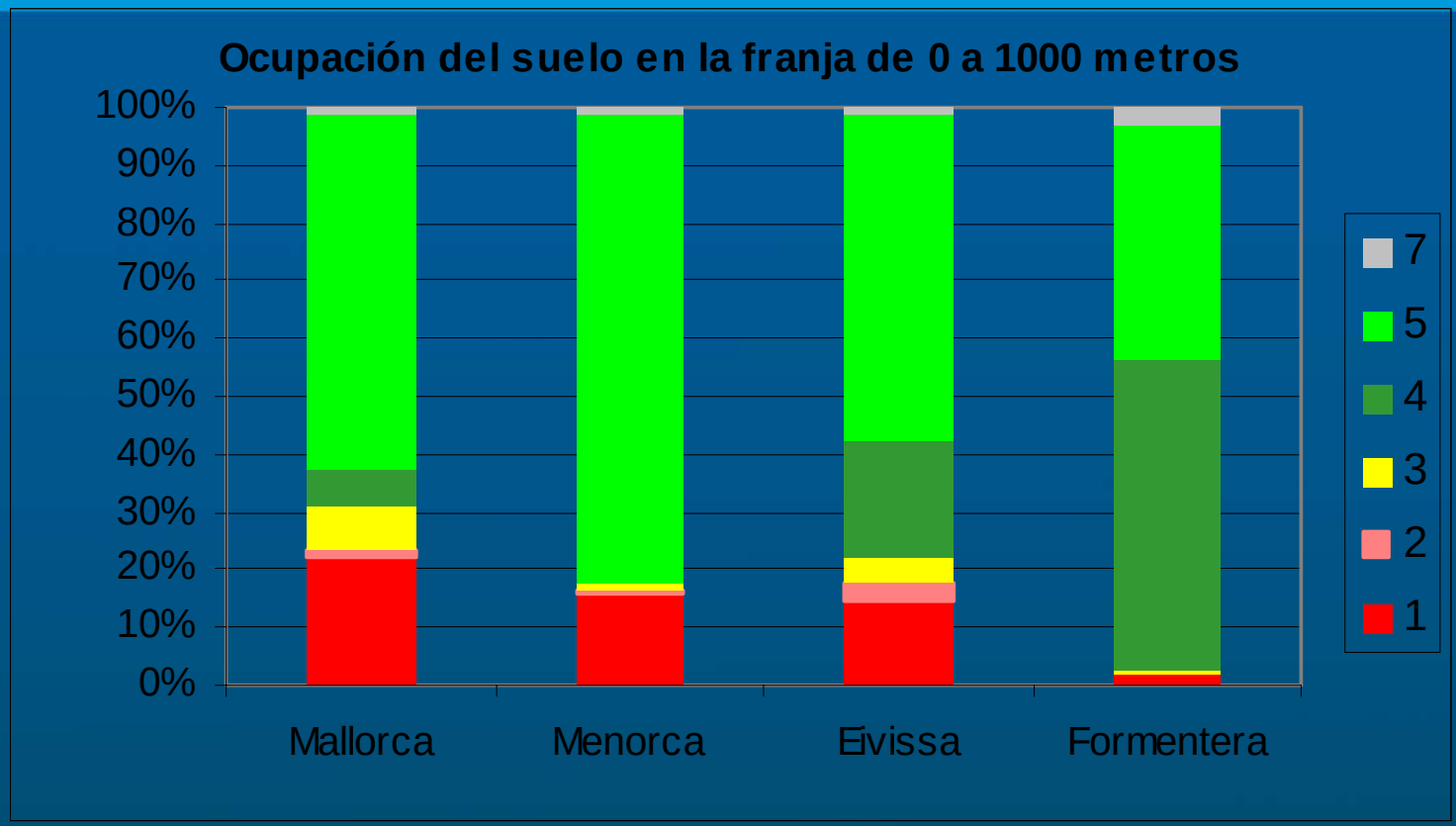
3 Suelo rústico con potencial elevado (por su clasificación úrbanística vigente), para cambiar su clasificación a urbano, urbanizable o sistema general

4 Suelo rústico potencialmente susceptible de ser ocupado por construcciones.

5 Suelo rústico protegido frente a nuevas edificaciones.

7 Suelo rústico ocupado por infraestructuras viarias o con potencial elevado para ser ocupado por estas.

Desarrollo urbanístico en el litoral Illes Balears



1 Suelo trasformado

2 Suelo urbano no transformado

3 Suelo rústico con elevado potencial para cambiar a suelo urbano o urbanizable

4 Suelo rústico potencialmente susceptible de ser ocupado por construcciones

5 Suelo rústico protegido frente a nuevas edificaciones

7 Infraestructuras viarias

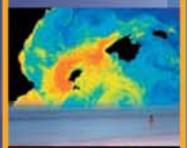
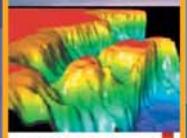
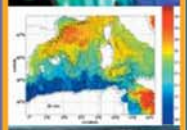
Working example ICZM Balearic Islands' project

Problem: Pressure from increasing human population.

Objective: Minimize habitat destruction resulting from human pressures.

An example of Indicators computed in ICZM Balearic Islands project (from DEDUCE):

- Size and proportion of population living in the coastal zone
- Percent of built up land x distance from the coastline
- Percent of new development on previously developed land
- Area converted from non-developed to developed land use




DEDUCE INDICATORS, first preliminary computations and tests

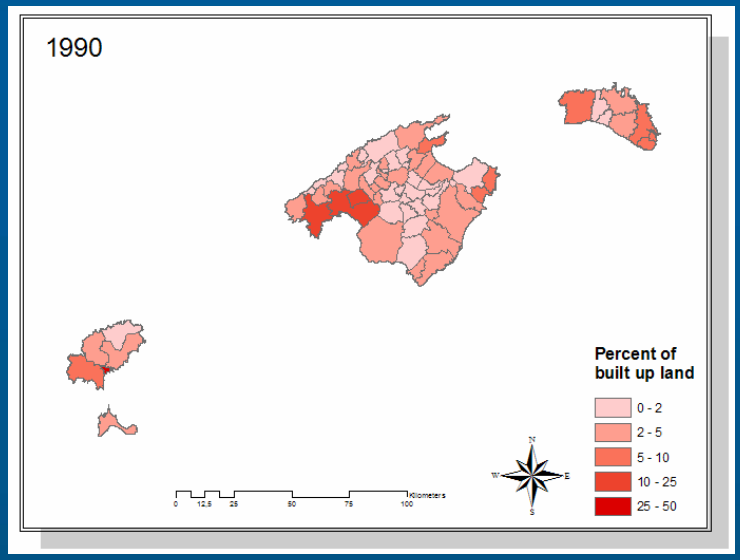
DEDUCE guidelines used in ICZM Balearic Islands project.

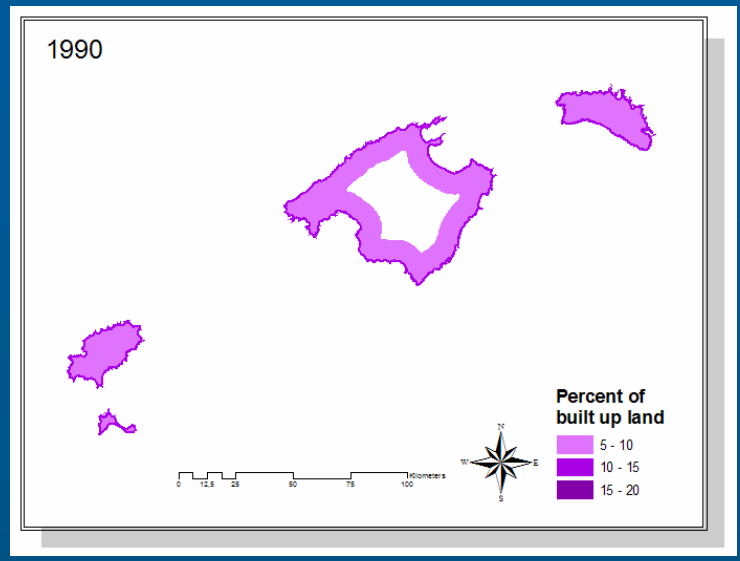
Indicator	
2	Area of built-up land
Measurement	
2.1	Percent of built-up land by distance from the coastline

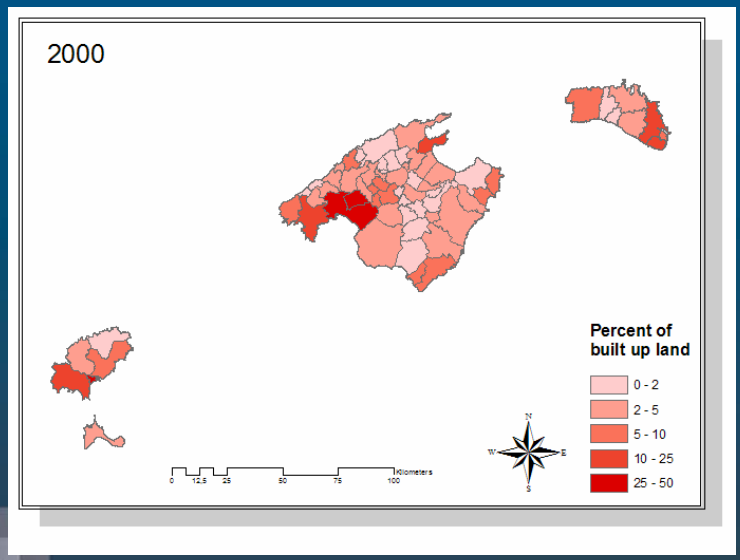
(i)	Area of built-up land [(1)] in hectares in coastal NUTS 5 as a proportion of the area of built-up land in hectares in the wider reference region.
(ii)	Area of built-up land in hectares in non-coastal NUTS 5 as a proportion of the area of built-up land in hectares in the wider reference region.
(iii)	Percent of built-up land by distance from the coastline in 0-1 km and 0-10 km buffers.

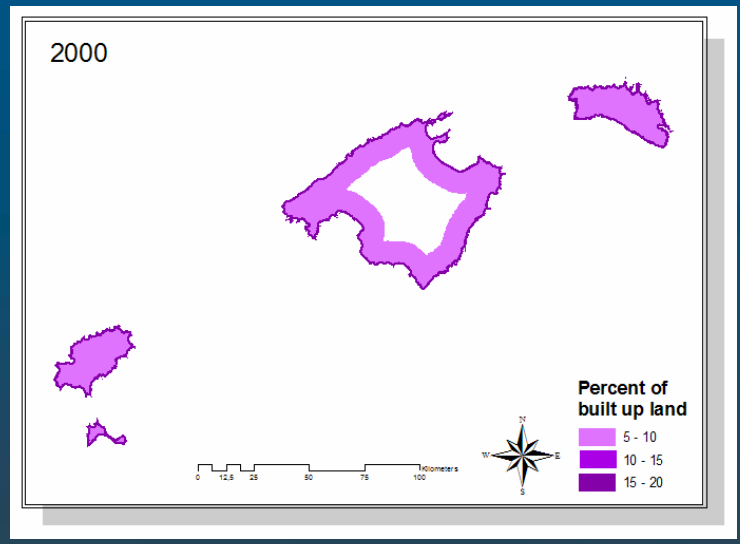
Presentation of the data	
Map 1	For the wider reference region, the percent of built-up land in each coastal NUTS 5 and in each non-coastal NUTS 5, for both CLC 1990 and 2000.
Map 2	For the wider reference region, the percent of built-up land in the 0-1 km and 0-10 km buffers, for both CLC 1990 and 2000.
Graph 1	Pie charts showing the percent of built-up land for the coastal and non-coastal NUTS 5 in 1990 and 2000 (or at equivalent sampling points if using national datasets).
Graph 2	Bar chart showing the percent of built-up land for the 0-1 km and 0-10 km buffers, for both 1990 and 2000 (or at equivalent sampling points if using national datasets).

Percent of built-up land for the coastal and non-coastal NUTS 5

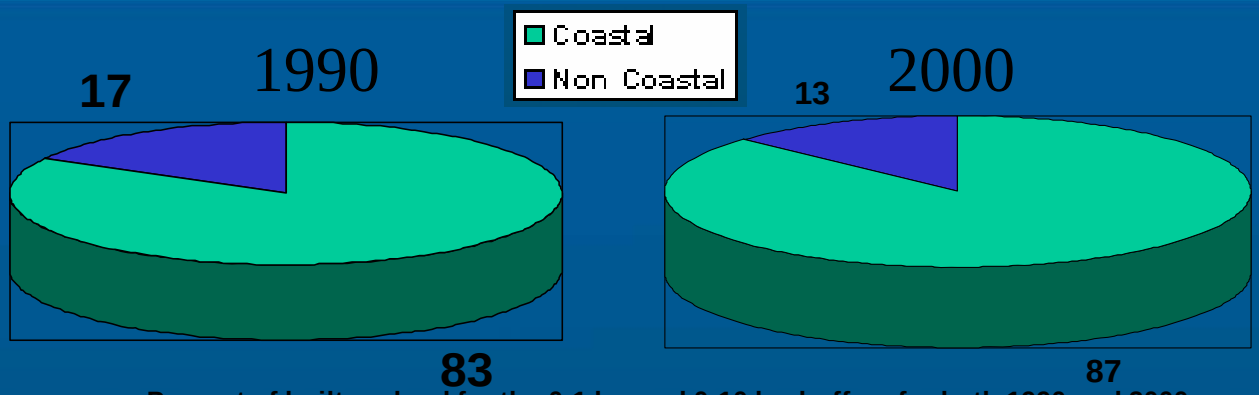




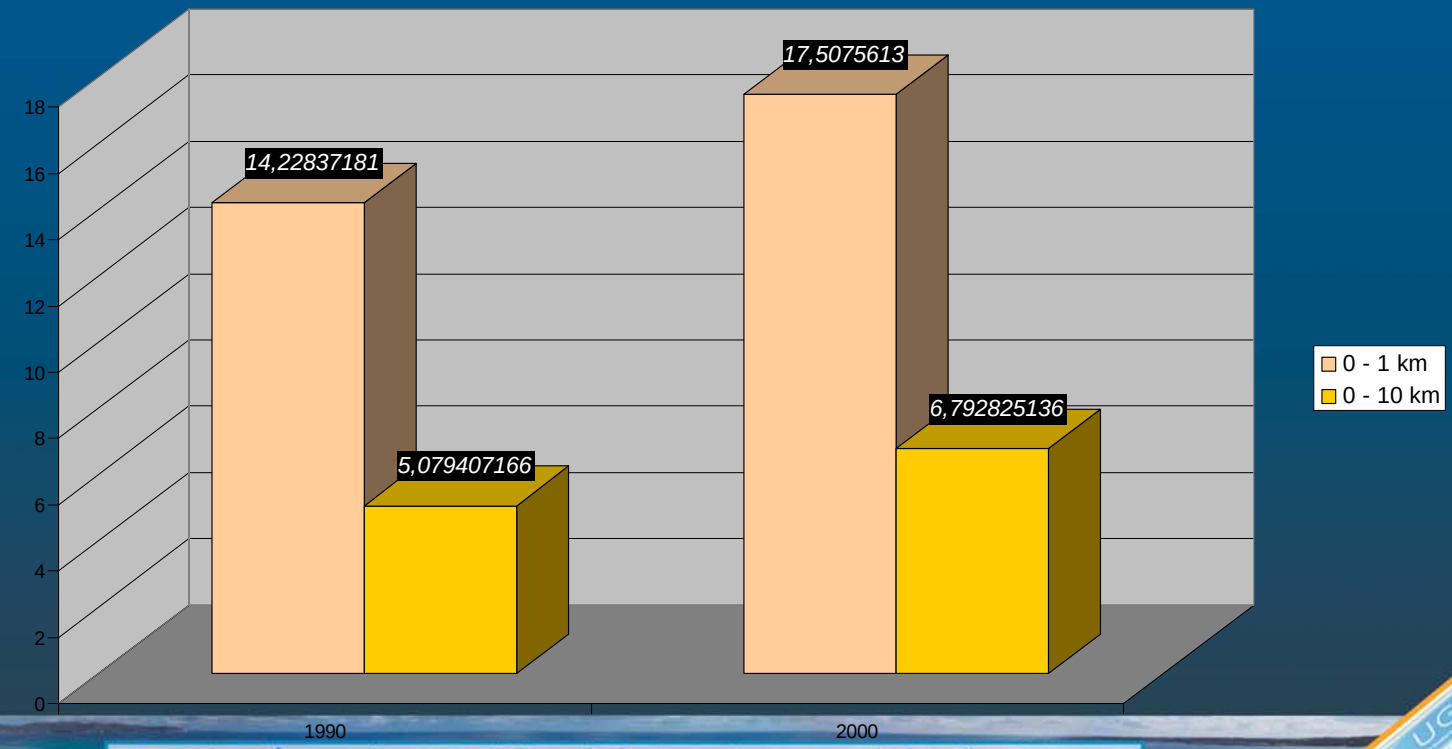




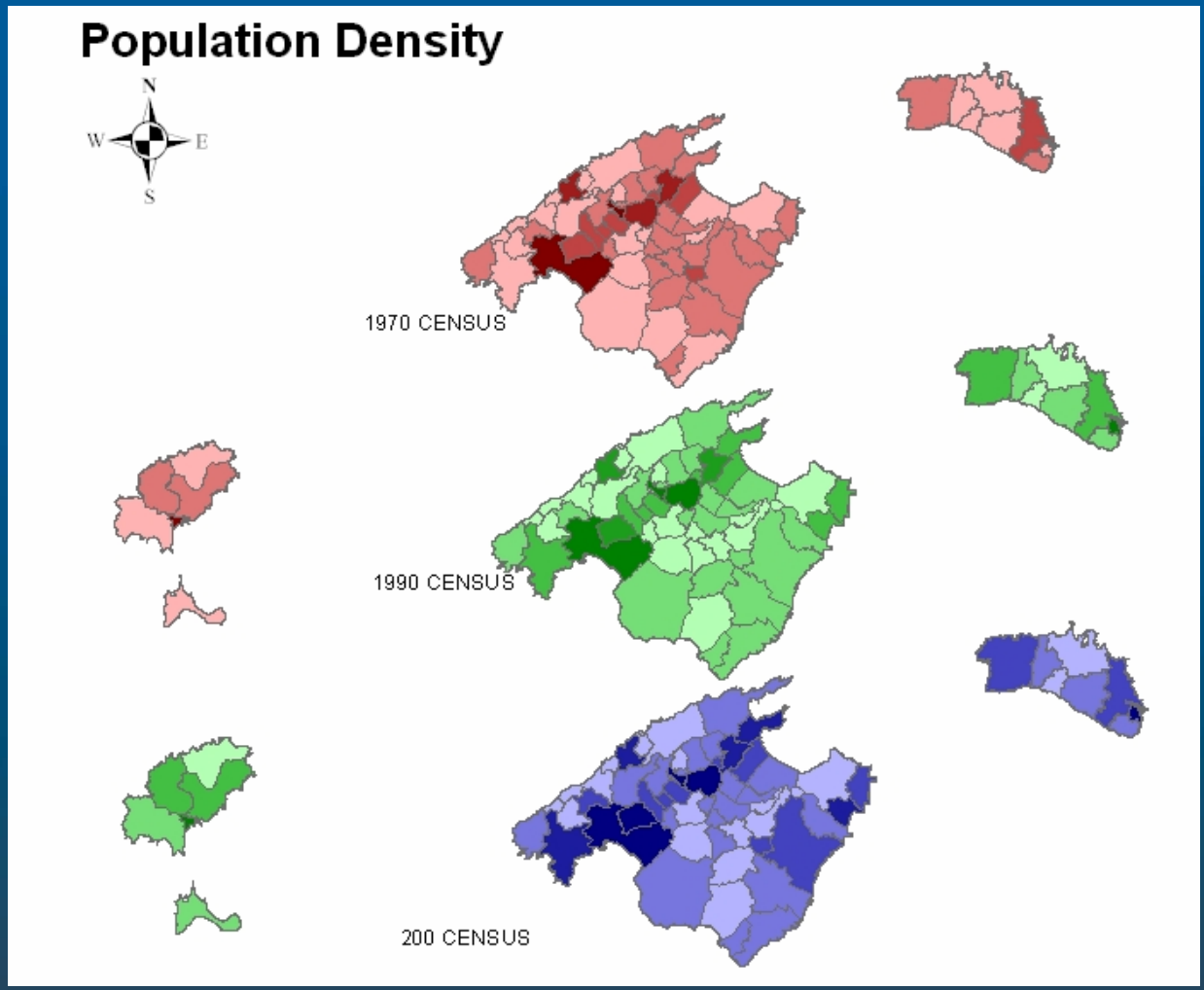
Percent of built-up land for the coastal and non-coastal NUTS 5



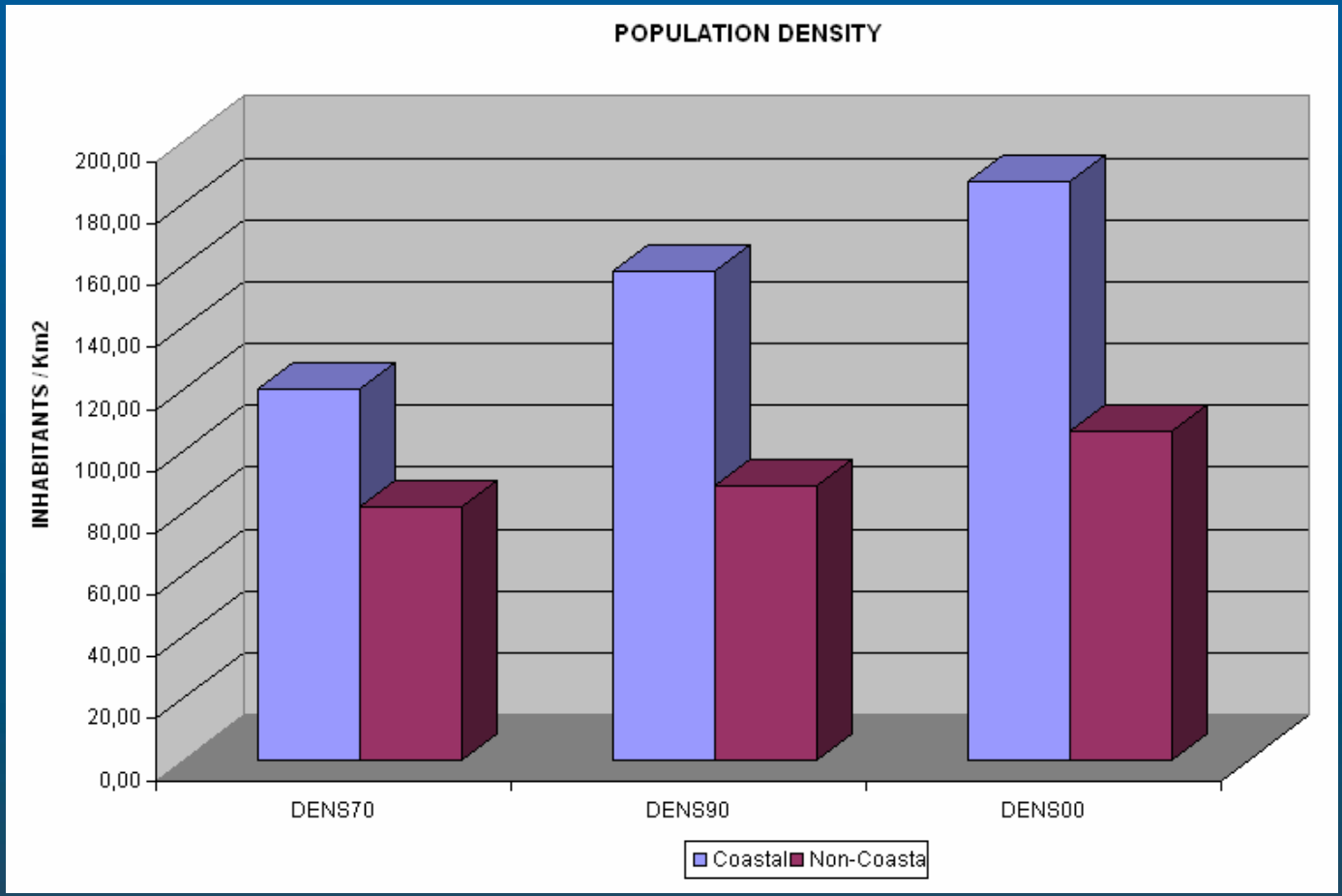
Percent of built-up land for the 0-1 km and 0-10 km buffers for both 1990 and 2000



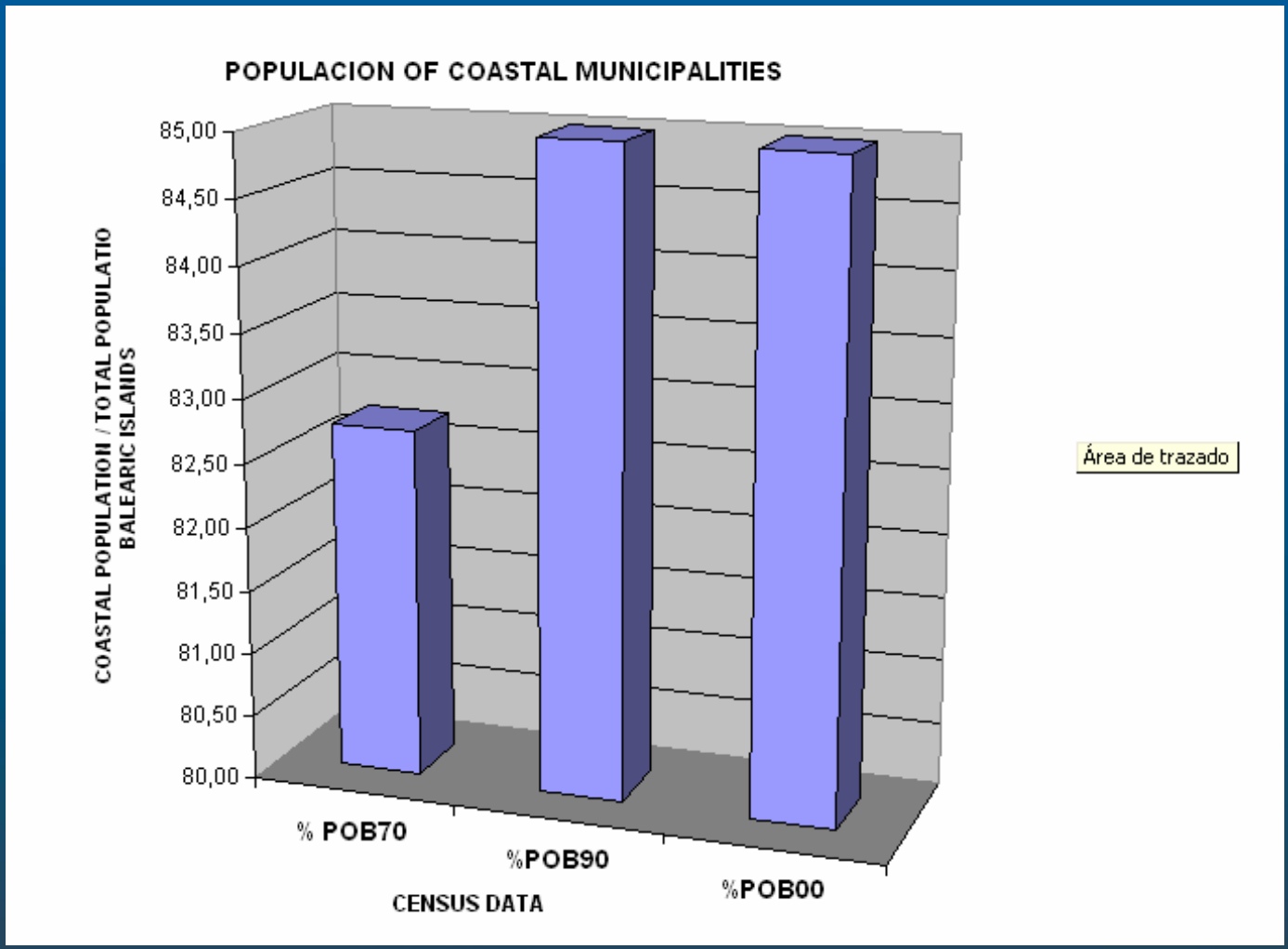
1.1 Demand for property on the coast



1.1 Demand for property on the coast



1.1 Demand for property on the coast



Outline of this presentation

1. What is ICZM?
2. What is the general frame, basic principles and challenges: sustainability?
3. What is the role of science on implementing ICZM?
4. What is IMEDEA?
5. What are the major scientific achievements from IMEDEA for ICZM?
6. What is Balearic Islands ICZM project and why do we need indicators?
7. What are the basic categories of indicators?
8. What are the criteria for selecting indicators?
9. What are the challenges in implementing indicators?
10. What is the process for developing an initial proposal of indicators for Balearic Islands ICZM project?
11. Working example: preliminary results on GIS and indicators in Balearic Islands ICZM project
12. Conclusions

Conclusions

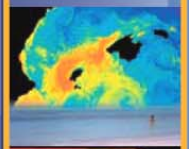
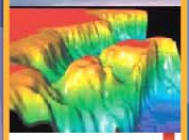
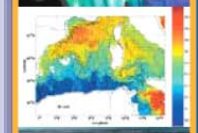
ICZM: need to agree on basic underlying principles

Science for ICZM as a basis for sound implementation

- Theoretical basis for ICZM implementation
- Observational needs for ICZM implementation
- Research needs
- Educational needs

The interest of the Balearic Islands as ideal pilot area for ICZM:

- ICZM Balearic Islands research project (2005-2007) has just started and first results are being obtained.
- Support from social society: general agreement that the coast is not an unlimited resource, need for introducing changes in coastal management.





We are just starting...

THANK YOU VERY MUCH

Govern de les Illes Balears
Conselleria d'Economia, Hisenda i Innovació

UGIZC
Unitat de Gestió Integrada de la Zona Costanera de les Illes