TOWARDS INTEGRATED COASTAL ZONE MANAGEMENT IN THE MEDITERRANEAN SEA

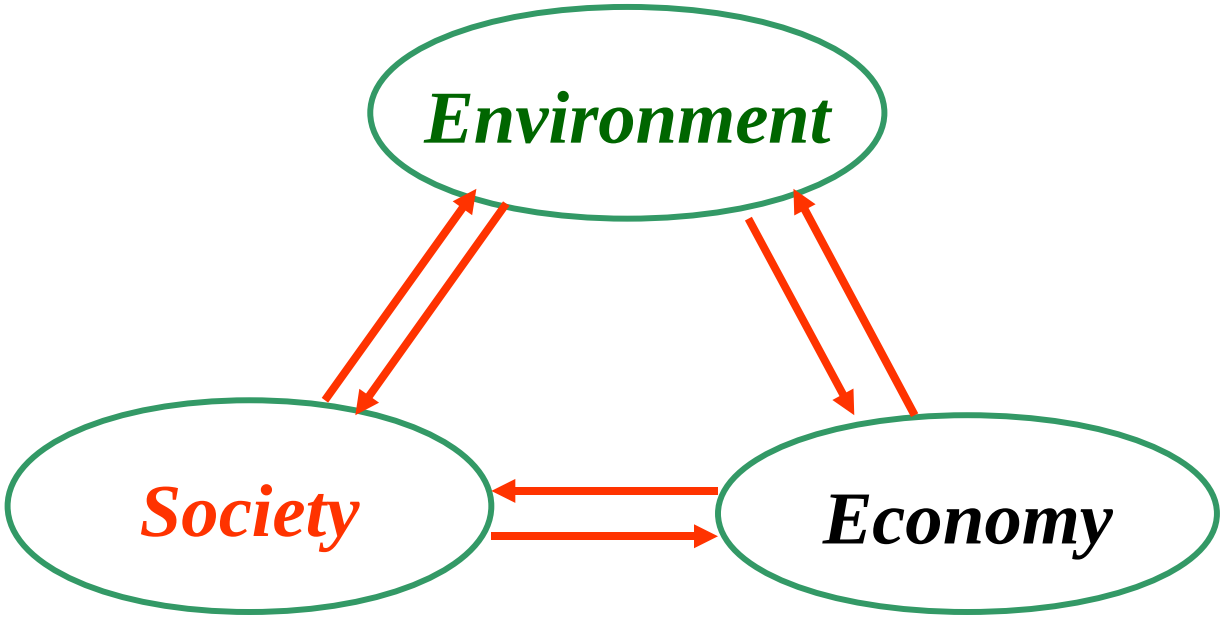
Christos ANAGNOSTOU
Institute of Oceanography
Hellenic Center for Marine Research (HCMR)

chanag@ath.hcmr.gr

The aim

The aim of this presentation is to summarize principles and praxis of the Integrated Coastal Zone Management (ICZM) in the *Mediterranean sea.*

Implementing Integrated Coastal Zone Management (ICZM) means developing a multidisciplinary assessment framework, with a balanced consideration of the Environmental, Social and Economic sectors of the Coastal Systems.



ICZM is a self-evolving, holistic research approach for integrated assessment of Coastal Systems so that

- ***the best available scientific knowledge (science) can be mobilized***
- ***to support deliberative and decision-making processes (policy)***

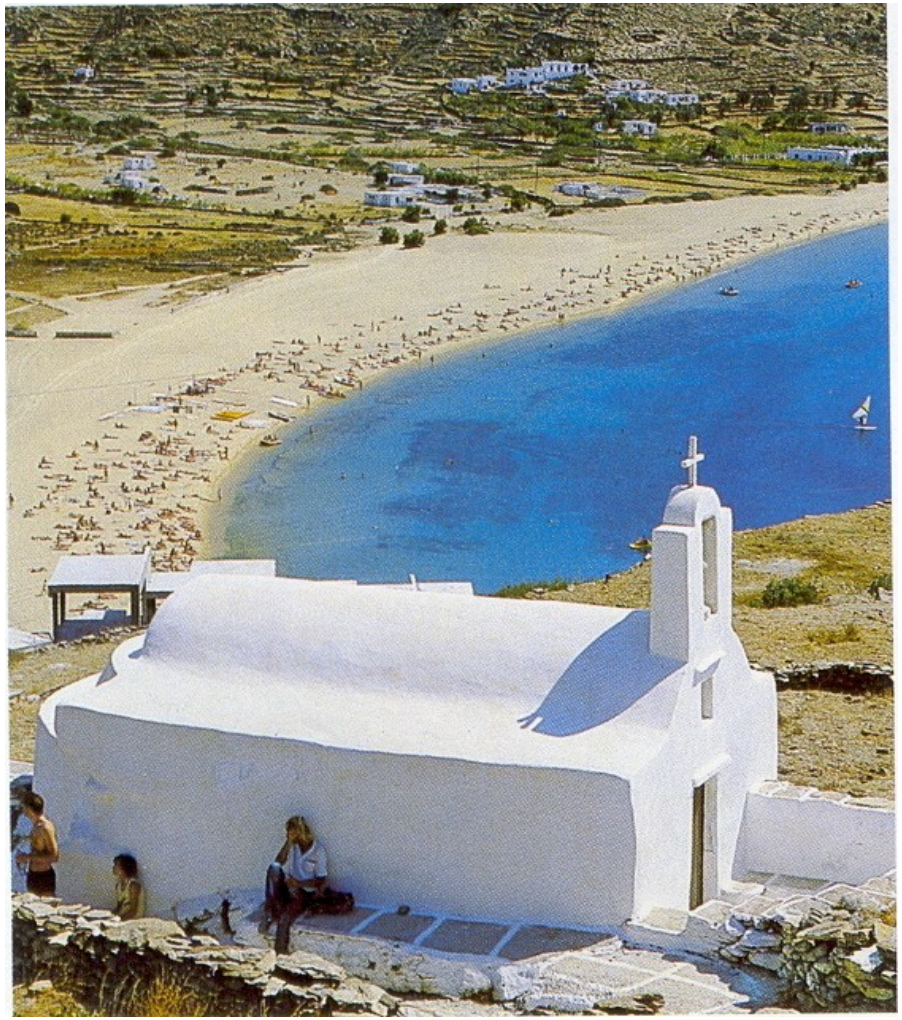
aimed at improving the sustainability of Coastal Systems.

How to achieve ICZM?

To achieve ICZM a restructuring of the science is needed in order to understand the interactions between complex natural and social systems at different spatial and temporal scales.

Participating in this procedure the biggest challenge is to establish a communication way between natural scientists, economists, social scientists, decision makers (politicians).

The natural scientists can present their results based on parameters which have some values,
the economists can do the same translated their parameters in dollars or Euros.
The social scientists, if they take into account the culture and the history, as well as the natural sites in one area cannot parameterize their values.





Who can give a value?





Who can give a value?

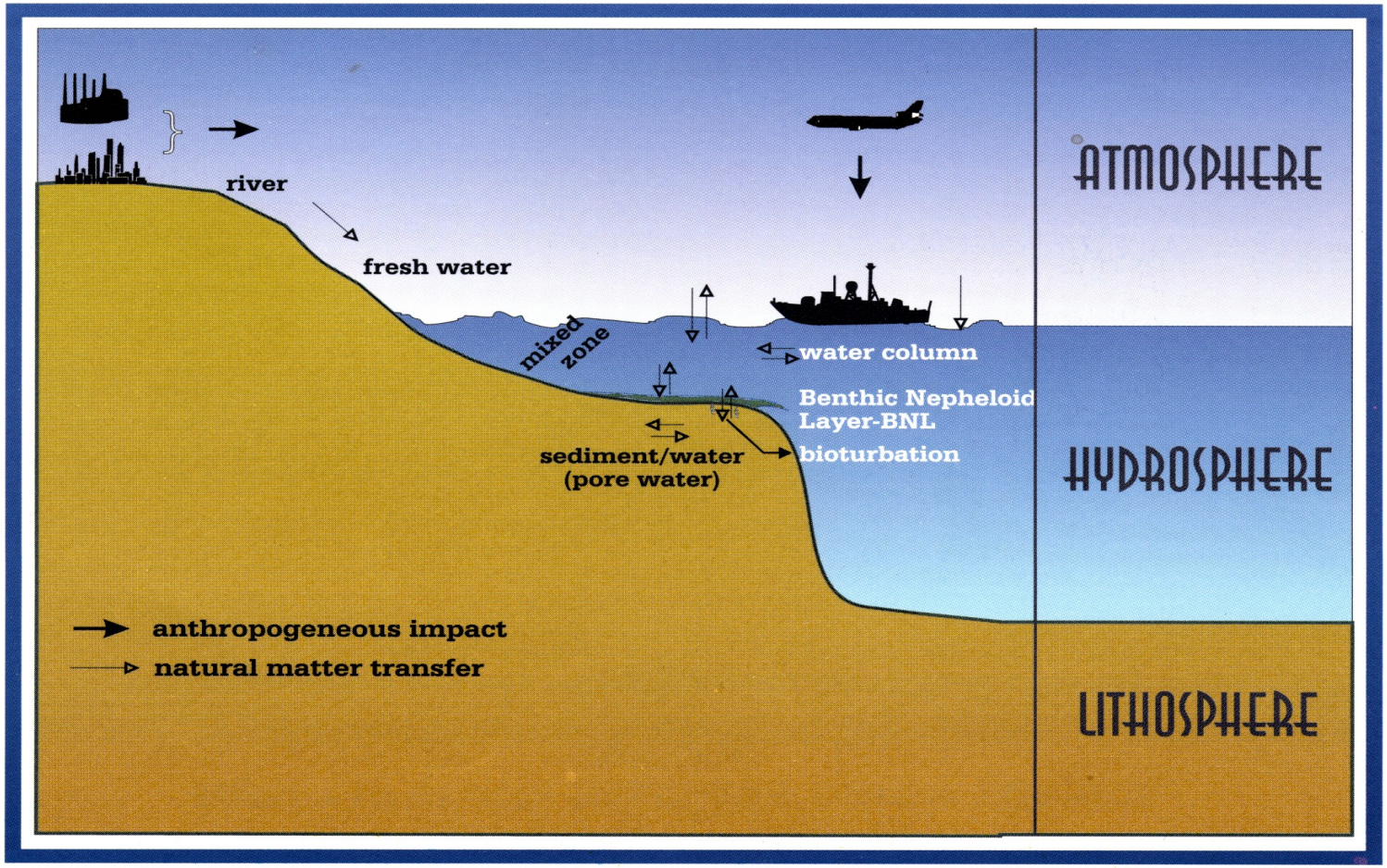
What we need to overcome?

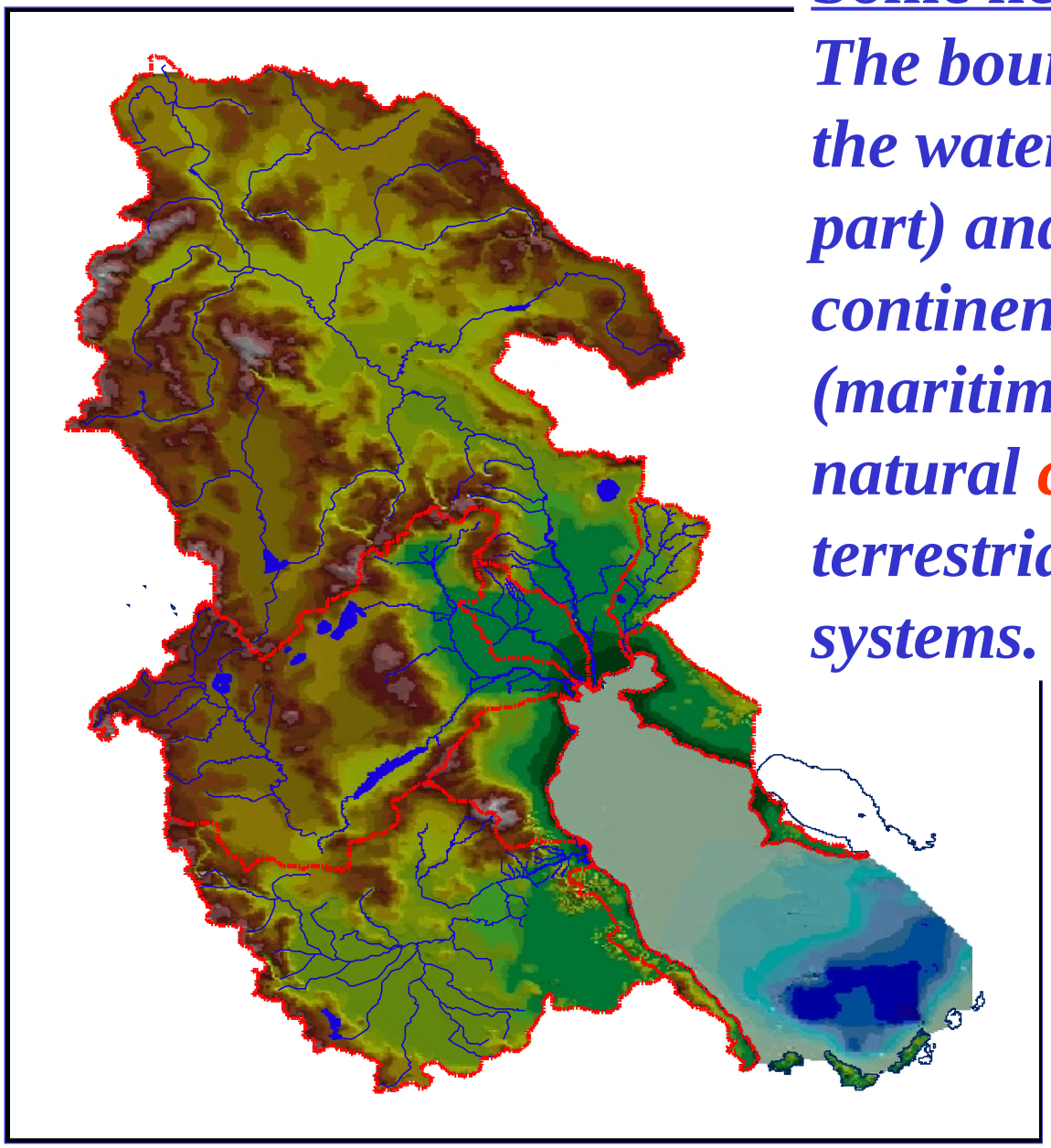
To carry out ICZM in a scientifically credible and operational functionality we need to overcome two critical points

- **to create a working science-policy interface and**
- **to qualify and quantify complex systems.**

Some necessary definitions

We define the term 'coastal zone', as the geographic region consisting of the boundary between land and ocean, which is a dynamic area of natural change.





Some necessary definitions

The boundary zone includes the watershed area (terrestrial part) and the whole continental shelf area (maritime part), keeping the natural continuum between terrestrial and marine systems.

Some necessary definitions

The term 'system' implies a more functional definition related to the interactions on all scales and all functions of the defined "coastal zone area".

Also the following aspects of a system will be discussed:

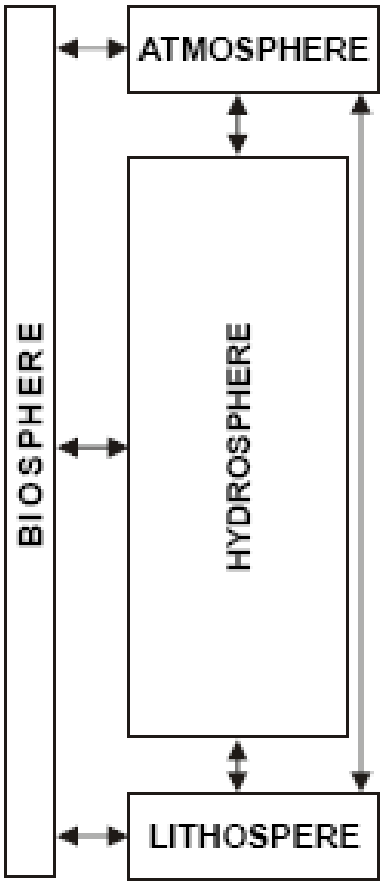
- ***The boundaries;***
- ***The structure;***
- ***The processes*.**

***The boundaries:* The drainage basin, the coastal strip and the shelf**

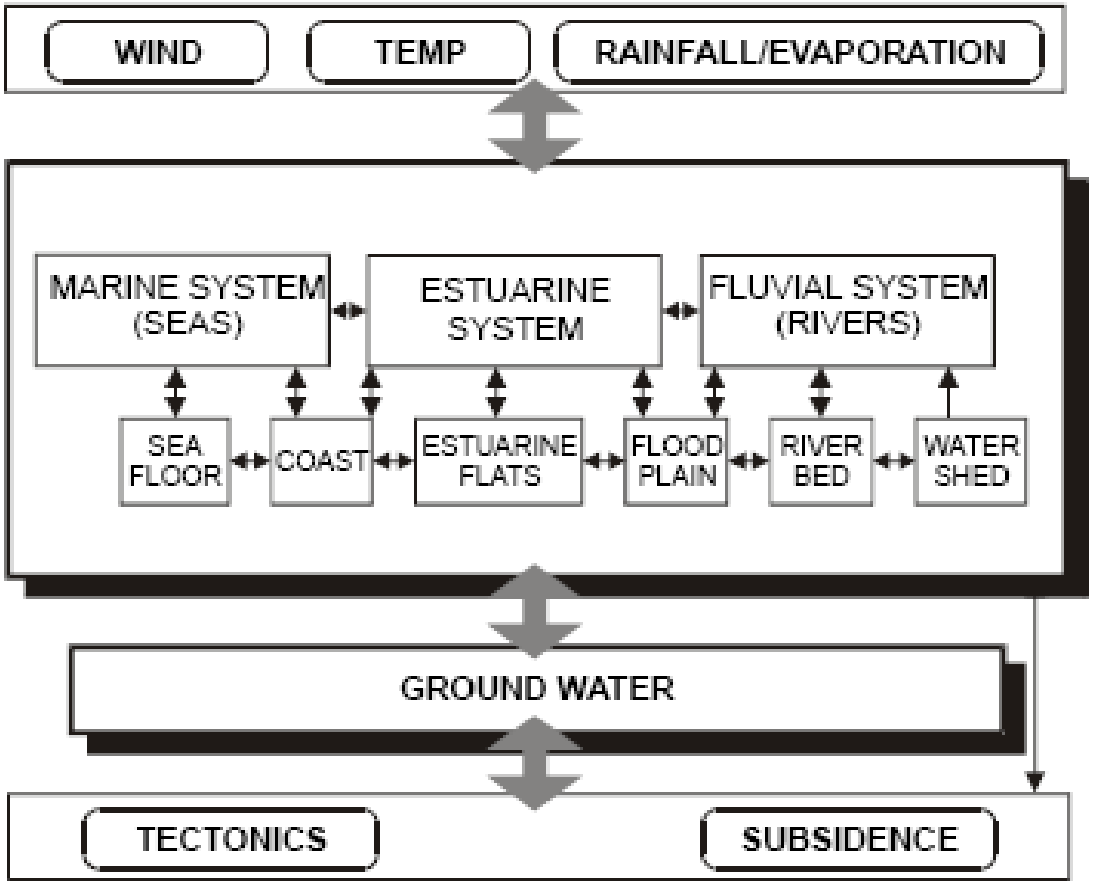
***The structure*: Natural systems have three interacting abiotic components:**

- ***The atmosphere;***
- ***The hydrosphere; and***
- ***The lithosphere.***

***The processes*: Matter and energy flow**



(a)



(b)

a) Generalised system diagram of the natural components of the system

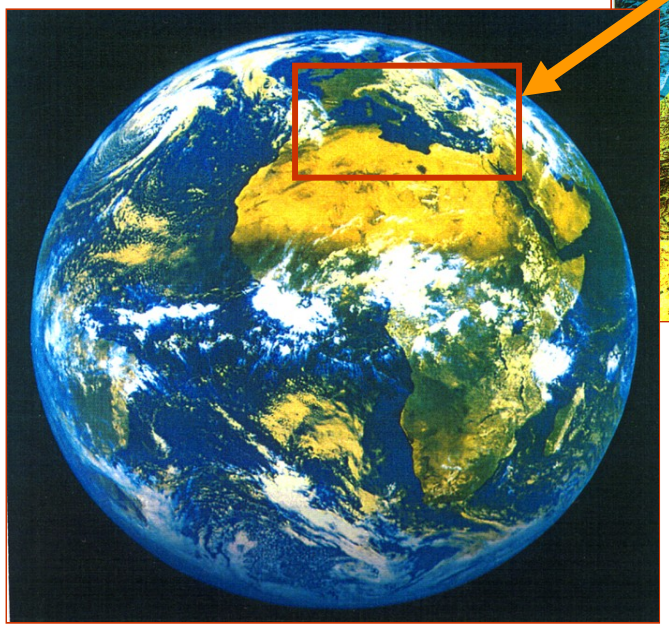
b) Elements of the abiotic component

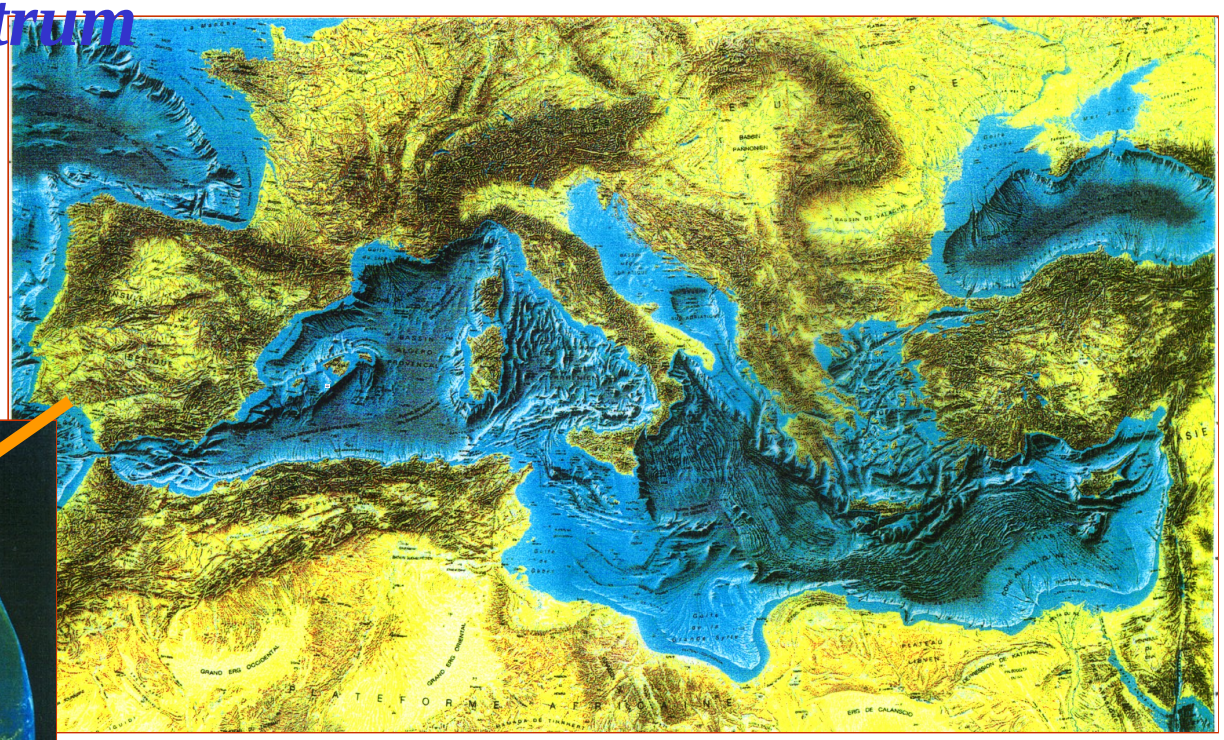
The human system

Also the various components of the human system are coupled through dynamic processes, such as:

- ***Movement of people;***
- ***Fluxes of goods and products;***
- ***Flow of money.***

The Mediterranean Sea, an "open" semienclosed" natural system – The natural laboratory – The small ocean – Mare nostrum





The state of Mediterranean coastal systems (I)

- ***The Mediterranean sea is a region rich in environmental data, specific information and scientific knowledge but extremely poor in consistent and integrated assessments. This difficulty is a major handicap that has to be overcome;***

- ***The Mediterranean sea has more or less unique natural conditions: biodiversity, oligothrophic conditions, regular water renewal, rich coastal biotopes and landscapes, mild climatic conditions, etc.;***

The state of Mediterranean coastal systems (II)

- ***If the sea is still in favourable condition, we are doing much to degrade the landscapes by urbanising the coast beyond carrying capacities; we are also degrading the transition zone, the biotopes.***

- ***We discharge too much untreated waste water and toxic substances; and biodiversity is threatened by bringing invading fauna and flora species and scraping the sea beds..***

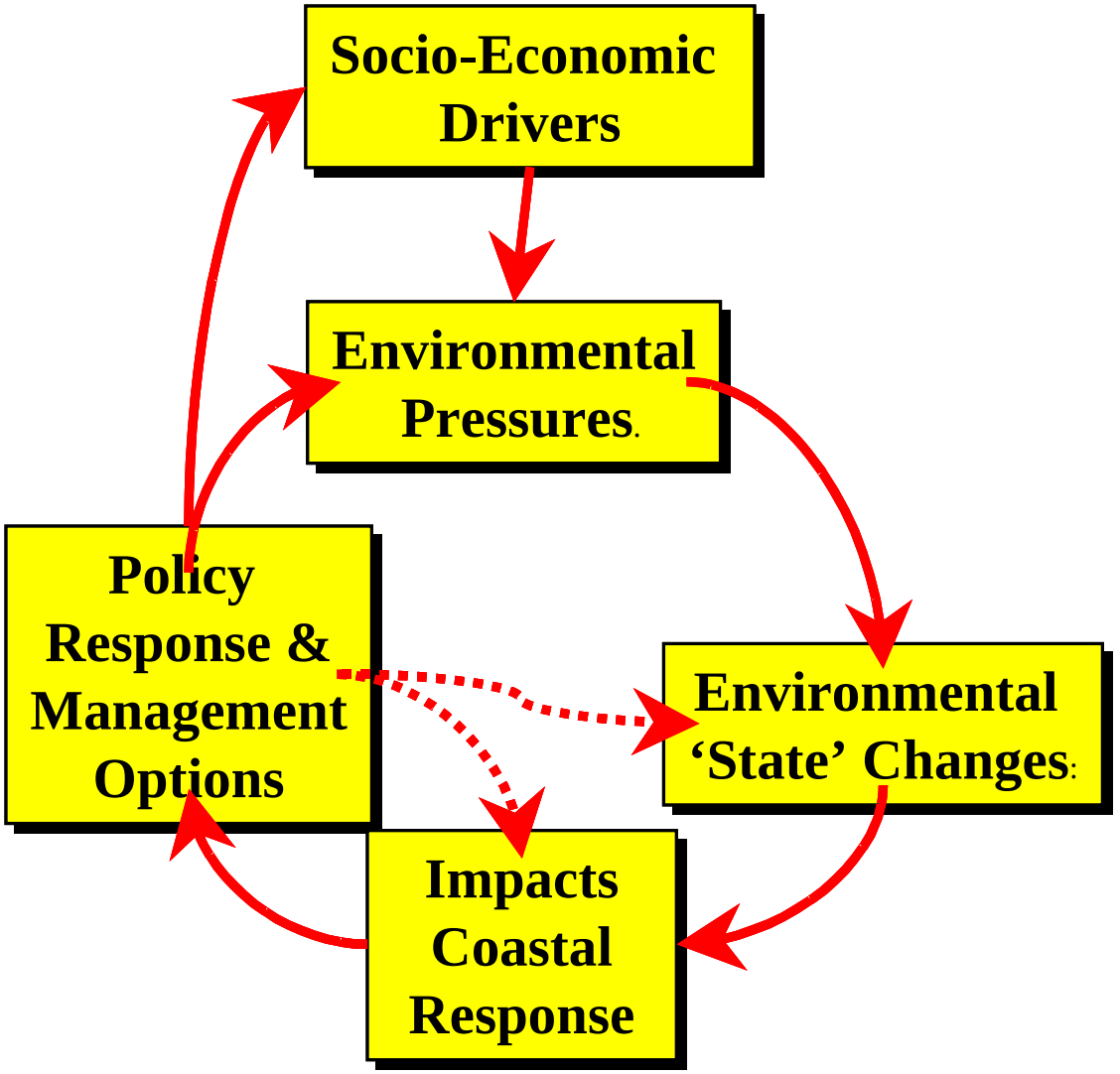
The state of Mediterranean coastal systems (III)

To approach the state of Mediterranean coastal systems we adopt the DPSIR assessment framework (Driving Forces/Pressures/State/Impacts/Response) developed by EEA.

This framework describes the various interactions between human activities and environment.

DPSIR Framework

For the management of the coastal zone the Driving-Pressure-State-Impact-Response (D – P – S – I – R) approach can be adopted.



The DPSIR causality model shows

***D**riving forces (e.g. industry and transport) producing*

***P**ressures on the environment (e.g. polluting emissions), which then degrade the*

***S**tate of the environment and have*

***I**mpacts on human health and eco-systems. Society*

***R**esponds with various policy measures.*

A. Driving forces and pressures in the Mediterranean coastal systems

Urbanisation

Tourism

Agriculture

Fisheries

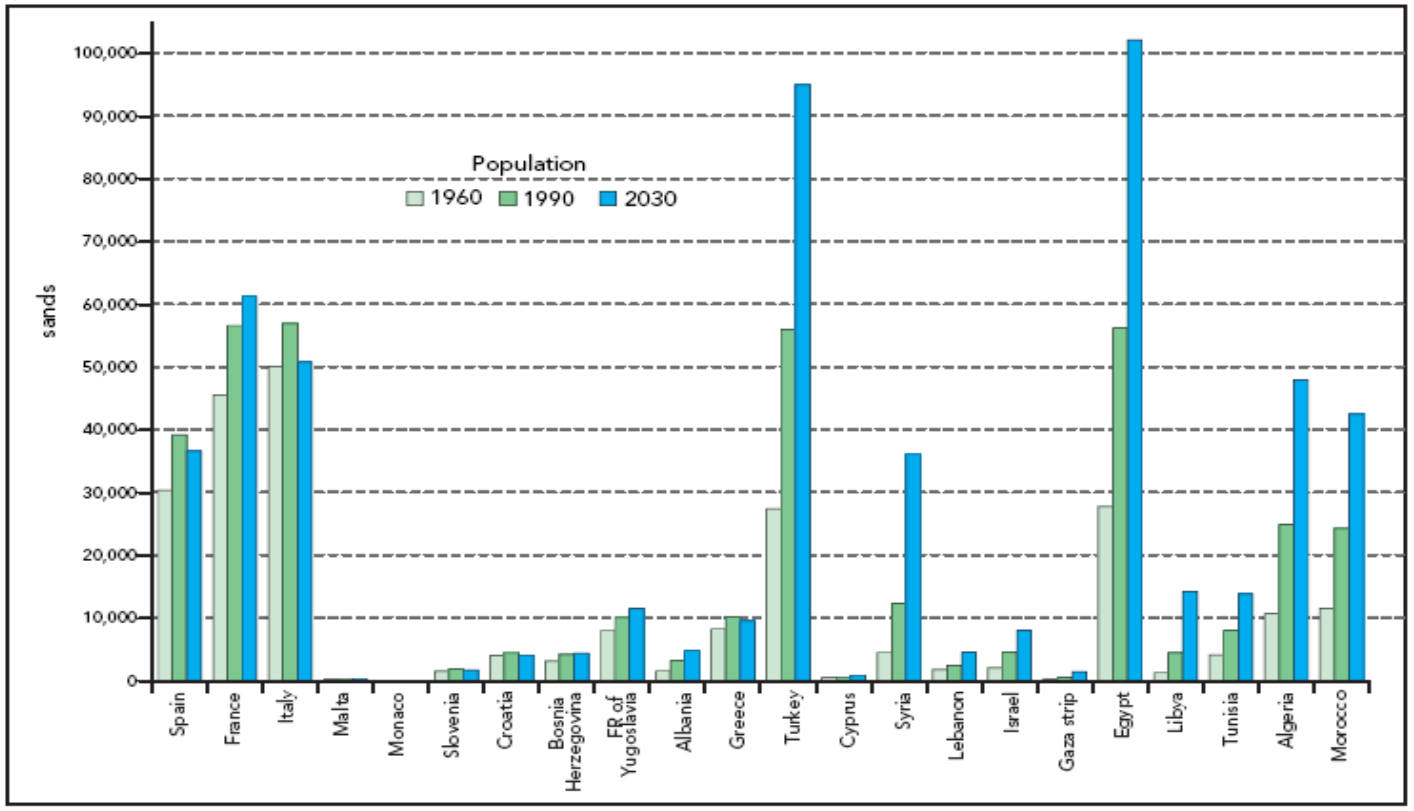
Aquaculture

Industry

Maritime transport

Concentration of populations (resident and non-resident) and human activities around the Mediterranean basin present considerable threats to coastal systems and resources:

Population increase in the different Mediterranean countries



Source: Blue Plan databases, United Nations, World Population Prospect, The 1994 Revision

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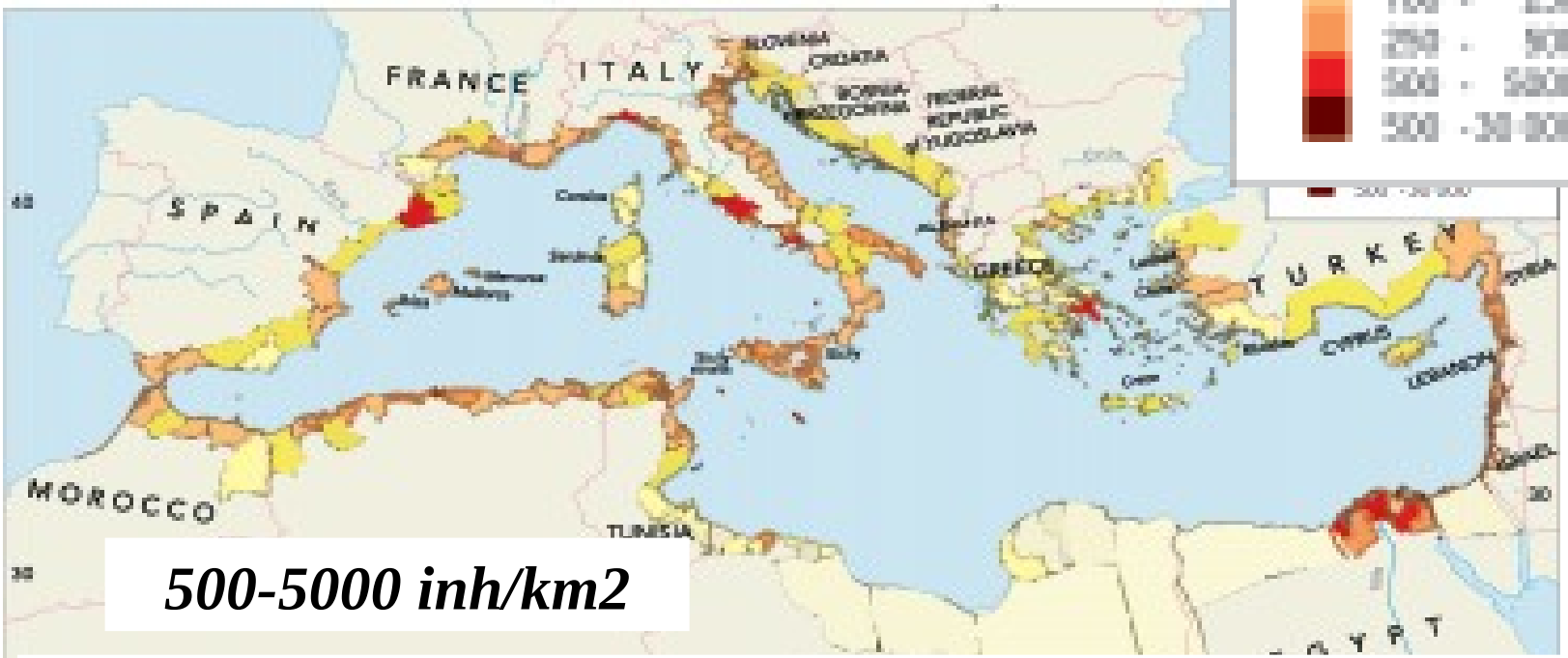
Urbanisation

The resident population of the riparian states of the Mediterranean was 250 million in 1960, and is expected to reach approximately 550 millions in the year 2030

Population density is greater in coastal regions, especially near the big cities.



Population density in coastal regions *Source: Blue Plan databases*

In



Population density in the EU coastal zone (10 km) by NUTS3 (2001)

Inhabitants/km²

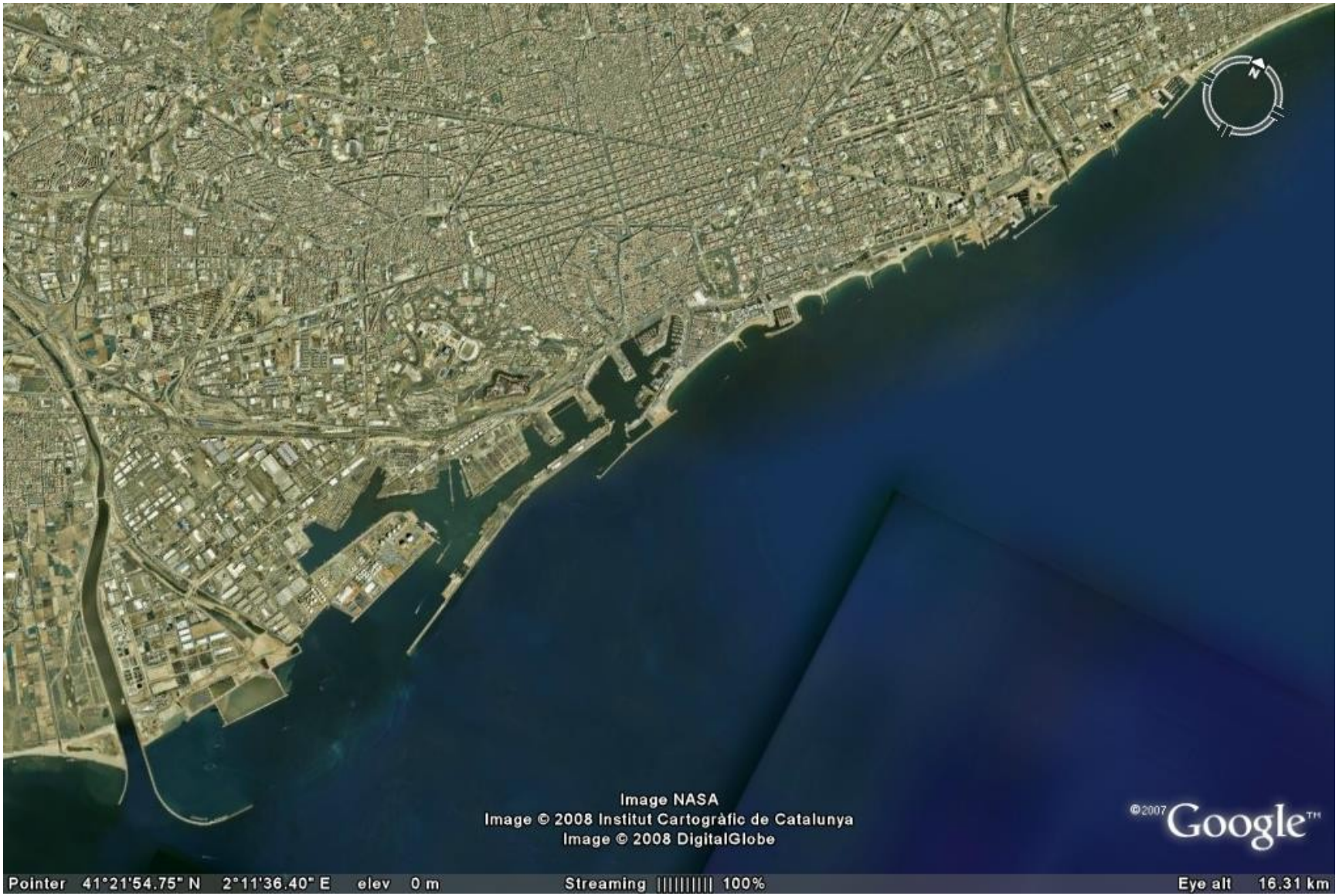
- < 100
- 100–200
- 200–500
- > 500
- No data
- Outside data coverage

Population density in the European coastal zone (0–10 km) in 2001

The ?city o Athens



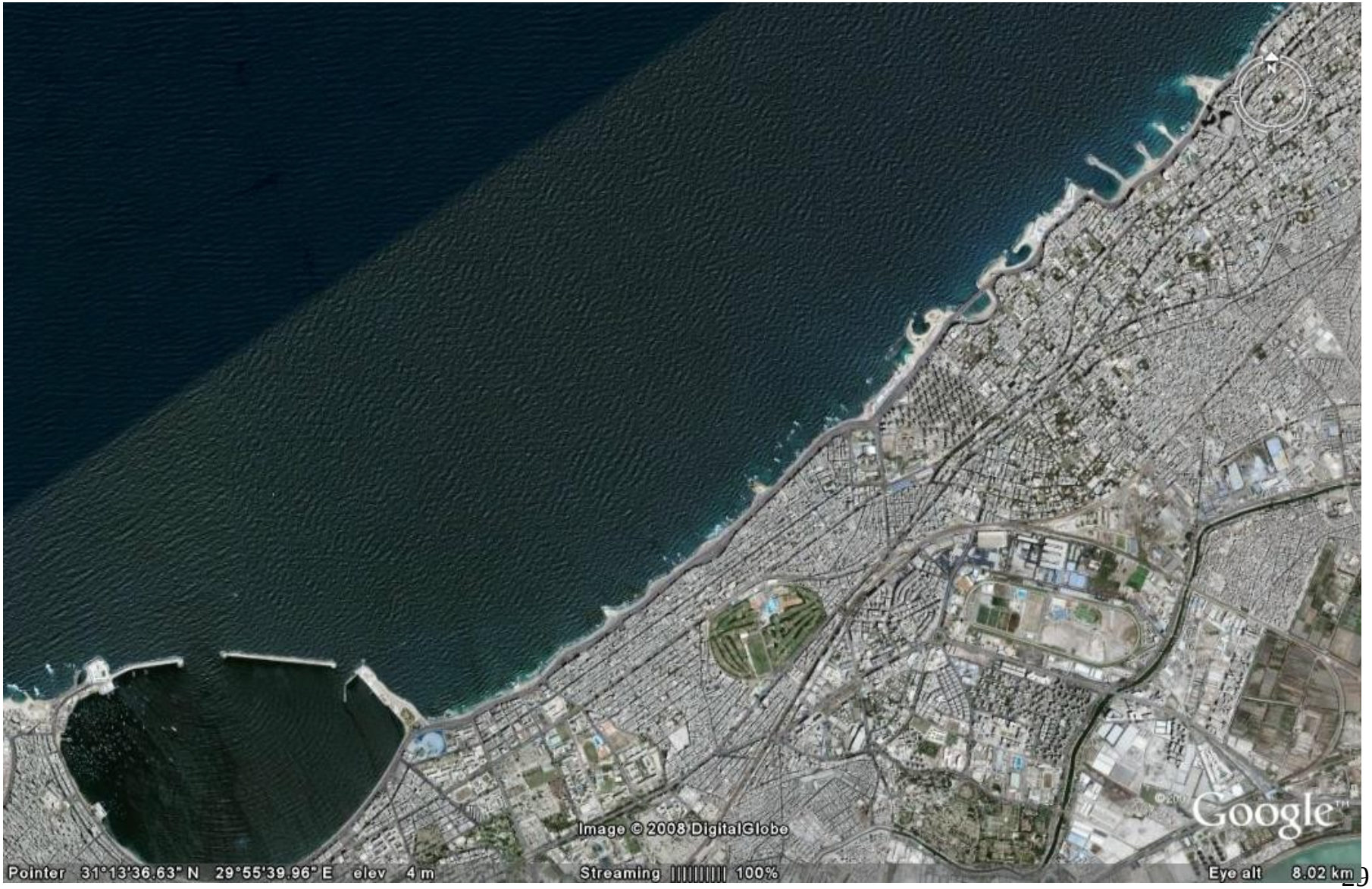
Barcelona water frond



The coasts of Rome



Alexandria water frond - Egypt



Limasol water frond - Cyprus



Tourism

The Mediterranean is the world's leading tourist destination, accounting for 30% of international tourism.

The interactions between tourism and the environment in the Mediterranean region:

-land use;

-consumption of water resources;

-pollution and waste and

-physical and socio-cultural pressures.



Rhodos



Attica


Elounda Crete
Image © 2008 DigitalGlobe
© 2007 Google
Pointer 35°14'28.14" N 25°43'50.63" E elev 80 m
Streaming 100%
Eye alt 681 m



Myconos Greece

Aquaculture along the coasts







Marine aquaculture has shown a large expansion in production in a number of Mediterranean countries.

Maritime transport

Three major passage ways to and from the Mediterranean Sea:

-the Strait of Çanakkale/Sea of Marmara/ Istanbul Straits,

-the Strait of Gibraltar and

-the Suez Canal.

The major axis (90 % of the total oil traffic) is from east to west (Egypt-Gibraltar).



On average, there are about 60 maritime accidents in the Mediterranean annually, of which about 15 involve ships causing oil and chemical spills.

B State and impact of the Mediterranean coastal systems

Eutrophication

Microbial contamination and human health risks

Land use and coastal erosion

Heavy metals and organochlorine compounds

Oil pollution

Radioactive contamination

Climate change

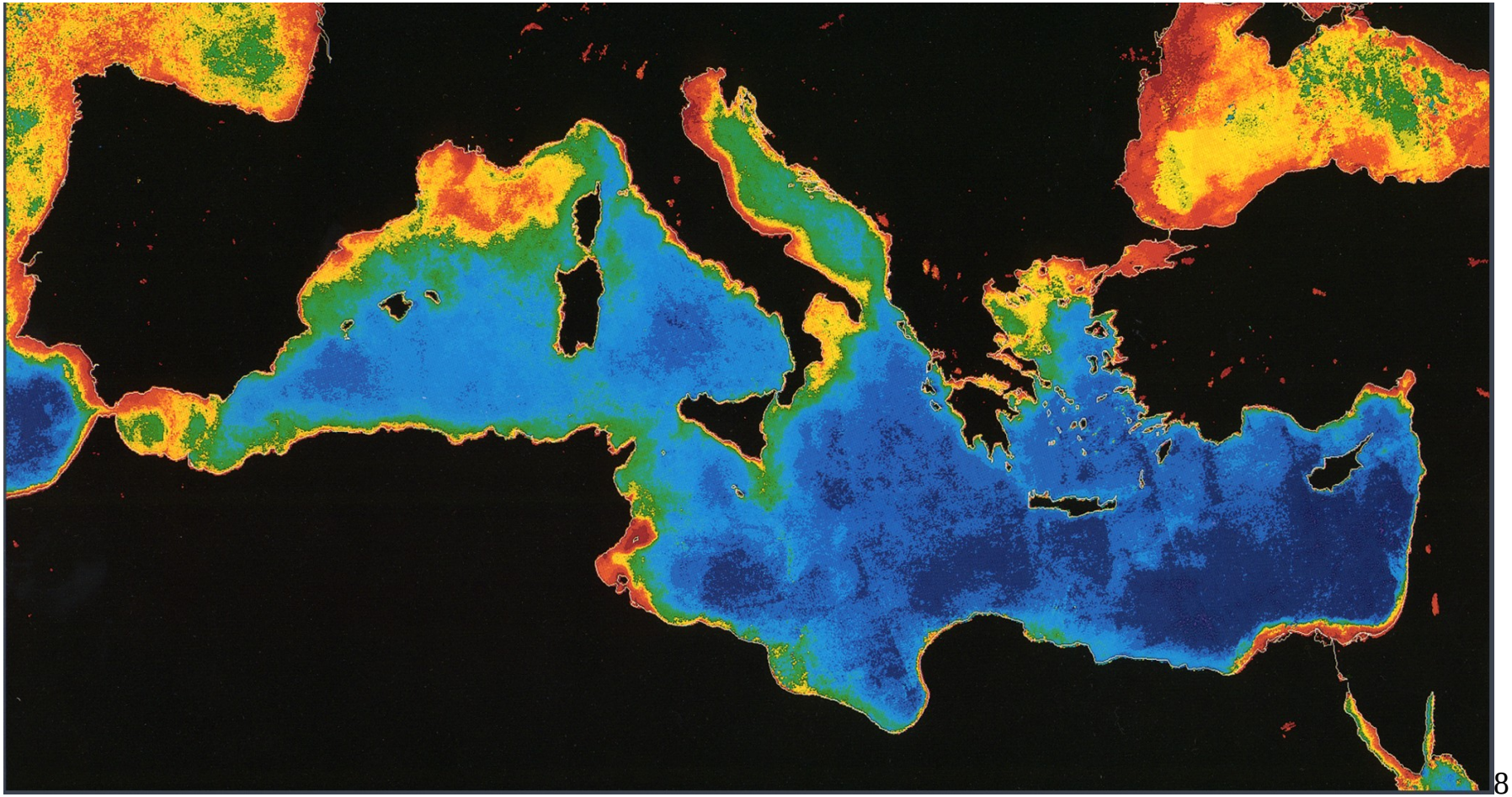
Biodiversity and ecosystem changes

In

Eutrophication

Eutrophication results from high nutrient loads from rivers and/or urban and industrial effluents.

In the Mediterranean it appears to be limited mainly to specific coastal and adjacent offshore areas



Problems associated with eutrophication

-algal blooms,

-diversity reduction of marine species

-depletion of oxygen

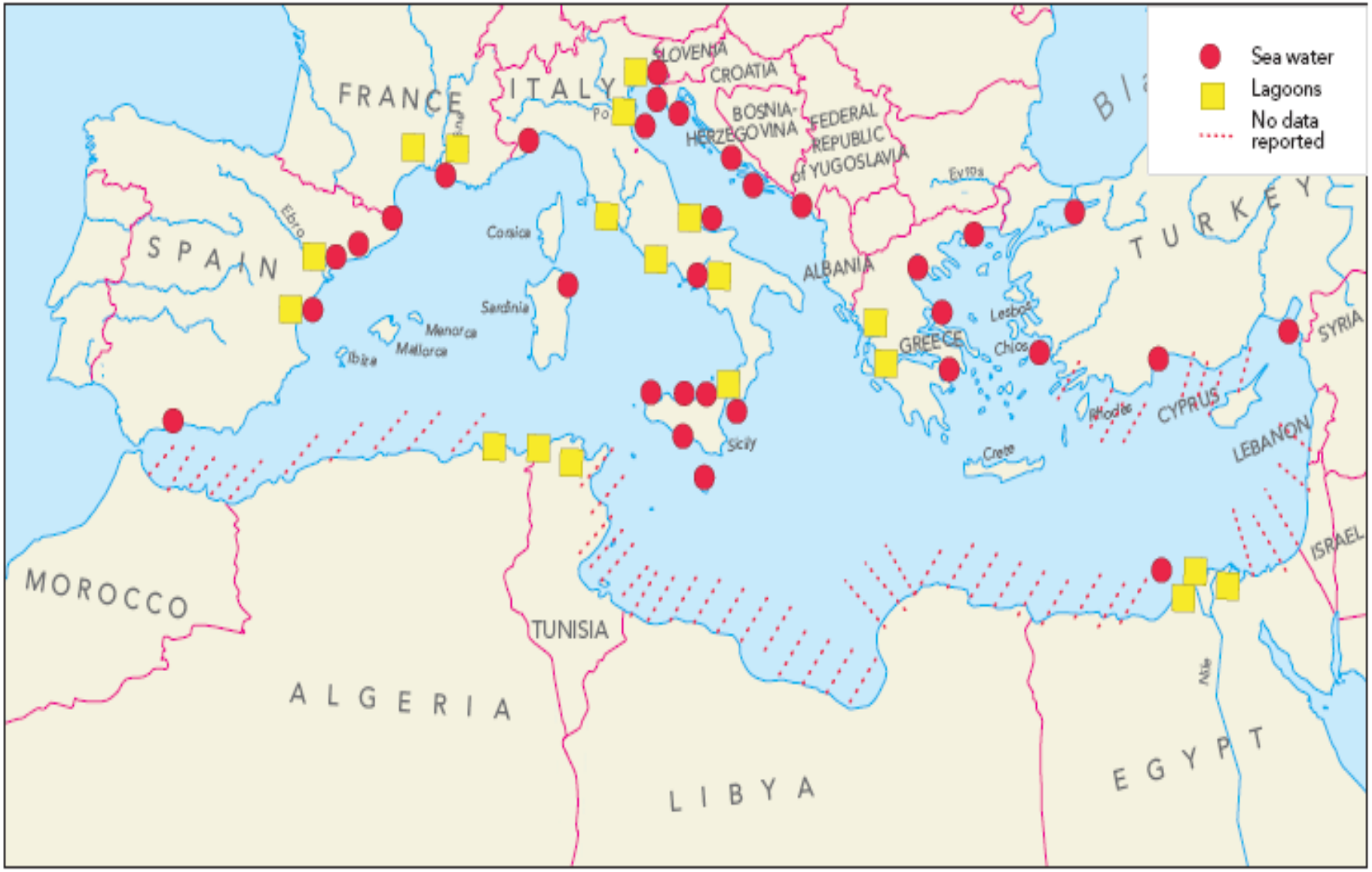
-potential human health risks related to the ingestion of seafood contaminated by pathogens or toxic algal blooms

Side effects from the eutrophication in Mediterranean

-hypoxia/anoxia,

-algal blooms

Mediterranean areas where eutrophication phenomena were reported



Source: UNEP/FAO/WHO, 1996 (Modified)

Microbial contamination and human health risks

Microbial pollution is related to urban wastewaters.

The most important eutrophication hot spots in the Mediterranean often coincide with coliform bacterial hot spots.

Pathogenic and other micro-organisms enter the marine environment mainly through municipal waste water discharges.

Land use and coastal erosion

Land use along the coast comes from

-tourism,

-agriculture,

-fisheries and aquaculture,

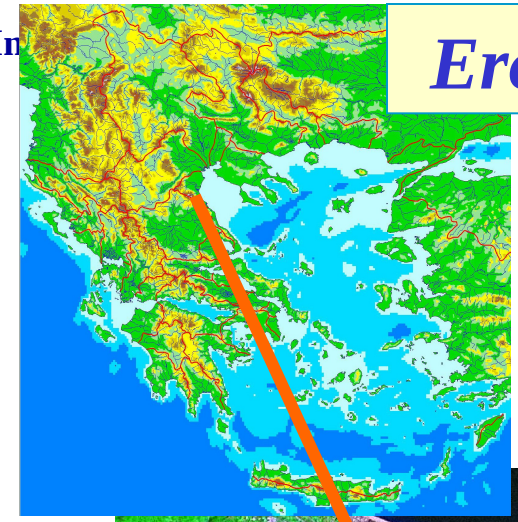
-transport,

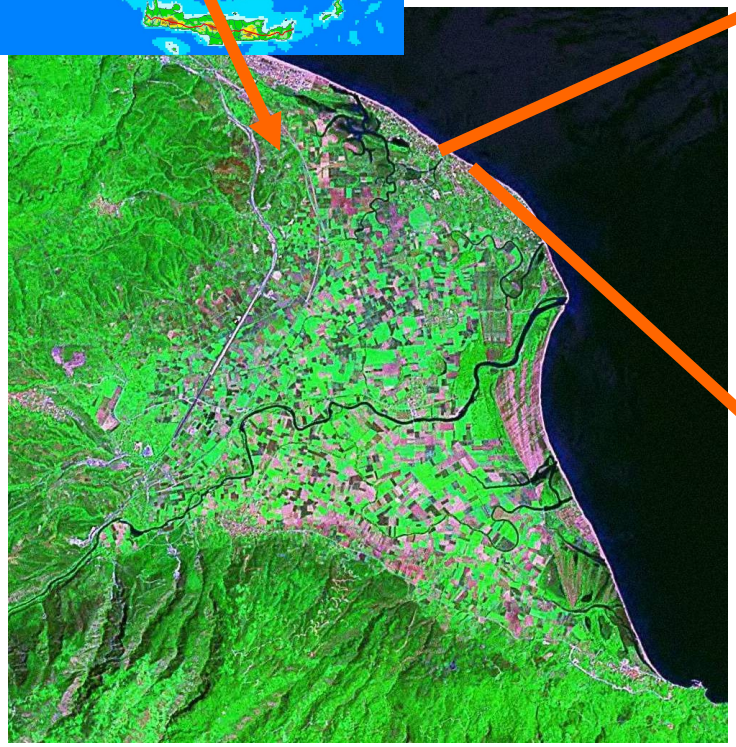
-energy and industry infrastructure,

causes acceleration of the modification of the morphology of the coastal system.

Coastal erosion is an environmental threat, related to a combination of human activities and global climate change

Erosion in the Pineios deltaic system

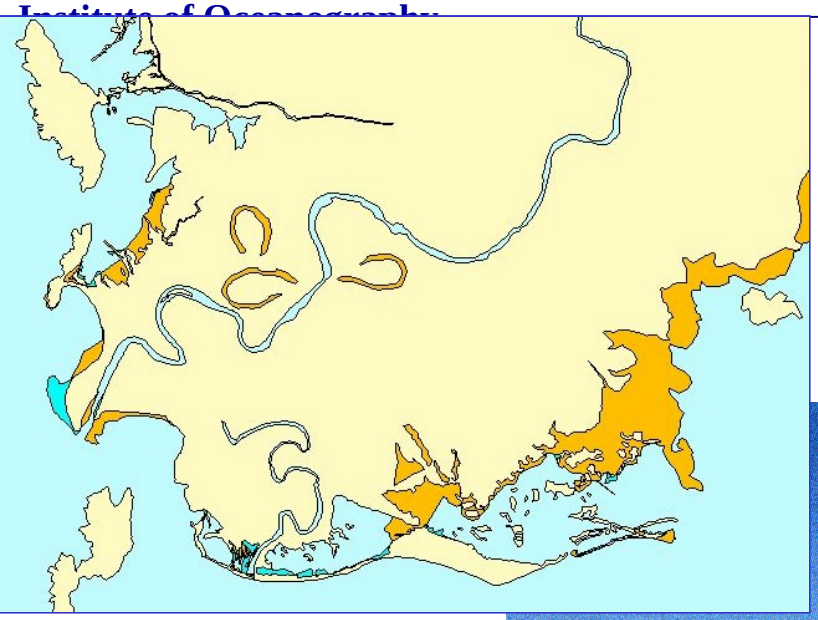






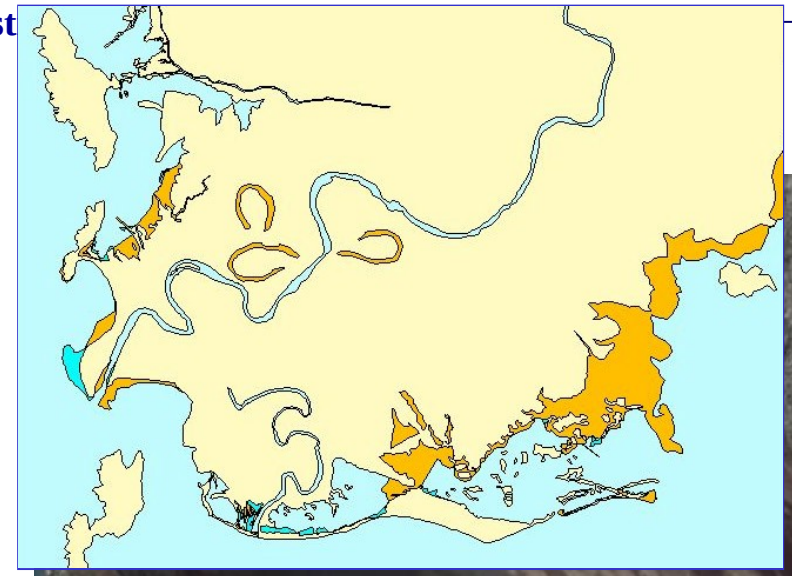


River bed deviation and erosion



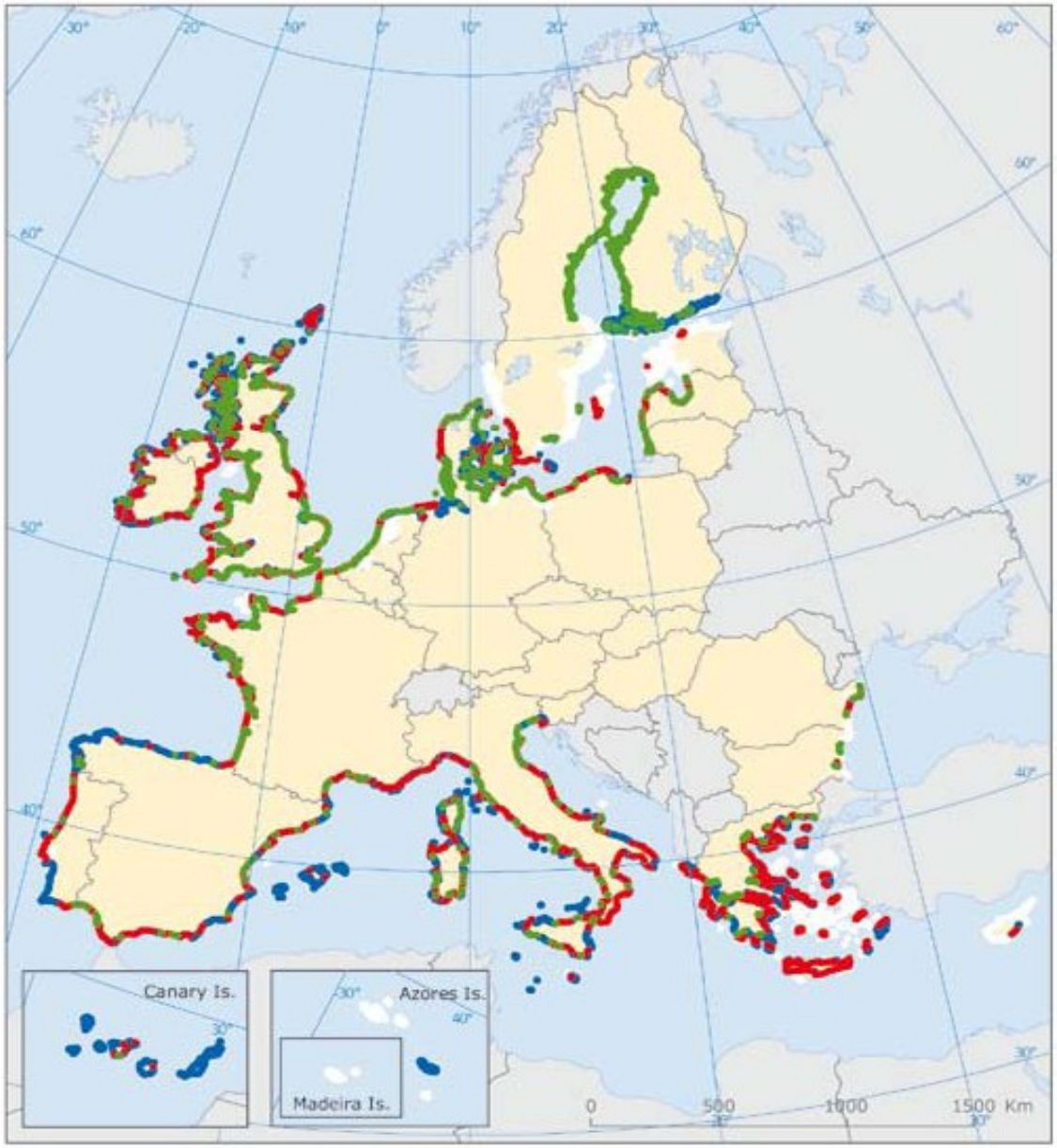


River bed deviation and erosion



Korinthos - Greece





Coastal erosion patterns in Europe (2004)

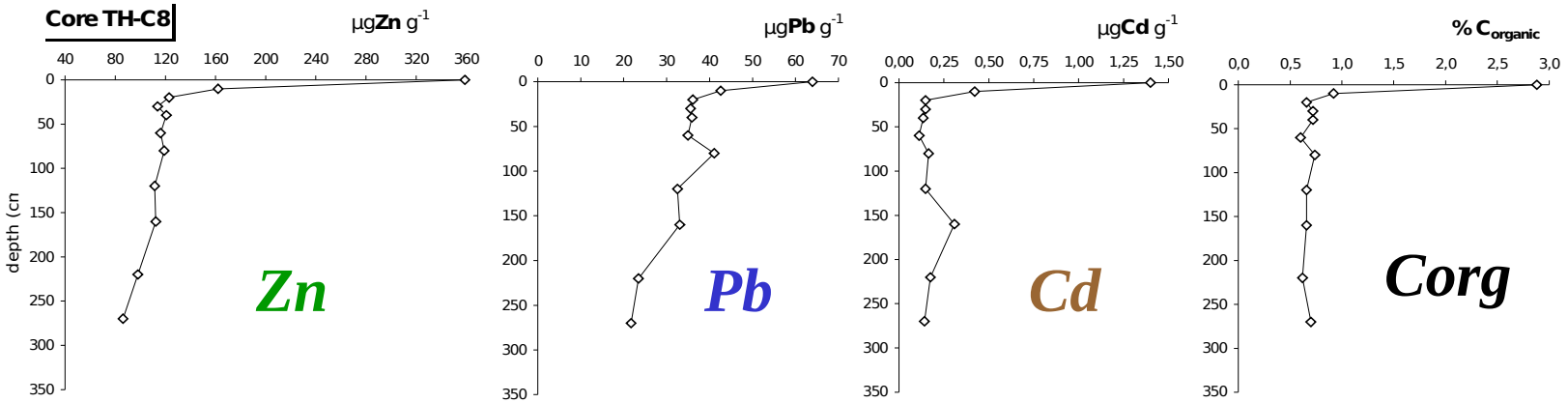
Status of coastline

- Aggradation
- Erosion
- Stable
- No data
- Outside data coverage

Coastal erosion patterns in Europe (2004)

Heavy metals - The anthropogenic fingerprints showing changes in the last century





Oil pollution

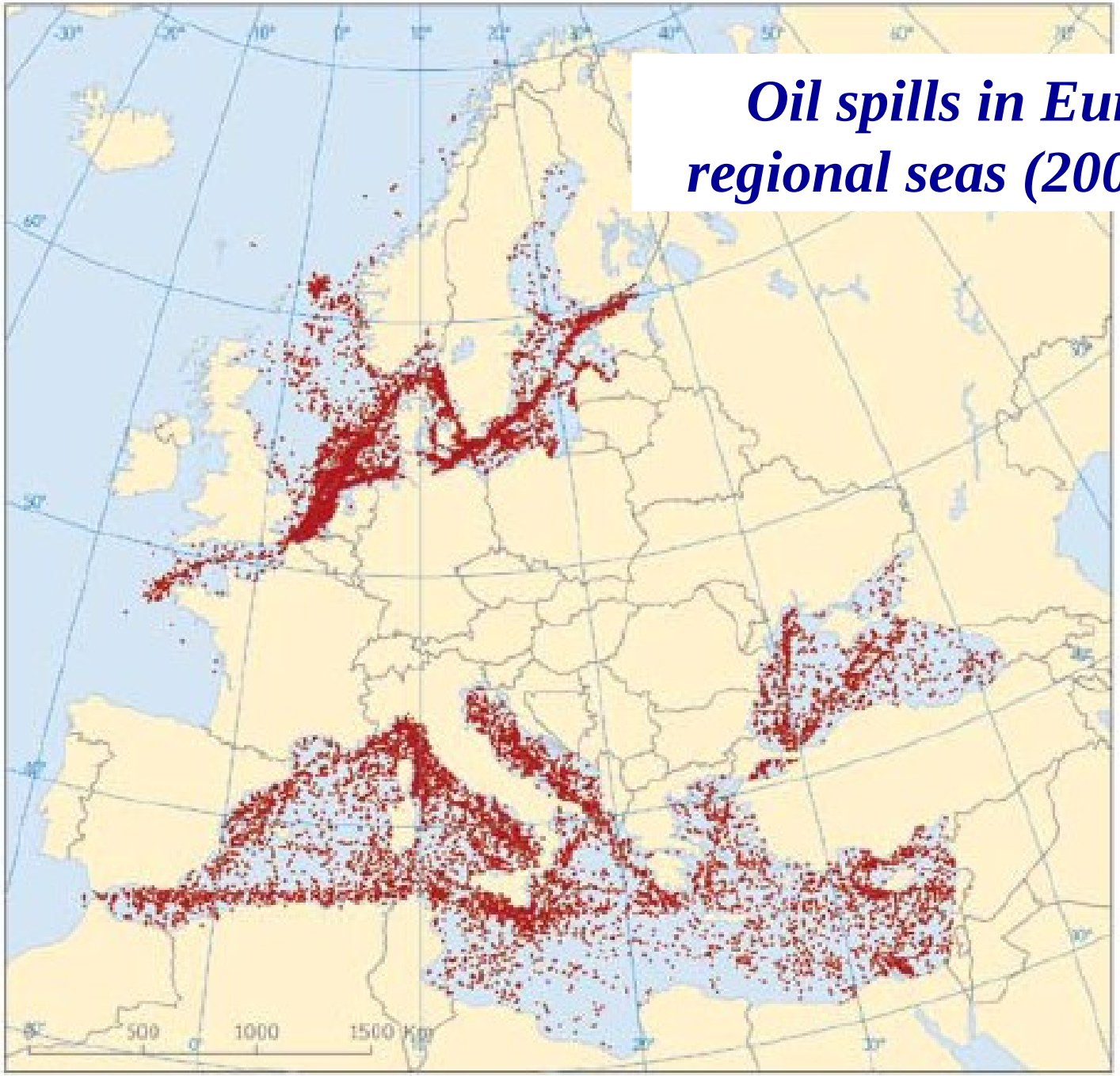
Oil spills float and drift.

Up to now, accidental oil spills have caused localised damage to the Mediterranean marine and coastal environment.

Out of 268 accidents for the 1977-1995 period, more than three-quarters involved oil.

The number of accidents is increasing in the Mediterranean Sea.

Oil spills in European regional seas (2000–2004)



Source: JRC, 2005.





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Climate change

Assessment of potential impacts of climate changes in the Mediterranean region include

-floods,

-changed soil erosion,

-desertification processes,

-storms,

-coastal erosion,

-seawater temperature and salinity

-currents,

-sealevel rise,

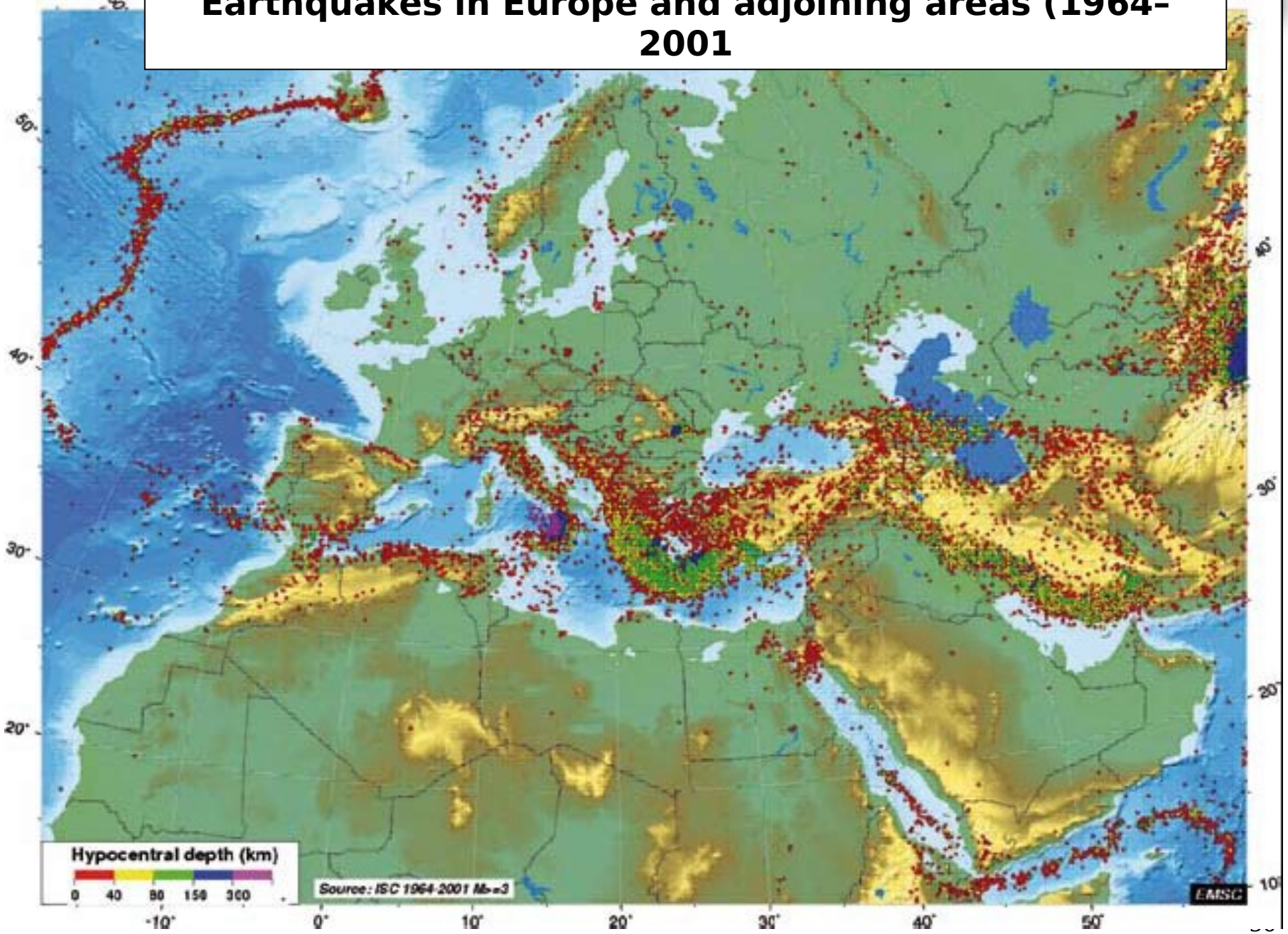
-biodiversity reduction.

Natural risks

Europe's major earthquake areas are in the Mediterranean and Black Sea basins along the active fault lines between the Eurasian and African plates.

Such events, even if only happening relatively infrequently over long periods of time confirm that coastal natural risks do exist in Europe and can hit at any time

Earthquakes in Europe and adjoining areas (1964–2001

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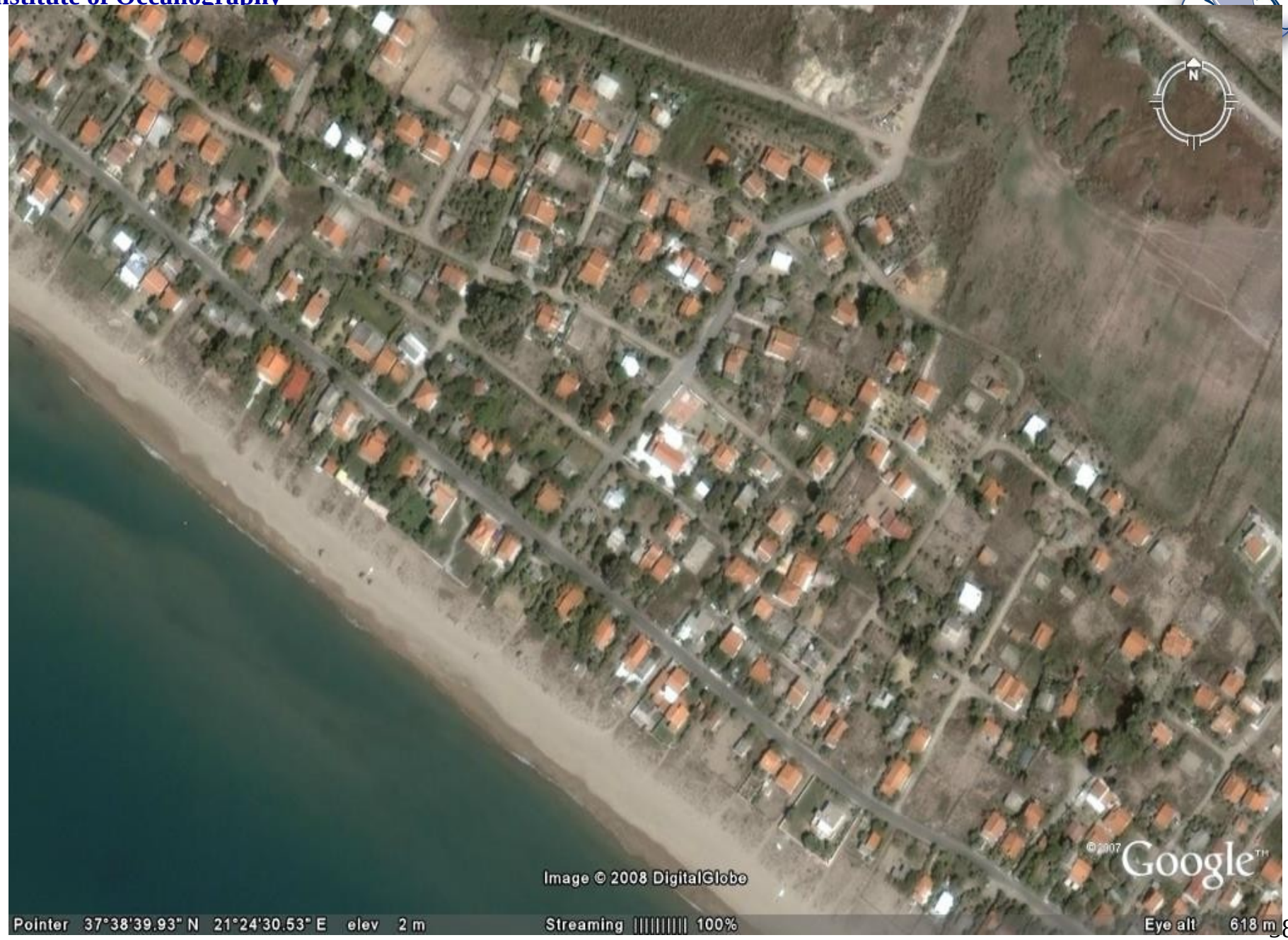
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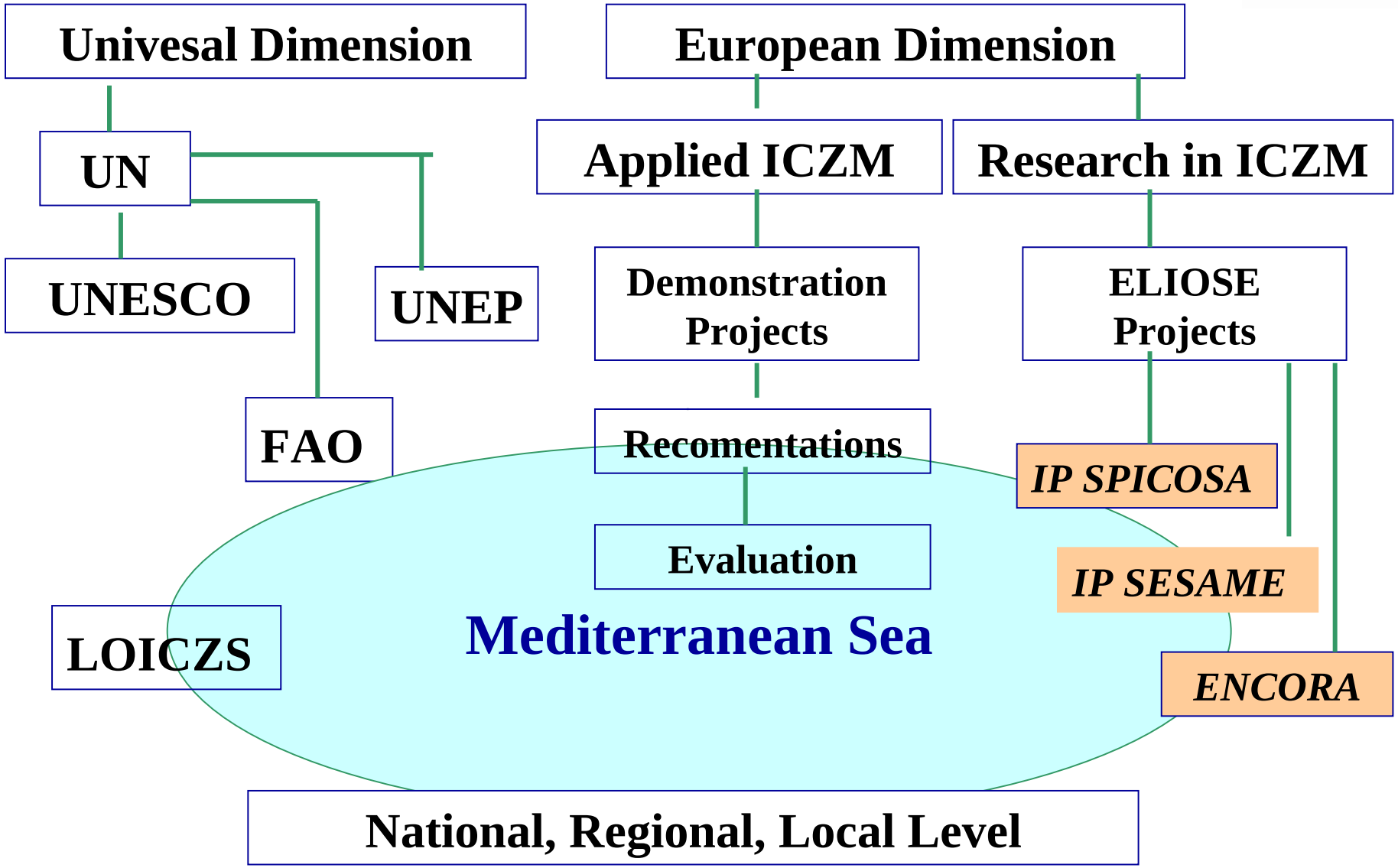
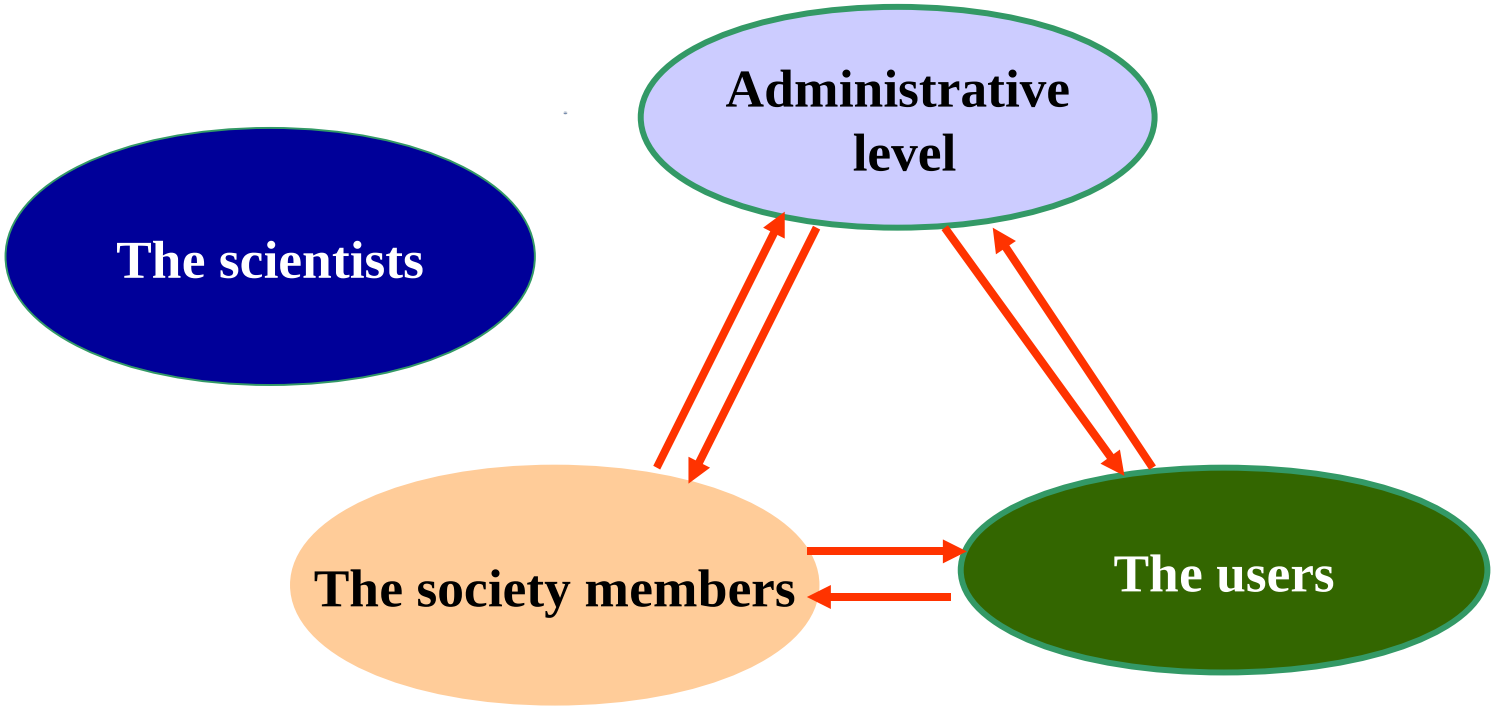
In C Responses



In ***All the mentioned responses are characterized as TOP DOWN approaches.***

The BOTTOM UP dynamic is missing

Participatory procedures are requested



"The Mediterranean basin will only be what we make of the coasts.

The time has come to implement common policies for action aimed to improve the current situation and stop the degradation.

Otherwise, there is little hope of honoring our responsibility to take care of what is still a treasure; the Mediterranean Sea.

It is not too late: it is a matter of understanding our collective interest as well as the rights of future generations".

EEA Report 2006

To carry out management of the natural and the human systems we have to change ourselves from manipulated individuals to emancipated members of the society

Thank you