LIFE08 ENV/GR/000554

AdaptFor

Adaptation of forest management to climate change in Greece

Adaptation of forest management to climate change in Greece: application at four pilot sites

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Introduction

Forests and Climate Change

Forests interact with climate change:

- new assemblages of species
- shifts in the geographic distribution of forest vegetation
- intensification of infestations by destructive pathogens

Introduction

The **Mediterranean** region

The Mediterranean region:

- biodiversity and climate change hotspot
- drought
- extreme forest fire risk
- biotic risks (i.e. fungi and insects' outbreaks)

Greece is projected to be among the most vulnerable countries to climate change and in need of adaptation measures

Adaptation of forest management

Adaptation to climate change requires us to:

- determine the **vulnerability** of forest ecosystems
- establish **objectives** for the future forests
- develop present and future cost-effective **adaptive actions**
- **manage** the forest to reduce vulnerability
- **monitor** to determine the state of the forest
- increase **awareness** and **education** within the forestry community

Introduction

Adaptation of forest management

Adaptive forest management

is characterized by continual evaluation and, if necessary, adjustment of management objectives

Correct balance

The need to **gain knowledge** for improving management in the future

The achievement of the best outcomes based on **current knowledge**

Introduction

The project **LIFE+ AdaptFor**

In the framework of LIFE+ AdaptFor:

- Understanding of ecological responses and vulnerability of four selected Greek forest ecosystems, in terms of forest health and vegetation changes, under the effects of climate change

- Drafting of measures to adapt forest management practices in these four ecosystems

- Incorporation of these measures in the Forest Management Plans of the four study areas

Methodology

Study areas and observed phenomena

Four (4) pilot sites:

- changes in vegetation
- distributed all over Greece
- public forest areas
- overlap with Natura 2000 Network

Study areas and observed phenomena

1. Ritini-Vria Forest at Mount Pieria

Forest Type

Pure stands of Scots pine (*Pinus sylvestris*)

Occurring phenomenon:

Dieback of Scots pine over the last 30 years due to the combined action of:

- primary pathogenic fungus *Peridermium pini*
- bark beetles
- changes in climatic parameters

Study areas and observed phenomena

2. Aspropotamos-Kalampaka Forest

Forest Type

Deciduous broadleaved species
Bulgarian fir (*Abies borisii regis*)
Black pine (*Pinus nigra*)

Occurring phenomenon:

Intrusion of conifer species into the broadleaved forest (700-1000 m a.s.l.)

- fir extends beyond its lower thermal tolerance limits becoming vulnerable to insects' outbreaks
- inappropriate management (clear cuts, coppicing) led to the weakening of the broadleaved forest

Study areas and observed phenomena

3. National Park of Parnitha

Forest Type

Greek Fir (*Abies cephalonica*) in pure or mixed stands with:
Aleppo pine (*Pinus halepensis*)
Juniper (*Juniperus* sp.)
Broadleaved shrubs etc.

Occurring phenomenon:

Dieback of Greek fir over the last decades:

- outbreak of bark beetles (mainly *Pityokteines spinidens*)
- low levels of insect diversity
- decaying wood that remained in the forest after the 2007 fire
- sensitive and unstable ecosystem

Study areas and observed phenomena

4. Mount Taygetos

Forest Type

Greek Fir (*Abies cephalonica*) in pure or mixed stands with:
Black pine (*Pinus nigra*)
Juniper (*Juniperus* sp.)
Broadleaved shrubs etc.

Occurring phenomenon:

Dieback of Greek fir over the last decades:

- bark beetles *(*mainly *P. spinidens* and *Hylastes brunneus)*
- high levels of insect diversity
- high levels of occurrence of the beneficial predator insect *Thanasimus formicarius*
- rather stable ecosystem

The **design** of adaptation and management measures was based on :

- adaptation process described by Robledo & Forner (2005)
- EU guidelines on dealing with the impact of climate change on the management of Natura 2000 Network of areas of high biodiversity value (2013)
- international literature on the subject

AdaptFor

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Methodology

Method

Field work + study

Vegetation
Fungi and insects
Tree physiology
Soil

→

Vulnerability assessment

of forest ecosystems to climate change

↓

Drafting of

Forest management objectives

Adaptation measures

↓

Public Consultation (project website)
+
Consultation Meeting (with forest services)

←

Finalization of

Adaptation Measures

Results - Discussion

Forest Management **Objectives**

halt further progression of the occurring phenomena

Study area	Management objective
Ritini–Vria Forest at Mount Pieria	Conservation of Scots pine forest
	Conservation of Scots pine genetic diversity
Aspropotamos–Kalampaka Forest	Rehabilitation of mixed oak forest and chestnut forest *at medium / poor quality sites*
	Favouring of fir stands *at good quality sites*
National Park of Parnitha	Conservation of Greek fir *at good quality sites*
	Replacement of Greek fir by other species *at degraded soils*
Mount Taygetos	Conservation of fir forests (*A. cephalonica* and *A. borisii regis*)
	Conservation of Greek fir genetic diversity
ALL AREAS	Protection of forests from other biotic and abiotic factors
	Research and awareness

Results - Discussion

Forest Management **Measures**

Adaptation of forest management to climate change

Sustainable silvicultural practices

- enhancement of productivity
- forest ecosystem services

- conservation of biodiversity
- availability of water
- enhancement of regeneration
- protection of soil
- promotion of ecosystem heterogeneity
- increase in connectivity
- monitoring of forest health

Forest Management **Measures**

3 Categories of Adaptation Measures

- **short-term adaptation measures**

  to be implemented immediately for controlling the occurring phenomena

- **medium and long-term adaptation measures**

  for the enhancement of forest ecosystems under the effects of climate change

- **supplementary measures**

  for measures' success and protection of forests from biotic and abiotic factors

Results - Discussion

1. Short-term adaptation measures

1.1. Sanitary logging (all 4 areas)

- removal and disposal of infected trees at areas suffering from outbreaks
- reduction of the infectious potential
- avoidance of similar incidents over the following years

1.2. Establishment of pheromone traps (areas 1, 3, 4)

- attract and trap harmful insects (mass depopulation)
- protection of study areas from further insects' outbreaks

2. Medium and long-term adaptation measures

2.1. Regeneration encouragement (areas 1, 3, 4)

- favoring of natural regeneration
- planting of seedlings
- facilitation of natural adaptation to climate change

2.2. Preservation of the dominant species genetic diversity (areas 1, 4)

- selection and preservation (e.g. seed bank) of propagating material
- establishment of seed orchards
- implementation of restoration actions in case of disturbances (e.g. forest fire)

2. Medium and long-term adaptation measures

2.3. Favoring of mixed stands (areas 1, 2, 4)

- naturally (through the use of silvicultural techniques)
- artificially (plantings to create a mosaic of mixed stands)
- increase in compositional and structural diversity
- enhancement of forest ecosystems' stability
- improvement of adaptive capacity
- increase in tree resilience to mortality due to pathogen activity
- increase in forests' drought resistance
- reduction of fire risk

2. Medium and long-term adaptation measures

2.4. Cessation of clear cuts to broadleaved forests (area 2)

2.5. Extension of rotation period (area 2)

- inversion and subsequent conservation of these forests
- protection of soil productivity
- reduction of erosion risk and soil degradation
- achievement of higher sequestration rates / greater CO2 storage capacity
- production of more valuable timber

2. Medium and long-term adaptation measures

However, as a prolonged lack of harvesting activities…

- increase biotic and abiotic disturbances
- increase fuel wood accumulation

2.6. Application of selective logging and thinning (areas 2, 3, 4)

- modifications in their frequency or intensity
- reduction of inter- and intraspecific competition for water, light and nutrients
- rendering species less vulnerable to the attacks of pathogens
- mitigation of negative impacts from droughts and forest fire

Results - Discussion

3. Supplementary measures

all 4 areas

3.1. Limitation of grazing both by wild and domestic animals

- protection of regeneration and soil resources

3.2. Protection of soil resources

- avoidance of management methods that destroy the forest floor

3.3. Protection against forest fires

- preventive and repressive measures

3.4. Gradual afforestation of forest roads

- limit vegetation fragmentation

3. Supplementary measures

all 4 areas

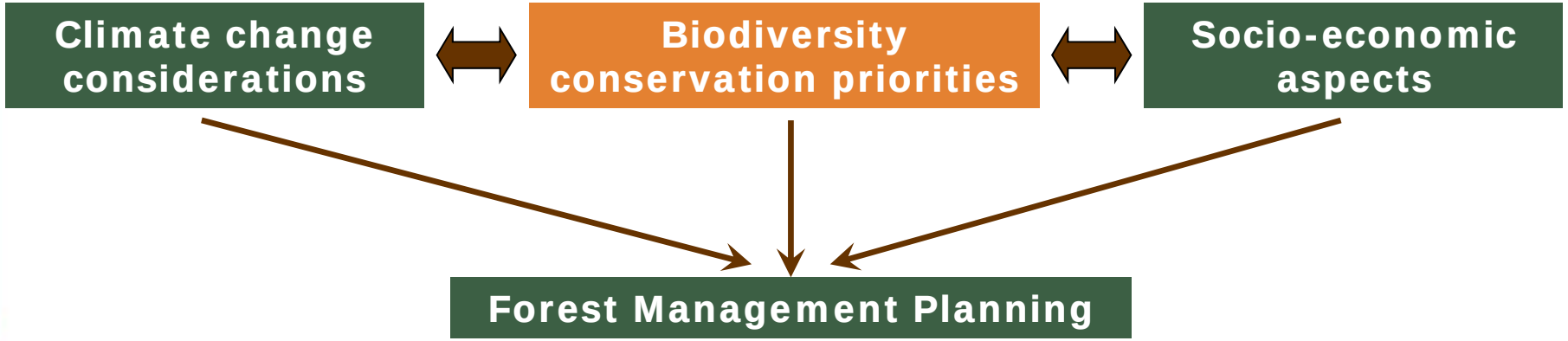
3.5. Establishment of a permanent monitoring programme

- assessment of climate change impacts
- monitor reaction of forest ecosystems to the adaptive management strategies

3.6. Awareness raising and training of stakeholder groups

- more successful adaptation strategies if identified and developed by local actors
- bottom-up approaches, which include the relevant stakeholders, are vital
- motivation of general public (educational training, participatory actions)

Conclusions



The current study puts into practice:

science

prescriptions for management

to bridge the gap between science and policy, in light of the changing climate

ACKNOWLEDGEMENTS

The current study was conducted in the framework of the project EU LIFE+ ENVIRONMENT POLICY AND GOVERNANCE, LIFE08 ENV/GR/000554, entitled AdaptFor "Adaptation of forest management to climate change in Greece" which is implemented by the Goulandris Natural History Museum/Greek Biotope-Wetland Centre (EKBY) in cooperation with the General Directorate for the Development and Protection of Forests and Natural Environment/Ministry of Environment, Energy and Climate Change (GDfDPFNE/MinEECC). The project duration is 5 years and its budget amounts to EUR 1,719,112.

With the contribution of the LIFE financial instrument of the European Community.

www.life-adaptfor.gr

Thank you for your attention!

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