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
IMEDEA (CSIC-UIB)

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

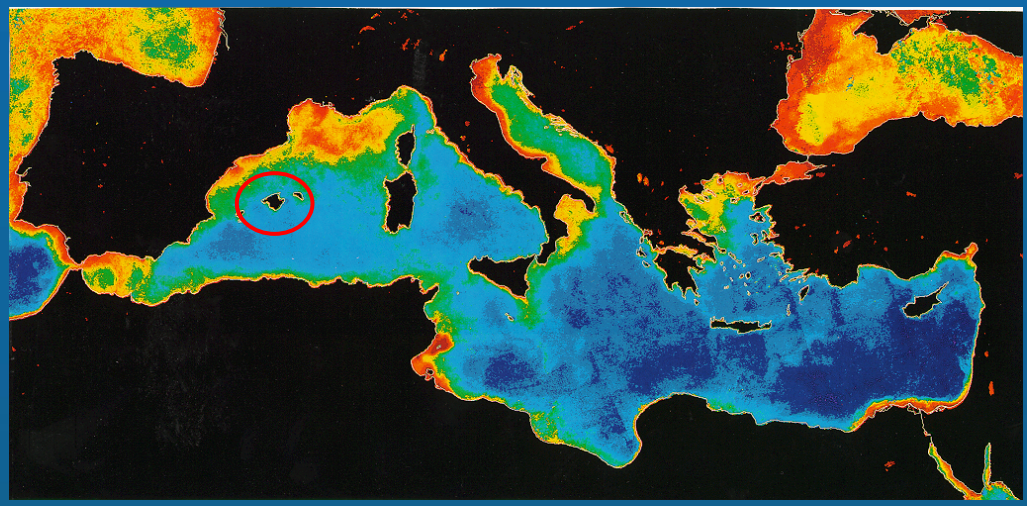
Objective

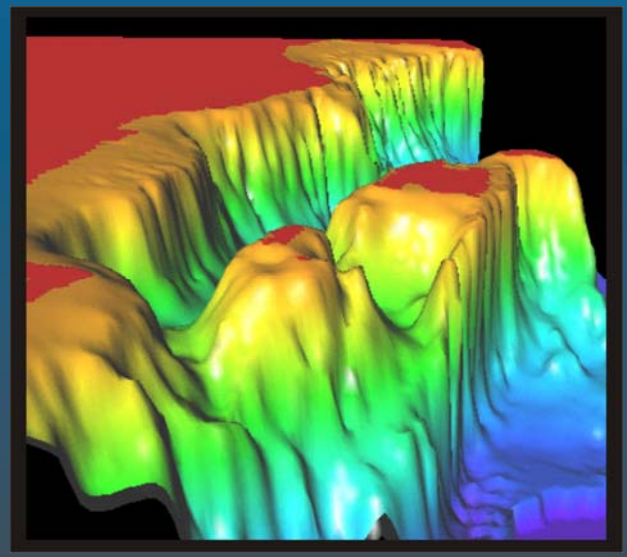
1. To show the relevance of scientific and technological high quality research to reach a real sustainability by means of an Integrated Coastal Zone Management and specific examples from IMEDEA results in the Balearic Islands (Mediterranean).

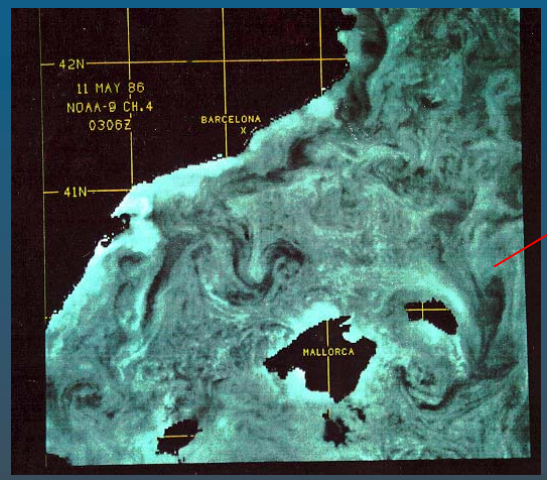
2. To discuss the new role of science in our society as a potential contributor to decision making processes.

Acknowledgements: Organisation of Aruba CZM and Riu Resorts for inviting me.

Presentation: the Balearic Islands, tourist destination







Menorca: some similarities with Aruba, 30x10 km, population, touristic, etc

Outline

1. The coastal zone, complexity, problems and threats
2. General frame, basic principles and challenges: sustainability
3. The new role of science in XXI's century society
4. Examples of coastal research at IMEDEA
5. Integrated Coastal Zone Management (ICZM)
6. The UGIZC project: towards an ICZM Strategy in the Balearic Islands

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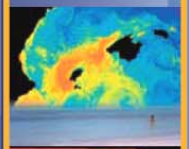
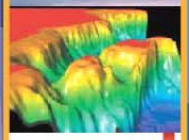
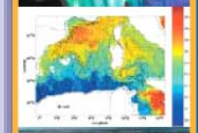






1. The coastal zone, complexity, problems, threats

Introduction

What do we understand by Coastal Zone

- In small islands, the coastal zone is really the whole island.
- It is a dynamic, fragile and complex area where a diversity of forces, processes and pressures are in place, all inter-related: waves, currents, sediment transport, bio-geochemical fluxes, biodiversity, socio-economic, cultural and institutional processes.
- The Coastal Zone has a unique biodiversity in terms of flora and fauna: unique and scarce
- The Coastal Zone is of high economic, social, cultural and recreational importance
- A large number of administrations and institutions have competencies on the coastal zone.

1. The coastal zone, complexity, problems, threats

Introduction

Services and functions

- Regulation of gases
- Regulation of climate
- Regulation of disturbances
- Erosion control
- Nutrient recycling
- Recycling of contaminants
- Seawater treatment
- Food production
- Genetic resources
- Recreation
- Cultural values

1. The coastal zone, complexity, problems, threats

Introduction

Socio-economical importance

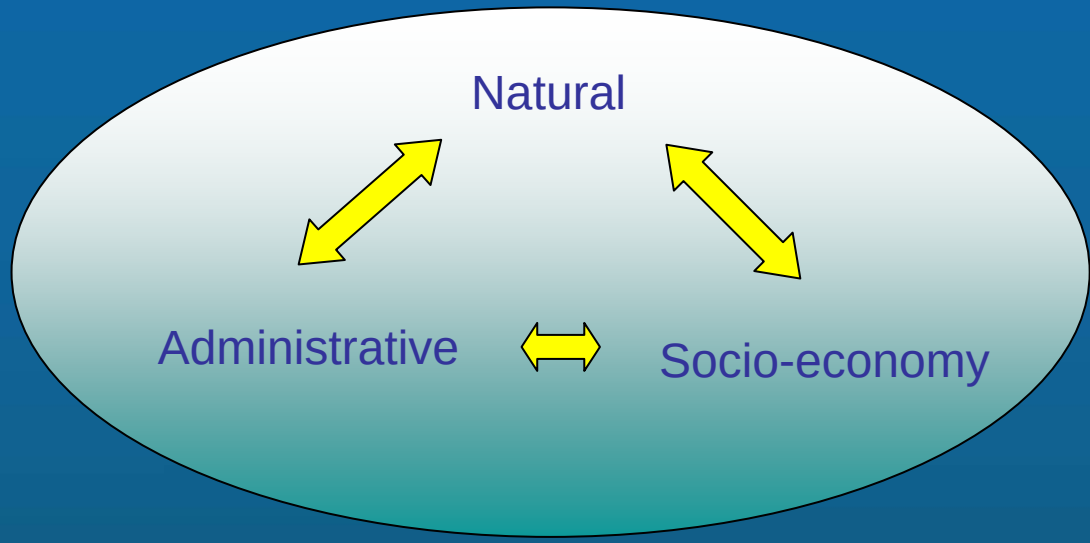
Tourism, recreational activities
Residences
Fisheries
Transport and commerce
Preservation of natural heritage

1. The coastal zone, complexity, problems, threats

Introduction

Three sub-systems:

Natural system
Socio-economy system
Administrative system



Multi-resources, multi-users, interacting, very complex system

1. The coastal zone, complexity, problems, threats

Problems (some examples from Balearic Islands)

- Deterioration of seawater quality
- Algal blooms
- Deterioration of sanitary conditions of seawater for swimming
- Proliferation of invasive species
- Deterioration of *Posidonia oceanica* meadows
- Loss of fishing areas
- Beach erosion
- Sand dune loss
- Coastal urbanization

- Theses problems now have clear **economic and social** effects.
- There is a significant pressure on the coastal zone as a resource.

“The natural resource is not unlimited”!

1. The coastal zone, complexity, problems, threats

Problemas comunes (Europa)

Programa de demostración de la Comisión Europea sobre la gestión integrada de las zonas costeras

Urbanización no planificada •Inversiones malogradas •Puestos de trabajo no estables •Degradación medioambiental y social	**Erosión de la costa y de la calidad de las aguas** •Degradación en los *hábitats* naturales •Degradación de los núcleos urbanos •Riesgos de desastres naturales •Pérdida biodiversidad
•Agotamiento de las reservas •Problemas sociales y económicos •Emigración	**Ausencia de infraestructuras y redes adecuadas de comunicación y transporte**

Fuente: Documento de la Comisión Europea, COM (2000) 547)

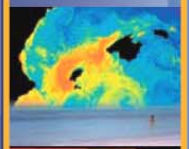
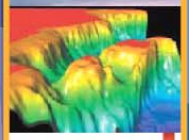
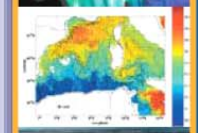
1. The coastal zone, complexity, problems, threats

Problemas comunes (Europa)

Principales impactos en la zona costera relacionados con las presiones

Presiones / *drivers*	impactos
Cambio climático	Erosión, pérdida biodiversidad, inundaciones, aumento fenómenos extremos, cambio composición especies
Agricultura, cambios forestales	Eutrofización, contaminación, pérdida biodiversidad/habitat, salinización, subsidencia, erosión
Urbanización, infraestructuras	Eutrofización, contaminación, pérdida biodiversidad/habitat, salinización, subsidencia, erosión, riesgo inundación
Desarrollo turístico	Impactos estacionales/locales, playas, demanda de agua, perdida de valores culturales
Comercio, industria	Contaminación, especies invasoras, dragados
Acuicultura, pesca	Sobreexplotación, pérdida especies, eutrofización, contaminación, impacto en especies migratorias

Fuente: *Integrated assessment and future scenarios for the coast. In Managing European coasts.* Springer 2005



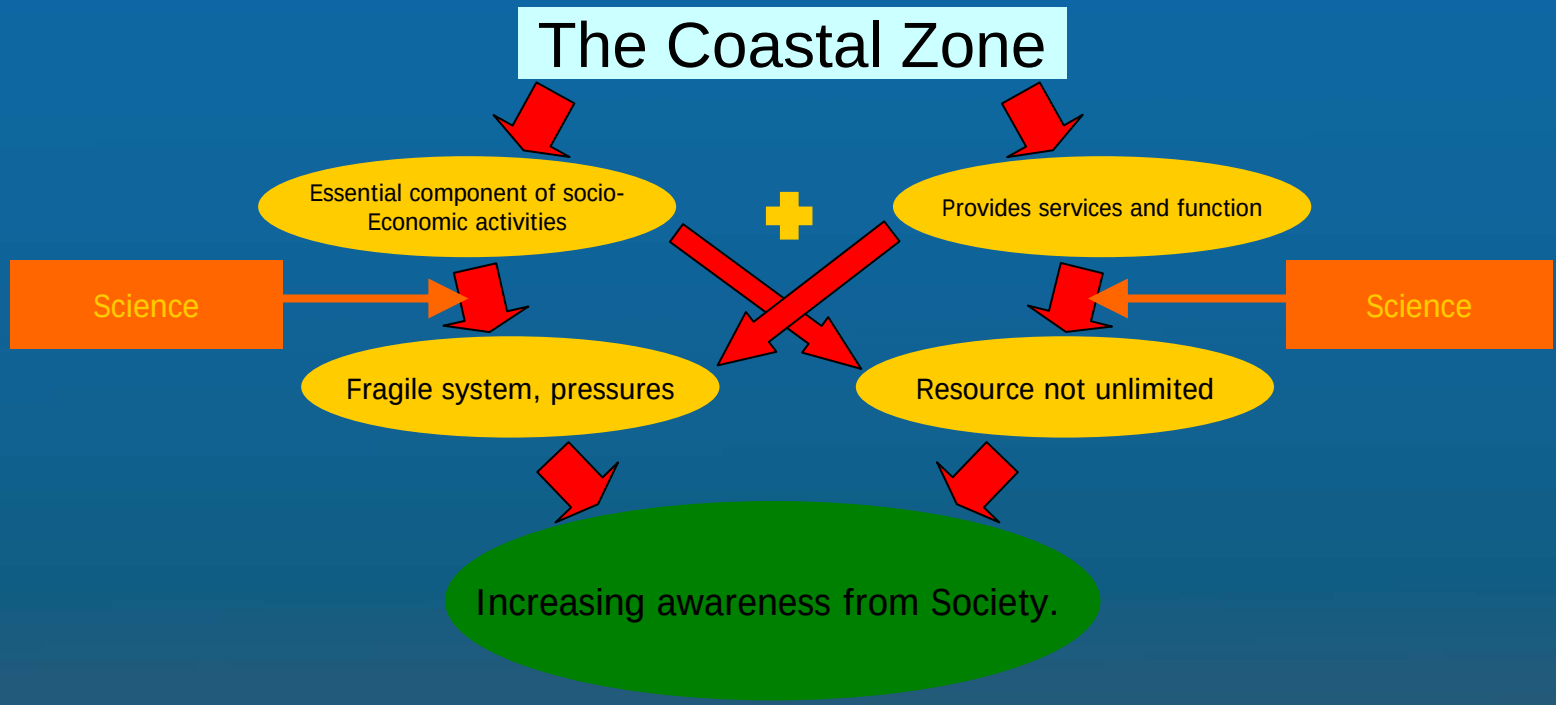
1. The coastal zone, complexity, problems, threats

Threats

- Loss of land resources with economical value
- Loss of land resources with natural and visual values
- Loss of properties
- Loss of marine and land species
- Loss of historic and archaeological resources
- Loss of public access to space and resources
- Pollution
- Congestion

1. The coastal zone, complexity, problems, threats

The coastal zone:



COASTAL ZONE HAS TO FULFILL TODAYS NEEDS AND THE ONES FROM FUTURE GENERATION.

¿How to deal with a complex, interdisciplinary and global problem?

Outline

1. The coastal zone, complexity, problems and threats
2. General frame, basic principles and challenges: sustainability
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2. 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

2. 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.

2. 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.

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3. 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.

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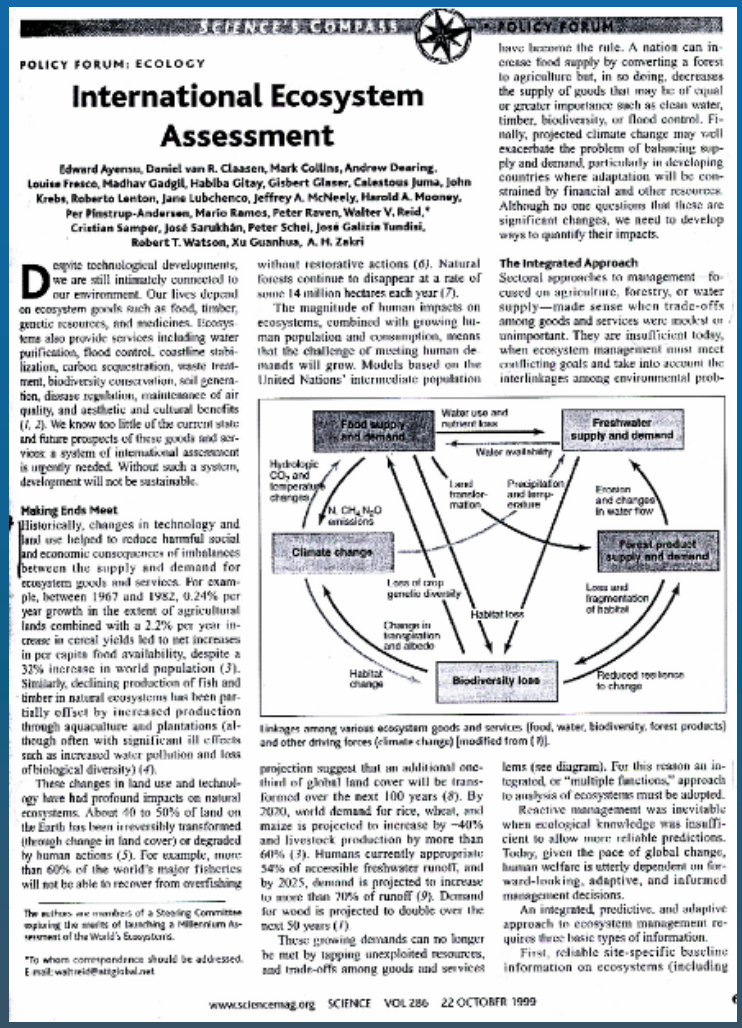
3. The new role of science in XXI's century society

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

'Strong science for wise decision'.

3. The new role of science in XXI's century society



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@sfglobal.net

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

3. The new role of science in XXI's century society

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

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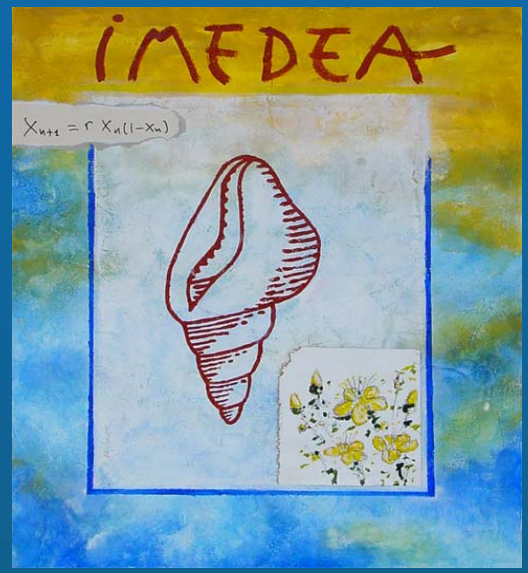
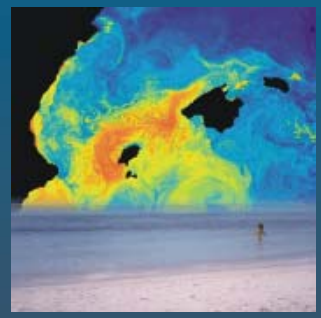
4. Examples of coastal research at IMEDEA





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

Research lines

1. Science based Operational Oceanography in the Mediterranean

- *Circulation and dynamics, scale interactions, basin, sub-basin and local*
  - Basin scale circulation and climatic effects
  - Sub-basin scale, mesoscale effects and interactions, shelf/slope exchanges
  - Local scale, interactions and residence time
- *Coastal zone variability and beach morphodynamics*
  - Beach erosion and sediment transport
  - Beach safety: longshore currents and rip currents
  - Tsunami forecasting
- *Physical-biological interactions at sub-basin and local scale: water quality*
  - Harmful Algal Blooms (HABS) in harbors, bays and beaches
  - Debris and floating material characterization and drift forecasting for recovery
  - Interactions between currents, waves, water quality and Posidonea oceanica extension
- *New tools for non linear systems forecasting: evolutionary computation*
  - Darwin Genetic algorithm (reg) : applications to ocean currents forecasting, solar spots, wave heights, precipitation, etc

Research lines

2. Marine Technologies: development of new low cost (in collaboration with Albatros Marine Technologies, spin-off)

- *Development of new platforms: Rov's, AUV's, gliders, buoys*
- *Integration of sensors and platforms for sound sampling of the coastal zone*

3. Operational Systems "to be" implemented at IMEDEA

- *Sub-basin and local scale currents circulation, interactions at different scales: Balearic Sea*
- *Rip currents in beaches: pilot study off northeast of Mallorca Island: Cala Millor*

4. Science based Sustainable Integrated Management in Coastal Zone

- *Scientific achievements, Science based management and Sustainability principles*
- *New Observational networks, GIS tools and modeling predictive capabilities*
- *Innovation in services in the coastal zone, environmental innovation and sustainable tourism*

Research lines

Scientific examples (observations and modelling)

from basin to beach scale.

Basin scale (10→5 km), since 1995 (*)**:** *large scale circulation, role of bottom topography, specific features, transport in detailed sections*

Sub-Basin regional scale (5→1 km), since 1992: *mesoscale/mean flow interactions, blocking basin scale circulation in specific sub-basins, circulation Alboran and Balearic Seas, etc.*

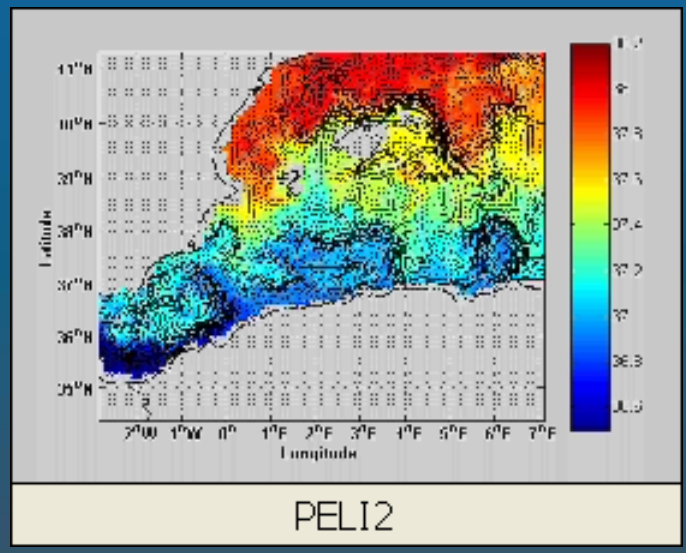
Local (1 km→500m), since 1993: *sub-basin-local interaction through canyons, shelf/slope exchanges, circulation in bays, residence times and water quality, etc.*

Towards… beach (500→10m), since 2004: *fine sediment resuspension by waves and recirculation and sediment transport by wind induced coastal currents in bays and beaches, (only still with PE non hydrostatic models and towards integration with wave models).*

Results at basin-sub-basin scale

Circulation and dynamics. Scale interactions: basin, sub-basin and local scales

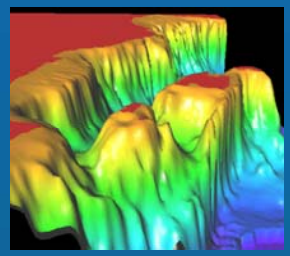
- Basin scale circulation and climatic effects
- Sub-basin scale, mesoscale effects and interactions, shelf/slope exchanges
- Local scale, interactions and residence time

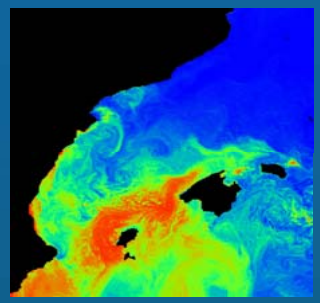


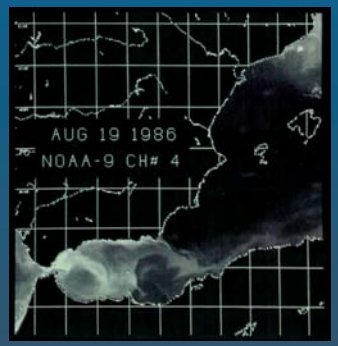
Fernández, D. E. Dietrich, R. L. Haney, J. Tintoré. *Progress in Oceanography*. 2005

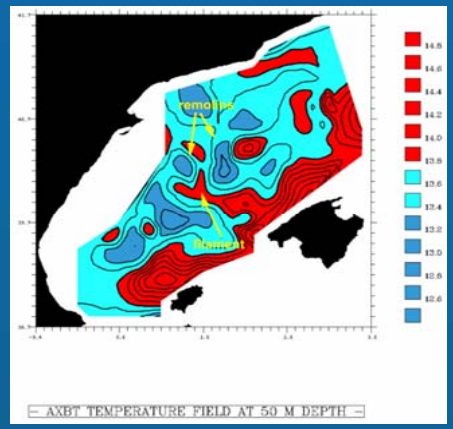
Main result: importance of general circulation and sub-basin interactions

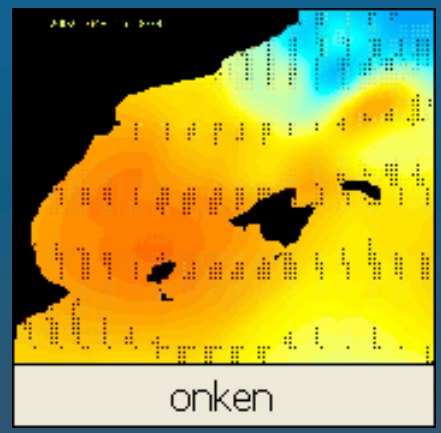
Results at sub-basin scale

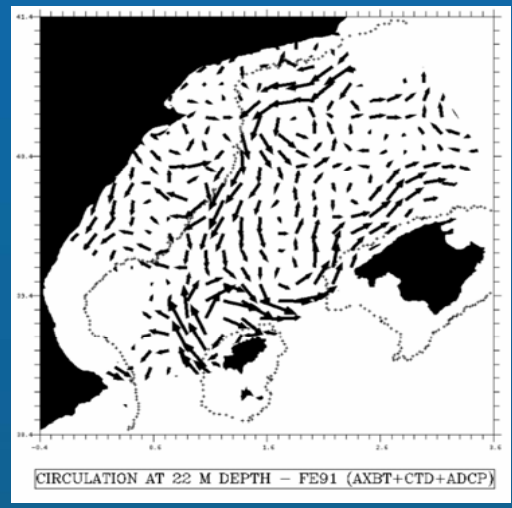


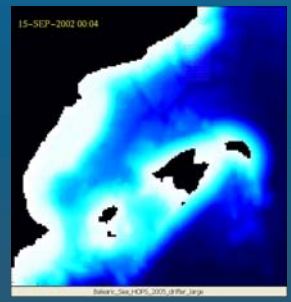








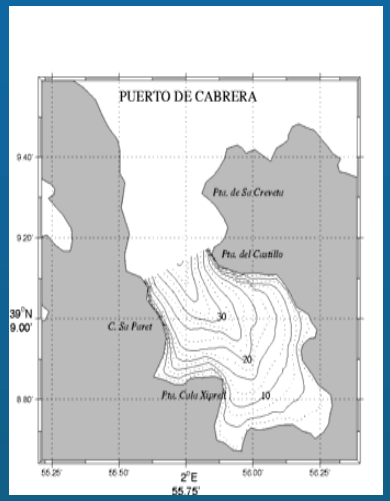


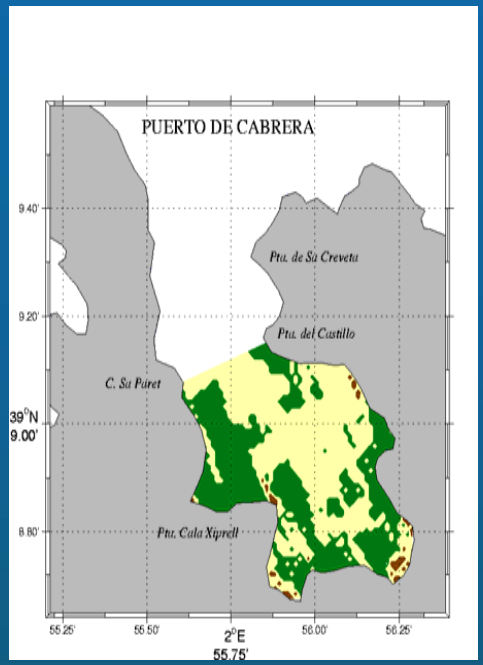


Main result: importance of mesoscale structures.

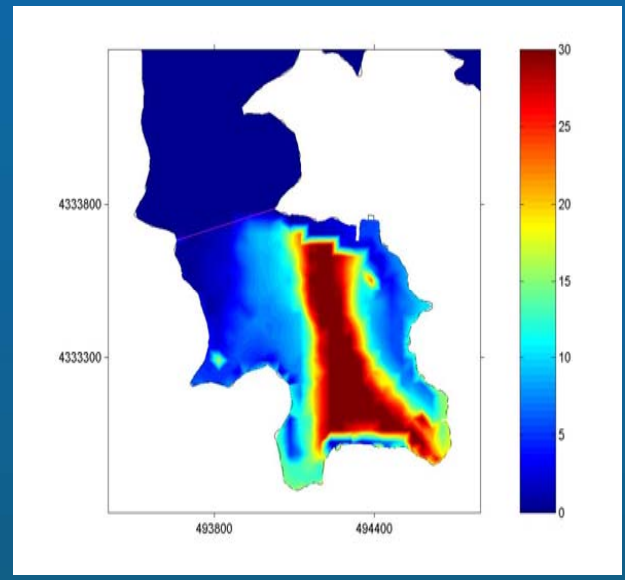
More than 30 papers in peer reviewed journal since 1988, mostly in Balearic and Alboran sub-basins

Results at local scale





Cobertura de Posidonia oceanica



Tiempo de residencia (en días) cerca del fondo. z

Main result: residence time and eutrofication. Water quality and relation with Posidonia Oceanica seagrass coverage in Cabrera Harbour.

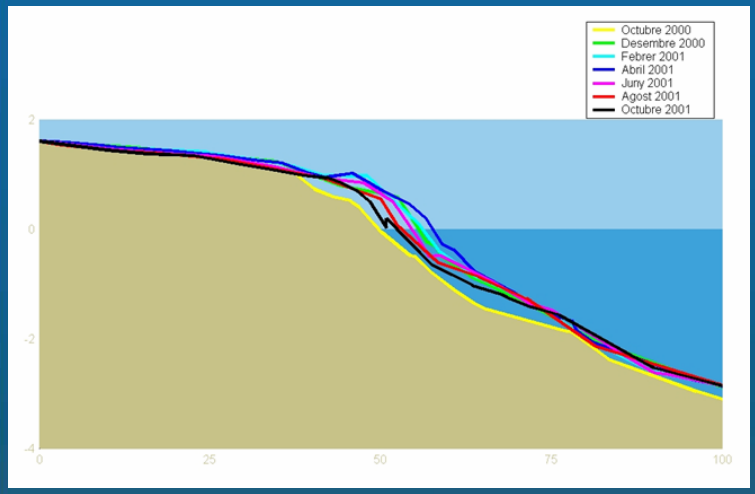
Implications for number of boats allowed in the moorings.

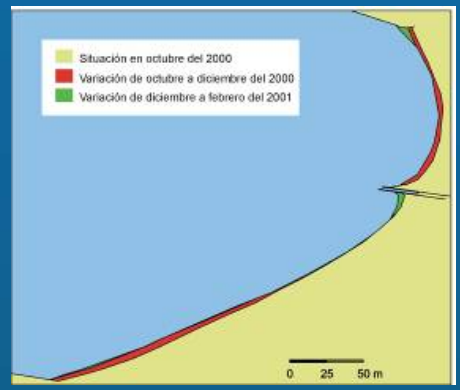
Orfila et al., Contin. Shelf Res., 2004

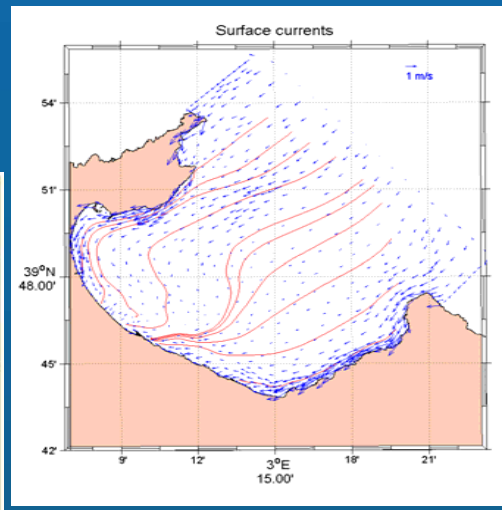
Results at local scale

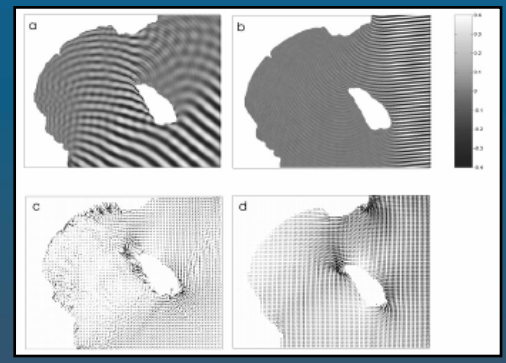
Coastal morphodynamics

Beach erosion and sediment transport







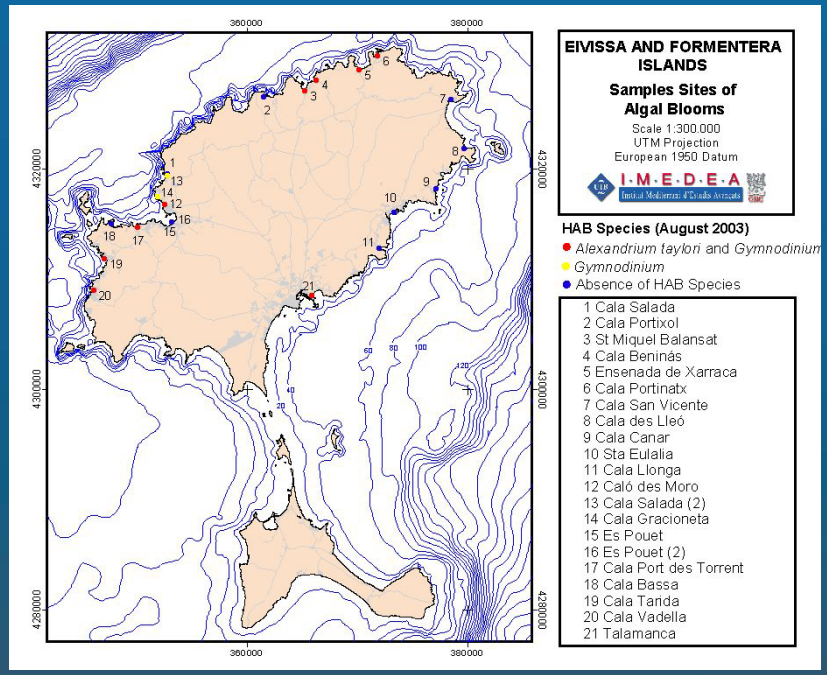


Main results: adjustment after extreme events, fine sediment resuspension by wind

Basterretxea et al., J. Coastal Res., 2004

Results at local scale

Water Quality: HABS proliferation



Playa de Palmira (Calvià)

Water quality, eutrofication: massive proliferation of micro-alguae.

Ec reserach projects.

Basterretxea et al., Estuarine Coast. Shelf Sci.

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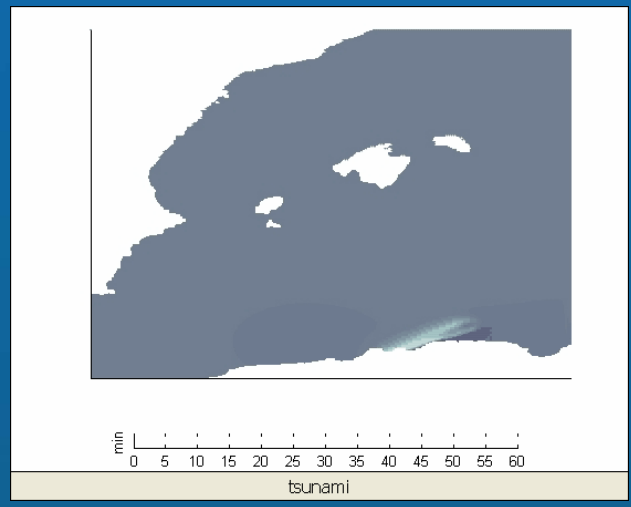
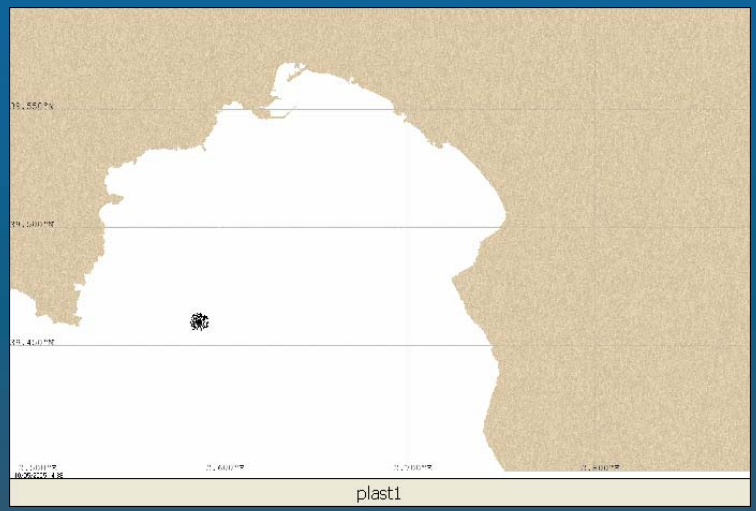
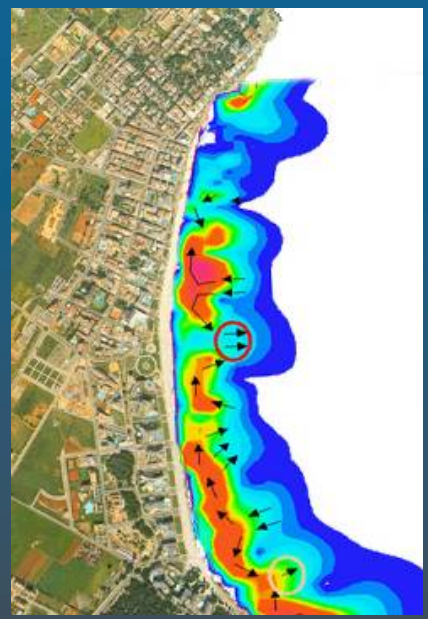
Operational systems being implemented

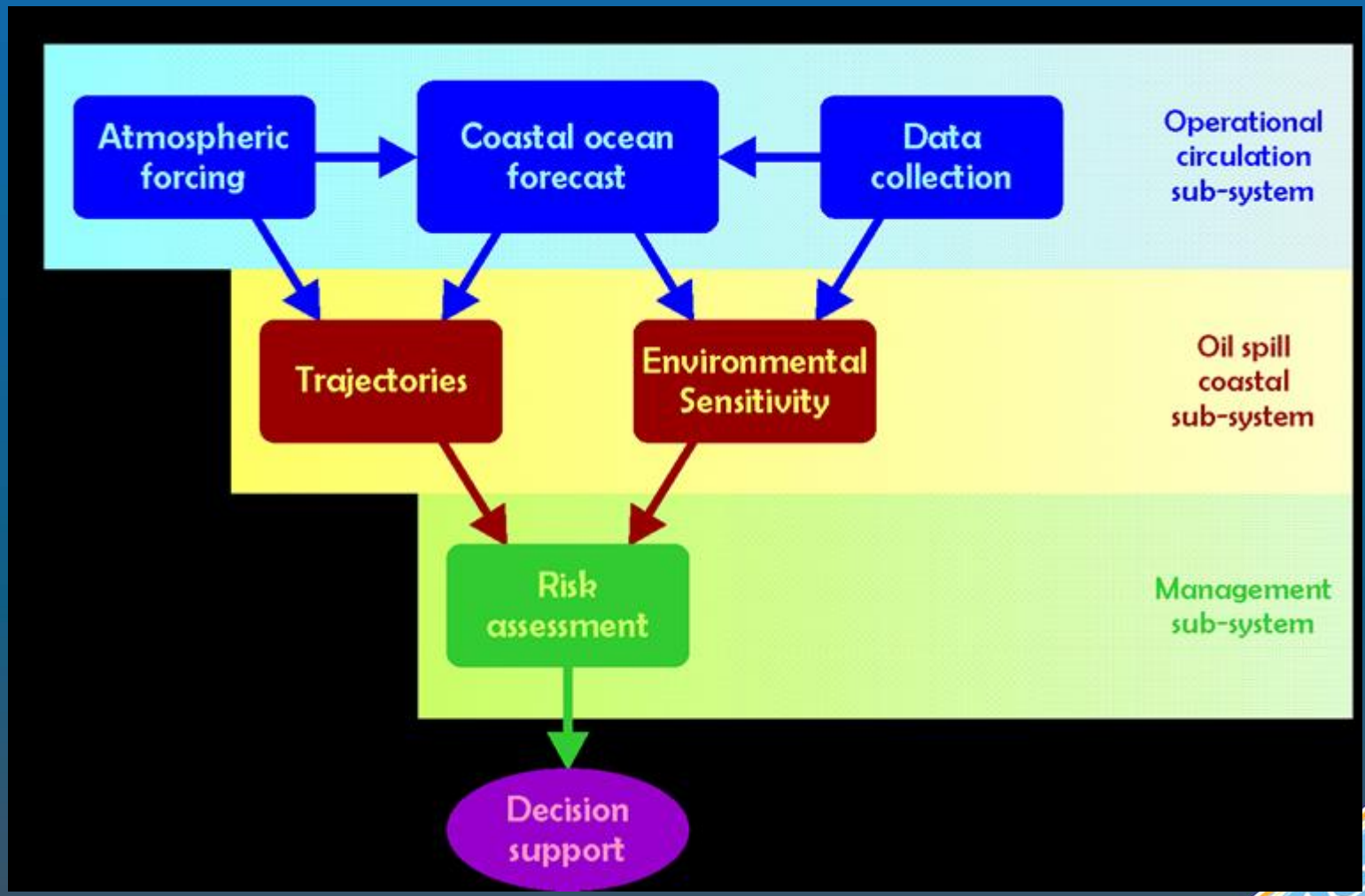
- Oil-spill mapping
- Land vulnerability
- Security in beaches – rip currents
- Prediction of trajectories from Tsunamis.





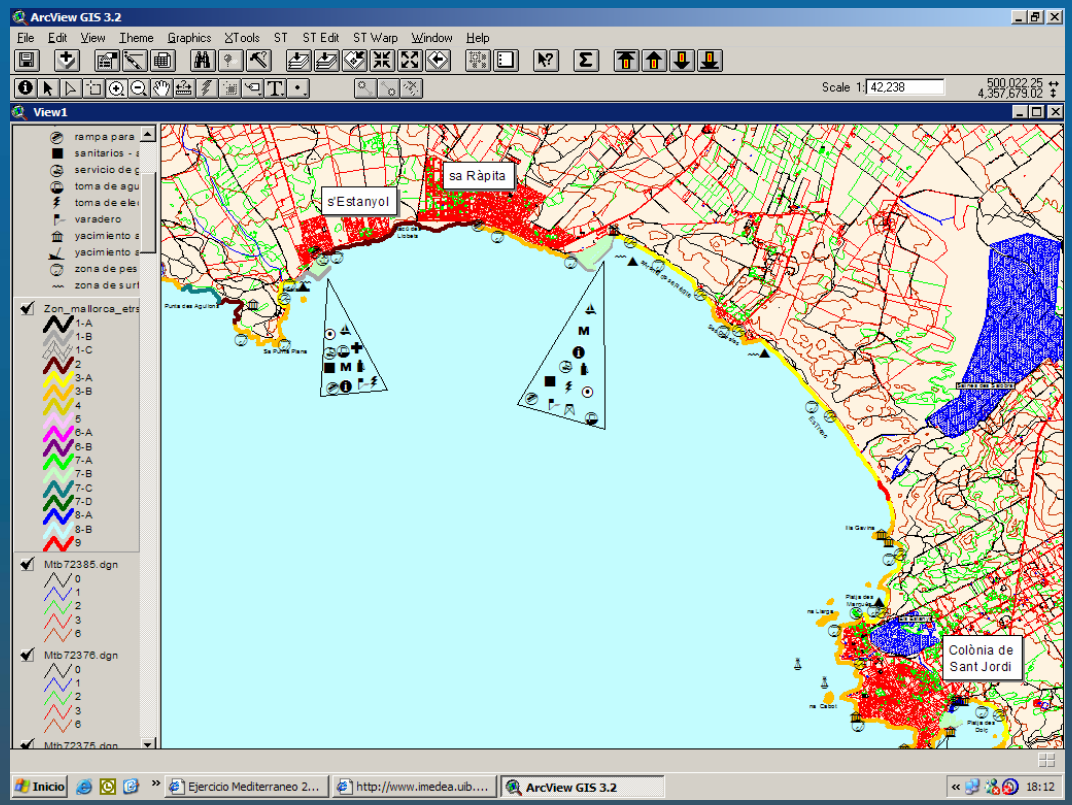


Operational systems being implemented



Operational systems being implemented

Management sub-system

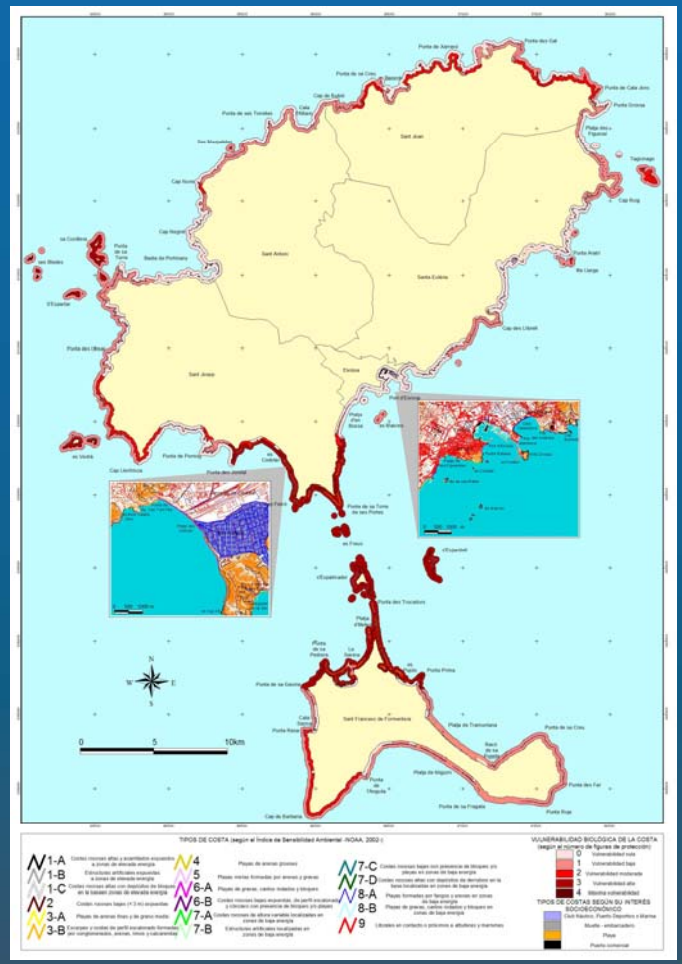


It is based on a Geographical Information System (GIS) for oil spill crisis management.

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

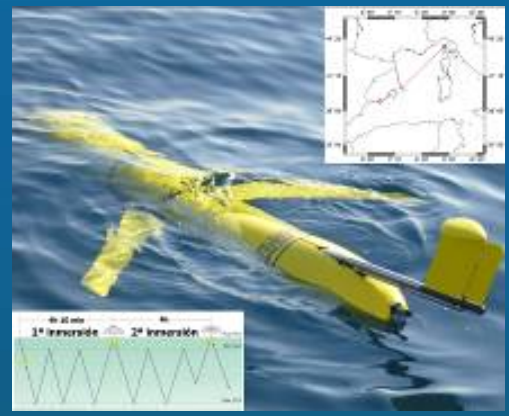
Operational systems being implemented

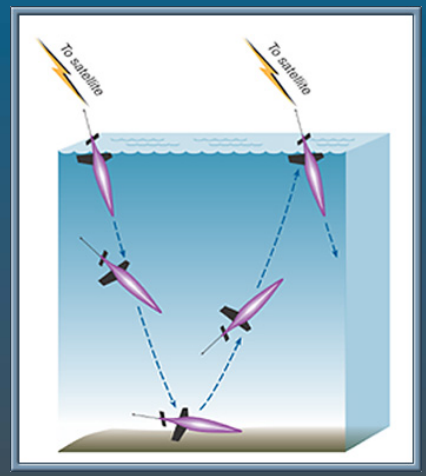
Characterization of the different types of coast: vulnerability and ESI.

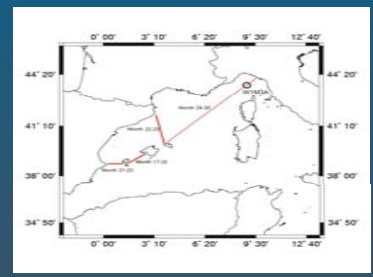


Technology development

- Cormoran (CICYT). *ROV's, AUV's, boyas*
- Mersea (EU). *Gliders*







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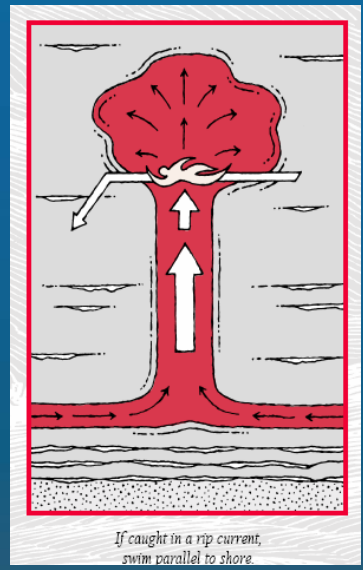
Technology development



Beach monitoring using cameras, breakers, rips, bathymetry changes, etc.

Summary examples of IMEDEA know how

- 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)
- 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)
- Sustainable beaches (Calvià)
- Operational systems for currents and waves in beaches (being implemented)

Outline

1. The coastal zone, complexity, problems and threats
2. General frame, basic principles and challenges: sustainability
3. The new role of science in XXI's century society
4. Examples of coastal research at IMEDEA
5. Integrated Coastal Zone Management (ICZM)
6. The UGIZC project: towards an ICZM Strategy in the Balearic Islands

Integrated Coastal Zone Management (ICZM)

- *ICZM (ICAM 2005)*

"A dynamic process of sustainable management and use of coastal zones taking into account at the same time the diversity of activities and users, the fragility of coastal ecosystems and their interaction"

- *ICZM*

Temporal and spatial scales of managing ?

Think globally, act locally

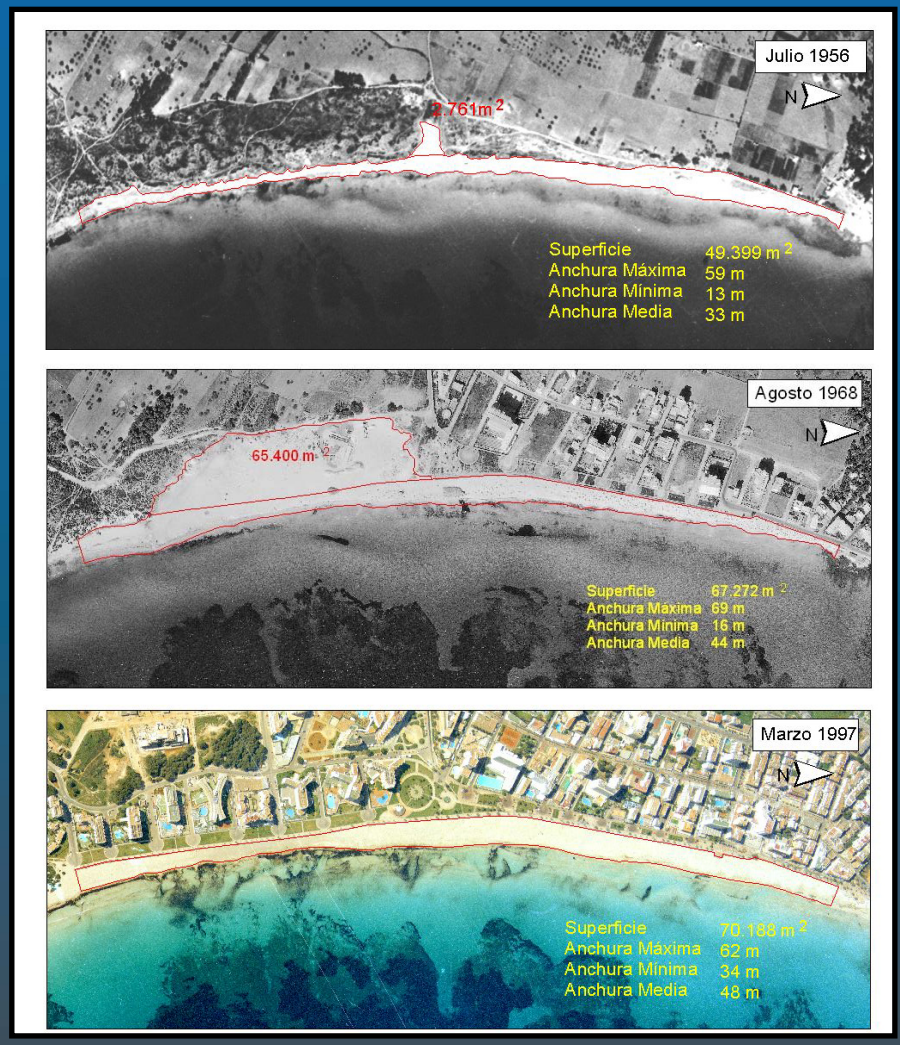
- *ICZM: involve all parties concerned in the management process. (from the beginning)*

Integrated Coastal Zone Management (ICZM)

Background in Europe:

- 70's 80's: Several coastal laws (Spain, USA...)
- 1987: World Commission on Environment and Development (WCED), "sustainable development"
- 1992: Agenda 21 ; Convention on Biological Diversity
- 1995: Global Program of Action for the Protection of the Marine Environment from Land based Activities
- 1996: European Commission, GIZC
- 2002: European Commission, Recommendation 413
- 2002: Plan of Implementation for the World Summit on Sustainable Development
- 2005: Protocol on Integrated Management of Mediterranean Coastal Zones, ICAM

Integrated Coastal Zone Management (ICZM)



Cala Millor study,

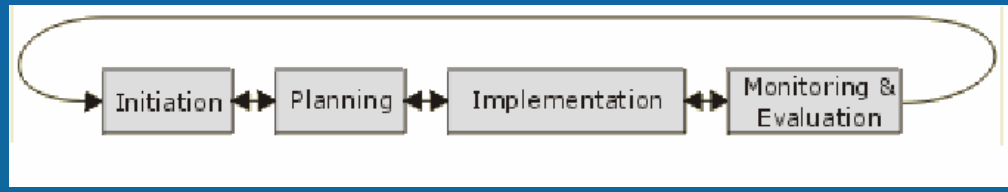
Mallorca, 2005.

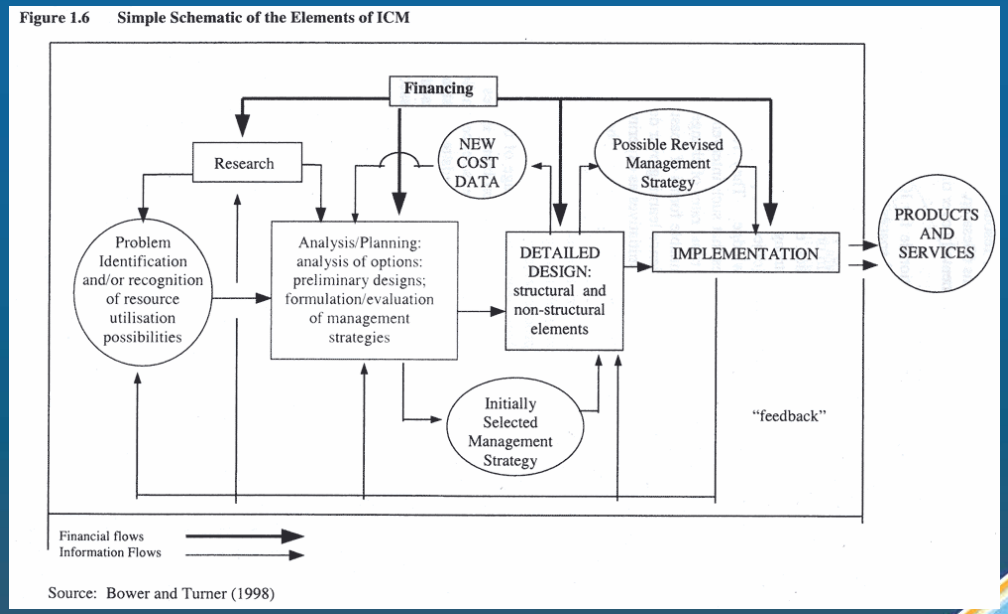
Integrated Coastal Zone Management (ICZM)

Master plan for ICZM

Four main steps

1) Start: problem identification, characterization and diagnostic of the coastal zone (natural, socioeconomic and administrative)
2) Planning phase: options, alternatives
3) Implementation
4) Monitoring and evaluation





Outline

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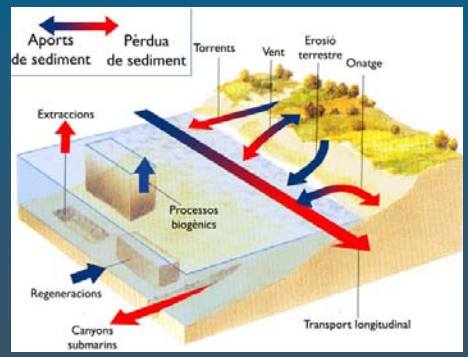
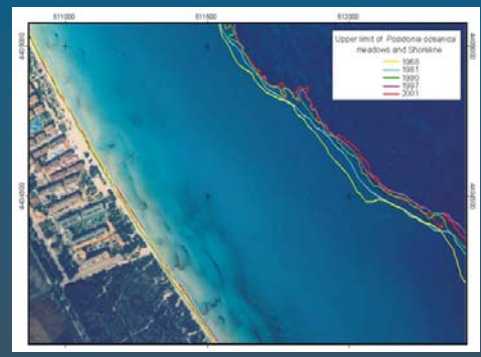
6. The UGIZC project: towards ICZM Strategy Balearic Islands

Specific objectives:

- Generate, develop and incorporate cientific knowledge to ICZM
- Develop new methods, tools and instruments for both science and management.
- Establish the bases and develop the strategies and tools from an integrated perspective to reach sustainability of the coastal zone.
- Re-enforce research on marine and coastal environment as a basis for future sound based decision making.





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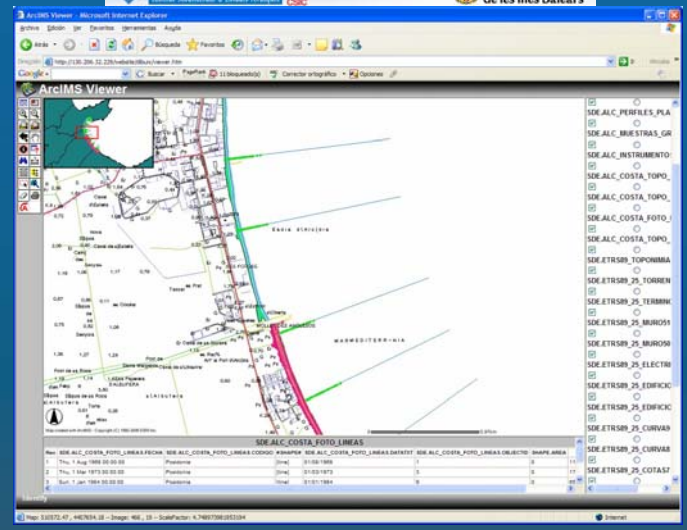
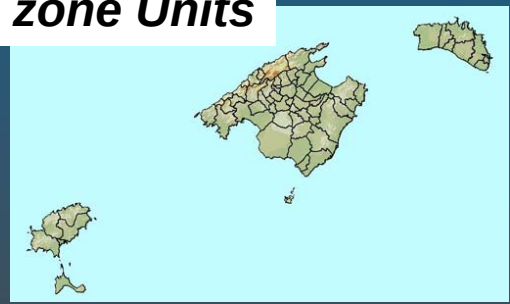
WP3: Tools

Coastal observatory

GIS_Coastal zone



Coastal zone Units



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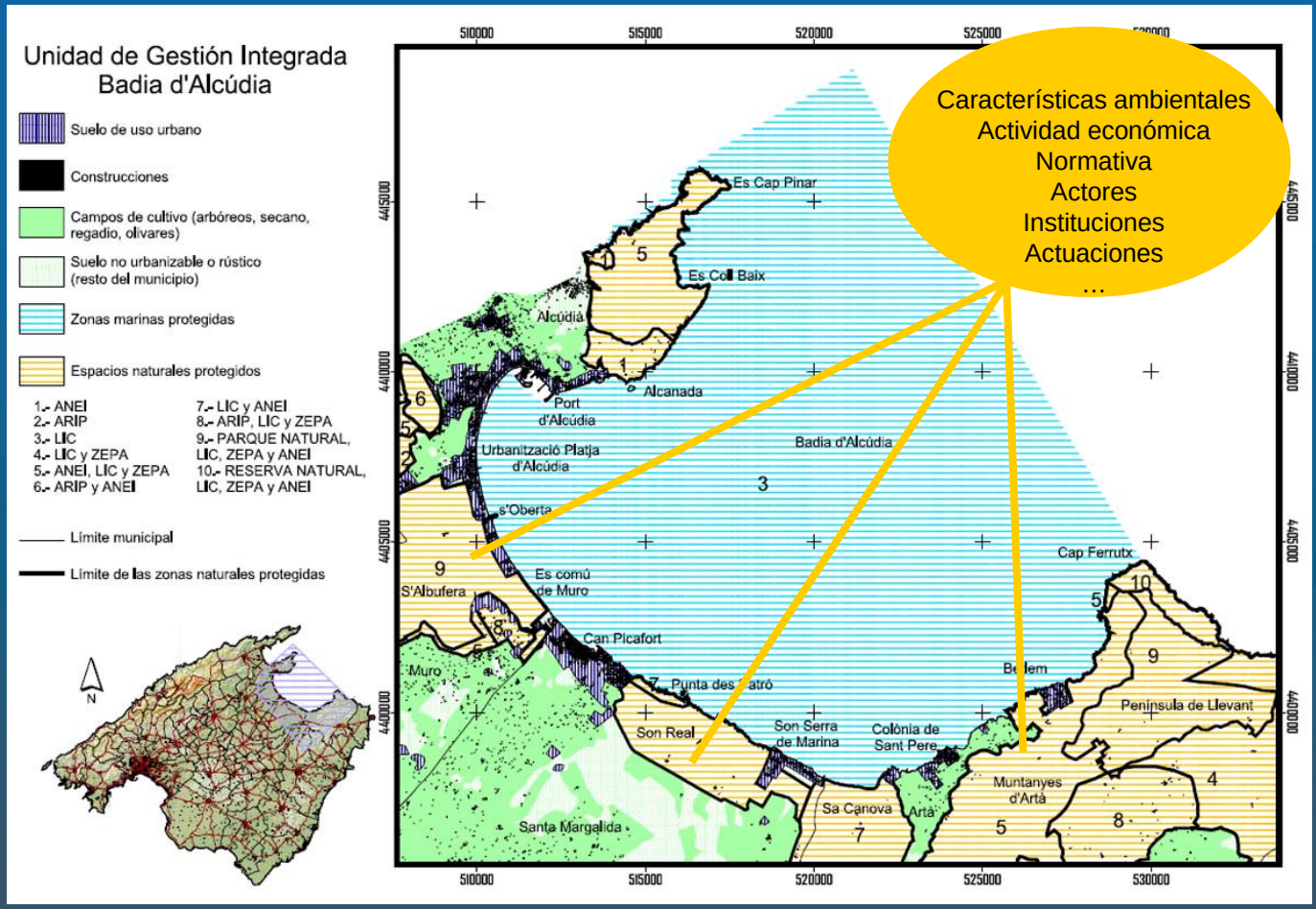
WP3: Coastal zone Units



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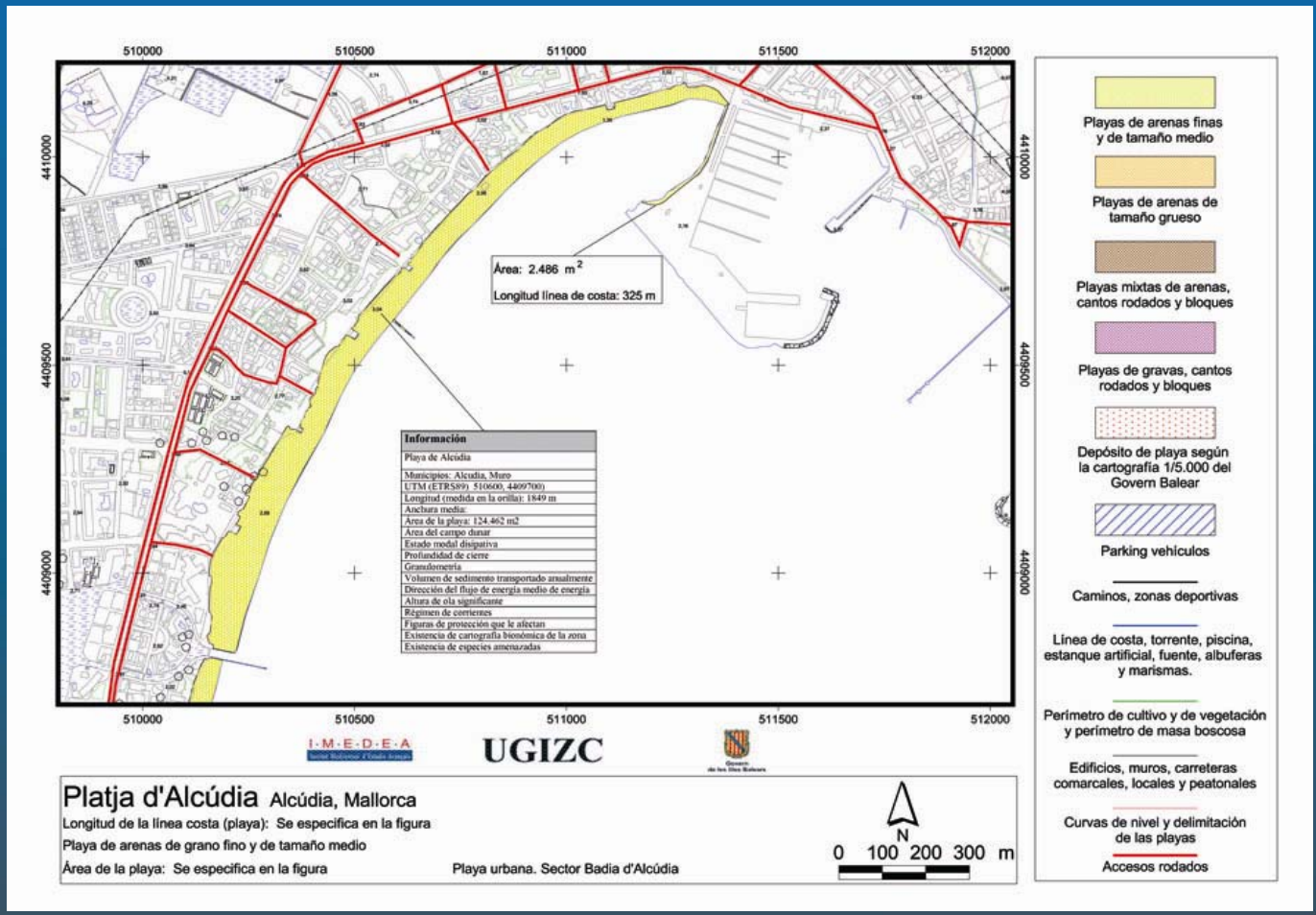
WP3: Coastal zone Units



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WP3: Coastal observatory

Obtención de información del medio costero

- Instrumentación UGIGZ: boya oceánica, sistema de video-monitorización de playas, topografía línea de costa, observatorio socioeconómico
- Instrumentación IMEDEA: boyas oceánicas, instrumentación oceánica, vehículos submarinos...
- Integración de información externa existente sobre el litoral balear

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6. The UGIZC project: towards ICZM Strategy Balearic Islands

Indicators:

OBJETIVOS	Núm	INDICADORES	MEDIDAS
Controlar apropiadamente el desarrollo futuro de los espacios de la costa no desarrollados	1	DEMANDA DE PROPIEDAD EN LA COSTA	11. Dimensión y estructura de la población de la costa
	2	SUELO OCUPADO	21. Porcentaje de ocupación del suelo segundos la distancia con la costa
	3	VELOCIDAD DE OCUPACIÓN DE LA COSTA	31. Áreas urbanizadas
	4	DEMANDA DE TRANSPORTE A{EN} LA COSTA	41. Volumen de tráfico a{en} las autopistas y carreteras principales de la costa
	5	PRESIÓN PARA LOS EFECTOS DEL OCIO EN EL LITORAL	51. Número de amarraderos deportivo s
Proteger y promover la diversidad del patrimonio natural y cultural	6	SUELO DESTINADO A AGRICULTURA INTENSIVA	61. Porcentaje de suelo agrícola intensivo
	7	EXTENSIÓN DE LOS HÁBITATS SEMINATURALES	71. Área con hábitats seminaturales
	8	ÁREA TERRESTRE Y MARINA PROTEGIDA POR NORMATIVA	81. Área protegida para conservación de la naturaleza, del paisaje y del patrimonio
	9	GESTIÓN EFECTIVA DE LUGARES PROTEGIDOS	91. Tasa de pérdida –o daño - a las áreas protegidas
	10	CAMBIOS DE HÁBITATS Y ESPECIES MARINOS Y COSTEROS SIGNIFICATIVOS	101. Estado y tendencia de hábitats y especies específicas
			102. Número de especies por tipo de hábitat
			103. Nombre de especies de la costa en peligro (incluidas en la Lista Roja)
Promover una economía dinámica y sostenible para la costa	11	PÉRDIDA DE DISTINCIÓN CULTURAL	111. Volumen e importancia de ventas de productos locales con distintivos de calidad ambiental regionales o europeos
	12	PARÁMETROS SECTORIALES DE OCUPACIÓN	121. Ocupación total, temporal y estacional, por sectores
			122. Valor añadido de cada sector
	13	VOLUMEN DE TRÁFICO PORTUARIO	131. Número de llegadas y salidas de pasajeros por puertos
			132. Movimiento de mercancías en los puertos
			133. Proporción de bienes cargados por rutas cortas
	14	INTENSIDAD TURÍSTICA	141. Numero de pernoctacions colocas turísticas
			142. Tasa de ocupación hotelera
	15	TURISMO SOSTENIBLE	151. Número de plazas turísticas en alojamientos con ecoetiqueta de la UE
			152. Ratio de noches por número de residentes
Asegurar el buen estado del agua de las playas y el agua de la costa	16	CALIDAD DE LAS AGUAS DE BAÑO	161. Porcentaje de aguas de baño que cumplen con la Directiva Europea de Aguas de Baño
	17	ACUMULACIÓN DE DESPERDICIOS EN EL MAR, LA COSTA Y LOS ESTUARIOS	171. Volumen de desperdicios recogidos por tramos de costa
	18	CONCENTRACIÓN DE NUTRIENTES EN AGUAS COSTERAS	181. Concentración de nitratos y fosfatos en aguas costeras
	19	CONTAMINACIÓN POR ACEITES	192. Volumen de vertidos accidentales de aceites
			193. Número de vertidos de aceite observados desde el aire
Reducir la exclusión social y promover la cohesión a{en} las comunidades costeras	20	GRADO DE COHESIÓN SOCIAL	201. Índices de exclusión social por área
	21	BIENESTAR FAMILIAR	211. Renta familiar media
			212. Porcentaje de población con niveles de educación calificados{cualificado}
			213. Valor de la propiedad residencial
	22	SEGUNDAS RESIDENCIAS	221. Relación entre primeras y segundas residencias

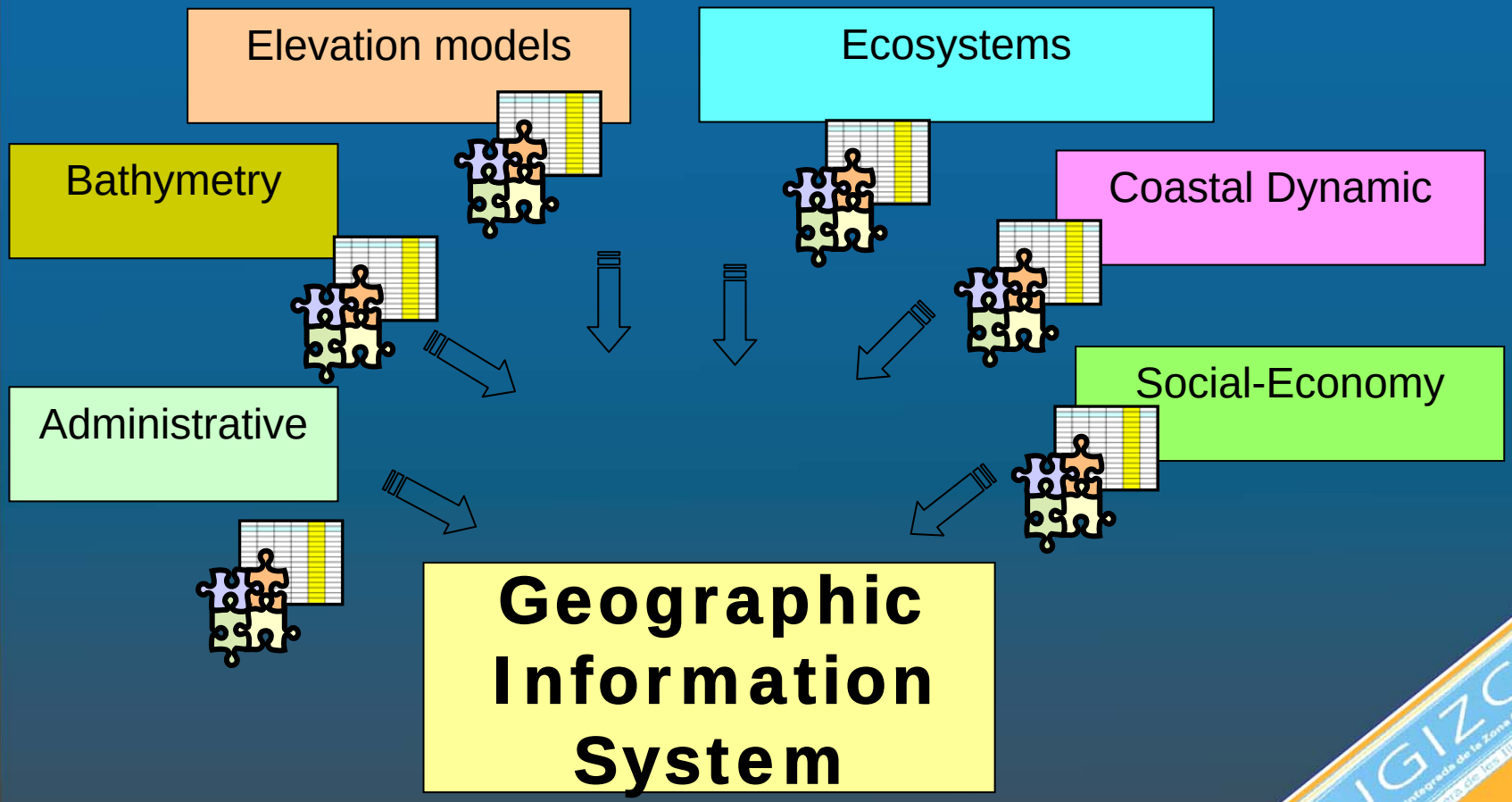
6. The UGIZC project: towards ICZM Strategy Balearic Islands

Indicators:

Uso respetuoso de los recursos naturales	23	ESTOCKS DE PESCA I CAPTURAS DESEMBARCADAS	231. Estado de los principales estoques{stock} de pesca para especie y área marina
			232. Repoblación y regeneración de stocks de biomasa por especies
			233. Captura y mortalidad de peces por especias
			234. Valor de las capturas por puerto y por especies
	24	CONSUMO DE AGUA	241. Número de días con suministro de agua limitado
Reconocer el riesgos para{por} a la cuesta asociados al cambio climático y asegurar la protección ecológica	25	INCREMENTO DEL NIVEL DEL AGUA Y CONDICIONES CLIMÁTICAS EXTREMAS	251. Número de días con tormenta
			252. Incremento del nivel del mar respeto el suelo
	26	EROSIÓN Y ACRECIÓN EN LA COSTA	261. Longitud de costa protegida de la erosión
			262. Longitud de costa inestable
			263. Área y volumen de aportación de arena
	27	PATRIMONIO NATURAL, HUMANO Y ECONÓMICO EN RIESGO	271. Número de personas que viven en zonas de riesgo
			272. Área protegida en zonas de riesgo
			273. Valor de los bienes patrimoniales en zonas de riesgo
Alcanzar una GIZC	28	GESTIÓN INTEGRADA DE LA COSTA	274. Avance en el desarrollo de la Gestión Integrada de la Costa

- Indicador
- Medida
- ¿Qué comunica la medida?
- Parámetros
- Ámbito
  - Espacial
  - Temporal
- Fuente de datos
- Metodología
  - Pasos
  - Productos
- Presentación de datos
- Incremento el valor de los datos
- Agregación y desagregación

WHAT IS GIS-IMEDEA?



GIS-IMEDEA WORKFLOW

GET

RESEARCH DATA

LOOK FOR

LOOK FOR

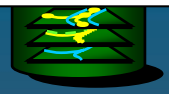
GIVE

GEOPROCESS

ArcView

INSERT

GEODATABASE



CREATE

MAP SERVICES

METADATA

EXTERNAL USER

USE

LOOK FOR

GIS-UGIZC

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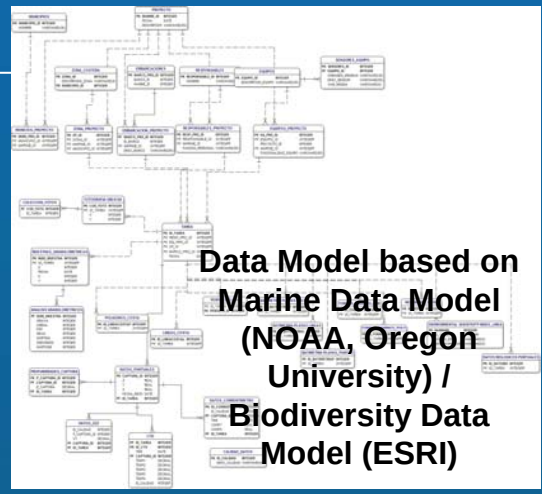
TECHNOLOGICAL ARCHITECTURE

SIGIMEDEA Data Model

GeoInfo. Images Alphanum.

DBMS RELATIONAL



Data Model based on Marine Data Model (NOAA, Oregon University) / Biodiversity Data Model (ESRI)

Protocols
Open Geospatial Consortium

WFS
WMS

File/Image Server

DBMS Server

GIS Server

Web

www

100 Mbps Ethernet

Desktop GIS Acces to Corporative DataBase SIGIMEDEA

Spatial Data Infrastucture uGIZC (following INSPIRE UE initiative)

Remote access from desktop user

Web Map Viewer
-Download data
-Maps on demand
-View, query…

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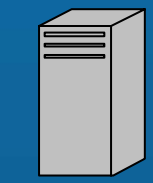
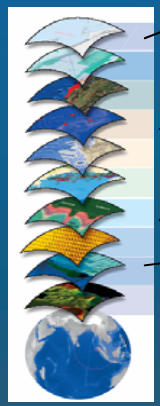
MAP SERVICES SCHEMA

IMEDEA SERVER





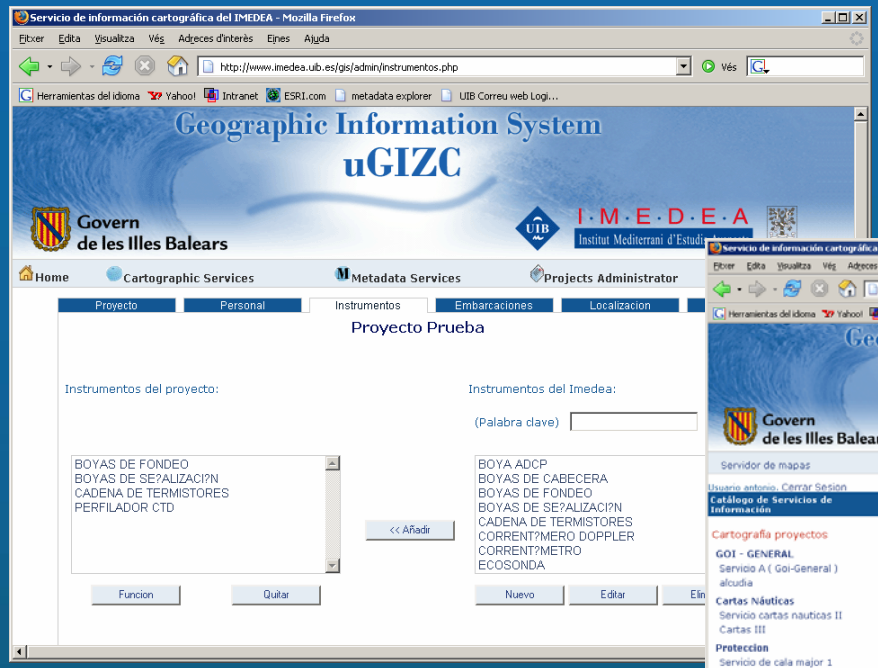
MAP SERVICES

Alcúdia Project
Cabrera Project
Cala Millor Project
Cala Nova Project
Cala sant Vicenç Project
Magalluf Project
Peguera Project
Peregons Project
Santa Ponça Project
Ginebró Project
Vessaments Project
Elevation Models
Bathimetry
(...)

WMS/WFS CONNECTOR

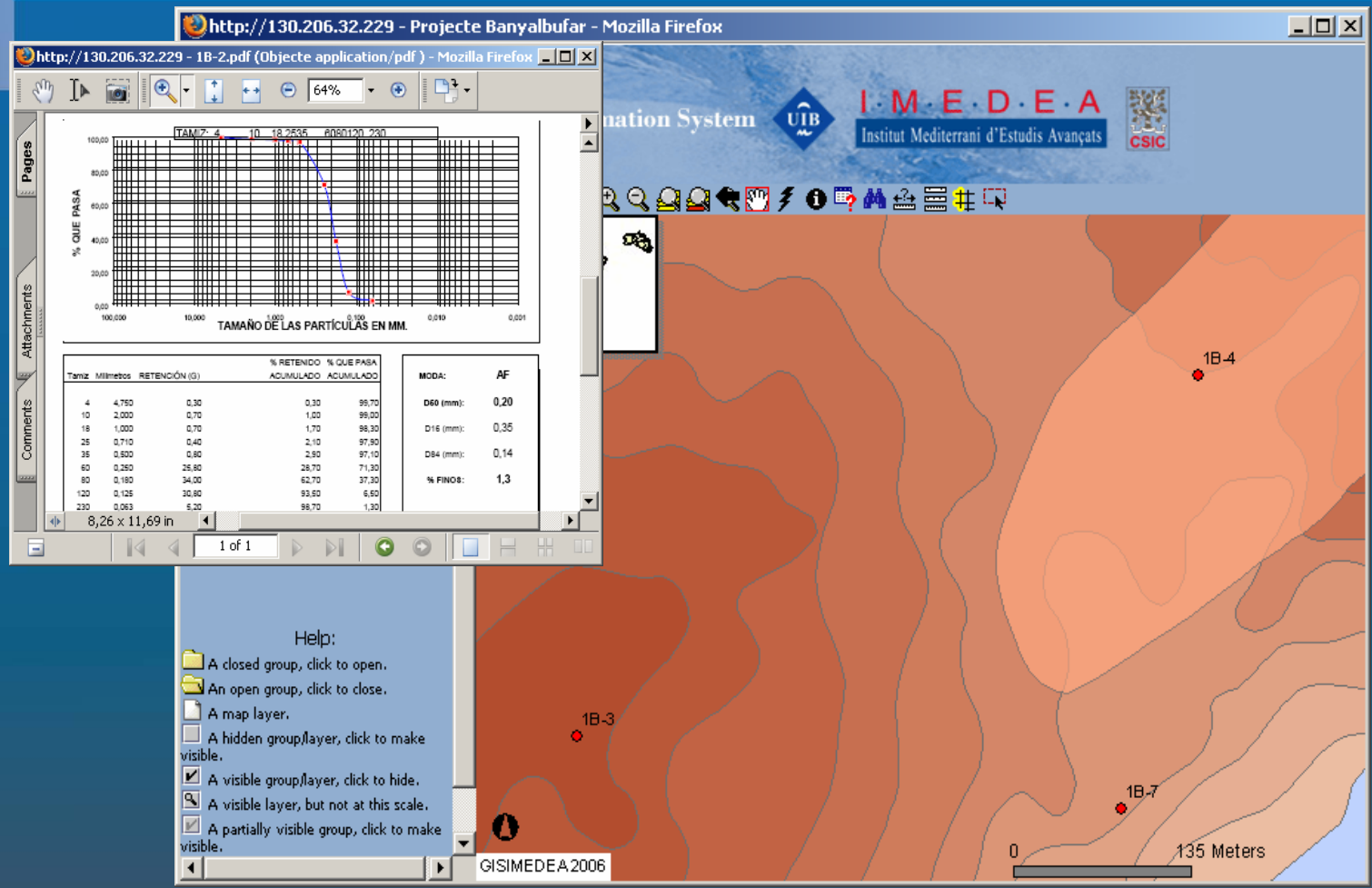
OWN VIEWERS

PROJECTS ADMINISTRATOR



- ORGANIZE PROJECTS
- CUSTOMIZE SERVICES FOR USERS BY GRANTS
- LINK DATASETS WITH DATA MODEL

MAP VIEWERS WITH SCIENTIFIC INFORMATION



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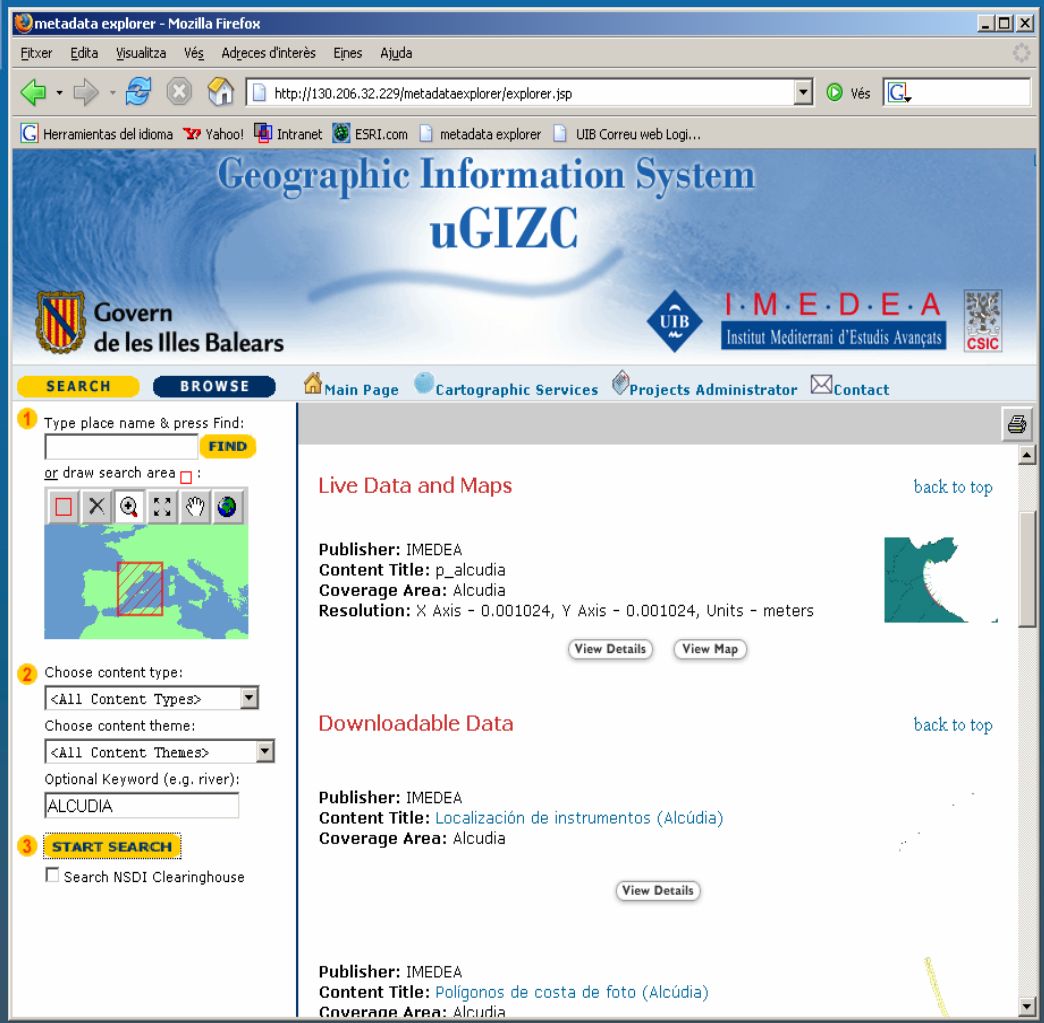
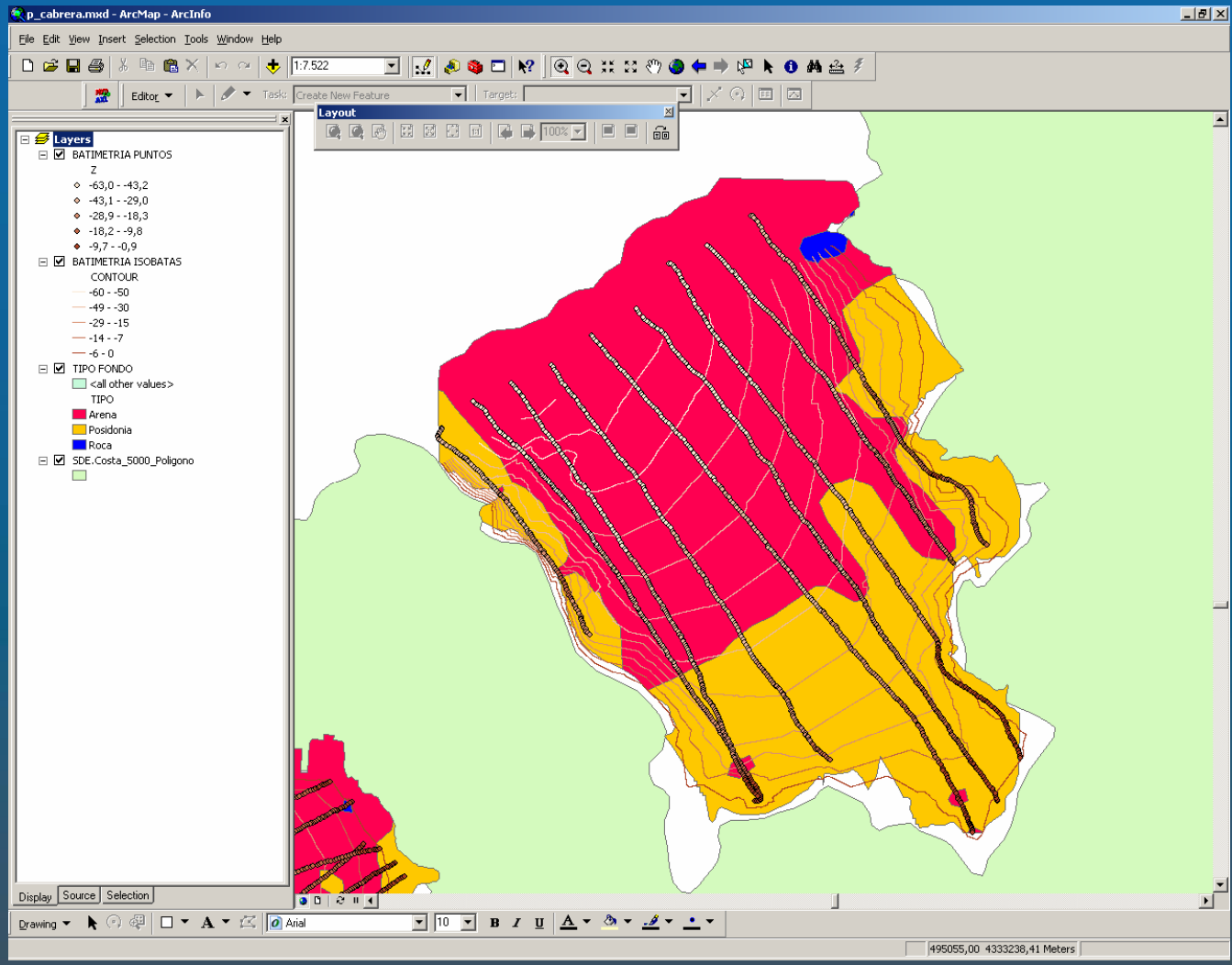
METADATA EXPLORER



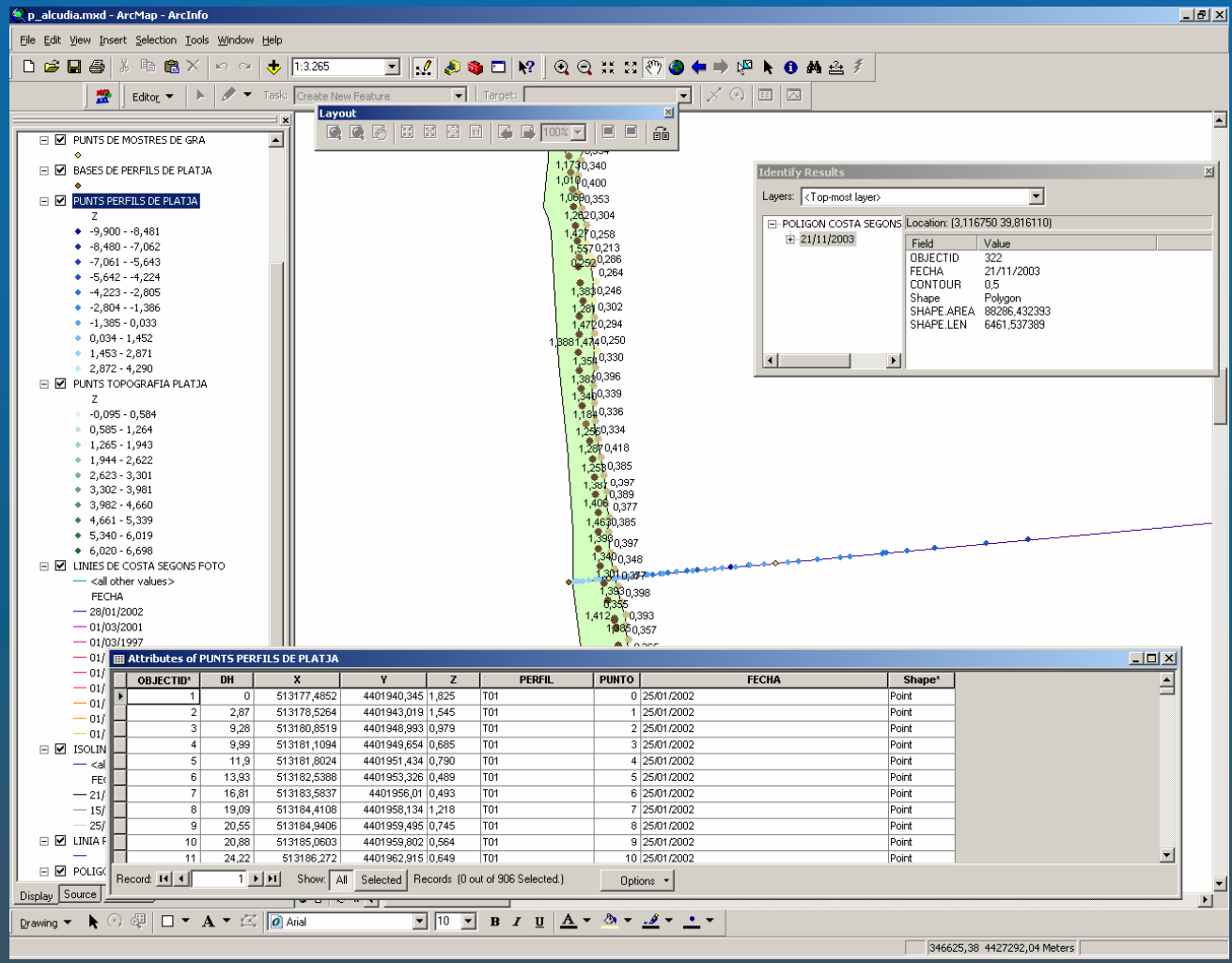
- find by *gazetter*
- Find by map
- Find by kind of data
- Thematic search
- Keyword search
- Find in other warehouses
- Thematic browser
- Data visualisation
- Data download

DAMAGE PROJECT'S OPEN SOURCE VIEWER

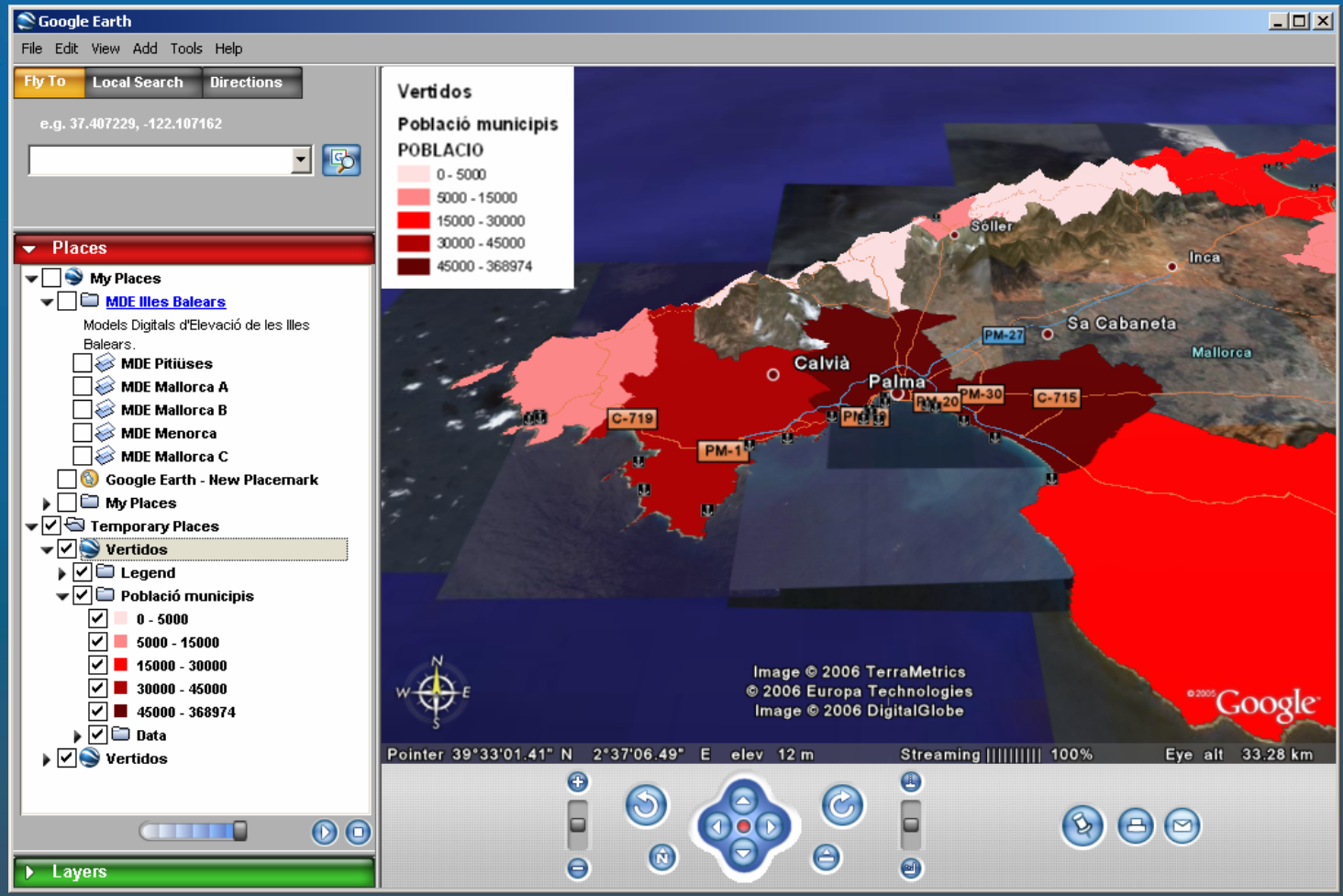
GEOPROCESSING



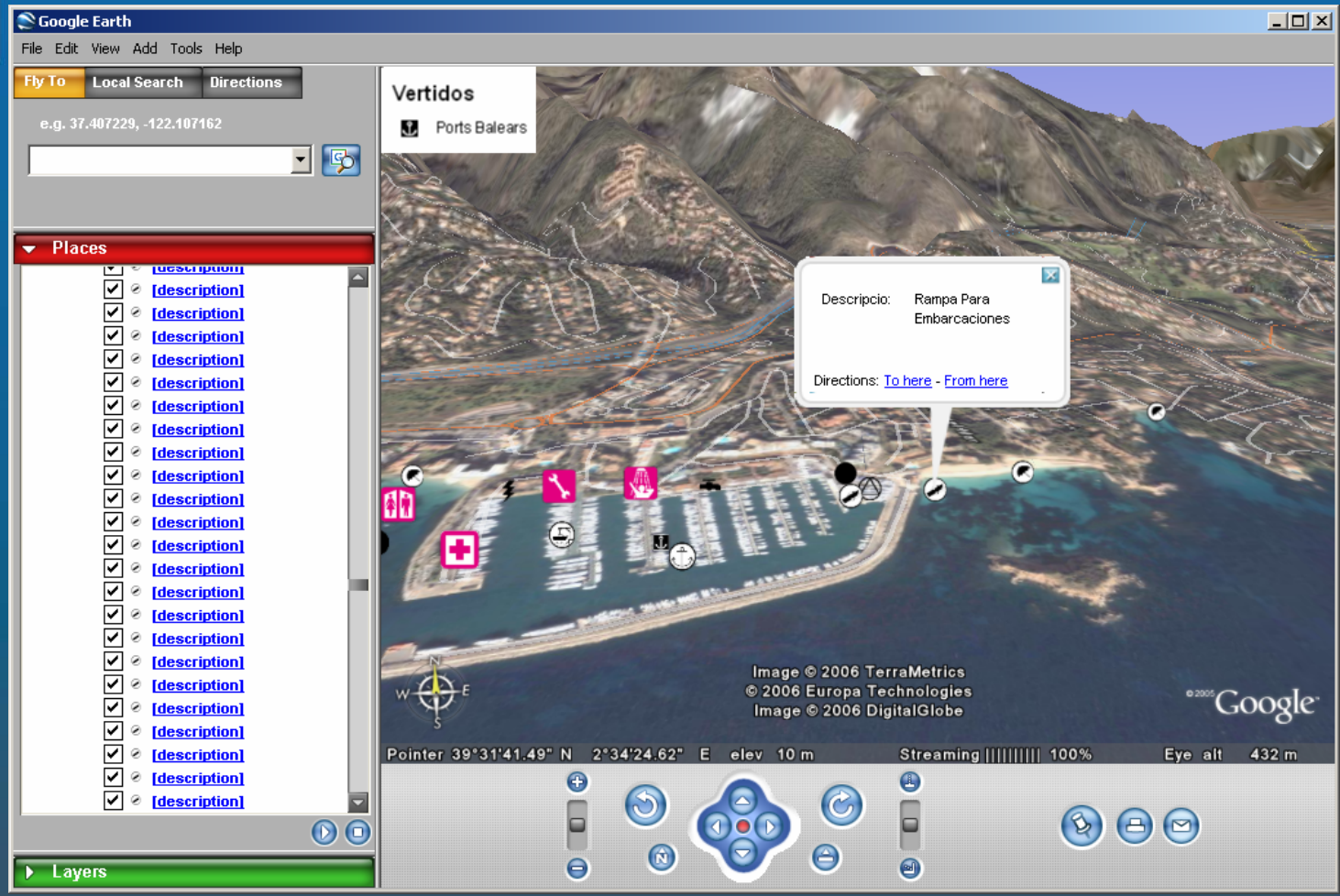
GENERATING BASE DATASETS



OVERLAYING OWN DATASETS WITH GOOGLE EARTH



QUERYING ELEMENTS WITH GOOGLE EARTH



SUMMARY

- We need strong and solid interdisciplinary knowledge of a complex system such as the coastal zone (3 sub-systems). *"Things have to be made as simple as possible, but not simpler" A. Einstein.*
- We need to identify the gaps and act to fill them, establish indicators, threshold values, etc.
- We need an information system public accesss with multiple capabilities for management
- We have to understand sustainability principles, adopt ecosystem based strategies
- We have to be able to solve specific problems without loosing a global longer term approach towards ICZM
- We need consensus approaches, independent scientific studies can be one of the options to reach agreements ("Strong Science for Wise Decision")

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SUMMARY

Tourism and recreation activities in the coastal zone have to be linked to the conservation of ecosystems and economic development.

ICZM is a science based process to reach sustainability.

Research & technology for operational oceanography and ICZM

All this is made possible by ...

Dr. Alberto Álvarez
Dr. Alejandro Orfila
Dr. Gotzón Basterretxea
Dr. Pau Ballester
Dr. Lluis Gomez Pujol
Benjamín Casas
Guillermo Vizoso
Mauricio Ruiz
Dr. Vicente Fernández (now at INGV, Italy)
Dr. Pedro Vélez (now at IEO, Canarias)
Antonia Fornés
Rosario Ferrer
Dr Reiner Onken
Miguel Martinez Ledesma
Daniel Roig
Bartolomé Garau
Macu Ferrer
Amaya Alvarez
Tomeu Cañelles
Saül Pitarch
Carlos Castilla

Muchas gracias

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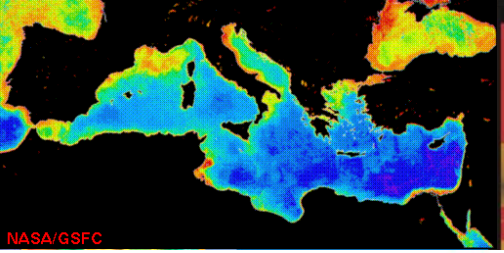

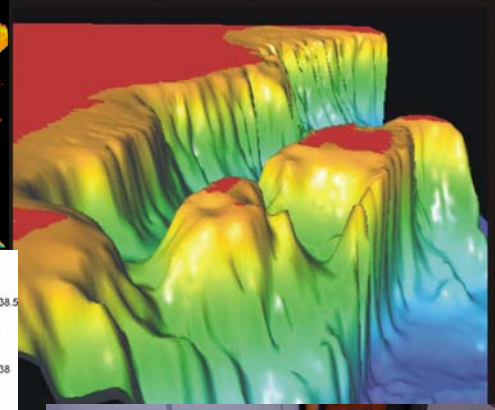

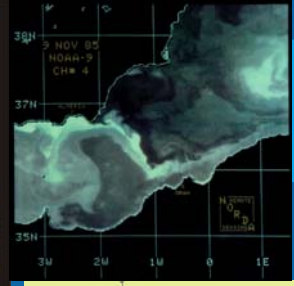

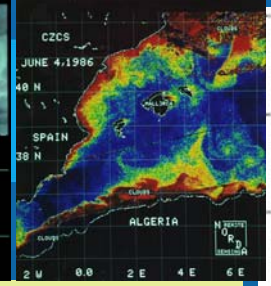

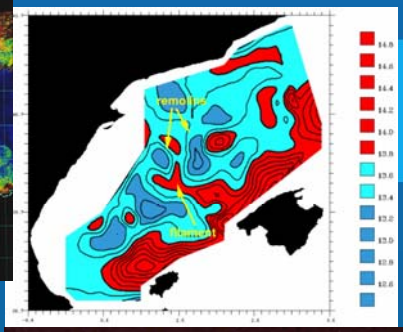

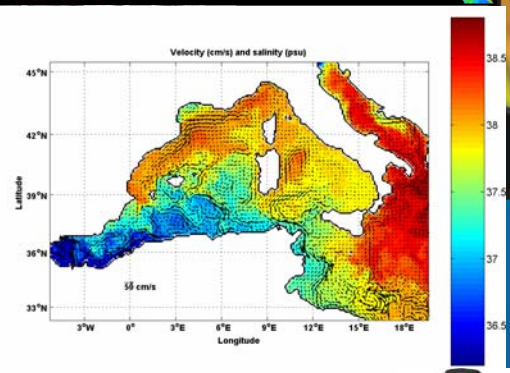

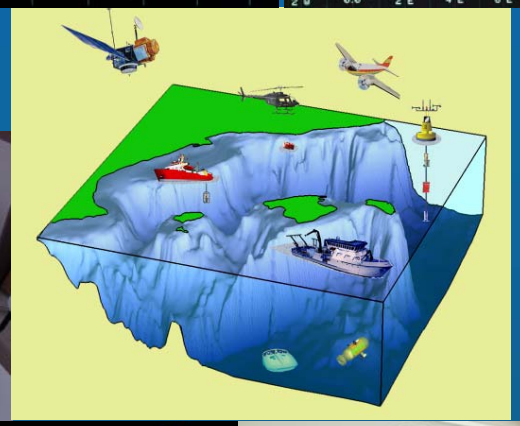

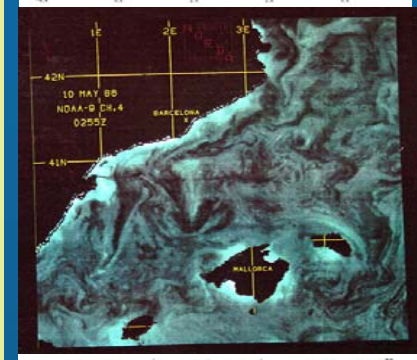

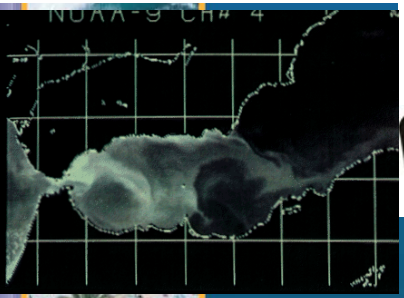

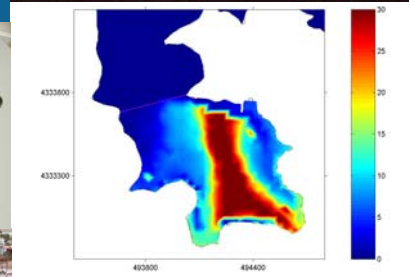

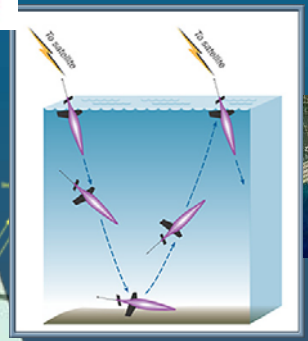

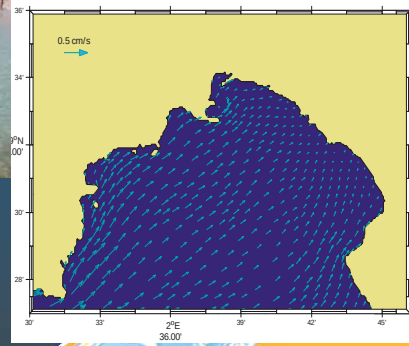

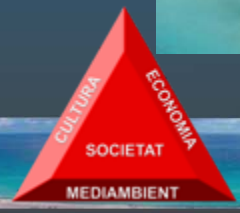

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http://www.imedea.csic.es/natural/goi/goifis/