

Progress book n°1

State of progress of the project
after two seminars

31 November - 3 December 2010 in Marseille, FRANCE

20 - 22 June 2011 in Mértola, PORTUGAL



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Foreword

We have the pleasure to present to the friends of the forests from every Mediterranean countries, the first information about the activities progress of our partnership within the framework of the project MED FOR CLIMADAPT.

Soon arriving at half-time of the project, our method is to spread its echoes without delay. Indeed, in most of the cases, and not only that of scientists, people wait until the end of the process to collect and publish results of their projects. We prefer to expose, on the way, the progression of our activities, although it could mean to put on the light things that are still not achieved, and even maybe not begun yet.

We think that this corresponds to the spirit of the European MED cooperation programmes, which help to promote dynamic and productive partnerships, and in that, statutory, of the AIFM and its friends-partners.

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Caution

This volume constitutes the first 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 first and second seminars of the project which took place from 30 November to 3 December 2010 in Marseille and the department of Alpes-Maritimes (France) and from 20 to 22 June 2011 in Mértola and the Natural Park of Vale do Guadiana (Portugal).

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 (Göteborg strategy).

Four priority axes 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 positioned on the priority 2 and responds 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 "naturalness" 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 GIEC report, 2007).

However, consequences on ecosystems are already evi-

dent, 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 forest is seriously threatened, leading to perturbations on associated economy and biodiversity.

Action is undoubtedly and urgently required to adapt to these 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 report of capitalization. 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 ecological restoration 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 identifiable "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 recommendations.
- 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.

Eléments de 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.

Outils de communication

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...).

- 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).

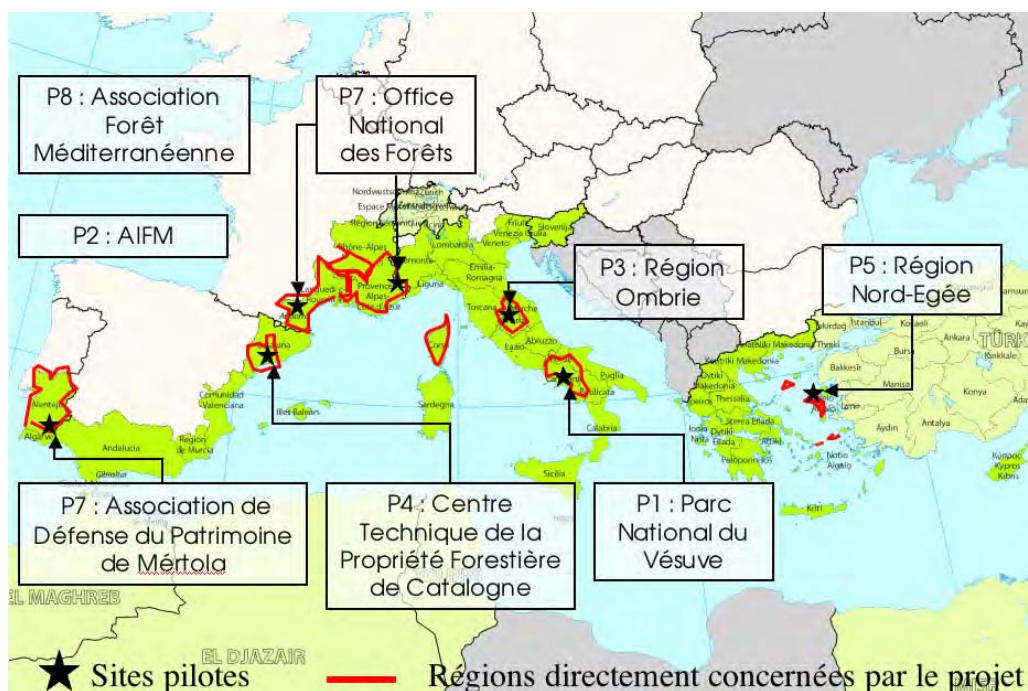
The partners' structures have an experience or are driving initiatives in connection with the problem of FOR CLIMADAPT project, within the framework of European cooperation programmes, or within the framework of specific actions.

Experienced partnership

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

- National Park of Vesuvius (Italy), Project leader.
- Region of Umbria (Italy).
- Forest Sciences Centre of Catalonia (Spain).

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.

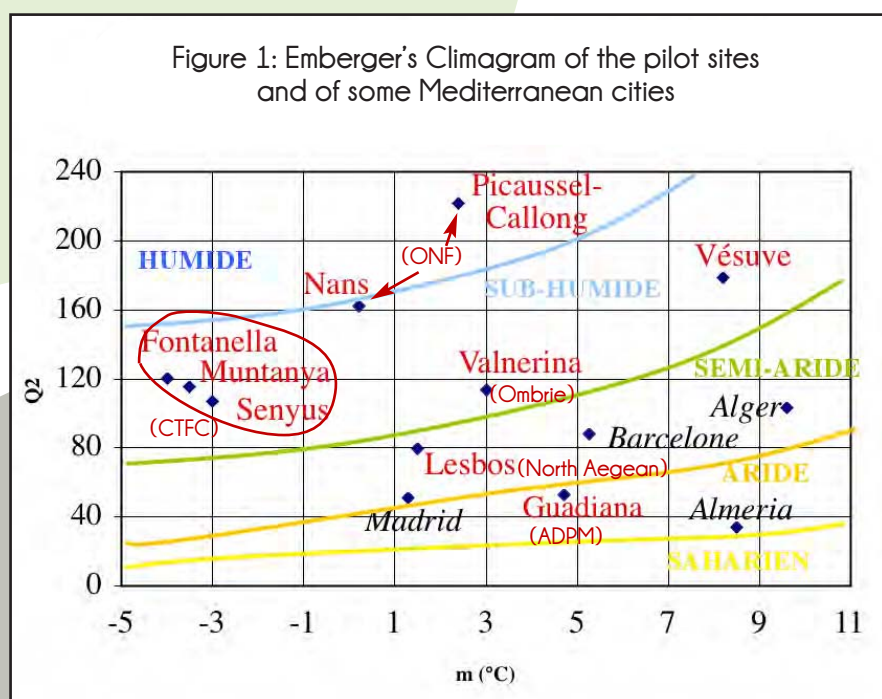


Figure 1 : Emberger's climagram identifies, at a glance, the general bioclimatic context of an area in relation to others.

Abscissa, m is the average minimum temperature of the coldest month ($^{\circ}$ Kelvin). Ordinate, Q_2 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/pnw/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 preserving the natural evolution of the ecosystems.

TERRITORY IDENTITY FILE	
Region or province area	Région Campanie : 13 593,54 km ² Province de Naples : 1 171 km ²
Population	Région Campanie : 5 831 461 (429 / km ²) Province de Naples : 3 068 604 (2620 / km ²)
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 / km ²)
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	Forêts artificielles dominantes (<i>Pinus sp.</i> , <i>Genista aetnensis</i> , <i>Robinia pseudacacia</i> , <i>Castanea sativa</i>) Peuplements purs et mixtes (<i>Quercus ilex</i> , <i>Q. pubescens</i>). Forêts naturelles à proximité du sommet (<i>Betula pendula</i> , <i>Alnus cordata</i> , <i>Populus tremula</i>)
Stand productivity	1400 arbres / 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 Inter-

reg III B projects Desertnet and PIT Vesevo - S26, some naturalistic 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.

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 1,3,000 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.

TERRITORY IDENTITY FILE	
Region or province area	8 456 km ²
Population	906 486 hab (107,2 hab/km ²)
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=initro_smb.jsp&id=56 } (Sécheresse et changements climatiques) POR-FESR 2007/2013 - Axe II, Activité a1), action 4

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/km ²)
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	<i>Quercus ilex</i> , <i>Pinus halepensis</i>
Stand productivity	Taillis matures : 156 m ³ /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, socio-economic 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 prevention 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

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.

TERRITORY IDENTITY FILE	Provence-Alpes-Côte d'Azur	Languedoc-Roussillon
Region's/province's name	31 400 km ²	27 400 km ²
Region or province area	4,9 millions d'habitants (156/km ²)	2,6 millions d'habitants (95/km ²)
Population	PIB = 26000 € / habitant	PIB = 22000 € / habitant
Global economic and social situation	Chômage: 10,8%	Chômage: 12,5%
	Budget régional 2010 : 1 800 M€	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: Narbonnaise, 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	

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 silviculture 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 exploitation, 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 fields 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 proceedings 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	<i>Forêt de Nans</i>	<i>Domaine de Picaussel-Callong</i>
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)	Espezel (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 3 m ³ /ha.an	Environ 500 arbres/ha Environ 5 m ³ /ha.an
Main role of the forest	Production ligneuse, accueil du public Pas d'activité pastorale	Production ligneuse, accueil du public 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% Faciès géologique: calcaire compact Matériau parental: grèze Type de sol: calcosol graveleux d'épaisseur moyenne, issus de grèze	Callong : altitude 1000 m., plateau Picaussel : altitude : 850 m., fond de vallon plat et pente moyenne 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.

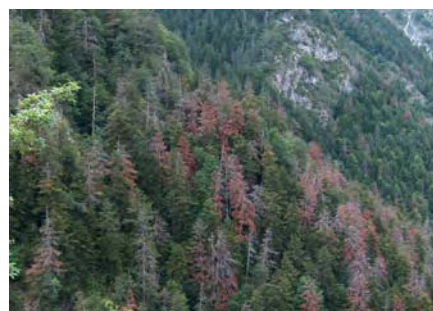


Photo 3 : Silver fir stands threaten of dieback process in the department of Alpes Maritimes (France).

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 threatening erosion in



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

areas affected by wildfire. Besides, the industry is under constant pressure from urban expansion, agricultural activities, illegal grazing and hunting.

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 polygon, there is a significant recovery after treatment. In dotted-lines polygon, a recently burned area (2006) regeneration 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 Mértola (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 particular 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 km ²
Population	125 066 hab (15/km ²)
Global economic and social situation	PIB/hab = 8900€ Unemployment rate = 11,5%
Institutional structure	Regional Departments that have some decision 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 - Direção-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 <i>Quercus ilex</i> and <i>Suber</i> , 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 activities) 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	<i>Natural Park of Vale de Guadiana</i>
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/km ²)
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	<i>Quercus ilex</i> , <i>Quercus suber</i> , <i>Olea europea</i> , <i>Fraxinus angustifolia</i> , <i>Populus alba</i> , <i>Salix sp.</i> , <i>Eucalyptus globulus</i>
Stand productivity	New projects (600 trees/há), <i>Montado</i> (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:

- Functioning 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 km ² (Lleida) 1,447 km ² (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. Sub-humid 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.



Map 4 : Localization of the pilote territory and the autonomous Region of Catalonia in the Iberian peninsula.



Map 5 : Localization of pilot sites in the Region of Alt Urgell.

PILOT SITE IDENTITY FILE	Site 1 : <i>Bosc de Fontanella</i> (Forêt de Fontanella)	Site 2 : <i>Muntanya d'Alinyà</i> (Forêt de Alinyà)	Site 3 : <i>Bosc de Senyús</i> (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	<i>Pinus nigra</i> (de 800 à 1200 m) et <i>Pinus sylvestris</i> (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		

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.

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 Méditerranéenne"



Contact : Denise AFXANTIDIS

Web site :

www.foret-mediterranee.org



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

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 beginning 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).

Project progress and partial results

Project of the association "Forêt Méditerranéenne"
First seminar, from 30 Novembre to 3 December 2010, Marseille

At beginning of the project the main activity for the association "Forêt Méditerranéenne" in FOR CLIMADAPT was to organize a symposium of international scope on the theme "Observe and adapt Mediterranean woodlands to climate change", as a continuation of the one it previously organised in 2007. Nearly 200 participants, who came from France and other Mediterranean countries, high quality interventions and a unique setting around the Provence-Alpes-Côte d'Azur Region, have made this a leading event in the field of climate change adaptation in Mediterranean forests.

We considered it necessary to initially cover the strong ideas of this seminar regarding observing and adapting forests to climate change by grouping them according to the 4 components of the FOR CLIMADAPT project (observation, adaptation, restoration and governance). Then, the main conclusions from the first day of the scientific symposium ("Integrating science and society to better assess climate change") and the workshop on the methods for transferring and communicating knowledge of 3 December will then be presented.

Note: The comprehensive content of the interventions is available in the folder distributed to the participants, as well as in the special issue "Observing and adapting to climate change in Mediterranean forests" of the magazine *Forêt Méditerranéenne* (Volume XXXII, No. 2, June 2011)¹. We will present some excerpts here (boxes) together with the main corresponding elements of discussions.



Photo 6 : Round table during the opening seminar.

Observe and adapt woodlands to climate change (Marseille, 1st December 2010)

Component 1: Observation and monitoring systems for ecosystem changes

Reality and perception of climate change

By Bernard Seguin, INRA and IPCC

During a symposium in 2007, the effects of several years of drought were clearly visible on forest stands. Now, however, the situation is no longer the same: the effects of droughts have been mitigated by a rainy year and media polemics about the reality of climate change have sown the seeds of doubt in people's minds. The political and social perception of climate change has been altered. (*Quelle réalité et quelle perception du changement climatique ?* P. 97 to 100).

2010 was the warmest year ever recorded worldwide. Since the 1990s, a drop in the average temperature difference has been observed, compared with the 10-year average. There was a significant increase in the average ETP, which rose by 100 to 200 mm per year according to the sectors, while rainfall was increasingly variable². These developments contribute to increasing the water stress for Mediterranean forest stands.

Observation network of the Unit Forest Health

By Bernard Boutte

Having the maximum amount of information on current trends will enable us to better adapt forests to climate change. Observation is essential and becomes a management act in itself. There are different networks for monitoring the state of health of the forests in France and especially in the Mediterranean region. The whole system enables monitoring over several time and space scales. (*Les réseaux d'observation du Département de la santé des forêts.* P. 119 to 126).

There are several international and European (Evoltree, for example: <http://www.evoltree.eu/>) and even French, observation networks. Each network specializes in a particular issue. For example, if you want to develop silviculture which can store carbon, you have to call on a type of specific network capable of developing corresponding management methods.

In the Provence-Alpes-Côte d'Azur Region, a "scientific culture network" has been established by the Regional Council. A website (<http://draaf.paca.agriculture.gouv.fr/Sante-des-forets>) on the health of forests has also been set up. One of the challenges is to ensure that the information reaches managers and users.

Three experimentation sites of the Mediterranean region.

By Thierry Gauquelin

The experimental site of the observatory of Haute-Provence attaches particular importance to better understanding and monitoring the evolution of the ecosystem of Pubescent oak woodland, subjected to climate change (*L'O3HP, Oak Observatory at OHP, un site expérimental pour l'étude du fonctionnement et de la biodiversité de la chênaie pubescente face au changement climatique*. P. 127 to 132).

O3HP is one of the three complementary experimentation sites in the French Mediterranean region, along with the one of Puéchabon in the Hérault and the one of Fontblanche in the French department of Bouches-du-Rhône. The latter follows the changes of a mixed forest of Aleppo pines and holm oaks. (*Evoltree, an European network to assess impacts of climate change on wooded ecosystems: case study on Ventoux*. By Guillaume Simioni and Roland Huc, P. 133 and 134).

Systems for monitoring and observing the forests have the objective of establishing an inventory of phytosanitary damage, to identify the causes, locate them, determine sensitivity or risk factors and follow their development in the context of global climate change. Each one works on specific problems and uses different methods and means.

So a system of forest ramps was positioned above the canopy at the O3HP³ site to adjust stormwater recovery. The phenology and the growth of the trees are closely monitored in order to assess any changes to some characters such as dormancy. An exhibition for the general public as well as an ecological trail with explanatory panels on the oak woodland, canopy systems, etc. have been put in place.

First results from the provincial Forest Health Observatory of Alpes-Maritimes.

By Guy Maréchal and Jean Ladier (ONF)

This article describes the history of the establishment of the Department of Forest Health observatory of Alpes-Maritimes and its initial results. It shows the political involvement of a department anxious to have a experimentation tool to better respond to local issues related to the effects of climate change on the forest, as well on economic, ecological and social levels. (*Veille sanitaire et dépérissement forestier dans le département des Alpes-Maritimes*. P. 135 to 140).

The dieback of stands is one of the major effects of global change. Trees take 7 to 8 years to recover from a situation of intense water stress. As there is a risk of this reoccurring in the future, it seems justified to continue the observation work in the long-term.

The ozone also causes significant damage, especially on north-facing sides and high elevation areas because the stomata are more open.

Impact of climate change on flora

By Michel Venetier and Christian Ripert

For some time we have noticed serious changes in the composition of Mediterranean flora. In addition, the compensation of the water deficit due to climate through favourable site conditions which, until now, permitted the survival of mesophile bacteria species is no longer adequate. The adaptation strategies for plants should permit temporary and partial resistance, but even the most optimistic climate scenarios will barely allow enough time for this strategy to be put in place. (*Flore méditerranéenne et changement climatique : la course-poursuite est engagée*. P. 141 to 142).

In terms of biodiversity, it seems that, to date, there have been few changes noticed in Mediterranean forests, which resists invasive plants fairly well because they evolved in a climate that requires capabilities for specific adaptations. The foreseeable changes for the Mediterranean flora primarily concern developing drought-resistant species (like Thyme) in mesophilic environments, due to increased episodes of drought.

There is also the worry of the effects of interactions between the different phenomena (a fall in summer precipitation, rising temperatures, extended drought period, etc.), which could cause much worse impacts than the predictions of the models which study them separately. Chronobiology is also a key factor to take into account. It is important to know vegetation periods and cycles in detail.

The results of Carbofor and QDiv projects (impacts of global changes on vegetal diversity), the questions raised and the progress with the project Climator.

By Vincent Badeau

Faced with climate change, forest managers are asking themselves several questions. The author highlights the various works being carried out to identify the relationships between the distribution of species and climate, in order to estimate how these distributions could be amended in response to different climate scenarios.

He also shows that it is necessary to link different modelling approaches in the hope of supervising future projections in a satisfactory manner. (*Les résultats des projets CARBOFOR* <http://www.pierroton.inra.fr/carbofor> *et ANR-Climator* http://w3.avignon.inra.fr/projet_climator/. P. 143 to 150).

Different adaptation strategies of species: phenology, physiology, morphology, genetic, migrating, etc.

By Roland Huc

Faced with the extended dry summer season linked to climate change, two strategies are used by plants: preventing water deficits and long-term deshydration tolerance. A vulnerability threshold appears from the relationships between species, habitat and bioclimatic region, information that is particularly useful when trying to select sources. (*Les réponses des arbres aux contraintes climatiques : aspects écophysologiques*. P. 167 to 172).

Trends of burnt surfaces with regards to meteorological changes.

By Eric Rigolot

Studies to establish a statistical relationship between forest fires and climate change do not currently exist in France. However during seasons with exceptional weather, prevention and control devices have shown their limits. Only Spain has carried out a retrospective study of the statistics of fires compared with climate records, which shows the changes in the existing rate of fires, related to an increase in the meteorological hazard of forest fires. (*Évolution des surfaces incendiées en fonction des changements météorologiques*. P. 213 to 216).

In terms of wildfire, the Météo France institute (French national meteorological service) regularly establishes ad hoc measures of the state of vegetation and risk. It then publishes a daily mapping based on specialist expertise. Météo France is open to (and requester of) any opportunity to improve its work. Fundamental research must however work in order to better explain behavior of fires (speed, propagation patterns, etc.).

The question is: "Was the period 2003-2007 really an exception, or was it evidence of changing climate?". In fact, there have been fewer large wildfires in recent years, but there is an increase in the average propagation speed (8 km/h on average in 2003) and of the virulence of the fires.

Component 2: Developing adaptive silviculture**General principles of adaptive silviculture**

By Myriam Legay (ONF)

Where are we three years after the symposium in 2007 and the first suggested guidelines for adapting silviculture to climate change? Myriam Legay offers a progress report of the reflections on this topic and the first operational measures: assessment of vulnerability, composition of stands, dynamic management, control of the impact of crises, monitoring effects, etc. (*Les grandes orientations d'adaptation au changement climatique : point d'étape*. P. 179 to 185).

The ECHOES network promotes the standardisation of approaches in order to obtain comparable results for Europe. However, because of the lack of resources, there are not enough sample plots and it is difficult to establish a direct link between the mortality of trees and the management methods because there is still not enough data. However, a general exacerbation of diebacks, particularly in un-cleared patches, has been noted. Silviculture would therefore, have a rather positive impact.

Managers however, still have inadequate resources and knowledge in terms of forestry to effectively influence water stress in forest ecosystems. We also need to be aware that management recommendations change in times of crisis. A guide on this subject will be issued shortly.

The ONF wants to create a network of sicultural facilitators to introduce technical developments in the field of forest management and to raise awareness among policy makers to the challenges of climate change.

Furthermore, the "Mediterranean Forest Technical Guide" (edited by Cemagref in 1995) is a useful model for the entire Mediterranean Basin, even though it was designed for the Provence regional context.

The leaf area index corresponds to the total leaf area of a tree or a forest. It plays an important role in the water balance of a forest. If the leaf area index goes down, rainwater interception and evapotranspiration will also fall. We can apply this in the field by decreasing the density of trees during markings or by low level clearing, while taking care not to take it too far.

However, it is difficult to establish a direct link between the leaf area index and water consumption because other parameters have to be taken into account. In fact when clearing, the development of the understorey consumes a significant amount of water and the water resource decreases by as much. A balance therefore needs to be defined according to the forestry context.

Myriam Legay (ONF) details the method of vulnerability diagnosis, which particularly enables the following:

- Developing an analytical approach for forestry stations (Dryade project, for example).
- Acting on the choice of tree species to change the composition of the stands.
- Reducing exposure to hazards by harvesting earlier (the trees are shorter and therefore less vulnerable to the wind) or even by managing the distribution of ages (lesser overall vulnerability to stress when the trees are of various ages, this is the case of the Sault forest in the French department of Aude).

It is important to make use of dieback populations as soon as possible so as not to lose the value of the wood. Sometimes this involves clear cutting whole stands, which may be poorly received by locals.

Local structures are getting involved: The Cevennes National Park has produced a catalogue of forestry stations. The Department of Forest Health of the ONF is in the process of drafting a guide on managing stands in crisis. However, according to Mr. Bonneau, because of flora changes, it will be increasingly difficult for them to be identified with the station catalogues. Geomorphic indicators, dominant height and leaf area index will probably need to be incorporated in future catalogues in order to provide reliable information on the soil's capacity to retain a useful water reserve.

Another adaptation route considered is promoting "mixed forests" (forest stands in which the 2 dominant species do not exceed 75% of the soil recovery, according to the French National Forest Inventory criteria) which present certain interests:

- Less vulnerability to attacks from insects, herbivores and mushrooms.
- Positive impact on biodiversity.

Mixed stands: how to regenerate and diversify forests for a better adaptation

By Bernard Prévosto and Christian Ripert

Faced with the new threats linked, among other things, to climate change, mixed forests have become a major issue for forest management.

The authors review the different benefits that these mixed forests could offer, particularly in the specific context of Mediterranean forests. But how do you create and maintain the mix? (*Les forêts mélangées en région méditerranéenne : quels bénéfices et comment créer le mélange ?* P. 187 to 196).

The procedures for establishing mixed forests are mainly:

- Mixed plantations (example of the Regefor workshop organized by the INRA).
- Introduction of species in a cleared stand.
- Regeneration cut.

Furthermore, according to Eric Rigolot, changing wildfire rates could have more impact than climate change itself. The adaptive measures must be based on forest work such as compartmentalising massifs, clearing and pruning, etc.

To sum up, several routes are open, but a great deal of uncertainty remains over the management direction to take to anticipate and adapt to the effects of climate change. The adaptations will struggle to follow the speed and brutality of the climate change conditions.

How is a newly forest fire-affected region organizing? Example of the Region Aquitaine

By Cécile Maris

The Aquitaine region has been particularly affected by major climate events, increasing the hazards facing forests. It is interesting to see how another region is preparing and organising itself to tackle the hazards, by incorporating concerns over climate change in its forest management.

(*Changements climatiques et gestion forestière en Aquitaine, Interrogations et recherches de réponses concrètes via le programme d'expérimentation CLIMAQ.* P. 197 to 204).

Component 3: Ecological restoration methods

In a mixed forest situated in the southern Alps comprising black pines and a varied hardwood understorey (rowan trees, maple trees), it is being maintained in favourable conditions, due to the cover of the dominant black pines. But when they are harvested or when they disappear, the understorey may not be capable of withstanding exposure to direct sunlight. To avoid a climatic accident that could potentially cause significant diebacks, some Mediterranean species resistant to water stress must therefore be favoured in order to compose a future stand adapted to new climatic conditions and droughts.

Climate change and impacts on Mediterranean forests.

By Bruno Fady

What can the forest trees and their ecosystems do in response to climate change which is here for the long-term? Like all living organisms, they can put in place three broad strategies: acclimatise, adapt and/or flee. In this article the author describes the different mechanisms of genetic adaptation to us and suggests reflecting on silvicultural practices enabling an adaptive management of Mediterranean forests. (*Les changements climatiques et leurs effets sur les forêts méditerranéennes : aspects génétiques.* P. 173 to 178).

In the field of genetic mixing, sometimes sexual reproduction difficulties are observed in a stand, a determining factor that the forest is able to adapt to changing conditions through the mechanism of natural selection. Bruno Fady recommends relying on the ability of species to adapt. He specifies that the strategy adopted by the manager will depend on the severity of the situation. For example the forester may just be content with opening up the stand in order to create spaces to facilitate sexual reproduction. He then demonstrates his suggestions with the example of the Mont Ventoux, where several local adaptation processes can be observed.

Jean Bonnier mentions the idea of marking carried out by using a genetic map⁴ of the forest stands to select the most resistant species and individuals, while exercising some caution over the exoticism of the selected species. Indeed, following the establishment of a Beech tree from southern Italy to help make up stands adapted to drought in Mediterranean countries with colder winters, many individuals, not very resistant to winter frosts, have died back soon after the plantations. Besides, the phenomena of hybridisation between exotic and indigenous species have been recorded. Plantations from exotic species are therefore possible, but they must be performed by taking all necessary precautions.

Component 4: Information, raising awareness and improving governance

According to a recent survey, more than 30% of French people do not believe in climate change. Furthermore, a significant proportion of the public is not convinced that climate change is due to the actions of man. Nevertheless, there is an urgent need to take the phenomenon into consideration, particularly in policies for defending forests from wildfire, and moving forward in terms of research on the issue.

There is, nonetheless, a strong demand from the public, which has to be responded to. However, if foresters are often the first people to be concerned by dieback, there is still little concrete demand from other groups of stakeholders.

But above all, there is a real need to translate the scientific results obtained by researchers into more concrete recommendations for managers, enabling them to better understand the complex issues regarding ecology, society and economy re-

lated to climate change, to anticipate and adapt to it. This implies a permanent interface between researchers and managers facilitating genuine dialogue and real sharing of information and their translation into management measures.

The research projects are mostly part of a strategic plan to develop forest management (including the research agenda for the Mediterranean forests promoted by EFIMED), in particular on issues related to adapting to climate change and the increased risk of fire.

The Associations "Forêts Méditerranéennes" and AIFM shall also endeavour to work on this, contributing to the creation of an integrated Mediterranean forestry strategy by setting up a substantial network of stakeholders, organising events and disseminating up-to-date knowledge on these issues. This is the main purpose of the FOR CLIMADAPT project.

Impacts of climate change and adaptation of woodlands: costs and adaptation measures in France.

By Pierre Bouillon

Are the expected climate change effects taken into account in policy drafting? The main results of the interdepartmental report have enabled an initial quantitative evaluation of the possible consequences of climate change on French forests. The first recommendations and actions confirm the taking into account of the phenomenon at national, and also European, level. (*Les impacts du changement climatique et l'adaptation des espaces forestiers : coûts des impacts et mesures d'adaptation en métropole*. P. 101 to 109).

Politically, there are several levels to consider:

- The European framework with projects such as COST ECHOES.
- The national adaptation policies of the different countries (National Plan for the Adaptation to Climate Change in 2011, for France, for example).
- Local planning documents: Territorial Climate Plan, Regional Plans⁵, Management and Sustainable Development Plan, Agenda 21, Protected Countryside Charter, etc.

For example, in the case of the Cevennes national park (with a total area of 350,000 ha), the "core zone" (with a surface area of 93,700 ha) has been determined in order to establish a compromise between conservation requirements and the ter-

Forest issues in the "Plan Climat" of the Pays d'Aubagne et de l'Etoile: from strategy to application.

By Jean-Marie Rame, Christelle Deblais and André Gortier

The urban community of the Pays d'Aubagne et de l'Etoile has made the political decision not to experience climate change and proposes anticipating climate change by establishing an adaptation policy. This territory is also exemplary in forest policy, because while using the existing tools at its disposal, it is opening up to the world of research and experimentation to try to concretely answer the many questions that remain. (*La forêt dans le Plan Climat du Pays d'Aubagne et de l'Etoile : de la stratégie à la mise en œuvre* P. 111-114).

ritorial structure. Thus, the indentations observed on the edge of the core zone of the Park are due to the inhabited areas, which cannot be part of it. The core zone includes various habitats and species and is estimated to be enough to develop a good network for monitoring the effects of climate change on ecosystems.

Increased risk of fire: How can a local authorities and combating units organize themselves on this perspective?

By Jean Labadie and Stéphane Farcy

Faced with the prospect of an increased risk of wildfire, John Labadie and Stéphane Farcy, respectively forester to the general Council of Var and Lieutenant Colonel at the Fire and Rescue Service in the same department, describe how their institutions anticipate the issue: reflections, new policies, strategies for intervention and first steps. (*Comment une collectivité et les services de lutte s'organisent-ils face à une augmentation des risques incendies ? L'exemple du département du Var*. P. 225 to 228).

Elected officials must listen to scientists and managers without being biased. For example, forest fires are often perceived as dramatic for forest ecosystems, while their role may, in some cases, be beneficial for vegetation and biodiversity. This is known by scientists, but the other stakeholders linked to the forest and even fewer elected officials and urban communities are aware of it.

It is necessary to support projects (management plan, research, etc.) and to create links between the various stakeholders (public and private) to decompartmentalise territorial policies, organise forest management and how the timber industry operates, and to optimise the distribution of operations in the territory.

A crisis is characterised by various thresholds. In several countries (Spain, France, etc.), the decline in productivity observed in forests marks the need to consider a new strategic approach to forest management. A "crisis unit" including stakeholders and decision-makers should be put in place to get the sector moving.

As regards wildfire, the increased water stress leads to an increase in the flammability of forests. It is an issue paramount to populations, hence the importance of prevention. In recent years, the burned area has decreased considerably as a result of efforts to combat it, but there has been a 10% increase in the number of outbreaks of fire, and a prolonged fire season.

Municipalities are responsible for fires. This requires growing resources, especially to install pipelines and fire terminals, revise local planning arrangements, establish agricultural and silvopastoral areas, intervention teams, etc. Very often, the population is not sufficiently informed. However, it is also part of the work of the local authorities who must act to raise awareness (educational documents and guides, etc.).

However, the priorities are difficult to establish regarding to other municipal competences (schools, housing, etc.). On the

other hand, people should be warned: "living on the shores of the Mediterranean Sea implies dealing with the risk of fire" (clearing, safety measures at home, chimney sweeping, etc.). The municipality cannot assume full responsibility for it.

Firemen estimates that buildings are often badly located, under-equipped or poorly adapted to intervention. However the potential damage can be greatly reduced in simple ways, by working on interfaces between the forest and buildings, for example.

Now, firemen are involved in drafting wildfire risks prevention plans as well as in the municipal planning for fire prevention and fighting. Furthermore, smaller (but greater number) of intervention units have been put in place in order to be able to act faster.

Foreign representatives are invited to outline their issues and their thoughts on adapting forest management to the challenges of climate change:

Cypriot foresters expressed their concern over the prolonged effects of droughts that their country experienced between 2005 and 2007, which resulted in a significant increase in mortality within forest stands on the fringe of their range, and by attacks of parasites (especially coleoptera). They called for a ten-year plan adopted in 2009/2010 aimed at preparing forest management to cope with the adverse effects of such drought episodes.

A Turkish representative expressed himself to highlight the concerns of the experts from his country. He wanted to continue to participate in this dynamic pooling of resources and ideas so that European observation and research networks could be extended to Turkey. This would lead to coordinated monitoring and the communicating of advances in terms of forest management on a Mediterranean scale. Lastly, he welcomed the research programme initiated by EFIMED for the period 2010/2020, which he feels is very beneficial for Turkey.

Important work is being done in Greece to raise awareness in schools and colleges, as well as to develop on-going training. A long-term project but which seems to be a good solution.

Integrate sciences and societies for a better assessment of stakes related to climate change

(Marseille, 30 November 2010)

Contributions of citizen science in the relationship between science and society

By Daniel Mathieu

How do you make society understand the issues related to climate change? How do you anticipate misunderstandings and conflicts of analysis and perceptions? How do you leave the debate between "insider" technicians, to be able to discuss it and talk about it with the general public? When the need arises for populations to be aware of the risks, the development of citizen sciences is a way of making citizens active. In fact, integrating the sciences of nature and society become indispensable to better assess the issues related to climate change. (*Observer la nature, une problématique de "science citoyenne" ?* P. 115 to 118).

Theme 1: Participatory and citizen consulting research ("bottom-up" approach)

Some climatologists like C. Fitzer (Switzerland) have researched representations of their climate and their natural environment by contemporaries from different eras, in historical texts (travellers stories, literature of the era and administrative documents, etc.). However, the random nature of keeping local archives make this method erratically effective, although notarial sources or even parish registers sometimes provide additional information.

A variety of initiatives have been taken by various research organisations to integrate the knowledge of stakeholders in the field and from civil society. In fact, any individual who has a use, whatever it is, for nature or the forest, sparks an observation. It is therefore important for institutions such as the National Institute of Agronomic Research to establish a dialogue and enter into discussions with civil society.

Thus, the National Museum of Natural History in Paris has launched a participatory research project, in particular inviting the botanists network Tela Botanica to participate in developing protocols that satisfy both scientists and nature lovers. Furthermore, the administration of Tela Botanica stands out by the absence of botanists as such. The knowledge available is the result of the massive participation of its contributors. It is about creating links between individuals to extract and act on this knowledge.

The advantage of a network dynamic lies in the fact that the pursuit of individual interests contributes to satisfying the collective interest.

Sometimes, researchers, and nature lovers must work together, without any exclusivity.

Theme 2: Forwarding knowledge to civil society ("top-down" approach)

The needs are also important for passing scientific knowledge on to stakeholders in the field (tools and work methods, etc.) and to the general public (raising awareness and education, etc.).

In the first half of the 20th century, the naturalists already had some awareness of the fragility of ecosystems, as demonstrated by the creation of IUCN (International Union for Conservation of Nature) in 1948. The associations are now the main bridge between science and civil society. However, young people do not have adequate access to in-depth awareness-raising about nature and the environment in the framework of public education⁶.

As for foresters, they need documents like "how to repopulate forests", including concrete and applicable recommendations and tools.

There are significant distinctions in terms of perception and awareness-raising. For example, foresters are particularly aware, because they are used to long-term thinking (wood is only obtained after a long period of growth of trees, so they are afraid of losing the fruit of decades of working and waiting), as well as grape growers who see the date of harvests progressively move forward.

For the general public, the information is contradictory, and not in-depth enough. The media, looking for sensationalism, use any resources available to them. In such a climate, it is very difficult for mass citizens to have a clear opinion.

Theme 3: Interdisciplinary approach and network dynamics (horizontal approach)

Network dynamics integrating the various scientific disciplines with respect to climate change, seems to be developing.

Interdisciplinary approach (dendrochronology, geography and botany, etc.) is paramount in the research or development programmes on climate change expectations.

In fact, we tend to focus on the impacts on ecosystems and on adaptation possibilities. Few impact studies (particularly socio-economically) have been conducted on the practices potentially caused by these adaptations.

In a lot of great institutions, such as the National Institute of Agronomic Research, specialists from each discipline are working on the issue of climate change. A meta-programme has therefore been established to focus the data on climate change. This should enable a multidisciplinary response to be constructed to tackle the major challenges posed by the phenomenon.

As regards Tela Botanica network, people do not know each other have diverse specialities and a very varied level of involvement⁷, but the system works well. The establishment of a cooperative company (SCOP) has been a good solution for conducting the network's activities.

Sociologists are increasingly integrated and less pure research is being done. However, the creation of specialist agencies, and the establishment of measures to support the associations that invest in it, is urgently needed.

Theme 4: Translation in the field and governance

Some overall recommendations and concerns:

- The importance of an approach by user type because, if things are taken globally, we are faced with indifference from the public.
- Climate change may cause an increase in the productivity of forest stands, but, on the other hand, plants release more CO₂ because of water stress. It is a complex problem.
- We have to work with specific scientific tools to propose relevant management approaches to public institutions in the long-term. But beware easy solutions: "I am not green because I sort my waste".
- What about the idea of a "Tela Climatica"?

A few examples of participatory exercises:

- The municipality of Correns (Var) has incorporated its intentions in the area of climate change into its Local Town Plan. The stakeholders of the municipal territory have been associated with the development of the SCOT (Territorial Coherence Plan) "Provence verte" and the creation of an Agenda 21.
- Actions carried out following the industrial disaster of Feyzin, which has provided remarkable results in a severely stricken city.
- The "Clim'Adapt" project aims to adapt the agriculture in the Alps, including working on the perception of farmers, sociology, etc.

Furthermore, projects like ECHOES, CLIMATOR or CARBOFOR, are giving rise to reports by country to supply a database containing possible adaptation measures.

Finally, it should be remembered that there is no miracle recipe: consultation and dialogue can only be gradually improved⁸.

Workshop “Methods of transfer and communication of knowledge”

(Marseille, 3 December)

Denise Afxantidis, General Secretary of the association “*Forêts Méditerranéennes*”, explains that this workshop is an important time for establishing a network of international stakeholders in adapting forests to climate change. It was also an opportunity to establish a direct link between the Mixed Technology Network (RMT) AFORCE⁹ and the FOR CLIMADAPT project to widen the network and provide a platform for exchanges on Mediterranean forests.

Olivier Picard defines the theme of the workshop as a dynamic of “co-construction in research and management”. Climate change is a complex problem, to which there is not currently an overall solution, but which requires a rapid response. Trainers need concrete and transferable tools to tackle this problem.

The following conditions are needed for a successful transfer:

- A proactive state of mind shared by researchers and developers;
- Get to know each other, exchange and share ideas with one another.
- Be open to innovation and mobility.
- Have places to meet, to exchange ideas and for co-construction.
- Have the tools, materials and resources.
- Avoid being binary (researcher/manager), but play on the multiplicity and the complementarity of the stakeholders in order to establish a truly cooperative approach.

1. A few principles of education and communication in the context of knowledge transfer

* Sciences didactic and Education in Sustainable Development : processes and stakes.

By Pierre Clément, professeur honoraire à l'Université Lyon 1

A UNESCO report assigns very broad fields to Education in Sustainable Development (ESD), ranging from combatting poverty in respect of human rights, biodiversity or even climate change. That is why the trainer must have a critical and holistic spirit, as well as an ability to improvise. For instance, he should ask himself whether indefinite economic growth is really compatible with the concept of sustainable development as it was defined by the Brundtland report in Rio in 1992. The solution may lie in a concept similar to that of “Sustainable Degrowth” issued by Serge Latouche in 2006.

Everyone constructs not only their own knowledge, but also their world, their “*umwelt*”, which they can perceive and on which they can act, both materially and intellectually¹⁰.

The same place, the same time, the same word, the same message... never has exactly the same meaning for each one of us because each of our background is unique and it permeates the way we perceive things. Indeed, some things seem familiar to some people but are totally foreign or abstract to others who, nevertheless, work in the same area.

Thus, a multiplicity of stakeholders interacts in relation to Mediterranean forests: forester, hunter, botanist, walker... Each has its own representation of the environment, more or less compatible with that of the other. One of the challenges of education or transfer of competence is therefore to “get the *umwelts* to interact” by relying on shared values and concepts.

The KVP (*Knowledge, Values, Perceptions*) approach¹¹ may bring a lot to ESD because there are common features:

- An interdisciplinary, systemic and holistic approach.
- Scientific knowledge not always stabilised (global warming, intervention in natural environments, etc.) supervised by experts.
- The objective is to generate actions and current and future social practices based on educational values.

However, the nature of the values (and the practices they underlie) merits more specific discussion.

In fact, it is proved that the notion of man's place in nature, the level of urgency of the environmental situation or even the introduction of genetically modified plants, varies greatly from one country to another.

This can particularly be explained by:

- different levels of economic wealth;
- different conception of the world: more anthropo-centred (use) or eco-centred (preservation);
- stronger religious beliefs and practices in the south;
- but also more macho, xenophobic and homophobic ideas.

For Jean de Montgolfier (AIFM), the awareness of this diversity of perceptions of the forest while constructing a collective management vision was a primary concern of the QUALIGOUV project. He notes that it has not always worked well.

Céline Perrier (RMT AFORCE) believes that the difficulty of rewriting a global vision is a characteristic of our society. Everything seems fragmented. Even professors dig their heels in when asked to make an effort to introduce multidisciplinary aspects in their teaching. Moreover, there is still not a Mediterranean group nor a common position clearly established on the international scene. We must continue to work on it, to promote good practices so that they may catch on.

II. Transfer examples

* The example of Mixte Technologic Network AFORCE ("Adaptation of forests to climate change")

By Céline Perrier, coordinator

The climate changes reported raise many questions among foresters, particularly in terms of adapting management methods. To anticipate these changes, forest managers have provided their questions for research. This approach has helped to highlight:

- The need for frequent updating of knowledge.
- The need for clear recommendations.
- A slow transfer, due to a gap between researchers and managers.
- Dispersed, poorly coordinated actions.

Faced with this situation, the foresters have deemed it necessary to create a forum for exchange and consultation, which contributes to coordinating actions in favour of adapting forests to climate change and which provides managers with the operational tools to help them in decision-making. Created in October 2008 for a period of 3 years, the Mixed Technology Network (RMT) is financially supported by the French Ministry of Agriculture.

Some of the actions carried out by the RMT in favour of knowledge transfer are as follows:

- Identify needs.
- Gather and disseminate information in an accessible form.
- Update knowledge based on recent scientific advances.
- Encourage interdisciplinary and inter-institutional meetings and exchanges.
- Provide tools and concrete information.

Thus, the Mixed Technology Network plays a part..

- As a trigger by initiating and supporting the transfer process.
- A unifier by ensuring cohesion between partners, strengthening

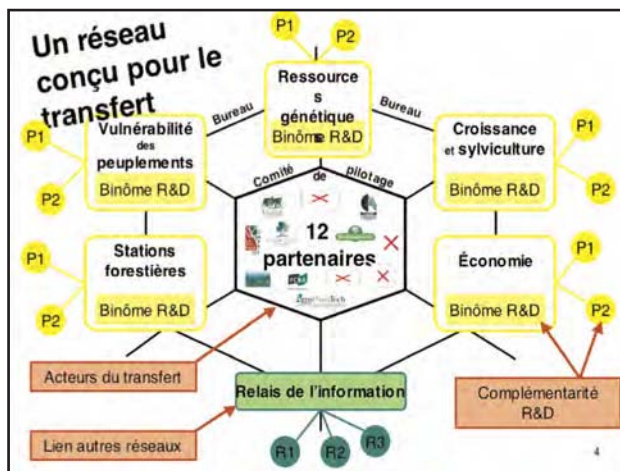


Figure 2 : Organigram of the Mixte Technologic Network AFORCE.

ening links and group dynamics.

It contributes, as far as possible, to furthering reflection, changing practices, promoting the assimilation of knowledge and increasing the capacity to integrate innovation.

* ConCert European certification of forest workers' competences

By Christian Salvignol, Head of the Forest Centre of the Region Provence-Alpes-Côte d'Azur

In the recommendations resulting from seminars, the innovations are only of interest if they are implemented in a practical way.

The entire forestry/wood sector indeed relies upon forestry entrepreneurs who harvest wood from forest owners and supply it to manufacturers. A team of specialists has written a guide to good practice to help these entrepreneurs, drafted under the aegis of the European Economic Commission to the United Nations, with a preface by the European Network of Forest Entrepreneurs, and published by the FAO.

It concerns writing a directory of competences and a joint training programme for all European countries, and preparing the system for issuing the ConCert certification to the forest entrepreneurs after training, or based on their background and experiences.

Deliverables and main achievements:

- A detailed training programme.
- A European body to award the certification.
- Recognition of professionals.

Some factors for success:

- Meet a real need by involving end users.
- Working in a network by choosing partners according to their competence and their own network. It is particularly important to involve a training partner and to ensure the ability of partners to sustainably disseminate the results, in several languages and to promote their use.
- Importance of the international dimension.

Dominique Micaux (ONF from the Aude) believes that, despite considerable training efforts, we always face the same problems: people who are under-paid and poorly supervised. In fact, the requirement of a level 4 diploma, required to obtain the ConCert label, is questionable and unproductive in his opinion. "We must simply say NO to the companies that neglect their management", he said.

*The *Communicoopération*

By Jean BONNIER, AIFM

The AIFM is fighting so that Mediterranean forests can be part of the concerns included in European environmental programmes. It has assumed the role of the technical organization partner in 4 major Interreg and MED projects, with the aim of developing interregional or international cooperation. An experience which has enabled it to form an important network and to develop effective methods in the field of knowledge transfer to:

- Acquire and capitalize on shared knowledge.
- Air new ideas and disseminate them.
- Communicate these ideas and methods to other stakeholders/networks and learn lessons for the future.

The first step towards an approach for communicooperation is local communication or internal to the project. In fact, you cannot communicate effectively with the outside world if you do not have good communication inside the project.

Consultation is not limited to the informed. It is a horizontal discussion aimed at constructing ideas shared by the various stakeholders concerned.

Communicooperation requires:

- A strong desire, facilitated by European programmes.
- An active technical operator with a network.
- Rules of play, leaving room for discussion.

The necessary processes for its smooth operation are:

- A standard programme (presentation, visit, debate, etc.).
- Records of specific visits and debates.
- Regular meetings which each involve work on capitalisation, proposals and putting into perspective.

Communicooperation must be integrated in the objectives and the resources implemented from the start of the project.

The distinctive feature of the AIFM is that its experience does

not come from teachers toward learners, but through the capitalisation and the dissemination of knowledge from populations and various stakeholders, fostering a shared vision and giving rise to transferable good practices.

For more details, refer to the article by Jean Bonnier which appeared in the magazine *Forêt Méditerranéenne* (Volume XXVII, No. 4, December 2006).

Conclusion

Each of these three methods has its own origin features and strengths, and responds to different needs:

- Communicooperation tends toward the co-construction of shared competences.
- ConCert method insists on the importance of moving beyond producing documents for managers to acquiring competences.
- RMT AFORCE strives to ensure the adequacy of the requests from stakeholders in the field with the objectives and the fruits of research.

It is important that these methodologies are used in a complementary way in order to contribute to improve balance in the field of knowledge transfer. This requires a diligent monitoring and evaluation system based on relevant indicators.

As the field component is important in this project, the translation of information into different languages must be ensured, without being limited to summaries.

To sum up, initiatives in the areas of awareness raising and training exist, but the exchanges between the various sectors remain inadequate. Regarding the requests from field stakeholders toward the research sector, some representatives believe that the returns are not sufficient, while others (the Institute for Forestry Development, for example) are swamped with requests.

Notes

- 1 - The page numbers, where the corresponding articles can be found, are listed at the end of each box, as well as the original title of the article.
- 2 - Source: National Observatory on the Effects of Climate Warming (ONERC).
- 3 - Oak Observatory of the Observatory of Haute-Provence.
- 4 - According to Bruno Fady, remarkable advances are being made in this area and this type of process will soon be accessible and more widespread.
- 5 - On 10 December 2010, the deliberation-framework No. 10-1554 related to the overall strategy for biodiversity in the Provence-Alpes-Côte d'Azur Region was approved by the Regional Council.
- 6 - A project conducted in schools in Finland consisted of conducting ex-

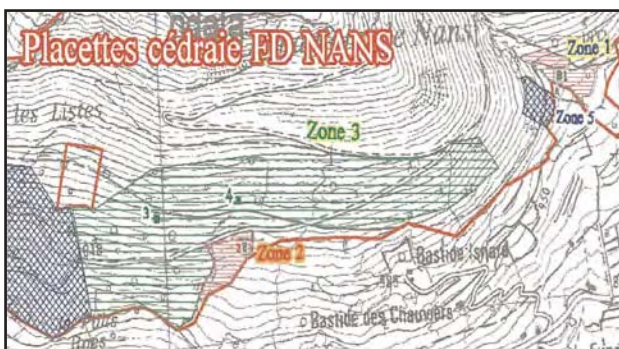
- periments on sustainable silviculture with the pupils. Prizes were presented to the best schools. Still a largely isolated example.
- 7 - Out of 100 members of the Tela Botanica network, 1 provides essential knowledge, 10 play a supervisory, correction or complementary role, and the remaining 89 are mere users.
- 8 - On this subject, the QUALIGOUV project has widely deepened reflection (www.qualigouv.eu).
- 9 - www.foretriveefrancaise.com/accueil-161899.html.
- 10 - The concept of "Umwelt" has been successively mentioned by von Uexküll (1926, 1934, and 1965), G. Cangulhem (1965), R. Campan (1980), P. Clément, R. Scheps & J. Stewart (1997)
- 11 - See Full report, which can be downloaded from the website: www.forclimadapt.eu.

Project of the French National Forests Office (ONF)

As a result of the symposium on 30 November and 1 December in Marseille, the FOR CLIMADAPT project team travelled to the Alpes-Maritimes, where part of the pilot sites for the National Forests Office (ONF) are located, to see the initial progress of the pilot actions, on the ground. They are mainly centred on the issue of forest stands dieback as a result of climate change. Some sectors are the subject of specific silvicultural measures (the public forests of Nans, in Alpes-Maritimes, and Collong-Mirailles in Aude), while others serve as witnesses (the Forest house sector, Listes trail and the Seranon Plateau). It is particularly about determining the best replacement species and silvicultural procedures which will enable the forests to remain in good health, despite the warming process.

Public forests of Nans (supra-Mediterranean stage): testing of adaptive silvicultural measures

The experimental plot is located in the Pre-Alps of Grasse, in the Alpes-Maritimes department, between an altitude of 1000 and 1100 metres (Zone 2 on the Map 6 below, clearly visible in the centre of photo 7). It is homogenous and extends over an area of 1.8 ha populated by Atlas cedar trees (*Cedrus atlantica*) planted in 1975.



Map 6: Zoning of different stands studied by the ONF as part of the Public forest of Nans project.

The aim is to test ways of managing fir trees suffering from dieback for their renewal, and their likely gradual replacement by other species, including the Cedar. The behavior of the latter is studied on the south slope where the climatic conditions are roughly equivalent to what they will be on the north slope (where most of the dieback problems are currently located) in 50 to 80 years from now as a result of climate change (rise in temperature of 3 to 5 °C).

Pierre Boyer, local manager in charge of the public forests of Nans, manages 441 ha purchased by the French State in the

early 20th century under the RTM (Mountain Land Restoration) programme. At that time, the slope was completely cleared of trees due to a strong rural presence (agriculture, grazing...). The ONF's forest management began in the 1950s and mainly consists of planting trees to fill the voids that could be wooded.

The choice of *Cedrus atlantica* was experimental and often quite controversial. The main cedar forests were planted in 1975, and then at the end of the 1990s (84 ha in total). This now enables there to be a diversity of stands especially as regards:

- the age of the trees;
- the exposure, fertility and soil quality/texture conditions (sub-soiling, terraces, presence of otherness, etc.);
- stand densities.

Different clearing treatments will be operated as part of the FOR CLIMADAPT project on the experimental plot (density of 1200, 600 and 300 stems/ha) in order to assess the supposed beneficial effect of low density silviculture in a cedar forest. The leaf area index, the water stress, the state of health and the growth of trees will be also carried out on these various stands (including on the experimental plot), in conjunction with the National Institute of Agronomic Research.



Photo 7: Overall view of the Public forest of Nans from the Col de la Faye. Tests of different silvicultural methods on young *Cedrus atlantica* stands on a southern slope.

Public forest of Callong-Mirailles (mountainous stage): testing of adaptive silvicultural measures

Situated at an altitude of 1100 metres on the Sault plateau, in the department of the Aude, it concerns a fir forest on the edge of distribution area, some of whose plots are showing diebacks or difficulties regenerating. The planned actions, complementary to those of Nans, consist of experimenting with various clearing treatments to check the effectiveness of low density silviculture in a Fir forest at ecological limit situation, and then to study the natural regeneration of the Fir tree, introduce Atlas cedars in open areas and monitor spontaneous renewal without fir trees.

In general, the Atlas cedar seems to behave well in these poor and relatively dry soils (south exposure, 45% slope, shallow soils, etc.). The oldest ones (35 years) are on average 12 metres high with a diameter of 25 cm.

Forest station and Listes Trail: testimony of local conditions of the forest stands

Here afforestation dates back to the 1950s, following the decline in agriculture (rural exodus).

The main species are as follows:

- The Black Pine of Austria (*Pinus nigra*), well-adapted, but there is currently a decrease in the density of the crowns (declining leaf area index).
- The White oak (*Quercus pubescens*), which is traditionally used as wood for heating and carpentry, has dry twigs and dieback marks.
- A few Atlas cedars (*Cedrus atlantica*) were planted at the same time and are in excellent health (28 to 30 metres). The regeneration is vigorous.
- About twenty Douglas fir trees (*Pseudotsuga menziesii*) in a restricted distribution area (but in quite a chilly small valley), which are showing signs of dieback in the treetops.

The advantages of the Cedar are as follows:

- It is about striking the right balance between the Pine and the Fir tree: it has a good ability to regenerate, while allowing other species to take hold.
- We hope to get logs from 50 to 55 cm diameter in just less than 100 years, but we do not consider them to be recoverable for 45 years.
- The high value of its wood, still barely recognised on the local market. But there is hope that it will be an interesting arrival on timber market in the long-term.



Photo 8: Seranon plateau. Stand of Silver fir trees on a northern slope, with signs of marked dieback despite vigorous regeneration which is encroaching on the Aleppo pine stands.

Seranon Plateau: a population of Scots pines colonised by the Silver fir

A part of the north-facing side has a stand of scots pines experiencing dieback in the lower part. Therefore, it is only valued for wood-energy, especially to supply the nearby wood chips plant (short supply chain, 3 to 5 euros a tonne). The general Council of the Alpes-Maritimes has supported the establishment of monitoring networks, as well as grants for the Municipalities to make use of dieback wood (15 euros/m³), which allows the use to be balanced.

The pine forest is relatively old and tends to clear itself naturally, leaving space for a large regeneration of the Silver pine. However, the pine forest does not really have a future here, because of the trends observed in these stands, which indicate a significant decline in the next few decades. On the other hand, the Fir tree has the disadvantage of preventing other species from taking hold because it does not let the light penetrate the understorey.

The following elements have been put in place to follow the developments of the stands:

- A scientific committee, which meets regularly.
- A concerted protocol for stands monitoring with accurate mapping.
- Monitoring plots.
- A mapping of the sectors prone to dieback.

The purpose of this work is to provide operational advice on how to better adapt to stand changes, especially for the municipalities which are the principal owners. No clear conclusion is currently available. However, it is assumed that a local policy favouring the Fir tree is not sustainable.

Concerning the replacement of the Silver fir, the primary solution envisaged is the Atlas cedar, which seems to have proven itself. The Corsican pine (*Pinus nigra laricio*) could be an alter-

native, but it does not typically grow in dominant limestone soils, such as here. As for the other species of fir trees, they pose genetic problems (risk of hybridisation between species *Abies spp.*) and would provide a lower-quality timber.

It will be difficult to reach clear conclusions by the end of a project as short as FOR CLIMADAPT knowing that phenomena with many factors that will be manifested in the long-term are being studied. However, the tests performed will help to stimulate reflection and add depth to management recommendations.

	Sapinière jeune <i>Young fir stand</i>	Sapinière âgée <i>Old fir stand</i>	Future cédraie <i>Futur cedar stand</i>
Préconisation Recommendation	Sylviculture à faible densité <i>Low density silviculture</i>	Remplacement par le cèdre de l'Atlas <i>Replace by Cedrus atlantica</i>	Sylviculture à faible densité <i>Low density silviculture</i>
Question Question	Efficacité ? <i>Efficiency ?</i>	Adaptation ? Provenance ? <i>Adaptation ? Origin ?</i>	Efficacité ? <i>Efficiency ?</i>

Figure 3: Recommendations and concerns according to the type of stand.

Debriefing of the field trip

A few technical remarks:

- As regards clearing, the long-term impact on the stand's growth will have to be studied. In fact, the benefits of less density could be offset by the development of concurrent interstitial vegetation.

- Measures of the water balance are still difficult to implement because they require information on the substrate, accurate meteorological information, etc.

- The relatively small size of the experimental plots makes the trends quite unstable and unreliable.

This visit has led us to a very particular terrain (mid-mountain) and it is not necessarily obvious to draw lessons for projects taking place in a different context.

Jean de Montgolfier draws a parallel with the QUALIGOUV project where each partner has done some interesting things but where a genuinely collective dimension was lacking: "If we really want to make things comparable between the partners, a clear definition of concepts is needed to develop a protocol..."

Jean Bonnier believes that we must try to have shared data, taking into account the diversity of situations enabling a freedom of action while relying on a global, shared vision. He also believes that all ideas should be released. "If we prevent ourselves from saying stupid things, we lose opportunities to say something intelligent!" The work of the peer group is to do the sorting, to discuss all the ideas and information available to establish a synthesis and "enrich the shared package" through knowledge or concrete and transferable tools.



Photo 9 : Debriefing of the field trip in the Auberge de Caille.

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

Scientific symposium “Forest and climate change in Portugal” (20 June 2011, Mértola)

The seminar began with a scientific symposium open to the public and to which local institutions and a few experts in the field of desertification and climate change were invited. The complete report is available at www.forclimadapt.eu.

Major impact of climate change in forests of Portugal, by Felipe Costa e Silva, Superior Institute of Agronomy

Two major trends were observed:

1. The reduction in the duration of the rainy seasons as well as dryer springs and irregular winters. The south and the east of the country are particularly affected by this fall in rainfall, creating favorable conditions for desertification.

2. Increased meteorological risk of wildfire throughout the country. The recurrence of devastating fires could make the forest unusable in certain areas of the country. On the other hand, with warmer and longer summers, the probability of the occurrence of extreme events increases.

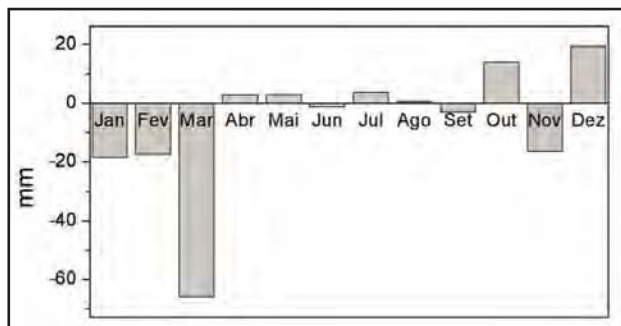


Figure 4: Change in monthly rainfall in Portugal between the periods 1941-1970 and 1971-2000.

Impacts on vegetation in Portugal

The Mediterranean region is a hot-spot for biodiversity, particularly sensitive to climate change. Portuguese forests could particularly suffer increased mortality of trees and the displacement of optimal geographical areas, causing profound and permanent damage to the productivity of ecosystems, and the fragmentation of natural environments.

The *montado* cork oak forest, a silvopastoral system typical of southern Portugal, is currently in decline due to the combined effects of the lack of water retained in the soil and the emergence of pathogens in the roots following several consecutive years of drought.

Impacts on the phenology

In Portuguese vineyards, the grape harvest has taken place one day earlier every year for the past three decades.

Certainly, we must not overlook the potentially beneficial effect of the increased concentration of CO₂ in the atmosphere on photosynthesis and vegetation growth. However, the benefits are mostly limited by the availability of another element, such as nitrogen or water.

Some species have a high capacity to adapt to new climatic conditions. The Maritime pine, for example, is able to develop a polycyclic growth enabling it to better take advantage of “climatic windows” (spring and autumn) which promote its growth. Other species, on the other hand, will tend to dieback.

In normal times, the forest retains more carbon than it emits. It therefore plays a vital role in regulating the climate. However, during the driest years, like 2005, it was noticed that the amount of carbon stored was significantly reduced, or even negative in some ecosystems.

Climate change and adaptation measures

The major adaptation measures are as follows:

- The improvement and/or the selection of the best suited species and genotypes.
- The adaptation of cultivation practices to a drier climate, and with more extreme events, by combating soil erosion and biodiversity.
- The adaptation of management measures to the increased fire risks and increased investment in prevention means.

The importance of Synergies between the 3 Rio Conventions: Biodiversity, Climate Change and Desertification, by Lucio de Rosário, National Forest Authority and National Action Programme to Combat Desertification in Portugal

The United Nations Convention to Combat Desertification (UNCCD) is the result of one of the recommendations of the Sustainable Development Action Programme (action 21) of the United Nations Conference for the atmosphere and for development, organized in Rio de Janeiro, from 3 to 14 June 1992. It was approved on 17 June 1994, and ratified by Portugal on 1st April 1996, and then by the European Union Council with Decision No.98/216/EC, on 9 March 1998.

According to the UNCCD, “desertification” corresponds to

the degradation of land in arid, semi-arid and dry sub-humid areas because of the influence of several factors, including climate change and human activities. Therefore, the profound links between desertification and climate change have been recognized.

World-wide phenomenon (particularly acute in the Mediterranean basin) the risk of desertification has increased considerably in continental Portugal. Arid areas represented 62% of the country over the period 2000-2010, compared with 36% over the period 1960-1990.

Adopting the UNCCD's principles for the 10-year Strategy 2008-2018, the National Action Programme to Combat Desertification (PANCD) proposal in Portugal over the period 2011-2013 was developed from January 2010 through a broad participatory process, involving more than two hundred institutions and a cycle of seminars and diversified workshops, on the general theme of "Examples of success in combating desertification". These workshops addressed both the question of the main symptoms, the solutions adopted and the systems that are the root cause (or result) of the desertification process resulting in soil degradation, drought and, finally, rural exodus.

The new PANCD¹ adopted a set of strategic objectives:

- The improvement of living conditions of populations in sensitive areas.
- The sustainable management of ecosystems in sensitive areas and the restoration of affected areas.
- The benefits and synergies in the process of adapting to climate change and managing biodiversity in sensitive areas.
- Governance of resources (mobilizing resources to implement the PANCD and the Convention to Combat Desertification).



Photo 10 : Wooded ecosystems such as montado have a great influence on the amount of carbon hold in soils.

Monitoring climate change in the Region of Bajo Alentejo: the Vale Formoso Erosion Experimental Centre, by Maria José Roxo, Faculty of Social and Human Sciences at the National University of Lisbon

Vale Formoso is located on the district of Mértola "Serra", 2 km from Vale de Poço. It is an old *hacienda* converted into a soil erosion experimental centre. The centre has 18 experimental plots, several meteorological stations and a laboratory.

It enables data to be collected, such as the water volumes and quantities of transported and suspended sediments.

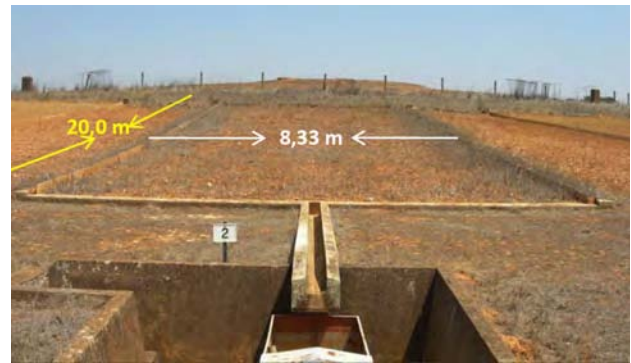


Photo 11: Plot set up and equipped with channels and trays to recover sediments to precisely measure the movement of the material.

The aim is to develop an initiation to soil conservation experimental programme based on:

- studies of soil behaviour under various conditions of slope, types of vegetation cover, crops and rotations;
- an analysis of the nature, intensity and duration of rainfall (average annual rainfall for the period 1931-2010: 540.7 mm);
- the determination of actions to be taken to conserve the soil and crops which occupy them;
- the validation of the effects of the usual use of the soil on the eroding phenomenon;
- the detection of faulty research system points;
- the identification of practices that preserve the soil.

Due to extensive experience of agricultural practices to conserve soil, the centre can contribute to the monitoring and modelling of the consequences of climate change by providing information and data on the ground over a long period, and through communication and awareness-raising among the public via educational sessions on the environment carried out on-site.

One of the main conclusions is that, the denser the vegetation cover and the forest is, the more important water infiltration will be, ensuring better resistance to dry episodes. Careful management of crop rotations, grazing, and use of the area in general (maintenance of the *montados* for example) to prevent soil leaching and erosion of the surface layers that constitute a non-return point of the desertification process.

- In extreme cases of broken ecosystem equilibrium, moving plantations towards more humid areas and replacing them with the most suitable species.



Photo 12 : Cork oak roots system.

II – The effects of climate change on the economic functions of the *montados*

By Inocêncio Seita Coelho

The main economic function of the Cork oak *montado* in Portugal is producing cork (annual turnover of EUR 400 million just for the Alentejo region). A study was conducted to evaluate the potential losses related to the impact of climate change on Cork oak stands.

By looking at the minimalist scenario, a 10% fall in cork production between two crops (10 years) by the combined effects of reduced areas and the slow growth of the trees, on a Cork oak stand covering 200,000 ha in the Alentejo region, the calculations assume losses of EUR 8 million for the owners and EUR 4.5 million for the workers.

If we introduce the dimension of breeding, the calculation is more complicated. In fact the *montado* is an extensive silvopastoral system, traditionally used at a rate of one pig per 1 to 1.5 ha. In the context of climate change, it is considered that the decline in the productivity of grazing implies limiting the livestock density to one pig per 3 ha (Holm oak stands) or 5 ha (Cork oak stands).

In the still minimalist scenario of a 1% fall in the production of acorns and grazing on a system of Holm oak *montado* of 423,000 ha, the potential annual losses would be EUR 105,750 for owners and EUR 743,634 for pig breeders. Once the product has been processed, the total losses for the region are estimated at EUR 1.4 million.

Note that the replacement of Cork oak stands by Holm oak stands would translate to a loss in the range of EUR 209.2 to 224.2 per hectare, per year, corresponding to the difference between the loss of income from cork and the gain in breeding. Cork oak acorns are actually hardly consumed by the pigs. However, they are consumed by the sheep. Herd diversification ex-

periences could therefore be pursued.

As we saw above, the Cork oak stand is much more sensitive to climate change. It therefore might not be appropriate to continue to reforest with Cork oak, despite the income that it represents for the region because of the increased dieback phenomena. We need to be inventive and seek solutions tailored to the different local problems in the current climate change situation.

Debates

The idea of a possible correlation between rainfall level and carbon storage has arisen. So, knowing the rainfall level, you could determine the amount of carbon potentially stored by the trees. However, the effectiveness of carbon storage is extremely variable since it is based on physiological factors. There are significant variations from one year to another. On the other hand, we know that some ecosystems such as grazing or eucalyptus plantations react more readily to meteorological conditions.

A distinction should be made between biomass production and carbon storage. "It is not because Eucalyptus grows rapidly that it fixes a lot of carbon" (Francisco Castro Rego). Such shortcuts can lead to dangerous policy decisions. Long-term monitoring would be necessary.

The Vale Formoso Erosion Experimental Centre is 50 years old. However, it has not been possible to perform continuous monitoring because some experimental devices have been temporarily damaged by bad weather. We can, however, state that the forest promotes the infiltration of water into the soil compared with other environments. On the other hand, it is important to involve the maximum number of stakeholders in the approach. For example, there is a significant need in the field of studying the impact of breeding on the environment, especially concerning the silvopastoralism systems such as *montados*.

Creating models that are designed to adapt forest management and agricultural practices to reduce the risk of wildfires has been proposed. As regards irrigated forestry, it would be difficult to justify it in the light of the few available water resources and the low priority level that this sector represents from society's point of view. Some believe, however, that the water resources of the region are largely under-used⁴, but the political will to make the most of it is lacking.

Lucio do Rosario believes that the genetic dimension is extremely important and that it has very clearly been taken into consideration in the guidelines.

All these questions frequently accompany the issue of governance. It should be noted that another MED project (QUALIGOUV) is currently in progress. It deals more specifically with issues of governance and quality of forest management in protected Mediterranean areas. It would be interesting for the projects to crossover and find synergies.

Maria da Conceição, a farmer from the montado, testifies:

As a producer, Cork oak is very important in my line of work. I hear talk of dieback, it is true, there are trees that die inexplicably. But I do not think that it is just down to climate change. Oak trees are planted in places where there is no reason why they should die, but they die nevertheless. Some researchers from the University of the Algarve also believe that there are other factors.

Be that as it may, I think there are too many specialists who concern themselves with not very important things or who are focussing on the wrong target, like a doctor who treats the right arm when the left arm is injured! I believe in the commercial potential of Cork oak and I don't understand why we continue to promote pig breeding by replacing Cork oak with Holm oak, although the number of Muslims in Europe is increasing! There are inconsistencies in the policies.

Conclusions, by Francisco Manuel Cardoso Castro Rego, Applied Ecology Centre Professor Baeta Neves, Superior Institute of Agronomy, and Teresa Avelar, Office of Policy Planning from the Ministry of Agriculture and Rural Development.

The Mediterranean region is particularly vulnerable to climate change and this will increase desertification factors⁵. The difficulty of adapting the vegetation to the accelerating pace of change could lead to major and permanent alterations to the natural environment and a decline in the productivity of forest ecosystems and their ability to store carbon.

It is important to establish strategies for adapting to the new regional Mediterranean conditions that integrate interactions and interdependence between climate change, biodiversity protection and combating desertification. To do this, we must take the following elements into account:

1. The diversity of the species and the strong intra-specific genetic variability are very significant in the Mediterranean region and constitute an important factor to be explored in the context of adapting to climate change.

2. The adaptation to drought processes of forest species involve finding silvicultural solutions best suited to the new conditions (stand density, etc.).

3. Groundwater must be managed in a sustainable way, taking into account the influences of climate change on the availability and water needs for populations and vegetation

4. Measures to conserve soil and combat erosion enable both water and the vegetation cover to be conserved, and should integrate the national strategies for combating desertification, protecting nature and managing forests.

5. All the actions implemented in this area must be based on the best knowledge available. Participatory experimental devices over a long period of time are essential.

6. The use of a network of small watersheds was specifically suggested, where base work has already been carried out, to experiment and model the use process of water by vegetation and erosion.

7. Finally, sharing knowledge is extremely important, especially internationally; also including the aspects associated with the participatory management models, in which the FOR CLIMADAPT project may take a leading role.

In light of the complexity and uncertainty associated with climate change, adaptation strategies require forms of governance that imply the various stakeholders contributing to the understanding of the phenomena and to the concerted action to tackle them, i.e. the scientific sector, public administration, economic agents and civil society organisations (associations and other). They also require a regional approach which incorporates sectoral perspectives. The preparation of the revision of the National Action Programme to Combat Desertification (PANCD) is a good example of this effort at good governance⁶.

Presentation of the ADPM

Since its foundation in 1980, the ADPM has developed a strategy based on a link between nature conservation and socio-economic development. From the need felt to intervene in different sectors considered crucial in the process of regional development, several lines of work have begun to take shape and be consolidated.

An interdisciplinary team of technicians has been assembled to confront the issues, capable of working together on a collective project for Mértola, in which the participation of local stakeholders is a key factor.

Introduction to the pilot site: Monte do Vento reserve

The site main features and values are as follows:

- A semi-arid Mediterranean climate.
- Significant biodiversity (Special Protection Zone, Guadiana site).
- Agriculture and agro-silvo-pastoral activities.
- A significant cynegetic potential facing increased mono-specific scrub.
- The Cork oak and Holm oak *montado*.
- Thin and even skeletal soils (lito-soils, see Photo 13).
- A torrential hydrological regime.
- A pronounced threat of desertification processes.
- A strong sensitivity to climate change.



Carte 9 : Uper view of the pilot site of the ADPM: Monte do Vento.



Photo 13 : Very narrow soils increase the vulnerability to desertification process.

Monte do Vento pilot project

In 1993, the ADPM acquired a property over 200 ha, through funding from the LIFE Programme, with the objective of establishing a pilot site for good management practices which could be copied by other owners and managers. The project was the result of collaboration between the ADPM, the WWF and the company Immobiente, responsible for the buildings work contract. The aim was to reconcile agriculture, forest and nature protection with the idea of having an area with multiple functions.

A few examples of its achievements are listed below:

- Promoting biodiversity through public awareness actions, environmental education, maintenance of plant species and local breeds.
- Soil conservation and restoration actions.
- Preventing natural hazards (wildfire, erosion, etc.).
- Promoting the productive potential of the properties with the aim of creating an economic value of the existing natural resources (organic farming, for example).

Most of these activities fall under the prerogatives of the FOR CLIMADAPT project which offers an opportunity to provide a helping hand while providing a multidisciplinary approach via the theme of climate change. The main funding comes from the national programmes AGRO and RURIS, and the European programme PRODER⁷ (restoring forest landscapes, minimising risk and installing traditional productive crops).

Other projects focus on reforesting agricultural land (Holm oak and Cork oak) and re-establishing the silvicultural production potential by combining shrub species, especially leguminous and the mycorrhisation of the roots of young seedlings for reforestation, etc.

Furthermore, modeling studies on soil erosion, monitoring the species used for reforestation and identifying the fauna and flora naturally present on the site have been carried out within the framework of the RURIS and AGRO projects and compared to the situation prior to intervention and control plots.

An important project of ecological restoration of Mediterranean rivers is also in progress. This consists of installing structures for torrential correction and protection banks (vegetation fringes), planting indigenous species and building natural traps to restore the environment (collection of sediment, maintaining a favourable environment for native species).

Local governance context

The Portuguese political-administrative is based on centralization and the organization of ministries and decentralised services. The municipalities tend to acquire more independence in terms of services and local planning, but central State's predom-

inance in the broad guidelines remains indisputable.

As regards property, large private properties dominate (barely 12.5% of forests are in the public domain). There are some professional organisations⁸, of farmers and forest owners, but few of them are actually present on the political scene.

Nature parks are run by 5 regional centres ("Nature Conservation" department of the Ministry of the Environment) and have no local representation. In light of the low level of involvement of public institutions in relation to the environment and heritage preservation, the ADPM has gradually gained an indisputable place regionally in these areas and was at the forefront of creating the Vale do Guadiana Nature Park in 1995.

In Portugal there is very little difference between a National Park and a Nature Park. In the first case, economic activities are not prohibited, but in fact, they are more focused on environmental issues.

Natural environment and climate change issues

As the Emberger's climagram shows us (see Figure 1 page 8), the Alentejo Region has a semi-arid climate (annual rainfall is less than 400 mm). The scenario that seems to be confirmed is that of a rise in temperatures while rainfall remains stable. One of the main consequences will be more defined climatic contrasts. The most productive areas, located in the north-west of the country, will be even more so, while the more arid regions, will be even more threatened by the process of environmental degradation and desertification.

The site is located on soil that is generally quite superficial and acidic because it is developed on primary schist. The absence of limestone and the scarcity of calcium in the soil results in extreme sensitivity to erosion due to the fragility of the aggregates. The soil requires extensive cultivation precautions and it is not surprising that the untimely use of ploughs on the hillsides results in the erosion and desertification of these landscapes.

For the ADPM, the solution locally lies in diversification, especially regarding agro-silvopastoral activities.

The pilot site context

The site has traditionally been occupied by a *montado* (Portuguese equivalent to the Spanish *dehesa*) which is a clear forest of Holm oak, Cork oak or a mixture of both. The low density of trees permits agricultural crops alternating with grazed fallow land. This agro-silvopastoral synergy is particularly effective for making the best of the Mediterranean resources.

The farmers ensure the regeneration of trees by identifying and protecting the young shoots from the teeth of livestock. Sadly, this subtle balance has been extensively altered follow-

ing the change to the rural world since the mid-20th century. Tractors and ploughs have replaced the swing plough drawn by oxen, causing severe soil erosion. Furthermore, the regeneration of trees is no longer protected and most of the *montados* are now in a state of dieback.

The Lower-Alentejo region has experienced a mass rural exodus and has been depopulated. Its population density has collapsed (4 inhabitants per km² in Vale do Guadiana Nature Park). The ADPM's goal is to halt this decline by proposing agro-silvopastoral development thus counteracting the desertification of these semi-arid areas, not forgetting a socio-educational component.

The property has recently been replanted with the aid of grants from the Portuguese State, according to certain innovative technical methods that were presented to FOR CLIMADAPT project partners during the field trip.

The objective displayed by the ADPM is to develop multiple functions, which is fully justified in the environmental and social context and in light of the weakness of purely forest productions.

Ecological restoration of the montado landscapes

Cork oaks and holm oaks are planted according to the contour lines. The lines are spaced every 12 m, the seedlings are 2 m apart, individually protected by tree shelters that are 50 cm high, with their base propped up to keep them in place.

On some plots, these plantations are pure, while on others planting dividing bushes has been experimented with the aim of achieving a synergy with the trees: nitrogen fixation in the air by the legumes, function of shelter from the wind, sun, etc. Also note the strawberry tree plantations in the open areas, whose fruits have considerable local outlets.

Although the harvesting of Stone pine is considered relatively profitable in Portugal, local species, such as oak trees, have been preferred, without going through a pioneer resinous



Photo 14: The Monte do Vento site is characterised by a semi-arid climate and the presence of a relatively degraded *montado*. Hedge works of reforestation have been undertaken by the ADPM.

stage. Oak trees are also more favourable for the multiple function use sought by the ADPM.

The Carob tree (*Ceratonia siliqua*) is also widely planted in the region due to the numerous lucrative uses of carobs as additives in the food industry, etc. However, the species is demanding in terms of agronomic care (watering in the first summer, repeated hoeings, etc).

Some owners in the vicinity of the site have benefited from the same financial aid for reforestation and clearing of vegetation, despite having applied management methods that do not care about biodiversity and the risk of soil erosion.

Restoring biodiversity

These introductions of shrubs also have the role of restoring the local biodiversity by hastening renaturation by forming a local shrubland in these areas degraded by ploughs and fire and too heavily dominated by *Cistus ladanifer*. Species naturally present in the vicinity will also contribute to enriching the flora: *Lavandula viridis*, *Ulex australis* and *Erica australis*. Herbaceous flora includes plant associations typical from dry cork oaks stands (*Helianthemum guttati*).

The "climax" vegetation of the region would be a forest quite clear of Holm oak and Cork oak dominating a maquis of *Ericaceae*, *Lentiscus*, *Ulex*, etc. The plantings carried out should accelerate the phytodynamic evolution towards such a climax.

This biodiversity change however ought to be validated by scientific observations according to a precise protocol.

Wildfire prevention

This is ensured by maintaining ploughed strips of land on the not very steep hilltops along the periphery of the estate, as well



Photo 15: One of the methods chosen to combat fire is to alternate 2 or 3 cleared or ploughed areas with 2 or 3 natural or just grazed areas (the "3 by 3" method).

as by adopting the "3 by 3" system which consists of alternating sequences of three cleared or grazed areas, and three un-cleared areas (see Photo 15). Note that these clearings have the disadvantage of encouraging the proliferation of the Gum cistus (*Cistus ladanifer*).

These slight fuel firebreaks are effective and adapted to the local risk (not very intense fires relatively because there is little biomass available) but the problem of the availability of water remains, as the hillside reservoirs are fairly remote. Large-scale rural-urban migration is also an aggravating factor for forest fires. The fields are no longer cultivated or grazed, prevention work has become necessary and the fires take on greater magnitude.

Desertification prevention

Ploughing on this type of fragile and steep terrain is recognized as a practice that encourages erosion and desertification. On the estate, it was decided to limit its use to just protecting strips of land from wildfire. The other plantation inter-bands are maintained by rustic sheep grazing.

Even well conducted grazing is not sufficient to keep the Mediterranean areas subjected to a strong woody dynamic "clean". It would be advisable to consider crushing pasture residue. This practice could replace ploughing in steep areas.

Developing agriculture

On the northern part of the property with slightly thicker, more fertile soil, cereal crops have been grown between the rows of trees.

Boosted by the presence of legumes, these crops mean the cleared soils do not have to be left bare while enabling the manager to draw an income or to constitute green manure. All agricultural crops on the site comply with Organic Farming specifications. The site is considered to be an agro-forestry space by the State.

The leguminous combination enabling nitrogen to be fixed in the soil, forest and local species to produce viable products (fruit, medicinal plants, etc.) and cultivated or grazed areas offer the fragile natural environment a certain balance.

Livestock development

Extensive pig breeding is traditional. Local meat products are very highly valued. One solution would be to plant other species of oaks to stagger the acorn production calendar: *Quercus faginea*, *Quercus coccifera*...

Sheep breeding, especially the local *campaniça* breed, is

also traditional and should be encouraged because it contributes to maintaining the silvopastoral environment.

The supply of local fodder should be increased. The sowing of *Trifolium subterraneum* should be especially suitable due to its winter-centred biological cycle⁹. This leguminous sowing could be supplemented by grasses with Mediterranean cultivars of *Dactylis glomerata*, *Phalaris tuberosa*, *Bromus catharticus* or even woody fodder such as Tagaste (*Cytisus canariensis*).

Bee-keeping development

Bee-keeping is also a locally productive activity because of the wealth of melliferous plants in the maquis.

The flowering calendar of local species presents a production gap during the summer. In the absence of transhumance towards the mountains, melliferous plantings using trees or shrubs that produce nectar and pollen in full summer could be proposed (*Evodia sp.*, *Sphora japonica*, *Koelreuteria paniculata*, etc.).

Promoting hunting

Small game (rabbits, red partridges, etc.) is abundant in the area, but the property is not hunted following a deliberate choice by the ADPM, it may build a wildlife sanctuary. Currently, the hunting economy represents EUR 8 million per year in the Mértola region.

In other regions, hunting is quite rightly encouraged. An ad hoc agreement could be passed with a hunting society or a group of hunters, with a specification setting out the rights and duties of each so as to avoid conflicts of use.

Harvesting aromatic plants

The pedoclimatic conditions being in principle favourable for many Mediterranean maquis aromatic plants, the ADPM has

included this option in its management guidelines. It would be particularly interesting to explore the trail of the *Cistus ladanifer*, because the *Cistus* genus is often very rich in essential oils, which would mean that this plant, which is currently perceived as invasive, could be encouraged.

Mushroom production

The oaks introduced are usually mycorrhizal by edible mushrooms, but in general you have to wait forest maturation until you see some recoverable species such as porcini mushrooms.

Educational dimension

The buildings have been constructed for the purpose of receiving the public, and in particular primary school classes, for education sessions on the environment for schools from the nearby region. There is a partnership with the public school of Mértola, which sends all of its students (one hundred) every year without any financial compensation. The site also hosts many other classes from the entire region, and from all over Portugal, for a provision fee. Each year a theme is chosen (hunting, introducing the Lynx, birds of prey, cork, the use of non-timber forest products from the forest such as honey, mushrooms and aromatic plants, etc.).

In order to give more weight to the experiment, a couple of farmers got involved and now reside on-site permanently. The problems faced at Monte do Vento are the same as those faced by many farmers and land owners in the region. It is therefore important to include a daily life dimension in this experimental approach in order to create a showcase to inspire new initiatives.

Furthermore, a partnership with a State programme designed to provide work for people seeking reintegration (for example, ex-prisoners...) has been requested, but has not produced any results so far.

Conclusion

This aridity context which is extreme for Europe (see Figure 1 page 8), is a good example of what long-term impacts climate change could cause in other regions.

The project visited impacted the minds of participants with its multifunctional, participatory and coherent nature. Rather than conduct experiments focused on a single problem and ignoring the rest, the ADPM has preferred to develop a project trying to respond simultaneously to multiple local problems. More than 15 institutions have been associated with the partnership.

The FOR CLIMADAPT project lets you analyse the results of the experiments developed by other ecological restoration and forestry projects.

All of this should now enable it to be seen that it is possible to sustainably restore a strongly degraded environment while developing income-generating activities and preserving the natural local heritage. However, it will take several decades to determine if this system is really suitable, and if it resists to climate change in the long-term. Be that as it may, the initiative deserves to be welcomed and seems not only to be part of the national forest strategy of Portugal (see www.forclimadapt.eu) but also to contribute to improve the adaptation and maintenance of this rural ancestral ecosystem symbolic of southern Portugal and particularly adapted to the Mediterranean climate that constitutes the *montado*.

Notes

- 1 - Note that the National Plan for the Adaptation to Climate Change for Portugal is currently being revised, particularly with reforestation and promotion projects of non-market forest goods.
- 2 - More details in the full report from the second seminar, which can be downloaded at www.forclimadapt.eu.
- 3 - Source: Institut national des ressources naturelles [National Institute of Natural Resources] (INRB).
- 4 - It should be noted that the south of Portugal only uses 50% of the water which is potentially available for irrigation.
- 5 - The change recorded confirms the scenarios provided in the framework of studies of the SIAM project (Climate change in Portugal, Scenarios, Impacts and Adaptation Measures) <http://www.siam.fc.ul.pt/>.
- 6 - This review is specifically focused on the strategic goal of supporting synergies of action with the two other United Nations conventions, "climate change" and "biodiversity", by proposing the establishment of reference centres which also provide awareness-raising and dissemination of this knowledge such as the Vale Formoso Erosion Experimental Centre. The absence of an equivalent reference for forest systems has led to the establishment of new structures in this area being proposed.
- 7 - Grants from the EAFRD, European Agricultural Fund for Rural Development.
- 8 - Note: To receive grants, the owners must be grouped together.
- 9 - International level expertise exists locally. David Crespo, an engineer from the Badajoz station, has worked extensively on the use of this fodder species.



Photo 16 : Debriefing of the field trip on the site of Monte do Vento.

Elements of capitalization

First peer group meeting Marseille, 3 December 2011

Reminder of the peer group's missions

As President of the peer group, Louis Amandier presents the different methodological points of the terms of reference of the peer group, and more specifically:

- The importance of clearly understanding the concepts and collectively approving the terms of reference for this group (see data sheet "Terms of reference for the peer group" contained in the folder distributed to the participants).

- The overall role of the peer group, namely capitalisation consists of extracting, discussing and redefining the ideas arising from the different actions of the project (seminars, pilot actions of the partners, etc.) in order to gradually acquire a shared view of the issues and to identify transferable good practices. To sum up: "find out what the problem is to act in a concerted manner".

- The debates should be restricted to the issue of adapting to climate change in Mediterranean forests. The aim is to achieve sustainable management of the resource (and not a simple mitigation of the effects of climate change).

- The peers are professionals; independent of the partner they represent, in order to provide an objective view. However, they must have a good knowledge of the context, situation and evolution of the actions carried out by their respective partner.

- Attendance by the members of the peer group over the 3 years of the project duration is essential for the system to operate effectively, unless there is a major impediment, in which case a replacement, well-informed on the progress of the discussions, can replace the member.

The terms of reference are approved by the peer group.

Tools and methods

The idea was proposed and adopted that each member of the peer group should fill in a "who is who" identity form with an identity photo and basic information.

The website for the project was set up and any information, records and other documents to be disseminated can be put online through the AIFM.

Finally, Jean Bonnier recalls that an evaluation of the project will be conducted half-way through by an external provider (still undetermined). This evaluation will consist of an assessment of the overall operation of the project, in contrast to the work of the peer group, which capitalises and assesses the pilot actions developed in the regions on an on-going basis.

The diversity of the various partners' projects is both an advantage and a disadvantage. Significant efforts will be needed to understand and identify a synergy (Louis Amandier). In particular, each partner should present a detailed description (in the form of project-sheet) of their work context, based on a common framework. Myriam Legay, for example, mentions the usefulness of nomenclature for the bioclimatic stages and the soils used in the Echoes project. Emberger's climagram and Pierre Quezel's synthesis on the Mediterranean region are also interesting alternatives for bioclimatic classification.

Lucio do Rosario mentions the case of the ADPM's combat against desertification. The project is part of a national strategy and it needs tangible numerical indicators (number of people affected, change in the amount of wood charcoal/carbon extracted, etc.) which will not necessarily be in line with those of other partners... Louis Amandier responds that there will inevitably be incompatibilities, but the important thing is to circulate the information between the partners and between members of the peer group.

The peer group must be able to ensure compliance with the objectives and the calendar, as well as reminding partners of these points. Jean de Montgolfier notes that it is particularly important for the partners to clearly define the planned actions. In the QUALIGOUV project, the evaluator was disturbed by a significant difference between planned actions and the reality on the ground, and by the weakness of the documents produced as feedback by the peer group.

The peer group requires at least a full day following each seminar. Exchanges of ideas can be supplemented by communication by email, or by Post-Its but this shall not replace direct exchange (Jean Bonnier). This brings the minimum duration of each seminar to 3 days. It is therefore necessary to allow almost an entire week and plan the deadlines as far in advance as possible so that this can be integrated in professional diaries in time.

Analysing the ONF's activities in the Alpes-Maritimes

On the Seranon site (scots pines in dieback downstream of a stand of silver fir trees), Jean Bonnier brings three interesting ideas to the debate:

- Should trees in a state of dieback be used, and if so how?

This action, condemned by some stakeholders during the symposium in Marseilles (on 30 November and on 1 December), is however subsidised by the General Council of Alpes Maritimes.

- There is great deal of uncertainty among forest managers as to the choice between natural regeneration and reforestation and the choice of appropriate species, etc. How relevant is introducing new (local or imported) species? What are the characteristics of an invasive species?

- The dynamics of the Silver fir tree is astonishing: it tends to spread beyond its natural range even though it is in a delicate position (dieback) due to climate change.

In fact, foresters today feel relatively lonely in decision-making. Projects such as FOR CLIMADAPT could provide them with answers, but the lack of time (3 years, not very long in terms of a forest, and even less in terms of climate change!). Moreover, not all the stakeholders are equally equipped. For example, there is a detailed study on the Silver fir tree in the Alps, but the manager of the other experimental site of the ONF, in the department of Aude, does not have an equivalent in the Pyrenean region.

The challenge facing FOR CLIMADAPT is therefore to develop support measures and concrete tools widely available to managers.

Making use of dying trees is about crisis situations management. However, it is not easy to offer a suitable answer given the variability of species and contexts. For example, in other places, cork oaks attacked by a parasite should be removed; however it is less problematic for pines, etc.

Favouring regeneration or planting?

According to local ONF agents, the best alternative to the Fir, by planting, would seem to be the Atlas cedar (*Cedrus atlantica*). But in natural regeneration, there does not seem to be any prospects there as fir trees tend to colonise the areas mainly with Scots pines, despite its tendency to dieback in adulthood.

This debate deals particularly with this ideological dimension related to the fact of artificially introducing new species. For Dimitris Lamprou, introducing a new specie has unforeseeable consequences on other species and therefore on the ecosystem balance. Myriam Legay believes that it depends on what species we are talking about. For example, we know that introducing the Cedar is not an irreversible process, unlike other species (including Fir tree).

However, the organisers of the trip recognised that the experimentation conducted by the ONF in the Alpes-Maritimes, and more precisely through the experimental plot, still does not tell us about the long-term impacts of introducing the Cedar.

Management objectives

It is not easy to clearly identify the objectives currently pursued by the ONF management in the region. Promoting wood, especially firewood (wood chip factory in the vicinity) has been expressed there, but does not seem paramount. The multiple functions aspect of the forest has hardly been questioned. Originally, these plots were acquired by the State within the scope of Mountain Land Restoration (combating erosion and natural hazards), unlike the site in the Aude, whose objective is purely wood production. The Seranon and the Public forests of Nans sites are now an "open-air laboratory" for studying stand changes related to climate change. Furthermore, in addition to work on these two sites, the ONF can draw on its overall experience and must therefore find a way to better centralise the enormous mass of information available on these issues (Louis Amandier).

Dimitris Lamprou presents the case of Greece where forests generally belong to the State and to the Orthodox Church, even if it concerns fallow former agricultural plots. The few private wooded areas are those which are intended for grazing (silvopastoral systems) or the planting of fruit trees or poplars for paper pulp. Wood prunings from orchards are even used as fuel wood. In the most arid part of the country, the forest as such has clear limits and there is generally little intervention apart from the regular clearing of vegetation and skidding of dead wood by the State forestry services, particularly for defence against forest fires (no political will to take responsibility over management). Large-scale wood production is the subject of a truly production-based culture on agricultural land, although they are quite rare.

This production-based approach is disputed, but even in the case of France, it could be that this is the best way of producing wood in large quantities. It would perhaps be more sensible to abandon the objective of mass timber production in the forests managed by the ONF, even more reason to do so given that the Mediterranean forest is not particularly suited to it because of its pedoclimatic characteristics. The management objectives should perhaps be more geared towards the multiple functions aspect (heritage, tourism, environmental services and prevention of natural hazards, etc.) of Mediterranean forests. Services to society that should also be taken into account in the policies and the managers should be duly compensated.

The challenge of using dry biomass by converting it into fuel wood during clearings remains; but some believe that this is only rarely profitable.

Giorgio Iorio believes that, whether it is commercially viable or not, wood will always be used in one way or another. For example, an isolated smallholder will always use his wood for heat, while offering a service to the community by maintaining the understorey and fire hazard prevention.

Links between the project and other Mediterranean initiatives

Lucio do Rosario pointed out that Portugal is working on tests to introduce new species, in partnership with Andalusia. He believes that a mixed stand (pine/oak for example) supplemented by shrub elements and possibly a pastoral component may be a good solution for maintaining stands. However, it is important to evaluate the indicators, especially the price and planned volumes of wood according to the selected species and the local contexts.

Olivier Picard mentions in particular the REINFFORCE¹ project by the European Institute of Cultivated Forests which provides for the planting of 35 study plots, including 4 from the north to the south of Portugal.

Taking other Mediterranean countries into account has also been questioned, and in particular those of the southern shores which should be incorporated in this sharing of indicators. There is actually a relative continuity between the south of Portugal and the north of Morocco.

It is important to understand the link between local initiatives and global projects, because this affects the highlighting of transferable good practices. Thus, ADPM's project is integrated in a national strategy to combat desertification, whereas the experiments conducted by the ONF in the Alpes-Maritimes respond to overall internal guidelines. The FOR CLIMADAPT project must have this unifying aspect, particularly via the peer group. Its objective, recalled in the terms of reference, is to strongly support collective reflection on specific sites and concrete actions while keeping a certain objectivity necessary for capitalisation.

The initiative of the AIFM-RMT Aforce network is also a long-term job which echoes the initiative of the association "Forêts Méditerranéenne" to develop a platform for exchanging ideas and transfers between multiple stakeholders on the topic of adapting Mediterranean forests to climate change and bringing it to national level. The originality of this approach lies in the diversity of the stakeholders involved. This approach should be initiated at international level particularly through the contribution of the AIFM.

The long-term objective of such networks is that the Mediterranean countries, often neglected by the major forest countries of the north (Germany, Scandinavia, Poland, etc.), can take part in the debate and be heard.

In this kind of network, the problem of language remains. We cannot expect a field forester or a shepherd to speak English. But whether we like it or not, English tends to have significant importance for cooperation, even in the Mediterranean!

To conclude, some points to remember (on the background)

- Foresters have an urgent need for knowledge and methods applicable in the field in a context of rapid change.
- The preferred replacement for Fir trees diebacks is the Atlas cedar. The secondary issue is using the dying wood (crisis management). In this case, which support policies should be developed for which usage?
- Mediterranean forests are not ideally suited to wood production. What are the main objectives for their management (biodiversity, limiting natural hazards, recreation/tourism, etc.)?
- By changing the environment, man inevitably affects natural processes. Besides the unforeseeable long-term consequences on natural environments, this poses an awareness problem for some. From which the basic questions arise: will climate change compel us to change our values in respect of forests?

Note

1 - Project Interreg IV B aimed at setting up some research infrastructures for facilitate studying of adaptation of forest species to climate change in the atlantique Arc.

Web site : <http://reinforce.iefc.net/>.

Second peer group meeting

Mértola, 21-22 June 2011

Evaluation of ADPM's project

Having a permanent and independent experimentation site such as the Monte do Vento and being able to use it to communicate and educate a wide audience is very valuable. This is already the first requirement of transferable good practices. However, it seems appropriate to go further in the management and reforestation plans by putting in place specific protocols, reference areas for comparison, a monitoring system especially in a period of water stress, etc.

Combination of other species of oaks, to spread the production of acorns in particular, has been suggested. However, this is only relevant if there are pigs to consume them.

It is important to know that the choice of species is conditioned by their eligibility or not in respect of the national guidelines (eco-conditionality of financial aid by the PAC for Portugal in particular). The latter are not necessarily relevant locally, which is why the ADPM chose unexpected species such as oak or Strawberry trees (native species) rather than the Stone pine.

Gaetano Di Pasquale proposes creating a database of all the species of reforestation which will be used by the partners with the characteristics, context and usage methods for each one in order to track them. On the other hand, the complementary systemic side of the various components of the project (aromatic plants, reforestation, agriculture, etc.) is a fine example for other similar projects.

It is also very important to integrate local stakeholders in the considerations via targeted communication. Otherwise there is a risk of always having the same problem: impressive accomplishments, but not suited to the actual needs of local populations. The socio-economic aspects and dialogue are in fact fundamental in the Mértola project and this is what gives it its strength.

For Jean Bonnier, it is precisely this "integrated" vision of regional projects that needs to be carried over to major forums (European Commission, Convention on Biological Diversity, etc.) by proposing concrete methods. It is one of the missions of the FOR CLIMADAPT project. Lucio do Rosario has already begun to do so, especially with the group "Mediterranean Basin and desertification" from the European Council.

Furthermore, the institutional position of the ADPM is not clear for some people. It seems that the State would prefer to delegate its powers rather than to do the work itself. However, there should be a precise book of specifications on the association's exact missions.

However, almost all of the ADPM's funding comes from projects. The State has therefore not invested actively to arrive at this

situation. The situation is very different in Spain, for example. In fact, the CTFC was a joint and concerted creation by local authorities and forest professionals, while in Portugal, a national policy promotes structures of this kind.

The ADPM not only works on environmental issues but also for agricultural and social development. It is a reference structure in its environment. In its early days it often worked in partnership with the WWF, but these days "everyone conducts their own business".

As regards the Vale do Guadiana Nature Park, it is more of a regional quality label, even though it has little of visibility on the ground. In the region, the ADPM is more recognised than the Park.

General organisation of the project and the seminar

Whilst the first seminar in Marseille was an opportunity to make a point on the changing situation since the symposium in 2007 on climate change in French Mediterranean forests, the one of Mértola went more to the heart of the matter from the point of view of a region faced with severe desertification problems.

The idea is raised to determine a specific theme for each seminar which matches the context of the country and the activities of the organising partner. So, the Mértola seminar could have focused on the theme of the desertification, the one of Marseille on the question of diebacks (ONF), as the one of Vesuvius insists on primary succession issues and ecological engineering, that of the CTFC on combating fires, etc.

Failing that, a better balance between general and specific data will have to be struck, which implies providing stakeholders with precise specifications.

It also seems necessary to devote more time to the presenting the progress of partners' projects, which is a fundamental aspect in the life of the project.

Greater agreement is also required over communication methods. For example, it would be interesting to present meetings in the form of workshops on concrete topics rather than under the heading 'seminar' which mostly attracts large national or regional institutions, but not field stakeholders.

Finally, it would be useful to know better 'who is who' in the meetings. This could be promoted by two main steps:

- Provide participants with name badges.
- Go round and introduce the participants.

The problem of language and interpreting services, which is not always of the highest quality, remains. The interpreters need to have the technical documents available, at least one week in advance, so that they can familiarise themselves with the subject and the vocabulary.

Update on the initial state of the pilot sites and partners' projects

On the publication date of this progress book, all the initial reports introducing the context of the pilot sites and partners' projects are finally available. Emberger's Climagram offers an idea of the context and central issues for each area, at a glance (see Figure 1 page 8). For example, we are not talking about timber at Mértola (arid climate), whereas the ONF and Catalonia (sub-humid climate) are more concerned.

By contrast, the request for additional information, particularly containing a complete ombrothermic diagram for each pilot site, as well as the anticipated trends, has not yet been prepared by some partners. On the other hand, not all GIS map files have been gathered.

It is clear that the peer is responsible for sending the information to the AIFM, but they are not required to gather and rewrite the data. The peer may call upon the partner to do this, depending on the availability and capabilities of each of them.

The initial state is also interesting to highlight the representativeness of the pilot sites in respect of the diversity of Mediterranean environments. On the other hand, it would be good to have a historical and heritage reference specific to each site.

However, this is not a scientific project but a project to promote actions on the ground. It should therefore try not to suffocate the reader with an excess of working papers or bibliographical references. The important thing is to be able to communicate with civil society.

Regarding the content of this initial state, the "international dimension" part should not be neglected. It should more serve to

highlight international perspectives and devote more energy and time to passing on what is being done locally. In retrospect, this could help to boost the local actions of partners and improve their teaching dimension.

Lucio do Rosario, moreover, suggests that the project's conclusions contribute to developing the respective national strategies of the partners on adapting to climate change or combating desertification.

The Mértola project can also provide solutions for North Africa, for example. In fact, the issues of arid environments are much more important on the southern shores of the Mediterranean.

It is also necessary to be aware that, by the end of the project, there will still not be concrete results in terms of the long-term adaptation of forests. For example, we will have to wait several decades to be able to assess and quantify the impact of reducing the stand density tested by the ONF. Be that as it may, the questions formulated by the project are already a step forward, even if there is no immediate answer.

Finally, a dimension of perspectives must be incorporated into the project, because most of the pilot actions will go on after the 3 years duration of the project.

State of progress of partner's activities After two seminars

National Park of Vesuvius

Project context and partner's background:

FOR CLIMADAPT is a continuation of other projects addressing the topic:

- "Desemet": desertification, biological engineering and soil protection in a Mediterranean environment.
- "RECOFORME": sustainable forest management.
- "PIT Vesevo": establishment of monitoring biological engineering constructions.

The work covered by the PNV in the framework of the FOR CLIMADAPT Project focuses on the following:

- Silviculture and developing degraded environments.
- Improving governance.

The specific objectives are as follows:

- Defining and standardising procedures to create small biological engineering constructions.
- Improving combating invasive species in the "Tirone - Alto Vesuvio" Reserve.
- In the PNV it is compulsory to intervene in biological engineering works. The standards provided for in the Plan for the park are crucial for regional laws.

Actions carried out during the last semester:

12 experimental plots were identified in the "Riserva Tirone - Alto Vesuvio".

The following were completed:

- surveys of the stands structure in the plots;
- surveys of the plants introduced in the experimental plots.

The progress of the PNV's activities is consistent with the timing indicated in the chronoprogramme.

AIFM

Actions carried out during the last semester:

Communication activities:

- Development of the graphic charter of the project.
- Setting up and actualization of the website www.forclimadapt.eu (delivery scheduled for October 2011).
- Publication and spreading of a pamphlet for presenting and promoting the project (French and English versions available).

Capitalisation activities:

- Writing of the reports of Marseille and Mértola seminars.
- Peer group supervision (holding of meetings in Marseille and Mértola, development of an initial state of the regions and pilot projects).
- Writing of the first Progress book of the project.
- Capitalisation meeting organised by the MED programme (Rome, June 2011, Marseille, November 2011): creation of a cluster on forest projects (sustainable management of natural resources). Idea for a shared event, to involve European authorities.

Activities to be carried out during the next semester:

- Preparation of the next Peer group activities.

Establishment of synergies with other initiatives:

- Participation in activities and synergies with the southern and eastern shores of the Mediterranean, particularly in the MENA region (Turkey, Syria, Lebanon, Tunisia, Algeria and Morocco) in the framework of the FFEM project, 2011-2014.
- Evaluation and promotion of the FOR CLIMADAPT results through the AIFM network and other networks.

Region of Umbria

Project context and partner's background:

The identified pilot site is the mountain community of the Valnerina, which extends over 34,200 ha, of which 44.7% is covered by highly flammable forests (*Quercus ilex* and *Pinus halepensis* mainly). Much of the forest is private (9,800 ha) and several parts are integrated in the Natura 2000 sites.

One of the major consequences of climate change in the Mediterranean region is the increase in forest fires. Between 1996 and 2010, 268 ha were burned. The majority of the wildfires were of criminal origin (68.7%).

Activities to be carried out during the next semester:

- Analysis of the data, especially on the causes of forest fires and the effects of climate change.
- Definition of a management model integrating the participation of local stakeholders.
- Deliverables: Local management plan for forest fires and wood supply and carbon storage plan.

CTFC

Actions carried out during the last semester:

A pilot site has been identified. It is characterised by:

- The planting and sowing of 3 species of the *Pinus* genus and from 2 different origins.
- Altitude gradients (700-1400 m.) and significant sunshine on the site.
- Micro-stations, the presence of herbivores and a considerable shrubby stratum.
- Detailed monitoring of the germination, survival and growth of the different planted species will be put in place.

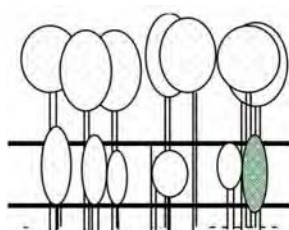


Figure 5 : Représentation schématique des différents niveaux de discontinuité d'un peuplement forestier.

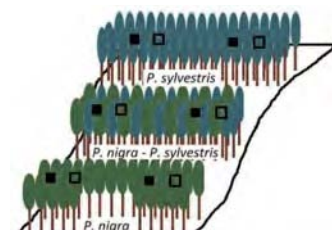


Figure 6 : Etagement des différentes espèces de pins suivant l'altitude.

Planned actions:

Action 1: "Enrichment plantings" in the mono-specific forests intended to improve the resilience of stands to natural disturbances

The solutions envisaged by the CTFC in planted forests are as follows:

- The naturalisation (succession, migration, specialisation) permitting species to adapt naturally to the new conditions.
- Promotion of this naturalisation through silvicultural processes.
- Help with the adjustments through "enrichment planting".

Action 2: Development of silvicultural treatments for creating fire-resistant forest structures.

The main solutions to lower the risk and the intensity of the wildfires are:

- Reduce horizontal continuity.
- Reduce continuity vertical.

The first thing to do is to characterise each forestry sector in the Region in order to determine which types of intervention should be carried out.

Possible interventions are as follows:

- Reduce the vegetation by removing the shrubby stratum greater than 1.30 m, as well as any large trees whose branchwood is in contact with the ground.
- Reduce surface fuel by performing selective clearings or prunings in the case of mixed forests.
- Remove cut remnants.

Monitoring of the pilot site will be established, and the treated surfaces will be tested using the NEXUS tool. Furthermore, the use of fire as a management tool (supervised burning) will be tested and evaluated in the Aleppo pine stands.

ONF

Actions carried out during the last semester:

See pages 29 to 31.

Difficulties faced:

- Delay in the state-of-the-art on adaptive silviculture in France due to the technician responsible for the report leaving.
- Picaussel experiment awaiting operation.
- Callong experiment on hold because the roots or cedar planes are not available.

Activities to be carried out during the next semester:

By the end of 2011, the actions to be carried out are:

- Achieve the state-of-the-art adaptive silviculture in France.
- Carry out the Picaussel experiment: clearing, initial measure, writing of the report.
- Callong experiment: seed collecting, site preparation.
- Nans experiment: report drafting.

ADPM

See pages 37 to 41.

Association "Forêt Méditerranéenne"

Actions carried out during the last semester:

This 3rd semester was largely devoted to the publication and dissemination of the proceedings of the symposium "Observing and adapting to climate change in Mediterranean forests", seminar 1 of the project. The final document consists of 26 articles (see pages 19 to 24) by 50 authors and 172 pages (<http://www.foret-mediterranee.org/fr>). 700 copies have been printed and disseminated.

The secretariat has ensured the dissemination of this document, for subscribers of the magazine and for all the project partners (via the services of a router).

The release of this document has been announced in the association newsletter (*La Feuille et l'Aiguille*, No.84, August 2011) released to nearly 4000 contacts in France and other Mediterranean countries.

The announcement has also been disseminated in all the French technical forest press, as well as to the association's mailing list.

A database, containing the details of the keynote speakers at seminar 1 of the project, was created: researchers and French managers who have conducted research programmes and experiments in the field of the adaptive management of Mediterranean forests to climate change, was already available. This database has been improved (topics entered) and completed during the 3rd semester with other details of researchers met during the various seminars, meetings and symposiums on the subject.

List of participants to seminars 1 and 2 of the FOR CLIMADAPT project

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

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