For Climadapt

Adaptation of mediterranean woodlands to climate change

Progress book n°2

State of progress of the project

after seminars 3 and 4

22 - 24 June 2012 in Torre del Greco (Vesuvius), ITALY

27 - 29 June 2012 in Peugia (Umbria), ITALY

ASSOCIATION INTERNATIONALE FORÊTS MEDITERRANEENNES

Med L'Europe en Méditerranée Europe in the Mediterranean

Projet cofinancé par le Fonds Européen de Développement Régional (FEDER)

Project cofinanced by the European Regional Development Fund (ERDF)

Table

Foreword

This is the second Progress book of the FOR CLIMADAPT project. If you still did not get the first Progress book, you can ask for it from the secretariat of the International Association for Mediterranean Forests (AIFM) or from any partner close to you (email addresses of their respective representative persons are available in the section "Presentation of the partners [...]", pages 8 to 19).

At this stage of the project, we estimate that we begin to perceive the concrete outcome of the project, both in terms of content and relevance of the central problem: how to improve the adaptation of the Mediterranean forest areas to the impacts of climate change.

But beyond the technical results, the project is now integrated into an overall dynamic made of numerous initiatives related to these themes, including beyond the perimeter of the Med area. Thus, the project contributes to the development of the "State of the Mediterranean Forests," which will be published by FAO, and assesses governments in the development of their own strategies on forests and climatic changes, like in Portugal.

FOR CLIMADAPT will also be sought within the framework of the third Mediterranean Forest Week (Algeria, March 2013), during which the main issues will be the adaptation of forests to climate change.

We hope that this project will continue to contribute to the synergy of actions in favour of a more sustainable and participatory management of Mediterranean forest ecosystems.

Good reading!

Paola CONTI
Project leader
National Park of Vesuvius

Mohamed Larbi CHAKROUN
President of the International Association
for Mediterranean Forests

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Caution

This volume constitutes the second Progress book of the FOR CLIMADAPT project "Adaption of Mediterranean woodlands to climate change", co-financed by the European Regional Development Fund.

It was realized in conjunction with the third and fourth seminars of the project which took place from 22 to 24 of February 2012 in Torre del Greco (Vesuvius) and from 27 to 29 of June 2012 in Perugia (Umbria).

Such international seminars are essential in the capitalization process of the project: they enhance debate, formulation of the difficulties faced during the undertaking of activities and to obtain results by passing word to the local stakeholders involved in concrete projects, to the local decision-makers, to the daily users and to the concerned institutions. Indeed, if international meetings on these subjects are recurrent, they are rarely opened to the numerous stakeholders' categories, in particular for the "daily" actors whose experiences are, therefore, not enough capitalized. The debriefing sessions, which follow the field trip during the seminars, allow us to gather various perceptions of common problems and to build gradually, and collectively, a "shared conception of Mediterranean forest management" faithful to the field realities.

Our methodology consists in communicating throughout the project, without waiting for its end. The vocation of the Progress books is thus to report, the most accurately as possible, and in a progressive way, main elements discussed during these seminars, following the field trips and the peer group's meetings. Each one of them synthesizes the information and the state of progress of all the partnership's activities, with more information concerning territories visited during a seminar.

So, the succession of three Progress books is aimed at presenting the project progress, between its initial and final state, in terms of improvement of the collective thinking about sustainable forest management and adaptation to climate change. The objective of these Progress books is to capitalize knowledge but also, and especially, to validate and to promote good practices, management tools and decision-making support which can be developed or used in other Mediterranean contexts. This constitutes an information and qualitative evaluation mean of the project for the FOR CLIMADAPT partners themselves, for the management authorities of the MED programme, and for other stakeholders of the Mediterranean territories. The capitalization report will resume all the conclusions, realizations and publications elaborated during the project.

Every step we make forward will allow us to better integrate the stakes related to climate change and Mediterranean woodlands into regional policies.

Note: At the same time as the Progress books publication, more detailed information is being published on the project website www.forclimadapt.eu. In particular, one shall find there the detailed reports of the seminars and Peer group meetings, steering committee's decisions statements, and other working documents produced by the different partners.

General presentation of the FOR CLIMADAPT project

MED Programme

The MED Programme is a transnational programme of European territorial cooperation. It is financed by the European Union as an instrument of its regional policy and of its new programming period. It continues the tradition of the European programmes for cooperation (previously named Interreg). It takes place within the objective "European territorial cooperation" of the period 2007-2013.

With a budget of more than 250 millions euros (whose 193 millions from ERDF), the Programme launches, until exhaustion of its ERDF envelope, calls for projects to build transnational partnerships aiming at meeting the priority objectives of the Programme in the Mediterranean space.

Programme objectives:

- To improve the area's competitiveness in a way that guarantees growth and employment for the next generations (Lisbon strategy).

- To promote territorial cohesion and environmental protection, according to the logic of sustainable development (Goteborg strategy).

Four priority axis were identified:

- Axis 1: Strengthening innovation capacities.

- Axis 2: Environment protection and promotion of a sustainable territorial development.

- Axis 3: Improving mobility and territorial accessibility.

- Axis 4: Promoting a polycentric and integrated development of the MED area.

FOR CLIMADAPT is positionned on the priotrity 2 and respond to the objective 4 : "Prevention and fight against natural hazards".

Problems of the Mediterranean forests

It is essential to remind here that in each one of our interventions we consider all the natural and forest areas characterized by Mediterranean climate. It does include deforested zones or areas affected by erosion, herbaceous natural habitats, scrubland or *dehesa*, as well as more intensively wooded areas and ageing forests, or also man-made artificial areas (plantations). Because of their historically quite intense anthropogenic transformation, the Mediterranean ecosystems incessantly evolve between "naturality" and "artificialization". The diversity of these areas is generally included under the term of "Mediterranean forests and other wooded areas". By convenience, we shall call them "Mediterranean forests".

Although Mediterranean forests generate a reduced commercial production, they provide many amenities to the society. They are subject to traditional and new uses (production, biodiversity conservation, soil, water, carbon sequestration, recreation) that follow to the needs of society and involve an increasing stakeholders' diversity.

This sometimes leads to situations of conflict and misunderstanding, especially about the development and the management of these areas. This is particularly evident in the Mediterranean region, the scene of suburban and tourist activities in which the pressures and challenges are increased.

Shared objectives, common difficulties, coordinated action

The Mediterranean Basin is considered as one of the regions most affected by climate change, particularly by temperature increases, frequency and intensity of extreme weather phenomena and reduction of water precipitations (see 4th IPCC report, 2007).

However, consequences on ecosystems are already evident, such as displacement northwards and in altitude, species extinction, decline of forest stands, increased risk of forest fires, torrential erosion, damages caused by pest infestations, desertification... Despite their exceptionally high adaptation capacity, the forests are seriously threatened, leading to perturbations on associated economy and biodiversity.

Action is undoubtedly and urgently required to adapt to this inevitable changes. Indeed, the Mediterranean forest manager is somehow helpless and its attitude reveals nothing but a lack of tools to tackle the impacts of these changes. Three types of efforts should be made to meet this challenge:

- The transfer of new scientific knowledge to professionals in the field.
- Improving the system of observation and monitoring.
- Cooperation between stakeholders and between countries.

The overall objective is to improve the adaptive capacity of natural Mediterranean sites to the risks associated with climate change, particularly the risk of erosion, fire and decay, around four complementary approaches:

- Developing observation systems and monitoring changes in ecosystems.
- Developing an "adaptive forestry" to protect biodiversity while maintaining the economic value of populations (e.g. by promoting on mixed and irregular stands, local origin adapted species, etc.).
- Developing methods for ecological restoration and reforestation of degraded land by erosion, fire or dieback.
- Informing, raising awareness of society and improving governance.

FOR CLIMADAPT suggests an ambitious strategy for the widest spread of the benefits accruing from the project. The activities will be carried out within a framework of collaborative transnational reflection thanks to a Peer group, composed by representatives from partner's organizations along with external experts. This group has been created to capitalize the results obtained from the project's experimental activities. Having once ascertained the strengths and the weaknesses of the various activities, the Peer group will contribute to the design and application of innovative mutually-shared tools for the adaptation of Mediterranean woodlands to climate change. The results of the project, validated knowledge and competence will be widely disseminated using various media throughout the partner's regions and the MED Programme area (see "Expected results").

FOR CLIMADAPT total budget, as approved by the MED Programme, is EUR 1,725,750 for an operating period of 36 months (2010 - 2013). The 75% is financed by the ERDF (European Regional Development Funds). The residual 25% is generally funded by the partner organization's own resources (self-financed) or by other parts like local authorities or other structures (French Ministry of Agriculture and Environment, Italian Ministry of Economy, Greek Ministry of Economy. . .).

Coordination, evaluation and capitalization: a proved method

Project leader and coordination

The National Park of Vesuvius is the leader of the project. It coordinates the implementation of FOR CLIMADAPT. It means that it is responsible for the project's good execution at institutional, technical and financial levels.

A steering committee, directed by the leader, has been set up since the beginning of the project in order to take care of the respect of the commitments established with the European Union.

Capitalization and communication strategy

Capitalization is a strong element of our methodology. It is based on three elements:

- A field trip on the different pilot sites during the seminars, in order to debate and to learn together thanks to a direct confrontation with local stakeholders and field realities.
- The establishment of a group of experts (Peer group) composed by independent and competent persons responsible for the analysis of the pilot projects. It is conducted by the AIFM as an independent partner (out of local projects).
- A qualitative assessment by an independent auditor at mid-term of the project implementation.

These methodological tools should enable the project to extract good practices and to analyze the bad ones, suggest improvement solutions and identify elements that are transferable to other Mediterranean areas.

Finally, FOR CLIMADAPT also commits to the spread of the results and achievements beyond the project; like towards other cooperation projects or initiatives, international agencies and through the AIFM's Mediterranean network. For this, some communication means are dedicated to FOR CLIMADAPT (www.forclimadapt.eu, notebooks, newsletters, reports...) and are completed by means developed by each partner (posters, magazine, WebPages, press releases...).

A partner dedicated to technical animation : the International Association for Mediterranean Forest

The International Association for Mediterranean Forest (AIFM, see page 17), which played a central role in the emergence of

the project and in the coordination of the phase of preparation, handles the technical animation of FOR CLIMADAPT. It is a guarantor for the general methodology thanks to its experience in the other projects that she drove.

Besides the AIFM assures the animation and the Presidency of the Peer group, as well as the secretariat in terms of capitalization. It handles in particular the drafting and publication of the Progress books and the Final capitalization book. The AIFM facilitates the exchanges between partners, and makes the outside promotion of the project through its Mediterranean network of contacts and its communications tools. It elaborates diverse media such as the web site www.forclimadapt.eu and Newsletters. It also works to promote the information and the recommendations elaborated by the projects toward the international institutions (European Union in particular).

It also participates in the organization of certain events such as the Mediterranean forest Week (Antalya, Avignon, and the next one in Algeria, in March 2013) or the meetings of capitalization on the scale of the Programme MED (last one in November 2011 in Marseille). The AIFM also joins to initiatives on similar subjects while establishing links with other projects (RMT AFORCE, Collaboration Partnership on the Mediterranean Forests, FAO / SilvaMediterranea, COST ECHOES project).

Expected results

Pilot activities of the partners

The pilot experiments have to allow to identify the "good practices" related to:

- Observation and follow-up of changes in ecosystems.
- Development of an "adaptative silviculture".
- Development of methods of écological restauration of degraded lands.
- Information, awareness raising and governance in terms of climate change adaptation.

Overall, FOR CLIMADAPT tries to achieve cooperative sharing among the various Mediterranean-based initiatives that focus on the forests and natural areas management and thus foster their mutualisation in order to speak to European and international organizations with one specifically identificable “shared Mediterranean voice”. Through the representation and participation of different Mediterranean woodlands stakeholders, FOR CLIMADAPT aims at bringing out problematics and overall relevant solutions that need to be transmitted to decision-makers and policy-makers (“bottom-up” approach).

Deliverables

The partners will publish, in a cooperative way when it is possible, some guides and reports such as:

– Bibliographic research.

– Diagnosis and studies about processes of adaptation of the ecosystems to climate evolutions.

– Operational guidelines and technical recomendations.

– Local action plans.

– Modelization (for exemple, fire behavior model).

– Information and communication products.

– Training sessions and workshops.

– Plateforme of exchanges and networking data base .

– Written balances of pilot projects.

Elements of capitalisation

FOR CLIMADAPT will produce several documents and reports for managers of protected areas, people needing reference works and decision-makers who seek an integrated overview of their territories, additionally to the global communication tools that are mentioned below:

- Every exchange meeting and event related to the project will be written up in detailed reports available on the website www.forclimadapt.eu.

- 3 Progress books will be compiled after each two seminars in order to present the visited pilot territories and scheduled activities and, above all, to summarize the main elements of discussion during the seminars.

- A Final capitalization report will round out the project. It will synthesise the acquired benefits and gains accruing from the project and its pilot activities, and indicate how transferring good practices of forest management and governance of local and regional entities to other areas in the MED Programme area. This report will be largely based on the work carried out by the Peer group.

- At the project’s mid-term, the project leader will commission a quality assessment report to be made by an independent auditor. The goal will be to estimate the quality and relevance of the undertaken activities in the light of project initial objectives and, as a consequence, to suggest certain adaptation measures in order to improve the project implementation for the remaining period.

Communication tools

The main elements that will allow to communicate about progression of the project and to promote it are the following ones:

- Newsletters, published every semester.

- The web site www.forclimadapt.eu.

- Some visual documents of promotion of the project (flyers, brochures, posters...).

Experienced partnership

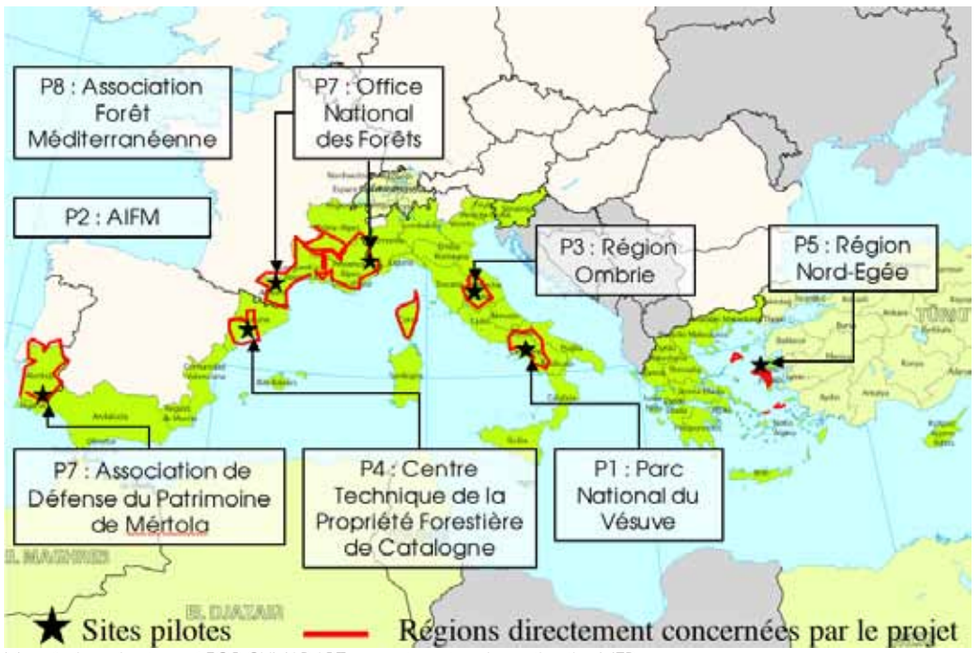
The partnership of the project is constituted of 8 organization from 5 different countries :

- National Park of Vesuvius (Italy), Project leadrer.
- Region of Umbria (Italy).
- Forest Sciences Centre of Catalonia (Spain).
- Mediterranean Direction of the French National Forests Office (France).
- North-Aegean Region (Greece).
- Association for the defense of the Heritage of Mértola, Region of Alentejo (Portugal).
- International Association for Mediterranean Forests.
- Association "Forêt Méditerranéenne" (France).

The partners' structures have an experience or are driving initiatives in connection with the problem of FOR CLIMADAPT project, within the framework of European cooperation programmes, or within the framework of specific actions.

They are recognized on their ground by the populations and by local stakeholders. There is a good complementarity between autonomous regions (Region Umbria and the North-Aegean Sea), national or regional forest administrations (CTFC, ONF), an organization in charge of a natural protected area (PNV) and associative actors (ADPM, AIFM, association "Forêt Méditerranéenne").

Additionally, at the level of their respective territories, each one is well coordinated with local key stakeholders.



Map 1: Localization of FOR CLIMADAPT project partnership within the MED area.

Presentation of the partners and their position in the project

This part consists of a short presentation of each partner of the project. You will find, in particular, information about the natural and bio-climatic context and the local problems, as well as information on the general frame (ownership status, local governance, existing initiatives in terms of adaptation to climate change…), in which take place the experimental activities.

Accurate data and some figures are grouped in tables "Territory Identity file" and "Pilot site identity file", will allow to compare situation and constitute a base for the elaboration of the modalities for the transfer of the experimented tools.

By analyzing the bio-climatic data of various partners, we established (below) a diagram according to the method of Emberger. It consists of positioning the various experimental sites with regard to each others, and comparatively with the reference sites (Madrid, Alger…) according to their degree of aridity. It allows, at a glance, to have a general view of the diversity of the considered sites, as well as to evaluate the relevance of the consideration of certain problems on a site or another. For example, it will not be question of valuation of timber wood in Mértola, who presents an almost desert climate, whereas partners such as the CTFC or the ONF (sub-wet climate) will be interested in this problem.

Otherwise, you will find, page 52, at the end of this document, a provisional cartography of the pilot sites.

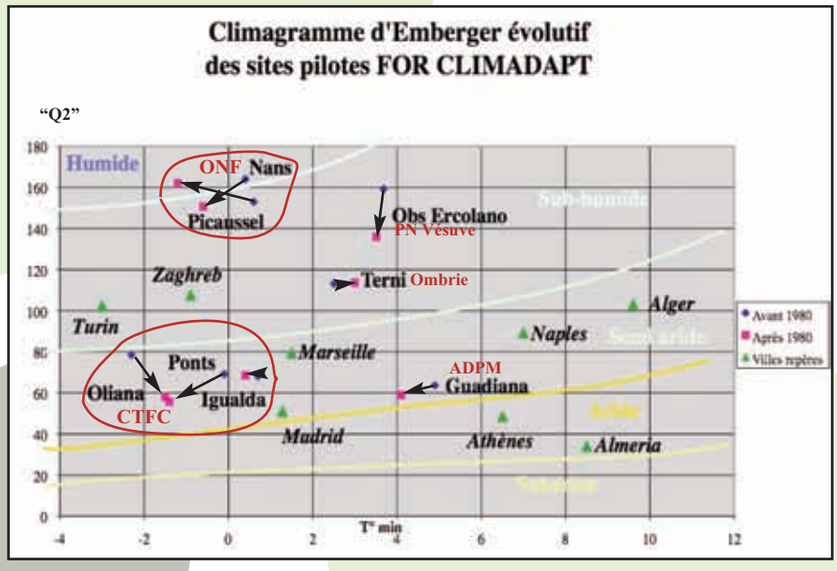


Figure 1: Emberger's climagram identifies, at a glance, the general bioclimatic context of an area in relation to others.

Abscissa, «T min» is the average minimum temperature of the coldest month (° Kelvin). Ordinate, «Q2» is an index based on annual rainfall and temperatures (including the differences between the warm season and cold season).

The combination of these two data sets the bioclimatic stage in which the site is viewed (arid, semiarid, subhumid, humid...) and allows easy comparison with other sites.

For more information, see Pierre QUEZEL's book: "Ecologie et biogéographie des forêts du bassin méditerranéens". Editions médicales et scientifiques Elsevier SAS. Paris, 2003. Plus de 500 p.

National Park of Vesuvius

Contact: Bruno DEL VITA

Web sites:
www.parks.it/parco.nazionale.vesuvio
www.vesuviopark.it/pnv/attivita/forclimadapt.asp

Partner's presentation

The Vesuvius National Park, lead partner of the project, was established in 1991 to safeguard the ecological and heritage of the territory, allowing seamless integration between man and the environment, promoting environmental education and research activities. The park covers 8 482 hectares in the Province of Napoli around the Mount Vesuvius, a typical volcano constituted of a truncated cone, still in activity. The area is rich in unique natural and historic elements, and has a quality agricultural production with great variety and originality of local flavor.

Initial state and justification of local needs

Climate change may induce a steady increase of the average temperatures, and an alteration of rainfall phenomena that result in decreasing light rainfalls, increasing heavy rainfalls, and intensified dry periods (tropicalization of the climate). These changes are accompanied by a variability of the soil's capacity to absorb rainwater, increasing alluvial phenomena and/or widespread phenomena of aridity and desertification.

These changes may also involve a change in biodiversity, particularly because the territory of Vesuvius has a volcanic lithology. Indeed, in previous centuries, many human interventions to combat erosion associated with volcanic eruptions have led to the introduction of exotic species.

The interventions against hydrogeological disasters, through eco-compatible techniques, and land development, oriented towards biodiversity conservation, can improve soil protection, while preserrving the natural evolution of the ecosystems.

TERRITORY IDENTITY FILE	
Region or province area	Région Campanie : 13 593,54 km² Province de Naples : 1 171 km²
Population	Région Campanie : 5 831 461 (429 / km²) Province de Naples : 3 068 604 (2620 / km²)
Global economic and social situation	PIB de la Région Campanie = 95 087 Millions d'euros (16 305€ par habitant)
Institutional structure	Parcs naturels = 350 083 ha Réserves biologiques = 38 279 ha Natura 2000 = 395 000 ha
Protected natural area	445 274 ha (32,7% de la surface régionale)
Forested area in the region/province	52%
National or regional organism for forest management	National
Global tendencies of the forest policy usually implemented in the region	Fort degré d'intervention, priorité donnée à la production et à la protection
Main potential climate change related impacts in the region	Érosion, désertification et aggravation des feux de forêt

Photo 1: Overview of the National Park of Vesuvius

PILOT SITE IDENTITY FILE	
Particular status and available regulation and planning tools	Parc National et Natura 2000
Pilot site area	8 482 ha (PNV)
Population	35 2180 habitants (42 / km²)
Main cities and municipalities	Napoli, Portici, Ercolano, Torre del greco, Boscoreale, San Giuseppe Vesuviano, Ottaviano, Somma Vesuviana, Sant'Anastasia, Pollena, San Sebastiano
Forested area in the pilot site	3 775 ha (44%)
Including private forests	
Organism locally responsible for forest management	Parc National du Vesuve, Région Campania
Main forest tree species Stand productivity	Forêts artificielles dominantes (*Pinus sp., Genista aetnensis, Robinia pseudacacia, Castanea sativa*) Peuplements purs et mixtes (*Quercus ilex, Q. pubescens*). Forêts naturelles à proximité du sommet (*Betula pendula, Alnus cordata, Populus tremula*)
Stand Productivity	1400 arbres / ha Volume extrait annuellement : 4 m³ / ha
Main role of the forest	Conservation et usages récréatifs Pas d'usage pastoral
Other land uses category on the pilot site (non forested area)	Agriculture
Annual precipitations	950 mm
Mean lower temperatures of the coldest month (°C.)	8.2°C
Mean higher temperatures of the warmest month (°C.)	26.5°C
Global geological conditions	Roches volcaniques : Vitric- Eutric Leptosols, Lepti- Vitric Andosols, Vitric Andosols-Calcari-Vitric Andosols, Calcari-Vitric Cambiosols, Molli Vitric Andosols, Tephric Regosols
Main natural risks threatening the pilot site	Feux de forêt, glissements de terrain

Programmed activities

Firstly, the Vesuvius Park tries to capitalize and to continue the work undertaken during the RECOFORME project (experimental plots and actions against invasive species were implemented), and PIT Vesevo (biological engineering interventions had been experimented).

In the framework of FOR CLIMADAPT project, priorities are:

- Carry out the data collection phase of the experimental results.

- Assess, critically, the protocol implemented by identifying any changes.

This requires the development of indicators. Indeed, the effects of forest management are difficult to assess in a short term. Therefore, the experimental measures need to be followed up in subsequent number of years in order to obtain reliable information.

A second phase will consist in:

- Determine how to move from the experimental phase to a large-scale management phase.

- Establish a projection of possible ecosystem changes taking into account the role of invasive species.

In parallel, following the experiments carried out under Interreg IIIB projects Desertnet and PIT Vesevo - S26, some natura-

listic engineering works selected by a team of experts will be implemented, as well as surveys aimed at identifying the parameters that contribute to a better management.

Deliverables

- Operational workbooks, synthesizing salient characters,

- Guidelines for adapting the choices in terms of town and country planning.

Region of Umbria

Contact : Francesco GROHMANN

Web sites : www.regione.umbria.it/
www.antincendi.regione.umbria.it/

Partner's presentation

In Italy, the regions have the exclusive competence in terms of forest. As a result, the administration of the Umbria Region exercises the functions of programming, orientation and implementation of EU regulations in this sector, particularly through the Regional Plan (AIB) for forest fires regulation.

In addition, the regional government develops activities related to the knowledge of the forests and is responsible for the promotion of research, experimentation and implementation of demonstration projects in forestry.

TERRITORY IDENTITY FILE	
Region or province area	8 456 km²
Population	906 486 hab (107,2 hab/km²)
Global economic and social situation	Taux de chômage : 6,8 % PIB / hab : 18 476
Institutional structure	Parcs naturels nationaux = 1 (17 790 ha) Parcs naturels régionaux= 7 (46 134 ha) Sites Natura 2000 = 103 (127 204 ha)
Protected natural area	371 574 ha (44 %)
Forested area in the region/province	73 %
National or regional organism for forest management	Région Ombrie, Service forêt et économie montagnarde
Global tendencies of the forest policy usually implemented in the region	Gestion active, application des critères de gestion forestière durable définis à l'échelle européenne
Main potential climate change related impacts in the region	Augmentation du nombre d'incendies, stress hydrique, dépérissement des peuplements.
Existing initiatives related with the project thematic	SECLI "*Siccità e Cambiamenti Climatici*" (http://secli.unipg.it/secli/frontend.jsp?script=intro_smb.jsp&id=56) (Sécheresse et changements climatiques) POR-FESR 2007/2013 - Axe II, Activité a1), action 4

Initial state and justification of local needs

In the Umbria Region, as well as in other Mediterranean regions, one of the most serious consequences of climate change is the increasing risk of forest fires. Indeed, the data show a significant correlation between the number of fires and increasing temperatures and droughts. Data provided by the Regional Plan AIB, show that in the period 1992-2006, the average forest area burned annually is approximately 370 hectares. The most sensitive forest formations, are the woods of *Quercus ilex* (Holm oak) and Mediterranean conifers.

Pilot site

The pilot area, covering an area of 13,000 ha, is located in the administrative area of the Mountain Community "Valle del Monte San Pancrazio e Nera" (municipalities of Terni, Ferentillo, Arrone and Polino). This is a chain of hills with limestone massifs in the southern area of the Umbria Region, along the lower valley of the river Nera. The territory is characterized by rugged terrain and extensive forest cover consists predominantly of coppice of *Quercus ilex* and *Pinus halepensis* stands.

PILOT SITE IDENTITY FILE	*Bassa Valnerina – Terni*
Particular status and available regulation and planning tools	Forêt Publique Plan de gestion forestière Site Natura 2000
Pilot site area	35 208 ha
Population	119 815 habitants, (340 hab/km²)
Main cities and municipalities	Terni, Arrone, Ferentillo, Montefranco, Polino
Forested area in the pilot site	18 979 ha (54%)
Including private forests	10 254 ha (54%)
Organism locally responsible for forest management	Communauté montagnarde «Valnerina»
Main forest tree species	*Quercus ilex, Pinus halepensis*
Stand productivity	Taillis matures : 156 m³/ha
Main role of the forest	Protection et production
Other land uses category on the pilot site (non forested area)	Zones agricoles 33%, zones urbanisées 8%, pâturages 4%, Fleuves et lacs 1%
Annual precipitations	963 mm
Mean lower temperatures of the coldest month (°C.)	3,0 °C
Mean higher temperatures of the warmest month (°C.)	32,1 °C
Global geological conditions	Massifs calcaires
Main natural risks threatening the pilot site	Incendies

Programmed activities

The main issue is the awareness and involvement of the population and local organizations in the defense of biodiversity and forest resources as a fundamental factor in the water cycle and wildfire prevention.

The Umbria Region conducts studies to raise awareness and actively involve the public and local agencies in the phases of systems development for the prevention of forest fires. The aim is to involve key stakeholders and implement actions to preserve forest heritage and biodiversity.

The project is structured around the following phases:

- Analysis of the territorial context (environmental, socioeconomic status...) in order to highlight the current (and potentially future) difficulties for fire prevention.

- Establishment of an initiation journey, to define a model of local organization focused towards the preven tion of wildfires in a changing context.

- Communication through leaflets, articles, website, seminars and other meetings.

- Evaluation and exchange of experiences with FOR CLIMADAPT partners.

French National Forests Office (ONF)

Contact : Jean LADIER

Web site : www.onf.fr

TERRITORY IDENTITY FILE	*Provence-Alpes-Côte d'Azur*	*Languedoc-Roussillon*
Region's/province's name	31 400 km²	27 400 km²
Region or province area	4,9 millions d'habitants (156/km²)	2,6 millions d'habitants (95/km²)
Population Global economic and social situation	PIB = 26000 € / habitant Chômage: 10,8% Budget régional 2010 : 1 800 M€	PIB = 22000 € / habitant Chômage: 12,5% Budget régional 2011 : 1 130 M€
Institutional structure	Etat central fort mais important travail de décentralisation durant les 2 dernières décennies.	
Protected natural area	-3 parcs nationaux: Port-Cros, Mercantour, Ecrins -5 parcs naturels régionaux: Camargue, Alpilles, Luberon, Verdon, Queyras -3 réserves de biosphère: Ventoux, Luberon, Camargue	-1 parc national: Cévennes -3 parcs naturels régionaux: Narbonaise, Pyrénées catalanes, Haut-Languedoc -1 réserve de biosphère: Cévennes
Forested area in the region/province	1 500 000 ha (48% de la surface régionale totale)	1 200 000 ha (44% de la surface régionale totale)
Including private forests	1 030 000 ha (68% de la surface forestière régionale)	910 000 ha (75% de la surface forestière régionale)
National or regional organism for forest management	-ONF pour la gestion des forêts publiques -CRPF pour l'appui à la gestion des forêts privées	
Global tendencies of the forest policy usually implemented in the region	-Défense contre l'incendie et autres aléas naturels (érosion, avalanches), -Préservation des écosystèmes... -Forêt = Composante essentielle de l'attrait touristique de ces deux régions. Les productions forestières (bois, liège...), qui étaient autrefois importantes, ne constituent aujourd'hui qu'un objectif secondaire.	
Main potential climate change related impacts in the region	-Sécheresses et dépérissements forestiers, principalement en moyenne montagne -Augmentation et extension des risques d'incendie	
Existing initiatives related with the project thematic	Institutions: Plan climat au niveau national (interministériel) et en Région (préfecture de Région Languedoc-Roussillon, Conseil régional PACA) Recherche: nombreux programmes et projets de recherche nationaux Gestion: adaptation des plans de gestion des forêts publique et privées	

Partner's presentation

Public institution created in 1966, the ONF main objective is to manage state forests and other public forests following the Forest Regime, and the achievement of public interest tasks entrusted by the French State. The ONF is also developing various services (management, expertise, forest works...) to the benefit of all kind of clients in the areas of natural areas management, environment, forestry wood and territorial development.

Concisely, some figures:

- Public forests correspond to 27% of the French forest in the metropolis, of which 1.8 million hectares (Mha) of state forests and 2.6 millions hectares of municipal forests.

- The ONF employs approximately 6 800 employees and nearly 3 200 forest workers.

- The ONF annually mobilizes more than 14,5 millions cubic meters of wood.

- 4,5 Mha are PEFC-certified, concerning 100% of the state forests and more than 50% of municipal forests.

The ONF is organized into nine regional branches and five regional offices. Extending from Spain to Italy, from seaside to summits of the Southern Alps (Languedoc-Roussillon and Provence-Alpes-Côte d'Azur regions), the Mediterranean office of the ONF is the regional office firstly involved in the FOR CLIMADAPT project.

The ONF intervenes in the field by integrating risk prevention (fire, erosion, pests damages...) in the forest management documents, by establishing and maintaining protective specific equipment for the defense of forests against fire and the Restoration of Mountain Lands (RTM program).

In the project, the ONF wants to improve its experimental activities in terms of adaptive sylviculture to climate change effects, including the replacement of decaying Silver fir stands by the Atlas Cedar.

Initial state and justification of local needs

The "warm" Silver fir stands, located in south-facing slope or at low altitude show, for over 30 years, signs of diebacks more or less diffuse with an alarming extent following the 2003 heat wave and drought which lasted until 2007.

Local conditions (dry climate, exposure...) drive to certain questions that cannot be resolved by considering only large Alpine and humid fir forest models:

- The homogeneity of the stands prevents managers from undertaking diversification using local species.

- The Atlas cedar has been introduced mainly in the supra-Mediterranean level and it is too early to have a feedback in terms of constraints of explotation, environmental impact and wood production.

Beyond these technical and economic constraints, it is not certain that a low density ensures a greater leaf area index, because water consumption by concurrent or accompanying vegetation can compensate effects of the reduction of the stand density.

Programmed activities

Facing diebacks, the ONF Mediterranean office works on the introduction of species, tests new silvicultural techniques, and develop a technical guide for adaptive forestry to cope with climate change effects.

The main fiels actions are spread on 3 different pilot sites as follows:

- Nans: Implementation of effective management methods aimed at reducing competition between trees for water resources, and studies on the behavior of the Atlas cedar as a potential specie for Silver fir dying back stands substitution.

- Callong: Comparative plantation of Atlas cedar from different procedings in order to replace a Silver fir stand.

- Picaussel: Testing effectiveness of a low density forestry in a mature pine forest.

The recommended silviculture for the Cedar forest on the site of Nans aims to promote the growth and the quality of the trees by reducing stand density (two plots with respectively 600 and 300 trees per hectare and one control plot with a density of 1200 trees / ha).

A monitoring system (health and growth) of a sample of 40 trees and the total production of the stand will be set up on each of the pilot sites.

Deliverables

- State of the art about adaptive forestry in France.

- Reports of initial measures (2011 and Nans Picaussel, winter 2012/2013 for Callong).

- Reports after 2 years in Nans and Picaussel (Winter 2012/2013).

PILOT SITE IDENTITY FILE	*Forêt de Nans*	*Domaine de Picaussel-Callong*
Particular status and available regulation and planning tools	Forêt Domaniale de Nans, acquise au titre de la RTM	Forêt Domaniale de Comfroide-Picaussel et Forêt Domaniale de Callong-Mirailles
Pilot site area	445 ha (Site pilote : 1,8 ha)	Picaussel : 657 ha (site pilote : 5 ha) Callong: 336 ha (site pilote : 2 ha)
Population	(sans objet)	
Main cities and municipalities	Saint-Vallier de Thiey (3 000 habitants) Grasse (50 000 habitants)	Esperel (200 habitants), Belvis (200 habitants) Quillan (3 500 habitants)
Forested area in the pilot site	244 ha (55%)	100%
Including private forests	0%	0%
Organism locally responsible for forest management	ONF, agence Alpes-Maritimes, unité territoriale des Préalpes d'Azur	ONF, agence Aude-Pyrénées-Orientales, unité territoriale du plateau de Sault
Main forest tree species	Pin sylvestre (32%) et Chêne pubescent (24%) Essence étudiée: Cèdre de l'Atlas (14%)	Pin sylvestre (32%) et Chêne pubescent (24%) Essence étudiée: Cèdre de l'Atlas (14%)
Stand productivity	Environ 1000 arbres/ha	Environ 500 arbres/ha
	Environ 3 m^3/ha.an	Environ 5 m^3/ha.an
Main role of the forest	Production ligneuse, accueil du public	Production ligneuse, accueil du public
	Pas d'activité pastorale	Pas d'activité pastorale
Other land uses category on the pilot site (non forested area)	Garrigue et rocher	(sans objet)
Annual amount of precipitations (millimetres)	1230 mm (St-Vallier de Thiey)	950 mm (Belcaire)
Mean lower temperatures of the coldest month (°C.)	-0,2 °C	2,4 °C
Mean higher temperatures of the warmest month (°C.)	26,6 °C	17,5 °C
Global geological conditions	Altitude : 1000 à 1050 m, Exposition sud Pente : 45%	Callong : altitude 1000 m., plateau Picaussel : altitude : 850 m., fond de vallon plat et pente moyenne
	Faciès géologique: calcaire compact Matériau parental: grèze Type de sol: calcosol graveleux d'épaisseur moyenne, issus de grèze	Faciès géologique: calcaire compact Matériau parental: altérite de calcaire et colluvion
Main natural risks threatening the pilot site	Sécheresse, incendie	Sécheresse

Photo 2: A forest manager of the ONF presents the problem of stands die-backs in the French department of Alpes-Maritimes.

Photo 3: Silver fir stands threaten of dieback process in the department of Alpes Maritimes (France).

North-Aegean Region

Contact : Stratos VOUGIOUKAS

Web site : www.northaegean.gr

Partner's presentation

The North-Aegean Region is composed of several islands. Each one has unique and distinct natural features. In addition, socio-economic activities of the population of the island differently affect the natural landscape.

These distinctions lead to a variety of climate change consequences that each island will have to face. For example, the island of Lesbos is under constant threat of large forest fires, while the islands of Lemnos and Ikaria undergo intensive grazing of thousands of livestock (sheep and goats in particular) highly destructive to the few remaining forest areas and preventing natural stands regeneration.

Initial state and justification of local needs

Since the experiment on reforestation applied to burned areas of the island of Lesbos, it is now clear that only artificial reforestation methods can be applied *in situ* to restore the area, while natural regeneration has not been successful due to problems of increased erosion and lack of post-fire reforestation programs in large scale (Map 3).

Frequent and severe fires caused over the past three decades a serious deterioration in the sector. The main tree species are Pinus brutia, Quercus infectoria and Arbutus andrachne. It is a mountainous and rough area with threathening erosion in areas affected by wildfire. Besides, the industry is under constant pressure from urban expansion, agricultural activities, illegal grazing and hunting.

Map 2: General View of the Lesbos Island and location of the studied area of the Amali peninsula (circle).

Climate change affects the fire regime in several ways:

- More intense forest fires (intensity, flame height, velocity, probability of transmission to the canopy ...), especially in natural ecosystems and in abandoned or poorly maintained areas.

- An increased risk of fire starts in areas where there is a lack of stability in terms of vegetation, poor seed bank and invasive species proliferation.

- Land degradation and erosion can cause a process of desertification.

- Changes in microclimates.

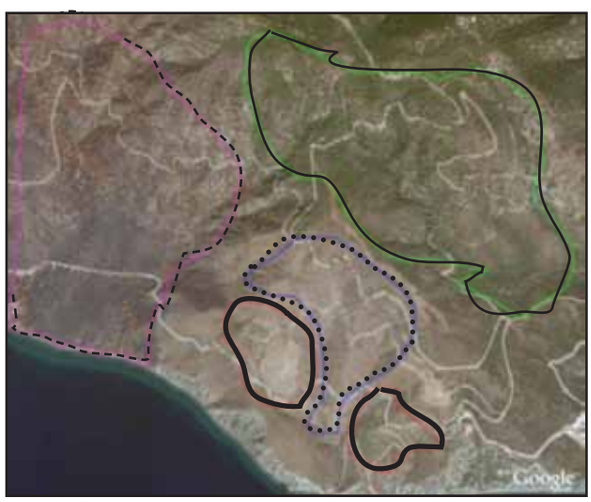
Programmed activities

North-Aegean Region considers several ways to prevent desertification processes on the island of Lesbos. The aim is to reverse the advanced desertification process.

The actions envisaged to rehabilitate ecosystems are:

- *Management of vegetation*

It examines how the forest fuels can be processed to reduce the threat of forest fires through effective action based on the use of prescribed burning and mechanical or manual techniques to limit the accumulation of fuel (brush, dead wood ...) and other management measures on natural resources and the interfaces between the rural and urban areas.



Map 3: Burned areas in the Amali peninsula on the Island of Lesbos. In the south (points polygon), we can notice that, after a decade, natural regeneration is absent, while the bold full-line polygo, there is a significant recovery after treatment. In dotted-liines polygon, a recently burned area (2006) regenaration is marked, while in narrow full-line polygons, forests naturally regenerated or not burned are also marked.

- *Development of automated systems*

It will include the installation of an automatic meteorological station that will allow to collect remotely and in real time from a central system, sensor data on various parameters such as temperature, relative humidity, wind speed and direction, soil moisture and fuels, rainfall, solar radiation, etc.

- *Modeling of wildfire behavior*

Our research team tries to create models that simulate fire behavior using prediction systems FARSITE (Finney 1998) and BehavePlus (Andrew and al. 2003). By locating origin of wildfires and inserting into the program data from the surrounding context (vegetation, wind speeds, fuel types, topography) and other data (road network, water installations, urban areas...), maps will be produced, plotting the rate of spread and potential intensity of fire in time and space. The possibility is thus given to users (firemen, rescue teams, authorities, etc.) to better plan their operations.

Association for the Defense of the Heritage of Mértola (ADPM)

Contact : Paulo SILVA

Web site : www.adpm.pt/adpm.html

Partner's presentation

Since its establishment in 1980, the Association for the Defense of the Heritage of Mertola (ADPM) has developed a strategic action based on the relationship between nature conservation and socio-economic development.

Priority action is ranging from sustainable local economy to the restoration of degraded lands and fight against desertification through public awareness and environmental education.

To deal with local issues, it was necessary to form an interdisciplinary team of technicians able to work together in a cross-cutting project for Mértola, in which the participation of local stakeholders was a key factor.

The ADPM is notably responsible for the establishment of the Vale do Guadiana Natural Park, contributing to its administration. It has also initiated various projects such as FAJA III on rivers ecological restoration, and implemented various training programs, in particularl a Master "Regional Economics and Local Development", in partnership with the University of the Algarve, the Polytechnic Institute of Beja and the Archaeology centre of Mértola.

TERRITORY IDENTITY FILE	
Region's/province's name	Baixo Alentejo
Region or province area	8505 km²
Population	125 066 hab (15/km²)
Global economic and social situation	PIB/hab = 8900€ Unemployment rate = 11,5%
Institutional structure	Regional Departments that have some decison capacity.
Protected natural area	-Natural Park of Guadiana Valley (69.773ha), -SIC of Mourão Barrancos (PTCON0053) (43.309ha), -SIC of Guadiana (PTCON0036) (38.463ha), -ZPE of Castro Verde (PTZPE0046) (85.344ha), -ZPE of Guadiana (PTZPE0047) (76.546ha)
Forested area in the region/province	427 524 ha (50%)
Including private forests	363 395 ha (85%)
National or regional organism for forest management	Ministério da Agricultura, Mar, Ambiente e Ordenamento do Território - Direcção-General da Conservação da Natureza e Florestas
Global tendencies of the forest policy usually implemented in the region	Low intervention degree. Priority given to protection and tourism.
Main potential climate change related impacts in the region	Die-back of *Quercus ilex* and *Suber*, increase wildfires, increase of erosion and desertification problems

Initial state and justification of local needs

The Region of Alentejo is severely affected by climate change, which, combined with increasing human pressure (including silvopastoral activites) and mismanagement of the ecosystems, is seriously exacerbating the desertification risk (increased aridity, lack of regeneration in *montados*, erosion and soil leaching...).

Pilot site

In 1993, ADPM has acquired a property of 200 ha with the aim of establishing a demonstrative experiment of good management practices that could be adapted by other owners and managers in their own fields. The aim is to combine agriculture, forestry and nature conservation in a sustainable development

approach. Various ecological slopes restoration project (reforestation, firebreaks...) and actions preventing erosion in rivers were conducted.

The pilot site is located inside of the Natural Park of Vale de Guadiana, in an ADPM property called Monte do Vento. It is located in the North of Mertola municipality, near Pulo do Lobo. It is more or less plan, with low altitude.

PILOT SITE IDENTITY FILE	*Natural Park of Vale de Guadiana*
Particular status and available regulation and planning tools	Natural Park, Natura 2000, Baixo Alentejo Forest Plan
Pilot site area	69 773 ha
Population	7500 (11/km²)
Main cities and municipalities	Mértola.
Forested area in the pilot site	13954ha (20%)
Including private forests	13500ha
Organism locally responsible for forest management	Ministério da Agricultura, Mar, Ambiente e Ordenamento do Território - Direcção-Geral da Conservação da Natureza e Florestas
Main forest tree species	*Quercus ilex, Quercus suber, Olea europea, Fraxinus angustifolia, Populus alba, Salix sp. Eucalyptus globulus*
Stand productivity	New projects (600 trees/há), *Montado* (90 trees/há)
	Main production is cork (2Ton/ha) and acorns for cattle (20 sheeps/ ha) or (3 cows/ha), firewood and charcoal
Main role of the forest	Protection, grazing, Tourism
	Grazing activities
Other land uses category on the pilot site (non forested area)	Agriculture, livestock, tourism, grazing
Annual amount of precipitations (millimetres)	450
Mean lower temperatures of the coldest month (°C.)	4,7
Mean higher temperatures of the warmest month (°C.)	33,8
Global geological conditions	Acid very thin schist soils with a very low productivity
Main natural risks threatening the pilot site	Drought, wildfire, desertification and high risk of erosion

Programmed activities

Action 1: Diagnosis

- Diagnosis and observation of the territory of Vale do Guadiana Natural Park in order to evaluate natural resources management (water, soils, vegetation management, agricultures practices...). This diagnosis will rely on field trips, studies, cartography and contact with local community.

- Monitoring of fauna and flora in Monte do Vento (birds, mammals and insects) and comparison with existing information before the forestry project.

- Survey on the perception of the impact of climate change and its relation to the management of natural resources in the territory of Vale do Guadiana Natural Park, focus on farmers and the local community.

Action 2 : Adaptive Silviculture

- Evaluation of techniques and species used in reforestation projects developed in the Natural Park of Vale do Guadiana, particularly in Monte do Vento, and comparison with a conventional forestry project. The following techniques will be monitored: mycorrhizal on cork and holm oaks, facilitation, intercropping between tree and shrub species, trench techniques and mound planting.

Action 3 : Ecological restoration and reforestation of damaged areas

- Lessons of ecological restoration techniques with international trainers.

- Monitoring of an ecological restoration project focused on control and reduction of torrential erosion rates.

- Projects of reforestation with firebreaks and inserted cultures carried on by the ADPM in the sylvopastoral ecosystem of Montado in the South of Portugal.

Action 4: Awareness, training and governance for social adaptation to climate change

- Realization of two Workshops to make populations aware of the restoration projects applied in Monte do Vento, and allow reflections on their success and impact.

- Realization of two workshops focused on agriculture activity and climate change scenarios in order to assess the best agriculture practices for sustainable development.

- Awareness raising campaign about the impact of climate change.

Deliverables

- Leaflets (1000 exemplary).
- Climate change game.
- Book (500 exemplary).
- Restoration workshop.

Photo 4: Projects of reforestation with firebreaks and inserted cultures carried on by the ADPM in the sylvopastoral ecosystem of Montado in the South of Portugal.

Forest Sciences Centre of Catalonia (CTFC)

Contact : Denis BOGLIO

Web site : www.ctfc.cat

Partner's presentation

The CTFC's main action is to contribute to the modernization and competitiveness of the forestry sector, rural development and sustainable management of natural environment, resource development, education, technology and knowledge transfer to society.

In the current context of global change, the activity is focused towards solving environmental problems of ecosystem management and interactions between natural resources and society, and improving the wealth and well-being while preserving sustainability of the natural environment. Results of operations are for the benefit of the whole society.

The content of the activities of the CTFC is based on the three following lines of work:

- Functionning of agroforestry ecosystems.
- Multi-function management of natural environment.
- Governance and socio-economy of rural areas.

FICHE D'IDENTITE DU TERRITOIRE	*Lleida / Alt Urgell (Pré-Pyrénées)*
Region's/province's name	12,150 km² (Lleida) 1,447 km² (Alt Urgell)
Region or province area	439,253 habitants (Lleida) 20,936 habitants (Alt Urgell)
Population	Taux de chômage (Lleida) : 12,8% PIB / habitant (Alt Urgell) : 21 150 €
Global economic and social situation	Etat fédéral. Forte autonomie des Communauté autonome, renforcée, dans le cas de la Catalogne
Institutional structure	Natura 2000: ES0000018 (Prepirineu Central català) ES5130010 (Serra de Boumort- Collegats) ES5130026 (Serra de Prada-Castellàs)
Protected natural area	Alt Urgell: 125,438 ha (86.7 %)
Forested area in the region/province	Alt Urgell: 80,651 ha (64.3 %)
National or regional organism for forest management	Ministère Catalan de l'Agriculture, de l'élevage, de la pêche, de l'alimentation, et de l'environnement ; CTFC
Global tendencies of the forest policy usually implemented in the region	Le degré d'intervention est relativement faible par rapport au potentiel élevé dans la Région
Main potential climate change related impacts in the region	Migration en altitude des espèces, stress hydrique, dépérissement des peuplements, augmentation de la magnitude et de la fréquence des perturbations (incendies, tempêtes, ravageurs, etc.)
Existing initiatives related with the project thematic	Quelques projets de recherche développés par les institutions (notamment le CTFC et le Centre de recherche en écologie et applications forestières)

Initial state and justification of local needs

As increased disturbances are expected in forests in the context of climate change, at least in Mediterranean forests, the managers must develop a forestry improving the resilience and adaptive capacity of forests.

At the regional level, the mountain and Mediterranean influences condition the formation of diverse forest ecosystems. However, some forests (conifers stands for example) have a very low diversity in terms of species and characteristics that make them particularly sensitive to disturbance such as fires, storms, or dieback, more than ever in the current climate change context.

In addition, climate change could alter the range of species, causing large migrations following the altitudinal and latitudinal gradients. However the ability of species to migrate would probably not be fast enough to cope with climate change.

Pilot site

The pilot sites are established in the heart of the Catalan Pre-Pyrenees, characterized by climate variability of mountain areas combined with a strong Mediterranean influence. Subhumid Mediterranean climate is dominant and the soils are mainly limestone.

The pilot site consists of three north-facing slopes with an altitudes from 1 000 to 1 600 meters (see cadre page 17).

Programmed activities

The actions planned by the CTFC in the project are the following ones:

- Action 1: Analysis of the subject and the experimental context (collect and analysis of existing information on the subject, research on plant material...).

- Action 2: Search for pilot sites in concertation with forest owners.

- Action 3: Application of the treatments (seeding/planting and establishment of protection barriers).

- Action 4: Monitoring and Evaluation of germination, survival and growth of plants.

- Action 5: Spreading of initial results and education (organizing field visits for researchers, technicians, students and the local population).

One of the concrete measures envisaged is the introduction of "pocket of dispersion" in low diversity forests. This involves the establishment of some plots for seedling or planting species with different features and enhancing their natural diffusion in the forest, in order to improve the resistance of forests and their capacities of adaptation on a long term.

In each plot, six different species are planted, with two distinct sources for four of them. That means a total of ten different cases. To avoid damage from herbivores, protective barriers are installed around each plot. The objective is to obtain valuable information about the adaptive capacity of the main hardwood forests species accompanying sub-Mediterranean Pine stands, studying the behavior of different species and provenances.

Besides, forest management will be used to accelerate the migration of forest species and to help forest ecosystems responding to the effects of rapid changes, by planting or sowing a range of species adapted to new climatic conditions, proceeding from southern areas or from lower altitude stands.

PILOT SITE IDENTITY FILE	*Site 1: Bosc de Fontanella (Forêt de Fontanella)*	*Site 2 : Muntanya d'Alinyà (Forêt de Alinyà)*	*Site 3 : Bosc de Senyús (Forêt de Senyús)*
Particular status and available regulation and planning tools	Forêt Publique ; Plan forestier ; Sites Natura 2000		
Pilot site area	670 ha (0,5 occupés par notre expérience)	0.5 ha	0.5 ha
Population	0	0	0
Main cities and municipalities	Organya et Figols i Alinyà (plus proches villages)	Alinyà (plus proche village)	Cabó (plus proche village)
Forested area in the pilot site	100%	100%	100%
Including private forests	0%	100%	100%
Organism locally responsible for forest management	Ministère catalan de l'Agriculture, de l'élevage, de la pêche, de l'alimentation, et de l'environnement	Privé	Privé (gestion par le Centre de la propriété forestière)
Main forest tree species	*Pinus nigra* (de 800 à 1200 m) et *Pinus sylvestris* (de 1200 à 1600 m)		
Stand productivity	600/ha	500/ha	750/ha
Main role of the forest	Protection	Protection	Protection
Other land uses category on the pilot site (non forested area)	-	Elevage, agriculture, tourisme, éducation, conservation, etc.	Elevage, agriculture
Annual precipitations	920 mm	900 mm	850 mm
Mean lower temperatures of the coldest month (°C.)	-4°C	-3,5°C	-3°C
Mean higher temperatures of the warmest month (°C.)	23°C	24°C	25°C
Global geological conditions	Calcaire, décarbonaté dans certains cas. Sols profonds dans les secteurs peu inclinés, sol calcaires peu profonds dominants dans les secteurs plus en pente		
Main natural risks threatening the pilot site	Incendies, sécheresse, ravageurs et maladies		

Internationale Association for Mediterranean Forests (AIFM)

Contact : Rémi VEYRAND

Web site : www.aifm.org

ASSOCIATION INTERNATIONALE FORETS MEDITERRANEENNES

Partner's presentation

Every issues related to Mediterranean forests interest and/or concerns, more or less directly, many different social and professional groups. Therefore, to address this diversity of stakeholders and sensitivities associated to the Mediterranean forest, the International Association for Mediterranean Forests (AIFM), founded in 1996, has the mission of facilitating the exchange of knowledge, experiences or ideas about this theme, in a cross-disciplinary way between all persons concerned by Mediterranean forests.

The AIFM has developed a network of organizations and individuals made up of approximately 3 000 international contacts including experts with varied skills (foresters, environmentalists, scientists, decision-makers, civil security…) and multiple stakeholders. Among other network driging activities, it publishes a quarterly newsletter ("Latest on Mediterranean Forests") in French and in English, moderates a website (www.aifm.org), participates in, and organizes, events related to Mediterranean forests.

In addition to the FOR CLIMADAPT project, AIFM has initiated and led several cooperation projects through community programs:

- 1999-2001: "Problem of the Mediterranean forest" (Interreg II Programme).

- 2003-2006: RECOFORME "Structuring of networks and cooperation activities of the Mediterranean forest" (Interreg III Programme).

- 2009-2012: MED QUALIGOUV "Improving governance and quality of the forest management in Mediterranean protected areas " (MED Programme).

- 2011-2014: PROFORBIOMED "Promotion of residual forestry biomass in the Mediterranean Basin" (MED Programme).

In addition, in collaboration with FAO, through its Committee Silva Mediterranea, and in connection with a group of institutions meeting within the Collaborative Partnership on Mediterranean Forests (EFIMED, Plan Bleu, GIZ, AFD…), AIFM enhanced cooperation activities, in this field, with MENA countries (Turkey, Syria, Lebanon, Tunisia, Algeria, Morocco) and participates to, or organizes, events such as the Mediterranean Forest Week, whose third edition, expected in Algeria in March 2013, should focus on the theme of desertification.

Role of the AIFM in the FOR CLIMADAPT project

The AIFM had a major role in the emergence of the project and played an active coordinating role during the preparation phase.

AIFM is responsible for leading technical exchanges and disseminating the main achievements resulting from these actions (capitalization). Throughout the implementation of the project, it is responsible for the work of technic animation. As such, in collaboration with the Lead partner and under the control of the steering committee, it guarantees the general methodology of the project (developed during the projects she has led such as RECOFORME and QUALIGOUV).

In addition, the AIFM provides the entertainment and the Presidency of the peer group and the secretariat in terms of capitalization. It is in charge of drafting the Progress books and the Final report of the project. The AIFM facilitates exchanges between partners and promotes the project through its Mediterranean network of contacts and communication tools. For this, it carries on various media such as the website www.forclimadapt.eu and Newsletters. It also works to transmit the information and recommendations to the major institutions (European Union in particular).

AIFM also participates in events such as the Mediterranean Forest Week (Antalya, Avignon...) or MED Programme events (latest one: capitalisation meeting in Marseille, November 2011).

AIFM is also involved in external events to establish a link with similar initiatives (RMT AFORCE, EFIMED, FAO/SilvaMediterranea, projet COST ECHOES. . .). Finally, it seeks to involve stakeholders in order to promote exchanges of ideas throughout the project.

Association "Forêt Mediterranéenne"

Contact : Denise AFXANTIDIS

Web site :

www.foret-mediterraneenne.org

Partner's presentation

Forêt Méditerranéenne is a French association (1901 law), created in 1978. It is a place of exchange and meeting for all people interested in the forest and natural areas of French Mediterranean regions.

Today, Forêt Méditerranéenne has a network of nearly 4 200 individuals and partner organizations, nearly 330 members and 450 subscribers to its magazine "Forêt Méditerranéenne".

Its network consists of institutional stakeholders, socio-professionals, associations... of the Mediterranean forest management and protection sectors.

Role of the association "Forêt Méditerranéenne" in the FOR CLIMADAPT project

The main contributions of the Association Forêt Méditerranéenne to the project are:

- To organize an international conference as a shared initial state of knowledge in the begining of the project,

- To provide a platform for knowledge exchange validated in French Mediterranean region (institutions, communities, organizations research, associations ...) and initiate this process in other countries associative partners (the writing of a methodological guide is provided for this purpose).

Photo 5: Scientist symposium in Marseille during the first seminar.

Project progress and partial results

*Please **note** that, in the following sections, we will frequentenly refer to a different seminar report or other capitalisation documents. All these documents can be download from the project website: www.forclimadapt.eu, under "Publications".*

Project of the Vesuvius National Park

"Forests are an invaluable asset for humanity. Major episodes of deforestation took place in Italy until the twentieth century, resulting in an increase in natural disasters, diseases, etc. Climate change threatens to exacerbate an already precarious situation. The FOR CLIMADAPT partnership can help make tools available to technicians and local officials as well as distributing them and teaching people to use them throughout the Mediterranean basin" (Ugo Leone, President of the Park).

About the project creation

Following the RECOFORME[1] project, the Vesuvius National Park considered as essential to continue the consideration and to specifically focus on adaptation to climate change. This is why they have taken the role of leader in this initiative.

In an ever-expanding Europe, it is a real challenge to maintain a common policy on thorny issues such as this one. Each partner pursues specific interests within their own experiences. However, capitalization allows sharing of tools and methods, resulting in a specific benefit: a common discourse between Mediterranean forest stakeholders on issues of adaptation to climate change.

This is not always easy. Firstly, it is difficult to appreciate tangible results in just three years (maximum duration of MED projects) for forests, which are high inertia ecosystems. In addition, certain difficulties had to be dealt with, including the loss and replacement of a partner for budgetary reasons. The Greek and Portuguese partners are also currently in a difficult situation however, we hope that these difficulties will not undermine the dynamics of cooperation that have been established and strengthened during this seminar on Vesuvius.

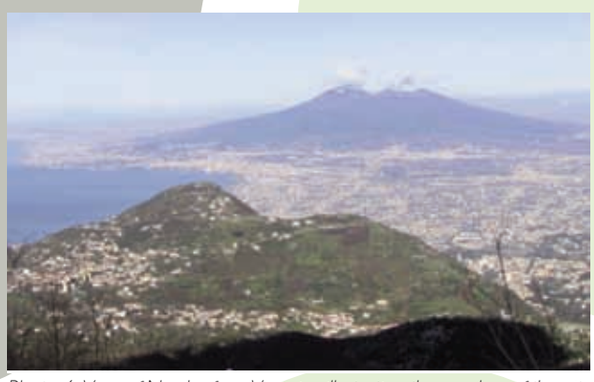


Photo 6: View of Naples from Vesuvius, illustrating the overlap of the city and the natural environment.

Overview of the site and key institutions

General context

Vesuvius is the smallest national park in Italy[2]. The altitude ranges between 250 and 1281 m above sea level (top of the cone). The proximity with the city of Naples causes significant anthropogenic pressure (50,000 inhabitants within the perimeter of the Park). The Park is now a "natural island" in the middle of a dense suburban tissue.

Moreover, Vesuvius has an international reputation. Nearly 600,000 people visit the volcano cone each year.

Although the last eruption was in 1944, the volcano is still active. The elevated seismic and volcanic risks further complicate land management.

On the lava flows of 1944, the development of lichens has been observed (specifically *Stereocaulon vesuvianum*, endemic species of Vesuvius) along with herbaceous species that are giving way to tree species, including pine. On the south facing slope, in particular, there are large pines dating from the late nineteenth century (*Pinus nigra, Pinus halepensis, Pinus pinea* etc.). There is also a large percentage of oaks, which are in progression (vigorous regeneration) but rarely dominant.

Significant stands are of anthropogenic origins. This is particularly the case of stands of Stone pine, or other exotic species such as the Black locust tree or *Genistae* (*Genista aetnensis* in particular) dating from the 1950s, which quickly spread through the Park. The State Forestry Corps was required to monitor and even contain the spread of these species.

Local governance and protection measures

Thirteen municipalities and other institutions (Region, Province, river basin authorities etc.) participate and interact in the management of this territory.

The Park strives to establish a dialogue with all the actors of the territory, to move towards a system based on "co-planning." The FOR CLIMADAPT project contributes to this objective.

Nearly half of the territory of Vesuvius is subject to at least one protection measure. The National Park and the Man and Biosphere Reserve "*Somma-Vesuvio e Miglio d'Oro*" are the main tools for the preservation of local natural and human heritage.

The isolation of the area by the Apennines is the reason for the very typical environments. Many of the plant species (18 endemic species) and fauna are protected by European directives (Lepidoptera, chiroptera, etc.). Two sites important for the community and one special protection area (Natura 2000 network) partially cover the site. Numerous studies and population monitoring operations are regularly conducted by the Park.

In terms of forest protection, the Forest Reserve "*Tirone Alto Vesuvio*" is managed exclusively by the State Forestry Corps (*Corpo Forestale dello Stato*). Different regulations apply to economic, agriculture and tourism activities within the boundaries. Access to the Reserve and the summit is subject to the approval of the Park and visitors must be accompanied by an agent.

Méthode de planification territoriale

The common goal is to "establish a natural balance by safeguarding biodiversity and cultural values, and to promote sustainable development."

Various projects and regulatory tools are used to implement this objective in the field (the Park plan, the multi-year economic and social plan, projects co-financed by the structural funds etc).

The Park consists of a wilderness area, an oriented general reserve, a protected area as well as an economic and social advancement area.

The organization in concentric circles starting from the summit crater aims to gradually recover a dynamic ecological balance and to limit fragmentation phenomena affecting the environment, while intervening as little as possible.

Important awareness raising, training and environmental education activities are also conducted on site, in partnership with schools across the region, training centres, environment professionals, and for the general public. Cultural activities, sports and promotion of local products are also organized.

Tourism is important and the Park is attempting to help the area to receive benefits in collaboration with the State Forest Service.

Intervention of the Corpo Forestale dello Stato

The activities of the State Forest Corps are extensive, both geographically and in terms of missions.

In 2004, following a reform, the Territorial Office of biodiversity was created. It aims to safeguard biodiversity, and maintain the State Natural Reserves (Natura 2000 areas, biogenetic reserves, *Man and Biosphere* Reserves, important community wetlands etc.), as well as study, research and disseminate environmental knowledge. It manages 500,000 hectares of national forest.

The State has created a network of protected areas, helping to highlight the important natural habitats of interest and contributing to the promotion and popularization of environmental protection.

The "*Tirone - Alto Vesuvio*" reserve, created by Ministerial Decree 29.3.1972 in 1995 is contained in the Vesuvius National Park. It covers an area of about 1019 ha. The Province of Caserta Office of biodiversity establishes systems to maintain the natural environment and prevent natural hazards. For example, 168 km of trail borders were equipped with anti-erosion systems.

The relationship between the Park and the forest corps are excellent and help create many opportunities for cooperation.

Photo 7: Examples of actions by the Province of Caserta Territorial Office of biodiversity in the "Tirone Alto Vesuvio" reserve.

The Vesuvius National Park "Integrated Project"

Since 1997, a major campaign against erosion, for trail maintenance and preservation of water basins is in operation and uses various environmental and naturalistic engineering techniques (see "The minor works…", above). These techniques include the use of native plant species and facilities built from local woods. However, the team consists of only 15 people for a complex and diverse challenge. The priority is experimentation. When the results are interesting, the techniques are transferred to field managers.

Various initiatives have been carried out around the site such as projects like the PI Vesevo, Life III "*Self-financing protected areas*", Desertnet, and RECOFORME R (see Full report of the seminar on the website www.forclimadapt.eu, "Publications" section).

FOR CLIMADAPT has somewhat "inherited" this set of projects.

Together with this, one of the main initiatives of the Park is the current PIRAP project *Progetti Integrati Rurali Aree Protette* (rural integration projects in protected areas). All Park municipalities and other local authorities are concerned.

Vesuvius pilot activities for the FOR CLIMADAPT Project

Under the 2007-2013 MED Programme, the Vesuvius National Park has developed a strategic document based on the current context, providing guidance and future scenarios. This document corresponds to local land planning, but also and more importantly attempts to address the real needs of local stakeholdersLes axes retenus sont les suivants :

The main areas covered are as follows:

- Respect of ecosystem functionality and maintenance of the natural heritage in the surrounding areas.

- Improving the quality of the environment and security.

- Valorisation of historical cultural identity and the landscape of the Park.

- Valuation of sustainable services and productive activities on the site.

- Consolidation of the advisory role of the Park and improvement of the knowledge of the environment as a basis for local development.

The project aims to open exchanges with European partners particularly interested in the management of forest areas in the Mediterranean, on how climate change risks are perceived, what solutions are designed to adequately respond and what experiments are in progress, with the aim of formulating shared recommendations.

FOR CLIMADAPT actions in the Park fall into two broad categories:

- Specification of operational protocols for the completion of "minor ecological engineering works".

- Improved control actions for exotic invasive plant species in the "Tirone Alto Vesuvio" reserve.

Minor works (ecological engineering interventions)

This is the use of locally available materials (wooden stakes made from local trees, etc.) to carry out work to maintain the stability of slopes. Tests were performed in the laboratory to check the resistance and other characteristics of the local woods.

The Park created projects studying the behaviour of plant species. The objective was to improve the knowledge of techniques with eventual updating of the reference parameters to be communicated to field managers after conducting small-scale tests.

More details on the implementation of these systems will be presented in the section on field trips (from page 22 to 25).

Analysis of the evolution of vegetation and forest management guidelines

Implemented over the period 2005-2011, under the RECOFORME project, 27 monitoring plots are divided into different types of vegetation on the site, with a total area of approximately 650 ha (see Figure 3). The measurements were repeated under conditions consistent since 2005.

Different initial treatments were tested:

- A: No action on vegetation.

- B: Cutting plants with a diameter of less than 5 cm.

- C: Clear-felling vegetation.

Three different species (*Quercus ilex, Quercus pubescens and Fraxinus ornus*) were then planted alternately. Ultimately, though all did not survive, artificially implanted species took over, including Flowering ash (*Fraxinus ornus*), which developed considerably. The Downy oak, however, developed less well (see Figure 2 below).

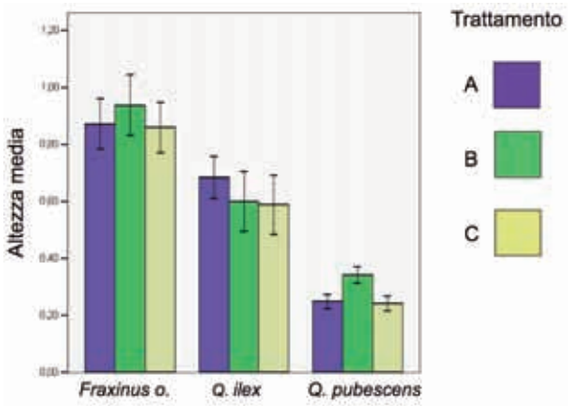


Figure 2: Average size of individuals planted in 2005 according to the different processes used.

Summary of results

1. The Stone pine decreased in density with almost no natural regeneration.

2. Maritime pine tends to progress slightly and has a better ability to regenerate, especially on boundaries and clearings.

3. The basal area of the Green oak progresses steadily, even when it is contained in the understory. It demonstrated a population increase on all soil types.

4. The Black locust (*Robinia pseudoacacia*), like pines, does not exhibit strong competitive abilities when relegated to the lower floor, with a mortality of between 4% and 43% (depending on local constraints). Only in the coppice cuts was an increase in its population observed, particularly because of lateral shoots.

The specific objective of the Park as a result of these studies is to try to eradicate alien species (Black locust, etc). This would make the timber more resistant to parasites, promote biodiversity, and would move from a monospecific to mixed forest on multiple layers. These mixed stands provide better stability and resilience of forest ecosystems against climate changes. Ways must now be found to sustain them.

The long-term objective of managing the forest cover of the Park is to support the phenomenon of vegetation succession in progress, that is to say, a progressive installation of hardwood deciduous and evergreen under the cover of reforestation conifers from the last century.

Actions remaining to be undertaken in this area are:

- Cognitive analysis of the different states of sites.
- Data analysis and verification of actions performed over time.
- Comparative analysis between 2005 and 2011 as well as future trends.
- Critical analysis of strategic choices of intervention and program of actions to follow as well as experimentation.
- Forecasting model and guidelines for forest management.

Field trip (Vesuvius, February 23, 2012)

The field trip, which took place on the morning of Thursday, February 23, was an opportunity for Park staff to deepen their explanations, and partners to better visualize the field activities on the ground. The trip consisted of a full tour of the volcano, including the "Tirone Alto Vesuvio" Biosphere Reserve.

Study of the evolution of the vegetation

At the first site, located in a mixed grove of oaks and pines (mainly *Quercus ilex, Pinus pinaster* and *Pinus pinea*), there remains a few individuals in the understory of Black locust (*Robinia pseudoacacia*) which tend to suffer from a lack of light. Some Downy oaks (*Quercus pubescens*) have been planted recently and are struggling to grow.

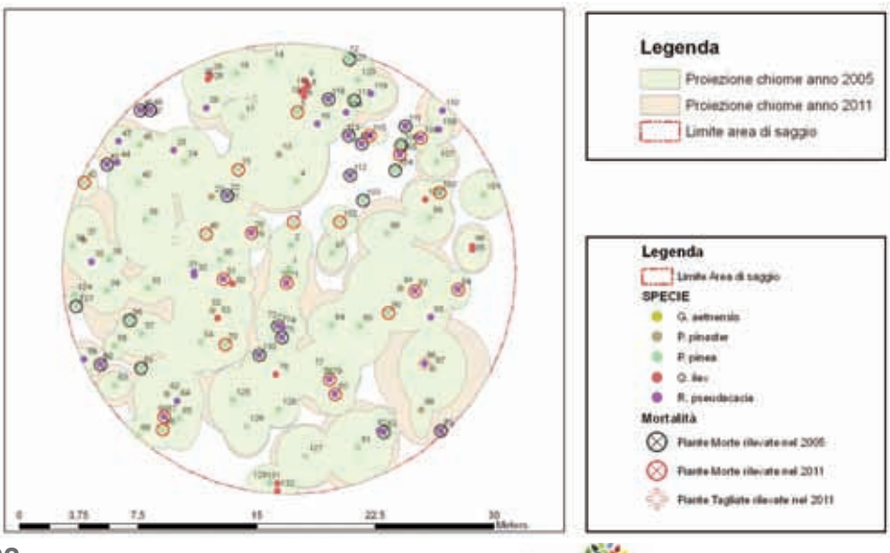


Figure 3: Example of circular plot delineated around a geo-referenced central point implemented in the Tirone Alto Vesuvio Reserve. All trees are geo-referenced according to species. Cover development appears in clearer buffer.

The main activity of the Vesuvius National Park in this area, in the framework of the RECORFORME project (2003-2006), was the establishment of 27 circular control plots (see Figure 3). All trees within 15 m around a fixed point were identified. The records were then used to measure changes in overall vegetation cover, the evolution of different species in relation to each other and regeneration. These records have continued under FOR CLIMADAPT to confirm the trends outlined above (see "Summary of results"). Despite the uncertainties because of difficulties in measurement, the canopy has clearly grown between 2005 and 2011.

On another site nearby, experimental work in artificial regeneration using native species has been carried out. Square plots of 3 meters per side were delineated (see Photo 8.). These plots were divided into 9 equivalent 1 m^2 squares, planted alternately with oak (*Quercus ilex*), Flowering ash (*Fraxinus ornus*) and Downy oak (*Quercus pubescens*). The objective is to determine which of these species are best adapted to the new climatic conditions.

Between 2005 and 2011, the survival rate of the Holm oak was significantly higher (56%) than for the Downy oak (44%). However, it is the Flowering ash that seems to better accommodate new climatic conditions, with a survival rate of up to 89%. It is also the species that grows faster. Almost continuous forest cover and litter consisting mainly of pine needles do not seem to affect its development.

Photo 8: Gino Menegazzi explains the methodology and the results of experimentation with the establishment of native species in the defined squares scattered over the territory.

Minor works to restore degraded land

Another important visible activity of Vesuvius National Park in the framework of the Recoforme and FOR CLIMADAPT projects is the design and development of systems to fight erosion and to restore the ecological dynamics of the environment.

The installations are intended to maintain the structure of the upstream slope beside tracks. The communication routes are crucial on Vesuvius. In case of eruption or fire, it is important to be able to move as easily as possible to allow fire fighters to reach the area concerned quickly. That is why this type of site was privileged to conduct these experiments[3] .

In most cases, the structure of the installations consists of posts, using local wood (Chestnut in particular) as much as possible. Some are implanted deep into the ground to ensure the sustainability of the system. Others are placed laterally to reduce the effective slope and retain sediments and soil minerals especially during heavy rainfall. Longevity and stress resistance of the structural elements are tested in the laboratory. The system must last a minimum of 10 to 15 years, the time required for perennial plants and shrubs to settle in the interstices. In fact, some works completed during the RECOFORME project are still in excellent condition and the surrounding vegetation will soon be able to take over.

Natural balance and risk prevention

The next part of the field trip led to a small clearing surrounded by pine trees. The opening of this sector was caused by the recent fall of a large tree. A relatively low intensity fire also burned in the area about 10 years previously.

The main finding here is that the abundant light was favourable to the survival of the Black locusts, in good condition, and for a vigorous regeneration of maritime pine. This site confirms the idea that the Black locust cannot adapt to the covered forest environment, actually the stage of mature forest at its "climax" on Vesuvius.

The fight against fires is an important mission of the *Corpo forestale dello Stato*. They have built pools of water scattered throughout the territory, those that partners observed near the tracks. These pools are designed to allow helicopter water bombers to pick up water (see Photo 10), and are installed with a reserve tank and pump to maintain the water level in the basin.

Photo 9: Experimental ecological engineering works, including along the trails in the Tirone Alto Vesuvio reserve, allow the development of a diversified vegetation type to permanently retain soil.

Photo 10: Fire-fighting facilities set up by the State Forestry Corps. A pool of water designed for helicopter water bombers with reservoir (top left).

Not far from the latter, a former tree nursery was rehabilitated and is intended for the preparation of plants for environmental engineering works. Many local species are cultivated: arbutus, broom, oak, fig, etc. The basin nearby ensures water for irrigation.

A little further, there is an area with high mortality in a stand composed exclusively of mixed pines (maritime and pinion). The Vesuvius National Park tested keeping dead trees here (there are many in this area) on the ground, in order to promote the enrichment of soils and biodiversity. Moreover, it is an interesting observatory of pure pines under new environmental conditions. Indeed, there is no significant regeneration of pine. In contrast, the Holm oak is beginning to appear.

Moreover, once again, there is a pronounced decline in the Black locust under a relatively dense and closed canopy.

The tour ends with a stop near the cone summit, to observe the fragility of the slope soils, where there is little or no vegetation. North of the volcano, in the passage between the cone apex and Mount Somma, the remains of the old caldera, the lava flow of 1944 is still clearly visible and clearly distinguished from the different stages of vegetation development (see Photo 11): lichens (including *Stereocaulon vesuvianum*, endemic species of Vesuvius), shrubs (Mount Etna Broom: *Genista aetnensis* ...), and forest species (oak, beech, pine etc.). There is also a plot entirely replanted with *Robinia pseudoacacia* from the 1950s.

Discussion with partners

Bruno Del Vita insists on the importance of experimental protocols. It is necessary to increase the number of experimental sites and to work over longer periods for a better overview. For example, in the case of the Black locust, it is still difficult to establish a clear strategy.

Gino Menegazzi states that, concerning soils, all parameters were studied (geological, ecological etc.), although only part of the measures has been completed. It is important to understand the relationship between roots and soil consolidation work.

Giuseppe Luongo considers that, to better adapt forests to climate, it is necessary to conduct an analysis of climate over the past 150 years on one hand and, on the other hand, an analysis of the current data. This is what should emerge from cooperation projects.

Antonio Saracino responded that the mission is not just to understand the impacts of climate change on this site, but also to anticipate possible changes.

In FOR CLIMADAPT, the follow-up actions have been pursued, given the volcanic nature of the site and the massive introduction of exotic species at a specific period, there is a high risk of natural imbalance and erosion. It is therefore difficult to make accurate predictions and measurements in such an environment.

Jean Bonnier observes that we can identify two approaches that voluntarily cross paths:

- The Vesuvius National Park, working on long-term missions (naturalist engineering etc.) and regularly monitored by Gino Menegazzi.

- The positioning of the FOR CLIMADAPT project: Forest and climate change adaptation.

The Park and also the partners must ensure this meeting bears fruit to allow both parties to move forward together.

Photo 11: This image shows clearly the difference between the diverse stages of vegetation recovery. Shaded area: the first stage of colonisation by lichens on dried lava. A little further to the right: Robinia (Black locust) reforestation. Foreground: shrub stage dominated by Mount Etna broom. Left: mature forest stage (dominated by pines).

Professor Ugo Leone, President of the Park, reminds us that the situation is indisputably critical. The questions that should now be asked are:

- Does climate change, which began on the Vesuvius cone, change the behaviour of stakeholders in the area?

- On the other hand, is there an imminent risk of land degradation worsening?

- Finally, are the actions and tools of the Park suitable in this new context of climate change?

These are the elements and lines of thought in consideration of the project continuation.

Extension of the project dynamic

Representatives of MENA countries (Middle East and North Africa), namely, Turkey, Lebanon and Tunisia attended the seminar on the Vesuvius with the support of the GIZ (German national agency of cooperation).

Ezzedine Taghouti *(Tunisia)*

Tunisian territory covers several bioclimatic zones. Tunisian forest covers about 1.2 million hectares, or about 8% of the territory. These are essentially communal lands, subject to the management of agricultural groups or community management plans. The dominant species are the Stone pine, Eucalyptus, Black locust, Green oak, Cork oak, etc. Human populations exploit many non-wood (including seeds, sap, carobs, mushrooms) and wood products (low rotation cuts to preserve the stands).

These areas are fragile and highly exposed to weather conditions (high variability in rainfall and temperature) and natural hazards that result. Climate change will undoubtedly have a significant and difficult to predict effects.

Ambitious plans for the development and integrated management of forests are underway. Reforestation with native species, adapted to the rather harsh geo-bio-climatic conditions are among the actions. In addition, fire prevention management plans are being elaborated.

Chady Mohanna *(Lebanon)*

Certain processes or invasive species, which are considered here as problems, could actually represent solutions on the southern and eastern shores of the Mediterranean. In Lebanon, there are many degraded areas where nothing more grows. It would be interesting to experiment with species described here as invasive, such as the Black locust, or some species of broom.

"Jean Bonnier proposed expansion of European cooperation projects in our country, and I think it is highly desirable. Indeed, despite the fact that too many people in high places are still doubtful, it is urgent that we act in this area".

Abdurrahman Kök *(Turkey)*

Turkey is a large country with many forests. There are large differences between regions, especially between the North and South. However, there are few projects specifically dedicated to forestry resources.

All Mediterranean countries are experiencing significant changes. "The international exchanges and international partners seem very interesting and we could greatly benefit from and contribute to exchanges."

Notes:

1- For more information on this project, visit the website of the AIFM (www.aifm.org) or consult the different site documents and the summary work "The achievements of the RECOFORME project".

2- A total area of 8,500 hectares, this reserve has 3,500 hectares of forest, consisting mainly of pine forests (900 ha), chestnut (300 ha) and coppice (1400 ha).

3- These have now been extended to the slopes of the summit cone of 1944, severely affected by erosion.

Project of the Umbria Region

"Forests contribute to the local economy and biodiversity. It is essential to provide a future for our forests in the very worrying climate change situation we are currently experiencing (Fernanda Cecchini, Agriculture and Forestry Advisor of the Umbria Region).

The context of forest policy in the Umbria Region

The Umbria Region is one of the first administrations to adopt a regional forest plan, developed on the basis of the Forest Strategy of the European Union[4]. The first Regional forests plan covered 10 years (1998-2007), and anticipated the successive provisions defined by the "Single Forests Text" (Regional Law 28/2011).

The new Regional Forest Plan 2008-2017 provides continuity to regional policy beyond a single term and even beyond parliamentary term found, in the Framework Programme for the forestry sector, a more precise variation on the national level of European policies.

One of the main features of the Umbrian forest strategy lies in the attention that is given to the coppice, which constitutes more than 85% of the forests. Over time, experimental and demonstration projects have been implemented in order to integrate this type of development among those able to ensure sustainable forest management.

It should be recalled that in 1977 the forest skills were transferred from the State (*Corpo Forestale dello Stato*) to the regions.

Some regions and autonomous provinces chose to create their own forest police force. Umbria was among the first areas to delegate forestry administrative and operational capacities to "mountain communities" (*Comunità montane*), to which were also appointed workers formerly employed by the Inspectorate of forests, by the State Agency for Forests, and by unions and organizations concerned with the sanitation and recovery of mountain areas.

The region has, however, retained its expertise in legislative and regulatory matters, general programming, implementation of Community policy, control and approval of projects on the ground in these mountain communities. Also, with the Single forests text, mountain communities saw their competences fully recognised, and so had to plan accordingly.

However, reforms of 2007 and 2010 have gradually led to the outright abolition of mountain communities. Their administrative capacities were transferred to the special community unions and will be redefined in the context of a territorial reorganization program. Other activities of a purely technical nature, once exercised by the mountain communities, will be transferred to the Regional Forestry Agency that will thus be an "operational branch" through which will pass all the skills and technical expertise in water, forestry and forestry resource management, and environmental enhancement in general.

At the regional level, forest issues are regulated by the Regional Forests Single Text (Regional Law 28/2001) and its implementation regulations (Regional regulation 7/2002). One of the main innovations is to develop a preferential channel for interventions, subject to compliance with the criteria of sustainable forest management established by the Regional Forestry Act, allowing greater flexibility in terms of choice of forestry exploitation.

In developing the regulations, one of the difficulties was to reconcile lighter procedures with the protection of forest and territory resources. In this regard, we note the use of the principle "silence means consent" and the use of a simple preventive communication for several types of interventions that previously required an authorization. In addition, procedures are even more complex if the potential impact of interventions is significant, in order to foster approaches that preserve the forest ecosystem or are part of a multi-year plan of action.

There are two new particularly important points:

- The list of "forest resources suitable for the use of forests for the benefit of others" (the previous regulation was limited to the use of public forests).
- The list of forest operators evaluating professionalism (safety, working conditions etc.). The objective is to guarantee work for companies that have invested to improve the functioning of their operations, especially in terms of training workers.

Forest work is still one of the few production activities in mountain areas directly related to territory that continues without financial support from the community. Therefore, the activities of the forest-based sector, if they are recognized and valued, can contribute to both the maintenance of jobs and the creation of new more-qualified employment opportunities, for example relating to the use of forest biomass for energy[5].

The fight against forest fires in Umbria

Regional forests, constantly growing, now cover 371,574 ha, or 44% of the territory (29% in Italy); a little less than a third part is public forest. The forests of the region consist of 87% coppice (42% across Italy), particularly Oak. More than 90% of production is for firewood. Approximately 40% of households use wood for heating.

On a regional level, the 28/01 law is the primary reference for the defence and protection of the forest heritage. Among the provisions, in particular, the role of the forest is stated as being to protect the natural environment, as well as being part of the prevention and active struggle against natural hazards.

Forest fires are a major cause of destruction of the forest heritage, especially in summer. To guard against this calamity, each year, there are many activities, such as cleaning of slopes and the creation of fire belts. The forest fires prevention activity is organized by a regional plan (Regional Council deliberation 865/2009) and an annual programming document.

From July to September, equipment and human resources are deployed under the leadership structures of the region, mountain communities, the *Corpo Forestale dello Stato* (National Forestry Corps), fire-fighters, and volunteer civil protection associations, to monitor the area and to fight against fires, when required.

Forest fires

In 2011, in Umbria, 123 fires were reported, 108 occurred in forest areas, and in total 217.26 hectares of forest area were affected by fire. On average, that year, each fire burned a wooded area of 2,01 hectares. In 73% of cases, the forest area burned by fire was less than 1 ha and the forest area burned did not exceed 30 hectares in any case

If we examine the data in more detail, we observe a concentration of fires during July, August and September. Fires that occurred during these three months represent approximately 70% of the total and almost 80% of the forest area burned.

In 2011, due to climate change, the trend recorded in recent years is towards the extension of the fire risk period into September and October. July 2011, unusually, was relatively quiet; the forest area burned was less than 11 ha.

The past few years have seen the emergence of fires during the winter-spring transition. Between February and April, in particular, there has been a high number of fires (18% of the total, higher than the values recorded in 2007).

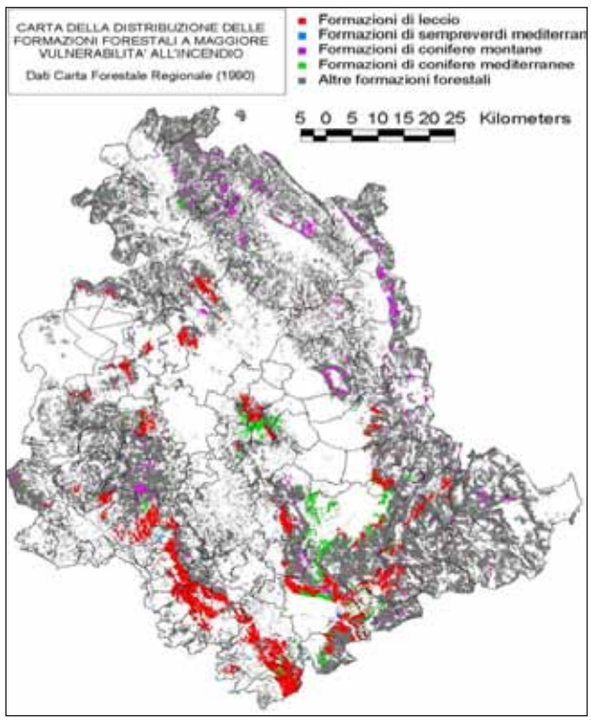


Figure 4: Map of distribution of main forest areas vulnerable to fire in the Umbria Region.

Actions of the Umbria Region under the FOR CLIMADAPT project

With the FOR CLIMADAPT project, the Umbria Region strives to conduct activities based on the close relationship between forests and climate change, taking into account the social and environmental characteristics of the region.

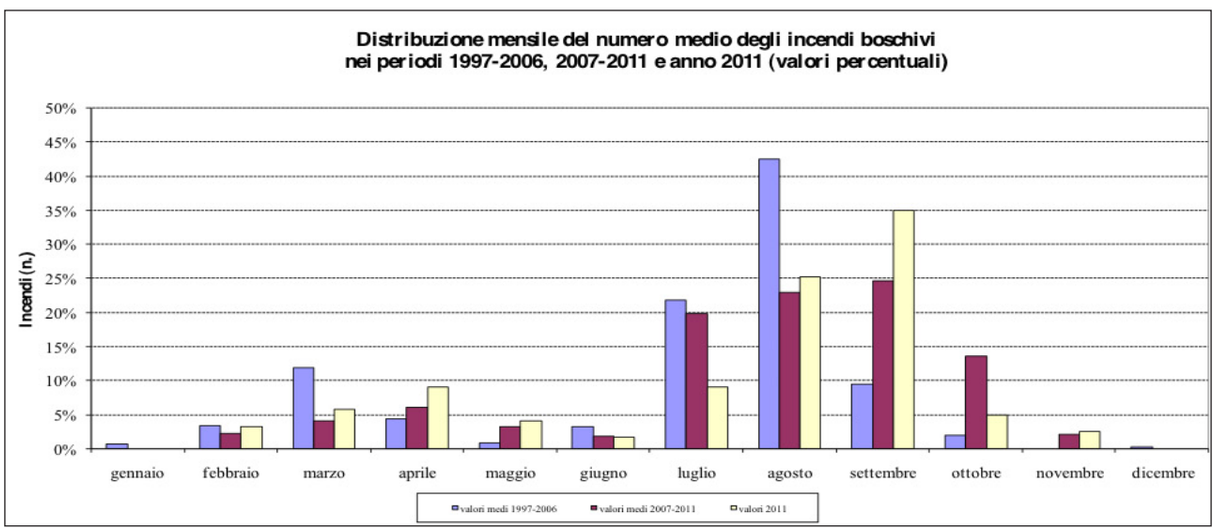


Figure 5: Monthly distribution (%) of the number of forest fires reported in 1997-2006 (left), 2007-2011 (centre), and 2011 (right).

The decision to participate in the project was based on the following considerations:

– Climate change is now an undeniable reality and the Mediterranean region is particularly vulnerable[6] .

– The existence of a European regulatory framework aiming to protect forests against the expected effects of climate change, and the fact that forests contribute to achieving the targets set by the Kyoto Protocol and subsequent agreements.

– Climate change is a phenomenon of considerable complexity which, combined with the specificities of the Mediterranean forest, requires co-operation with other countries in the MED region in order to achieve a double objective:

- The development of joint initiatives and sharing of innovative solutions in order to jointly develop a strategy for the management of Mediterranean forests.
- Harmonization of European and national forest policies, which are currently fragmented into several sectors, resulting in slow and poorly coordinated changes.

In Umbria, as in many other Mediterranean regions, a consequence of climate change is the increased risk of forest fires due to rising temperatures and droughts, as shown by the regional fire prevention data.

The Forest Service (which has jurisdiction in the fight against fires) decided to join the project because they consider that forest policies can significantly influence the effects of climate change, not only in reducing greenhouse gas emissions, but also by improving the resilience of forest ecosystems and their resistance to fire[7] .

Under the FOR CLIMADAPT project, the Umbria Region has planned to establish a local fire prevention plan in the lower Valnerina area. This plan will be based on a participatory process. It consists of educating and engaging the public in a program for fighting forest fires, especially the local stakeholders (forest owners, loggers, hunters etc.) living, working and / or visiting the pilot area.

In the Umbria Region, the majority of fires are caused by people. This is why continuous prevention awareness can be an even more valuable tool against fire.

The participatory process is a major innovation in regional policy. Improved governance is expected because this process should promote a comprehensive vision of the territory by policy makers.

Adaptive forestry

In this context, the decision was taken to develop innovative techniques in forestry to increase the resilience of forest areas vulnerable to fire. In particular, the pilot activities are silvicultural (thickets of Holm oak and Aleppo pine) and the establishment of fire breaks.

The development of a methodology for the preparation of a biomass supply is also planned, and will be discussed later.

The pilot site will be used to optimally develop the activities mentioned above, because it is characterized by:

– A forest area suitable to new forms of intervention to reduce fire risks and to evaluate the adaptation of forest species by innovative silvicultural treatments;

– A mainly public forest, including a significant area of wood subject to forest management plans.

The pilot project aims to be a valuable tool for the application of regional policy in terms of promotion and multifunctional management of forests.

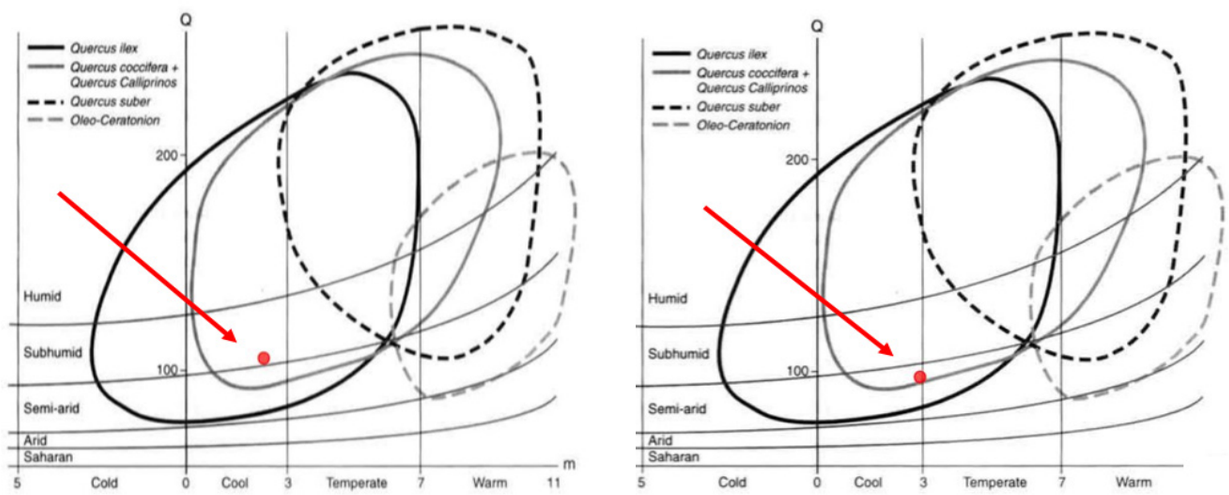


Figure 6: Climagram describing the pilot site in the succession of bio-climatic stages in the periods 1950-1980 (left) and 1981-2010 (right). We note the change from a sub-humid to semi-arid climate, and we reach the limit of the range of Quecus calliprinos and Coccifera species (solid gray line).

The Valnerina area (pilot site)

Valnerina includes 15 municipalities and covers an area of approximately 113,000 hectares. It is located in a largely mountainous region, marked by deep and narrow valleys with steep slopes and peaks often exceeding 1,000 meters.

Forests cover about 57% of the territory (compared to only 44% across the Umbria Region) and are characterized by a high density of Beech. The main management system used is **coppice** (more than 90% of the forest area). Semi-natural grasslands take up higher mountain areas. The most important rivers are the Nera (main tributary of the Tiber) and the Corno. A large part of the flow of these two watersheds is taken up to feed the hydroelectric system in the area of the Marmore waterfall.

The difficulties of the karst relief led to a strong depopulation during the second half of the 20th century, accompanied by a marked aging of the population[8].

Economic activities are mainly farms, forestry and pastoral, often in a familial structure. The tourism sector is also significant, especially in localities with an important religious heritage and others hosting major sporting events, sometimes international.

Community dimension of the territory

A feature of this area is the presence of **collective properties for citizen** use, in total about 30,000 hectares for more than 70 different entities. Under different forms (Agricultural Community, Agricultural University, Collective Domaine, Consortium of residents, etc.), some of these entities have existed for over 100 years and have had and continue to have a fundamental role in planning.

The "citizen use" is a right for every user of the Community to use available resources (timber, grazing, truffles etc.) within the Community territory. It is governed by the rules laid down in the statutes of the owner organization. The user can, for instance, cut timber assigned by Community for home heating, limited to a specific amount per year. They may, in addition, graze a certain number and a certain kind of livestock on the Community grazing lands.

There are 30,000 ha of collective properties in addition to the 18,000 ha of communal property. Thus, in total, over a third of the area is part of collective properties (see Figure 7). Forestry activity is not only "citizen use" but also commercial with 80 companies. In addition to these operations, there are more than 700 registered private forest operators. These figures show the importance of the Valnerina forestry sector at the regional level.

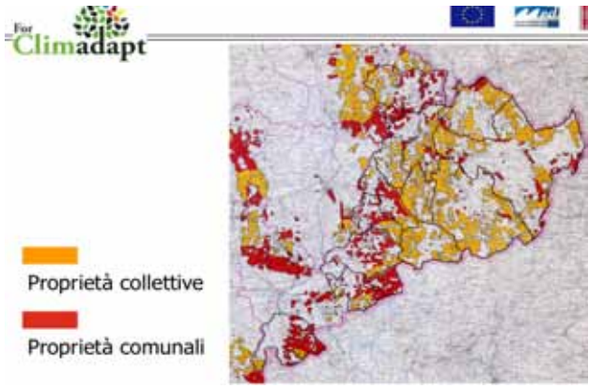


Figure 7: Map of collective (clearer) and communal (darker) ownership distribution in the Umbria region.

Finally, it is worth noting the importance of the production and harvesting of truffles: highly valuable Black truffles, Summer truffles (*Tuber aestivum*) and Burgundy truffles (*Tuber uncinatum*) which is why Valnerina is historically one of the world renowned main centres of this product.

In general, the area is known for its high quality local products.

Photo 12: In Umbria, forests under management plans cover 86,000 ha and 5,000 ha are in the planning phase under the 2007-2013 program.

Forest planning in the lower Valnerina territory

Under the Rural Development Plan 2000-2006, based on FEDER funds, the **Forest Management Plans** (FMP)[9] have been introduced into the forest formations of 17 public properties and three private properties located within the jurisdiction of the Mountain Community "*Valle del Nera e M.te S. Pancrazio*".

For the establishment of methodological guidelines for the preparation of plans, and to work on the basis of a coherent information system, the decision was taken to adopt the forest management system developed at the regional level for the "*Riselvitalia*", project financed by the Ministry of Agriculture and Forestry (sub-project "Information systems and support for forest management").

The main goals of the methodological approach used are the preparation of a comprehensive tool analysing forest resources, as well as the development of a flexible management tool, suitable for local conditions and taking into account the requirements expressed by owners and other stakeholders in the territory. These features provide perspectives, particularly in terms of diversification of functions assigned to the resources involved (use of wood, tourism development, risk prevention, conservation of natural habitats etc.), while respecting the resilience of the forest as a resource (approach integrating economic, social and environmental aspects of natural areas).

Photo 13: View of the Terni valley.

On the pilot site, 11 FMPs have been applied, 10 concern collective properties, recognized regionally as public and one private property. The FMPs were approved in November 2007. The managed wooded area covers more than 10,200 ha, or about 54% of the forested area on the pilot site.

Currently, 8 of the 11 FMPs of the pilot site are being revised, following an analysis of the state of application. The review phase will be completed for the most representative properties of the pilot site by the establishment of a procurement plan, according to the pilot action from the FOR CLIMADAPT framework.

The procurement plan is a component of the FMP considered essential in the wood energy sector, to the extent that it can significantly influence the level of environmental sustainability in the use of biomass for energy purposes. The methodology adopted for the preparation of the procurement plan specifically incorporates the previous experiments, concerning the knowledge and planning of forest resources in the supply basin and the sizing of the biomass generator(s). Indeed, the power of the latter should not rely solely on thermal requirements, but consider actual production availability, identified in the plan of action of the supply basin forest planning. A geographic information system (see Figure 8) was set up to archive and organize the information effectively.

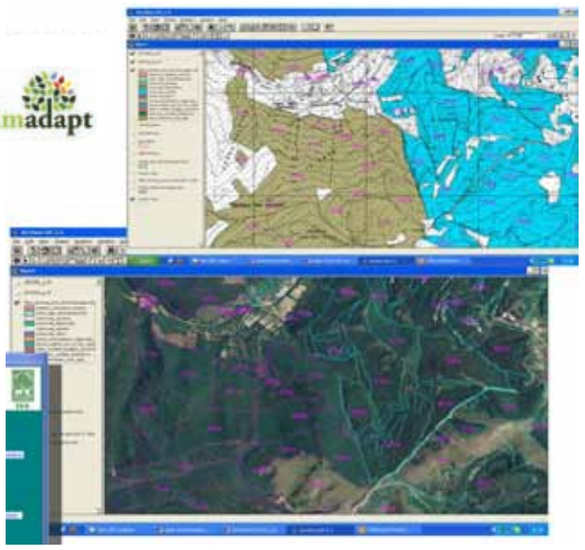


Figure 8: Computer systems supporting forest planning. A GIS was implemented across the region to coordinate the different management plans.

The participatory process for the preparation of the local fire-fighting plan

The Umbria Region considered that to develop a more effective local fire-fighting plan, it was necessary to obtain the support and participation of stakeholders residing in the municipalities involved in the FOR CLIMADAPT project. To do this, three participatory meetings were planned in February, May and September 2012.

The objectives of this participatory approach were:

– To involve local stakeholders in the monitoring and prevention of forest fires

– To understand:
  - their relationship with the forest
  - their perception of the territory
  - and identify critical points in the local fire control plan

First meeting, February 7, 2012: Targeting priority subjects

5,200 brochures were published and many invitations were made directly by phone. This first meeting provided more information about the following:

– Frequency of visits and types of forest-related interests. It appears that visits are higher in autumn and winter. 57% correspond to leisure uses, 38% to commercial activity and 5% to voluntary activities.

– Perception of risks to the forest. The main risks identified are fire and climate change.

– Causes of fires and damage found in the forest. The people questioned are particularly concerned about ecosystem

degradation and the mass emission of CO2.

– Effectiveness of prevention strategies. Those questioned would like more frequent checks and harsher penalties.

– The forest as a vector to limit CO2 emissions. The people questioned seem to have limited knowledge of these issues.

Second meeting, May 8, 2012: integration

Once again, significant resources were deployed to gather a maximum of entities involved. The themes were as follows:

- Organisation of monitoring. Greater citizen participation and targeted use of resources are desired.

- Participatory monitoring. The people questioned stated that they are available to participate in monitoring for 4 hours a week. Some say they are also ready to contribute on a tax plan (€5 per year).

- Acceptance of restrictions for fire prevention reasons. People understand the need to restrict access to forest trails.

- Effectiveness of silvicultural prevention measures. Statutory clearing around routes must be done for free. Owners must implement a coppice system through the necessary funding.

- Voluntary and active participation in prevention. People seem less likely to participate in prevention than monitoring.

The philosophy of the approach is to maximize the value of different opinions, and especially not to exclude any fire prevention idea in the context of climate change.

NB: The same exercise was carried out with the participants of the FOR CLIMADAPT seminar (see Annex 1 and 2 of the field trip report) to compare the positions of local operators with those of international experts on these issues.

The questionnaire and the results are presented in appendices 1 and 2 of the full seminar 4 report, which can be freely downloaded on the project website: www.forclimadapt.eu, under "Publications."

Elements for the development of the Local Fire Fighting Plan

Under the FOR CLIMADAPT project the Umbria Region has launched a pilot project to contextualize the Regional Fire Fighting Plan to adapt to smaller parts of the territory. This experiment consists of analyzing the phenomenon of forest fires in more detail and in more homogeneous situations from several points of view: climate, vegetation, infrastructure, social dynamics etc. The aim is to identify, within the territory examined, areas most exposed at risk and, therefore, the actions to be taken to limit the damage caused by forest fires.

The local pilot fire fighting plan concerns five municipalities in the south-east of the region (Terni, Arrone, Polino, Ferentillo Montefranco), and covers a total area of approximately 350km^2. Activities in progress for the development of the Plan are as follows:

– Analysis of the territorial context.

- Historical analysis of the phenomenon of forest fires.

- Involvement of local communities and awareness raising to protect forests against fires.

- Analysis of the hazard level and fire risk in existing forests.

- Identification of actions and priority levels for fire prevention interventions.

- Demonstrative interventions.

The forest fire **risk map** in the territory examined was developed by indexing a series of factors over the territory considered critical for both starting fires and for their propagation, as well as assessing the risk to the surrounding population. It is the result of two main components:

1. The Hazard map that defines the probability of occurrence of a fire and concerns the structure of woodlands. This map is prepared using a Geographic Information System (GIS) based on the following factors:

– Number of fires and forest area burned in the period 1992-2011.

- Types of stands (forest, or others) and development conditions.

- Altitude.

- Exposure.

- Slope.

- Rainfall, prevailing winds and other micro-climatic characteristics.

2. The **vulnerability map**, which assesses the potential damage from fire for both populations and ecosystems. It too has been developed using the GIS system, based on the following factors:

– Distance to infrastructures (pipelines, power lines, roads and railway lines etc.).

- Distance to urban centres.

- Location of protected areas (Regional Natural Park, remarkable habitats, Natura 2000 sites etc.).

- Presence of natural or architectural heritage features.

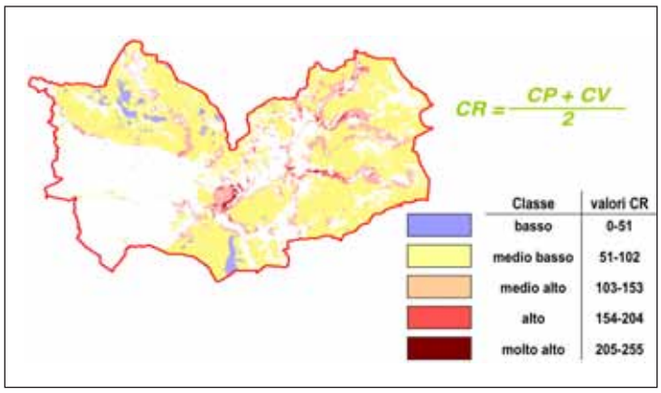


Figure 10: Map of forest fire risks, result of the hazard and vulnerability maps.

Forestry demonstrations (field trips)

Under the FOR CLIMADAPT project, the Umbria Region conducts two forestry demonstrations. The goal is to identify ways of managing forest likely to reduce the vulnerability of forest areas to forest fires, especially in a context of an increasingly arid climate.

Intervention areas were identified within the public properties and the forest formations considered most vulnerable. The woods chosen are mixed with a dominance of *Pinus halepensis* and *Quercus ilex*, which are associated with thermophilic deciduous or meso-thermophilic deciduous and evergreens.

In both intervention areas, the Aleppo pine is evenly distributed throughout the stand and is thus a clear overstory cover, while the Holm oak and other hardwoods are managed as coppice with older growths of more than 30 years old.

The two types of interventions are:

1 - Early Intervention

This silvicultural demonstration aims to identify management methods to reduce the vulnerability of forest stands to forest fire risks.

Interventions take place on plots of public property (8,000 ha in total, including the Arone communal forest) that have forest management plans.

The Aleppo Pine is either dominant or distributed. Note that this is a subspecies significantly different from that usually found in the south of Italy (light and durable, traditionally used in mines). In fact, this is not the usual altitude of this species (the altitude here ranges between 400 and 800 m.). The stands date from the Middle Ages, with recurring passage of fires. The Aleppo Pine does not have much commercial value today. Nevertheless, it is a heritage species which the locals are keen to preserve.

The Aleppo pine was favoured by the removal of oaks in the understory, in order to reduce vertical continuity, and thus avoid the transmission of fires to the canopy.

The Aleppo pine is a pioneer species (needs high amounts of light). It may therefore jeopardize the regenerative capacity of the population, in the absence of fire. However, the objective here is not the production or conservation, but the defence against fire.

The presence of olive groves implies an increased risk of fire ignition because the owners often burn cuttings nearby. At the same time, these crops are effective fire breaks.

Structure of interventions

Different silvicultural measures were applied alternately on five types of zones:

- Zone 1 (along the route, about 6 meters wide): Elimination of herb and shrub layers (plants and shrubs less than 3 cm diameter and / or less than 3 m in height) and cutting of trees to 2.5 m in height.

- Zone 2 (10 m.): Removal of the shrub layer, thinning to limit the continuity of Aleppo pine canopy and tree height up to 2.5 m in height.

- Zone 3 (15 meters): Thinning of the tree layer (fuel reduction), and reduction of the shrub layer to create openings.

- Zone 4: Complete elimination of the tree layer in a diameter of 3 to 4 m.

- Zone 5: No intervention.

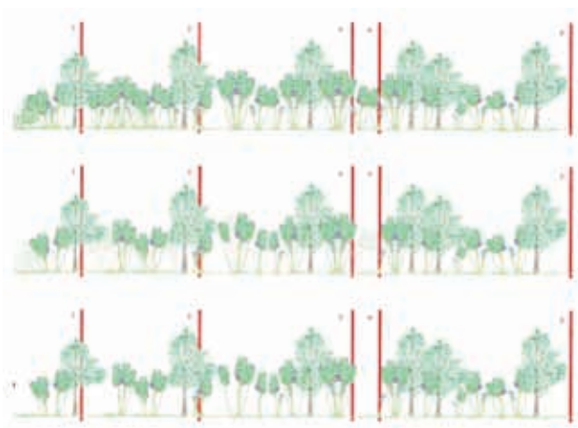


Figure 11: Schema of interventions (top: original situation. Bottom: situation after the intervention. The vertical red lines separate the different zones).

The cost of these measures is relatively high: about € 8,000 per hectare. The steep slope (67% on average on this side) makes the operation more expensive. Personnel costs are high (€26 per hour). However, engineers are hoping not to have to intervene again for another ten years. The financial element should thus balance out.

These procedures are performed uphill of the route because this is where the risk of fire outbreaks are highest.

In Catalonia, the costs are also lower. In contrast, the frequency of fires is higher (every 8 years on average). According to Miriam Pique (CTFC) fifteen meters above the route are usually sufficient if the work is well done.

In France, regulations impose a fringe of 25 meters on either side of any communication route, where fire fighters regularly carry out clearing and the removal of crowns. Costs are much more limited.

Grazing goats in the area would reduce costs while enhancing forage biomass. However, there are few farms in the area, and this activity is declining.

Jean Bonnier suggests to the technicians of the Umbria Region, obviously new to fire management, to come train in Provence or Catalonia, where there is already considerable experience in the field.

Mauro Frattegiani puts things in perspective: "In Umbria, when more than 100 ha burn, it is a disaster, while in other more arid regions (Portugal, southern Spain) this is considered almost negligible. We merely seek to pave the way gradually to be able to cope with the increased risk of fire due to climate change".

2 - Productive intervention

The group then visited a parcel owned by an individual on the opposite side, part of a private owners union subject to a management plan, and regularly subject to timber production interventions. There is significant undergrowth clearing to allow the maintenance of some Aleppo pines. The presence of Holm oak is noted and more distributed than the Turkey oak. Stand productivity is relatively low.

Selection by groups

In Italy, clear cutting is now banned. Here, coppice is cut keeping one or two individuals ("mother trees") for each strain, that is, 100 to 200 individuals per hectare.

The method called "Selection by groups"[10] was tested several times in the region. During cutting operations, clumps of a diameter 0.5 times the average size of the "mother trees", and spaced 1.5 times the average size of "mother trees" from each other are retained. While traditional selection is done directly by the woodcutter, the selection by groups is the result of strategic planning by a forestry technician, marked on the ground by using a boundary wire or ribbon encircling groups of trees to be retained. The bouquets are preferably comprised of diverse

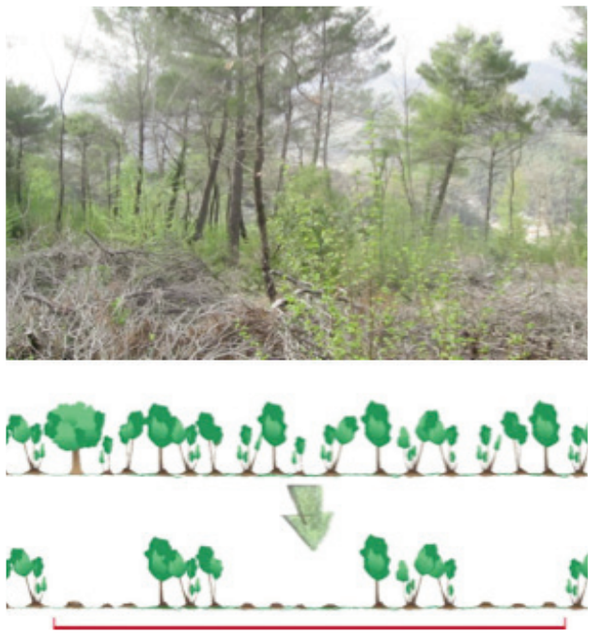


Figure 12: Selection by groups is a way of coppice cuts sparing more or less carefully selected clumps of trees.

species, and healthy individuals (seed carriers). Some very old trees (or dead trees) can also be integrated to promote the presence of mature environments. The return period from cutting is about 35 years. At each cut, the operation is repeated, irrespective of the position of the previous saplings.

This technique is interesting, not only from an ecological point of view but also economically to achieve a level of sampling of between 90 and 93% (compared to 85 to 90% for traditional selection). We must not forget that the primary objective here is for the owner to earn income from operations, while preserving the regeneration capabilities for the future.

Photo 14: The clumps are delimited by red ribbons positioned by forestry technicians in order to group individuals with a potential for conservation and some diversity.

Fonctionning of the owners' communauty

The owners elect a board who decides on the amount of timber to be removed, in line with national regulations. The wood is valued either standing or cut. Under the rules of the community of owners, 10% of revenues must be dedicated to maintenance (not necessarily directly related to the forest) for the benefit of the whole community. These provisions are applied under the supervision of the Umbria Region.

The implementation of this system has led to a significant increase in revenues related to the forest. Tree marking costs are high (it takes 2 people / day to perform a selection of 4 ha). However, cutting promotes stand regeneration and productivity.

Photo 15: The Terni valley, mountainous territory of the Community of Valnerina.

Finally, it should be noted that group selection is unfavourable for the production of truffles.

Notes:

4- Site of the Ministerial Conference on the Protection of Forests in Europe (MCPFE) http://www.foresteurope.org/eng/.

5- A Strategic MED project, in progress and called PROFORBIOMED (www.proforbiomed.eu), in which the AIFM is taking part, specifically addresses these issues.

6- See Fourth Assessment Report of the IPCC (Intergovernmental Panel on Climate Change). *http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml.*

7- *White Paper: The Italian forests, mitigation strategies and adaptation to climate change. National Rural Network 2007-2013, Italian Ministry of Agriculture, Food and Forestry and the European Union.* Septembre 2011. 102 pages. http://forclima-dapt.eu/sites/default/files/ITALIE_foreste_Libro_Bianco_20110921_155458.pdf .

8- In the past 60 years, the valley has lost 50% of its inhabitants. Today, 30 % are over 65 years old. The number of farmers is also falling sharply, causing desertification in the most marginal areas.

9- The RR Regulation 7/2002 also provides for the creation of land cross sections and forest compensation plans.

10- Ancient technique (recommended by the Romans).

Elements for capitalization

3rd meeting of the Peer group
(Torre del Greco, February 24, 2012)

Analysis of the Vesuvius National Park project (PNV)

Analysis of activities presented by the PNV

The development of a strategy for climate change involves a very long term vision involving many sectors such as urban planning and the prevention of risks.

Especially because of its volcanic character, Vesuvius is a very interesting area for the diversity of geo-bio-climate conditions and is a seed bank for species including those able to withstand to climate change. A significant elevation gradient creates a juxtaposition of species and environments at different stages of maturity, forming a "mosaic" of ecosystems[11] in perpetual motion, forming a veritable world apart. "It is like studying a living body in motion". This is why the Reserve seems very resistant to change.

Vesuvius is a relatively young massif (only about 50 years old with regard to most forest stands) yet at the same time quite artificial (reforestation etc.). It is quite paradoxical to observe it with such ambitious goals as the adaptation to climate change.

There has been massive use of non-native plants (Broom, Acacia, Stone pine etc.) in order to reclaim the forest area.

The area has a sub-humid bio-climate. This is not the most representative of Mediterranean climates, nor the most exposed to climate change. For example, *Quercus ilex* is a relatively resilient ecosystem in itself.

At the institutional level, there is both a park that belongs to a national Italian administration (*Ente Parco Nazionale del Vesuvio* / Ministry of the Environment), and a forest that belongs to another (*Corpo Forestale dello Stato* / Ministry of Agriculture). Coordination of the whole is complex and explains the absence of a formal project in the forest. However, there is necessarily an implied project across the entire territory.

In terms of climate change, it is not an emergency: the climate, orographic situation and vegetation are relatively "flexible" and able to accept change without serious immediate consequences. Indeed, the impact of the evolution of human activities is probably more significant than climate change.

Overall, we can say that this is not a major concern here (there are other priorities such as fires, biodiversity protection etc.), but whatever happens, we must take these developments into account sooner or later when dealing with in forestry issues.

The objective of the project is a "broad extension" of these issues. The experiment in the Park, which dates back 7 or 8 years, will highlight species which are very useful for adaptation to climate change. There is therefore an important structural dimension and improvement in the understanding of the mechanisms of adaptation of species and stands.

The main issues identified on the site, concern aspects of forestry. This should lead to the development of management approaches likely to limit the impacts of climate change. Park officials have an approximate idea of the "naturalness" of a stand. However, the forest is now moving towards a state of advanced maturity. One of the challenges in terms of adaptive forestry could be to accelerate this process. But the best strategy to be implemented to achieve this has not yet been defined. What is certain is that, in case of a new eruption or other stand destruction process, reforestation with exotic species such as Black locust or Stone pine, would not be renewed. Native species would be favoured in order to restore a natural balance that enriches itself gradually. This is the best approach in an environment with limited natural resources (soil, water etc.).

The working protocol (see plenary session report, available on the project website) was recovered from the RECOFORME project (analysis of test plots), which provides results in terms of stand development over a determinate period of time. Data is not directly related to climate change, but will be very useful in the future in terms of choice of species for reforestation, ecological engineering works, etc.

Finally, carbon sequestration studies are underway, but the results are not yet available. As for non-tree species (shrubs, etc), they are also studied, particularly in the context of ecological engineering works.

Recommendations for the attention of the PNV

This seminar was a success. Many topics related to climate change have been addressed in one way or another (the dynamics of the Black locust, the reintroduction of native species, etc), however, in the activities of the PNV, there is a lack of a specific dimension of adaptive forestry, a definition of climate change issues for each site (increased summer drought, stands die-back, etc) and a defined argument to assess the extent to which responses correspond to the issues identified at the various sites.

On the other hand, the objectives of the experimental activities do not seem to be clearly defined (lack of focus of the research methodology). Yet, it is important to have clear goals and then know where to replicate these activities, develop technical manuals, etc.

In this type of issue, the immediate impact is not perceptible. This is about long-term developments. It is pointless to minimize the potential impact of climate change on a site such as Vesuvius. Even though we do not expect major impacts on human activities, there are many issues. For example, the increasing frequency of extreme precipitation could lead to accelerated erosion. All this should be further analyzed and anticipated.

A park manager is inevitably confronted with problems of forest management. Whether we like it or not, it is absolutely necessary, sooner or later, to develop a forestry strategy (management, planning etc.). However, in the PNV project, the purely "plant" dimension of climate change is missing. It also forgets to ask precisely the question of the future of species (Arbutus, Scotch broom etc.) under the new climatic conditions.

Indeed, it may be positive to try to forecast the future of the evolution of plant species, but in fact, the main changes in vegetation in recent history have been caused by changes in land use rather than climate change. It is not necessarily obvious to rely on past trends to predict the future of a species.

Park officials remind us that Vesuvius is a very "young" environment threatened by permanent risks (lava flows, landslides, fires etc). Therefore, the forest dynamics are both recent and complex. The site is an excellent observation laboratory. However, its management involves careful thought and planning, not only because of the diversity of natural environments, but also because of the multiplicity of institutions involved in the management (PNV, *Corpo Forestale dello Stato*, Campania Region, Napolitano agglomeration, etc.).

When the Ministry of Agriculture had more resources available, the Park was able to consider large-scale interventions. Over time, this work has been slowed. Moreover, it should be noted that the PNV has a very high level of protection compared to the rest of Italy. It is therefore difficult to make important interventions in the forest.

The representative for Tunisia and Lebanon underlined that, in a protected area, it is understandable to restrict the introduction of exotic species as much as possible. However, the difficulties of Stone pine regeneration could be solved by making small clearings in the stands.

Moreover, they are very interested in the potential contribution of the project in terms of analysis of the impacts of climate change, in their respective countries (increasingly hotter summers, even drier winters) and tested technical solutions, especially in the restoration of degraded areas.

Faced with climate change, Vesuvius seems to favour of the advance of the Holm oak at the expense of the Pines (*Pinus pinea* and *pinaster*). The reserve is now moving towards a dominance of Holm oak, with the risk of losing an important forest heritage. Finally, some participants were surprised at the insistence of the PNV to eradicate the Black locust, even though it does not pose much of a problem since it tends to naturally die off when relegated to the forest floor.

The group recommends that the Park move rather towards the implementation of a strategy to accelerate the growth of native and biologically resistant species. The resilience of species to new conditions should be studied in different scenarios to forecast vegetation cover and environmental change due to climate change.

Transferable elements

- The ecological engineering work (including techniques to increase the longevity of systems and to enhance local species) and recovery the stands securing the ground (Black locust and Scotch broom) are interesting and may be tested by other partners and other regions suffering from erosion and land degradation.

- The co-operation between the Park and the local *Ente Forestale* has been described as exemplary. This communication does not work as well in some countries, such as France, whereas the ONF considers that forest administration would have much to gain from this proximity.

Valentina Garavaglia, representative of the FAO, is currently writing "The State of Mediterranean Forests", which will be published in March 2013. One of the main chapters of this document should specifically address the issue of climate change in Mediterranean forests. She emphasizes that the experience of the Vesuvius National Park in the FOR CLIMADAPT project should be among the case studies presented in this chapter, similar to that of the ONF in the Alpes-Maritimes.

Overall progress of the project

Shedding some light on a technical level

Concerning the Emberger climagram, it would be interesting to develop a scheme to characterize sites according to their degree of human impact in relation to their current state. In the Mediterranean regions, this is particularly high due to the high density of the population.

A scalable climagram was developed by the AIFM, based on additional elements to the initial state recently submitted by the project partners. These documents are very revealing. For Catalunia, for example, according to the Emberger climagram (see page 8), it seems that one of the pilot sites (Oliana) has changed, since the 1980s, from a sub-humid climate to a semi-arid climate. It is therefore urgent to act now.

Silvicultural interventions are not central to the actions of the Umbria Region. The sociological aspect is very important because it creates better consideration of the value of forests (wood energy, non-timber forest products etc). A major investigation is being conducted in this direction[12].

For the Vesuvius National Park the link with the local population is absolutely important, perhaps less so for the Alpes-Maritimes ONF, which is sovereign in forest management and where population density is lower [Editor's note]. Communication techniques need to improve to involve people who live close to the project sites now and in the future. This seems very well implemented by the Umbria Region.

In general, the group requested that partners develop further the link between forestry issues and proposed actions in the adaptation to climate change.

Bioclimatic data gathering ("initial state" of the project) calls for an extension of the study of potential future developments. Indeed, we find that there are often conflicting scenarios depending on the species. On the other hand, the boundary between the impacts of climate change and those of land occupation by human activities is unclear.

Collective dynamics

One of the difficulties we face in this project is to move from considerations compartmentalized "by site" to "horizontal" considerations (common to several sites). In effect, each partner has basically followed their own schedule while gladly recognising some delays in their activities. But it would be positive to make progress on exchanges between players, where everyone strives to compare their own activities in relation to those of others. There is the synthesis work of the Peer group, but it is also necessary that the partners themselves make an effort to position their activities within the FOR CLIMADAPT project for pooling, sharing of experiences, etc.

For example, the activities of the Umbria Region have several points in common with activities in Catalonia. It will be very difficult to make a comprehensive and homogenous evaluation of various plant types and evolution scenarios corresponding to each site, but all have something to learn from each other's activities.

The Umbria Region has, in fact, invested a considerable amount of energy to build its wildfire prevention plan and to incorporate social issues in a participatory manner. The method could be transferred to other sites and could be a collective project deliverable.

Although there are common issues, specific objectives and circumstances are very different from one partner to another. This is why it is so difficult to initiate internal thematic cooperation.

On the other hand, the pilot sites are already chosen and most activities have already begun. We can not really consider integrating, in progress, recommendations from other partners.

However, we can be inspired for future actions and for sites, to which these recommendations may possibly apply more appropriately.

To highlight the possible synergies between projects, a proposal has been made to develop a list of topics in which each peer group's members identify the convergence points of its activities with those of other partners. For example: "Could the activities in Umbria contribute to the activities of Vesuvius, and how?" It is also conceivable that the Peer group produce possible recommendations or common guidelines: "Such and such forestry measures appear to be effective in a particular situation, to face particular local impacts of climate change".

Thus, similar to what was done by the QUALIGOUV project Peer group, thematic sub-groups could be formed to prepare the project findings. This formula has been discussed at length, but was ultimately not used. Peer group's members prefer the production of freely co-authored thematic publications.

Capitalization method and tools

Jean Bonnier reminds that the Peer group's role is to enhance the content of the project to extract value. During the RECOFORME project, the AIFM was alone in completing this capitalization work. However, it was felt that it was more legitimate that this synthesis be "pre-digested" by a meeting of experts. These must be external to the project, while being fully up-to-date on the project and the working environment of the reference partner.

État initial

Concerning the documents on the initial state of the project, the information collected so far is very satisfactory and indicative of the situation of each partner[13].

Numerical and graphical tools, such as the Emberger's climagram are particularly useful, although more common indicators might have been necessary (water deficit, carbon footprint etc).

Some members of the Peer group also believe that detailed information concerning the climate change dimension and impacts on specific pilot sites are missing.

The proposal was also made to add information on the evolution of local bioclimatic conditions at each site. But it seems technically difficult to go into detail of species endangered and/or in progression. We must be content with global trends (average date of budburst, for example).

It has been decided to request additional information from partners on specific climatic changes and their local impacts as well as responses. This does not consist of very precise or even quantified projections but rather a more specific definition of context of the project theme.

However, in some cases, it seems unnecessary to repeat geographically restricted forecasts. For example, Catalonia has already a scalable analysis assessment. However, more must be done to link the locally implemented actions in response to these regional forecasts.

Website www.forclimadapt.eu

An "interface Peer group" was set up on the website www.forclimadapt.eu. This is a special page for organizing thinking, to channel exchanges, and to serve as a repository and distribution site for working papers and deliverables produced individually or collectively by members of the Peer group.

The documents on the initial state, and the "trombinoscope" listing the members of the Peer group and their professional data will also be downloadable.

This interface will be a good way to develop thematic debate and contribute to the improvement of collective capitalization dynamics.

Finally, if this proves to be useful, the set up of a wiki page (text and image documents editable by all) may be considered, especially in view of the development of the Final capitalization book.

List of useful species in the project

A discussion was held regarding the proposal by Gaetano di Pasquale to compose a list of species that the partners have used in ecological restoration or reforestation carried out under the project.

There is, indeed, a wider range of species that could be adapted to different climates or situations and this would be a very interesting list. It would constitute a simplified tool for partners, and possibly for other Mediterranean forest actors within the framework of future operations. Moreover, it would be a first step towards examining the consequences of current climate change.

This implies a reference to genetic issues. The latter is not necessarily an obstacle, but before introducing a species into an environment where it does not grow naturally, we must ensure that the genetic variability of the plant is sufficient.

The question of content remains. It must at least clarify what natural environments are suitable (for example, a particular species is suitable for the alpine environment, another for arid zones, etc) and optionally specify the types of soils and local conditions for optimal development.

This list could also contain a field specifying whether the prospect of change is positive or negative for the species on the study site.

Gino Menegazzi believes that it would be very useful for ecological engineering to know the basic characteristics (roots, ability to regenerate, productivity, impact on wildlife, etc) of new species.

Several partners could contribute to this database. Thus, the CTFC could introduce species used in the pilot activities. That said, these were chosen for very specific reasons, closely related to the local characteristics and issues.

Jean Bonnier sums up by saying: it would take the form of a list where each partner would list the species the used and why. This could be a framework for the Final capitalization book.

Thus, in 10 years, or more, a person looking for information on the appropriate use of one of these species may find the organization that conducted experiments including this species and to ask them about the results, strengths, weaknesses, etc.

FOR CLIMADAPT has the advantage of covering a wide range of Mediterranean ecosystems and types of local problems and issues. This initiative could be a good way to make the best of the project.

Adaptation strategies to climate change

During the previous seminar, David Gasc brought up the proposal to collect papers on national and / or regional strategies (existing or planned) of the respective partner countries concerning adaptation to climate change.

At present, we have the following elements (see www.forclimadapt.eu under "Useful Links"):

- The National Forest Strategy of Portugal, which should be used to extract elements for adaptation to climate change.

- The National Strategy for Adaptation to Climate Change in Spain, which should be used to extract elements on forests.

- Preparation documents of the national strategy for adaptation to climate change in France, as well as a summary document on forest-related elements.

Catalonia has its own strategy for adaptation to climate change and could provide a summary document on the forestry component.

For the Umbria Region, there is a strategic document on forests, but not specifically about climate change.

Myriam Legay, meanwhile, participated in the preparation of a European-wide comparison for the ECHOES project. She may possibly provide the article written about it.

4th meeting of the Peer group (Perugia, June 27 and 29, 2012)

Analysis of the activities of the Umbria Region

The integrated nature of the work is of primary importance: climate change is taken into account in broader policies, from wood energy to fire prevention, and through public information campaigns. The FOR CLIMADAPT project is a decisive support in this regard.

Climate change and fire prevention

On the massif, an original approach to communication was undertaken for the attention of the local population (surveys, meetings, group discussions, etc) so that people would appropriate the problems of fuel wood and fire prevention. It was an innovative approach in the context of climate change, which generates increased risks (adaptation) and requires limiting the proportion of fossil fuels in energy production (mitigation).

On the other hand, the risk mapping (see Report of the plenary session), set up by the Region of Umbria, is an effective way both to communicate over the territory and to technically establish fire prevention works at optimal locations. The territory visited has many well-maintained olive groves, which are a very valuable asset for the prevention of fires. The fire prevention plan should be based on these agricultural plots to make forest connections for continuity of fuel breaks.

The preservation of Aleppo pine (species considered as a heritage in this region) does not seem compatible with long-term issues of protection against fires. Rather, this pioneer species is doomed to die off in a changing phytodynamic evolution leading to a very dense forest of Holm oak and manna ash, where pines can not regenerate. Only in case of fire can the pine benefit from the open space created by the fire to vigorously regenerate from seed[14]. The primary objective, however and here above all, is to prevent the outbreak of fire rather than protecting the pines.

The work is of high quality. The cut is very clean, but it is prohibitively expensive (€ 8,000 / ha). Moreover, the width of the strip (32 m) and the way it is done (succession of areas treated differently) seem poorly suited according to some experts.

In France, a "*fuel break network*" includes most of the researchers in this field with forest practitioners and fire fighters who cooperate to learn from past fires and publish the best guidelines on techniques and fire prevention equipment in the mountains. The Spanish and Catalans also have extensive experience in the field from which the technicians of the Umbria Region could benefit.

Given the strength and density of understory thickets, a simple undergrowth removal and pruning, with thinning using strands of coppice, would help remove fuel and create a vertical discontinuity, without touching the canopy cover, thus avoiding fires rising to the treetops. The road itself could stop a litter-level fire. Finally, in order to provide fire fighters with safer working conditions, treatment should also be carried out twenty meters down from routes.

Climate change and forestry

"Group selection" has been tested on a plot at an average altitude (upper part of the meso-Mediterranean level) in *Ubac*, comprising of limestone, relatively deep and decarbonated brown soil (presence of *Erica arborea*, an acidophilus species). Some great aleppo pines dominate a vigorous coppice of Holm oak and other various hardwoods. Fertility conditions are ideal for the Holm oak, allowing a short rotation period of only 35 years.

Italian law prohibits clear cutting, which led most farmers to leave 100 to 200 pseudo-selected saplings per hectare. Usually these filiform trees dry on top, are soon covered by secondary shoots, and are blown over hence the advantage of

alternative forestry such as "group selection".

This type of coppice cut, conserving about 10 to 15% of individuals concentrated in small clusters of a few areas, according to a systematic grid of the plot (see Report of the field trip), creates an irregular mosaic structure. When defining groups, preferably species characterized by their richness in valuable hardwood are chosen, with some stable Aleppo pines, or even a few standing dead trees, with the aim of improving biodiversity.

The Forest environment is preserved, which is favourable for both the production, for the protection of soil, for tree diversity, but also for biodiversity in general. Social acceptance of the cut is easier because the landscape is much less affected than in the case of clear-cutting. In addition, the maintenance of vegetation cover should prevent some of the expected impacts of climate change such as increased droughts or more violent wind.

The disadvantage of such a generalization is the amount of forestry work involved in the delineation of clusters to be retained by forest technicians or by loggers, subject to adequate training and careful scrutiny of the clusters. This represents an additional cost that would be prohibitive, except in the case of high quality coppice, as is the case here. But what is the case of lower fertility classes? Productivity in clusters would level off, thus causing a loss of overall production, and therefore a sacrifice in terms of income from operations. Therefore these experiments should be done in much less fertile coppice, which are also the most widespread, especially in France.

Ecophysiological measures should be undertaken by researchers to validate the effects of this type of forestry in terms of water savings, compared with clear-cutting. Moreover, this is also the case for other "closer to nature" silvicultural techniques such as that developed by Prosylva[15], which should also be examined in this way, in the current context of climate change.

Overall project progress

Evaluation of the first Progress book

This first progress analysis of the project, in particular following the visit to the ONF sites (France) and ADPM sites (Portugal) is satisfactory overall, although slight discrepancies have been noted, for example on the Emberger's climagram. More reliable data should be used, and some benchmark cities should be added to the scalable climagram before the integration in the next specifications.

An assessment of concrete changes expected by the partners in terms of temperature, rainfall, extreme events and purely forestry related impacts as well as the specific responses contemplated locally should be part of a new request to partners. Myriam Legay shall provide the AIFM with a proposal template based on a model used in the framework of the Cost Echoes Program (see "1. The perception of climate change by partners", below). The AIFM will undertake to distribute this to partners, to centralise responses and integrate these as soon as possible into the "initial state" of the project.

In addition, appropriate scale maps with a consistent format that will provide a view of the location of various pilot sites in the different project partners' countries will be integrated into the "Presentation of the partners and their position in the project" section of the next Progress book, similar to what was done for the Progress books of the Med QUALIGOUV project[16].

The need for a thematic focus of the pilot activities

The Peer group emphasizes the need for a thematic focus of pilot activities, because many operations presented during visits to Vesuvius and Umbria Region, despite being of some interest are quite far from what should be the leitmotif of the FOR CLIMADAPT Project: adaptation to climate change. It is therefore essential, before attempting to capitalize on best practices, to identify, explicitly, links between the various projects and the central issue of the project, at all stages of its realization.

Given the extreme variability of situations and activities, a global analysis must be done. In this context, Louis Amandier is proposing a framework that should organise most contributions from the group, identifying guidelines in relation to climate change. The importance of identifying the points where research would be useful or necessary is also highlighted.

This overall structure, validated by the Peer group, shall serve as a basis for discussion at future meetings, particularly in the context of writing the Final capitalization book.

1. The perception of climate change by partners (all partners)

To better understand the perception of climate change by the partners, Myriam Legay proposes an analytical table resulting from the Cost Echoes program , listing the following questions:

- The locally observed and expected changes due to climate change.

- The impact on forests: loss of vitality and production decline, changes in phenology, moving ranges etc.

- The species that seem more vulnerable and those that seem more resilient.

- The management methods that may allow a better adaptation of forests to climate change.

- The relevant scale: the small region around each site seems to be pertinent.

In addition, the IDF / CNPF (*Institut national des forêts - National Forestry Institute / Centre national de la propriété fores-*

tière, France) has developed diagnostic sheets for simulations on the period 2030-2050 at various sites, including one in the French Mediterranean region, close to the ONF pilot sites in the Aude department (France)[18].

2. The identification and prevention of risks generated by climate change (ADPM, PNV, Umbria Region, North-Aegean Region)

Changes in the structure and composition of forests, loss of production, new or worsening diseases, increased frequency and intensity of fires, new territories affected by the fires, erosion risk and desertification in driest areas... These findings deserve to be examined by experts.

3. The impact of each project on ecosystem services (all partners)

Lucio Do Rosario offers a reading table (see table below) to locate the impact of each project pilot activity on the various services provided by forest ecosystems: production of market and non-market goods, water quality, water quantity, protection against erosion, carbon sequestration, fire control, biodiversity, landscape, etc. Each activity or homogeneous sector of the project will be online while the items listed above will be the columns of the table, including the possible impact of the project in relation to major international policy defined at the first summit in Rio 1992: adaptation to and mitigation of climate change, sustainable development, biodiversity preservation, fight against erosion and desertification[19].

Each cell in the table could be a representative number (0, 1, 2 or 3) as estimated by the partners. Despite some inevitable subjectivity, this table could provide a shared vision of all FOR CLIMADAPT project activities.

	Biodiversity	Erosion	CO2 Air	CO2 soil	Water quality	Water supply	Fire control	UN conventions	Other
Project actions	Marked: 0 to 3 ...								

4. Possible responses of forest entities for adaptation to climate change (Umbria Region, CTFC, ONF, ADPM, North-Aegean region)

Innovative forestry practices, at the plot level or on a massive scale, aim to improve the **resilience** of forests, that is to say the speed of return to the initial state after a disturbance.

Water Conservation and Resilience

Water saving and resilience are major concerns, both at stand management level and at installation. Partner work in this direction raises several questions:

- The density reduction by thinning, bush clearing or pruning is proposed (ONF project) to reduce water consumption and conserve it for only specific species. However, some researchers believe that the growth of the understory caused by thinning offsets the loss of trees cut[20].

- Is the actual forestry approach of conserving bouquets ("group selection") in Umbria better than clear-cutting of bushes in the same site context?

- The "dry-farming" techniques of Mertola, that is to say, the establishment of trees and shrubs along the contours, separated by strips ploughed and hoed frequently seems adapted to this particularly difficult semi-arid context. A choice of various species of large and small timber should provide a good resilience.

- Environmental engineering devices, for occasional actions against erosion (experience from Vesuvius) could be useful for soil conservation and their potential production as well as water resources in sensitive areas.

- Is the enrichment by introducing deciduous trees in pine monospecific stands (Catalonia) conducive to the overall production of the ecosystem and its resilience?

Reducing combustibility

Modifying the structure by creating *vertical and horizontal discontinuities in plant fuel* is a recognized means to limit the spread of fires, in particular crown fires, which are the most dangerous. This is what is being done in the context of the experiments in Umbria, in Catalonia and in Greece.

Choice of species

Change will be gradual (slow increase in average temperature), which requires adaptation largely based on genetics and selection of locally resistant species (intrapopulation) or from the southern ranges (specific variability). This is being discussed in France (ONF pilot activities in the Aude[21]) in the context of a seed usability test of Atlas cedar from different sources in a reforestation project.

All partners are concerned about the forest species they must manage because they are present on their territory; sometimes adapted, sometimes vulnerable to climate change, or by reforestation species that may offer a good alternative to local species and / or supplement them (enrichment of stands) to improve forest resilience.

A **summary table** of all these species of trees or shrubs used

by the partners will be developed. In addition to the name of the species and provenance, a focus on the reasons for their use in a particular context is required. Genetic issues should come to light. Note that we should not be limited to trees and shrubs, but also include scrub plants (*Phrygana*, etc), especially those used in the reconstruction of stands.

Risk mapping and fire spread models

At the massif level, rather than stand level, foresters can provide diagnostic **mapping** and action planning.

This is the case of fire risk mapping (hazard + vulnerability) developed by the Umbria Region (see Report of the plenary session). Logical extension is planning fuel breaks whose locations and procedures are optimized to make best use of the financial efforts of the owners, in particular local authorities and the state.

The **fire spreading models**, such as those experimented by the North Aegean Region, are highly efficient modern instruments used to determine the best locations for preventive actions, as well as choosing the size and forestry equipment more directly committed to fight fires.

This is also the case of forest dieback maps made by some regional observatories, including the Alpes-Maritimes one in France. These maps define stands with the dieback level as a guide to future urgent actions for exploitation of wood and reconstruction of stands, but also to monitor the development of these phenomena and to analyze factors.

5. Shared governance (Umbria Region, North Aegean Region, ADPM, CTFC)

Climate change should not be a concern shared only by ecologists or foresters. In our often quite complex social systems, marked by a long history of territorial use, it is clear that the conditions for successful collective action concerning particular issue is the proper adoption of the project by all categories of stakeholders involved, and not only research entities, administrations or sole proprietors. This is one of the main conclusions of the Med QUALIGOUV project, which has just ended[22].

The "public" communication project recently conducted in Umbria (information leaflet, opinion survey, feedback meeting, reformulation of conclusions in groups) seems quite exemplary in this regard. Mapping the territory (here, the fire risk) has proved to be an excellent tool for communicating with local populations. Some participants went as far as making themselves available to participate in the monitoring of fires! The rules of caution in the use of forests and the rapid and spontaneous involvement of populations in incipient fires may be an effective barrier against the increasing expansion of areas susceptible to fires.

The Umbria Region also reported a high use of wood energy in rural areas, but using often inefficient heating equipment (including traditional fireplaces). Strong policy action should be encouraged, through tax incentives or other systems, like the installation of more efficient fireplaces or furnaces.

We may, in this context, be inspired by the experience of stakeholders' groups conducted in the Alps, within the FORGECO project[23] .

Other information communicated to the Peer group

National and / or regional approaches to forest and climate change adaptation

The specification summary proposed by Teresa Baiges (CTFC Peer group's member) was presented and discussed, in particular the "water balance" of native species. The data must be relativised, and especially completed.

Myriam Legay also proposes that we refer to Appendix 9 of the EFI (European Forest Institute) report coordinated by Marcus Lindner, entitled *"Impacts of climate change on European forests and options for adaptation"*[24].

Publication of a special issue of the journal Forêt Méditerranéenne

Denise Afxantidis, of the French association "*Forêt Méditerranéenne*" (Mediterranean Forest) proposes the publication, with a possible transfer of budget balances from the North Aegean Region, a special edition, in French and English, of the "*Forêt Méditerranéenne*" (Mediterranean Forests) journal, that could replace the Final capitalization book of FOR CLIMADAPT. This would contain, on the one hand, various **thematic contributions** written or co-written by the various project participants (partners or peers), and other self-assessments of pilot activities by respective partners. The readership would be greatly extended compared to a conventional Final capitalization book, given that final distribution of the latter would only be limited to the respective networks of the project partners.

The Peer group would in some ways become the "Reading Committee" for this future special issue. However, the decision of the Steering Committee and the approval from the STC would be required before going further.

Extending the FOR CLIMADAPT approach beyond the partnership

The project was presented by the AIFM at several international events, and more particularly:

- The International "Tackling climate change…" Conference organized by the GIP Ecofor in Tours (France) from May 21 to 24, 2012. The AIFM was invited to present the FOR CLIMADAPT project during the closing plenary session to a large audience of researchers and other forestry professionals from many countries.

- The Final Conference of the COST FP0701 Action "Post-fire management in Southern Europe" on March 27 and 28, 2012 in Thessaloniki (Greece), where the AIFM was also invited because of its activities in the project.

In addition, several institutions such as the AIFM, the "Silva Mediterranea" Committee of the FAO, the French Agency for Development (AFD), the German Cooperation Agency (GIZ), the international "Model Forests" network, the CTFC, and even the EFIMed would be willing to work with countries gathered under the acronym MENA (Middle East and North Africa) on the theme of the adaptation of forests to climate change.

Thus, the Mediterranean Forest Week, in which the AIFM is involved in the organization, is an intergovernmental conference, including representatives invited by the various governments of states from around the Mediterranean. Posts made will have a certain political impact, aiming at the emergence of a shared discourse about specific issues concerning Mediterranean woodlands, often ignored by major international bodies. After Antalya (Turkey 2010) and Avignon (France 2011), the city of Tlemcen, in western Algeria, was chosen to host this international event in March 2013.

The main topics dealt with will be:

- Governance and local development.
- State of the art of climate change.
- Measures proposed for the adaptation of forests.
- Presentation of the state of Mediterranean forests, where the FOR CLIMADAPT project was demanded (two case studies on pilot activities of the National Park of Vesuvius and the ONF).

The FOR CLIMADAPT project, which will be almost complete by this date, could use the opportunity to be represented in a manner yet to be defined, if the partners wish, through a decision of the Steering Committee. A verification must be made with the Med Programme, regarding the eligibility of such expenditure in the budget.

The FOR CLIMADAPT project is included in the Portuguese national strategy in preventing climate change

Portugal, represented by Lucio do Rosario, used the FOR CLIMADAPT project work to build the National Climate Change Adaptation Plan and proposed elements during the international conventions on climate change (UNCCC) and desertification (UNCCD).

He also believes there is an opportunity to introduce our issues into the Mediterranean Forestry Program[25] which, for Europe, stretches from Portugal to Israel.

Two options are especially possible in this regard:

– A research orientation policy at the European level in 2020.

– Proposal for a Life + project: "Forest biodiversity in the European Union" (2013 - 2018).

These proposals are detailed in the Report of the closing plenary session (www.forclimadapt.eu, under "Publications").

Photo 16: Louis Amandier, President of the Peer group, presents the group's findings to the project partners during the closing plenary session.

State of progress of partners' activities after 4 semesters

Vesuvius National Park (PNV)

Actions carried out during the semester 5 (March-September 2012)

– ***Action 1***: Standardization of the application of bioengineering procedures and transfer of method to the Forest Service.

– ***Action 2:*** Fight against invasive alien species (27 plots in three sites located on different sides of Vesuvius). The main target species is *Robinia pseudoacacia*.

– Maintenance of the weather station. Measurements were carried out on February 16, April 25 and June 17, 2012.

Actions to be carried out during the semester 6 (October 2012 - March 2013)

– Objectives: Selection of permanent testing plots and communication activities for the distribution of results. For more details, refer to the section "*Vesuvius National Park Project*" pages 19 à 25.

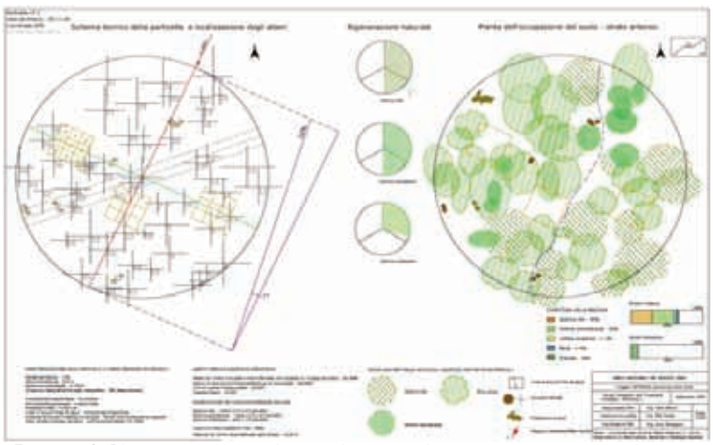


Figure 13: Plots for studying the evolution of the vegetation put in place on Vesuvius (see Report of the seminar 3 on the Vesuvius).

International Association for Mediterranean Forests (AIFM)

Actions carried out during the semester 5 (March-September 2012)

– Development and activation of the website www.forclimdapt.eu (news, events, Peer group etc). Modest attendance but steadily increasing.

– Publication and dissemination of project Newsletters n°2 (March) and n°3 (July).

– Linking the project with various initiatives concerning climate change and the forest.

– Presentation of the project at the International Conference "Tackling climate change: the contribution of forest scientific knowledge", organized by the GIP ECOFOR (www.gip-ecofor.org/) in Tours (France) from May 21 to 24, 2012.

– General Communication and dissemination of leaflets during various events (PROFORBIOMED Seminar, COST Conference in Thessaloniki, General Assembly of the AIFM etc.)

– Participation in the communication workshop, organized by the Med Programme in Marseille (April 2012).

Capitalization actions carried out during semester 5 (March-September 2012)

- Finalization and dissemination of the first Progress book.

- Drafting the Report of the 3rd and 4th seminars, centralization of partner's comments and diffusion.

- Supplement to the project initial state: creation of an "evolution climagram" of the project pilot sites.

- Monitoring and recovery of the Peer group activities.

Development of synergies

- Contribution to the preparation of the State of Mediterranean Forests: Intermediate between FAO, the author of the document, and potential partners as a case study.

- FOR CLIMADAPT has been integrated into the Cluster "Integrated and sustainable management of natural areas and resource in Mediterranean", formed at the initiative of the AIFM in order to respond to the call for proposal of capitalisation project of the Med program.

- Various actions linking the project with close or similar initiatives.

Overall progress and key challenges encountered

- Lack of human resources (AIFM currently manages 3 MED projects[26], in addition to its normal activities, for only three full-time employees).

- Slight delay on Newsletters.

- Capitalization is progressing according to plan.

Actions to be carried out during the semester 6 (October 2012 - March 2013)

– Continuation of website development and publication of the newsletters 4 to 6.

– Capitalization:

• Continuation of the Peer group's activities in accordance with decisions of the latter.

• Preparation of the project conclusion (gathering of partners' deliverables, redaction and publication of the Progress book n°3 after seminar 5 and 6, preparation and redaction of the Final capitalization documents, etc).

- Continuation of the development of synergies (FAO, Med cluster, GIZ, Life projects in preparation, etc), particularly in view of the forthcoming Mediterranean Forest Week, co-organized by the AIFM, which will be held in Algeria in March 2013, and will address similar topics. AIFM will also present FOR CLIMADPT in the European final conference of the PROTECT project on October 10, during the Open days of Bruxelles.

- Overall planning of the project closure in cooperation with the Lead partner.

CTFC

1. Forestry treatments for fire-resistant forest structures (Dr. Míriam Piqué Nicolau)

Actions carried out during the semester 5 (March-September 2012)

1) Forest inventories before silvicultural treatments (site 1).

- Plot A (3 x 1 m): Fuel, average height, characterization of the litter.

- Plot B (20 x 0.5 m2): Shrub cover (%) and average height (m), herbaceous layer presence (%) and average height (m).

2) Inventory of fuel after silvicultural treatments (April). Samples of material on the ground:

- Fine dry fuel (layer in contact with the ground).

- Large standing fuel (coarse material).

- Fine standing fuel.

3) Laboratory Work (April). Establishing a typology of fuels (litter, grass, forest residue, shrubs)

- Dried / live material.

- Diameter classes <6mm / > 6mm and <25 mm / > 25 mm.

- Fuel load (kg).

- Humidity.

4) Value of data (May): Production of statistical studies to assess the impact of interventions on fire behaviour.

Conclusion : In all cases, the treatments delay a surface fire from becoming a canopy fire, especially if the wind is low.

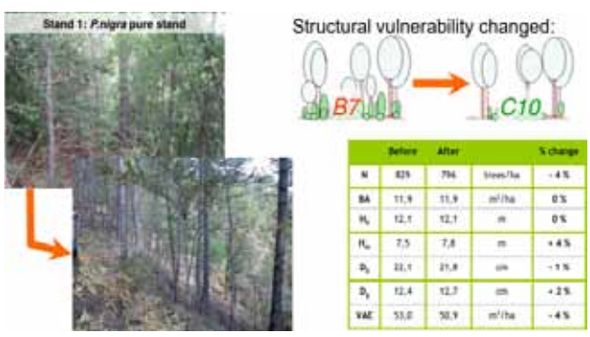


Figure 14: Inventory of fuel before and after silvicultural treatments.

Communication activities

Contribution to the field trip and seminar (Baronia de Rialp, April 23, 2012, more than 50 participants) organized by the Centre of forest ownership in Catalonia (CPF) about silvicultural treatments for the prevention of forest fires. Presentation of treatments and results from the pilot site to forest owners and forest managers from Catalonia.

Capitalization activities (initial results and conclusions)

– Compilation of bibliography on forest and treatments for the prevention of fires.

- Protocol for monitoring treatments.

- Simulation of fire behaviour using Nexus to test the effectiveness of treatments.

- Report on key features of the pilot sites and silvicultural treatments applied.

- Information on the implementation, harvesting and silvicultural treatment outcomes.

2. Enrichment planting (Lluis Coll)

Actions carried out during the semester 5 (March-September 2012)

Action 1: Study of vegetation dynamics

- Classification of forest cover (canopy).

- Assessment of changes in vegetation over 50 years and study of implications for forest management.

Preliminary results show a significant process of colonization and increasing density of mountain forests (particularly significant in the second half of the 20th century), with a considerable expansion of *Pinaceae* species. Currently, the forest continues to grow overall however, the distribution of species increasing in population has changed significantly between the periods 1956-1990 and 1990-2009, with a much weaker presence of the Scot pine and the emergence of Birch (see figure 15 below).

Action 2 : Enrichment of Pine stands in mono-specific Pine forests

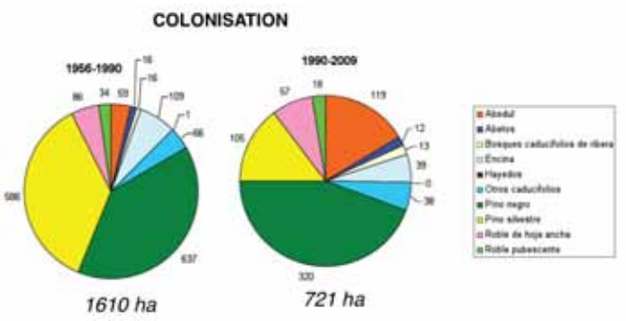


Figure 15: Evolution of the distribution of species colonizing the pilot sites between the periods 1956-1990 and 1990-2009.

– Monitoring and evaluation of the level of survival and growth of planted individuals. It was found that the mortality of Mediterranean species (*Quercus ilex, Quercus coxifera...*) is important at medium and high altitudes (1300-1600 m.). However, many individuals are able to produce shoots after senescence.

- Maintenance of fencing, installation of mini-meteorological stations and mortality monitoring (1st winter).

- Visit of plantations by Canadian researchers and students (University of Quebec in Montreal).

- Organisation of the seminar "*Disturbance and resilience in Mediterranean forest ecosystems*" (Solsona, June 8, 2012).

Actions to be carried out during the semester 6 (October 2012 - March 2013)

Action 1: Final Results / Report Writing

Action 2:

– Monitoring the survival and growth of plants.

- Establishment of germination tests.

- Communication and training activities on sites.

Organization of the 5th seminar of the project in Solsona in October 2012.

ONF (Jean Ladier)

Actions carried out during the semester 5 (March-September 2012)

– Pilot site Picaussel: Installation and initial measurements.

- Pilot site Callong: Failed germination of seeds from three sources. Raising seedlings in progress for 4 other sources.

Communication activities

– Installation of panels explaining the actions of the ONF in the framework of the project (see Figure 16 below).

Figure 16: Panneau explicatif mis en place par l'ONF.

Overall progress and key challenges encountered

– Failure of Cedar seed germination.

- Delay in the preparation of interim reports.

- Delay in certification of expenditure.

Actions to be carried out during the semester 6 (October 2012 - March 2013)

– Pilot site of Picaussel: Report on installation.

- Pilot site of Nans: Report on installation.

- Report on the state of the art of adaptive forestry in France to be finalized.

A visit to the pilot sites in the Aude, which could not be done during the first seminar of the project, will be held following the seminar 5 in Solsona (Catalonia), in October 2012.

ADPM (Paulo Silva)

Actions carried out during the semester 5 (March-September 2012)

Action 1: Diagnosis

- Diagnosis and observation of the Vale do Guadiana Natural Park territory: Report in progress.

- Survey on the perception of climate change impacts.

Action 2: Adaptive forestry

- Evaluation of techniques and species used in reforestation projects developed on the territory of the Vale do Guadiana Natural Park.

Action 3: Ecological restoration and reforestation techniques of degraded areas.

- Monitoring of an ecological restoration project focused on the monitoring and control of torrential erosion

Action 4: Awareness, training and governance for social adaptation to climate change.

- Awareness campaign for the attention of civil society on the impact of climate change.

First results and conclusions of the pilot actions

– High level of success in attempts to install stands of Quercus ilex (over 90%), which can be probably explained by the success of the mycorrhizal (Pisolithus sp.).

Photo 17: Awareness raising campaigns for the general public and students

- 100% owners have some knowledge in terms of climate change, but they need more technical information.

- Biodiversity higher in the new forest stands compared to old local techniques (especially cereals): 89 species of birds, 10 of mammals, 8 of amphibians, 5 of reptiles and 81 of plants, in an area of only 190 ha .

- Awareness raising of students from the municipality of Mértola on climate change.

Overall progress and key challenges encountered

- Pilot activities have been implemented as quickly as possible to achieve the initial objectives.

- Communication and capitalization activities progressing as planned, even a little ahead of time due to the early organization of the seminar in 2011, when it was originally scheduled for 2012.

- Important delay in entry of costs. € 56,714.33 were entered in PRESAGE and are actually being certified[27] .

Actions to be carried out during the semester 6 (October 2012 - March 2013)

Action 1: Finalization of the report

Action 2: Analysis of mycorrhization techniques and monitoring of soil erosion.

Action 3:

– Evaluation of a project of ecological restoration, monitoring and reduction of torrential erosion rate.

- Organization of training in ecological restoration with international experts.

Action 4:

– Completion of two workshops to introduce the example of restoration projects implemented in Monte do Vento and to generate reflection on their success and impact.

- Completion of two workshops focused on agriculture and climate change scenarios to assess the best practices for sustainable agriculture.

Action 5: *Promotion activities held at the pilot sites*

– Articles in newspapers, websites, brochures, radio announcements, games for children linked to climate change and the forest.

Action 6: Promotion across the Mediterranean region

– Publication of a book presenting the pilot site and the overall results.

North-Aegean Region

Actions carried out during the semester 5 (March-September 2012)

Action 1: Improvement and enhancement of risk maps.

Action 2: Student training in simulation programs..

Action 3: Monitoring the effects of plantations.

Action 4: Establishing standards - purchase of methods for the weather station.

Action 5: An expert from the region visited countries where prescribed burning is used (Spain, Great Britain, Slovakia).

Action 6: Reflection on the organisation of seminar 6 of the project in Lesbos (early 2013) in the presence of international experts.

Overall progress and key challenges encountered

A year after natural seeding, it appears that:

- The area, despite the terrible heat of the previous days, was waterlogged.

- The "*seedballs*" (balls of earth with a high concentration of seeds) that had been scattered early in the project have totally disappeared.

- Total absence of forest plants or legumes..

The supposed reason for the failure is that the soil is too compact. The water is stagnant and a crust forms on the surface. Tree species such as *Pinus brutia* and other shrubs are suffocated.

Regarding the implementation of prescribed burning, the major difficulty is to obtain a special permit from the National Fire Service.

The overall delay in the implementation of activities is mainly due to important changes in the administration of regional governments in Greece, as well as municipalities. The situation is gradually stabilising.

Actions to be carried out during the semester 6 (October 2012 - March 2013)

Action 1: Complete the development of maps.

Action 2: Complete training of students.

Action 3: A new attempt of reforestation will take place. In addition, an action aimed at promoting natural reforestation will be conducted, and a selection of tree species will be conducted using GIS technology.

Action 4 : Installation of automatic weather stations controlled remotely from Lesvos.

Action 5: Implementation of prescribed burning, with the permission of the Greek Fire Service.

Action 6: Organization of seminar 6 with the presence of experts in specific areas of forest restoration and climate change.

Notes:

11- Lichens, including *Stereocaulon vesuvianum*, the endemic species of Vesuvius, marks the recovery of vegetation after a lava flow. Sometimes pioneer species were introduced (Genet, Etna, Stone pine, Acacia etc) and, once forest is established, deciduous species appear.

12- For more information on the activities of the Umbria Region, refer to pages 26 à 34.

13- This information can be downloaded from the website www.forclimadapt.eu in the "Publications / Reports and capitalization elements".

14- A method of silviculture was developed in Provence to promote the renewal of the Aleppo pine in thickets.

15- See www.prosilvaeurope.org/

16- The final capitalisation documents of this project are available on request from the AIFM, or downloadable (reduced version) on the AIFM's website: www.aifm.org.

17-.See proposal of template sent by e-mail to members of the Peer group, September 12, 2012.

18- The document about the Mediterranean area is online on the project site: www.forclimadapt.eu

19- See the websites of the various Rio Conventions about this (UNCCC, CBD, UNCCD), available on the project site under "Useful Links" http://www.forclimadapt.eu/content/ useful-links

20- The hypothesis is validated by researchers, but only for a continental or Atlantic climate zone. It should be validated specifically in the Mediterranean area.

21- For the seminar 5 of the project, in Solsona (Catalonia, October 2012), the pilot sites will be visited by the partners. Detailed information will therefore be available in the report from seminar 5, and in the Progress book n°3.

22-For more information on this project, visit the website http://aifm.org/nos-activites/projets-de-cooperation/qualigouv.

23- FORests, management and ECOsystems,"From diagnosis to action: creating the conditions for sustainable and integrated management of forest ecosystems in the territories." See https://forgeco.cemagref.fr/ , including the first item in the "news" tab on the right.

24-Appendix 9 provides a typology of actions to adapt forests to climate change. See http://www.forclimadapt.eu/sites/default/files/Rapport 20EFI%% 20Linder.pdf, ANNEX 9: "List of grouped adaptation measures".

25- Approved at the session of the Committee Silva Mediterranea in 1992, the PAF-MED provides a conceptual framework to facilitate review by countries of their forest policy and planning, as well as to harmonize and strengthen cooperation in the international field of conservation and development of Mediterranean forests. See the site http://www.fao.org/docrep/x1880f/x1880f09.htm.

26-. One in particular is coming to an end: Med QUALIGOUV. For more information: http://aifm.org/nos-activites/projets-de-cooperation/qualigouv/.

27- The main difficulty concerns the language used in PRESAGE (French and English, not Portuguese).

Annex 1: Participants to seminars 1, 2, 3 and 4 of the FOR CLIMADAPT project

- First seminar: 30 of November to 3 of December 2010, Marseille [1]

- Second seminar: 20-22 of June 2011, Mértola [2]

- Third seminar : 22-24 of February 2012, Torre del Greco [3]

- Fourth seminar : 27-29 of June 2012, Perugia [4]

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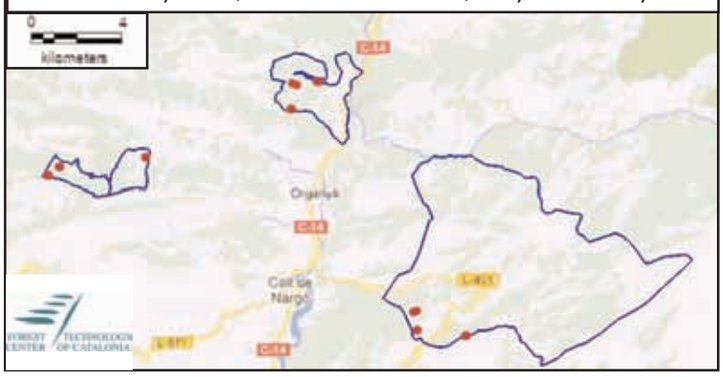
Annex 2 : Cartography of the pilot sites

Provisional maps of the different pilot sites of the project, waiting for more complete files from some partners. The definitive maps will apear in the Progress book n°3. Source of background maps: Google Maps.

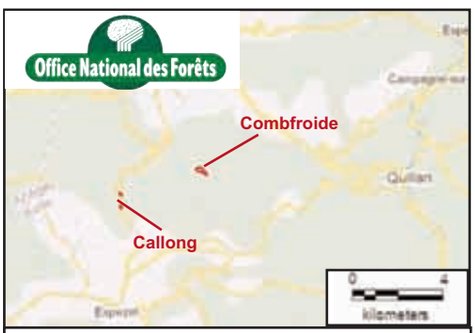
Umbria Region, Municipality of Arone

Catalan Pyrenea, forests of Fontanella, Alinyà and Senyùs



Localisation of pilot sites within the Mediterranean bassin

Catalan Pyrenea, Baronia de Rialb

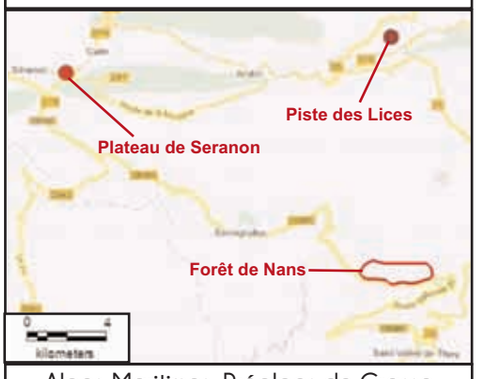


Aude, Plateau de Sault

N

Pilot sites

Experimental plots



Alpes-Maritimes, Préalpes de Grasse

For Climadapt

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L'Europe en Méditerranée
Europe in the Mediterranean

Natural Park Valle do Guadiana

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Project cofinanced by the European Regional Development Fund (ERDF)

For Climadapt

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