

# State of Mediterranean Forests

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Socio-economic division on each side of the Mediterranean  
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- Biodiversity, forest genetic resources and climate change
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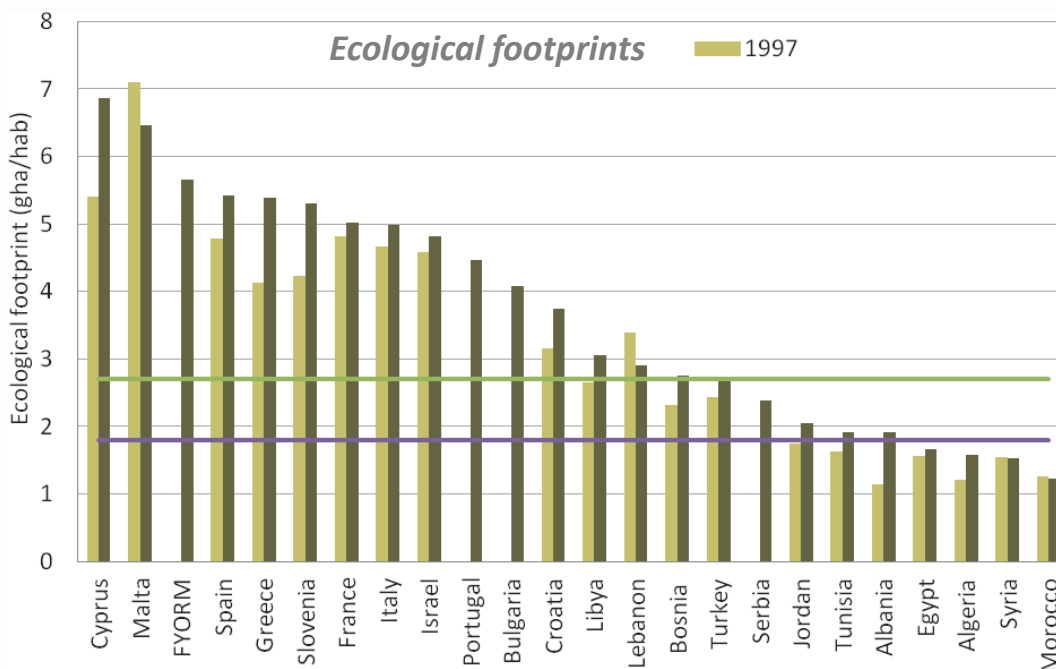
## Sharp socio-economic differences between the Mediterranean rims

### Northern countries :

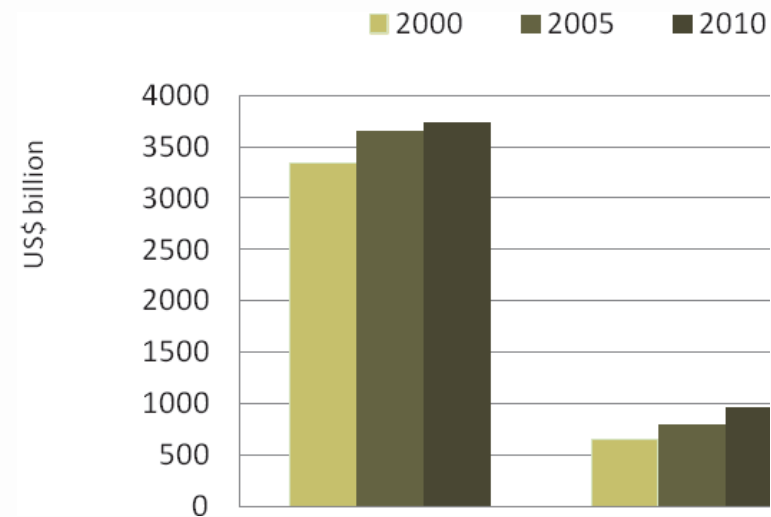
- Population stability and higher Human Development Indices
- Concentration of the regional economic wealth (80%)

### Southern and Eastern countries :

- Higher poverty rates and rapid population growth
- Lower Ecological Footprints but lack of control over growing anthropogenic pressures

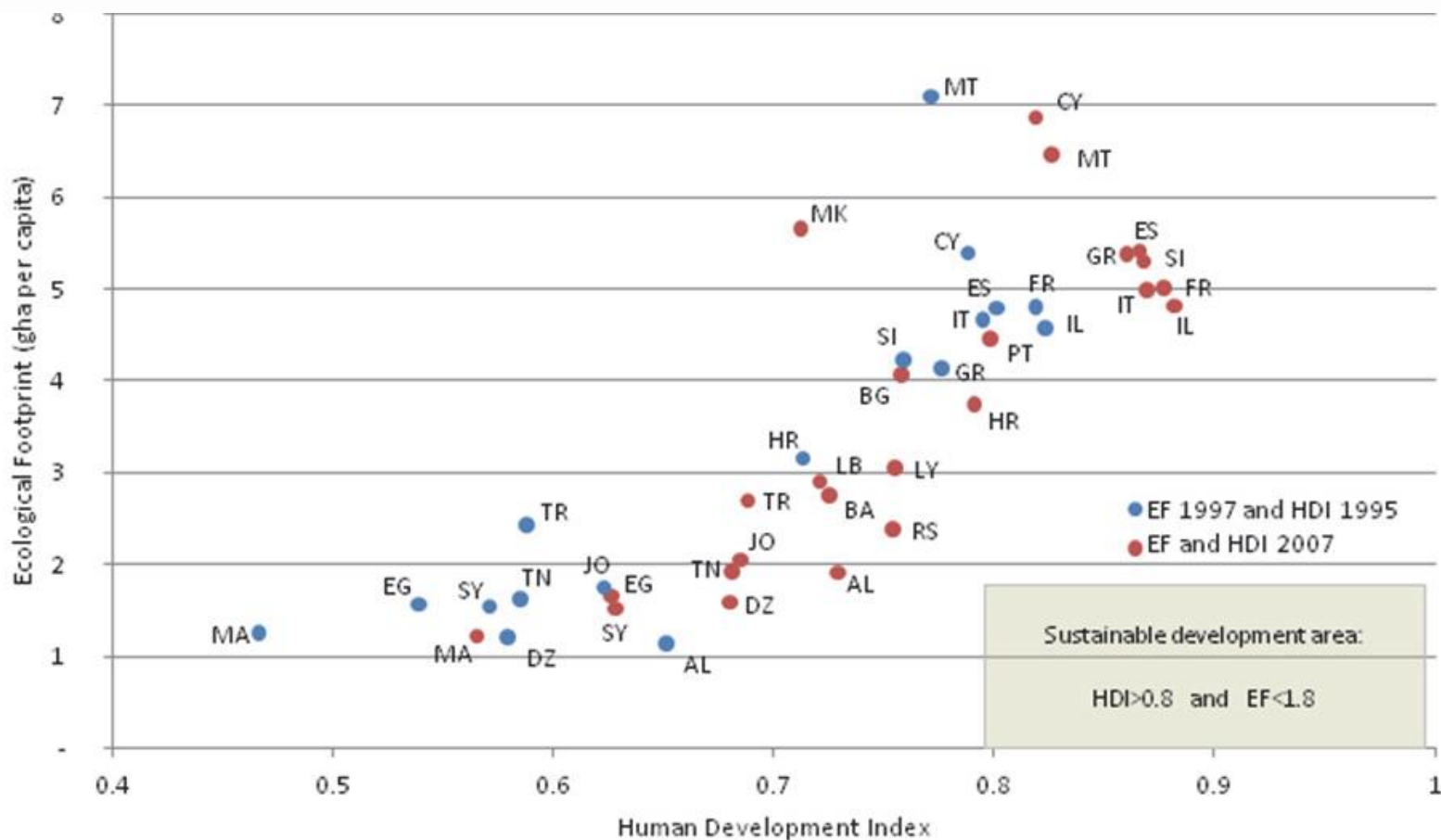


*GDP per capita  
in Northern / Southern & Eastern countries*



## Sharp socio-economic differences between the Mediterranean rims

No country in the “Sustainable Development Zone”

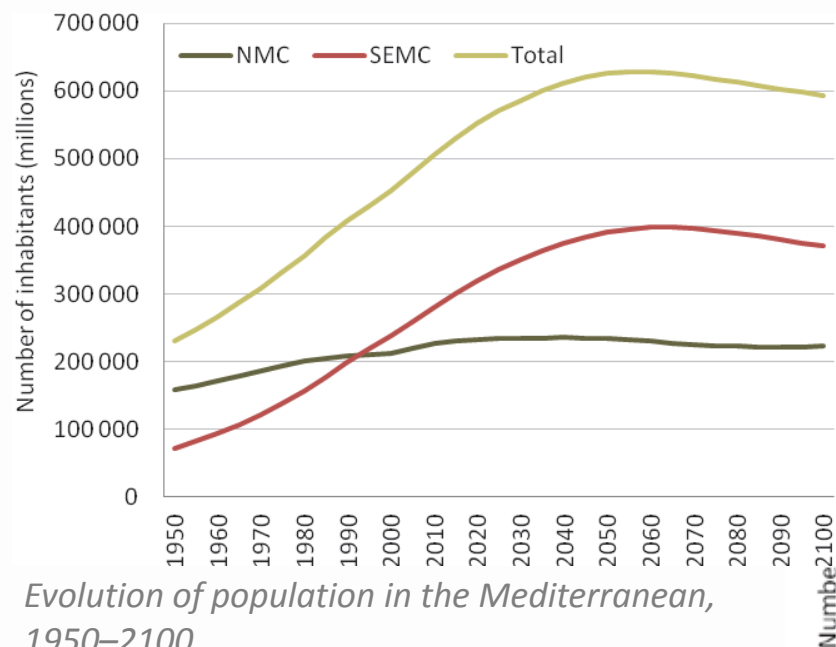




# Towards sustainable development in the Mediterranean: challenges to face

## Demographics: stabilization in the North, transition in the South and East

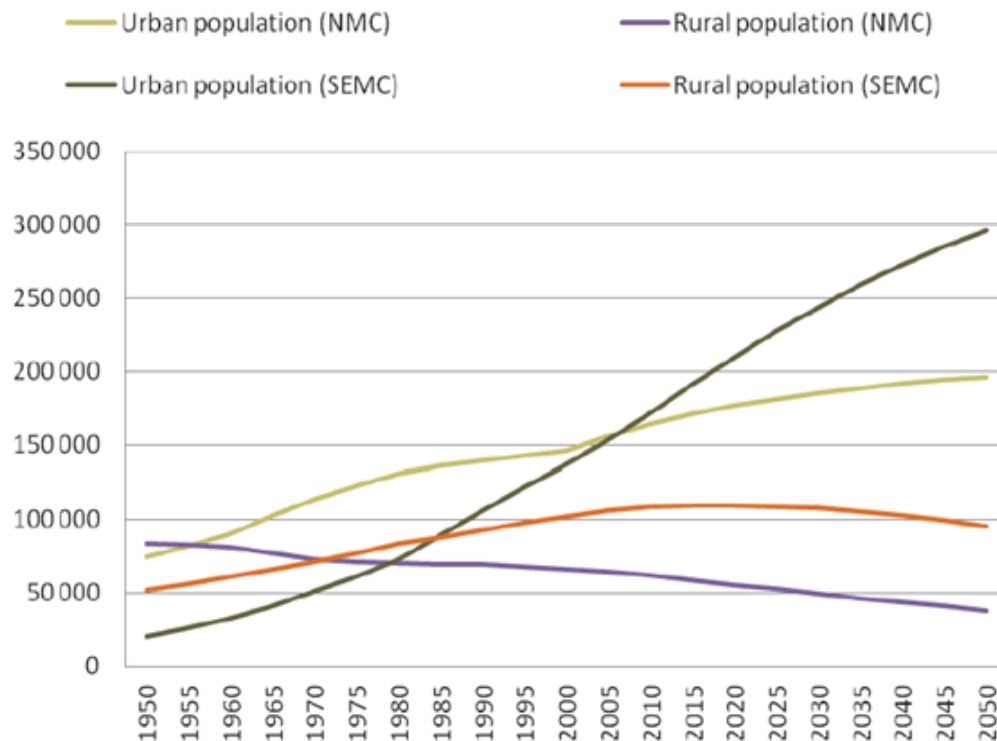
**Population to reach 625 million inhabitants in 2050 (507 million in 2010)**



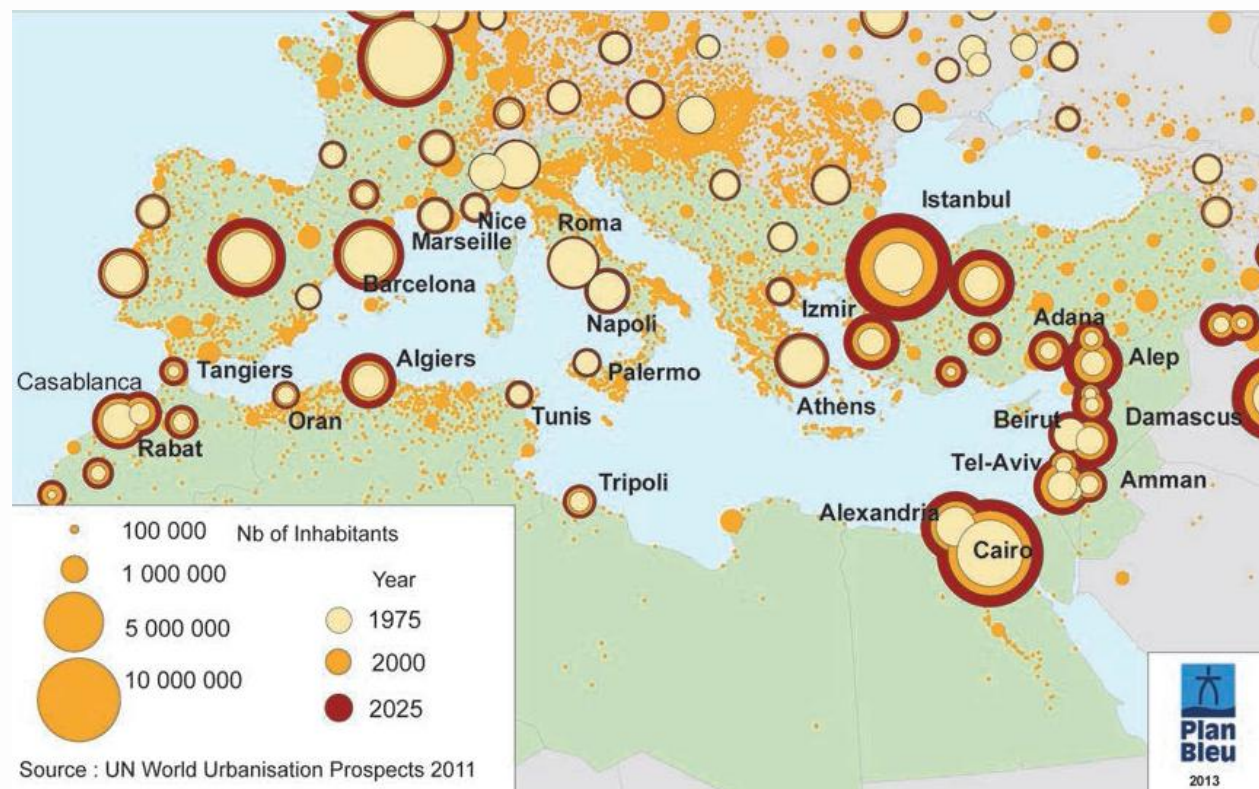
### Rapid growth mostly:

- In the Southern & Eastern countries
- In urban/suburban areas
- In coastal areas

### Evolution of urban & rural population in the Mediterranean 1950–2050



## Demographics: continuous, poorly managed and mainly coastal urban sprawl



*Urban population distribution and increase in Mediterranean countries 1975–2025*

Although **demographic pressure** should start to **decrease after 2015** in rural areas, the often unplanned **urban sprawl** is **intensifying threats on ecosystems** and biodiversity through habitat loss and fragmentation

**Loss of arable land:** area per capita divided by 2 in the last 40 years



## *Increasing pressures on the environment:*

### Threats on biodiversity

About **18%** of Mediterranean species are threatened with extinction

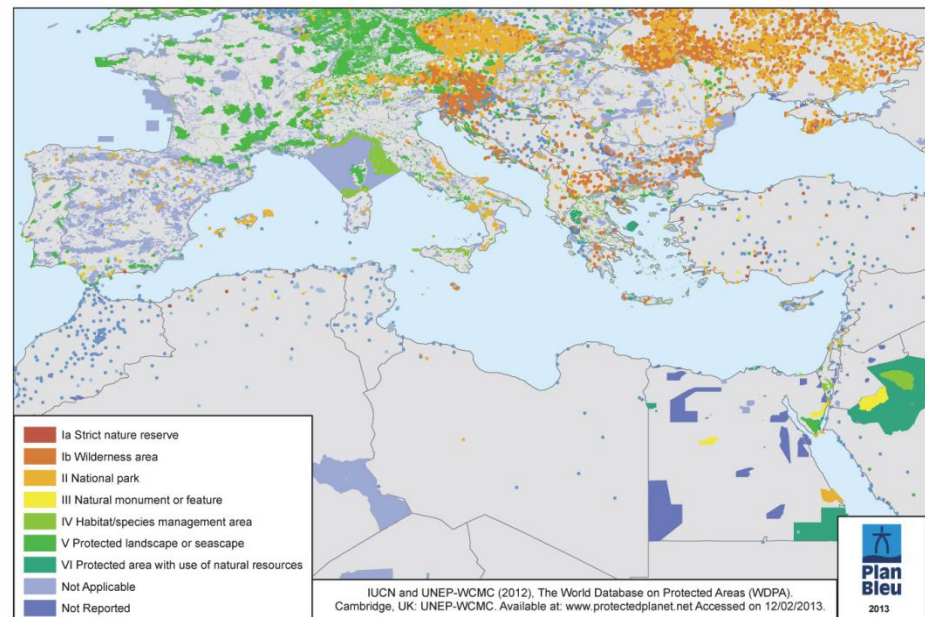
**5** oak species endemic to the Mediterranean are threatened with extinction

**Growing environmental pressures** from tourism, urban concentration in coastal areas, development of intensive agriculture

+ in Northern countries: forest expansion with high fire risks (agricultural decline)

+ in Southern & Eastern countries: overexploitation of forest resources (grazing, woodfuel)

Protected areas are unequally distributed  
more than **90%** are found  
in Northern countries





# Towards sustainable development in the Mediterranean: challenges to face

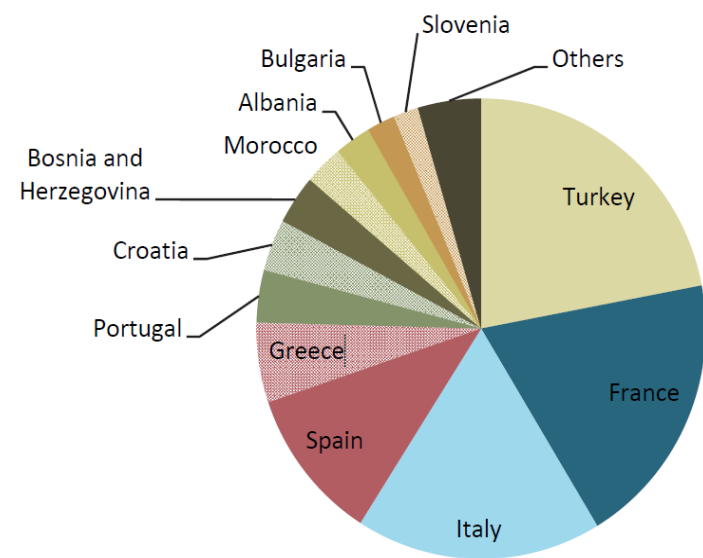
## Increasing pressures on the environment:

### Water: a scarce, unequally distributed and overexploited resource

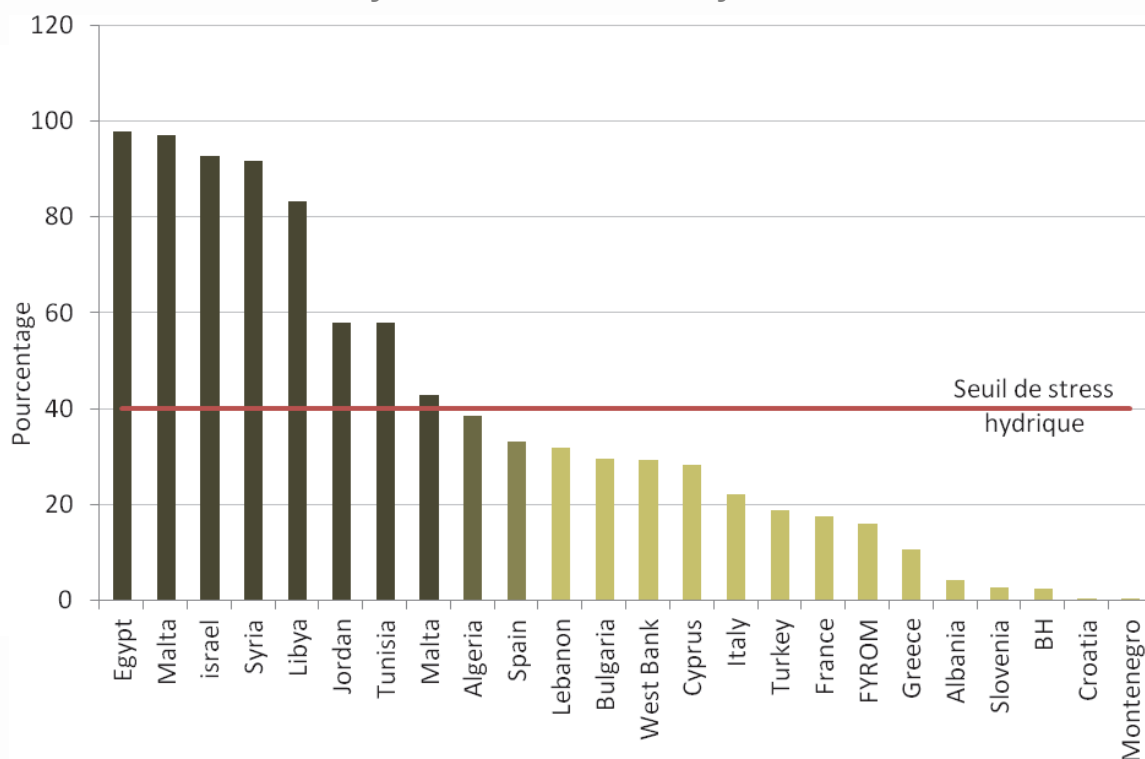
**27% of regional water resources in Southern & Eastern Mediterranean countries (2009)**

If Turkey excluded, they account for only 6 percent, yet they are home to 40% of the region's population

*Water resources per country*



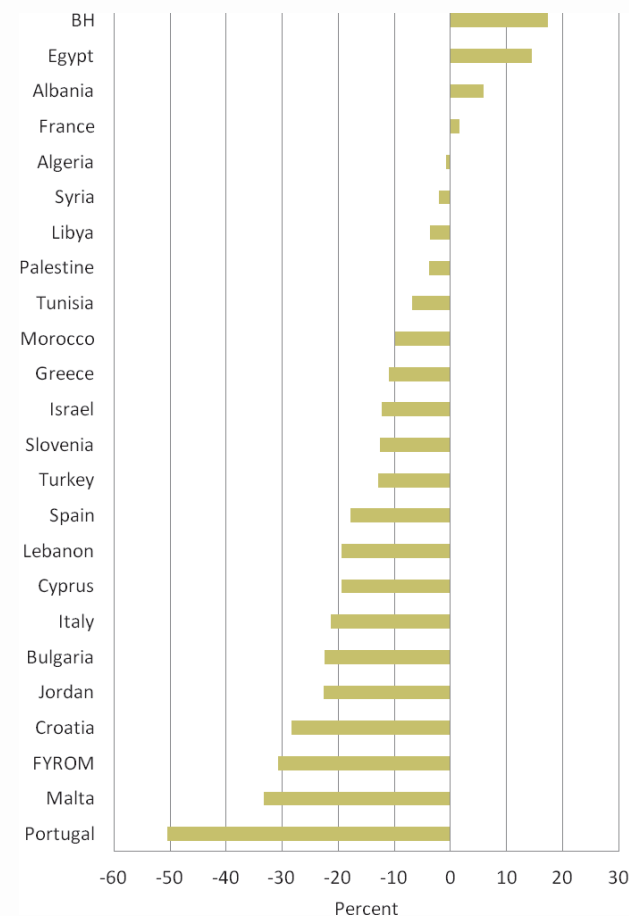
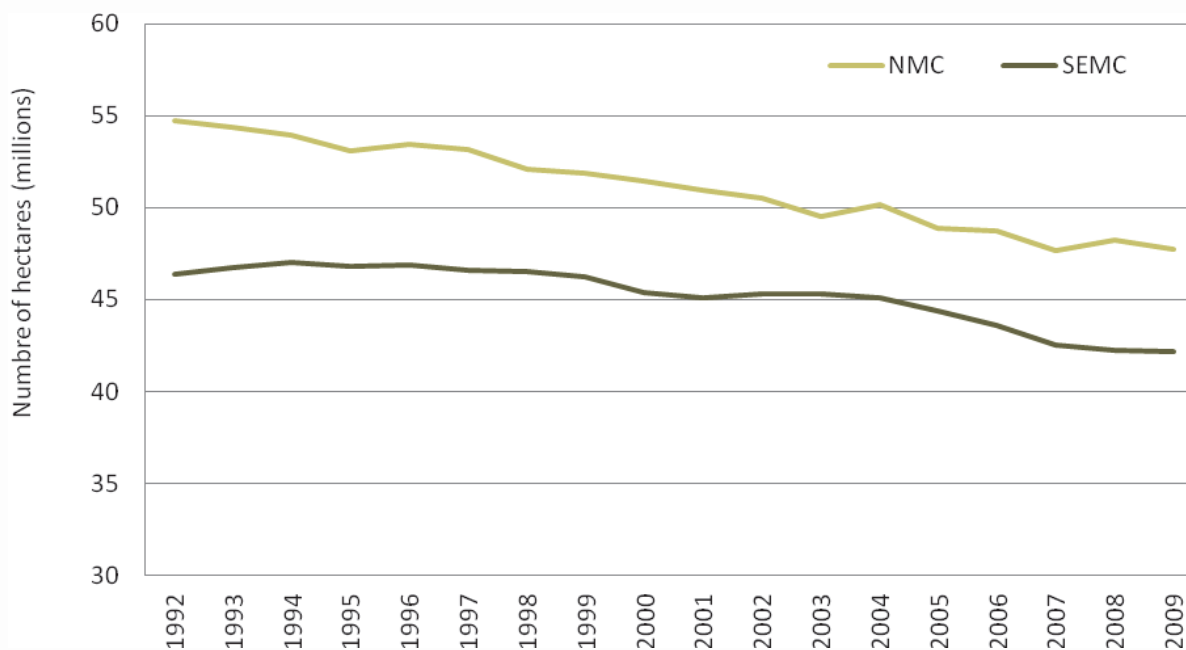
*Water exploitation index  
for natural renewable freshwater resources*



## Increasing pressures on the environment:

Soil degradation and land-use change proceed at alarming pace

*Evolution of arable land in Northern / Southern&Eastern countries  
1992-2009*



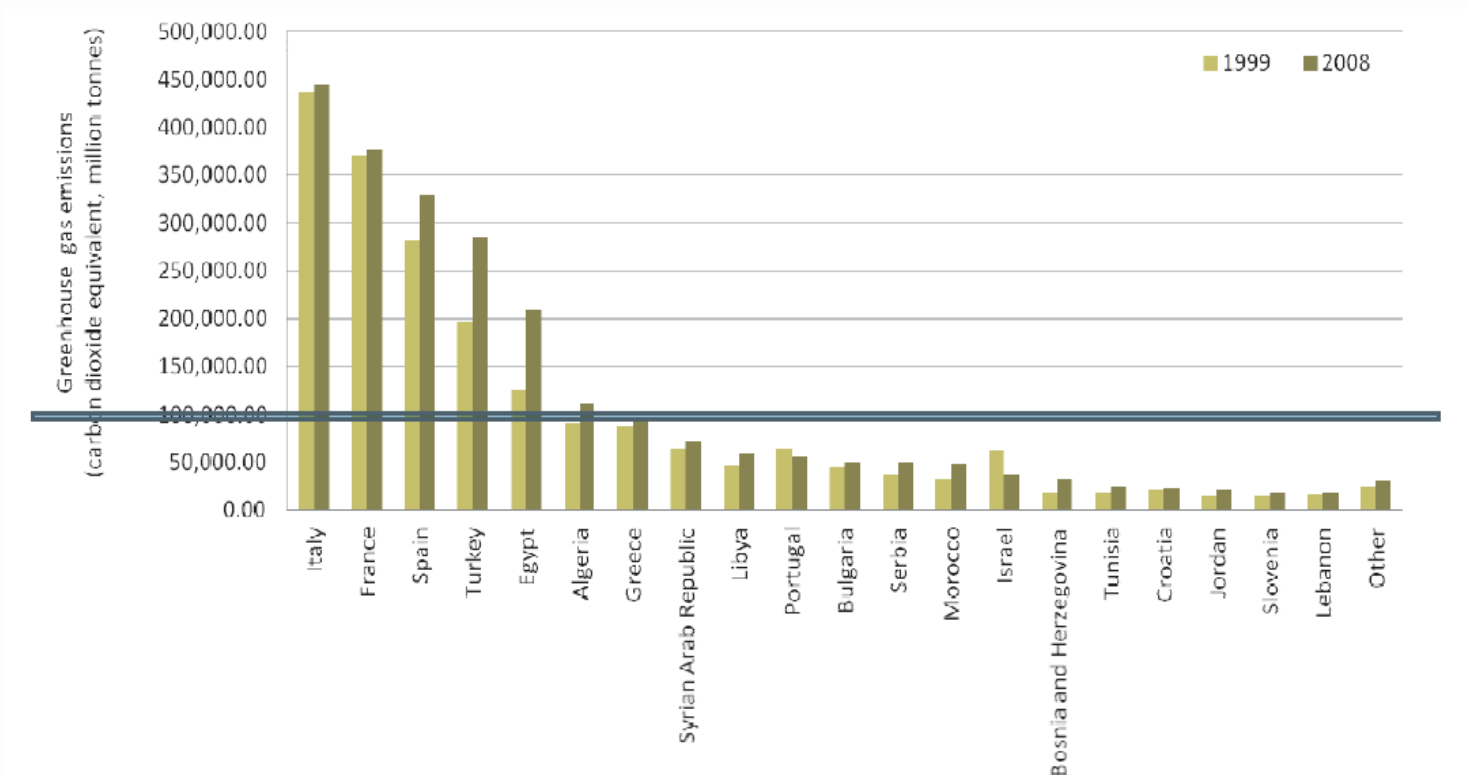
# Towards sustainable development in the Mediterranean: challenges to face

*Increasing pressures on the environment:*

Growing energy demand met mainly by fossil fuels

Increasing greenhouse gas emissions

Emissions mainly from Northern countries (63%) but increasing more rapidly in Southern&Eastern countries



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## *Increasing pressures on the environment:*

### Climate change: aggravating existing problems

#### *Forecasted adverse effects of climate change (IPCC data 2007):*

##### Hotter & drier

- > Increased **fire** risk
- > Accelerated **desertification**
- > Strong impact on water resources: increased **water stress** esp. in Southern countries

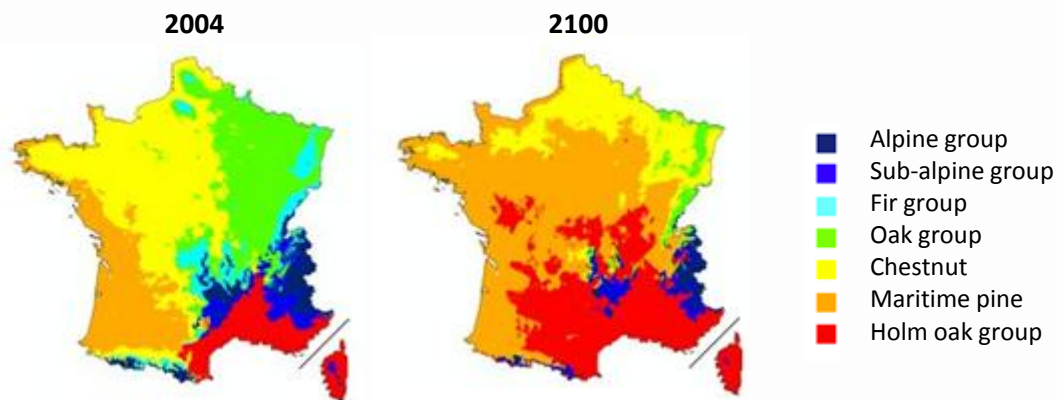
##### Increased frequency of extreme climate events

- > Longer periods of **summer droughts**
- > Increased frequency of floods

##### Southern & Eastern countries more strongly affected

Impacts on ecosystems & biodiversity :

##### ecosystem shift & species extinction



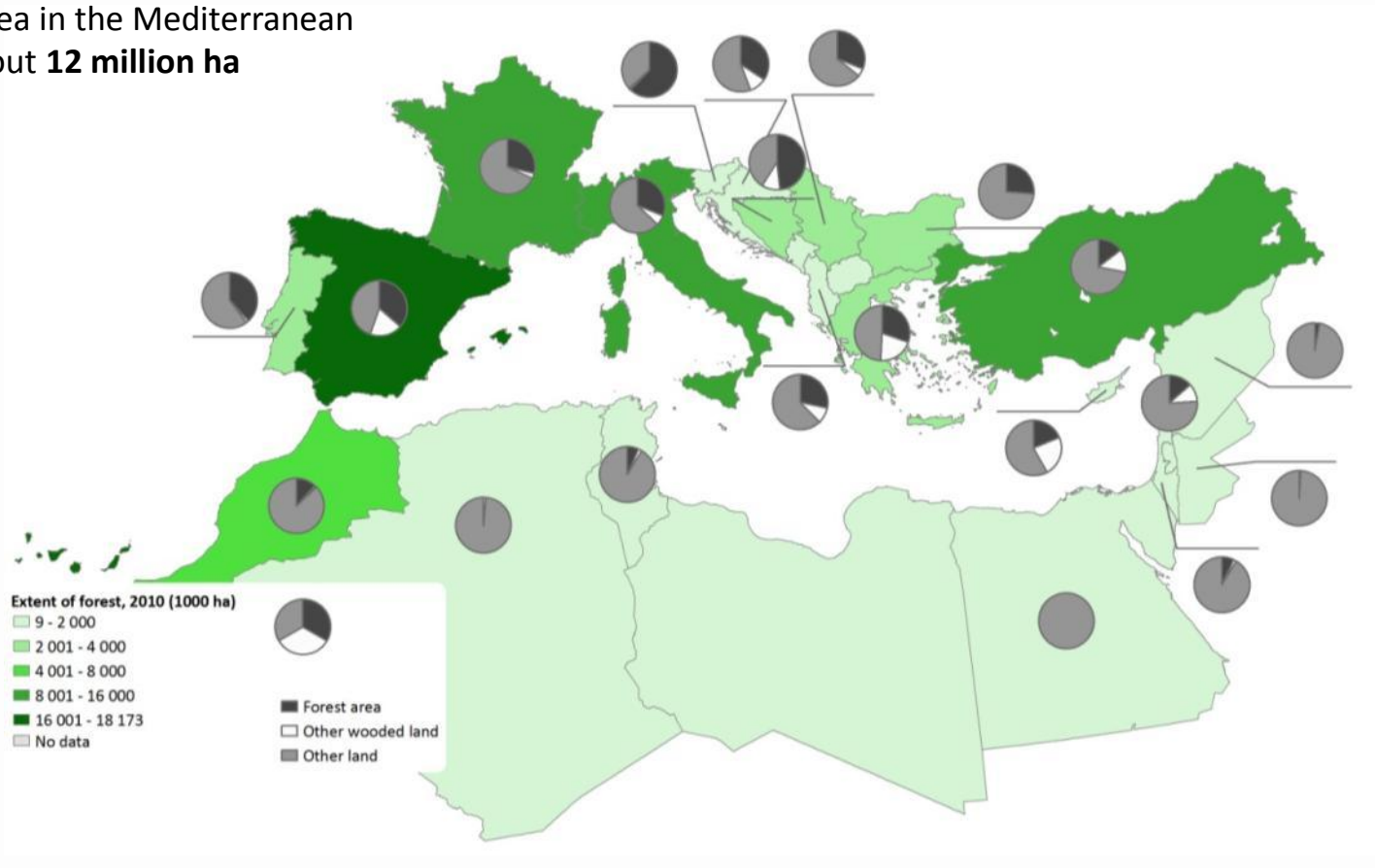
# Extent of forest resources in countries of the Mediterranean region

Forest area in countries of the Mediterranean region in **2010: 85 million ha**

**2% of total world's forest area**

(4 billion ha)

In **1990-2010**, forest area in the Mediterranean region increased of about **12 million ha**  
(0.68% per year)



Extent of Mediterranean forest resources in countries of the Mediterranean region  
FAO Global Forest Resources Assessment remote sensing survey

Extent of Mediterranean forests in 2005 : 25.5 million ha

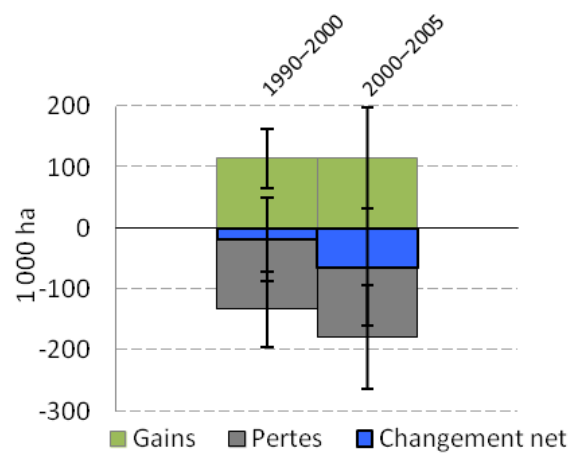
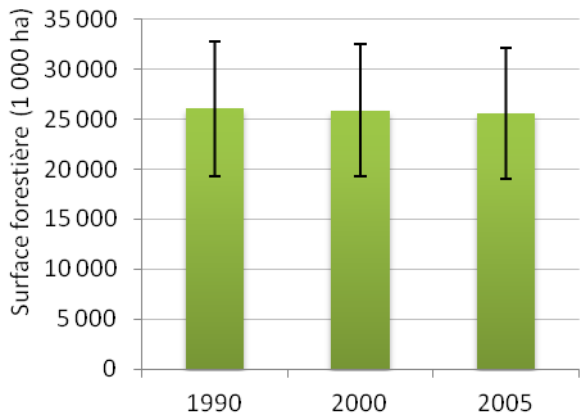
Other Wooded Lands: ~ 50 million ha





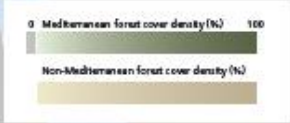
# Extent of Mediterranean forest resources in countries of the Mediterranean region

## FAO Global Forest Resources Assessment remote sensing survey



No significant net change in the total area of Mediterranean forest between 1990 and 2005

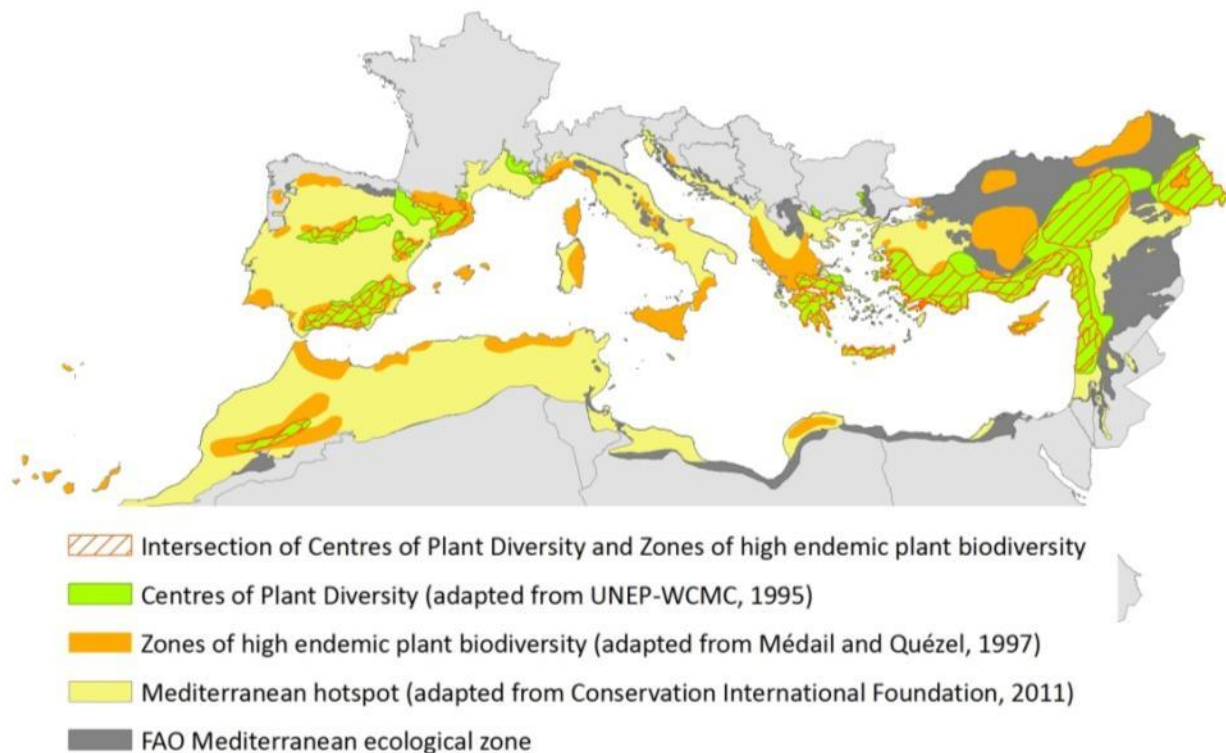
However, the considerable gains and losses indicate that forest cover is dynamic



- There are more than **25 000 plant species** in the Mediterranean region (Scarascia-Mugnozza *et al.*, 2000)

- Mediterranean forests have **247 woody species** (135 species in central and northern European forests)

- **158** of the **species** in Mediterranean forests are **exclusive** to those forests or largely preferential, (46 in central and northern European forests)



- There are **7** endemic *Acer* species, **8** fir species and **9** pine species; *Cupressus* and *Cedrus* are also present in the region.

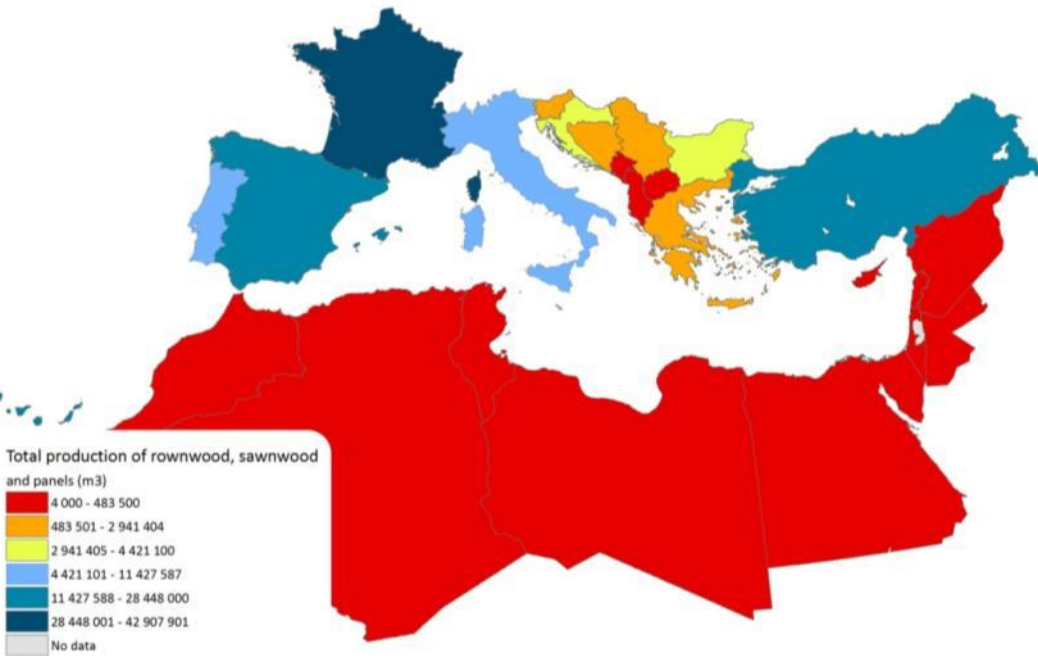
- **34 genera** of woody species exclusively in Mediterranean forests, (7 exclusively in central and northern European forests)



# Good and services provided by forest resources in the Mediterranean region

## Wood products

- **Industrial wood:** 84 million m<sup>3</sup> in 2010 (56% of which was softwood) (5.5% of world production)
- **Woodfuel:** nearly 82 million m<sup>3</sup> (4.4% of world production)
- **Sawnwood :** 23 million m<sup>3</sup> (5.8% of world production)
- **Panels:** 8.3% of world production
- **Paper and paperboard:** 35 million tonnes (8.8% of world production)
- **Pulp:** 7 million tonnes (4% of world production)



Total production of roundwood, sawnwood and panels (top) and total production of cellulose pulp, newsprint, other papers and boards (bottom), Mediterranean region, 2010

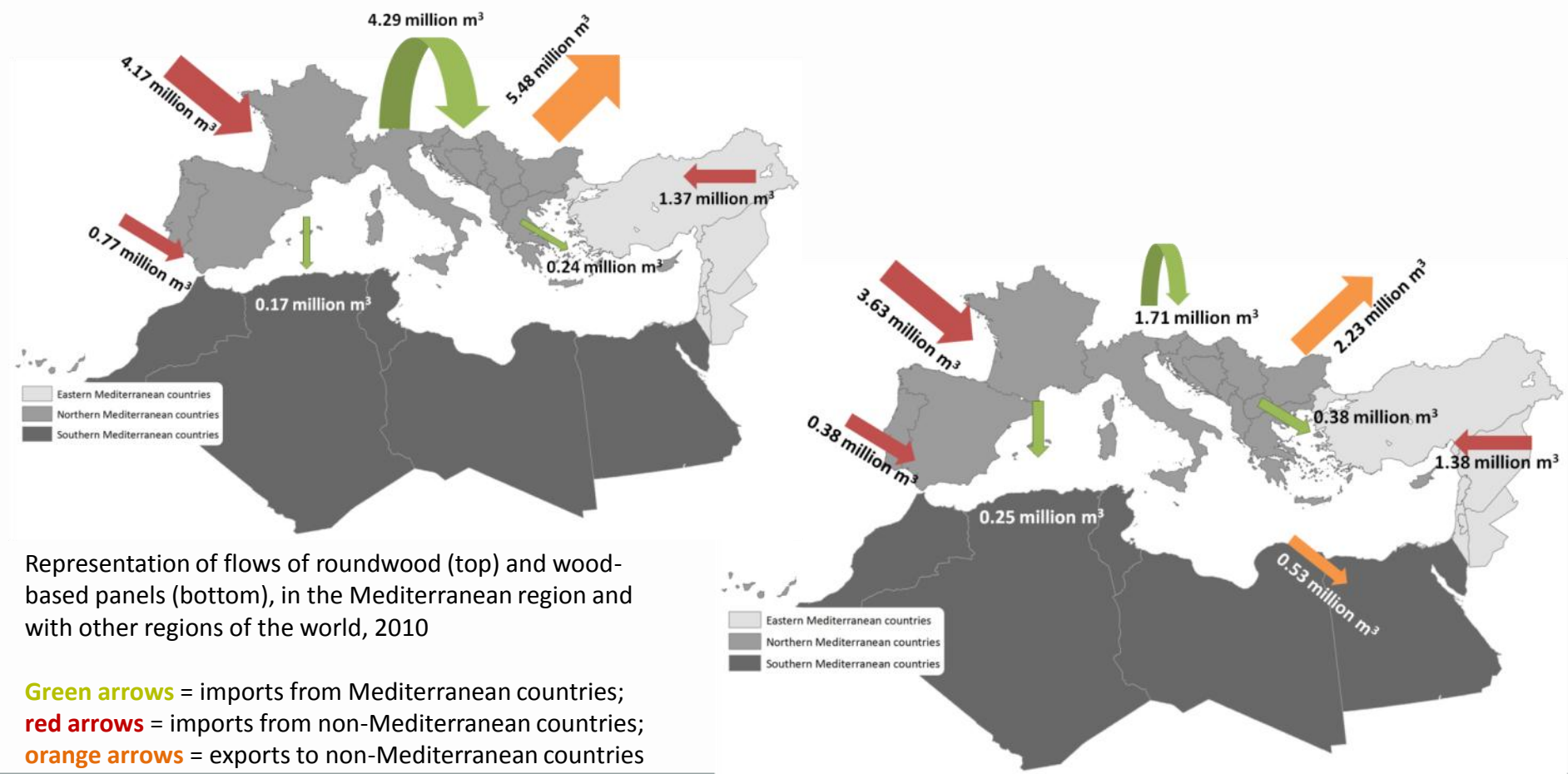




# Good and services provided by forest resources in the Mediterranean region

## Wood products

The Mediterranean region is a **net importer** of wood and wood products. In 2010, the region collectively imported wood and wood products to the value of more than **US\$40 billion**, **80%** from non-Mediterranean countries. Imports are increasing.

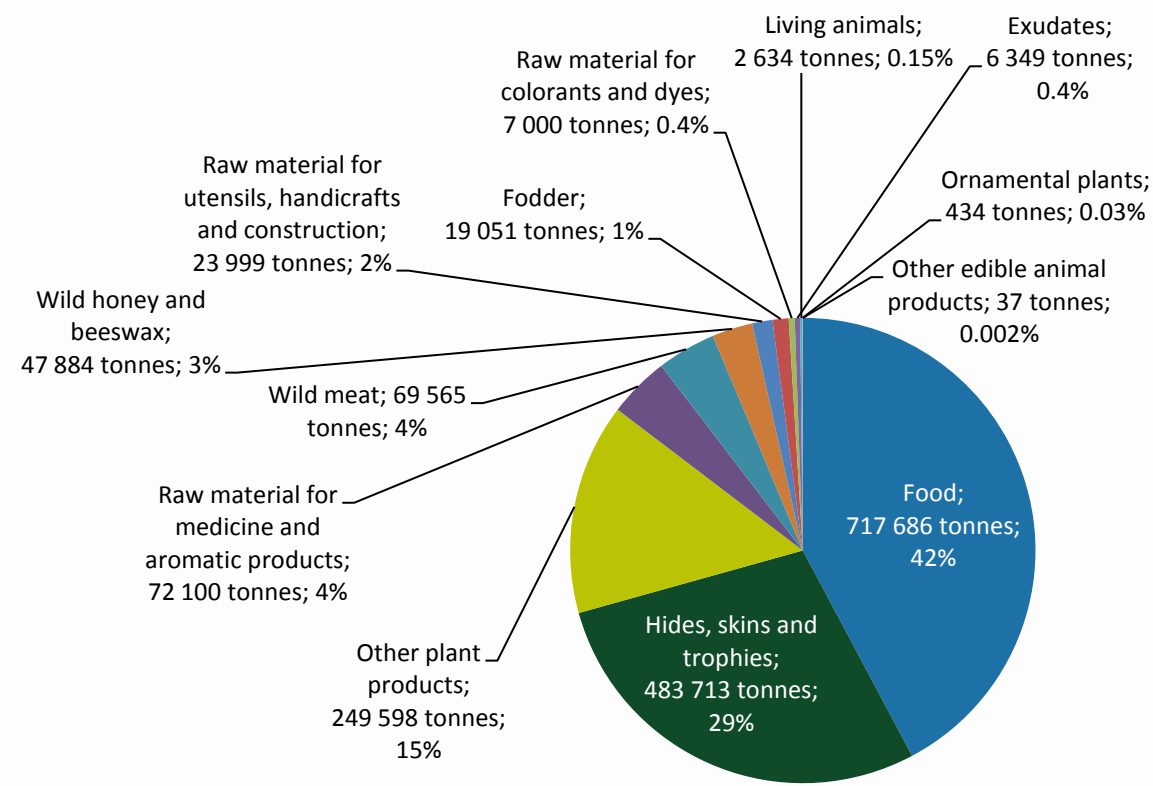


Representation of flows of roundwood (top) and wood-based panels (bottom), in the Mediterranean region and with other regions of the world, 2010



# Good and services provided by forest resources in the Mediterranean region

## Non-wood forest products

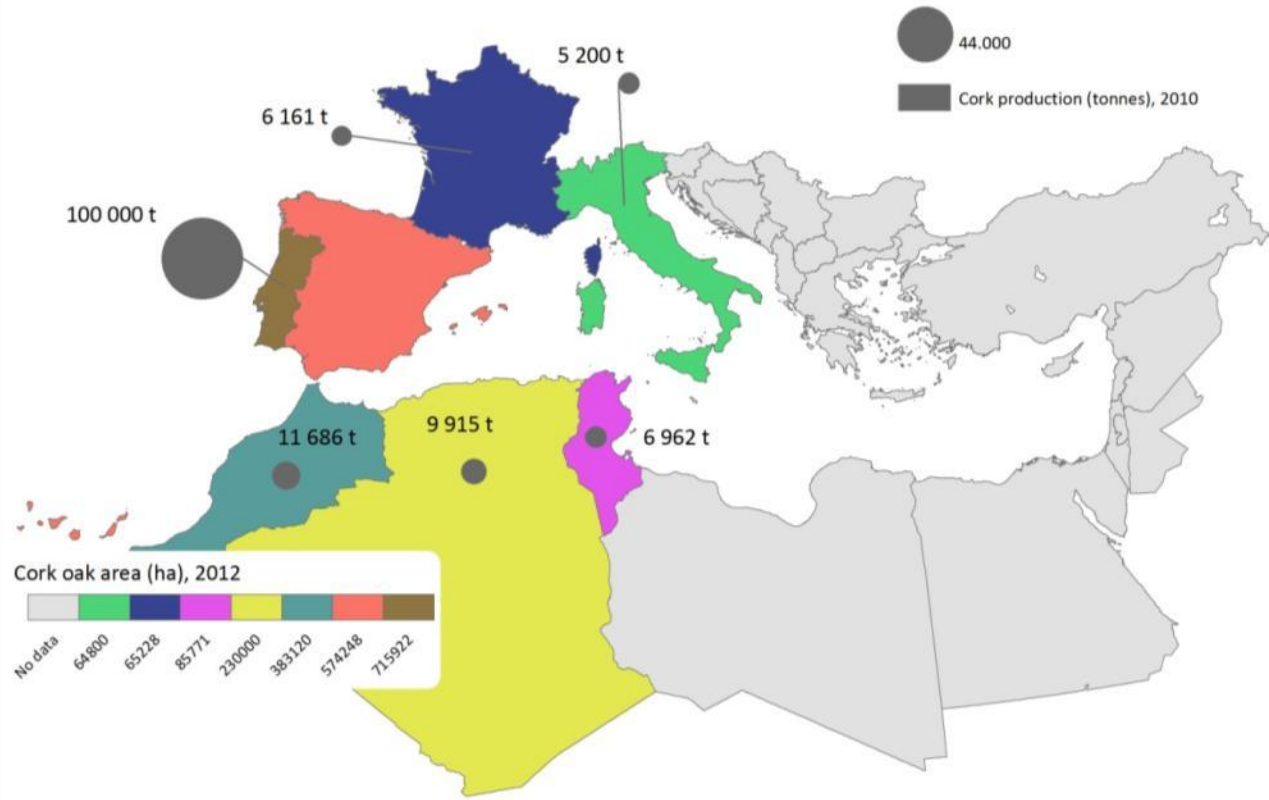
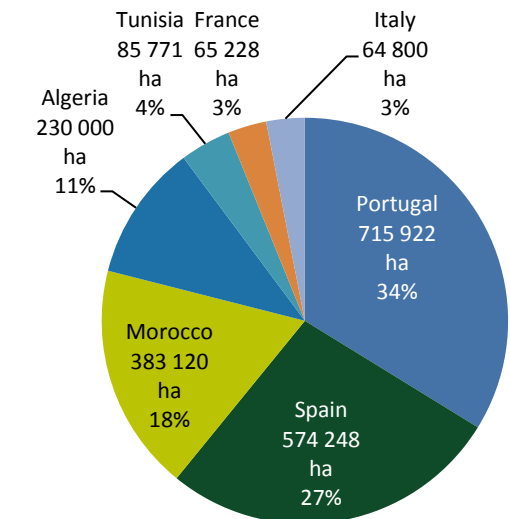


NWFP removals in the Mediterranean countries, 2010

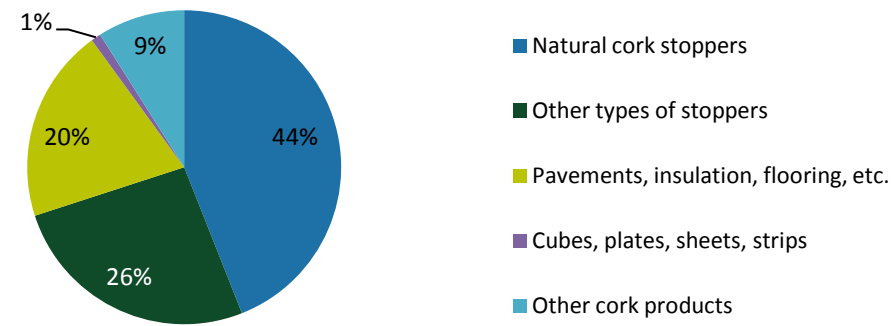


# Examples of non-wood forest products provided only by Mediterranean forests

## Non-wood forest products : cork oak (*Quercus suber*)



- Total cork oak area: **over 2 million ha**
- Top producer : Portugal (**50%** of tot production)
- Top cork product: **stoppers**
- Top importer: France (235 million €)
- Top exporter: Portugal (805 million €)



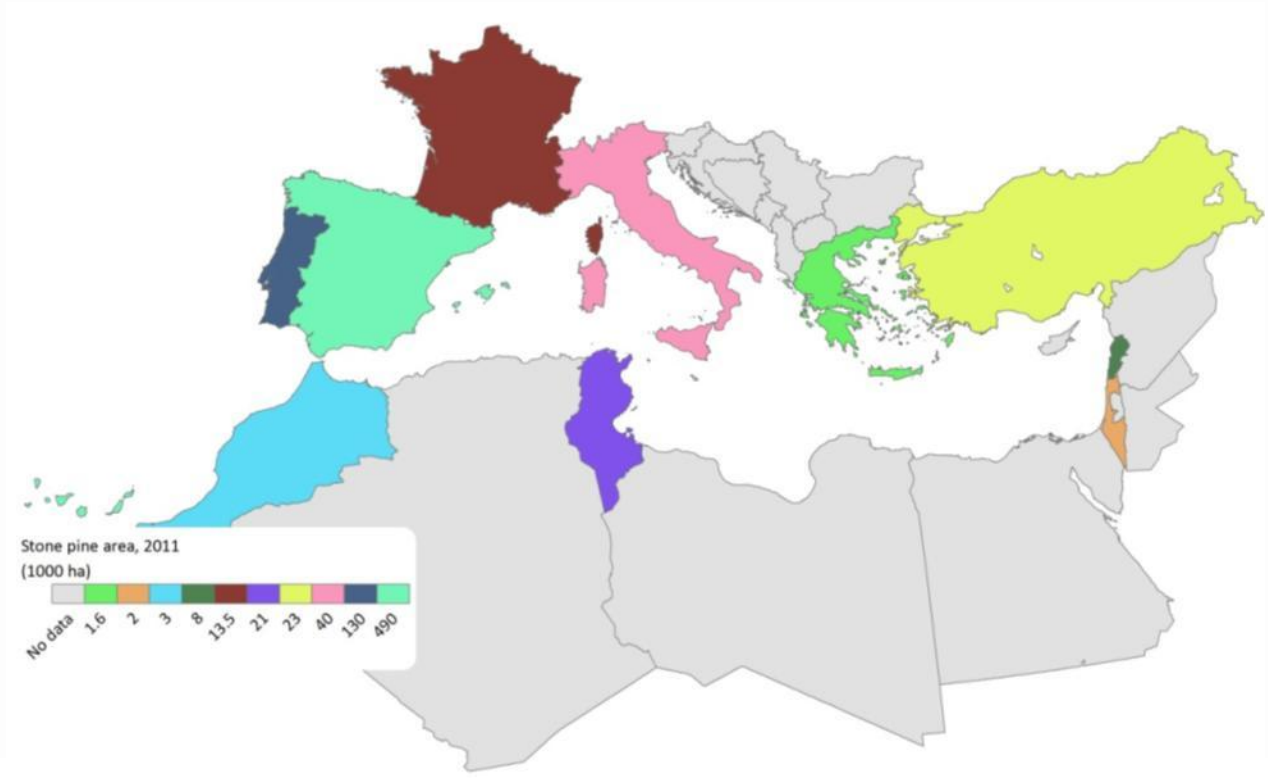


# Examples of non-wood forest products provided only by Mediterranean forests

## Non-wood forest products : stone pine (*Pinus pinea*)

Annual average production:

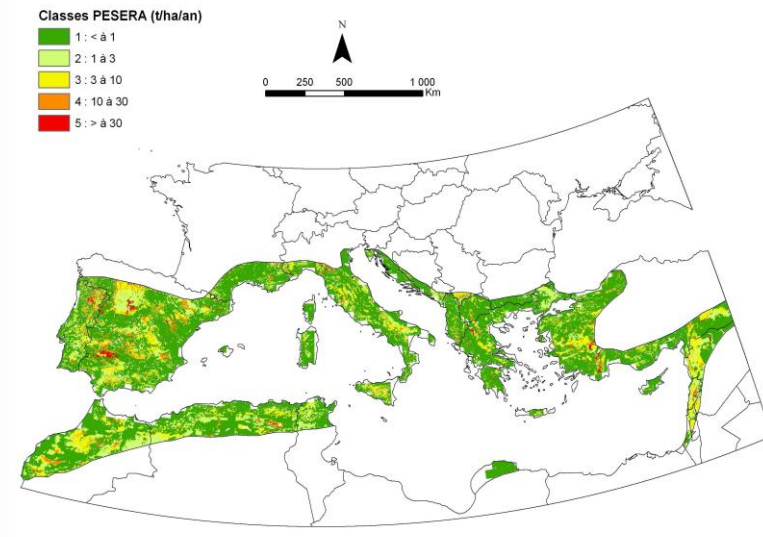
- Portugal: 3 500 tonnes/year
  - Lebanon: 1 500 tonnes/year
  - Spain: 1 500 tonnes/year
  - Turkey: 1 250 tonnes/year
  - Italy: 1 000 tonnes/year
- 
- The current price in international markets is **€25–30** per kg for shelled pine nuts
  - The retail price is **€40–60** per kg



Country	Species	Shelled kernel (tonnes)
Mediterranean countries	<i>Pinus pinea</i>	6 000–9 000
China	<i>P. koraiensis</i> , <i>sibirica</i> and others	5 000–12 000
Russian Federation	<i>P. sibirica</i> , <i>koraiensis</i>	8 000–17 000
Republic of Korea	<i>P. koraiensis</i>	1 500–2 000
Pakistan/Afghanistan	<i>P. gerardiana</i>	2 000–10 000
USA	<i>P. edulis</i> and others	500
World		30 000–40 000

## Erosion control

Mediterranean region was among the first regions worldwide to witness widespread human-induced erosion



Erosion risk in the Mediterranean region, as assessed using the PESERA model (Le Bissonnais *et al.*, 2010)

Vegetation plays a crucial role in preventing water erosion by decreasing the effect of erosive forces and keeping the soil in place

- **Forest fires** lead to the destruction of forest biomass and a loss of capacity of ecosystems to regulate water, nutrient and sediment flows

- Sediment loss by erosion increases with the area annually burnt in the Mediterranean region

- In the European-Mediterranean countries there was a decreasing trend in the total burnt area, and also in the average size of fires. It can be expected that this trend resulted in a decrease of soil erosion.



## Water-related services

- Forests are the **best land use for guaranteeing water quality** (relative naturalness of forest management)
- **Many cities in the Mediterranean region** obtain **drinking water from forested catchments** and pay forest owners and managers to maintain and sustainably manage the forest cover
- Large programmes of **forest restoration for soil and water conservation** have been established in some countries:
  - **e.g. Turkey:**
    - 810 731 ha subject to erosion control works in 2010
    - 1 453 492 ha of degraded forests had been rehabilitated
    - 2 040 046 ha of new forest had been established

Country	Total forest area (1 000 ha)	% primarily designated for soil and water protection
Albania	776	17
Algeria	1 492	53
Bulgaria	3 927	12
Croatia	1 920	4
Cyprus	173	0
Egypt	70	49
France	15 954	2
Greece	3 903	0
Israel	154	15
Italy	9 149	20
Jordan	98	98
Lebanon	137	25
Libya	217	100
Montenegro	543	10
Morocco	5131	0
Palestine	9	
Portugal	3 456	7
Slovenia	1253	6
Spain	18 173	20
Syrian Arab Republic	491	0
Tunisia	1 006	41
Turkey	11 334	17

Forests designated for soil and water protection in Mediterranean countries, 2010



- Forest ecosystems play a **key role in the global carbon cycle and climate regulation**
- **Mediterranean forests** are estimated to sequester **0.01–1.08 tonnes of carbon per ha annually** (Merlo and Croitoru, 2005)
- that is, **between 0.8 and 90 million tonnes of carbon per year** (Merlo and Croitoru, 2005)
- the **economic value of carbon storage in Mediterranean forests** (latitude 35–45° N) ranges **between US\$37 billion and US\$63 billion**, (13% of the forests total economic value, for the IPCC climate change scenarios A1 and B2, respectively, with 2050 as the horizon)
- Economic value is smaller than that of forests from central–northern Europe but higher than that of forests in northern Europe (Ding *et al.*, 2011)





# Environmental services provided by Mediterranean forests

## Social ecosystem services

• The **socio-economic changes** have **increased the importance of the ecological, recreational and landscape functions** of Mediterranean forests (Palahi *et al.*, 2008)

• Forest ecosystems provide a **wide range of opportunities for leisure, mental development and spiritual enrichment**



Country/area	Total forest area (1 000 ha)*	Percentage primarily designated for social functions*	Percentage primarily designated for multiple use*	Annual visits per ha of forest and other wooded lands**
Albania	776	0	0	..
Algeria	1 492	..	0	..
Bulgaria	3 927	6	8	..
Croatia	1 920	2	9	0.8
Cyprus	173	8	28	1.7
Egypt	70	0	46	..
France	15 954	..	22	28.7
Greece	3 903	0	0	..
Israel	154	3	64	..
Italy	9 149	..	0	16.8
Jordan	98	1	0	..
Lebanon	137	0	66	..
Libya	217	0	0	..
Montenegro	543	0	0	..
Morocco	5 131	0	67	..
Palestine	9	..	..	..
Portugal	3 456	0	30	..
Slovenia	1 253	6	11	..
Spain	18 173	2	46	..
Syrian Arab Republic	491	0	100	..
Tunisia	1 006	0	32	..
Turkey	11 334	..	6	..



Today, most **Mediterranean cities** suffer for a **lack of green space**

Urbanization and the associated process of land consumption continue to increase

New approaches can help in changes in climate, deep modifications to lifestyles, and heavy landscape alteration, posing major challenges for urban decision-makers: high-tech “smart cities” are pursuing new models and tools of urban governance

Potential benefits of urban and peri-urban forests and trees:

- **climate-change mitigation and adaptation** in urban areas
- **supplemental food supply**
- **increased health, well-being**
- **jobs and income**
- **biodiversity conservation**
- **watershed management**
- **disaster risk prevention**



# Biotic and abiotic disturbances in forest resources in the Mediterranean region

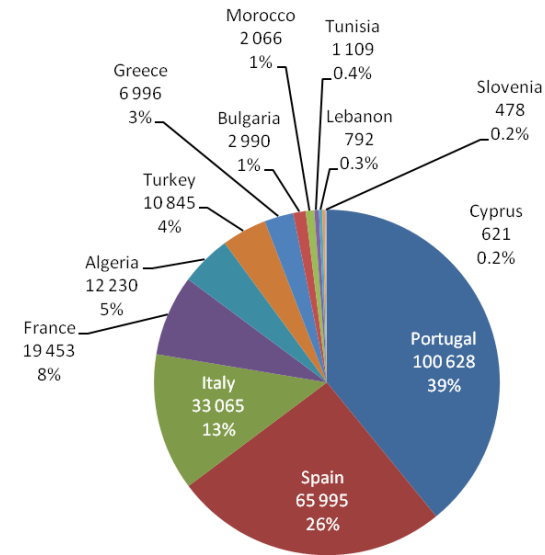
## Insect pests, diseases and other disturbances

- **5 million ha** of forests damaged by Outbreaks of forest insect pests
- **14%** of total reported damage worldwide
- **6%** of the total forest area of the region
- **Lack of data**

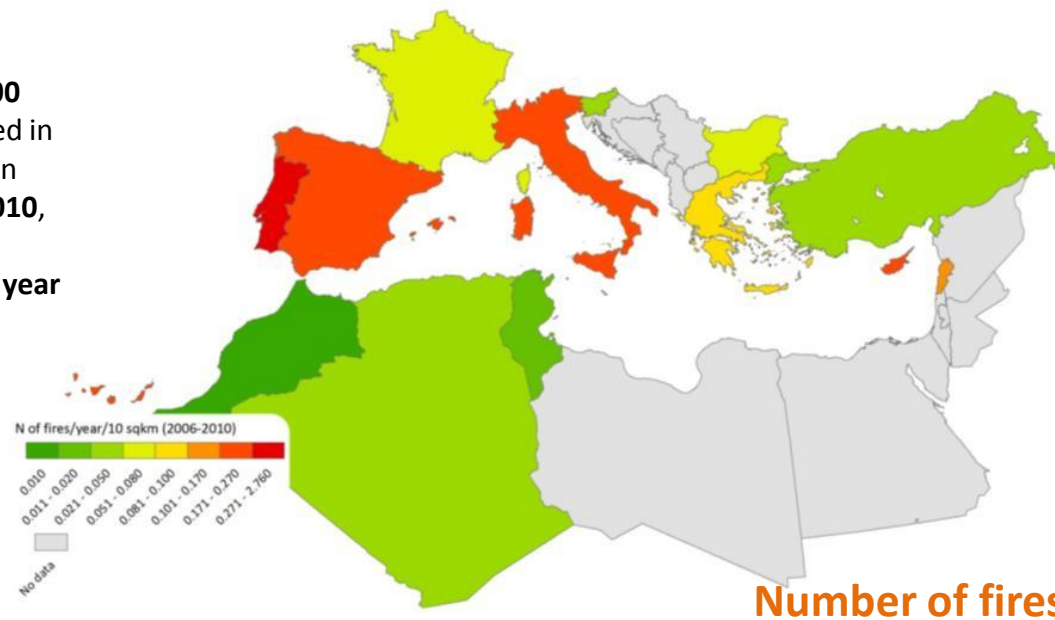


# Biotic and abiotic disturbances in forest resources in the Mediterranean region

## Forest fire

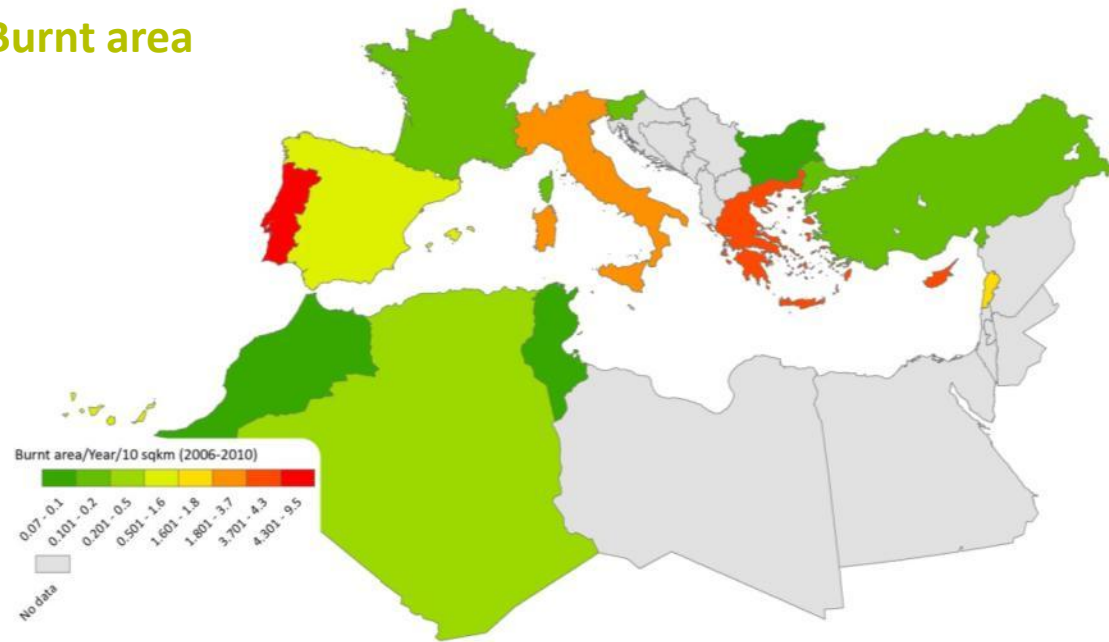


More than **269 000** fires were reported in the Mediterranean region in **2006–2010**, an average of just under **54 000** per year

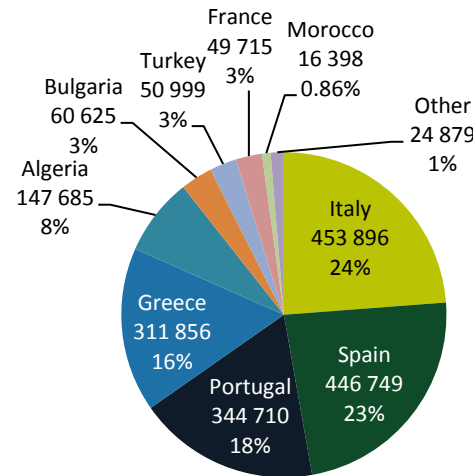


Number of fires

## Burnt area



More than **2 million ha** were burnt in the Mediterranean in that period, an average of more than **400 000 ha per year**





Changes to a forest fire regime can have significant impacts on natural resources and ecosystem stability, with consequent direct and indirect economic losses

On the other hand, active forest and fire management can help counteract the impacts of climate change

Climate change projections suggest **substantial warming and increases in the number of droughts, heat waves and dry spells** across most of the Mediterranean region



Increase in the length and severity of the fire season, the area of forest at risk, and the probability of large fires, possibly leading to increased desertification

### Fire prevention and adaptation options:

- fire prevention is equally important to fire suppression
- integrated management that includes prescribed fuel-reduction burning
- fire management strategies adapted to a changing climate should be integrated with forest management



# Mediterranean forests and climate change

## Biodiversity, forest genetic resources and climate change

The Mediterranean region is home to a tremendous **variety of species and FGRs** that are important for forestry locally

Mediterranean FGRs are both diverse and vulnerable

With the projected climatic changes **Mediterranean FGRs** will come **under increasing pressure**



Understanding how much genetic diversity is available and needed for adaptation under climate change remains a challenge

**Science–policy–management interactions** are needed for prioritization and to take action for adapting Mediterranean forests to the challenges posed by climate change



Forest management objectives, decision-making tools and strategies need to be **adapted to** potential **new conditions** and new demands for forest goods and ecosystem services.

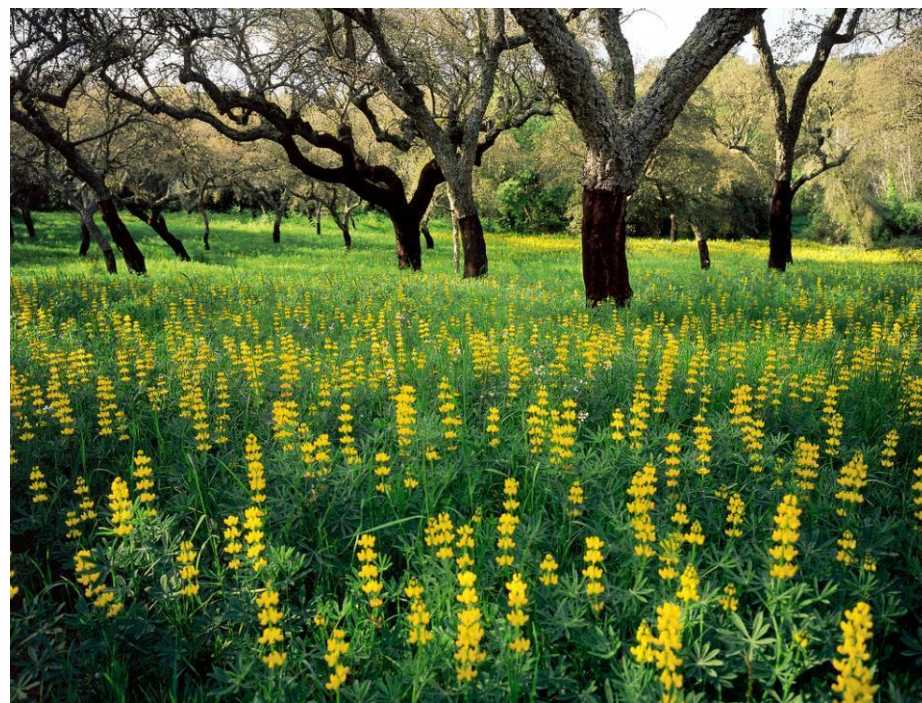


Adaptive management is not urgent for

- the Mediterranean forests themselves
- for regions that might experience a shift in climate towards a typically Mediterranean one in the future and which could benefit from Mediterranean FGRs

Networking and collaboration with and beyond the scientific community working on Mediterranean forests should be encouraged

The state of the environment in 50–100 years cannot be predicted with any certainty, but the direction of change is clear. **Action is needed now** towards adaptation and the development of new forest practices





### Policy challenges

- forest resources conservation
- socio-economic development (pressures)

### Mediterranean forests **specificities**

- multifunctionality
- with important non-market goods and services for local users

→ **Policies to regulate pressures and to control uses** that are often informal

**Very different political, legal and institutional frames** for woodlands management among countries, depending in particular on :

- the more/less strong decentralization
- the importance of the forested area

**Analysis** on the basis of FRA2010 data, SoEF2011 data + complementary sources

- Limited by weak availability and reliability of data
- Limited relevance of some comparisons between contrasted situations





Policy and legal framework status (20 countries, 91% of forest area)

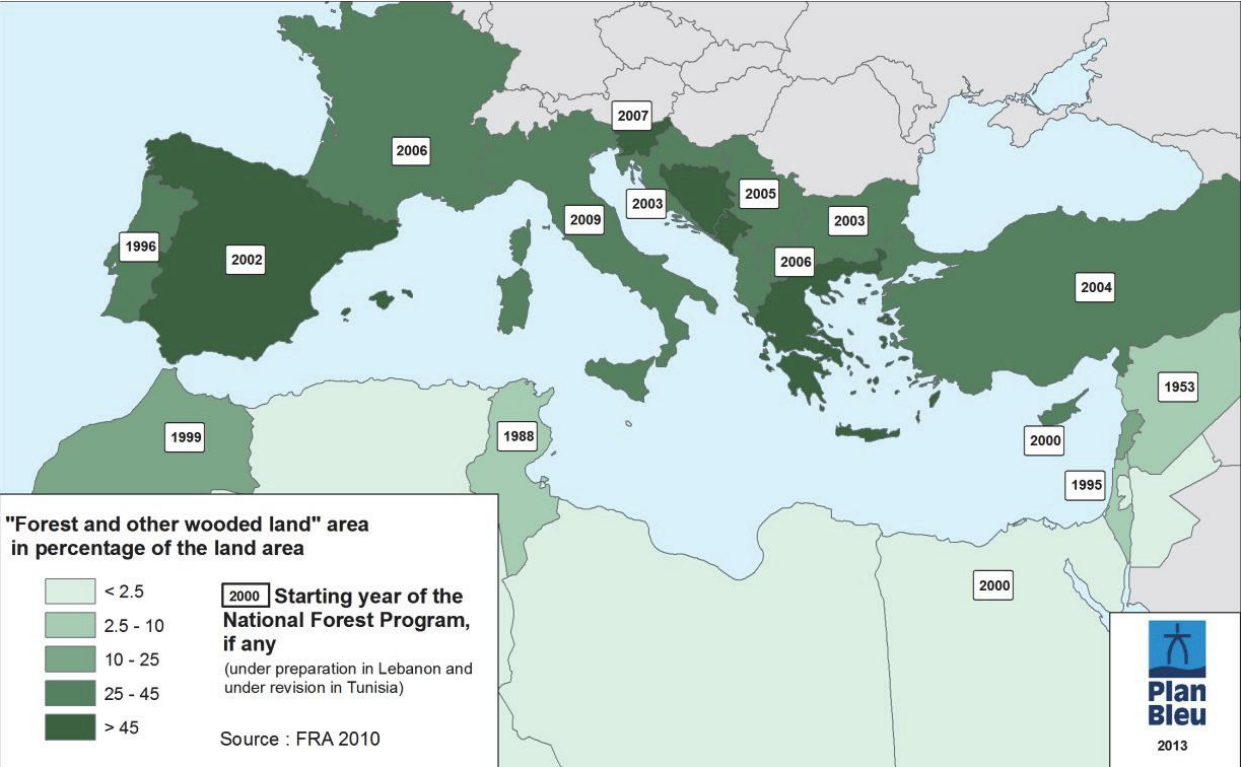
All 20 countries have a regulatory framework regarding forests

**14 countries** have a **National Forest Policy Statement** (*frame for elaborating consistent laws & policies*)

**15 countries** have implemented **National Forest Programs**, among which **11** since 2000

→ 86% of forests in Mediterranean countries are managed under an internationally recognized framework

**17 countries** have a **dedicated forest law**,  
**14** have renewed or amended it since 2000



### International conventions and agreements

Most Mediterranean countries have ratified the international legally binding and non-legally binding agreements on forests

Convention or agreement	No. of Mediterranean countries ratified, as of 1 January 2010
Non-Legally Binding Instrument on All Types of Forests	25
Convention on Biological Diversity	24
United Nations Framework Convention on Climate Change	24
Kyoto Protocol	24
United Nations Convention to Combat Desertification	25
Convention on International Trade in Endangered Species of Wild Fauna and Flora	23
Convention on Wetlands of International Importance (Ramsar)	23
World Heritage Convention	26
International Tropical Timber Agreement, 2006	5



### Institutions (20 countries, 91% of forest area)

Forests are generally under the responsibility of the **Ministry in charge of Agriculture**

### Human resources in forest administrations

**77 000 persons working in forest administrations (2008)**

**General decrease of -1.7% since 2000** affecting mostly the technical jobs

**17 000 executive positions**

increasing in the Northern countries

decreasing in the Southern and Eastern countries

**13,5% of female staff**

a slow increase with important differences from one country to another

**Overall decreasing staff**

Even though this is not informing on the quality of the management and work done

It raises the issue of resources availability to develop and implement forest policies



## Education & Public research

*1<sup>st</sup> data collection on education (FRA 2010), with problems of homogeneity concerning only 13 countries (60% of forests)*

### Education

**5700 students graduated** in forestry topics in 2008, half at technical level, half at university level

A **third of female** students

**Strong increase** since 2000 : **+26%**

### Research

Around **2000** people involved in public forestry research (without data from FR, GR, IT)  
with 40% holding a PhD

**Stable figure**

Issue of **employment opportunities** for the **increasing number of graduates**,  
esp. in Southern Mediterranean where forest jobs are mainly in the public sector  
and the **number of positions are decreasing**, while **youth unemployments rates** are alarming





### Various approaches for policies dealing with forests

In some countries, forests are managed through policies that are **specifically targeting forests** & focus on:

- **forest cover** : overall stability or some extension planned
- **carbon balance and climate change issues** :  
carbon sink function of forests, wood as a renewable energy, but very rarely about adaptative forestry
- **health and vitality** of forests, and forest fires issues in particular
- **production and use of wood** : stability or some increase planned
- **production and use of non-wood goods and services** :  
mostly on recreative services, rarely on non-wood forest products
- **biodiversity and protected areas** : overall extension of protected areas
- **forests' protective functions** : water and soil protection, stream regulation, erosion control

Progress remains to be accomplished regarding :

- **Climate change and adaptative forestry**
- Forest management valuating **non-wood forest products**
- And most importantly **governance : participatory decision-making processes and management, public awareness**



## Various approaches for policies dealing with forests

### In some countries, policies affecting forests are mostly cross-cutting

(Algeria, Egypt, Jordania, Lebanon, Syria, Tunisia)

These countries are mostly **arid** and some have **very limited extents of woodlands**

Forests have the status of **national heritage** in most countries

and governments have the objective to protect them, while ensuring the provision of **multiple services**

### Cross-cutting policies :

- **Desertification**: most countries have elaborated National Action Plans to combat desertification, and all of them include forests, mainly through afforestation campaigns to extend the vegetation cover and reduce anthropogenic pressure on existing forests
- **Poverty-reduction policies** with the aim of better **controlling** and **managing resources extraction** (woodfuel, non-wood products, grazing)

### Some countries are developing forest policies targeting:

- **Control** of forest resources uses
- Creation and management of **protected areas**
- **Fire control**

Very active National Forest Program in Tunisia

Efforts being done in Lebanon and Algeria for a greater political focus on forests



### Conclusions & recommendations for future analysis

Updates of legal frameworks and policies development are **indicators** of the national **efforts** put into forest policies development, but do not provide insights on how **adapted and efficient** they are

An adapted **data collection process is needed**

especially for countries with forests being addressed through cross-cutting policies

Assessing **policy implementation and results** ?

through qualitative indicators, e.g. based on national reports on **policies evaluation**



### *Some food for thought about policy challenges in the Medierranean*

Mediterranean specificities: multifunctionality, low productivity and central role of non-market services

→ Challenges for forest policies: to address the increasing **need to value ecosystem services, essential for human well-being but increasingly threatened** by climate change and anthropogenic pressures

**National and regional public authorities are less and less able to fulfill their policy development role**, due to decreasing financial resources and the increased questioning of “top-down” approaches

Some government functions could, in certain situations, be substituted by **market mechanisms** (e.g. payments for ecosystem services)

But these are **unlikely to match all needs**

And implementing such market instruments **requires efficient and transparent local governance**

**Financing forest management** remains a challenge - crucial for ensuring the production of multiple goods and services

**Innovative instruments** should be developed and tested to address the current challenges and constraints

