

SUB-REGIONAL WORKSHOP ON THE INTERLINKAGES  
BETWEEN IWRM AND ICZM

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# The Philosophy of Integration: Integrating the Integrated Plans

A review of concepts, methodologies and frameworks

JOINT TRAINING BETWEEN SWIM-SM AND H2020 CB/MEP

*ALGIERS 30 OCTOBER- 1 NOVEMBER 2012*


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ΕΘΝΙΚΟΝ & ΚΑΠΟΔΙΣΤΡΙΑΚΟΝ  
ΠΑΝΕΠΙΣΤΗΜΙΟΝ ΑΘΗΝΩΝ  
NATIONAL & KAPODISTRIAN  
UNIVERSITY OF ATHENS



# **The Mediterranean**



—Coastal aquatic systems—  
with important  
environmental, economic  
& social values **need to be  
managed in an integrated  
way**

## Some lessons from management of natural resources from the past

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- Short-Medium term development , benefits and success linked with long term disaster (e.g. forest management for buildings fleet in Minoan Crete)
- Medium-Long term development, benefits and success linked with sophisticated management, disaster when the latter collapsed (e.g. hydraulic works in ancient Mesopotamia)
- Long term mining, silver and lead production, benefits and success linked with sophisticated management with no disaster for the entire period of management 6th Century BC to 2nd century AD (e.g. wise forest management for fuel, recycling water for washings and enrichment of the ore in silver and lead production in Lavrion/Greece)

**WHY?**

**Because pressures  
need to be addressed urgently with the  
appropriate measures**

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# WHY?

## Mediterranean coastal sites and river basins face serious problems/urgencies

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- Land-based pollution (eutrophication & marine litter)
- Growing levels of shipping (oil spills, emissions of greenhouse gases, alien species, etc.)
- Overfishing (stock collapse, by-catch, proliferation of jellyfish, etc.)
- Dredging (disturbance to the sea floor, release of toxic chemicals, etc.)
- Off-shore energy production (underwater noise, oil or gas leakages, intense shipping traffic, etc.)
- Climate change:
  - Rising sea levels may wipe out areas of intertidal habitat
  - Increased sea temperatures may alter the distribution of plankton
  - Increase in coastal flooding and erosion

Where marine species and habitat types have been assessed, the majority are found to be in unfavourable or unknown condition (EEA, SOER 2010)

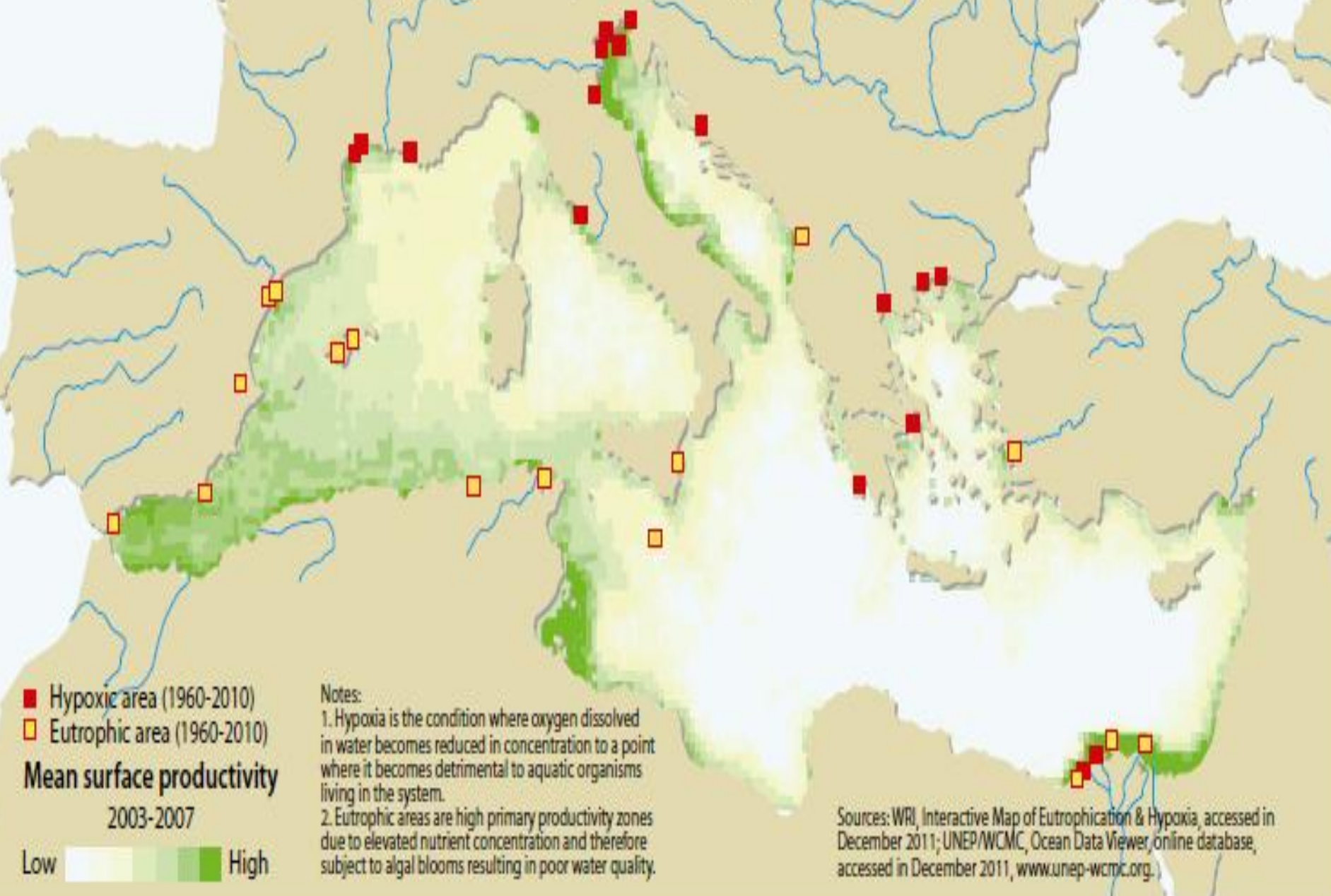
# WHY?

## Mediterranean coastal sites and river basins face serious problems/urgencies

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- Water scarcity is becoming extremely challenging due to combined impacts of climate change and rapidly increasing populations, particularly in the southern and eastern shores of the region
- Freshwater quality is deteriorating due to pollution and reduction of the natural purification mechanisms ecosystems could provide
- Groundwater quality is deteriorating due to contamination from nitrates / expanded use of fertilizers and pesticides and salt water intrusion due to overabstraction
- Reduction of flow of rivers leading, among others, to transboundary frictions
- Increase of extreme events responsible for reducing water security including droughts and floods

# Mean surface productivity and eutrophic and hypoxic hot spots in the Mediterranean





## In sediments

### Lead

Concentration,  $\mu\text{g/g dw}$

- Up to 20
- 21 to 46
- 47 to 218
- 219 to 370

## In Blue Mussels (*Mytilus galloprovincialis*)

### Lead

Concentration,  $\mu\text{g/g dw}$

- Up to 1.56
- 1.57 to 3.74
- 3.75 to 8.15
- 8.16 to 28.05

### Cadmium

Concentration,  $\mu\text{g/g dw}$

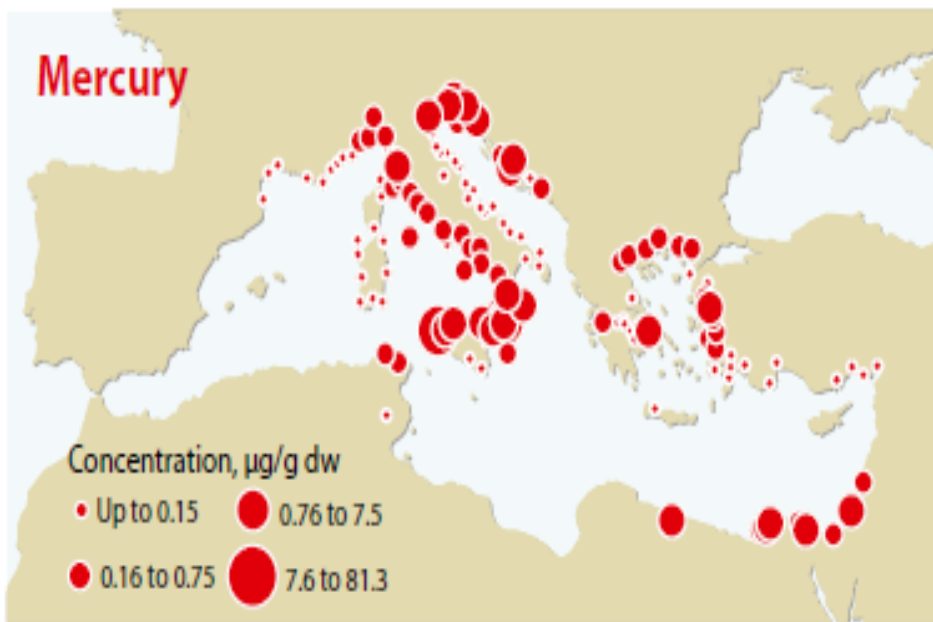
- Up to 0.6
- 0.7 to 2.0
- 2.1 to 4.5
- 4.6 to 64.1

### Cadmium

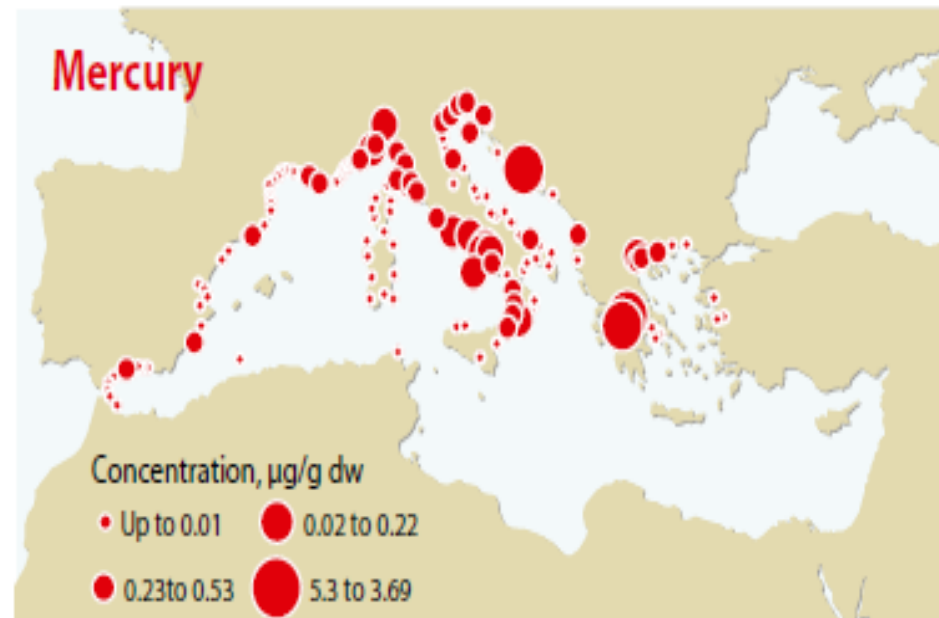
Concentration,  $\mu\text{g/g dw}$

- Up to 0.80
- 0.81 to 1.15
- 1.16 to 2.00
- 2.01 to 3.91

## In sediments



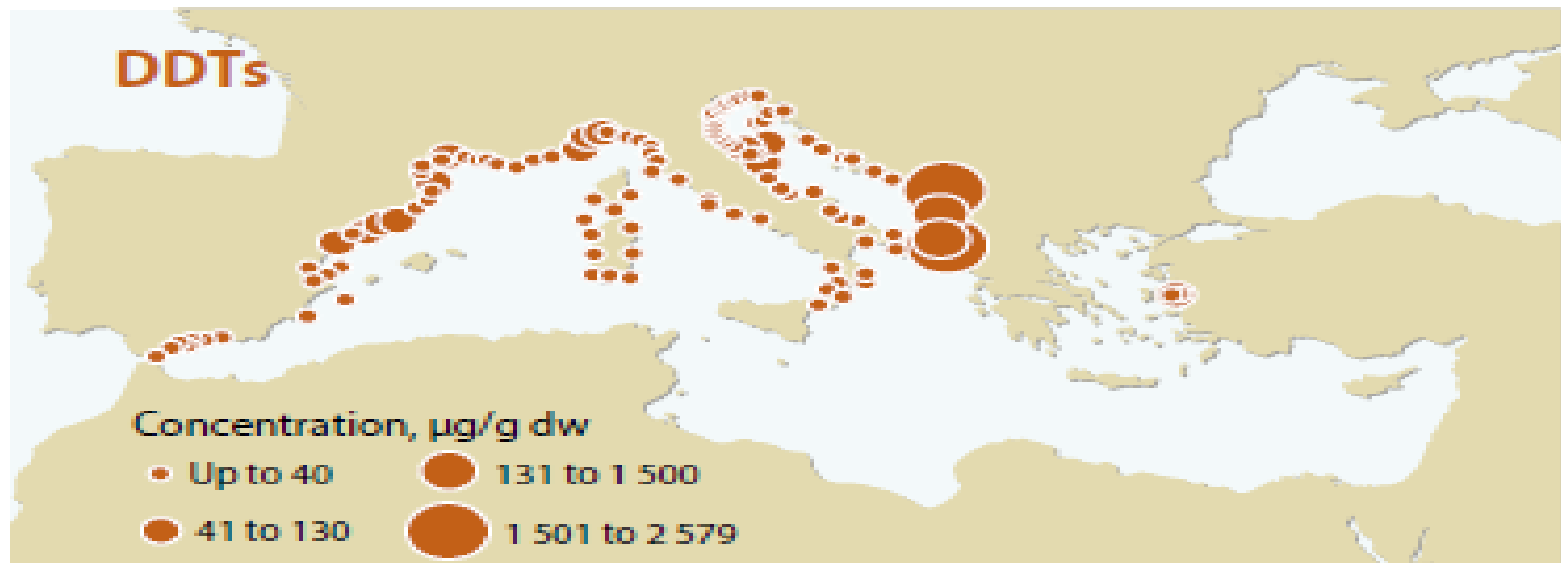
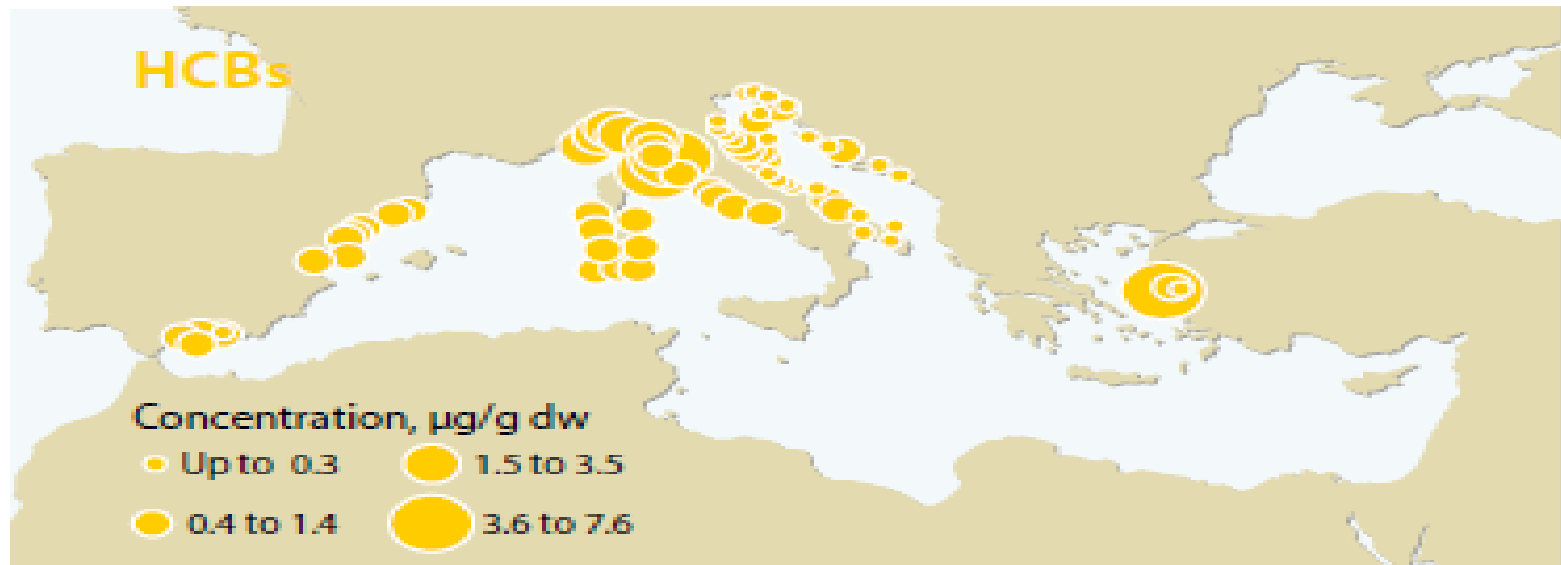
## In Blue Mussels (*Mytilus galloprovincialis*)



Note: Information is only shown where concentration measurements were reported by the coastal States.

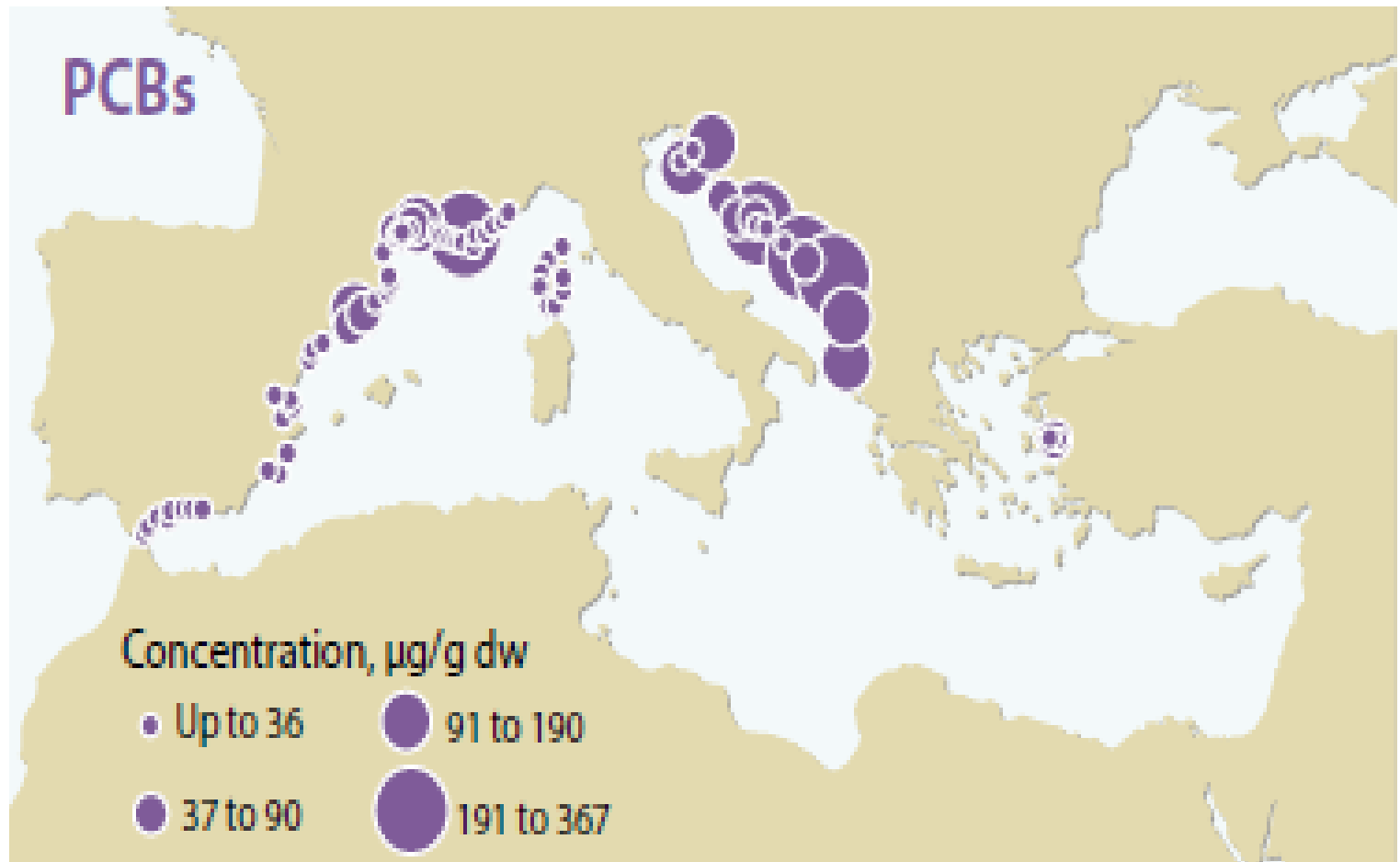
# Mean concentrations of Persistent Organic Pollutants (POPs)

In Blue Mussels (*Mytilus galloprovincialis*)



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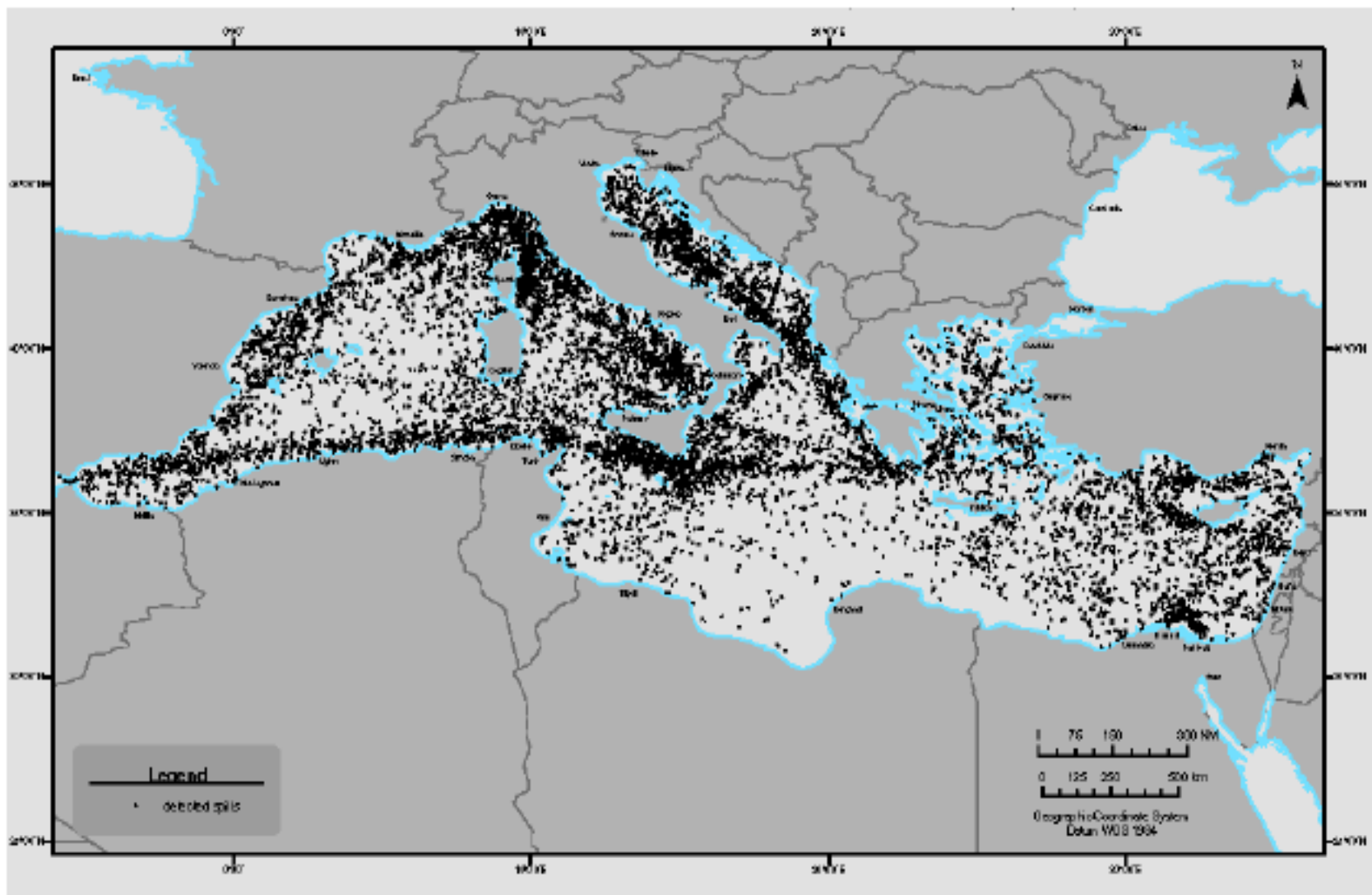


Source: Hazardous substances in the Mediterranean: A spatial and temporal assessment, UNEP/MAP-MEDPOL, 2011.



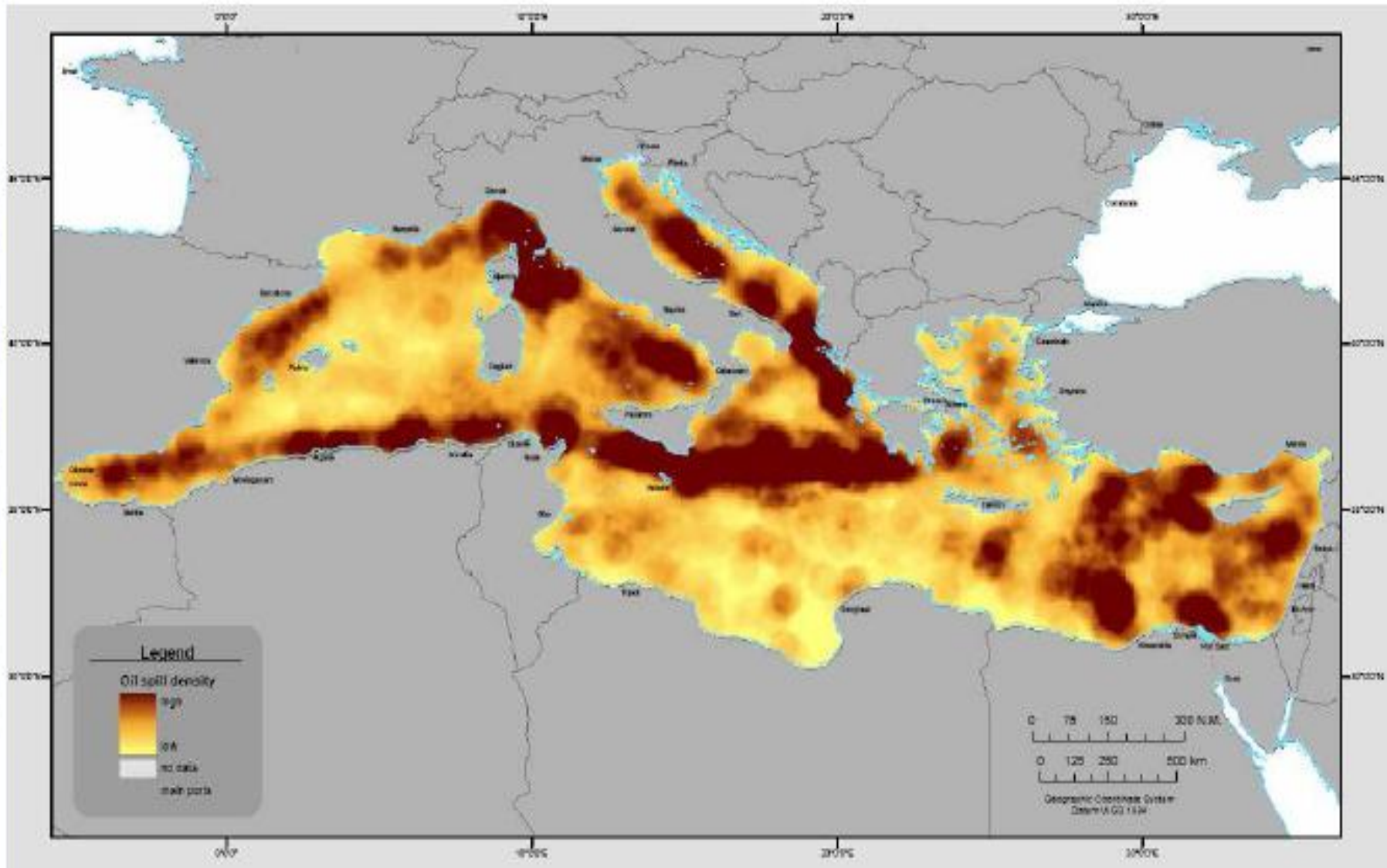
# Analysis of satellite images from archives Mediterranean Sea 1999-2004

**18947 SAR images analyzed - 9299 possible oil spills detected**

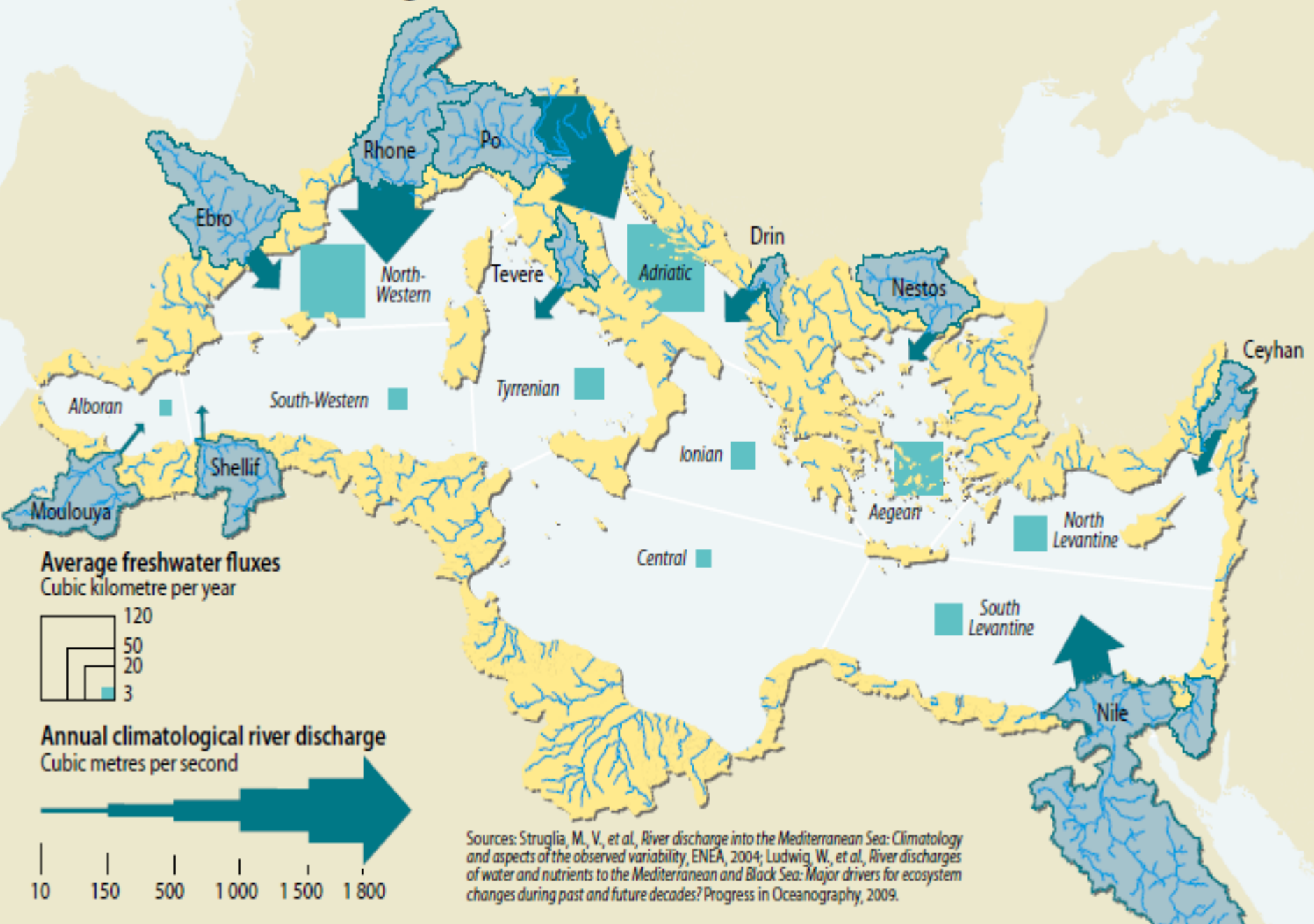


# Identification of hot spots

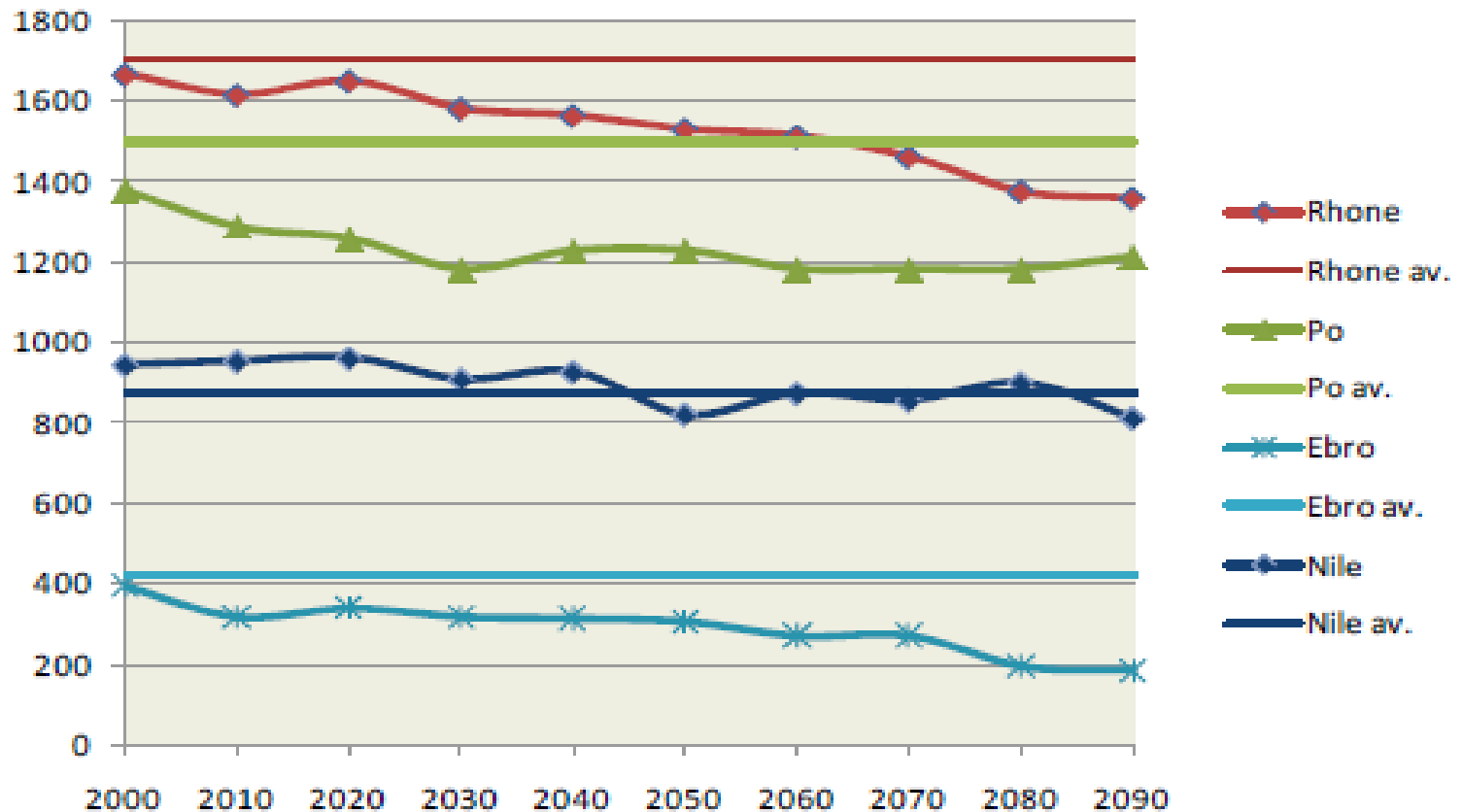
Joint Research Centre



# River freshwater discharge in the Mediterranean



# Annual average flow of the main rivers, 2000-2090 (m<sup>3</sup>/s)

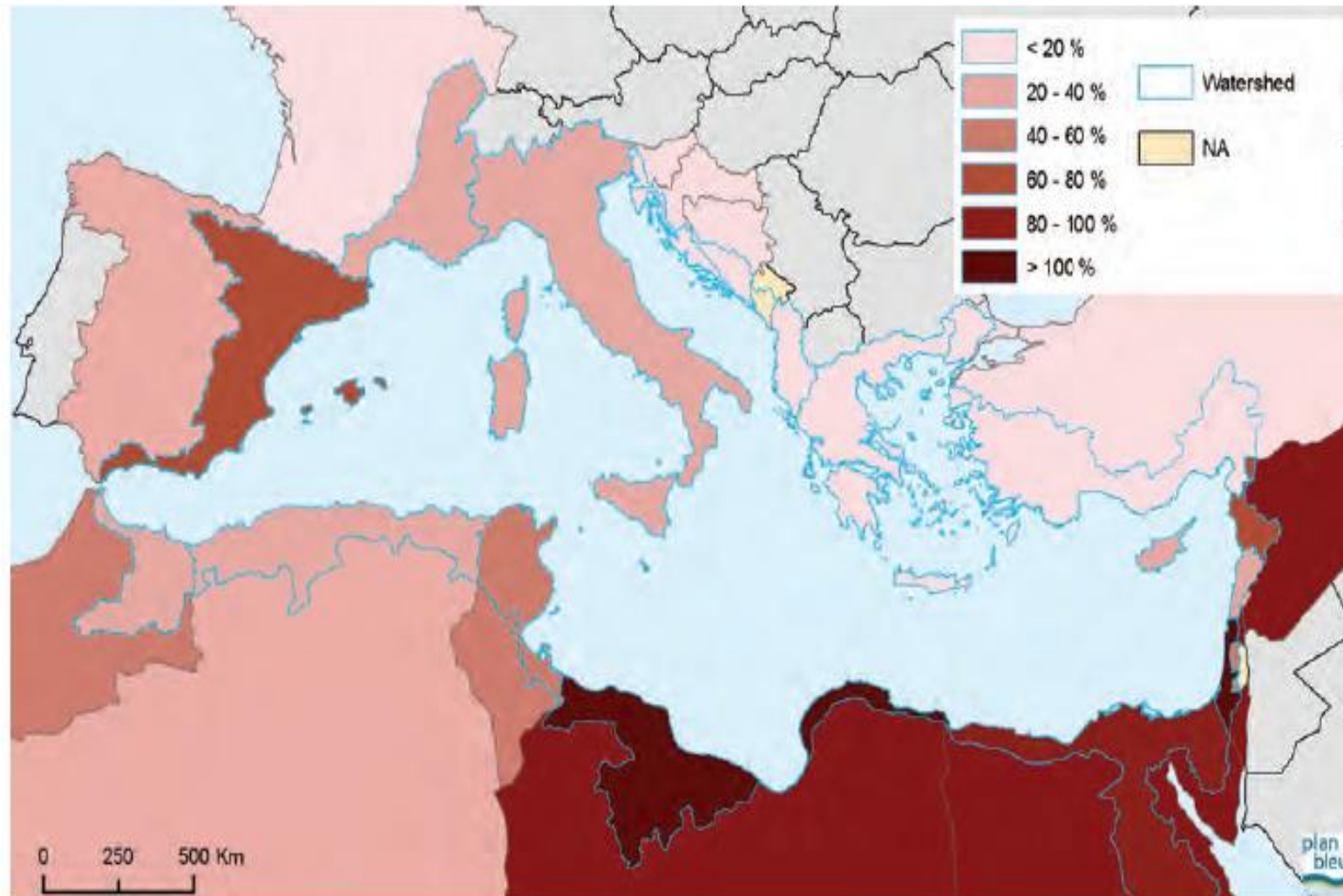


Note: av. = average over the 20th century.

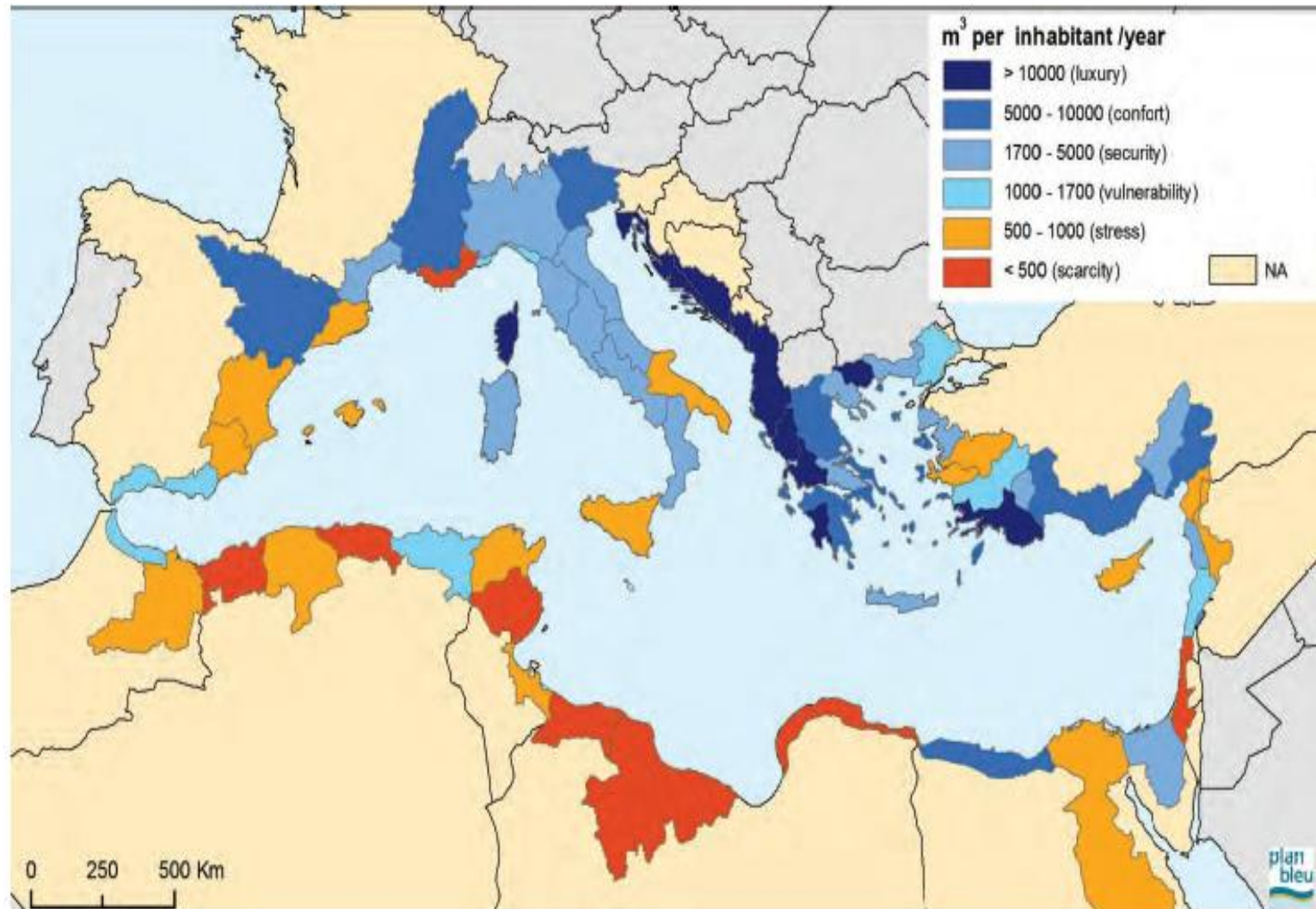
Source: Somot S. (2005)



# Exploitation index of renewable natural water resources, at national and river basin level, 2005 (in %)

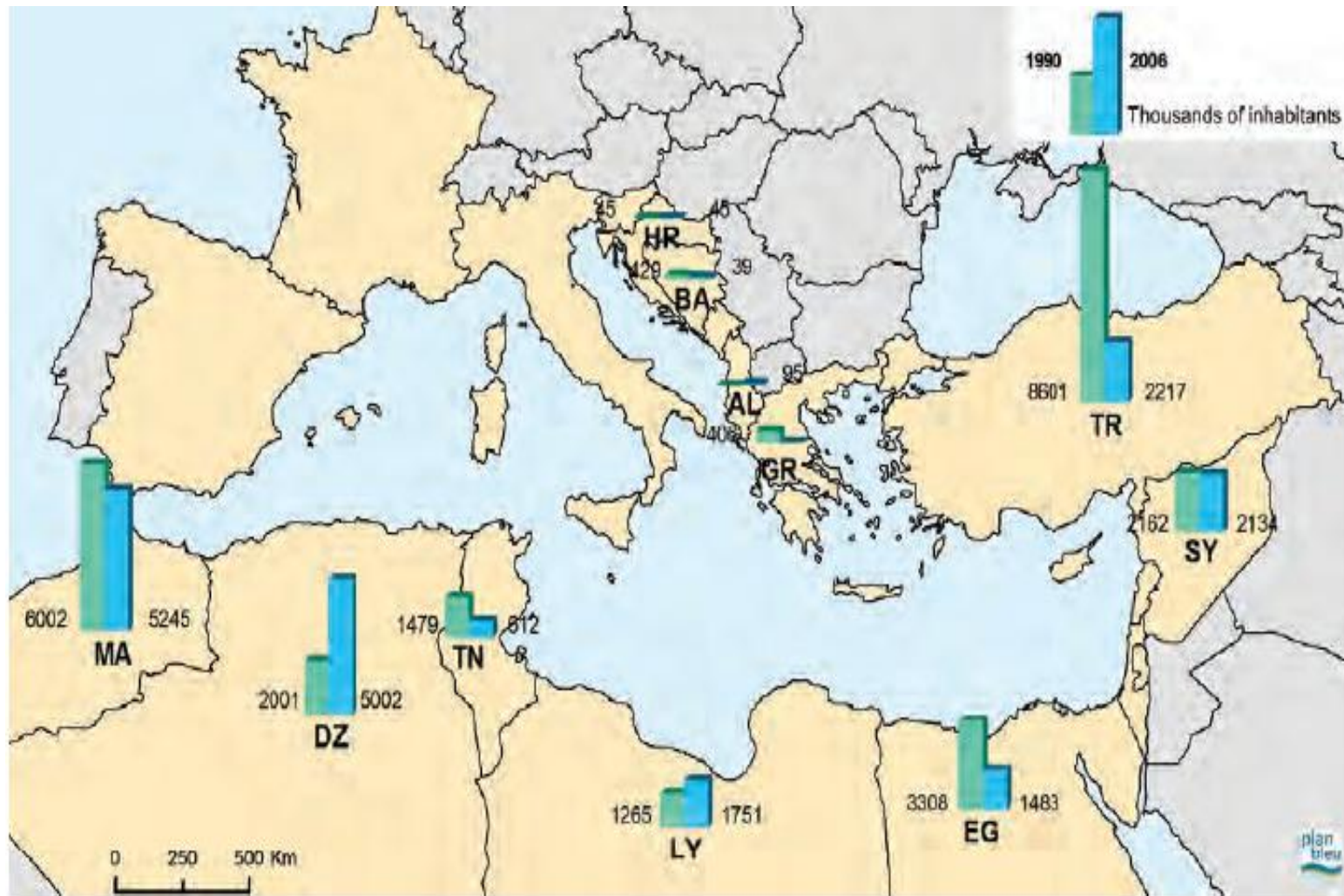


# Renewable Fresh Water Resources per inhabitant in Mediterranean elementary river basins between 1995-2005



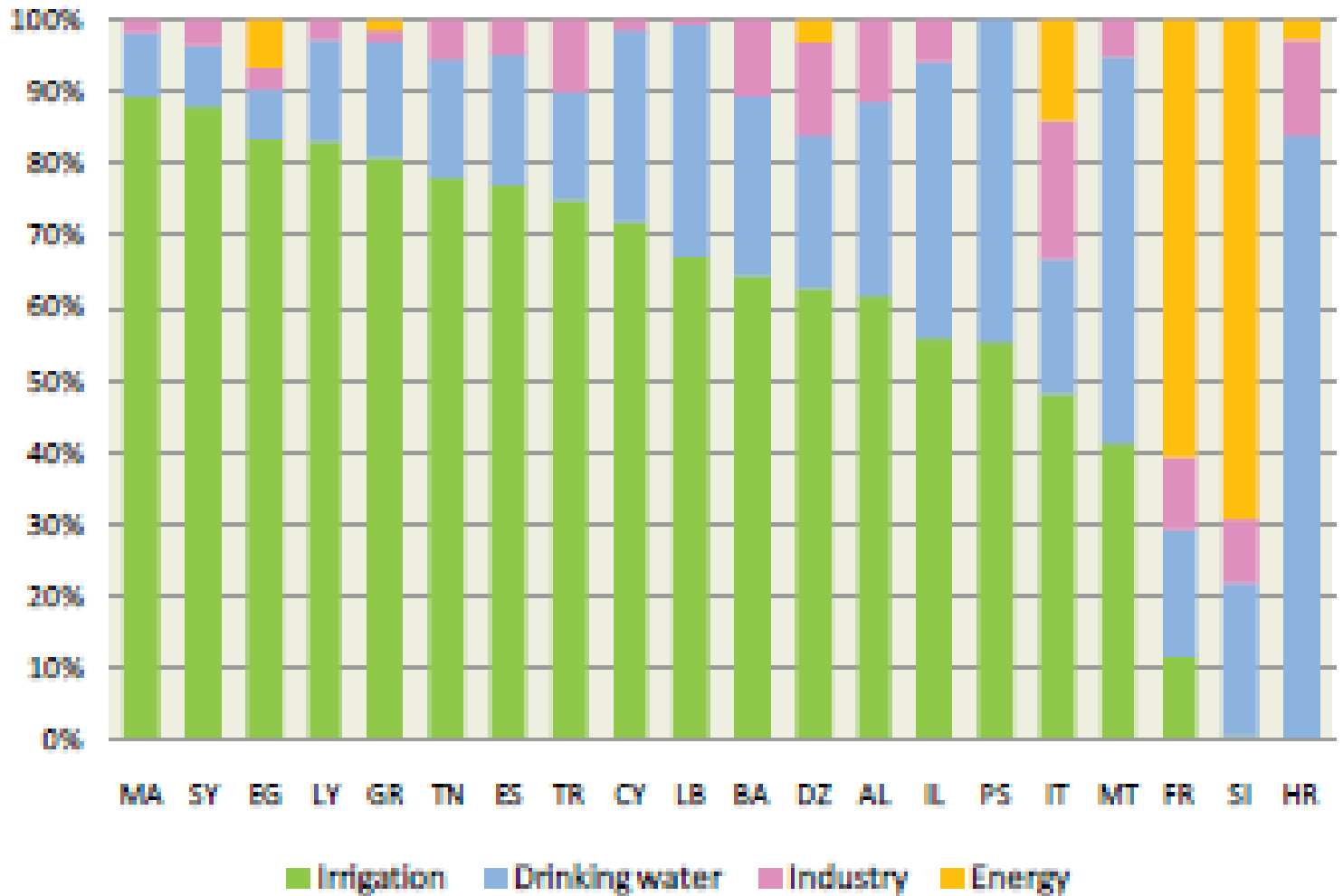
Source : Plan Bleu from national sources

# Population without access to drinking water (1990-2006)



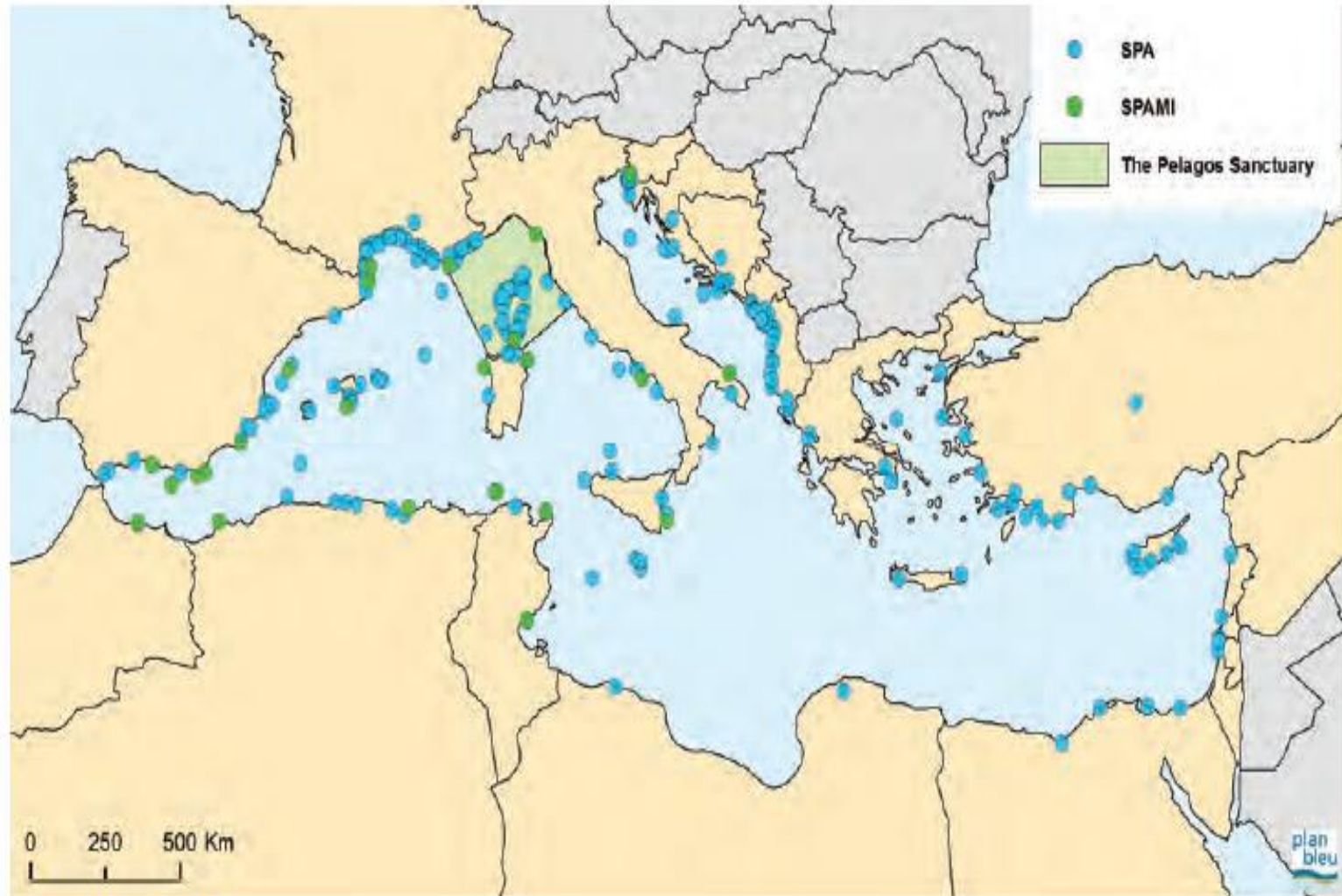
Source : Plan Bleu

## Total water demand per use (2005-2007)



Source : Plan Bleu

## Specially Protected Areas & Specially Protected Areas of Mediterranean Interest, 2009



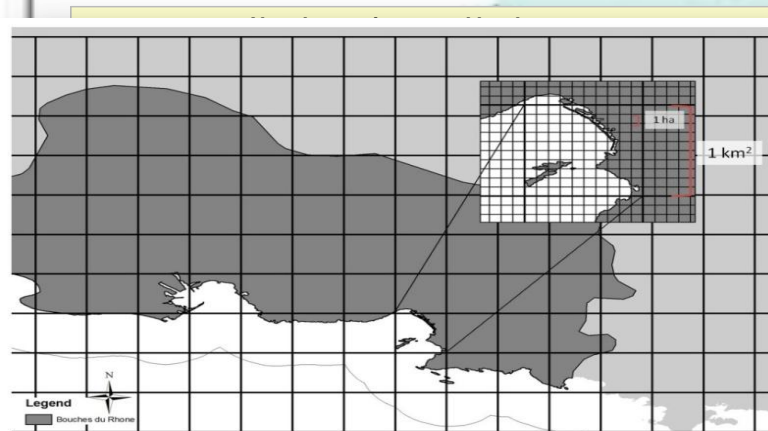
# Wetlands



**WHERE  
WETLANDS  
ARE?**

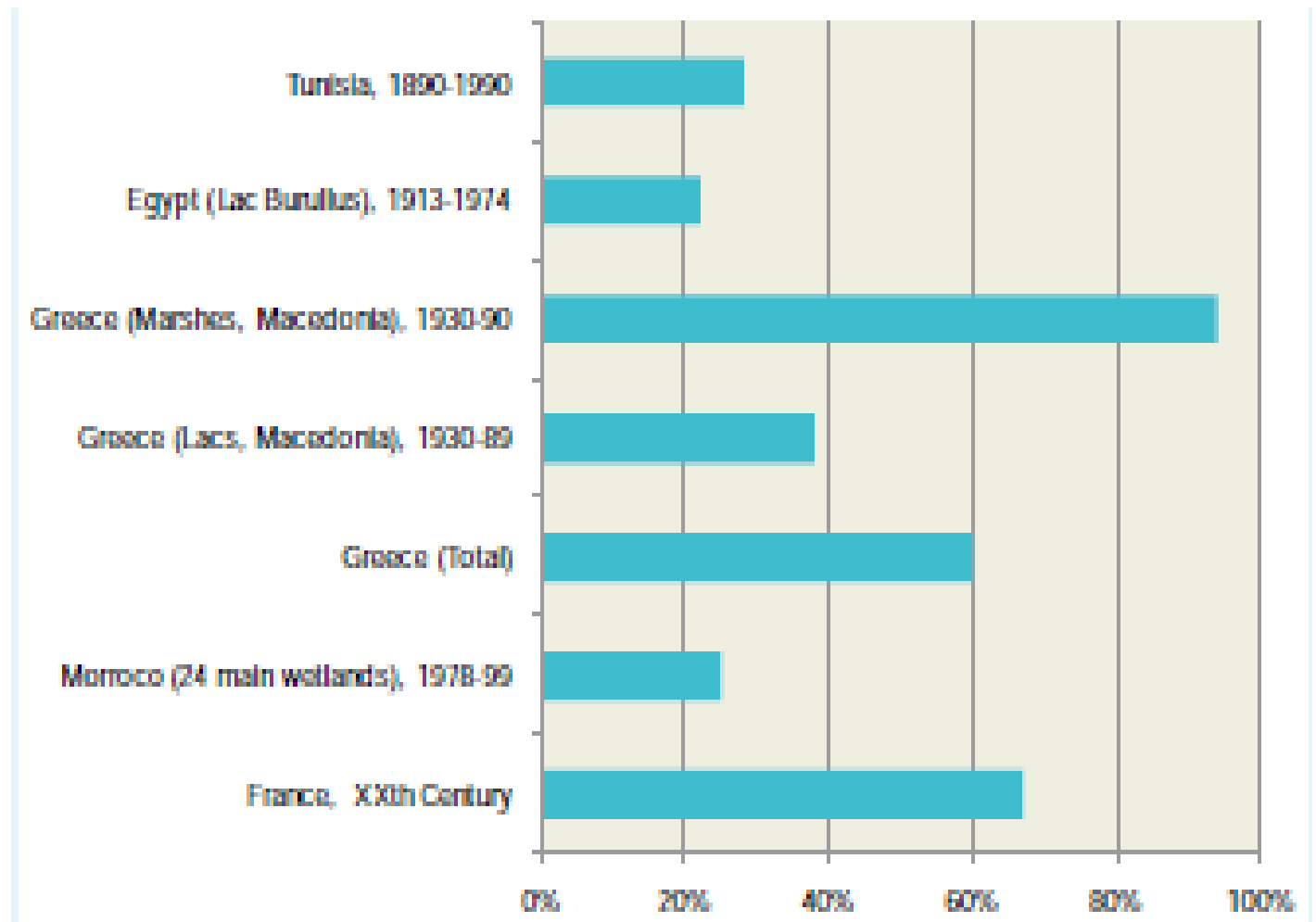
**HOW MUCH WE  
LOSS?**

Between 1990-2000 wetlands have a net loss of 390 km<sup>2</sup>



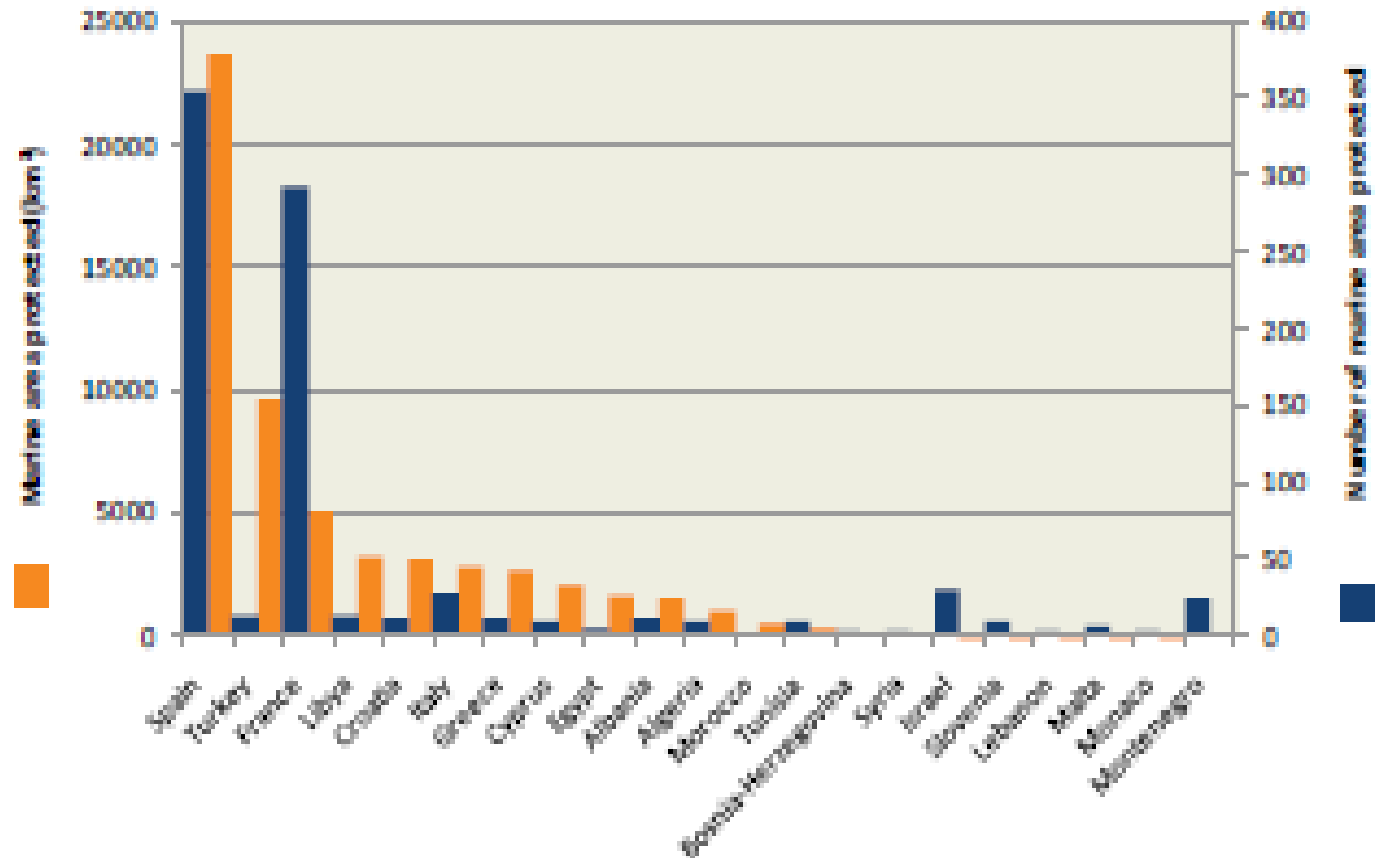
**Calculation on a grid 1km<sup>2</sup> for land and sea**

## Examples of loses of wetlands in various Mediterranean countries (or part of countries)



Source: Mediterranean wetlands observatory's national reports

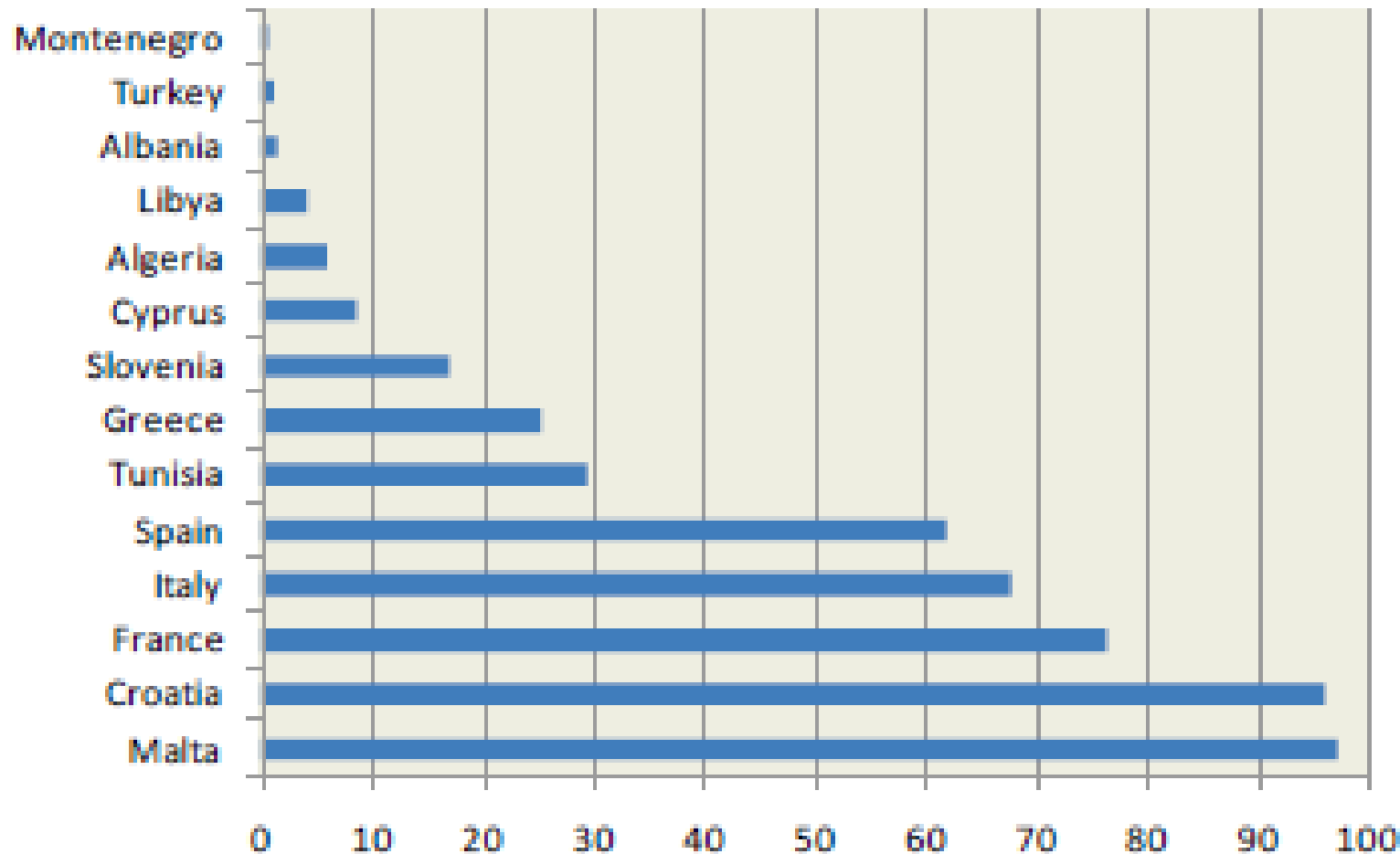
# Numbers and total area of Specially Protected Areas in the Mediterranean, 2000-2007



Source: National report on the implementation of the ASP/DB protocol during the 2000-2007 period

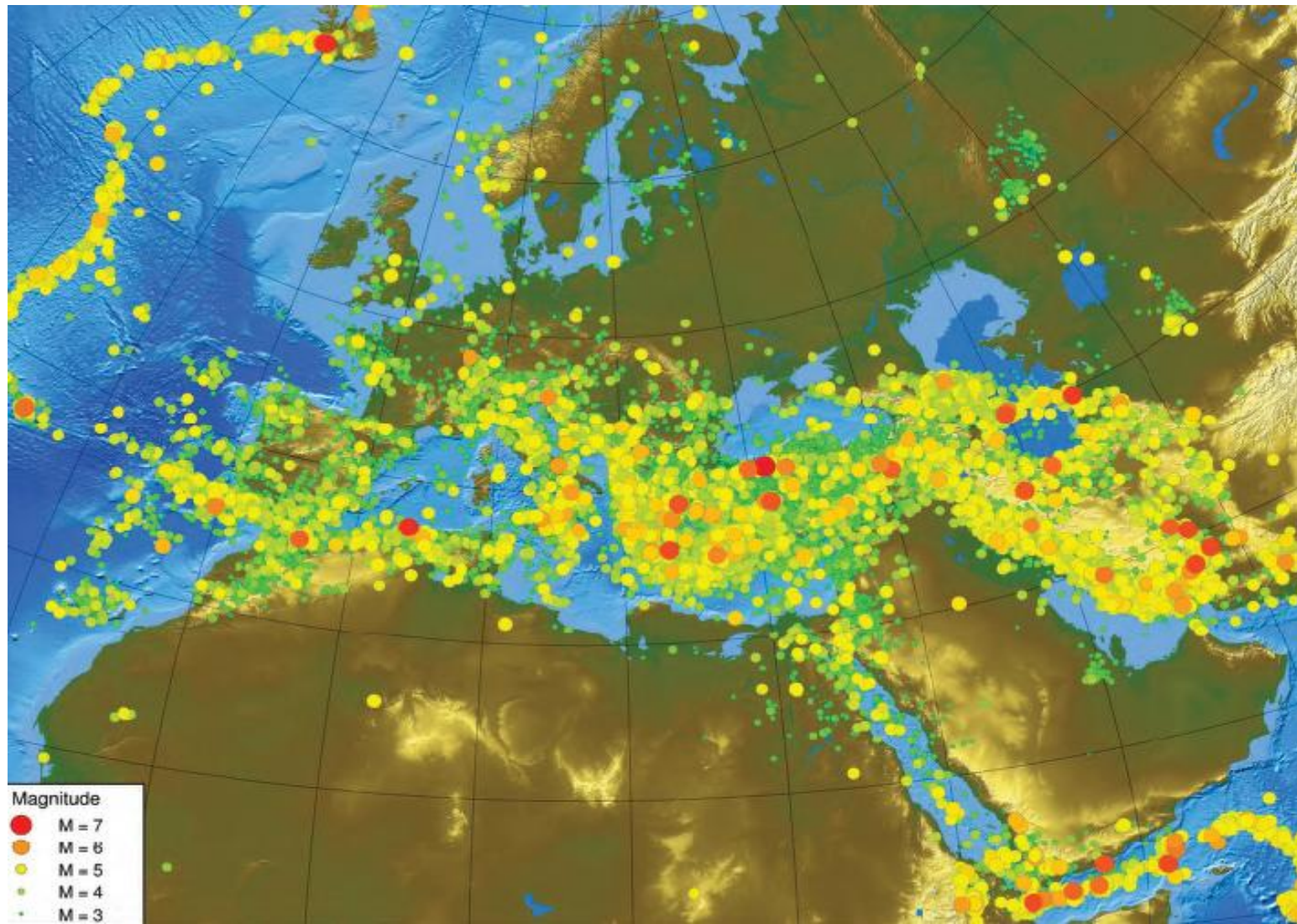


## Percentage of coastline's priority habitats (Magnoliophytes and corallogenic reefs)



Source: Leonardini et al. 2008, Agnesi et al. 2009

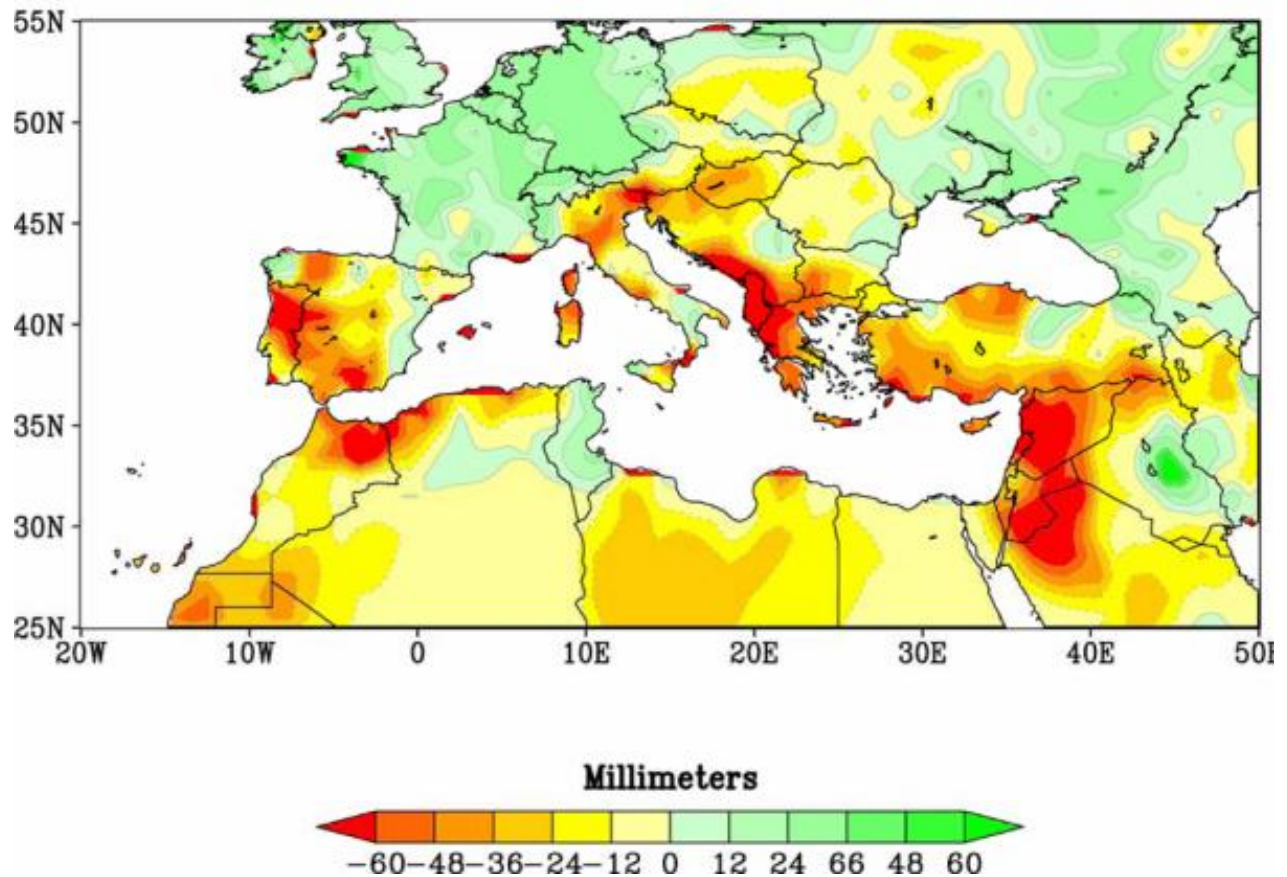
# Seismicity in the Mediterranean Region, 1998-2007



# Climate Change

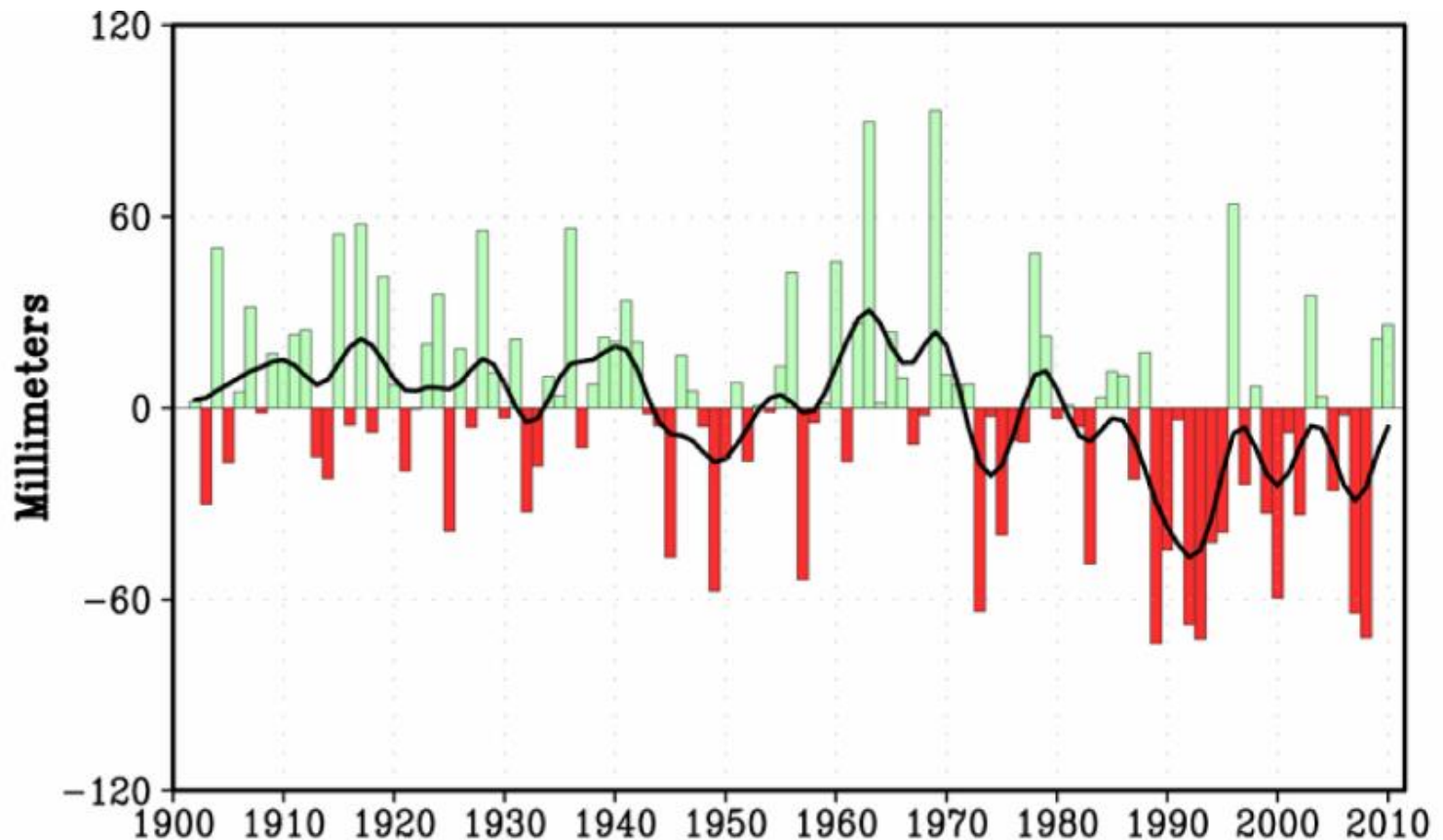
Reds and oranges highlight lands around the Mediterranean that experienced **significantly drier winters** during 1971-2010 than the comparison period of 1902-2010.

*Source: NOAA, November 2011*

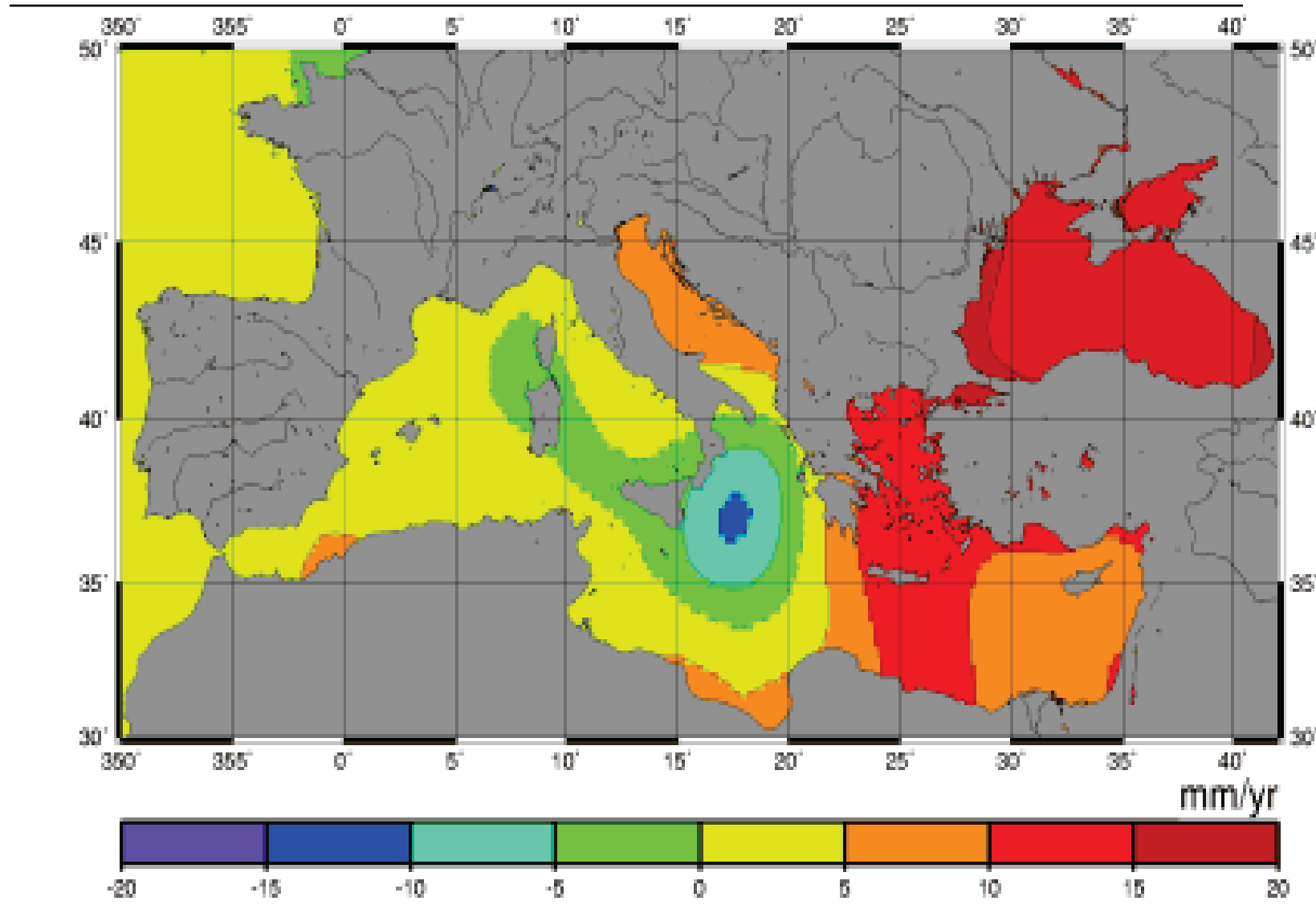


Wintertime droughts are increasingly common in the Mediterranean region, and human-caused climate change is partly responsible. **In the last 20 years, 10 of the driest 12 winters have taken place in the lands surrounding the Mediterranean Sea.**

*Source: NOAA, November 2011*



## Variations of sea-level rise observed between 1999 and 2006 by the TOPEX/Poseidon project, mm/year

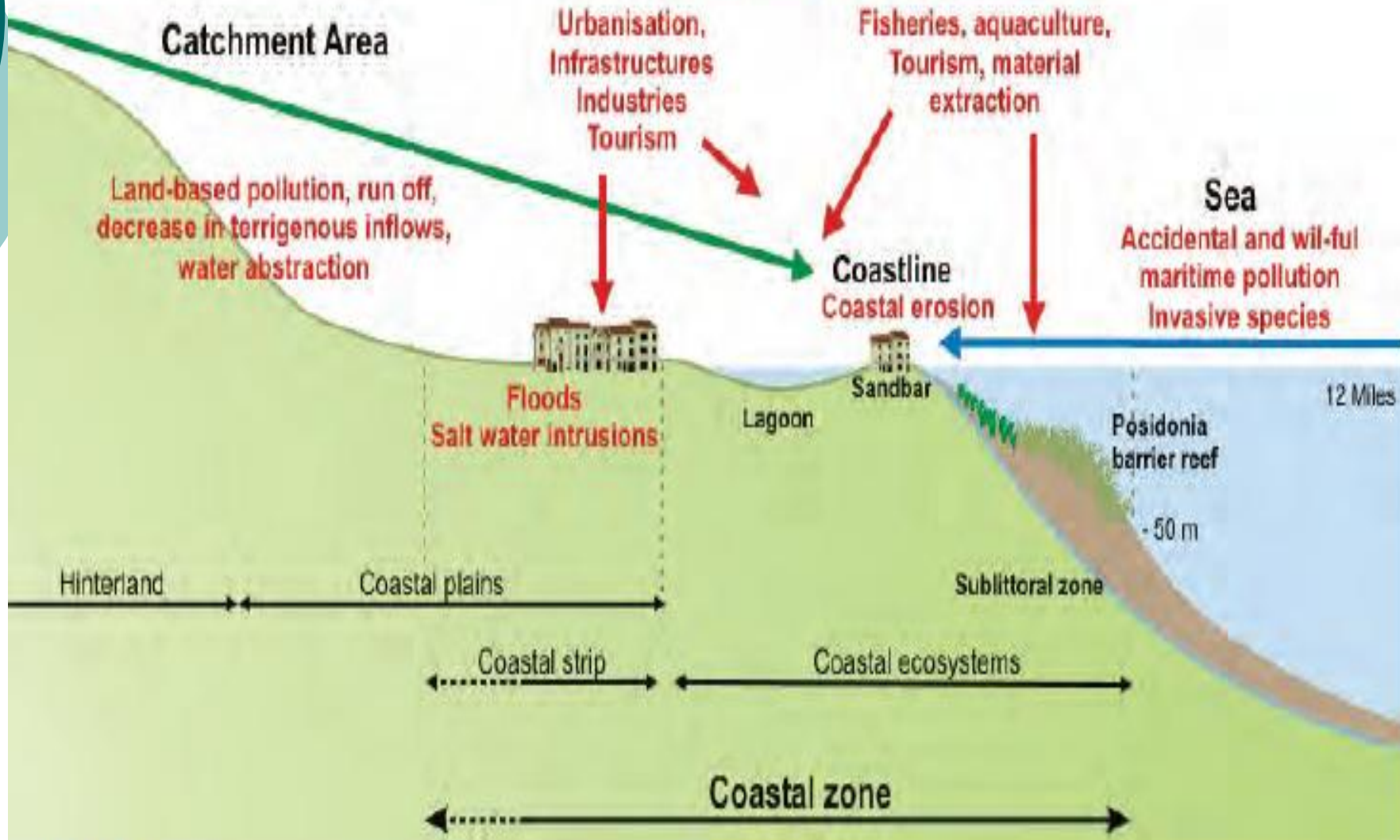




# Approaching Integrated Management

# Pressures

## Direct pressures on the coastal zone



# Basis of Integration = proper understanding of:

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- Basic biogeochemical processes in nature
- Basic socio-political and economic parameters
- Basic cultural and behavioural features of groups involved





# The 5 Is

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- Integration
- Information
- Innovation
- Implementation
- International cooperation

# Understanding & fully utilising the basic functions & services of the aquatic systems

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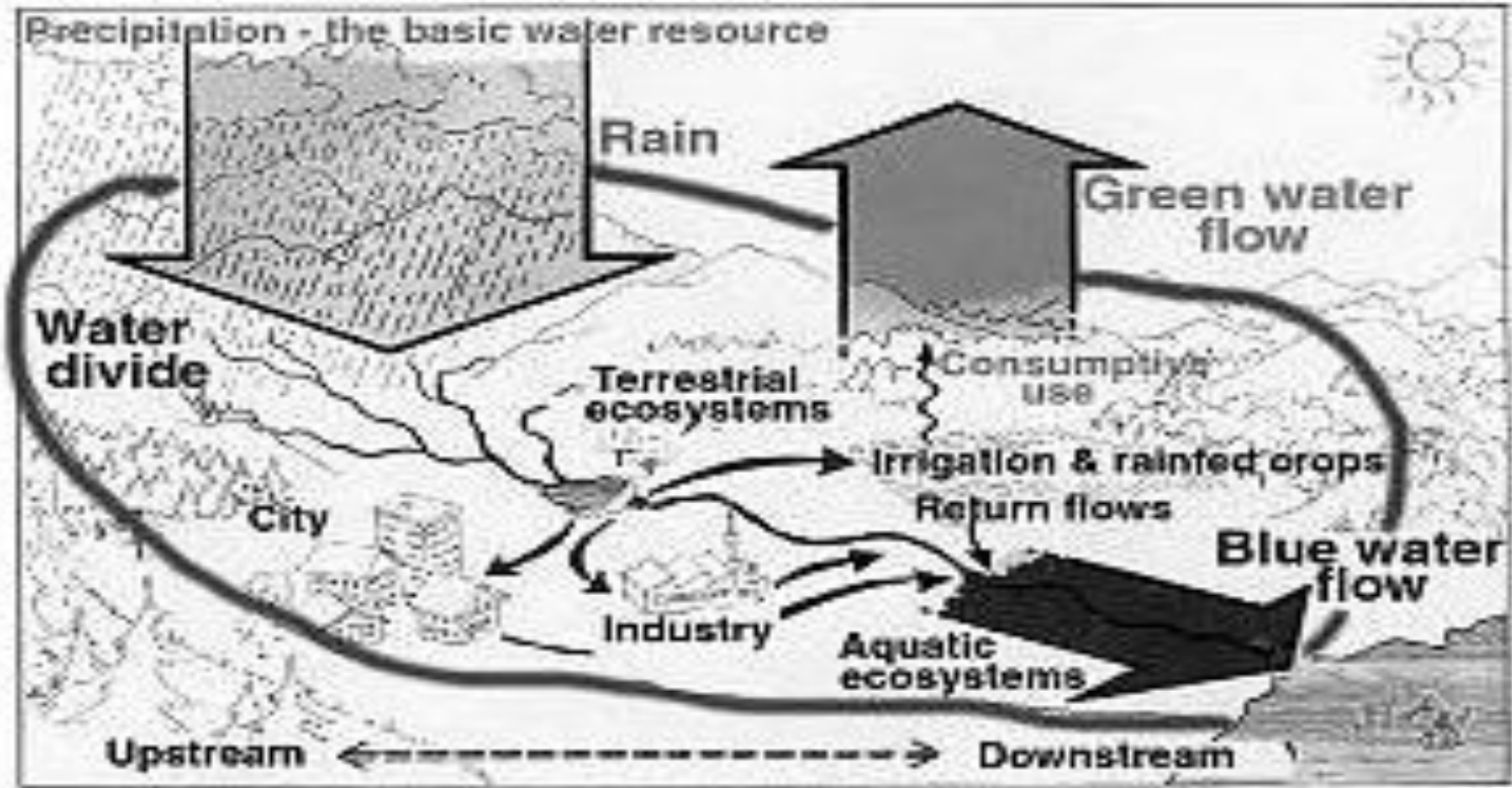
The main **linking cycle** is of course, the **water cycle** in all its aspects, (spatial, time, water, phase, etc.) and what water eventually “carries” with it, from pollution, eutrophication, etc.

A part from problems of **pollution, water scarcity** and **loss of biodiversity** related to the management of water **upstream** a series of pressures and problems are also observed **downstream** within the basin, by industrial, agricultural and domestic water abstraction and discharges to its transitional waters, the coastal zone and also offshore. All these are **interlinked** (see for instance erosion of coast, or impact of fisheries from dams build upstream, etc).

The situation becomes much **more difficult** with **climate change** and increased variability.

# The Water Cycle





*The water consumed in plant production and evaporation from moist surfaces is the **Green Water** flow while the surplus to recharge aquifers and rivers is the **Blue Water** flow, available for societal use and aquatic ecosystems / wetlands.*

# Significant differentiation in the understanding of basic processes by the different disciplines

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Engineers → Emphasis on hydraulic aspects of **Blue Water**

Biologists → Emphasis on processes of **Green Water** circulation

Chemists

Hydrologists

Geologists

} → Emphasis on specific aspects of the Water Cycle

Sociologists, Economists, Political Scientists, Psychologists, etc....???

Necessary multi-disciplinarity

(e.g. biological, geological, chemical et c)

Engineers  
Biologists  
Chemists  
Hydrologists  
Geologists

*Individual contributions* →



Engineers  
Biologists  
Chemists  
Hydrologists  
Geologists

*Integrated contribution by the team* →

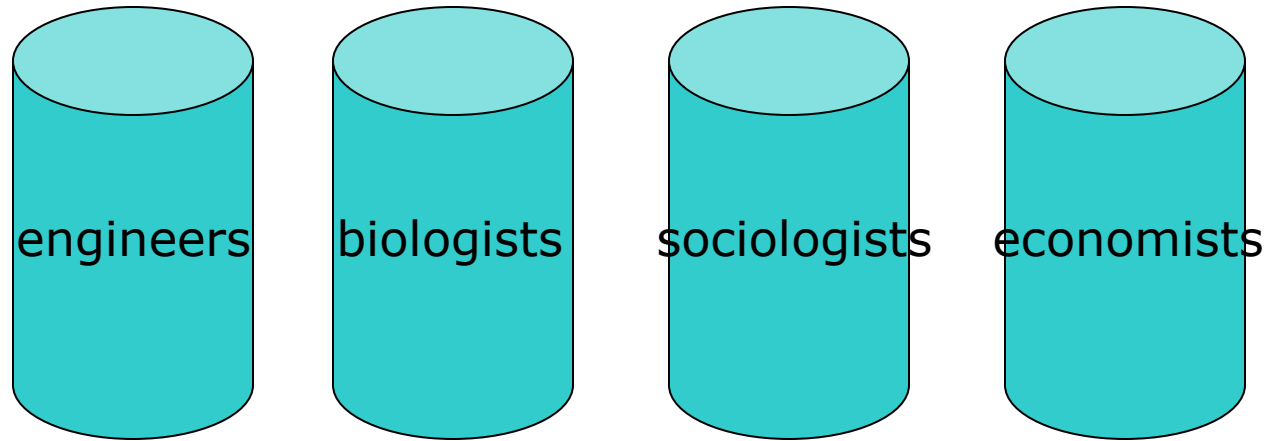


Intra / Inter / Trans disciplinarity

(e.g. biogeochemical)

# Need to overcome the “silo” effect

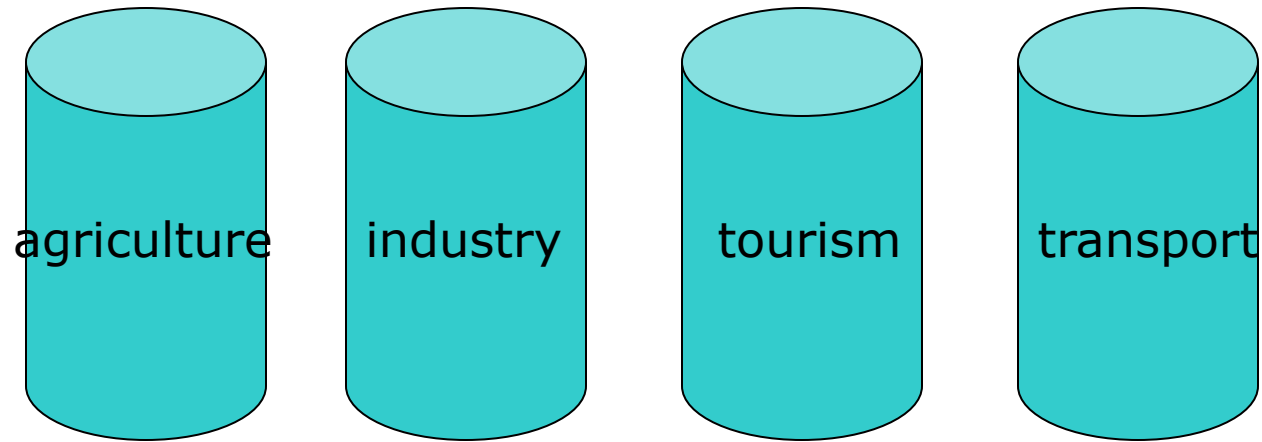
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- Multi- and inter- disciplinary approach

# Need to overcome the “silo” effect

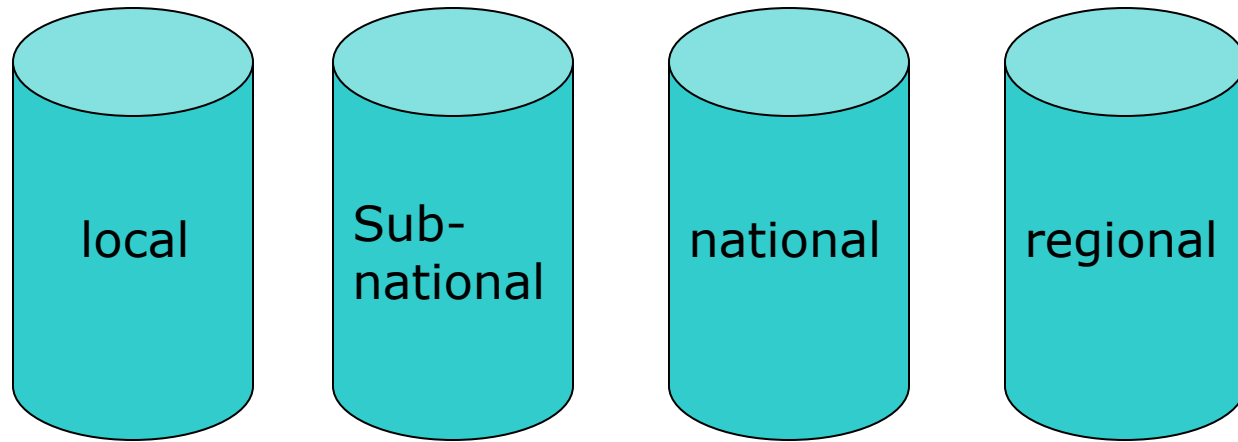
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- Multi- and inter- sectoral approach

# Need to overcome the “silo” effect

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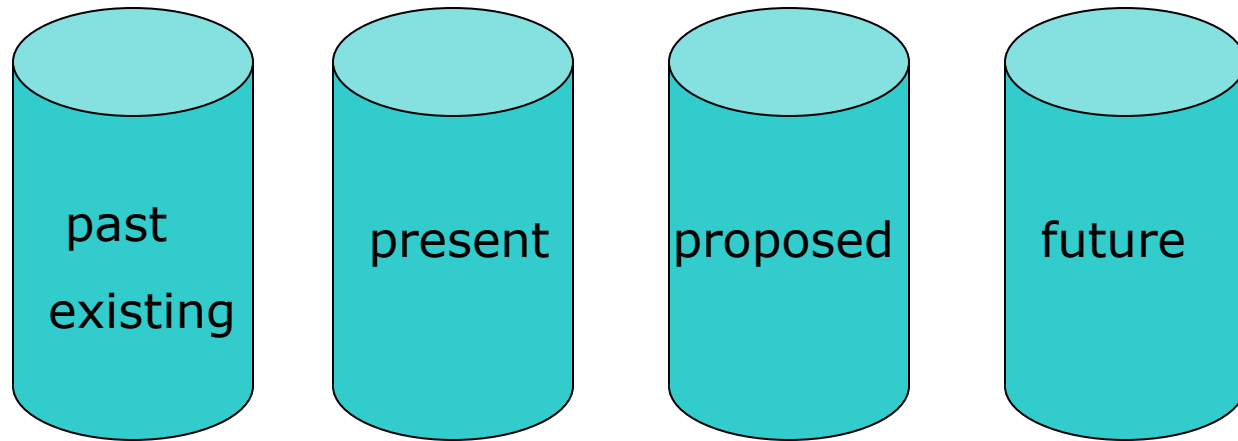


- Multi-level approach



# Need to overcome the “silo” effect

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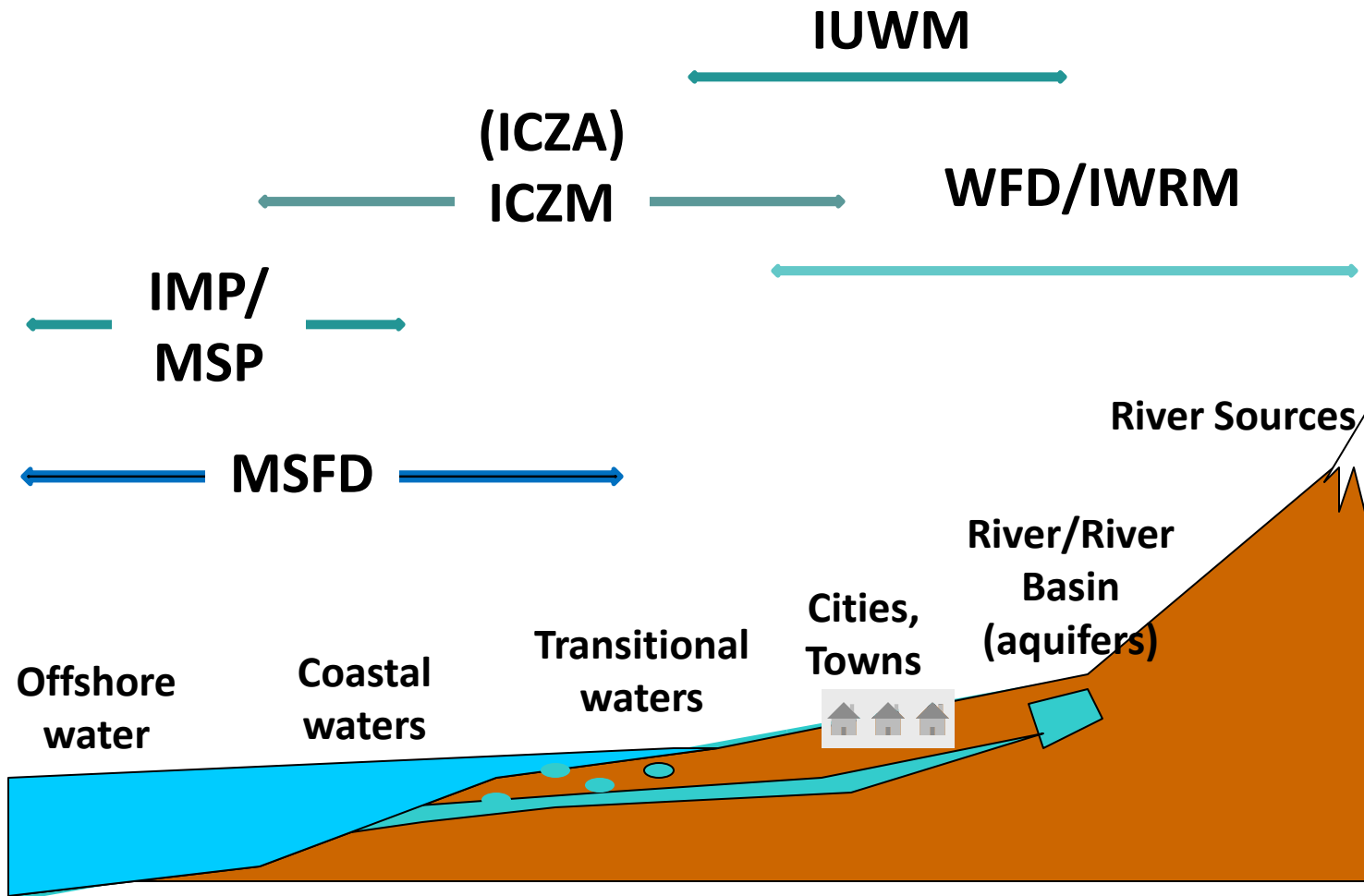
- Coherence and continuity / Inter-generational approach

# Learning from accumulated knowledge, initiatives and methodological & operational management frameworks :

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- Integrated Coastal Zone Management (ICZM)
- Integrated Water Resources Management (IWRM)
- Integrated Ground Water Management (IGWM)
- Integrated Urban Water Management (IUWM)
- Integrated Solid Waste Management (ISWM)
- Integrated Pollution Prevention & Control (IPPC)
- Sustainable Development Planning (SDP) / SUDECIR methodology, etc.
- Ecosystem Approach (ECAP)
- Spatial Maritime Planning (SMP)
- Holistic Approach/Holistic Management
- Environmental Management and Planning
- Physical/Space Planning (urban planning, e.g. city planning and management)
- Environmental Resource Management (ERM)

# Various types of Integrated Management



# The relationship between Integrated and Holistic

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**«Αρχή σοφίας ονομάτων επίσκεψις»**

*“The approach of wisdom begins with the understanding of words (terms)”*

*Integrated Water Resources Management*

*Integrated Coastal Zone Management*

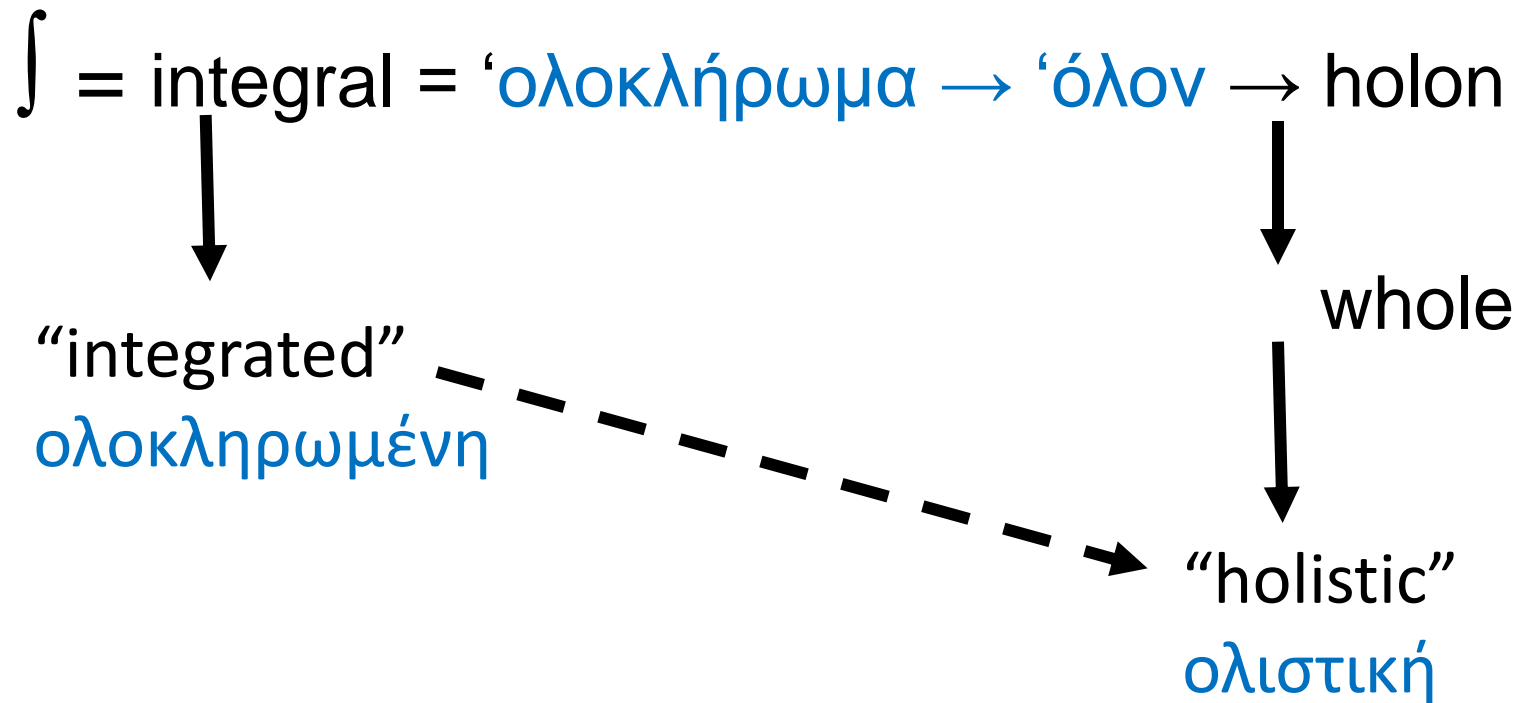
*As an attempt to approach the vision of **Wise Management***

*However, in most cases the result is closer to “informed” management populated by too many data leading to “information” and, perhaps, “knowledge” but rarely to “wisdom”*

# The relationship between Integrated and Holistic

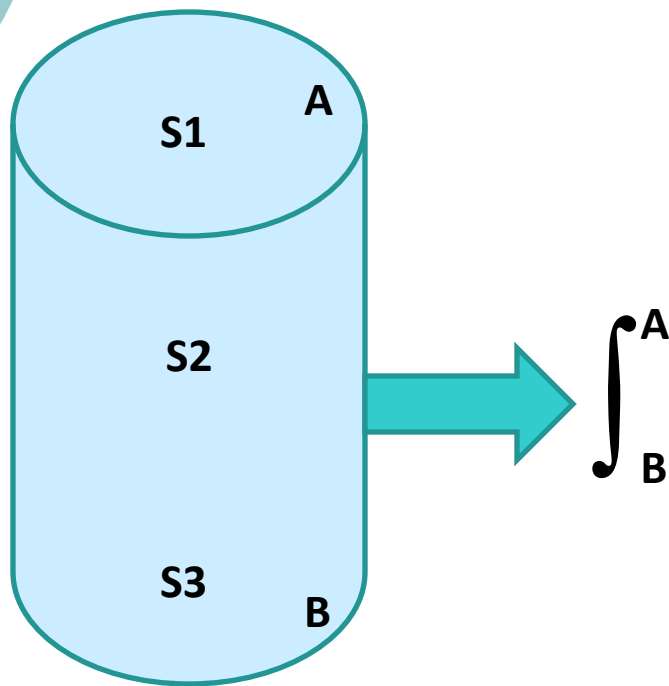
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## Multiple Integration Πολλαπλή Ολοκλήρωση



# The relationship between Integrated and Holistic

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“Integrated management” allows for more complete understanding and accurate representation of the whole, respecting, however, the differentiations within it.

It goes beyond a simple coordination.

It is a comprehensive approach still “coordinated” but not “homogeneous”.



# The relationship between Integrated and Holistic

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- The Holistic approach considers that the whole contains more than its parts
- **Holistic Management** refers to the management of the whole
- **Integrated Management** considers all or as many as possible aspects of the whole as critical for the management of any part of the whole

# Integrated Water Resources Management (IWRM)

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**Integrated Water Resources Management (IWRM)** is a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment (GWP definition)



# First approach to IWRM: Inter-sectoral allocation of resources

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## Intégration intersectorielle

- Environnement favorable
- Rôles institutionnels
- Instruments de gestion

Eau pour  
les êtres  
humains

Eau  
pour la  
nourriture

Eau pour  
la nature

Eau pour  
l'industrie  
et autres  
utilisations

# Key principles of WFD\* for the integrated river basin management

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## Objectives:

- Achieving 'Good Status' for all EU groundwaters, rivers, lakes, coastal waters, etc. by 2015
- Establishing a 6-year planning cycle for the development of River Basin Management Plans. First reviewed in 2015

\*EU Water Framework Directive

# Key principles of WFD for the integrated river basin management

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- Protecting all waters, surface and groundwaters
- Covering all impacts on waters
- Water quality comprehensively defined in terms of biology, chemistry and morphology
- Water management based on river basins
- Monitoring programmes for surface and groundwaters, both as a planning tool and as an assessment instrument
- Economic instruments: getting the prices right - to promote prudent use of water
- Mandatory public participation
- Complemented/guided by an enhanced cooperation on implementation
- Reducing marine pollution from land-based sources and protecting ecosystems in coastal waters

# ICZM approaches

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- **Coastal Management** was traditionally developed in the second part of the 20th century and mainly since the 1970's as a subsystem of both **Physical Planning** and **Environmental Planning** and management.
- **Physical Planning** is defined as a form of (mostly urban) **Spatial/or Land Use Planning** which attempts to achieve an optimal spatial coordination of different human activities for the enhancement of the quality of life (LANDV).
- **Environmental Planning** is the identification of desirable objectives for the physical environment, a subsystem of which is the coastal one, including social and economic objectives and the creation of administrative procedures and programmes to meet those objectives (GILP, 96).
- **Latest developments on ICZM: The 7<sup>th</sup> Protocol of the Barcelona Convention**

# Integrated Coastal Zone Management (ICZM) Protocol

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- ICZM Protocol entered into force in March 2011
- Objective: Sustainable development of coastal zones and sustainable use of natural resources
- Principles: Integrated approach; ecosystem based approach to coastal planning (relation to MSFD and IMP/MSP)
- Vulnerability to climate change
- An Action Plan (2012-2019) for the implementation of the Protocol is under development and could be submitted at the forthcoming COP



## Ecosystem Approach (ECAP)

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- **Ecosystem Approach** is defined as a Strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.
- It has been adopted by the Conference of the Parties of the Convention on Biological Diversity (CBD) as the primary framework for action under the Convention.
- In fact, the vision behind it, is that through this approach we allow natural systems to provide services for the solution of a rapidly growing number of global concerns.

## ECOSYSTEM-BASED & INTEGRATED APPROACH

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### Objectives:

- **The collective pressure of human activities is kept within levels compatible with the achievement of GES**
- The capacity of marine ecosystems to respond to human-induced changes (e.g. climate change) is not compromised
- The use of marine goods and services by present and future generations is sustainable

### Requirements:

- The preservation and enhancement of ecosystems and ecosystem services is systematically taken into account in the development of human socio-economic activities.
- The objectives to protect and restore the environment should increasingly set the boundaries for sustainable use of the natural environment



# The EU Marine Strategy Framework Directive

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- The Marine Directive aims to achieve **Good Environmental Status (GES)** of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is the first EU legislative instrument related to the protection of marine biodiversity, as it contains the explicit regulatory objective that "biodiversity is maintained by 2020", as the cornerstone for achieving GES.



# The EU Marine Strategy Framework Directive

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- The Directive enshrines in a legislative framework the **Ecosystem Approach** to the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use.
- In order to achieve its goal, the Directive establishes European marine regions and sub-regions on the basis of geographical and environmental criteria. The Directive lists the **Mediterranean Sea** among its four European marine regions located within the geographical boundaries of the existing Regional Sea Conventions (for the Mediterranean, the **Barcelona Convention**)

# The Barcelona Convention

## ⇒ UNEP/MAP and its Regional Centers

- MAP Coordinating Unit (MEDU)
- Mediterranean Commission on Sustainable Development (MCSD)
- Programme for the Assessment and Control of Marine Pollution in the Mediterranean Region (MED POL)
- MAP Regional Activity Centres (RACs)
  - ✓ Blue Plan Regional Activity Centre (BP/RAC), France
  - ✓ Priority Actions Programme Regional Activity Centre (PAP/RAC), Croatia
  - ✓ Specially Protected Areas Regional Activity Centre (SPA/RAC), Tunisia
  - ✓ Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), Malta
  - ✓ INFO/RAC, Italy
  - ✓ Cleaner Production Regional Activity Centre

# The Barcelona Convention

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- The forum for regional cooperation required by the MSFD
- Ecosystem based approach (ECAP) implemented in several steps
- ECAP deliverables compatible with MSFD deliverables, adapted to Mediterranean conditions and needs
- Initial assessment, ecological and operational objectives and indicators, roadmap have been submitted and adopted by COP (Paris, 2012)
- Other key points adopted by COP include biodiversity protection, marine litter strategic framework and implementation of Offshore Protocol and ICZM Protocol

# Ecosystem-based & Integrated Approach in relation to GES

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## Objectives:

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- The capacity of ecosystems to respond to human-induced changes (e.g. climate change) is not compromised
- The use of ecosystem goods and services by present and future generations is sustainable

## Requirements:

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# How To Achieve Good Environmental Status (GES)

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**Good Environmental Status** is “the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive” (MSFD, art. 3(5)).

In addition, GES means that:

- ⦿ The different uses made of the marine resources are conducted at a sustainable level, ensuring their continuity for future generations.
- ⦿ Ecosystems are fully functioning and resilient to human-induced environmental change;
- ⦿ The decline of biodiversity caused by human activities is prevented and biodiversity is protected;
- ⦿ Human activities introducing substances and energy into the marine environment do not cause pollution effects.

# MSFD Descriptors for Good Environmental Status

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1. Biodiversity is maintained
2. Non-indigenous species do not adversely alter the ecosystem
3. The population of commercial fish species is indicative of a healthy stock
4. Elements of food webs occur at normal abundance and diversity
5. Eutrophication is minimised
6. The sea floor integrity ensures structure and functioning of the marine ecosystem
7. Permanent alteration of hydrographical conditions does not adversely affect the marine ecosystem
8. Concentrations of contaminants give no pollution effects
9. Contaminants in seafood do not exceed safe levels
10. Marine litter does not cause harm
11. Introduction of energy (including underwater noise) does not adversely affect the ecosystem

# Maritime Spatial Planning (MSP) and ICZM Protocol

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- **Maritime Spatial Planning (MSP)** is about planning and regulating all human uses of the sea, while protecting marine ecosystems.
- It refers to the part extending from the shoreline to the territorial limits offshore.
- It focuses on marine waters under national jurisdiction and is concerned only with planning activities at sea.
- It does not cover management of coastal zones or spatial planning of sea-land interface.
- The **ICZM Protocol** points to the same direction and has compatible aims. However, the marine part of the coastal zone (defined as extending from the shoreline to the territorial limits) is considered for management purposes in a “continuum” with the terrestrial part of the coast.



# Management of natural resources

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- - The “cluster” of all kinds of measurements, approaches, tools to handle a **natural** resource (e.g. minerals, water etc.)
- - Gradually the time and spatial concerns were built in, usually for short (or medium) terms and for restricted space. The latter has been recently expanded to the “river basin” scale with due consideration to future needs and also to future generations



# Environmental Resource Management (ERM)

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- **Environmental resource management** is defined<sup>1</sup> as “a purposeful activity with the goal to maintain and improve the state of an **environmental resource** affected by human activities”. It is not the management of the **environment as such**, but rather the management of the interaction and impact of human societies on the environment.
- ERM aims to ensure that ecosystem services are protected and maintained for equitable use by future human generations, and also, maintain ecosystem integrity as an end in itself by taking into consideration ethical, economic, and scientific (ecological) variables.
- ERM tries to identify the factors that have a stake in the conflicts that may rise between meeting the needs and protecting the resources.

# Millenium Development Goals (MDGs) & Strategy for Water in the Mediterranean (SWM)

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The need for a Strategy for water in the Mediterranean became clear immediately after Johannesburg (2002), partly as framework for stimulating the implementation of the relevant MDGs.

It took, however, some years to mature: the 3<sup>rd</sup> Euro-Med Ministerial Conference (Dead Sea 2008) mandated a Water Expert Group to elaborate the SWM and an Action Plan. The Draft SWM, within the framework of the Union for the Mediterranean, was prepared and presented at the 4<sup>th</sup> Euro-Med Ministerial Conference (Barcelona 2010) but for political difficulties over two words adoption is pending. The recent 5+5 Initiative may facilitate the way forward.

# WATER STRATEGY IN THE MEDITERRANEAN

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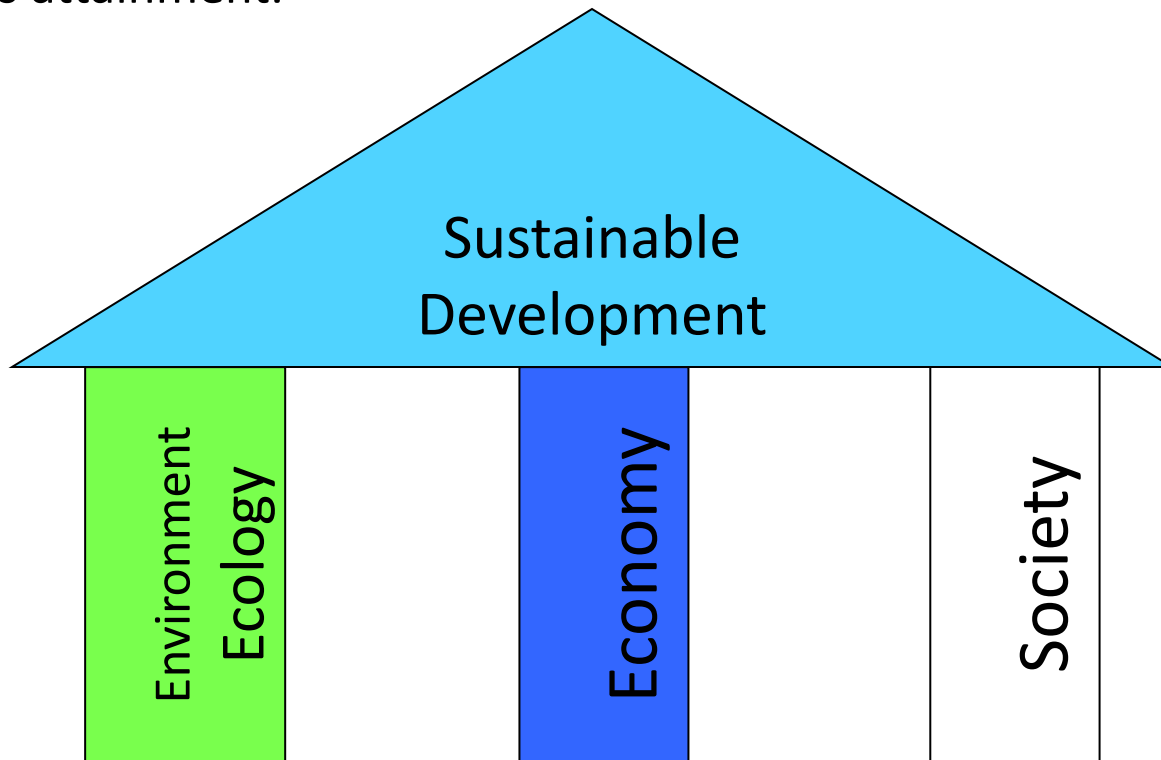
The four major priority themes for the Strategy for Water in the Mediterranean:

- **Enhancing effective governance for integrated water resources management**
- **Adapting to climate change and enhancing drought and flood management**
- **Promoting water demand management, efficiency and non-conventional water resources, and protecting quality of water and biodiversity**
- **Optimizing water financing, water valuation and appropriate instruments, with emphasis on innovative mechanisms**

# In all integrated management schemes the final aim is sustainable development

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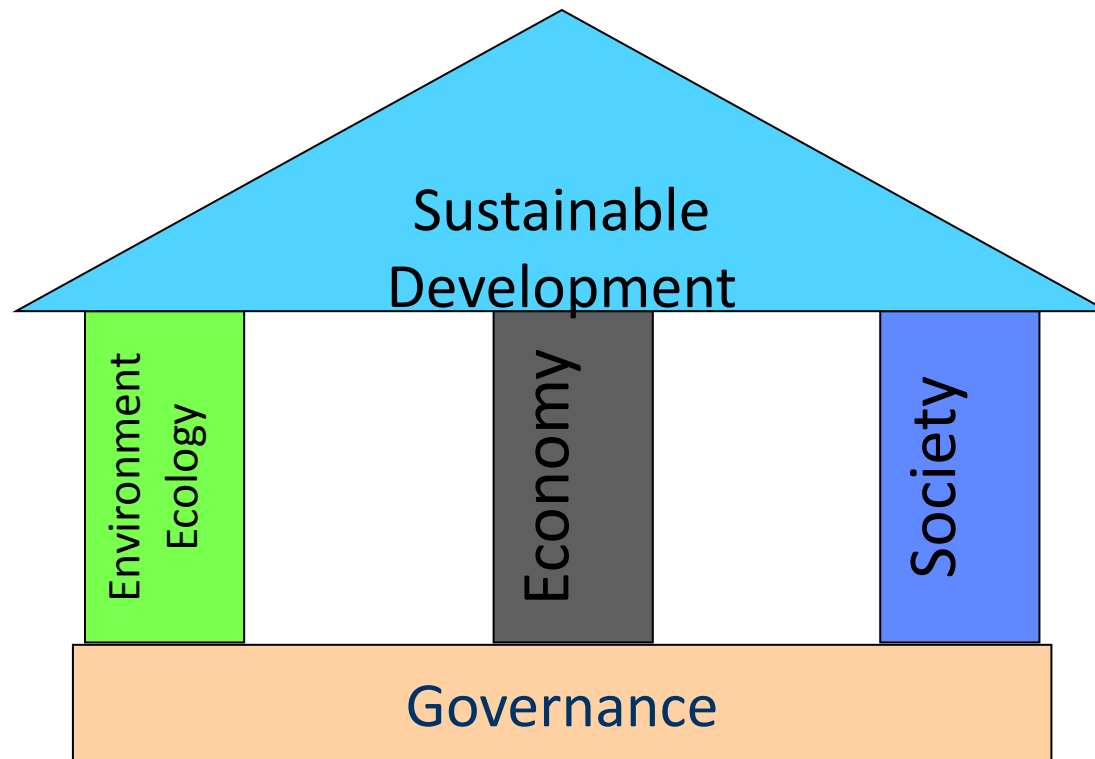
**Sustainable Development Management** requires understanding of the concept of Sustainable Development and the tools available for its attainment.



Rio, 1992

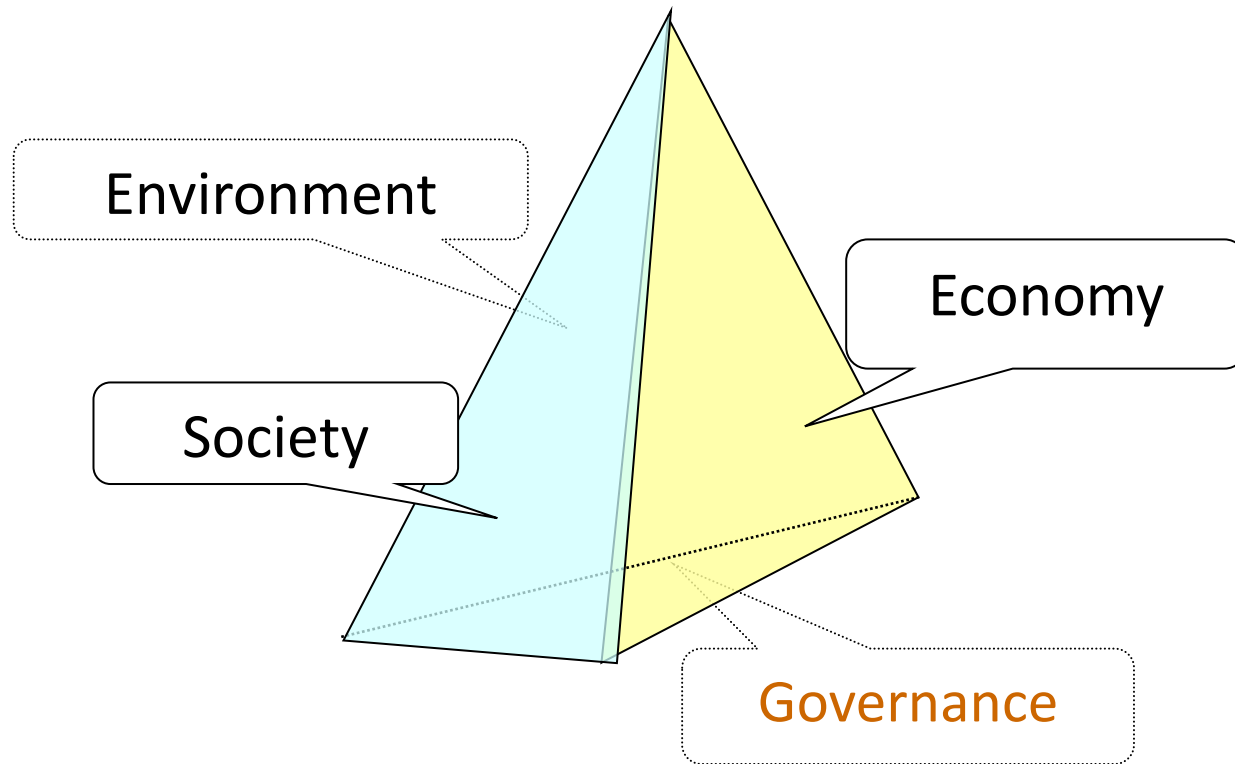
# Governance is the prerequisite for good Integrated Management

Appropriate **Governance** is the prerequisite for Sustainable Development. However, it is unclear how environment, economy and society interact for the achievement of Sustainable Development.



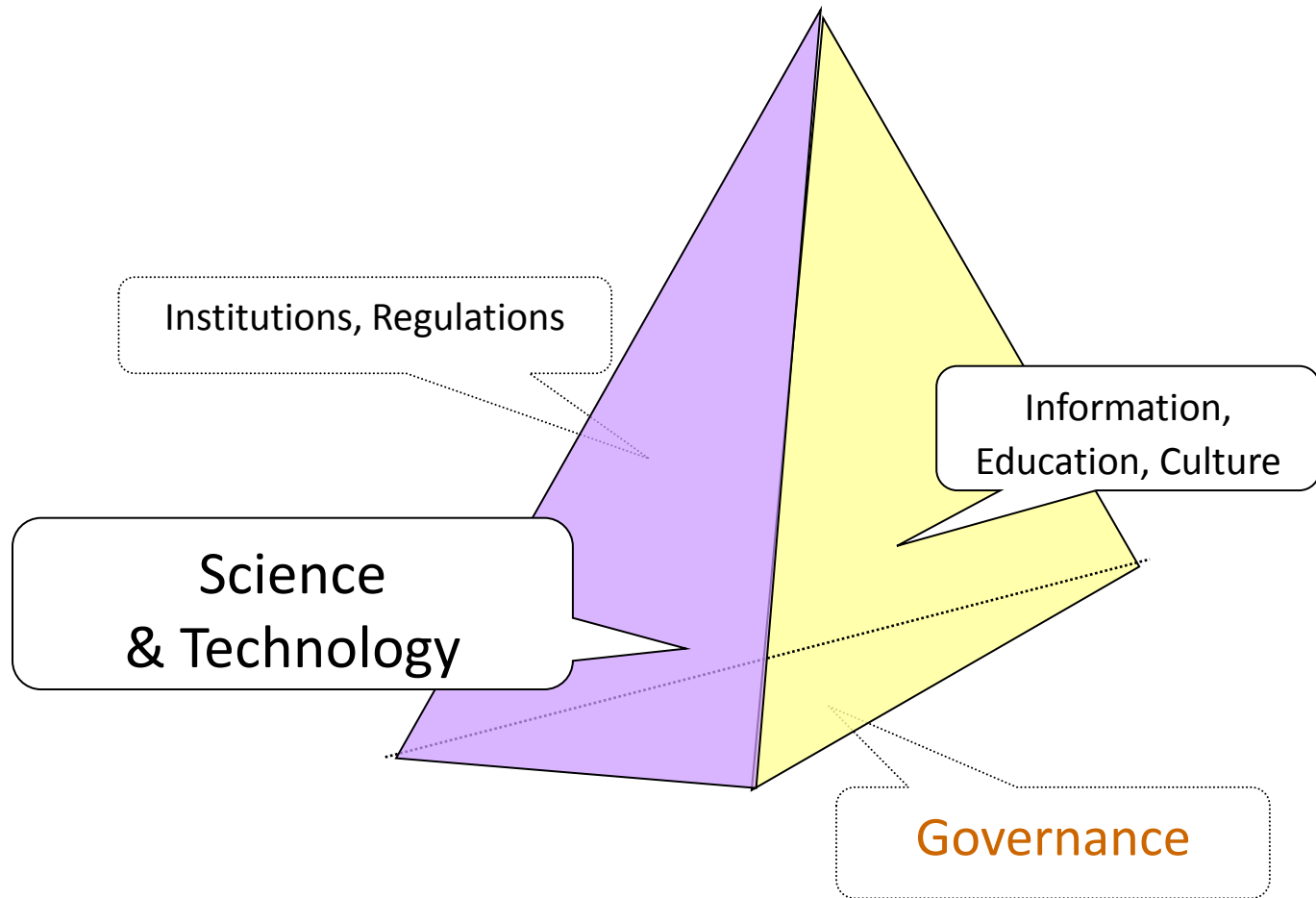
# Governance is the prerequisite for good Integrated Management

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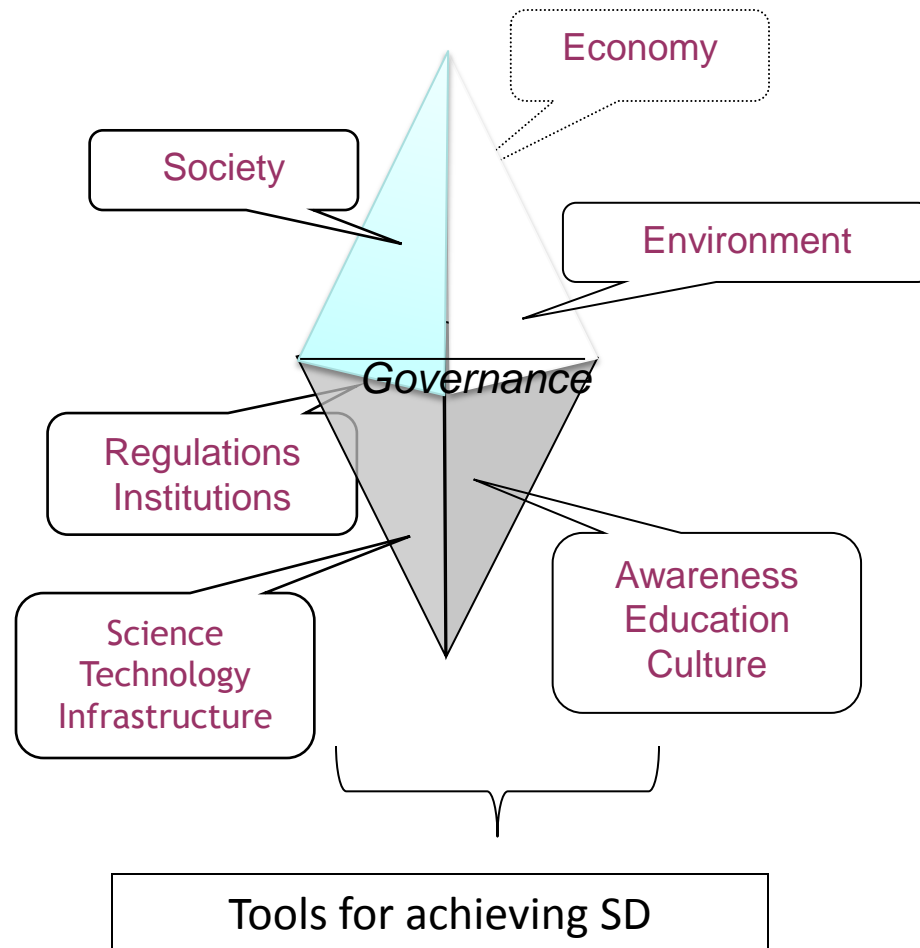
# Analysis of Governance and its tools

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# In all integrated management schemes the final aim is sustainable development

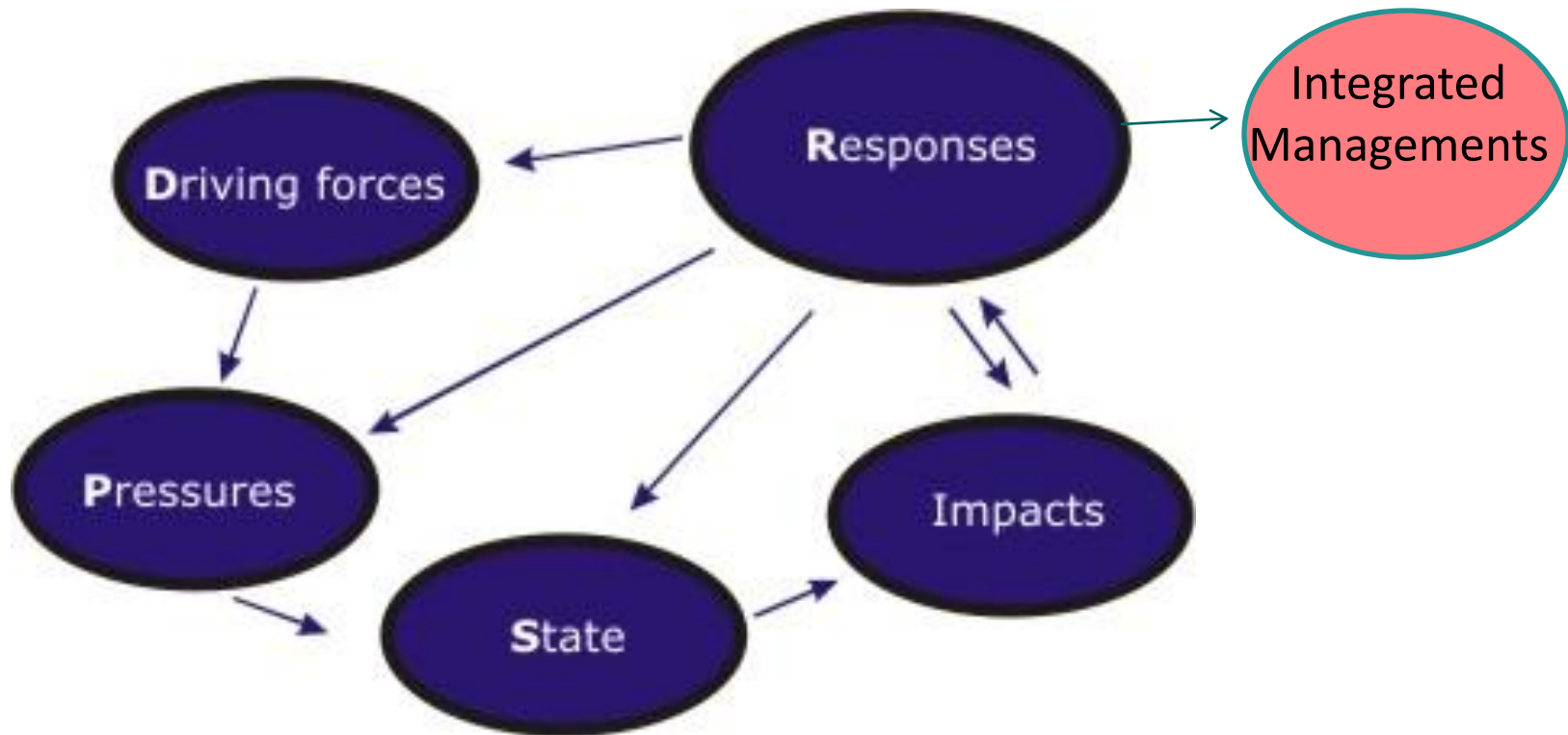
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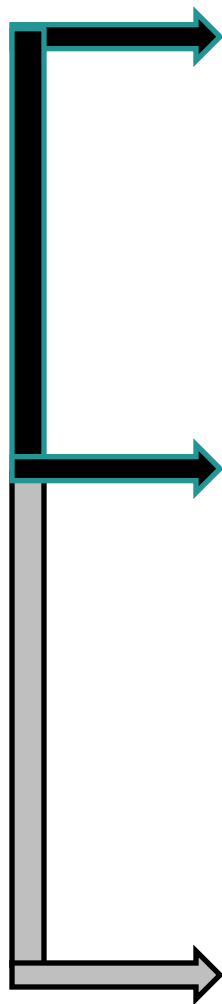
# Timeliness of the management cycle & the DPSIR Framework

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# Adaptability



Most people refer to emerging issues or changing conditions:

**Flexibility**

Has another component:

**“Pruning” (ameliorating)** the pre-existing management

**AND/OR**

Drastically change the **enabling environment** (remove root causes of distortion)

# Adaptive Management

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## **Key principles**

- Flexibility and adaptability of the measures to implement IWRM (and other Integrated Management approaches)
- Regular update of environmental targets to take into account the changes observed
- Integration of the outcomes of future scientific research

## **Instruments**

- Monitoring programmes
- Provisions for regular updates according to the outcomes of monitorings

“Learning-by-doing” approach to deal with the uncertainties linked to the complex functioning of ecosystems & to climate change

# Adaptive Management Provisions in the Marine Strategy (example)

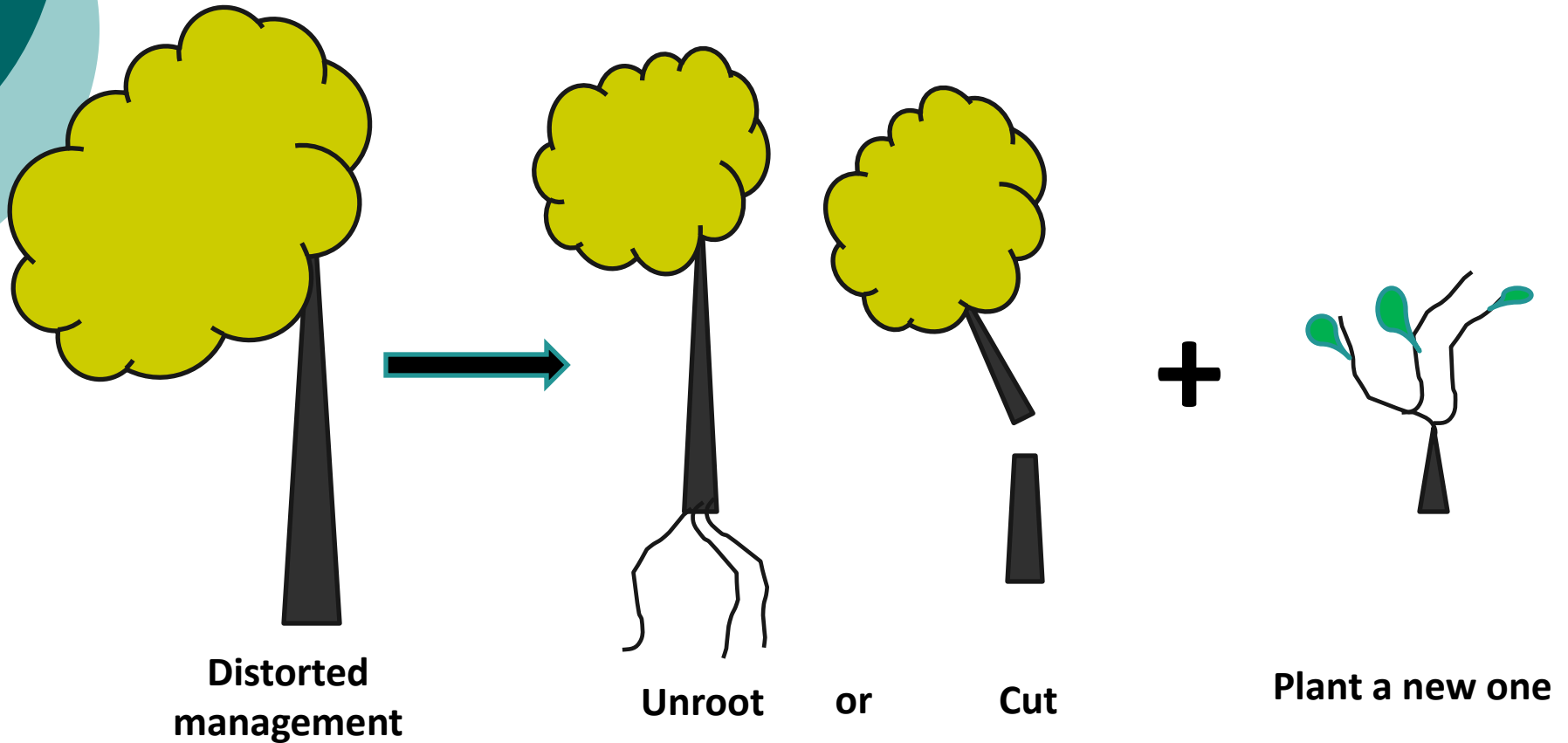
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## **Instruments**

- Monitoring programmes: measure progress towards GES, using specific targets
- Update of Marine Strategy according to the outcomes of the monitoring process
- Obligation for Member States to review their marine strategies every 6 years
- Review of:
  - The initial assessment of the state of the marine waters
  - The environmental targets
  - The monitoring programmes
  - The programme of measures

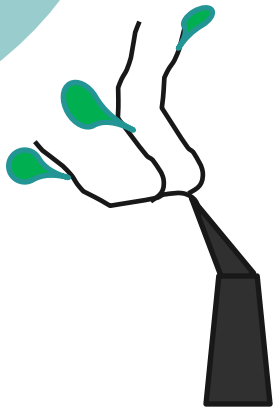
# The Common Approach

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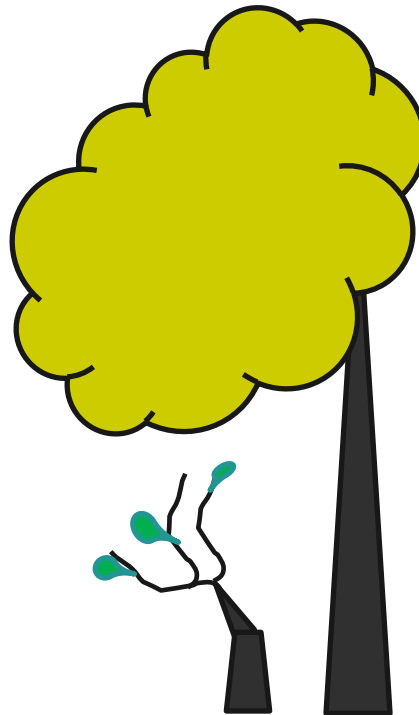
## The Usual Result...

## Very rarely...

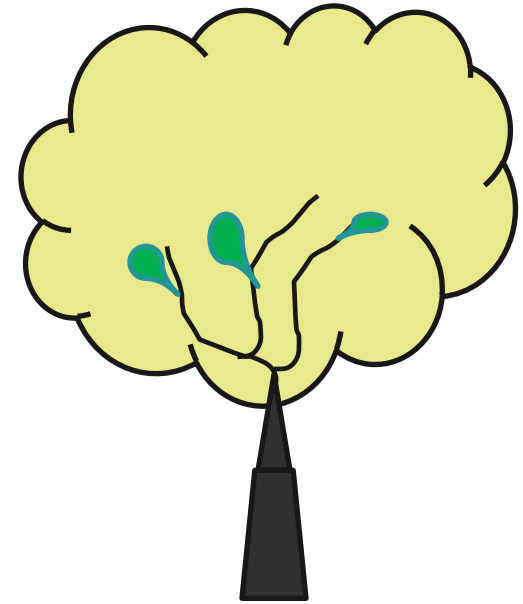


The new management becomes distorted due to inherent conditions

or



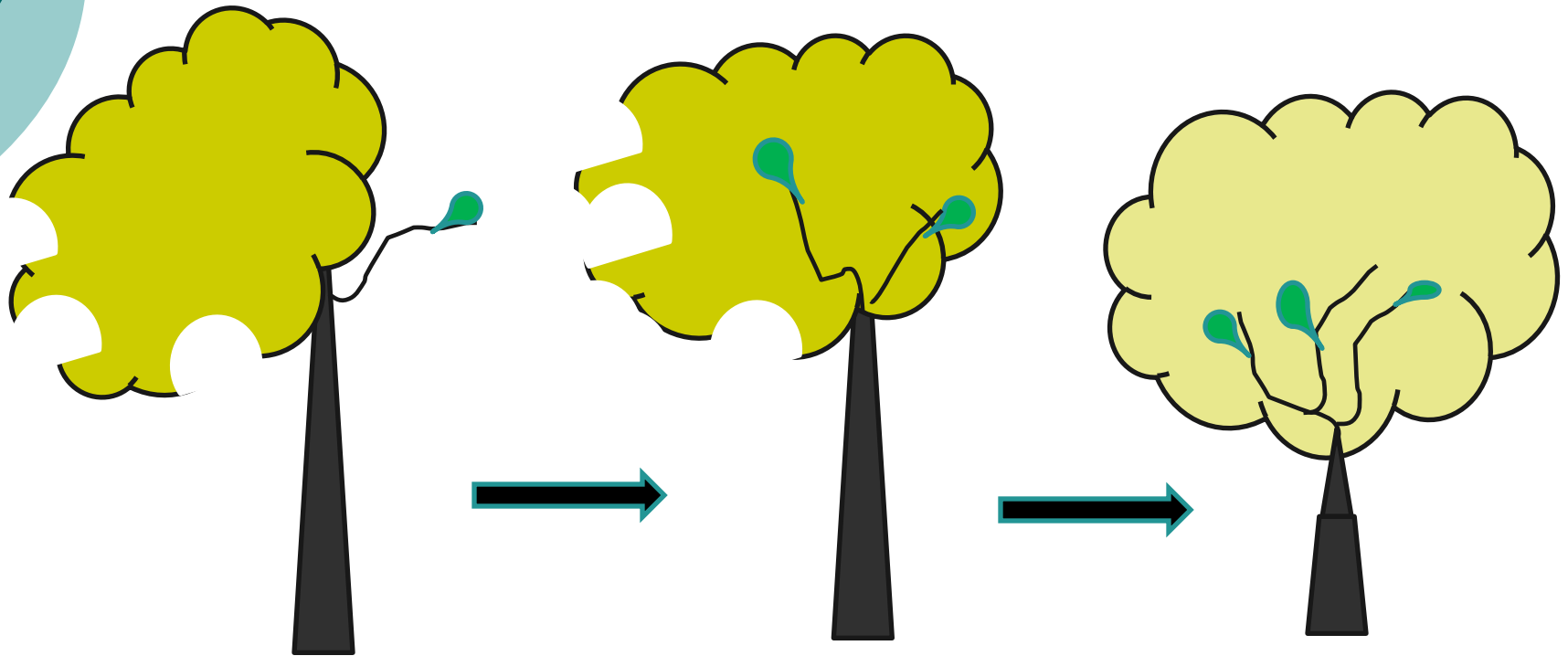
The new becomes distorted due to resilience of the old system



The new well developed as expected

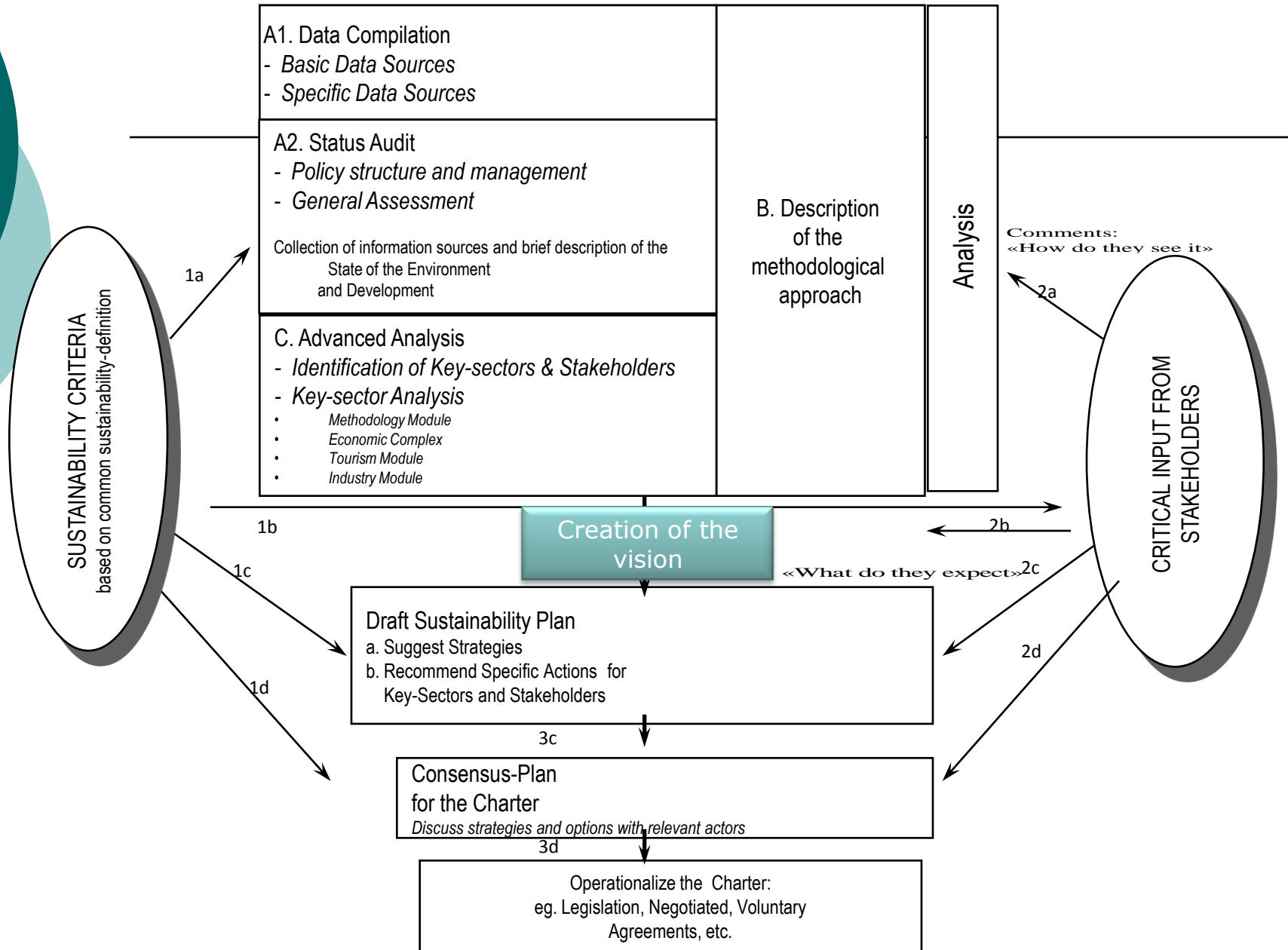
# Adaptive management

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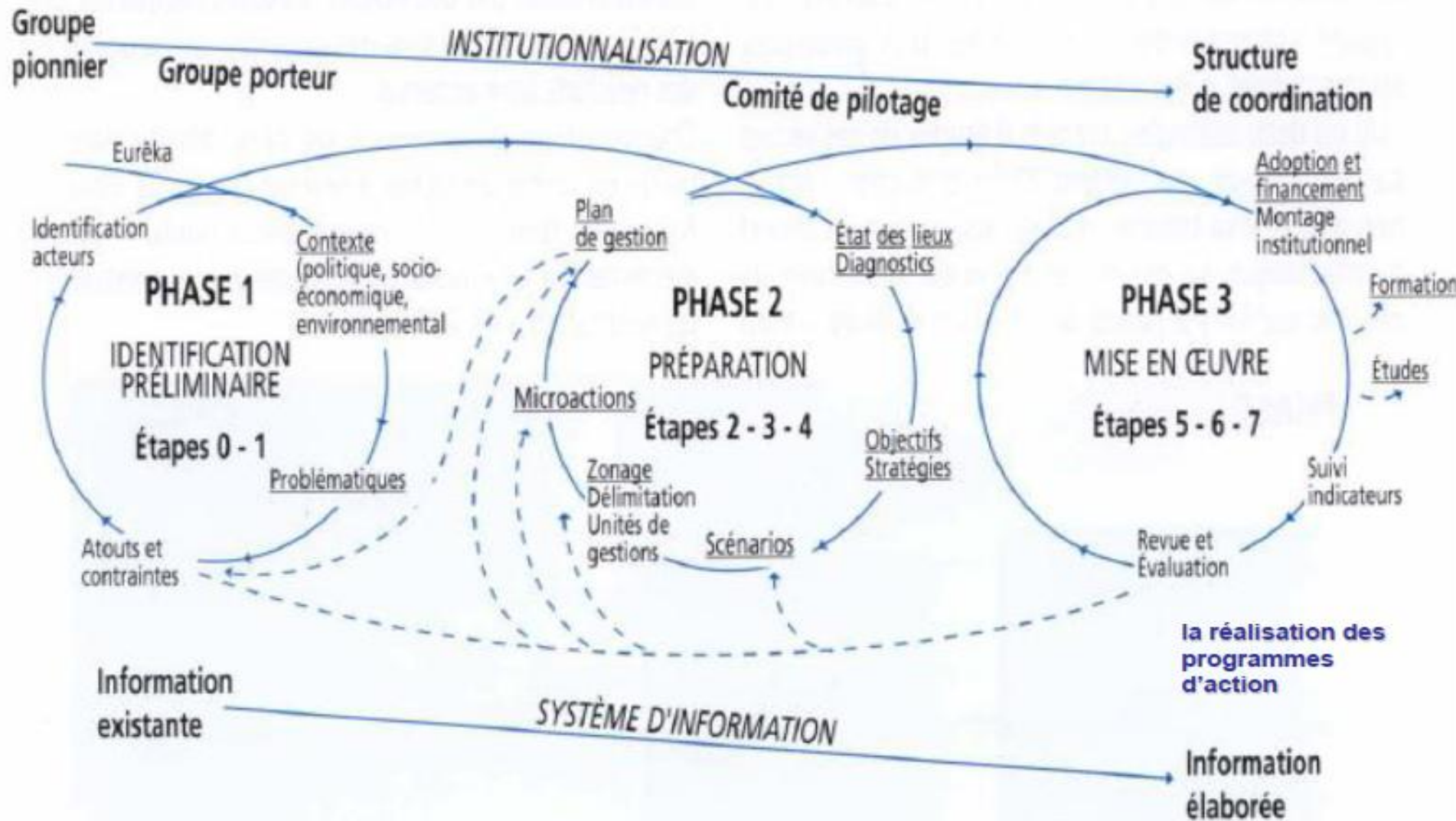
Pruning and gradual improvement

# PROCESS DIAGRAM





# Dynamic Nature of Integrated Management





## In conclusion: Integrated Management Schemes require flexibility and innovation

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For each one of the Integrated Management Schemes we need a slightly different “mix” of Environment/Economy/Society obtained through appropriate combination of the Institutions/Society & Technology, Innovation and Awareness/Education, Cultural tools. The needed criteria & indicators are, in most cases, common.

Basic philosophy behind the “**wise**” management of natural resources is the appropriate use of water, biodiversity, productive space, carrying capacity, etc.

In many cases this is encapsulated into, the so called, **Good Environmental Status (GES)**, which links the **Ecosystem Approach (ECAP)** to IWRM, ICZM, MSFD, etc.



# Towards wisdom...

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The strength & weakness of IWRM and all integrated managements lay in the fact that they are site-specific and evolutionary throughout the design and implementation phases, while directly responding to local needs and specific conditions

The ultimatum success of Integrated Plans is to robustly approach its vision for **Wise Management**



***THANK YOU!***

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