A Brief Characterization of Portuguese Forest Strategy for Climate Change Effects

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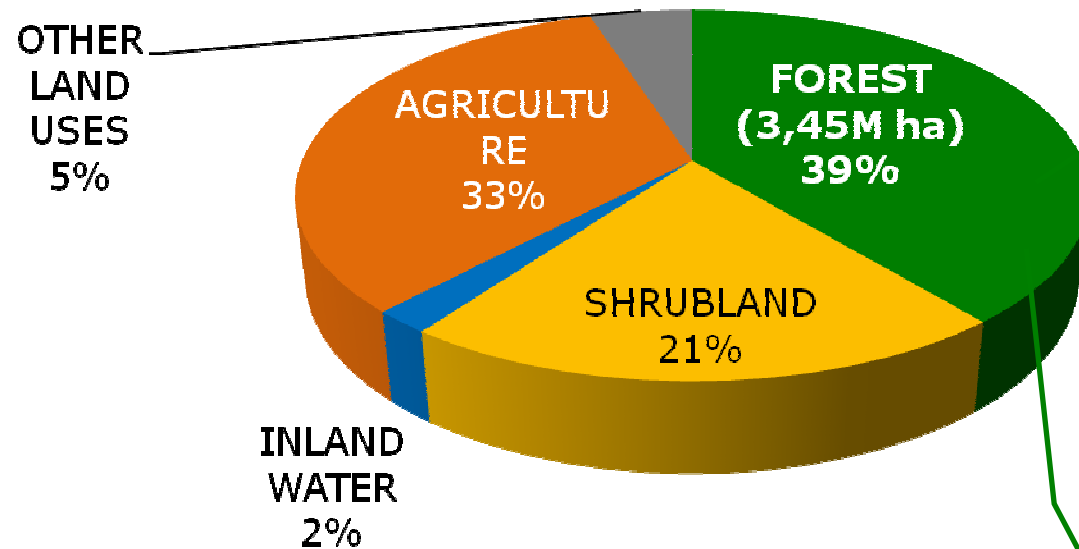
AFORCE
RMT Adaptation des forêts au changement climatique

INSTITUTO SUPERIOR D AGRONOMIA
Universidade de Lisboa

Hinc Patriam Sustinet

International Workshop - 4 February 2014

Portuguese Forest Characterization

OTHER LAND USES 5%

AGRICULTURE 33%

FOREST (3,45M ha) 39%

SHRUBLAND 21%

INLAND WATER 2%

Three species *(Pinus pinaster*, *Eucalyptus globulus* and *Quercus suber*) cover 72% forest area

89% privately owned
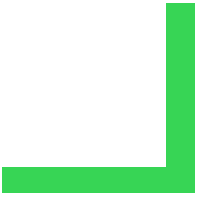
(more then 400 000 forest owners)

In the North and Central part of the country average forest property area is **lower** than **5 ha**

1.2 M € (2% NPV / 4% GDP)

117 000 direct jobs (2% active population)

1.Climate change effects in Portuguese forest
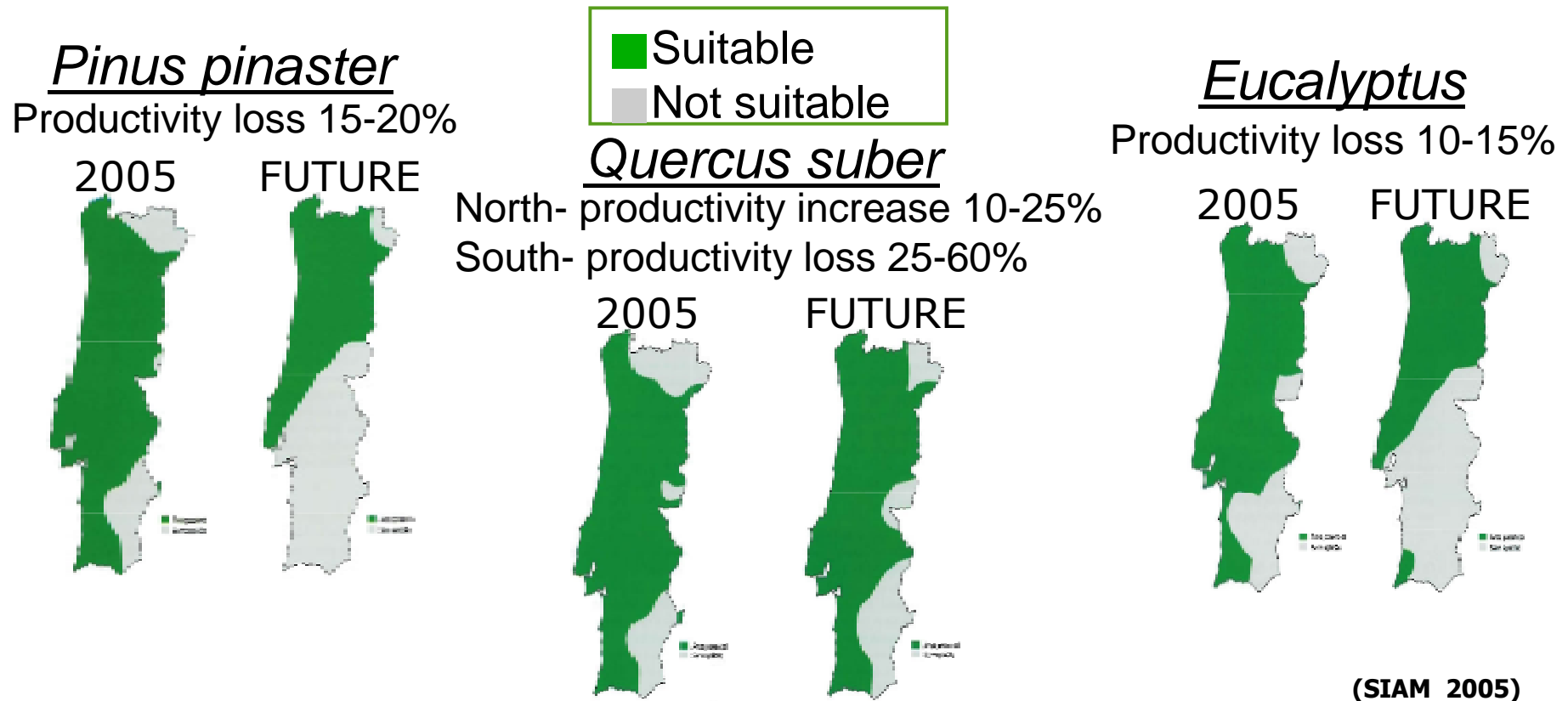
Future climatic scenario

•Since the 70's, maximum and minimum temperatures have risen about 0.50º C each decade, corresponding to twice the average world temperature increment.

•Longer, more frequent and more intense drought periods are expected. Water stress will therefore be a leading constraint to primary production.

•**2011-2040**   •**2041-2070**

•**Temperature rise**

Precipitation loss

Source:IMAR 2013
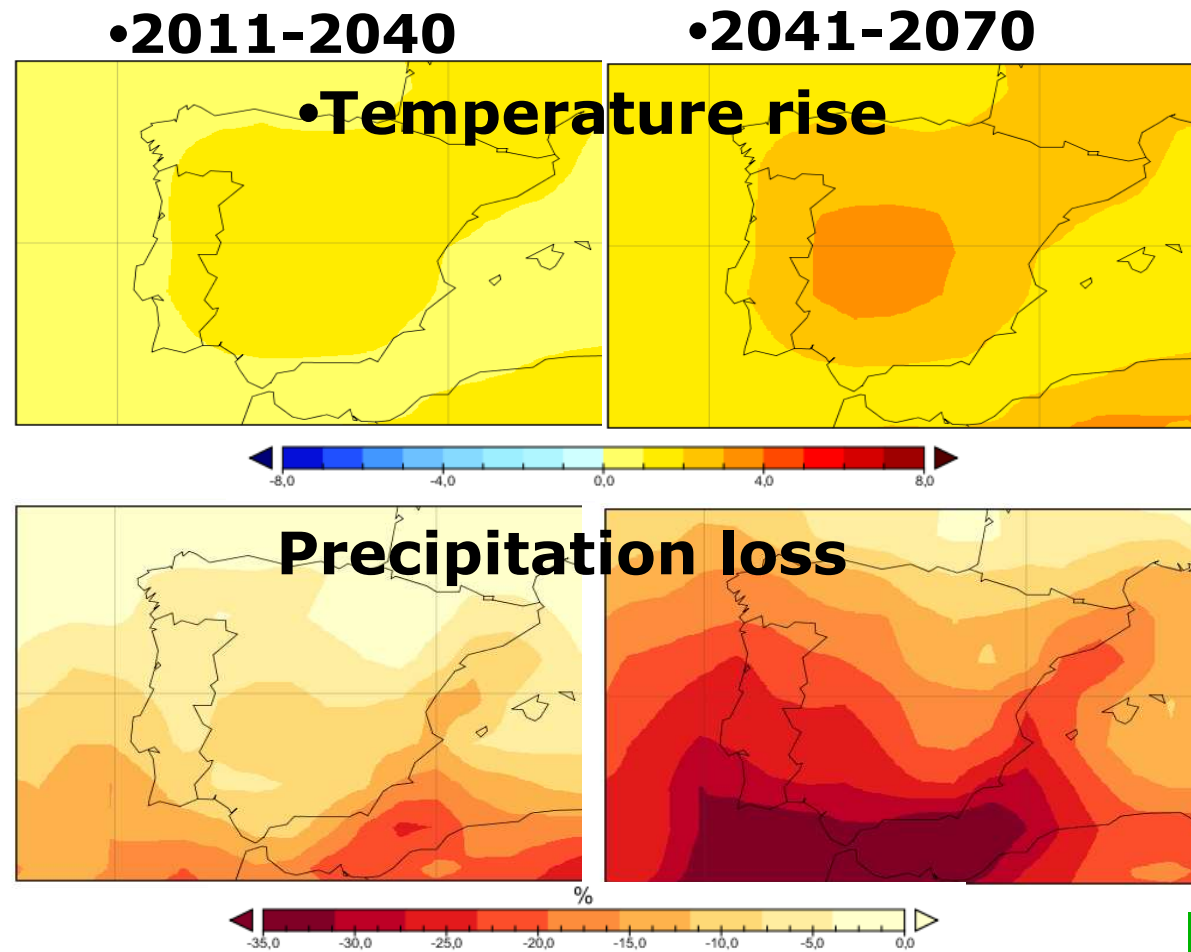
Changes in potential distribution

In some regions winter warming with CO_2 fertilization will be beneficial (North).

Pinus pinaster
Productivity loss 15-20%

2005   FUTURE

Suitable
Not suitable

Quercus suber
North- productivity increase 10-25%
South- productivity loss 25-60%

2005   FUTURE

Eucalyptus
Productivity loss 10-15%

2005   FUTURE

(SIAM 2005)

The South and interior regions may become inhospitable for some of present species (Cork oak, Pinus pinaster).

Extreme Events

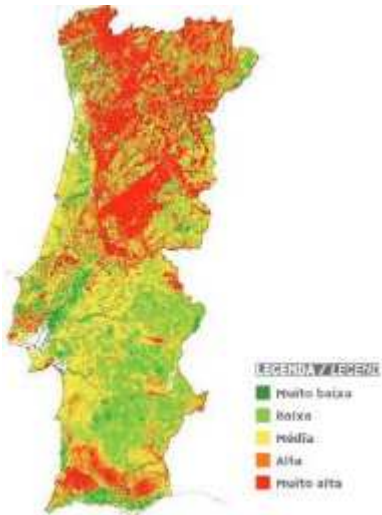**Extreme events (drought, heat waves, big storms) will be more frequent.**

Wildfire Risk

Source:ICNF 2013

Windthrow, <u>big fires</u>, floods

Fire hazard as main factor for low forest productivity
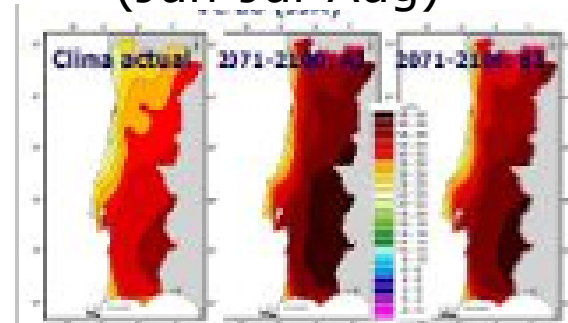
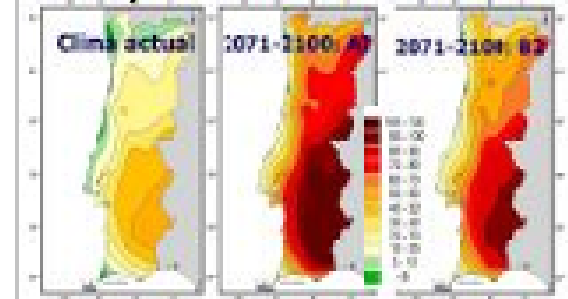**Rise of meteorological fire hazard in Portugal**
Increasing fire season
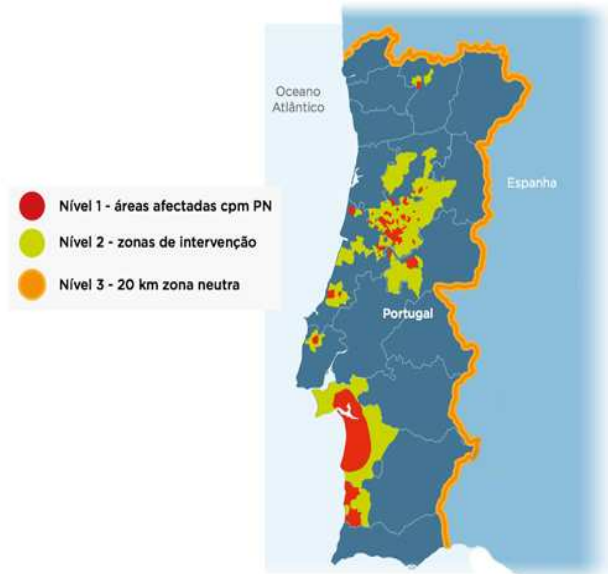
Sumer Max T ºC
(Jun-Jul-Aug)

Days with T>35º C

Source:IMAR 2013

Desertification susceptibility:
58% of Portuguese territory

Pest and Diseases

Increase in pest attack and spread of diseases

Pine nematode

Source:Syngenta 2013

Gonipterus in Eucalyptus
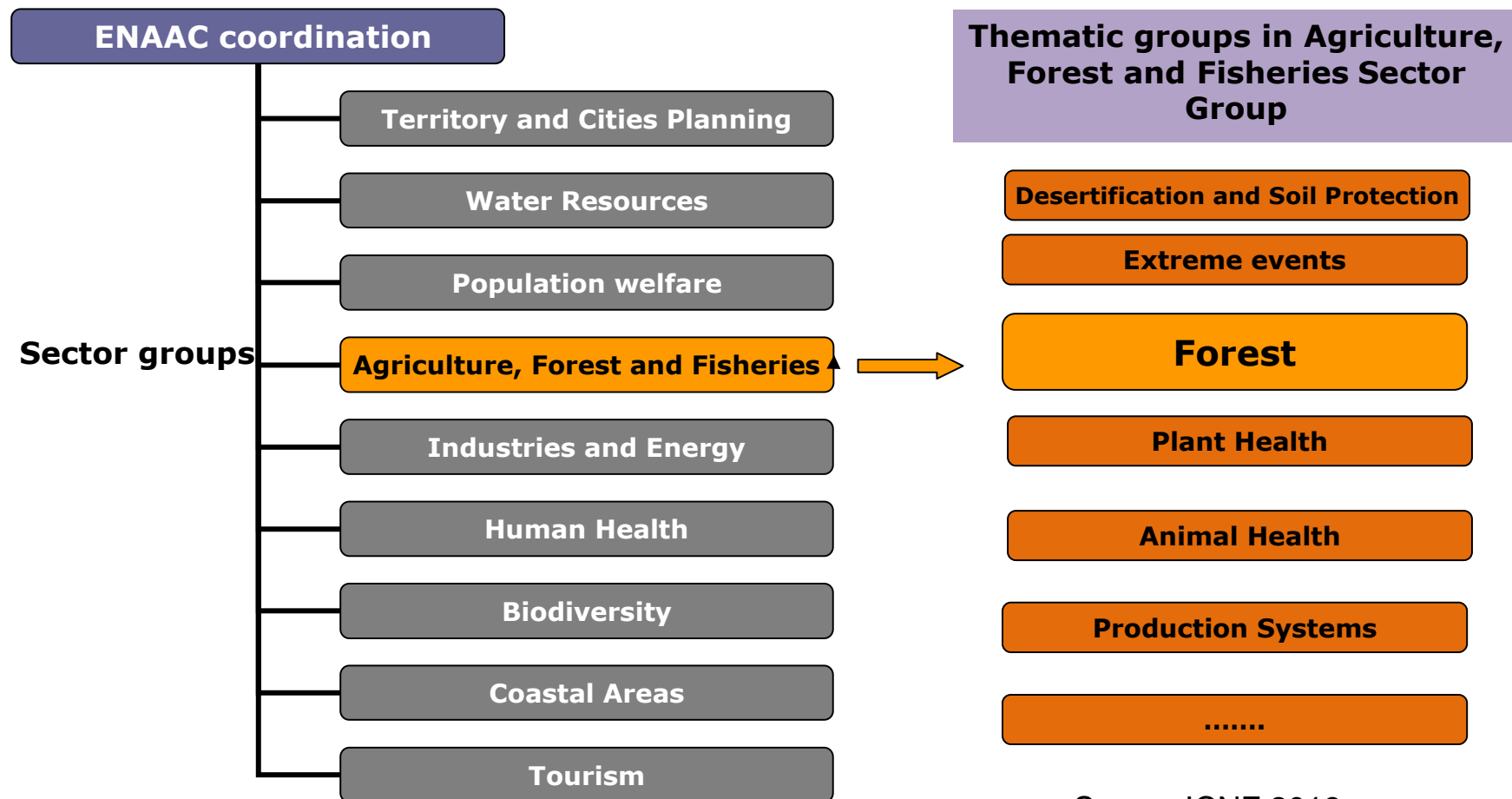

Source:ISA 2013

Decline in Montado

Source:INRB 2013

2. Adaptation Measures and Disseminating the Information

Portuguese Strategy for Climate Change Adaptation (ENAAC)
Sector and Thematic Groups

ENAAC – Resolution of the Council of Ministers nº 24/2010 of 1st of April: 9 strategic priority sectors for the development of adaptation measures

ENAAC coordination

Thematic groups in Agriculture, Forest and Fisheries Sector Group

Sector groups

- Territory and Cities Planning
- Water Resources
- Population welfare
- Agriculture, Forest and Fisheries →
- Industries and Energy
- Human Health
- Biodiversity
- Coastal Areas
- Tourism

- Desertification and Soil Protection
- Extreme events
- **Forest**
- Plant Health
- Animal Health
- Production Systems
- ....

Source:ICNF 2013

ENAAC : Sector and Thematic Groups

ENAAC is structured around four objectives that reflect its approach to the issue:

1.Information and knowledge.

This is the basis for the development of the strategy, focusing on the need to collect, consolidate, and develop a strong technical and scientific basis;

2.Reducing vulnerability and increasing the response capacity.

This is the core of ENAAC and frames the work of identification of vulnerabilities, definition of priorities and implementation of the main adaptation measures;

3.Participation, awareness raising and dissemination.

This highlights the importance of educating and involving all relevant agents in the efforts to identify and implement the most adequate adaptation measures;

4.International cooperation.

This addresses cooperation efforts within the European Union, the UNFCCC and other international forums to promote coordination and information sharing and to support adaptation efforts in developing countries.

Building ENAAC - Participation

Thematic groups:
- Participation of 21 entities
- Conducting 4 open meetings
- Invitation of specialist speakers

Writing Committee:

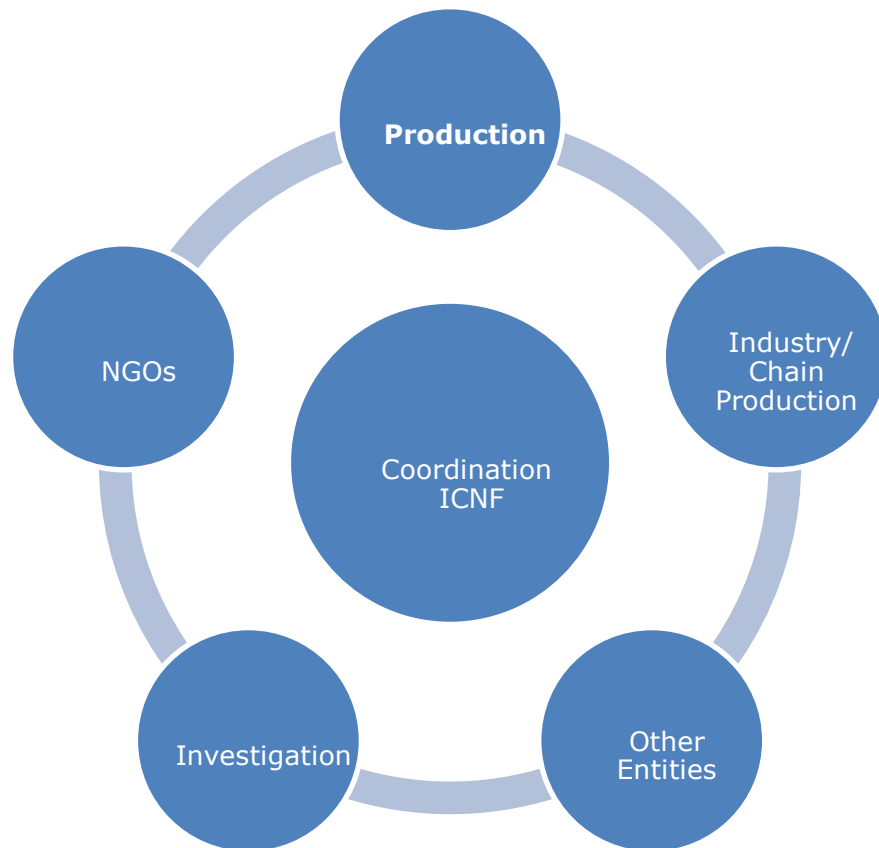Nature Conservation and Forest Institute (ICNF)

Competitiveness and Technology Center for Forest Products (AIFF)

Association of Forest, Agriculture and Environment Enterprises (ANEFA)
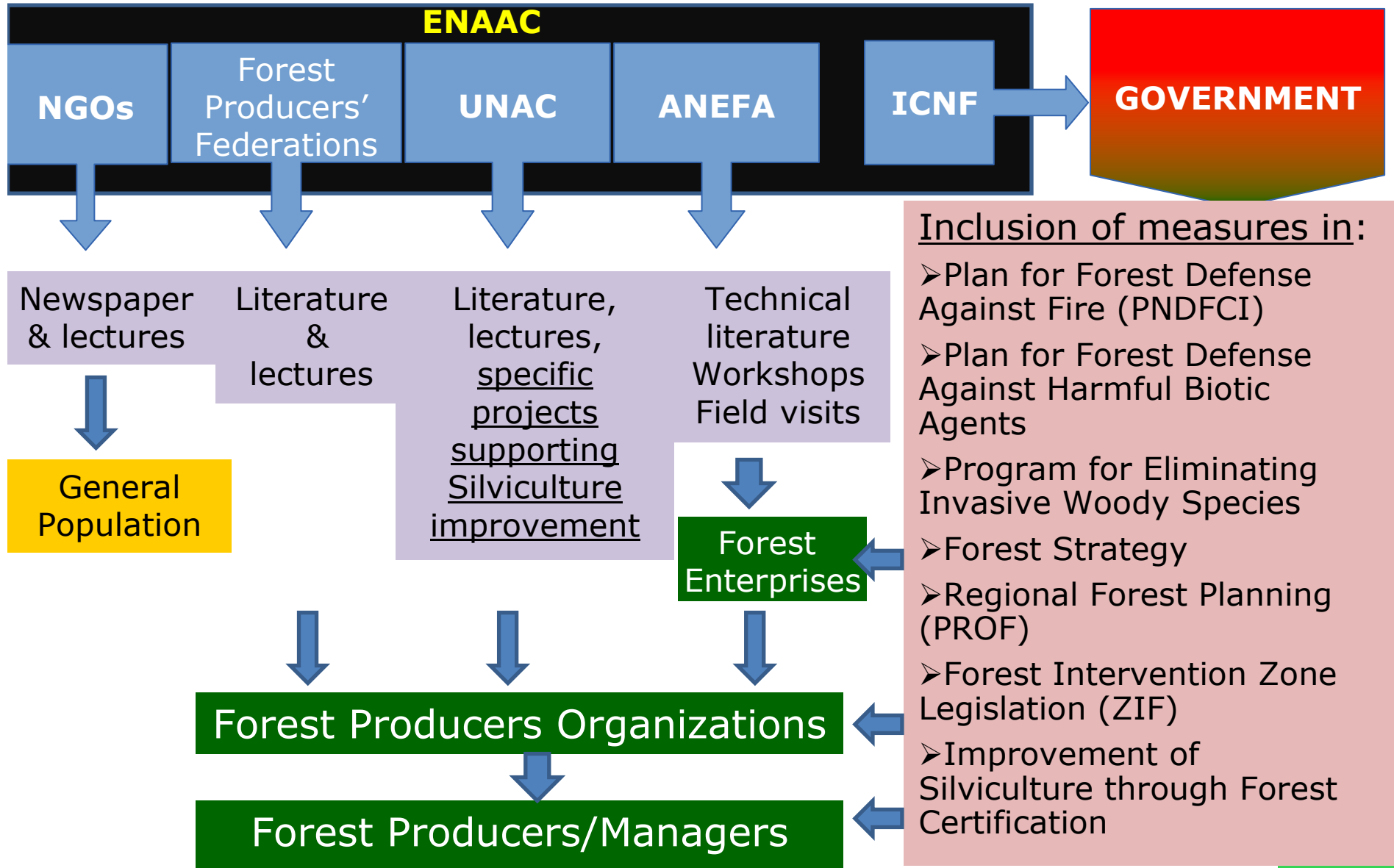
Portuguese Paper Industry Association (CELPA)

Mediterranean Agroforestry Association (UNAC)

National Federation of Cooperatives of Forest Products (FENAFLORESTA)

Production

Industry/ Chain Production

Coordination ICNF

NGOs

Other Entities

Investigation

Source:ICNF 2013

Disseminating Information

ENAAC

| NGOs | Forest Producers' Federations | UNAC | ANEFA | ICNF | → | GOVERNMENT |

Newspaper & lectures → General Population

Literature & lectures

Literature, lectures, <u>specific projects supporting Silviculture improvement</u>

Technical literature Workshops Field visits → Forest Enterprises

Inclusion of measures in:

➢Plan for Forest Defense Against Fire (PNDFCI)

➢Plan for Forest Defense Against Harmful Biotic Agents

➢Program for Eliminating Invasive Woody Species

➢Forest Strategy

➢Regional Forest Planning (PROF)

➢Forest Intervention Zone Legislation (ZIF)

➢Improvement of Silviculture through Forest Certification

Forest Producers Organizations

Forest Producers/Managers

3. Implementation and Recommendations for Climate Change Adaptation

Implementation and Recommendation

GOVERNMENT

Planning/ Management

Research

Fire Prevention
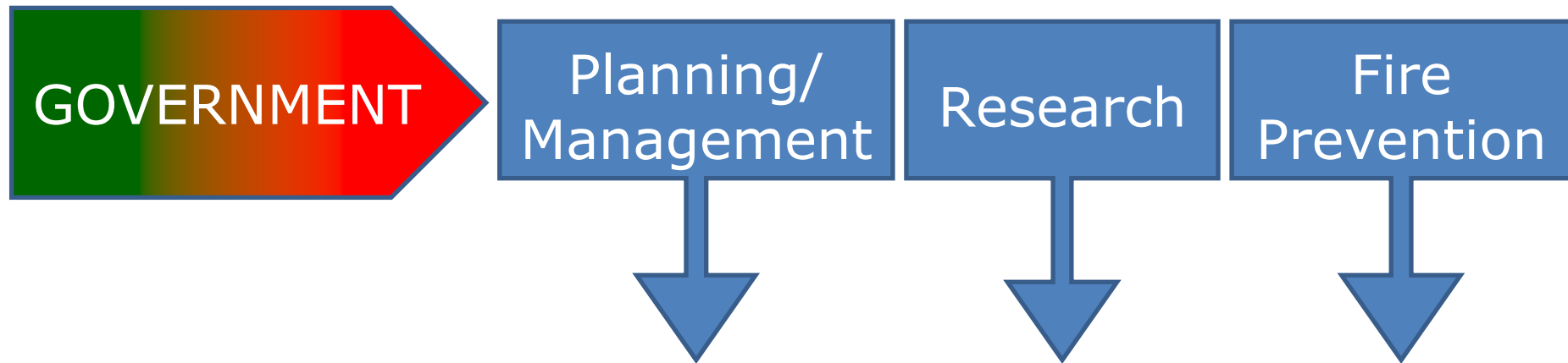
Implementation of Forest Intervention Zones (ZIF):

- ✓ **By-passing the problem of extremely fragmented forest property;**

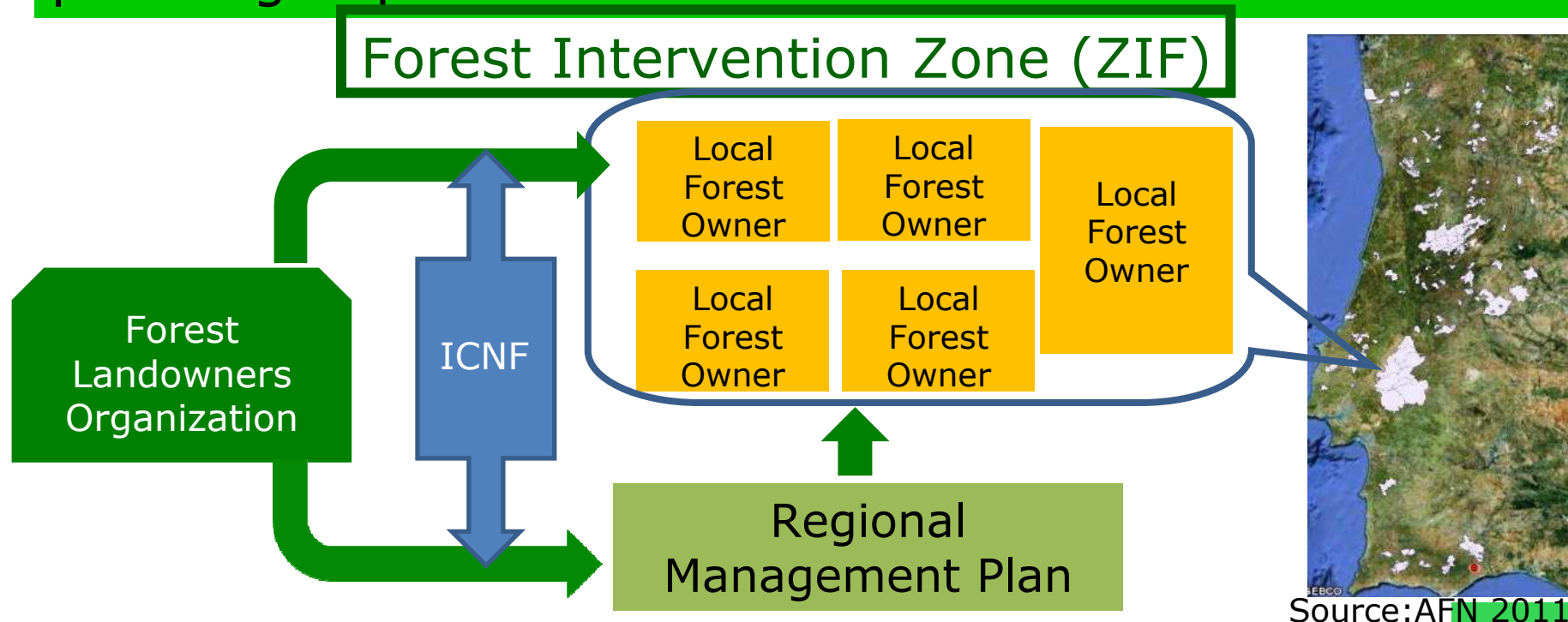- ✓ **Creating continuous management areas for region-specific measures implementation**
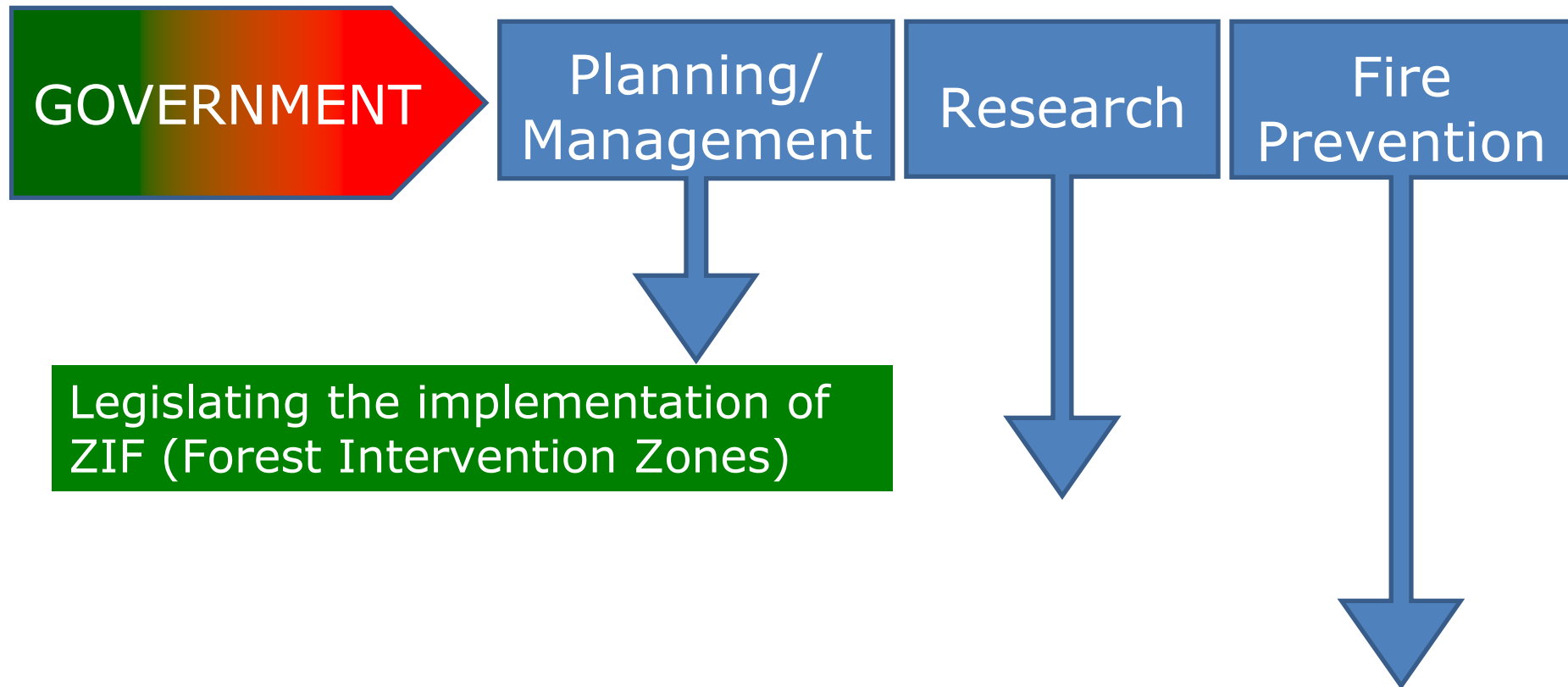
What is a ZIF?

The Problem:
Extremely fragmented Forest Property (North/Center)

Solution:
Continuous area management for region-specific planning implementation

Forest Intervention Zone (ZIF)

Forest Landowners Organization

ICNF

Local Forest Owner

Local Forest Owner

Local Forest Owner

Local Forest Owner

Local Forest Owner

Regional Management Plan

Source:AFN 2011

Implementation and Recommendation

GOVERNMENT

Planning/ Management

Research

Fire Prevention

Legislating the implementation of ZIF (Forest Intervention Zones)

➤ Legislating the Increase of Forest Fire Surveillance Period
➤ Improving Support on Forest Fire combat (equipment and staff) to avoid forest productivity loss and CO_2 emissions due to forest fires

Implementation and Recommendation

UNAC

Implementation of TERRAPRIMA - UNAC /PORTUGUESE CARBON FUND – SHRUB CONTROL PROJECT: Improving Silvicultural practices for low soil disturbance on shrub control operation (70 000 ha)

ANEFA

➢ Technical information brochures and articles on pest and diseases combat;
➢ Information on species' change to more resistant ones adapted to water stress and pest damage;
➢ Specific workshops on climate change effects for each chain production (Pine, cork, Pulp and others)

Implementation and Recommendation

RAIZ (Private research on Eucalyptus) → Breeding program – Selection of more drought resistant clones
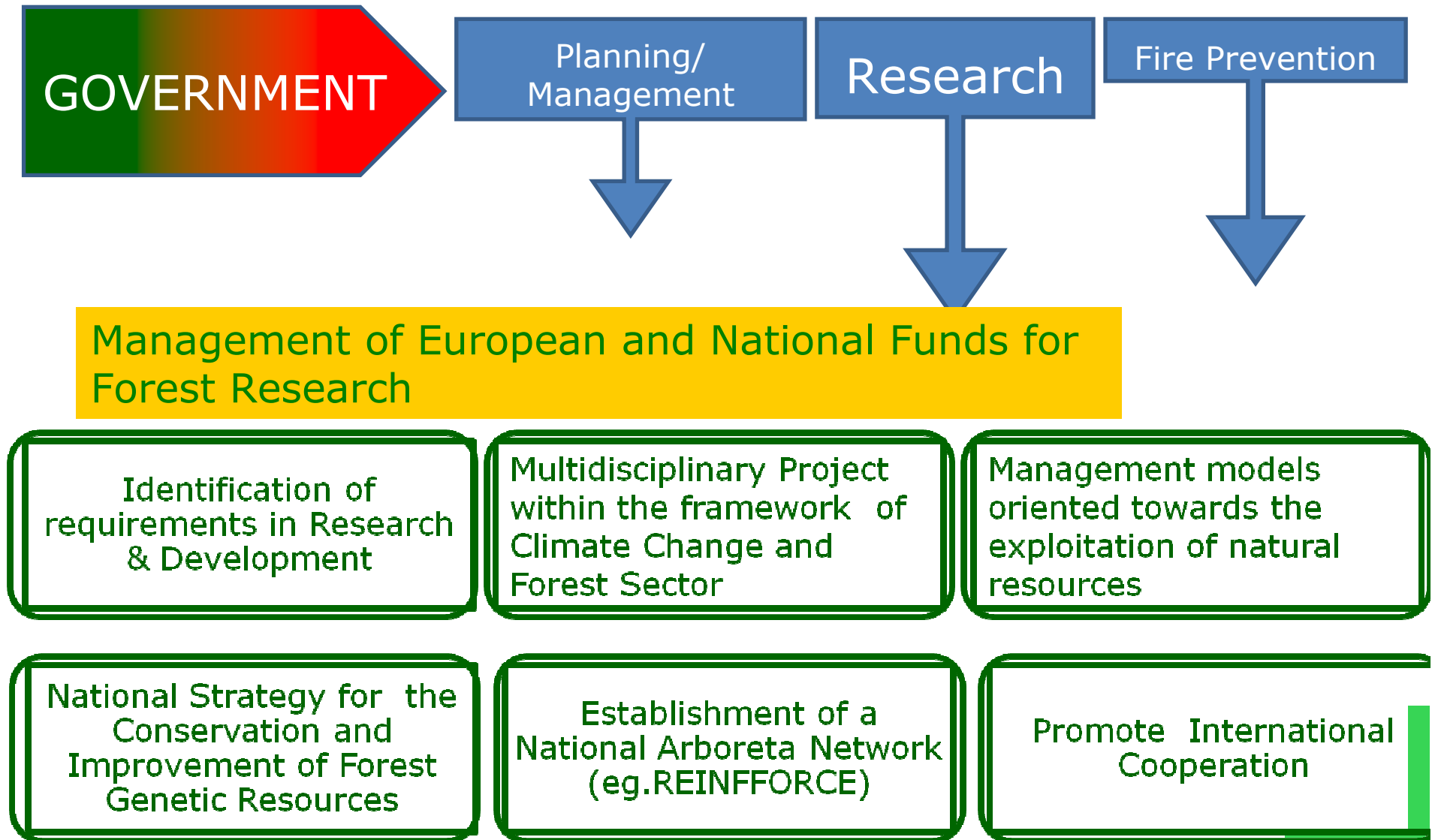
Society for Forest Sciences → Discussion on Climate change research and current measures at the 7th National Forest Congress – Guidelines for foresters

Research Centers → Research on predicting climate change effects and adaptation: Modeling, Pest and Diseases, Water Stress, Alternative Species/Provenance, Silviculture

Implementation and Recommendation

GOVERNMENT

| Planning/ Management | Research | Fire Prevention |

Management of European and National Funds for Forest Research

Identification of requirements in Research & Development

Multidisciplinary Project within the framework of Climate Change and Forest Sector

Management models oriented towards the exploitation of natural resources

National Strategy for the Conservation and Improvement of Forest Genetic Resources

Establishment of a National Arboreta Network (eg.REINFFORCE)

Promote International Cooperation

Contribution to Research and Monitoring

•REINFFORCE Arboreta Network

- 38 arboreta with 35 species
- 6 arboreta in Portugal (3 Continent, 3 Azores archipelago)
- Monitoring for adaptation (survival, growth, phenology and pest / diseases)

Arboreta network

52º N

37º N

Species origin
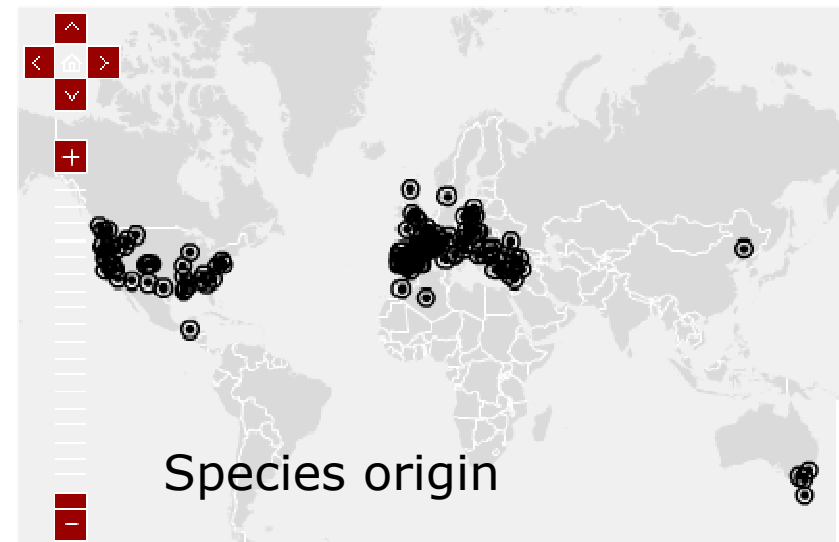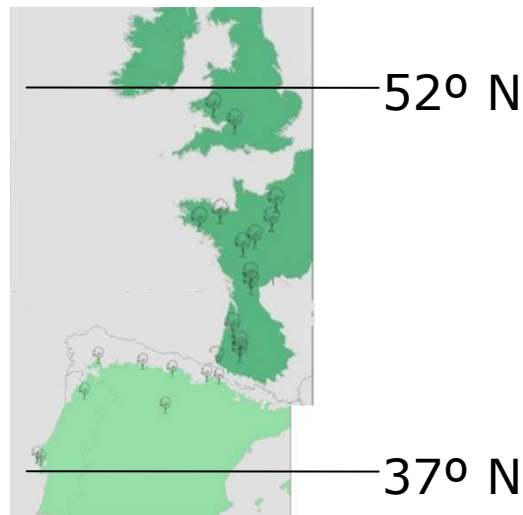
Arboreta instalation - ISA

ISA Arboretum

- 2 plots: Broadleaf and Conifer
- Plot divided by species
- Genetic Units randomly
distributed inside species division

WOODTECH Group Visit

Change in one arboretum location – Viseu to Sintra

Contribution to Dissemination

•REINFFORCE Demonstration Sites

- *Quercus suber* and *Quercus robur* provenance test
- Understorey management in *Quercus suber* Montado
- *Quercus suber* individual tree debarking coefficient effect

Cork oak
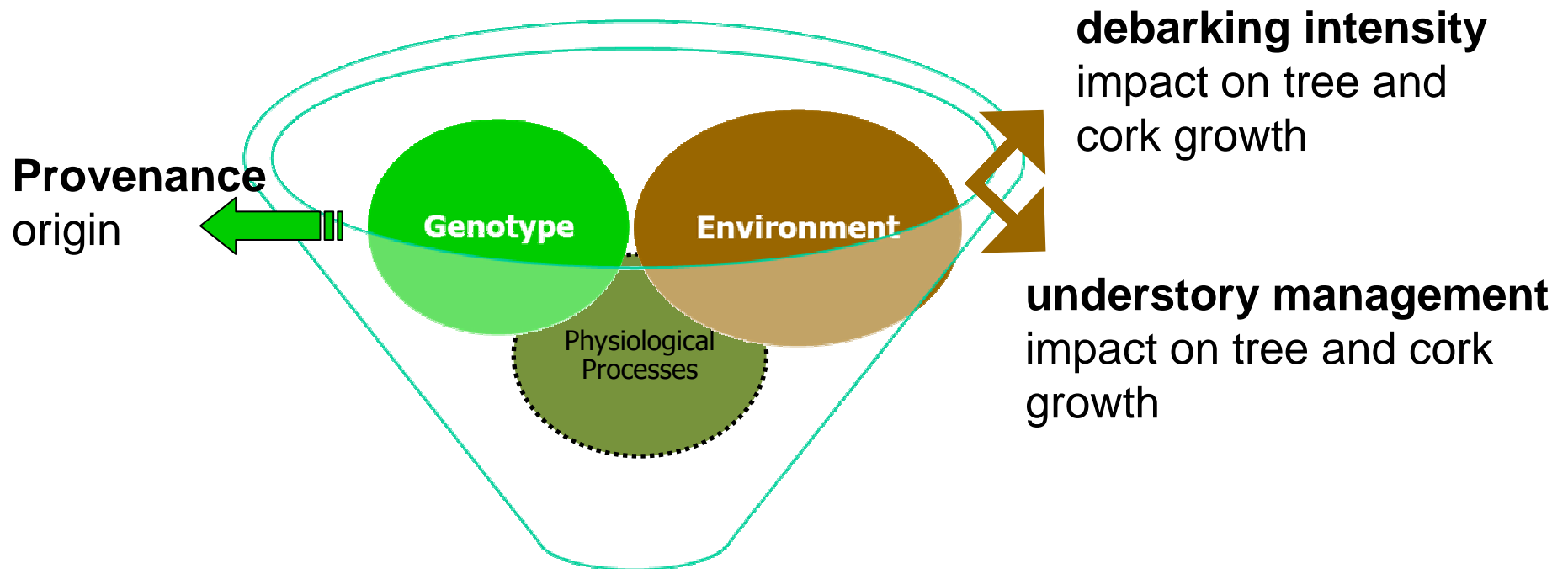
Provenance
origin

Genotype

Environment

Physiological
Processes

debarking intensity
impact on tree and
cork growth

understory management
impact on tree and cork
growth

35 populations of cork oak covering the **whole natural distribution**

Quinta da Nogueira

North

Mata Nacional das Virtudes

Tagus Valley

Herdade do Monte da Fava

South

Randomized Complete Blocks: 30

Significant differences at Population level?
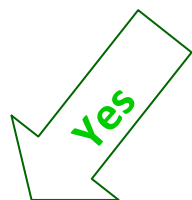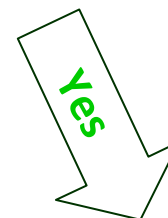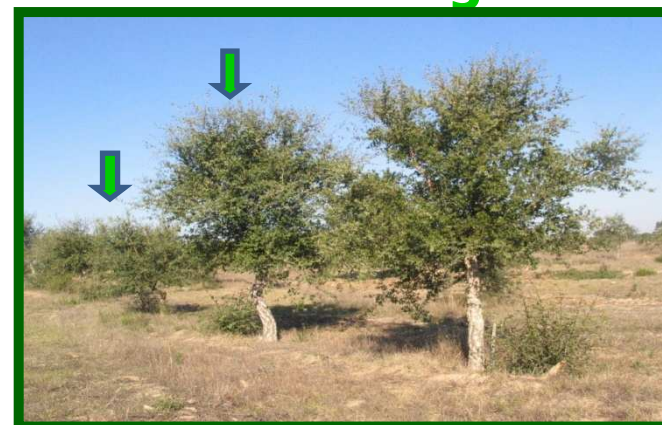
Yes → **Survival**

Yes → **Total Height**

Survival
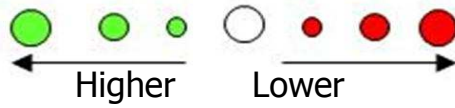
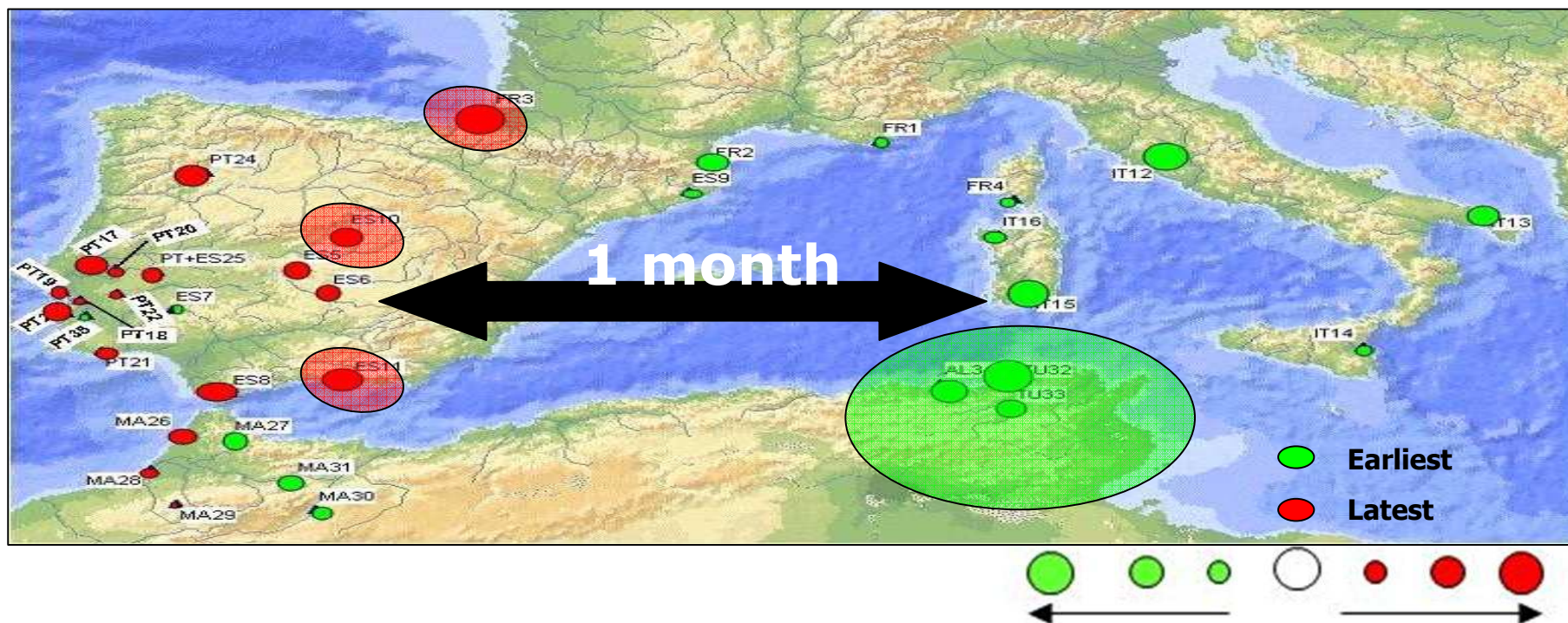| Site	%
North	57,5 – 80,0
Tagus Valley	9,4 – 29,6
South	40,8 – 77,5

Higher ← → Lower
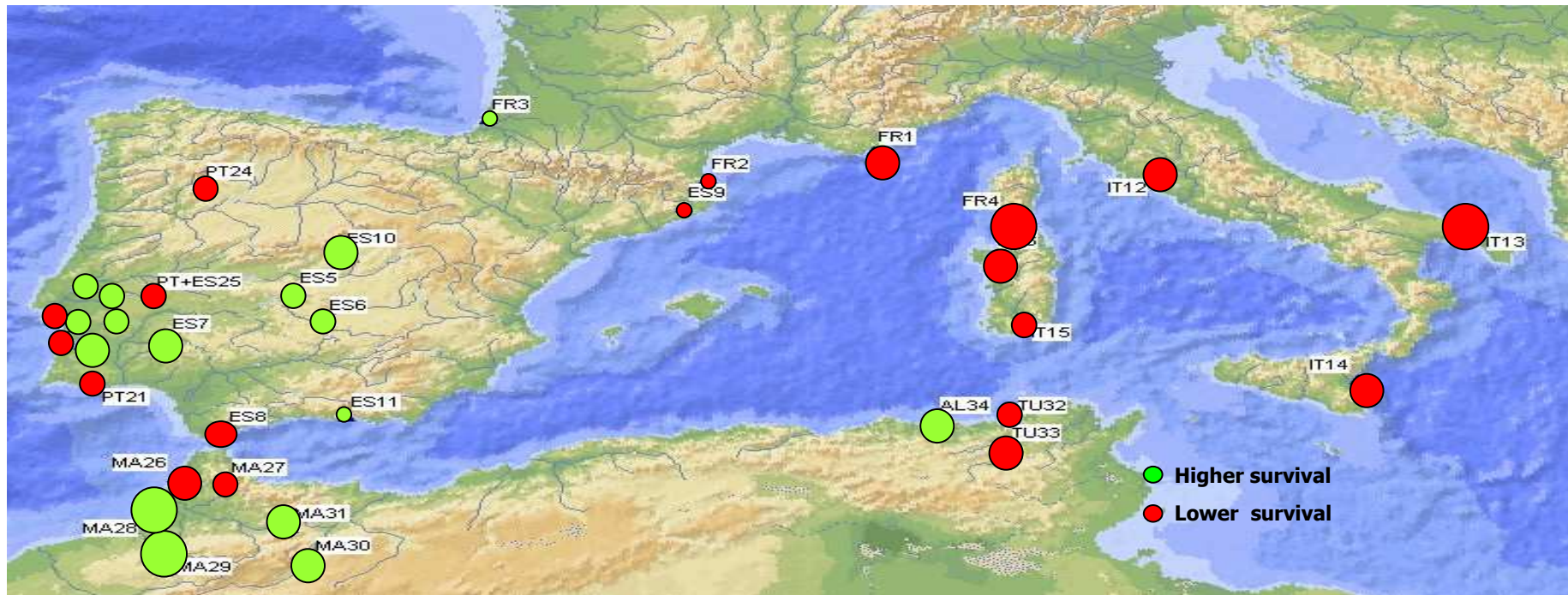
Most Westerly populations have higher survival rates

Budburst - Leaf pest damage

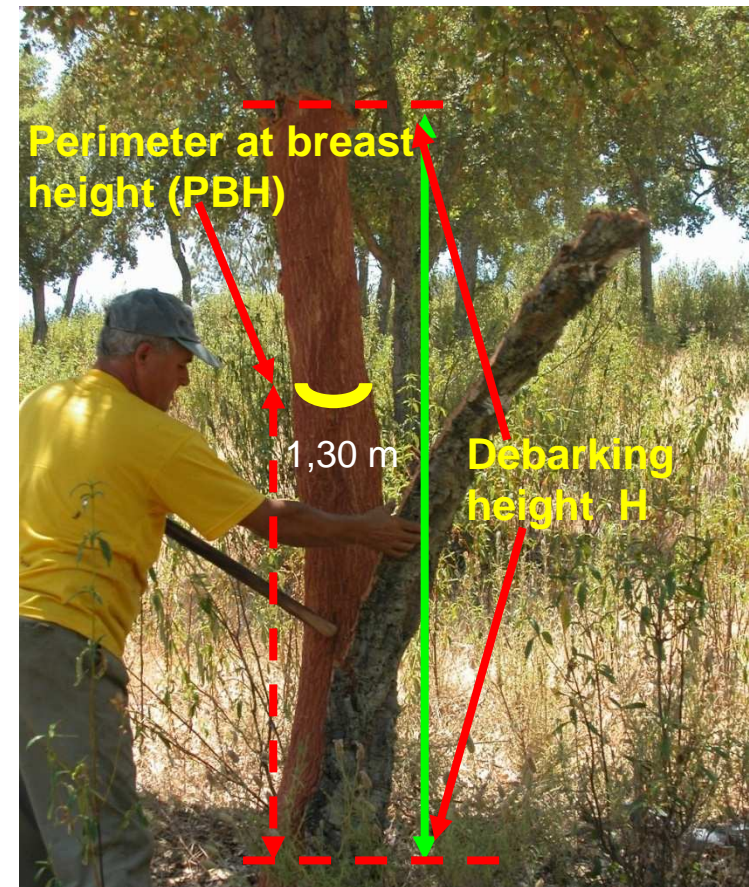## Earliest flushing showed higher leaf damage

debarking intensity impact on tree and cork growth

COEFICIENT DEBARKING= PBH/H

- ## 2003

  - Public forest

  - Mean annual precipitation: 309 mm

  - Mean annual temperature: 16.2 ºC

  - Trial installed at the moment of the 1st debarking

  - Even aged stand (plantation in 1960)

Perimeter at breast height (PBH)

1,30 m

Debarking height H

on debarking intensity impact on tree and cork growth

2003

- **Coef. Debarking**
- **> 2,5 ; = 2 ; < 1,5**

2012

Debarking surface

Cork growth

Climate change is already impacting on cork growth

Cork Growth Index

Debarking 2nd sample (Year: 1986 or 2007) — vertical axis

king - gci1$_{i,j}$ - mm)

Debarking 1ˢᵗ sample (Year: 1986 or 2007)
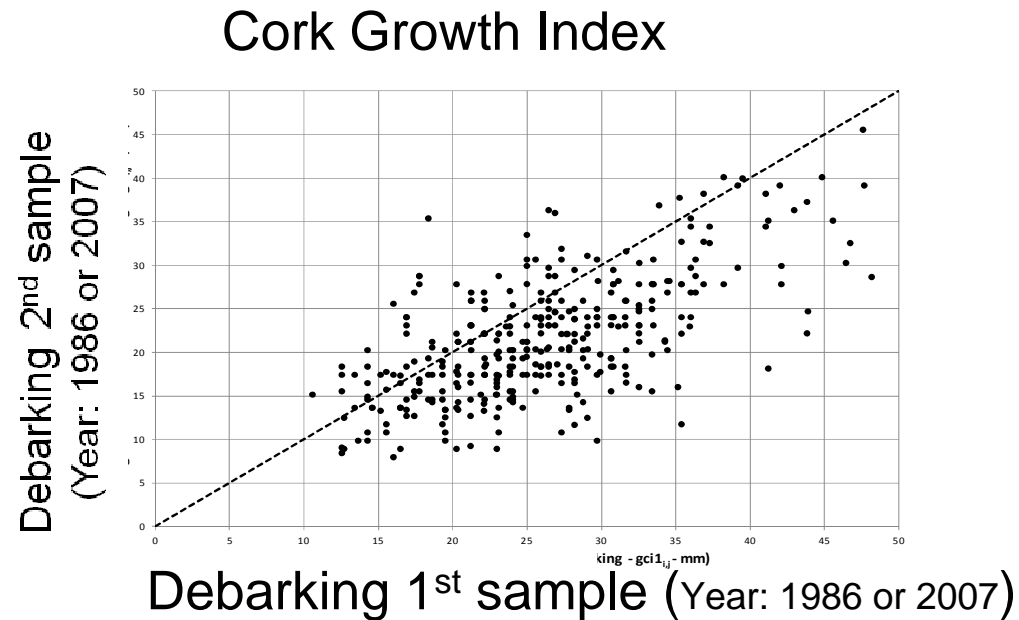
Using a mixed model approach it is possible to observe that the most important variables related to **cork caliber** are:

  ✓ Individual tree variability => importance of **genetic material**

  ✓ Precipitation values => **climate change impact**

The large variability in the individual tree response reinforces the importance of tree / provenance selection for current and future plantations

Thank you

Research Networks & International cooperation

ForEAdapt- Knowledge exchange between Europe and America on forest growth models and optimization for adaptive forestry

IMECC- Infrastructure for Measurement of the European Carbon Cycle

ICOS- Integrated Carbon Observation System

REINFFORCE- RÉseau INFrastructure de recherche pour le suivi et l'adaptation des FORêts au Changement climatique

TRANZFOR- Transferring research between EU & Australia - New Zealand on Forestry and Climate Change

CARBOWATCHSRUB - shrub encroachment and its effect on carbon, nitrogen and water exchange

FOR CLIMADAPT- Adaptation of the Mediterranean forests to the climate change

DROUGHT-R&SPI- Promoting research on drought at European scale and interaction between science and politics